Cretulae with Linear A script from Archanes, Crete, Greece. Minoan civilisation, 15th century BCE. Archaeological Museum of Rethymno. Photo by DeAgostini/Getty

Cracking the Cretan code

Linear B has yielded its secrets, but Linear A remains elusive. Can linguistic analysis unlock the meaning of Minoan script?

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A. At the end of the 19th century, when Arthur Evans was the keeper of the Ashmolean Museum at the University of Oxford, he became fascinated with a tiny carved agate gemstone. It was donated to the museum by a Reverend Greville John Chester, in 1886, who seems to have purchased it in a bazaar in Greece. The stone bore small enigmatic symbols, which Evans took to be evidence of early writing. On finding out the gemstone was originally from Crete, he headed to the island in search of more traces of this strange, unknown language. He didn't have far to search. Once there, he found that these gemstones were locally known as

'galopetres' (milk-stones), and commonly used as amulets by breastfeeding mothers to ensure milk supply for their babies. He purchased a good number of these stones and, to his great excitement, found that they were carved with similar symbols. He soon started to formulate his theory of the existence of pre-alphabetic writing, culminating in his 1893 announcement before the Hellenic Society in London that he had a 'clue to the existence of a system of picture-writing in the Greek lands'. The results of this initial investigation were further illustrated in his [monograph](#) *Cretan Pictographs and Prae-Phoenician Script* (1895).
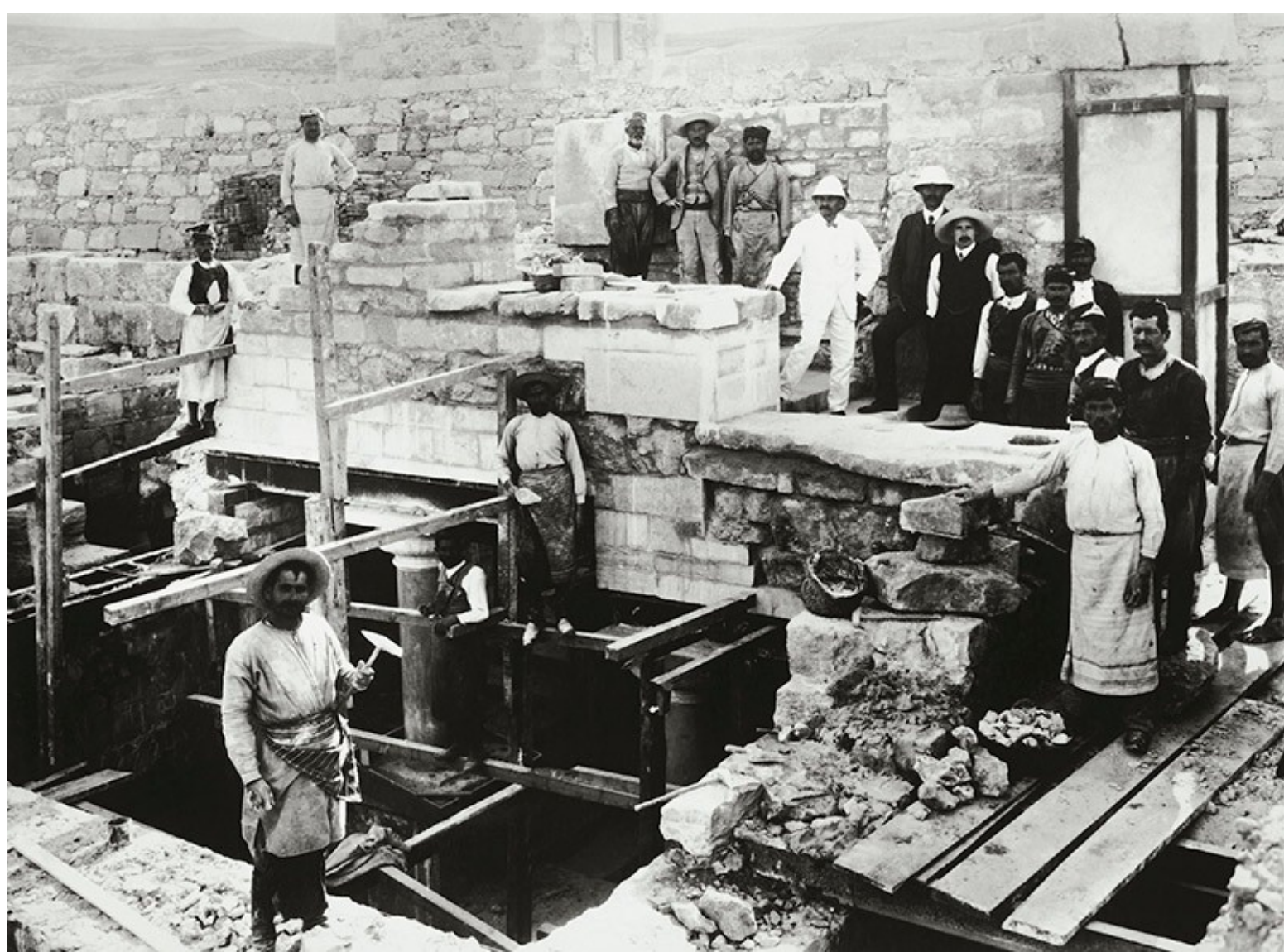
The archaeologist Arthur Evans photographed during the reconstruction of the Minoan Palace at Knossos, Crete. Late 19th/early 20th century. Photo by Getty

Why was Evans so driven to seek out early examples of writing in the Aegean? The anthropological theory of his day assumed that writing, deemed a significant cultural achievement, was one of the features expected of 'complex'

societies. Determined as he was to find tangible evidence of Homer's Palace of Minos and its thriving civilisation (just as Heinrich Schliemann had earlier discovered Priam's Troy), Evans could not but expect the existence of writing in that context. Moreover, in the age of intensifying nationalism, finding evidence of writing in prehistoric Greece would be instrumental in claiming the independent character of Europe, freed once and for all from the influence of the *ex oriente lux* paradigm. Finally, the acquisition of the Rosetta Stone by the British Museum in the early 19th century and the subsequent [decipherment](#) of Egyptian hieroglyphs by Jean-François Champollion in the

1820s sparked a general interest in dead languages and undeciphered scripts. Evans was determined to decipher another unknown language.

Unfortunately, he was less lucky than Champollion: Evans never found a bilingual text, like the Rosetta Stone, which would have enabled him to decipher Cretan scripts (indeed, no one has so far). He did, however, succeed in setting the foundations for the classification and systematic study of Cretan scripts. More than a century later, how close are we to bringing back to life the dead languages of the early Cretans?

B. The island of Crete saw the rise of the earliest writing on European soil. Although the theoretic concept of 'writing' (a way of marking speech by means of graphic sign-units) is likely to have been adopted from the neighbouring areas where it had already been in use, namely Egypt and the Near East, the particular shape of signs and the layout of inscriptions make it stand out as a local innovation, independent of pre-existing templates. The earliest scripts, going back to the Bronze Age, are Cretan hieroglyphic (*c*1900-1600 BCE) and Linear A (*c*1800-1450 BCE). The former is almost only attested to on Crete, while the latter is found across the Aegean. Both

scripts remain undeciphered to date and it is still unclear whether they write the same or different 'Minoan' languages.

Out of Linear A, another script developed, which is traditionally called Linear B (*c*1450-1190 BCE). Although its earliest attestations come from Knossos on Crete, Linear B is mostly found in mainland Greece, especially Pylos, Thebes, Mycenae and Tiryns. We can read Linear B: it was successfully deciphered in 1952 by the British architect and RAF navigator Michael Ventris, who demonstrated that this script encoded a very early form of Greek, then dubbed 'Mycenaean' (after the first ever known Indo-European culture of mainland

Greece). We are therefore in a position to say that the Linear A to Linear B script-transmission process was prompted by the need to adapt the template script (Linear A) to a different language: Greek.

Clay tablet inscribed with Linear B script, recording offerings of oil to a number of religious personnel and deities. c 1375 BCE. Courtesy the Trustees of the British Museum

Despite their linguistic differences, the use of both scripts was similar. All Linear B evidence and most of Linear A are economic records in the shape of small clay

tablets for the bookkeeping of Bronze Age palatial centres. These written documents outlasted their expected timespan – no more than a couple of years or so – and survived to the present day because the clay got baked in a fire in the second half of the 2nd millennium BCE. However short and concise, these tablets, recording the inflow and outflow of goods from the palaces, give us invaluable insights into the economic interests, societal organisation and religious beliefs of the contemporary palatial centres.

Evans named the earliest script 'Cretan hieroglyphic' after Egyptian hieroglyphs, for a putative resemblance, although no

clear derivation link has yet been demonstrated. By contrast, given their more linear appearance if compared with Cretan hieroglyphic, Evans labelled as 'Linear' the other two scripts, addressed as 'Linear Script of Class A' and 'Linear Script of Class B' respectively. Evans also held the view that the latter script superseded the former due to a 'dynastic revolution' or because it represented a 'Palace School of Calligraphy'.

However, he never questioned that Cretan scripts (and especially the Linear classes) noted one and the same language: the Minoan language indigenous to Crete – 'the language itself is identical,' Evans [wrote](#) in the fourth volume

of *The Palace of Minos* (1936). For Evans, an ardent believer in the independent character of the Minoan civilisation, the Minoan language could *not* possibly be Greek, or of Greek descent, and therefore it had to be part of the pre-Indo-European linguistic substratum.

Evans's influential views had a significant bearing on the historical and linguistic reconstruction of what he called the 'Minoan' civilisation, and remained long unchallenged. Only the amount of evidence and systematic consistency of the patterns shown by Ventris, alongside the substantial number of lexical matches between Linear B words and alphabetic Greek

ones, militated in favour of the Greek hypothesis: we now know that the language of Linear B is Greek. 'A difficult and archaic Greek,' Ventris said on BBC radio in 1952, 'but Greek nevertheless.'

From the very outset, Linear A has resisted decipherment

Ventris, though, is not the only character who played a role in the decipherment of this script. Much of his work drew on research conducted by Alice Kober. A classicist by training, Kober was able to identify, in the Linear B texts, a number of recurring patterns in the form of triplets. Now known as 'Kober's triplets', these are identical sequences of signs that differ only in the last one or two letters: one such triplet

is, for example, what we currently read as *ko-no-**so*** 'Knossos', *ko-no-si-**jo*** 'Knossios' (masculine adjective) and *ko-no-si-**ja*** 'Knossios' (feminine adjective). Kober understood that this morphological variation was most likely indicative of the presence of word-endings in the grammar, thus demonstrating that the language behind Linear B was inflected (that is, a language that changes the ending of its words, as most languages of the Indo-European family do). This was a decisive discovery because it opened the door to Ventris's Greek hypothesis (although she never suggested taking Linear B as Greek). Ventris's hypothesis was confirmed by the philologist and

Classics professor John Chadwick, with whom Ventris entertained an intellectually stimulating and productive correspondence, culminating in the joint publication of the monumental monograph *Documents in Mycenaean Greek* (1956).

Once Linear B had been singled out as Greek, the different linguistic character of Linear A caught the eye. Linear A was unlikely to be Greek: no lexical correspondences could be securely identified between Linear A words and alphabetic Greek ones (as Ventris was able to do for Linear B), nor did Linear A show systematic patterns comparable with Kober's triplets. From the very outset, Linear A has resisted

decipherment: the Minoan language it encoded stood in stark contrast with the Mycenaean Greek language of Linear B.

From linguistic interpretations soon arose historical narratives, triggering the influential theory of the takeover of Minoan Crete by Mycenaean mainlanders around the middle of the 2nd millennium BCE. Scholars began to savour the quality and quantity of novel information that Linear B texts disclosed, and the implications of this academic advance for the overall sociohistorical reconstruction of the Mycenaean society. As a result, for some time Linear A took the back seat – but not for long. Linear A never ceased to attract the interest of

linguists around the world, and no more than a few years had passed since the decipherment of Linear B before new linguistic theories about Linear A saw the light of day.

Since the late 1950s, a bevy of hypotheses have been put forward about the linguistic affiliation of the enigmatic Minoan language of Linear A. What language is it related to? If we could secure that knowledge, we would have made great progress in deciphering Linear A. Evans proposed a connection between Linear A and Etruscan. Alternatives challenged his Etruscan hypothesis: notably the Luwian hypothesis (a language from Anatolia) pioneered by Leonard Palmer (1958), the

Semitic hypothesis advanced by Cyrus Gordon (1966, 1969), and the proposal by Vladimir Ivanov Georgiev to understand Minoan as a form of Greek (1957).

In the decades that followed, all these positions found their champions: Jan Best joined the lines of the Semitic hypothesis (1972, 2000); Margalit Finkelberg (1990) and Edwin L Brown (1990, 1993) stepped into the footprints of Palmer, proposing a derivation of Minoan from Anatolian languages; Gregory Nagy proposed to identify Greek-like elements in Minoan, therefore positing an Indo-European affiliation (1963); Giulio Facchetti (2001) and Mario Negri (2003) revived the Etruscan theory. New

views were also advanced, notably and recently the proposals – by Orazio Monti (2006) and Peter van Soesbergen (2017) – to link Minoan to another of the non-Indo-European languages of Anatolia named Hurrian. No one theory, however, has so far proven to have the edge over another. Strenuous debate continues.

C. All these attempts at identifying the language behind Linear A rely on the etymological method. This method consists in comparing the lexicon (vocabulary) and individual lexical items (the constitutive units of a language's lexicon that bear meaning) of two or more languages to identify a potential affinity. But the etymological method is fraught with problems. The main pitfall is that vocabulary alone is not sufficient to identify a language: for this we also need an accurate understanding of a language's grammatical structures (especially morphology and syntax, on top of phonology).

In fact, even though there can be superficial similarities between two languages, they can turn out to be structurally different. An example of this is the existence of 'false cognates', words that look the same (in terms of both sound and meaning) in different languages, but are in no way related and have different etymologies. An often-cited example is the occurrence of a word that has not only the same spelling but also the same meaning in two unrelated languages: *bad*. In both English and Persian, *bad* means the same thing and sounds very similar, but has a completely different historical development in each linguistic context.

If such instances are easier to spot in known languages that have long been subject to comparative linguistic analysis, this task is much more challenging when it comes to languages of which we still lack an accurate understanding. To make matters worse, vocabulary is easily borrowed and the presence of [loanwords](), especially if not identified as such, may have a considerable bearing on the final interpretation of the data. Moreover, when comparing different languages, we need to be mindful of the historical contexts in which these were used and of any potential connections, borne out by the archaeological record,

between the societies that spoke the languages.

In this respect, because of the historical context of adaptation and use of the Linear writing tradition, it is legitimate to draw a comparison (of signs and words) between the known Linear B and the less well-known Linear A. Although the underlying languages are different, evidence suggests that those signs that have the same shape in both Linear A and Linear B ('homomorphs') can be read with the same, or at least approximate, phonetic value identified for Linear B (hence called 'homophones'). There are, in fact, a number of sign-sequences (or words) that are the same in both

Linear A and Linear B: mostly place names and personal names.

By way of example, the place names *pa-i-to* 'Phaistos' and *se-to-i-ja* (which has not survived) show the same spelling in both Linear A and B, as do a number of personal names such as *ki-da-ro, da-i-pi-ta, pa-ra-ne*. There are also morphological adaptations from Linear A personal names (*di-de-ru, ka-sa-ru, a-ta-re*) to Greek in Linear B (*di-de-ro, ka-sa-ro, a-ta-ro*). This comparison, whose legitimacy has been recently [supported](#) by Torsten Meissner and Pippa Steele, has allowed scholars to reconstruct a sketchy outline of Minoan phonology. Today, we are therefore able to

'read' Linear A texts – without gaining full access to the contents of the inscribed documents.

Moving away from the etymological method, scholars then focused on a script-internal analysis of Linear A, which has produced some good results. Among the most significant ones, Yves Duhoux [demonstrated](#) that the language behind Linear A makes heavy use of prefixes and suffixes for word-formation (that is, the individual syllables added at word-start or word-end to convey additional information, such as gender and number). John Younger [carried out](#) a contextual study of the Linear A documents to identify recurrent patterns in the position of words and numbers

within the texts, which led to the identification of a number of 'transaction words' (such as *and*, *or* and *so*). Ilse Schoep worked on a classification of Linear A documents [based on](#) their alleged content (recognisable by the presence of picture-signs representing commodities) to narrow down semantic fields and identify further systematic patterns. The resulting systematisation allowed for further identifications of transaction words. These are used in isolation within a text and are most likely abbreviations, which means, unfortunately, that most of what we see of Linear A is stenographic writing – that is, shorthand.

Another significant step forward has recently been made possible by sophisticated statistical approaches to the data and by recent advances in the fast-growing field of digital humanities. An innovative statistical [approach](#) is currently being explored by the linguist Brent Davis. Davis has been conducting a system-internal analysis of words' positions and sound constraints, both within Linear A and across other Bronze Age Aegean scripts, in order to evaluate the likelihood that any two of these scripts may encode the same language.

This approach is centred around the notion that, within a given language, only a definite number

of sound associations are possible – what's called a linguistic constraint. Since these are language-specific, identifying and comparing the typology and frequency of such constraints may therefore give us clues as to the level of linguistic similarity between the languages under investigation. In the case of the Aegean scripts, Davis's work aims at understanding whether they notate the same language, or different languages of the same Aegean linguistic family, or even different languages belonging to different families.

To carry out statistical and comparative analyses of the Linear A corpus, new digital resources are also under

development. A new [resource](#) is 'SigLA: The Signs of Linear A: A Paleographical Database', co-developed by Simon Castellan and myself. This is the first ever digital tool that allows users to carry out comparative and statistical analyses of Linear A signs in great detail. The project's aim is ultimately to display the whole of Linear A in a unified digital space, thereby enabling the identification of meaningful recurrent structures and clusterings that may escape the human eye, and laying the foundations for further original research and interpretative frameworks. We are also exploring ways in which to apply computer vision techniques to the dataset

with a view to identifying the number of individuals responsible for writing the Linear A inscriptions and, ultimately, assessing the overall level and spread of literacy in Bronze Age Crete.

D. With so many brilliant scholars and such advanced technology at our disposal, why does Linear A still resist decipherment? Although incremental progress is being made in the field, scholars still face a number of significant obstacles. The first is the quantity of the Linear A evidence that has survived to us. The entire corpus of Linear A does not exceed 1,400 inscriptions (by comparison, the Linear B corpus is just short of 6,000 inscriptions). These are also more often than not in a fragmentary or poor state of preservation. This significantly hampers our ability to identify individual signs with certainty, as well as examine entire texts and the overall textual structure of

any given document. As a result, the lack of precision in the exact identification of number and typology of Linear A signs and sign-sequences, alongside the relative low number of total attestations, may ultimately bias the outcomes of any statistical analysis.

The second obstacle is the quality of the Linear A evidence. Since most Linear A inscriptions are administrative records of economic transactions, they are extremely short, formulaic and laconic, without much syntax. A typical Linear A tablet displays several entries of the type *sign-sequence* (often a personal or place name) + *logogram* (iconic sign standing for the commodity

recorded) + *numerals*, at times with additional transaction terms and signs. Such a terse textual structure consistently undermines our chances to examine the grammatical features of the underlying language. And those few inscriptions that are not economic records do not help much, as they are all dedicatory or cultic inscriptions bearing highly formulaic and repetitive texts (such as the so-called 'libation formula'). There is no evidence of historiographic writing, diplomatic correspondence, monumental inscriptions or private letters, which might have displayed longer and more complex texts, thus giving us more material to work on to detect

syntactical structures and linguistic variation.

Lastly, we do not (yet) have a bilingual inscription like the Rosetta Stone, juxtaposing the same text written in both Linear A and a known language. But never say never: the absence of evidence is not the evidence of absence, and it may well be – as we all fervently hope – that future archaeological fieldwork will one day bring to light such an invaluable object. Until then, we have to rely on our creativity, and work out innovative methodologies and approaches to tackle the meagre evidence at our disposal.

If not for anything else, deciphering Linear A may well ultimately be an excellent exercise in human creativity, backed up by thoroughly sound and multidisciplinary research. Linear A is, after all, 'partially deciphered', inasmuch as we can read the texts in phonetic transcription with some approximation, understand some of the words (because of their contextual position within a text, we know the word *ku-ro*, which means 'total'), and get a general idea of the documents' contents. To arrive at a full decipherment, however, we still need to understand the linguistic nature of the Minoan language encoded in Linear A, as well as any

potential linguistic affiliations. Without a Rosetta Stone-like inscription, that might be a long way off. But that's OK: the journey of trying to understand the same kind of marks that so enchanted Sir Arthur Evans more than a century ago is well worth the effort in its own right. We are still out on the high seas – but at least we know where to head.