The Phonology of Minoan: Evidence from Linear A

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1 Introduction

Minoan is the undeciphered indigenous language of the island of Crete, spoken by the Minoan civilisation who dominated the island from their emergence c. 3000 BC until its occupation by Mycenaean Greeks c. 1480 BC (B. Davis, 2019).

The language is written in Linear A, the source of Linear B, deciphered in 1952 and revealed to contain an early form of Greek (Chadwick, 1959). Because of the close correspondences between Linear B and its older cousin, Linear A can effectively be read by substituting the known values of Linear B. This places Linear A in exactly the opposite position to Linear B prior to 1952: a script we can by and large read, documenting a language we cannot understand. The Minoan language appears unrelated to any other, and, despite repeated attempts (see for example S. Davis, 1967), has yet to be deciphered.

This article aims to present a new analysis of one part of the language, its sounds, in the belief that understanding the structure of Minoan is a useful precursor to future decipherment. With a known script and unknown language, the decipherment of Minoan is a linguistic question, not a historical one, and one which represents another of the benefits linguistics can bring to archaeology. Unlike Linear B, Linear A inscriptions occur in both administrative and religious contexts (Preziosi & Hitchcock, 1999). The prospect of what new linguistic and archaeological light might be shed from this trove of undeciphered texts, comparable in significance to Hittite or Egyptian, is tantalising in the extreme.

The analysis of Minoan has benefitted from linguistic evidence, and study of the typology of how languages operate around the world has been used to interpret data from Linear A. B. Davis (2019) has successfully applied typological techniques to Minoan grammar, while Stephens and Justeon (1978) have applied these methods to its phonology.

Building on thir work, this article sets out to examine the sound system of Minoan based on how it was recorded in Linear A. The key to this line of inquiry is that while we can read Linear A, we can only do so by assuming that the Linear A relatives of the signs of Linear B, writing Greek, represented the same sounds in Minoan. While this assumption is broadly justified, a more accurate analysis is able to produce a significantly more coherent picture of Minoan phonology. We will begin by discussing the value of an attempt to analyse Minoan phonology in the first place. The features of Linear A that make this possible will then be discussed in depth, before a preliminary analysis of Minoan phonology.

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2   Linear A and B

2.1   Why Phonology?

Minoan is a language that has not been spoken for thousands of years, and which survives only in the form of semi-legible texts – what is to be gained by investigating the phonology of a language nobody speaks?

Firstly, only three words of Minoan have been interpreted from context alone thus far (B. Davis, 2019): the most productive path towards decipherment is a comprehensive understanding of its linguistic structure, phonology included. Secondly, sounds themselves may prove useful to archaeology: being able to properly interpret place and personal names in Linear A may help connect them with known archaeological evidence, making sections of the texts useful even without total decipherment.

Most importantly, however, the language's phonology is the only sure method to confirm or refute the prevailing view that Minoan – and, by extension, the Minoan civilisation – is unrelated to the other families of the region, a proposition of enormous archaeological and linguistic significance. Attempts have been made, for instance, to connect Minoan to Anatolia on the basis of a word supposedly shared between Minoan, Hittite and Luwian. Despite its warm initial reception (B. Davis, 2019), this claim has recently been reconsidered (Valério, 2015). (For a more extensive argument to this effect, see Marangozis, 2007, countered by B. Davis, 2018. The identification of the regular and natural sound correspondences on which the comparative method relies is impossible without an understanding of the subject language's phonology. Understanding Minoan phonology is not only useful for linguists and archaeologists wishing to interpret the Minoans on their own terms, but also insofar as it helps us understand the relationships of their language and civilisation to the other peoples of the Aegean.

2.2   Languages and Scripts

Despite the complexities of trying to separate them, the interrelationships of the various languages and scripts of Cretan history are central to this analysis. The first script to emerge on the island was Cretan hieroglyphs in the Middle Minoan IA, developing into Linear A soon afterwards in MM IB or MM II (Younger, 2019). The two scripts both recorded Minoan, and were in contemporary use until the abandonment of hieroglyphs in MM III. Linear A marginally survived destruction in the Late Minoan IB, but was abandoned soon after (Younger, 2019). Minoan was still spoken, and by classical times had developed into a language called Eteocretan, which is documented in inscriptions written in Greek. Meanwhile, by the Neopalatial period (Younger, 2019), a close cousin of Linear A had developed into Linear B, which was used to record Greek both within Crete and on the Greek mainland until the fall of the Mycenaeans; the classical Greek alphabet did not emerge until the Archaic period, c. 900 BC.

Table 1: Languages and scripts of Crete

Language	Language family	Script family
Minoan	Cretan	Cretan (Cretan hieroglyphs, Linear A)
Eteocretan	Cretan	Greek (Greek alphabet)
Greek	Greek	Cretan (Linear B)
		Greek (Greek alphabet)

2.3   Linear A and Linear B

The question, then, is how we are to understand Minoan phonology – or, better put, what is wrong with the picture on the surface? Below is a list of Linear A signs substituting their values from Linear B (Packard, 1974). The completeness of this list is unclear.

Table 2: Linear A signs with the same values as Linear B (Packard, 1974)

	-a	-e	-i	-o	-u
ø-	*a*		*i*		*u*
p-	*pa*	*pe*	*pi*		*pu*
	pa₃	*pte*			*pu₂*
t-	*ta*	*te*	*ti*	*to*	*tu*
		twe		*two*	
	ta₂				
d-	*da*	*te*	*di*	*do*	*du*
		dwe		*dwo*	
k-	*ka*	*ke*	*ki*	*ko*	*ku*
	kwa	*kwe*			
	zda				
m-	*ma*	*me*	*mi*		
n-	*na*		*ni*		*nu*
	nwa				
s-	*sa*	*se*			*su*
r-	*ra*	*re*	*ri*	*ro*	*ru*
	ra₂				
w-	*wa*		*wi*		
y-	*ya*	*ye*			

Note: Linear B readings are conventionally given in italics, and Linear A readings in capitals: pa and PA refer to different transcriptions of the same sign. Where phonemic transcription appears later this is in usual broad transcription.

Linear A, like Linear B, is a syllabary: instead of representing a sound, each sign represents a syllable, almost always consonant-vowel. Both scripts also have logograms (symbols for whole words that replace or clarify phonetic signs). The majority of the script, however, is phonetic (Packard, 1974).

2.4   Problems in Linear B

The irregularities in this uniform grid require explanation. Central to this analysis is that Linear A, devised for the Minoan language, should be well-suited to Minoan phonology, just like the Roman alphabet is for Latin. When Linear B was co-opted for Greek, the script's sounds did not perfectly match those of the language, just as our current alphabet, designed for Latin, struggles to represent the sounds of English.

The problems that arise from this adaptation are our chief source for Minoan phonology. Crosslinguistic evidence makes it unlikely that these irregularities existed for the language the script was designed to write (Stephens & Justeon, 1978): they are consequences of being poorly fitted onto Greek.

The evidence is manifold. Firstly, Linear B ignores important distinctions in Greek and makes others which are comparatively unimportant. In Linear B, three separate sounds /p, b, p^h/ and /k, g, k^h/ are written identically: *pa* represents /pa/, /ba/, and /p^ha/. Separate sounds /l/ and /r/ likewise collapse into r, discussed below. Conversely, Linear B has multiple symbols for the same Greek sounds: /pa/ (or /ba/ or/p^ha/) can be written either *pa* or *pa$_3$*; likewise *pu* and *pu$_2$*, *ta* and *ta$_2$*, and *ra* and *ra$_2$* (Packard, 1974). Linear B also has signs for combinations of consonants and /w/, of which Mycenaean Greek only needed /k^w/ (Chadwick, 1959). Based on the behaviour of other writing systems, Stephens and Justeson (1978) argue that this is because the opposite was true in Minoan. Linear A, designed for Minoan, distinguished two different sounds written *pa* and *pa$_3$*, but did not distinguish /pa/, /ba/, and /p^ha/. When Linear B was adapted for Greek, Mycenaean scribes ignored distinctions they found meaningless and adapted it to Greek as best they could.

Two other points are significant. Although Linear B does not distinguish between /p, b, p^h/ or /k, g, k^h/, it does make a highly unusual distinction between /t, t^h/ and /d/ (Stephens & Justeon, 1978). It is not unusual that Linear B distinguishes the sounds themselves – they were distinct in Greek – but rather that the type of distinction is unusual: it should be made for all voiced stops or none. This suggests that the signs used for Greek /d/ in Linear B did not make that sound in Minoan Linear A. Additionally, most of the signs above are consonant-vowel or consonant-*w*-vowel: why do some signs (*pte*, *zda*) seem to represent multiple consonants? Greek is full of consonant clusters, so their presence is not surprising, bar again their unusual distribution. Far commoner clusters /nt/ or /ps/ are not represented, so why is /pt/? The argument is that these signs did not represent consonant clusters in Linear A, but rather syllables of the form consonant-*y*-vowel, mirroring the signs consonant-*w*-vowel; see below.

3   Minoan Phonology

From this evidence, we can adapt the Linear B readings of Linear A signs given above into the following chart, representing their original Minoan values.

Table 3: Linear A signs with Minoan phonetic values

	-a	-e	-i	-o	-u
ø-	A		I		U
p-	PA	PE	PI		PU
	PYA (=pa$_3$)	PYE (=pte)			(pu$_2$)
t-	TA	TE	TI	TO	TU
		TWE		TWO	
	TYA (=ta$_2$)				
d-	DA	DE	DI	DO	DU
		DWE		DWO	
k-	KA	KE	KI	KO	KU
	KWA	KWE			
	KYA (=zda)				
m-	MA	ME	MI		
n-	NA		NI		NU
	NWA				
s-	SA	SE			SU
r-	LA (=ra)	LE (=re)	LI (=ri)	LO (=ro)	LU (=ru)
	LYA (=ra$_2$)				
w-	WA		WI		
y-	YA	YE			

Most readings are identical to Linear B. The differences are the resolutions of the irregularities introduced above, addressed in turn below.

3.1   Labialised and Palatalised Consonants

The largest change is the unified classes of labialised, /kʷa/, and palatalised, /kʲa/, sounds for the stops /p/, /t/, and /k/. The labialised class remains in Linear B, though only kw was used properly for /kʷ/; others, e.g. *twa*, were used for sequences like /tu.wa/. The palatalised sounds, however, have been lost in Linear B, but explain both the disparate multiconsonant signs and some syllables' odd alternate spellings (Packard, 1974). Linear B's *pte* and *zda* represent PYE and KYA, and doublets *pa/pa$_3$*, *ta/ta$_2$*, and *ra/ra$_2$* are explained as PA vs. PYA, TA vs. TYA, LA vs. LYA (see below on *r-* vs. L-). Palatalised consonants in Greek are known to have evolved into the consonant clusters seen in Linear B. *zd-* in Linear B was used to write Greek words

that had come from /kʲ/, /gʲ/ and /tʲ/, and *pt-* from /pʲ/ (Stephens and Justeson, 1978; Reekes, 2009). Further evidence is provided by later Greek double lambda, discussed below. They also pattern with the labialized class: /w/ and /j/ are both approximants, and a syllabary that permits syllables of the form consonant-vowel, consonant-*w*-vowel, and consonant-*y*-vowel is both internally consistent and comparatively plausible.

3.2 d, r, and L

As noted above, the typology of scripts worldwide makes it implausible that the signs for /t/ and /d/ in Linear B represented the same sounds in Linear A. To account for the sound written *d* in Linear B, Stephens and Justeson (1978) posit a whole new class of implosives for each series of stop. They suggested a class of nine new sounds to be unnecessary, since the problem in Linear B lies with only one. As others have suggested (see Stephens and Justeon, 1978; p. 279), I argue that the Linear B sign *<d>* was originally used for a Minoan tap, /ɾ/. Mycenaean scribes hearing the unfamiliar sound adopted it to its closest Greek counterpart, /d/. One gap in this theory is that Stephens and Justeson (1978) also use implosives to explain *pu* vs. *pu₂*, here unexplained.

Packard (1974) suggests that the same Minoan sounds adapted for Greek /d/ and /r, l/ were instead borrowed as /r/ and /l/ respectively in Cypriot. This suggests that Linear B *d* was a sound that could be interpreted as either /d/ or /r/, and that Linear B *r*, used for Greek /r/ and /l/, was originally simply Minoan /l/. This supports the Minoan value /l/ for Linear B *r* and a tap for *d.*

Table 4: Liquids in Linear A, Linear B and Cypriot

Minoan (Linear A)	/ɾ/	/l/
Greek (Linear B)	/d/	/l/, /r/
Cypriot	/r/	/l/

3.3 Evidence from Pre-Greek

It has been suggested that the Greek word *mallós* 'flock of wool' was borrowed from Minoan *ma-ru* 'wool', one of a series of Greek words derived from an external source termed Pre-Greek (Beekes, 2009). This origin provides further evidence for the Minoan phonology presented above. Greek /lj/ regularly developed into /ll/, which suggests *ma-ru* should be read MA-LYU: the original borrowing *malyós* developed into *mallós* later. This provides independent evidence for both palatalisation and the value /l/ in Minoan; detailed investigation of Pre-Greek is a promising direction for future research.

3.4 Vowels

While an analysis of Minoan vowels is beyond the scope of this paper, a brief word is surely warranted. Although Linear B distinguishes five vowels, *a e i o u*, signs for syllables ending in *-o* and to a lesser extent *-e* are conspicuously rare. It is likely Minoan distinguished four vowels,

/a e i u/. Notably, many signs with *-o* are syllables of the form consonant-*w*-vowel. Packard, 1974, p. 117 suggests a preceding /w/ opened original /u/ to [o]: *two* represents Minoan /twu/. Though /e/ after labialised consonants could be similarly explained from /i/, it is not clear what would explain its presence elsewhere, hence its tentative assignment to Minoan.

4   Conclusion

The following chart summarises Minoan phonology. Sounds in brackets are typologically likely to have existed, on the basis of the behaviour of similar sounds, but are not directly evidenced above.

Table 5: Minoan phonology

	Labial			Dental			Palatal	Velar		
Stops	p	(pʷ)	pʲ	t	tʷ	tʲ		k	kʷ	kʲ
Nasals	m			n	nʷ	(nʲ)				
Fricatives				s						
Taps				ɾ	ɾʷ	(ɾʲ)				
Liquids				l	(lʷ)	lʲ				
Approximants	w						j			

	Front	Back
Close	i	u
Mid	e	
Open		a

    Drawing on previous efforts, this paper has attempted to present a brief original analysis of Minoan phonology, summarised above, by interpreting the irregularities of Linear B sounds as resulting from the mismatch between the sounds of Greek and the Minoan of Linear A. More rigorous analysis along these lines is sorely needed; investigations of the Minoan vowel system, sign frequencies, and the extent to which Minoan has contributed to Pre-Greek are particularly wanting.

    For a language like Minoan, with no known relationship to any other, knowledge of its structure is a necessary precursor to its decipherment, and comparison with patterns of languages around the world is a fruitful guide to its interpretation. While phonology alone is valuable to archaeology in contextualising the Minoans, particularly given that a more accurate method of reading Linear A may allow the identification of proper nouns already known to archaeologists, it is principally important for the approach it represents. An understanding of the language's structure, be it morphological, syntactic or phonological, is essential to its future decipherment, and as this article and others have shown, linguistic techniques are the most effective path towards the interpretation of its structure.

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