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Signs of the times?
Testing the chronological significance of Linear A and B palaeography

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Palaeography and chronology

Palaeographic analysis has been used to establish chronological divisions between Linear B documents whose archaeological dating is disputed, chiefly at the controversial site of Knossos: Jan Driessen's palaeographic analysis assigned the Knossos tablets to at least three different chronological phases,[1] while Richard Firth and Christina Skelton used phylogenetic systematics (a method of reconstructing evolutionary relationships) to reach similar conclusions about Knossian Linear B, as well as assigning dates to these tablets relative to those from other sites.[2] The comparison of tablets from Khania to Knossos Hand 115 has also been used as evidence in the debate over the dating of the final destruction of Knossos,[3] while at Pylos, palaeographic features have been used to date a small number of texts to an earlier period than the main body of the tablets.[4]

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[1] Driessen 1997, 130-132; 2000, 150-157.

[2] Skelton 2008; 2011; Firth & Skelton 2016a-c.

[3] E.g. Driessen 2000, 152.

[4] This includes the 'Hand 91/Class iv' tablets (Palaima 1983; 1988, 111-113, 133, 172; on current attributions of these tablets, see *CoPY*) and tablets from the Megaron (Melena 2000-2001, 367; Skelton 2008, 171-172; 2009; 2011, 75; Firth & Skelton 2016c, 223-234). None of these have a secure archaeological date: see Davis *et al.*, this volume.

All of these analyses start from the assumption that palaeographic variation correlates with chronological variation, and that simplification of sign-forms over time is the usual process of script development.[5] A reliable chronological analysis, however, would first require using the available data to demonstrate these assumptions to be true. Moreover, the reasons for selecting certain variants as palaeographically 'earlier' or 'later,' or particular signs as showing chronologically significant variation, are rarely made explicit. Our recent analyses of synchronic variation within individual sites or deposits, which showed that multiple variant sign-forms are often in use contemporaneously,[6] along with the demonstration that, contrary to the assumed transmission of archetypal 'master signs' from Linear A to Linear B,[7] there is considerable continuity in variant sign-forms between the two writing systems,[8] have showed that the situation is much more complicated. The inheritance of multiple variant sign-forms from Linear A and the persistence of many of these throughout the history of Linear B call into question the assumptions underlying the increasing use of palaeography as a chronological tool: there is no straightforward correlation between variation in sign-forms and the documents' relative chronology.

Ultimately, only a full analysis of palaeographic variation in both Linear A and Linear B will allow us to establish the processes of development which took place in these writing systems over time, and thus which palaeographic features, if any, are likely to have a true chronological significance. This paper provides an initial exploration of these development processes, and an illustration of their complexity, via a case-study of ten signs which show significant variation in both scripts: AB 06/*na*, AB 07/*di*, AB 08/*a*, AB 13/*me*, AB 21/*qi* (also OVIS 'sheep'), AB 24/*ne*, AB 30/*ni*, AB 73/*mi*, AB 77/*ka*, and AB 81/*ku*.

To ensure equivalence with Linear B, the Linear A analysis is restricted to administrative documents, specifically tablets, from the most prominent sites (Haghia Triada, Khania, Zakros, Phaistos, Arkhanes, Malia, Knossos, Tylissos). Linear A evidence is treated as a single chronological unit (LM IA-B), given our limited ability to see internal

[5] E.g. Driessen 2000, 100-101, 144-145, 151; Skelton 2008, 164.

[6] Salgarella 2019; 2020; Judson 2020, Ch. 5.

[7] Driessen 2000, 33-34, 108-109, 112, 144-145.

[8] Salgarella 2020, Ch. 4.

chronological changes within this script.[9] For Linear B, we focus on Knossos and Pylos, which provide tablets from various time-periods: at Knossos, we analyse tablets from the Room of the Chariot Tablets [henceforth: RCT], the oldest Linear B deposit (LM IIIA1-early);[10] the Northern Entrance Passage [henceforth: NEP] and the Room of the Column Bases [henceforth: RCB], which have been argued to be intermediate between the RCT and the latest Knossian tablets;[11] and the West Wing [henceforth: WW], which belongs to the final destruction (LM IIIA2 or IIIB1).[12] At Pylos, we include the complete corpus of tablets, most of which are dated to the palace's final destruction (early LH IIIC); those which are not securely associated with this destruction are indicated as belonging to the Hand 91/Civ or Megaron groups and treated as of unknown date.[13]

Variants of case-study signs

This section illustrates the palaeographic variation shown by each of our case-study signs in Linear A and Knossian and Pylian Linear B, along with the proportion of examples which display each variant form.[14] In most cases, different features of any given sign vary independently of each other, and hence each feature will be discussed separately.[15] Numbers in square brackets refer to illustrations of the most important types of variation throughout the images that follow (Figs. 1-10).

[9] See Salgarella 2020, 42-49.

[10] Driessen 2000, 10, 220. This analysis includes all documents assigned by Driessen to the RCT.

[11] Driessen 1999; 2000, 151; but cf. Judson 2020, 206-207, 216-217. This analysis includes all documents assigned to these deposits by Firth 1996-1997, 22; 2000-2001, 225-230.

[12] For a summary of this dating controversy, see Firth 2000-2001, 154-157. This analysis includes all documents assigned to the WW (Magazines II-XII, XIV-XV; B4, F19, F21, E5, G1-G2/3) by Firth 1996-1997, 39; 2000-2001, 172-232.

[13] See Davis *et al.*, this volume, and n. 4.

[14] Percentages given are of the total number of certain attestations of each sign, and hence will not add up to 100 when some examples of that sign cannot be palaeographically classified.

[15] See Salgarella 2019.

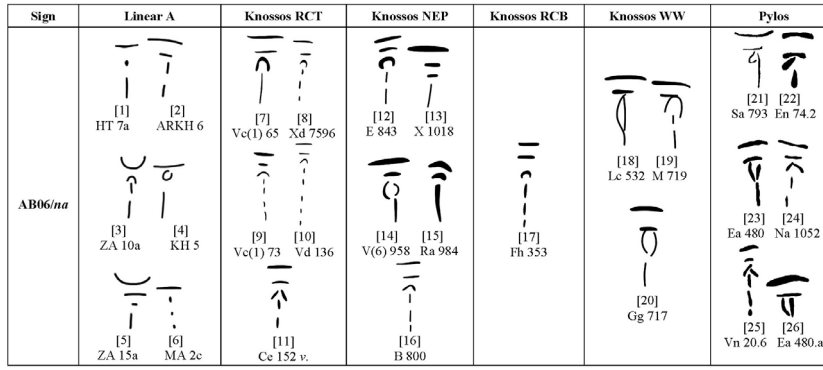

Fig. 1. Linear A and Linear B sign-forms, representative examples of the most important palaeographic variants: sign AB 06/*na* (drawings not to scale; Linear A and Knossos: by Salgarella, after *SigLA* (following *GORILA*), and after *CoMIK*; Pylos: by Judson, after photographs taken in the National Archaeological Museum, Athens).

AB 06/na

Top: (minimal) variation in number of horizontals

- Linear A: always a single horizontal (straight or curved)
- Linear B: almost always two horizontals
  - Pylos: occasionally three horizontals (three–four examples)

Centre: variation in shape and number of strokes

- Linear A: a dot (43% of examples) [1], single horizontal (31%) [2], curve (9%) [3], circle (4%) [4], double horizontal (1%) [5], or nothing (6%) [6]
- Knossos:
  - RCT: curve (86%) [7-10] or triangle (14%) [11]
  - NEP: curve (60%) [12], horizontal (22%) [13], circle (19%) [14], or nothing (one example) [15]
  - RCB: curve (one example) [17]
  - WW: oval (94%) [18], curve (6%) [19], or circle (<1%, one example) [20]
- Pylos: the most significant variation is in the number of strokes, with considerable intra-scribal variation in their shape and orientation. Two strokes: 83% (including one Megaron example) [23-26]; one stroke: 3% [21-22]

Stem: variation in number of strokes

- Linear A: one stroke (81%) [1, 4-5], two strokes (14%) [2-3], or three strokes (5%) [6]
- Knossos:
  - RCT: one stroke (17%) [7], two strokes (33%) [11], three strokes (33%) [8], four strokes (8%, one example) [9], or five strokes (8%, one example) [10]
  - NEP: one stroke (44%) [13-15], two strokes (53%) [12], or three strokes (3%, one example) [16]
  - RCB: three strokes (one example) [17]
  - WW: one stroke (94%) [18, 20], two strokes (6%) [19]
- Pylos: one stroke (76%, including one Megaron example) [21-23], two strokes (11%) [24], three strokes (<1%, one example) [25], or no stem (<1%, one example) [26]

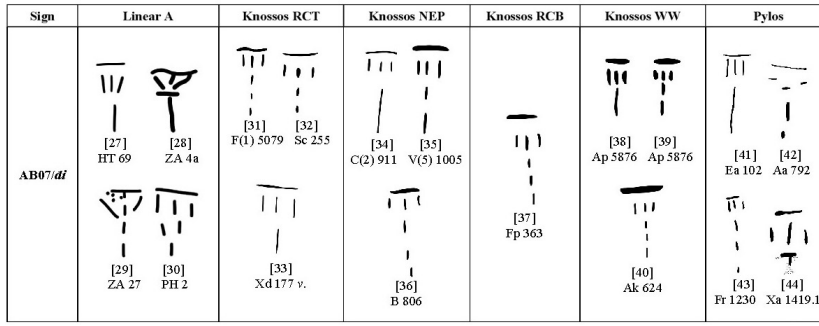

Fig. 2. Linear A and Linear B sign-forms, representative examples of the most important palaeographic variants: sign AB 07/*di* (drawings not to scale; Linear A and Knossos: by Salgarella, after *SigLA* (following *GORILA*), and after *CoMIK*; Pylos: by Judson, after photographs taken in the National Archaeological Museum, Athens).

AB 07/di

Stem: variation in number of strokes

- Linear A: one stroke (94%) [27, 28], four strokes (1%, one example) [29], or "grape"-shaped (multiple strokes arranged in a triangle: 5%) [30]

- Knossos:
  - RCT: three strokes (31%) [31], two strokes (44%) [32], or one stroke (25%) [33]
  - NEP: one stroke (52%) [34], two strokes (35%) [35], or three strokes (13%) [36]
  - RCB: three strokes (one example) [37]
  - WW: one stroke (71%) [38], two strokes (26%) [39], or three strokes (3%, one example) [40]
- Pylos: one stroke (38%, including one Megaron and one Hand 91/Civ example) [41, 44], two strokes (46%) [42], or three strokes (1%, one example) [43]

Top: rarer variation in number/orientation of strokes

- Linear A: verticals (87%) [27] or oblique strokes (13%) [28-29]; two examples with a horizontal below the top [28]
- Knossos: only verticals [31-40]
- Pylos: horizontals (57%) [42] or verticals (35%, including one Megaron example) [41, 43]; one example with a horizontal below the top (Hand 91/Civ) [44]

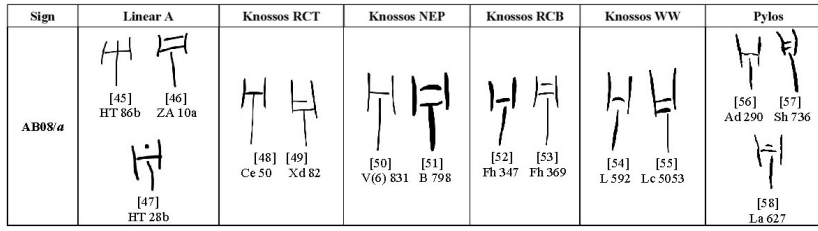

Fig. 3. Linear A and Linear B sign-forms, representative examples of the most important palaeographic variants: sign AB 08/*a* (drawings not to scale; Linear A and Knossos: by Salgarella, after *SigLA* (following *GORILA*), and after *CoMIK*; Pylos: by Judson, after photographs taken in the National Archaeological Museum, Athens).

AB 08/a

Single or double horizontal:

- Linear A: single 70% [45], double 22% [46], dot 3% [47]
- Knossos:

- RCT: single 68% [48], double 32% [49]
- NEP: single 22% [50], double 78% [51]
- RCB: single 52% [52], double 43% [53]
- WW: single 11% [54], double 88% [55]

- Pylos: single 59% (including two Megaron examples) [56], double 27% [57] (including three Megaron examples, two with an unusually short upper horizontal [58])

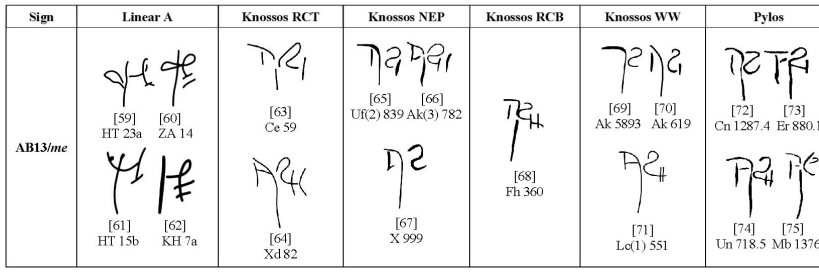

Fig. 4. Linear A and Linear B sign-forms, representative examples of the most important palaeographic variants: sign AB 13/*me* (drawings not to scale; Linear A and Knossos: by Salgarella, after *SigLA* (following *GORILA*), and after *CoMIK*; Pylos: by Judson, after photographs taken in the National Archaeological Museum, Athens).

AB 13/me

The Linear A and Linear B forms of this sign are generally quite different in construction; only a few Linear A examples, e.g. [60], appear close to the Linear B form.

Left-hand side: variation in presence/absence of strokes

- Linear A: loop present (38%) [59-60] or absent (56%) [61-62]
- Knossos:
  - RCT: vertical (40%) [63] or vertical plus horizontal/slanted stroke (60%) [64]
  - NEP: vertical (14%) [65] or vertical plus horizontal/slanted stroke (54%) [66-67]
  - RCB: vertical (one example) [68]
  - WW: nothing (58%) [69], vertical (16%) [70], or vertical plus horizontal (11%) [71]

- Pylos: vertical (<1%, one example) [72] or vertical plus horizontal (95%) [73-75]

Right-hand side**:** variation in shape (Linear A: loop or curve; Linear B: usually *we*-shaped curve) and number of cross-strokes:

- Linear A: one cross-stroke (13%) [59, 61] or two (81%) [60, 62]
- Knossos: all *we*-shaped:
  - RCT: one cross-stroke (27%) [63] or two (73%) [64]
  - NEP: zero cross-strokes (2%, one example) [67], one (23%) [65], or two (43%) [66]
  - RCB: two cross-strokes (one example) [68]
  - WW: zero cross-strokes (67%) [69], one (8%) [70], or two (10%) [71]
- Pylos: *we*-shaped with zero cross-strokes (87%) [72], one (1.5%) [73], or two (1.5%) [74]; or curved with a second curve inside (1%, four examples) [75]

Sign	Linear A	Knossos RCT	Knossos NEP	Knossos RCB	Knossos WW	Pylos
AB21/*qi*	[76] HT 94b [77] ARKH 2 [78] ZA 14	[79] Np(1) 85 [80] Xd 197 [81] Ce 50	[82] C(2) 911 [83] Ai(3) 1037 [84] Dk(1) 936	-	[85] As 604	[86] Ta 642.2 [87] Vn 851.13

Fig. 5. Linear A and Linear B sign-forms, representative examples of the most important palaeographic variants: sign AB 21/*qi* (drawings not to scale; Linear A and Knossos: by Salgarella, after *SigLA* (following *GORILA*), and after *CoMIK*; Pylos: by Judson, after photographs taken in the National Archaeological Museum, Athens).

AB 21/qi

Variation in the number of legs (syllabograms only)[16]

- Linear A: three-leg (86%) [76-77] or four-leg (14%) [78]

[16] At Pylos, the number of strokes in the head also varies significantly; this appears much rarer in Linear A and at Knossos, but is very difficult to identify reliably from photographs, so has not been included.

- Knossos:
  - RCT: one-leg (40%) [79], two-leg (40%) [80], or three-leg (20%, one example: only five in total) [81]
  - NEP: one-leg (9%, one example) [82], two-leg (81%) [83], or three-leg (9%, one example) [84]
  - WW: two-leg (one example) [85]
- Pylos: one-leg (76%) [86] or two-leg (24%) [87]

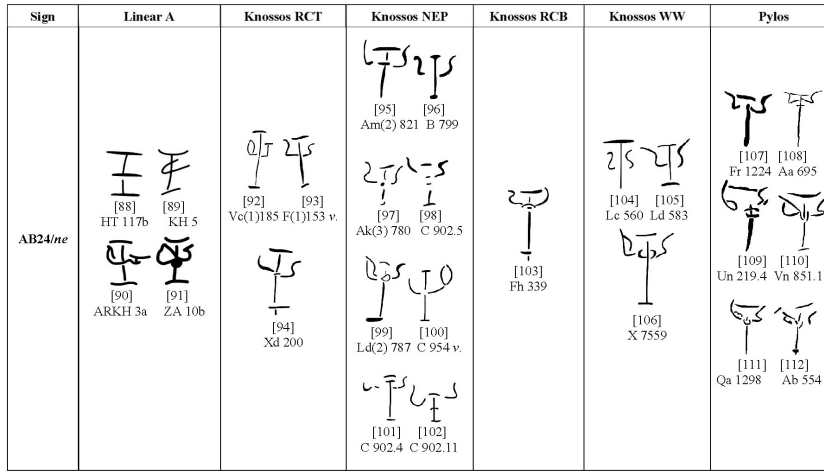

Fig. 6. Linear A and Linear B sign-forms, representative examples of the most important palaeographic variants: sign AB 24/*ne* (drawings not to scale; Linear A and Knossos: by Salgarella, after *SigLA* (following *GORILA*), and after *CoMIK*; Pylos: by Judson, after photographs taken in the National Archaeological Museum, Athens).

AB 24/ne

- Linear A: 76% simple variant (vertical crossed by top and bottom horizontals, central element straight [88] or curved [89]), 24% elaborate (two lateral arms, with left-hand loop and round central element [90-91]). This latter is the source of all Linear B variants.
- Linear B: variation in arms, centre and baseline

  Arms: number of strokes (both arms single-stroke, vs. one single-stroke and the other – almost always the left – with two or occasionally three converging strokes)
  - RCT: 64% two-stroke left arm [92], 36% one-stroke [93-94]

- NEP: 85% one-stroke left arm [95-98, 101-102], 12% two-stroke [99]; one example with two-stroke right arm [100]
- RCB: one-stroke left arm (one example) [103]
- WW: 98% one-stroke left arm [104-105]; 2% two-stroke (one example) [106]
- Pylos: 48% one-stroke left arm [107-108], 34% two-stroke (including two Hand 91/Civ examples) [109-111], 1% three-stroke (three examples) [112]

Central element: none, single/double crossbar, circle/curve, V-shape

- RCT: 91% none [92-93], 9% single crossbar (one example) [94]
- NEP: 42% single crossbar [95], 35% none [96], 13% circle [99], 6% dot [97], 3% double crossbar [98]
- RCB: circle? (one example) [103]
- WW: 98% none [104-105], 2% circle (one example) [106]
- Pylos: 22% none [107], 62% central element present. Of these: 43% single crossbar [108], 1% double crossbar [109], 8% V-shape [110, 112], 7% circular/curved element (usually two-stroke, occasionally one/three-stroke; including two Hand 91/Civ examples) [111], one example with one slanted stroke, 2% of uncertain form

Baseline

- RCT: always present [92-94]
- NEP: 74% present [96-102], 26% absent [95]
- RCB: present (one example) [103]
- WW: 57% absent [104], 28% present [105-106]
- Pylos: 75% absent [107-109, 111], 10% present [110, 112] (including one Hand 91/Civ example of each)

AB 30/ni

Leaves: presence/absence of horizontal(s) crossing X-shaped 'leaves'

- Linear A: 37% short cross-strokes [113], 36% single long cross-stroke [114, 116], 3% none [115]

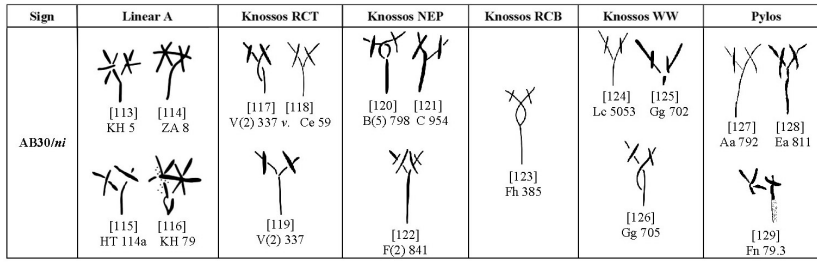

Fig. 7. Linear A and Linear B sign-forms, representative examples of the most important palaeographic variants: sign AB 30/*ni* (drawings not to scale; Linear A and Knossos: by Salgarella, after *SigLA* (following *GORILA*), and after *CoMIK*; Pylos: by Judson, after photographs taken in the National Archaeological Museum, Athens).

- Linear B (Knossos and Pylos): absent, except for three NEP examples (on one tablet) with short cross-strokes [122]

Stem: variation in shape and construction (straight stem, either two- or three-stroke; twisted stem, two-stroke)[17]

- Linear A: 82% straight stem (63% two-stroke, 19% three-stroke) [113-115], 2% twisted stem [116]
- Knossos:
  - RCT: 60% twisted stem [117], 40% straight stem (27% two-stroke [118], 13% three-stroke [119])
  - NEP: 90% twisted stem [120], 9% straight stem (two-stroke only) [121-122]
  - RCB: 100% twisted stem (17 examples) [123]
  - WW: 59% straight stem (54% two-stroke [124], 5% three-stroke [125]), 33% twisted stem [126]
- Pylos: straight stem only: 75% two-stroke (including one Hand 91/Civ example) [127]; 8% three-stroke [128], including unique form with two-stroke left branch [129]

AB 73/mi

Central element(s): varying numbers (none to three) and forms (curve, dot, stroke)

[17] Olivier 1967, 27 classifies these as 'simple,' 'intermediate,' and 'complex,' respectively.

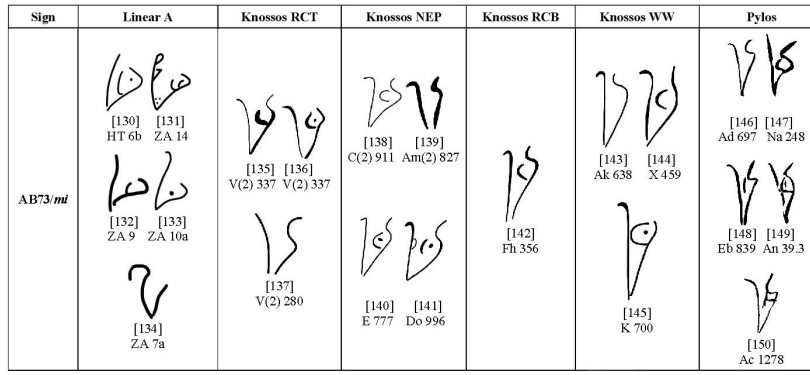

Fig. 8. Linear A and Linear B sign-forms, representative examples of the most important palaeographic variants: sign AB 73/*mi* (drawings not to scale; Linear A and Knossos: by Salgarella, after *SigLA* (following *GORILA*), and after *CoMIK*; Pylos: by Judson, after photographs taken in the National Archaeological Museum, Athens).

- Linear A: 61% two elements (curve enclosing dot/line) [130], 10% two elements plus additional left-hand element(s) [131], 15% one element (10% curve [132], 5% dot [133]), 3% none [134]
- RCT: 67% one element (curve) [135], 25% two elements (curve enclosing dot) [136], 8% none [137]
- NEP: 74% one element (curve) [138], 17% none [139], 4% two elements (curve enclosing dot; one example) [140], 4% three elements (curve enclosing dot plus additional left-hand element; one example) [141]
- RCB: one element (curve; one example) [142]
- WW: 76% none [143], 21% one element (curve) [144], 2% two elements (curve enclosing dot) [145]
- Pylos: 38% none [146], 45% one element (41% curve, 2% vertical, 2% horizontal) [147-148], 4% two elements (one each of curve plus

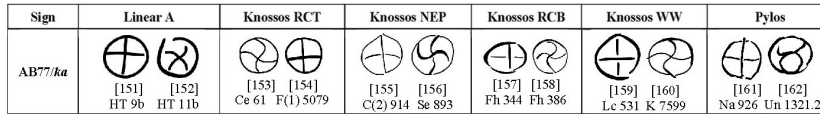

Fig. 8. Linear A and Linear B sign-forms, representative examples of the most important palaeographic variants: sign AB 77/*ka* (drawings not to scale; Linear A and Knossos: by Salgarella, after *SigLA* (following *GORILA*), and after *CoMIK*; Pylos: by Judson, after photographs taken in the National Archaeological Museum, Athens).

horizontal, curve plus vertical, two curves, vertical plus horizontal) [149-150]

AB 77/ka

Internal cross-strokes: straight or wavy

- Linear A: 95% straight [151], 1% wavy (one example) [152]
- RCT: 95% wavy [153], 5% straight (one example) [154]
- NEP: 66% straight [155], 39% wavy [156]
- RCB: 83% straight [157], 17% wavy (one example) [158]
- WW: 96% straight [159], 4% wavy [160]
- Pylos: 93% straight (including two Megaron examples) [161], <1% wavy (three examples) [162]

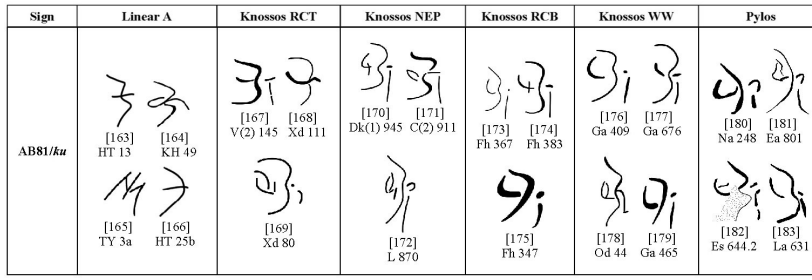

Fig. 10. Linear A and Linear B sign-forms, representative examples of the most important palaeographic variants: sign AB 81/*ku* (drawings not to scale; Linear A and Knossos: by Salgarella, after *SigLA* (following *GORILA*), and after *CoMIK*; Pylos: by Judson, after photographs taken in the National Archaeological Museum, Athens).

AB 81/ku

Shape of body: 3-shaped vs.)-shaped

- Linear A: 94% 3-shaped [163-164] (including M-shaped variant [165]), 6%)-shape [166]
- Knossos Linear B: almost always 3-shaped,)-shaped only attested one–two times in RCB [175] and WW [179]
- Pylos: 87%)-shaped [180-181], 3% 3-shaped [182], 2% intermediate (wavy: including one Megaron example) [183]

Sides: varying number of strokes

- Linear A: 83% nothing at sides [163, 165-166], 17% loop at left [164]
- Linear B: sides vary independently. RCT, NEP and Pylos show a large amount of variation in the number (usually one to three) and shape (curve, dot, stroke) of the elements on both sides [167-175, 180-183], while the WW shows much less (maximum two elements per side) [176-179]

Patterns of palaeographic variation

Simplification over time

As stated above, simplification – involving the creation of simpler sign-forms, the disappearance of more elaborate forms, and/or an increasing relative frequency of simpler forms – is generally assumed to be the most common process of palaeographic development over time. Examples of this process in the case-study signs include: the decrease in popularity of the multiple-stroke stem of *na* and of the right-hand cross-strokes of *me* within Linear B; the decrease in the number of legs of AB 21/*qi* in Linear B compared to Linear A; the creation of the simpler Linear B form of AB 24/*ne* from the Linear A/Linear B complex form; the almost complete absence of extra strokes on the branches of *ni* in Linear B, and the rarity/absence of the twisted-stem form in the WW/Pylos; the increasing frequency of forms of AB 73/*mi* with no or only one inner element both from Linear A to Linear B and within Linear B; and the rarity of the 3-shaped body of AB 81/*ku* at Pylos compared to Linear A and Knossos.

Elaboration over time

Elaboration – the creation of more elaborate sign-forms, the disappearance of simpler forms, and/or an increase in the relative frequency of more elaborate forms – appears to be nearly as common as simplification. Examples of this include: the increase in the usual number of top horizontals in AB 06/*na* in Linear B compared to Linear A; the increase in frequency of the multi-stroke stem of AB 07/*di* in Linear B compared to Linear A and of the double-horizontal form of AB 08/*a* over time at Knossos; the increased frequency of the form of AB 13/*me* with one-two strokes at the left from Linear A to Linear B and, with the exception of

the WW, within Linear B; the complete absence from Linear B of the highly simplified Linear A form of AB 24/*ne*; and the increased number of strokes at the sides of AB 81/*ku* in Linear B compared to Linear A.

Persistence of variation

For nearly all the signs in this case-study, at least some features have variants which coexist throughout the history of both Linear A and Linear B: AB 06/*na* in the number of strokes in the stem and the central shapes; AB 07/*di* in the number of strokes in the stem; AB 08/*a* in the number of horizontals; AB 13/*me* in the number of strokes on the left-hand side (Linear A and Knossos; minimally at Pylos) and the number of cross-strokes on the right; AB 30/*ni* in the shape of and number of strokes in the stem; AB 73/*mi* in the presence/absence of stroke(s) inside the V-shape; AB 77/*ka* in the straight vs. wavy cross (although the latter is rare in Linear A and at Pylos); and AB 81/*ku* in the shape of the body and the number/shape of strokes on each side. In addition, AB 21/*qi*'s variation between one and two legs persists throughout the history of Linear B (and Linear A similarly has variation between three and four legs), while AB 24/*ne* varies between a simple and complex form at all times, although the nature of the simpler form changes between Linear A and Linear B. Even the patterns of simplification or elaboration mentioned above are almost always changes in the frequency of particular variants rather than their complete disappearance.

Coexistence of multiple patterns of development

Most of these signs also show multiple patterns of development, whether simultaneously across different features (for instance AB 81/*ku*, whose body has undergone simplification but whose sides have undergone elaboration), at different points in their history, and/or at different sites. AB 73/*mi*, for instance, appears to simplify when comparing Linear A (where two inner elements are most common) and Knossian Linear B (one inner element most common in the RCT and NEP, zero in the WW), but at Pylos the more elaborate forms (mostly with one inner element) are slightly more common again. Conversely, the one-stroke stem of AB 06/*na* is preferred in Linear A, the WW, and Pylos, but the multi-stroke stem is the most common in the RCT and NEP; the single-horizontal form of AB 08/*a* is preferred in the Linear A, RCT, and

Pylos, but the double horizontal in the NEP and WW; and the wavy-cross form of *ka* is strongly preferred in the RCT but very rare elsewhere in both Linear A and Linear B: in all of these cases, comparing Linear A to particular Knossian deposits would show a process of elaboration, while comparing those deposits to Pylos would show simplification. Yet more complicated patterns are shown by AB 07/*di* (whose multi-stroke stem is rare in Linear A and the WW, the most common form in the RCT, and of approximately equal frequency to the single-stroke stem in the NEP and at Pylos); AB 13/*me* (whose apparent trend of increasing frequency of the form with one or two strokes at left is broken only by the WW, where zero left-hand strokes are strongly preferred); AB 30/*ni* (whose twisted-stem form is very rare in Linear A, the most common form everywhere at Knossos except for the WW, and entirely absent at Pylos – which nonetheless has the highest frequency of three-stroke-stem forms, which are rare in Linear A and Knossian Linear B); and AB 24/*ne* (whose elaborate Linear A form undergoes simplification to produce the simpler Linear B form, alongside a continuing process of elaboration – often site/deposit specific – of the more elaborate form, particularly with regards to the central element: see especially the NEP and Pylos).

How much of this is really chronological variation?

The above discussion has observed the palaeographic differences in the case-study signs between Linear A and Linear B and between Linear B tablets dating to various different time-periods: broadly speaking, the RCT is treated as 'early Linear B,' Pylos as 'late Linear B,' and the other Knossian deposits as belonging to a time-period between these two extremes (whatever the chronological relationship of the NEP and RCB to the WW). However, since Linear A and Linear B are different writing systems separated by a process of adaptation, and since we have no Linear B at Knossos contemporary with that at Pylos and only one securely-established chronological phase at the latter site, it is extremely difficult to be sure how much of this variation is in fact due (purely) to chronology: even an apparently straightforward process such as the simplification in the body of *ku* over time (3-shaped most common at Knossos,)-shaped most common at Pylos) or the stabilization of the form of *me* with two perpendicular strokes at the left (highly variable

at Knossos, almost entirely consistent at Pylos) could in principle be geographical variation – communities of writers at different sites making different choices/learning different palaeographical traditions – as much as chronological.[18]

Many of these signs apparently simplify in form over time at Knossos (again, comparing the RCT and WW, with the NEP and RCB as possible intermediate deposits) but then show (a greater frequency of) more complex forms again at Pylos. Examples of this pattern include the stems of *na* and *di* (only 6% and 29% of WW examples, respectively, have multiple-stroke stems, compared to 82% and 75% in the RCT, including four- and five-stroke versions in the case of *di*, and 11% and 47% at Pylos); the left-hand side of *me* (58% of examples in the WW have no left-hand strokes; this simplified form is entirely absent from the RCT and Pylos); the inner elements of *mi* (76% of WW examples have no inner elements; only 38% of Pylos examples and 8% of RCT examples lack this feature); the more complex forms of *ku*, e.g. with an additional small vertical or a loop on the left side [169-172, 174], which are never found in the WW; and the more complex forms of *ne*: 98% of WW examples have neither a double left arm nor a central element (just one example has both), while 73% of RCT examples have one of these features (none have both), and in Pylos this figure is 75% (23% with both).

This suggests that, rather than representing the outcome of chronological change, the simplification in the WW may reflect the preferences of the two writers who are predominant in this deposit, Hand 103 and Hand 115 (responsible for about half of WW texts),[19] who use very few of the more complex forms of these signs. (This is not, however, the only pattern seen in the WW: both double-horizontal *a* and *qi* with two legs are more frequent in this deposit than anywhere else, and both are used by Hand 103 and Hand 115). The predominance of Hand 1 and Hand 2 at Pylos can similarly skew the results, e.g. in this site's apparent preference for the form of *di* with horizontals at the top (57% of examples, but used only by Hand 1, Hand 2, and Hand 3; the form with verticals is written by at least eight scribes but provides only 35% of examples) or *ne* with a single-stroke left arm (48% of examples, of which Hand 1 and Hand 2 are responsible for over four-fifths, with seven other scribes

[18] Compare the site/deposit-specific palaeographic preferences in Linear A identified by Salgarella 2020.

[19] Based on Firth 2000-2001, 172-237; *KT*^{6}, 460-461, 463.

also using this form; the two- or three-stroke left arms provide 35% of examples but are used by at least sixteen scribes).[20] Moreover, if the NEP and RCB are actually contemporary with the WW (n.11), the apparent chronological pattern at Knossos largely disappears.

Idiosyncratic variants

Variants specific to one site, deposit, or even individual writer exist at all periods of the Linear writing systems' history. For instance, in Linear A the variant of AB 08/*a* showing a dot atop the horizontal bar [47] is only attested at Haghia Triada and Khania; the grape-shaped AB 07/*di* [30] only occurs at Phaistos and Knossos, although this could be chronologically rather than geographically significant;[21] the elaborate shape of AB 24/*ne* [90-91] is limited to Arkhanes and Zakros; AB 06 with one curved horizontal, a semicircular central element and a segmented stem [3] is unique to Zakros. In Knossian Linear B, *na* with a five-stroke stem [10] only occurs in the RCT, and *na* with an oblong oval stem [18] only in the WW; Hand 201 (NEP) uses various idiosyncratic shapes of *ne* [101-102]. Unique to Pylos are the forms of *di* with horizontals at the top ([42]: Hand 1, Hand 2, Hand 3), *me* with curves at the right instead of a *we*-shape ([75]: Hand 14, Hand 15, Hand 22), and *ne* with a three-stroke left arm ([112]: Hand 5, Hand 21), while others are unique to a single Pylian hand (e.g. *ni* with a two-stroke left branch: Hand 45 [129]; *mi* with various inner elements, e.g. [149], Hand 9A; [150], Hand 20). It is, therefore, an open question whether the Hand 91/Civ *di* ([44]), whose extra horizontal is paralleled only on **TH Z 857**[22] and in Linear A [28], and the form of *a* on two Megaron tablets [58], whose short upper horizontal is perhaps comparable to the Linear A dot [47],[23] are rare continuations of those Linear A forms (and thus 'early' at least in palaeographic terms) or independent, idiosyncratic developments by their writers. (Far from being paralleled only at Knossos,[24] the Hand 91/Civ form of *ne* [**Ae 995** and **Xa 1419** *v.*1], with a central circle and two-

[20] Pylos scribal attributions are based on *PTT*[2]; on corresponding attributions in other editions, see *CoPY*.

[21] **PH 7** dates to MM IIB; **PH 2** and **KN 22**b may be of similar date (Schoep 1995, 65).

[22] Palaima 1983, 82.

[23] Skelton 2009, 112-113.

[24] Palaima 1983, 81-82; 1988, 113.

stroke left arm, is also found at Pylos in Hand 12, Hand 15, Hand 31, Hand 32, and Hand 41 [111]).

Conclusions

This paper has shown that, in the context of the Linear writing tradition of the Bronze Age Aegean, any chronological assumption purely based on palaeographic analysis is to be taken with extreme caution. The palaeography of Aegean Linear scripts is complicated to say the least, and graphic variation often prevails over standardization. Frequently, no clear and systematic processes of development over time can be identified with certainty, even assuming that Linear A, Knossian Linear B, and Pylian Linear B straightforwardly represent different stages of chronological development. Simplified sign-forms are not necessarily a result of chronological development, while elaboration and other more complex processes of variation (which frequently affect individual features of signs independently) coexist throughout the scripts' history. Moreover, even where (for instance) simplification or elaboration does take place over time, this usually affects only the frequencies of use of sign variants: most individual variants tend to persist over time, both from Linear A to Linear B and within Linear B, while idiosyncratic forms also appear throughout the history of both scripts. Other contextual factors may also significantly alter our overall understanding of chronological stages of script development: for instance, the apparently simplified palaeography of the Knossos WW may be due to the predominance of two scribes' individual writing styles in this area, without having definite chronological implications. Therefore, any chronological analyses purely based on palaeography are to be regarded as thoroughly unreliable until further analysis, taking into account both script-internal factors (e.g. variation of whole signs and individual features) and script-external ones (e.g. variation by site or scribal hand), enables a more rigorous and nuanced understanding of palaeographic development over time.

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