Introduction: High and Low Chronology

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Since the founding of the international research programme SCIEM 2000, which led to this conference, we have been working toward establishing a general framework of interregional chronology of the second millennium BC. In the course of the discussions and the previously and recently published exchanges, it became clear that this aim could be achieved in reasonable time only within the relative chronology, which means that the periodisation of the different regions in the Eastern Mediterranean could be shown through their relationships to each other. In order to apply such a scheme with absolute dates, we still have the problem of two chronologies: the historical chronology, based mainly on Egyptian and Assyrian chronologies and their interrelationship and radiocarbon chronology.[1] Despite all attempts to discuss these differences away or at least to minimize them, one has to realise that there are periods with a considerable difference between radiocarbon- and historical chronology which cannot be denied nor be reconciled at the moment.[2] However, other sciences being involved, we hope for decisive results.

It can already be considered progress – last but not least within this congress – that in the dating of the Thera eruption, the package of ^{14}C, the Greenland ice-core- and/or dendrochronology – which looked in combination very impressive for some time and had stimulated alliances – has been dissolved for various reasons. Raising the radiocarbon dates for the Thera eruption from the late towards the middle of the 17th century and thus breaking it away from the 1628/27 dendro-signal in the northern hemisphere,[3] brought them very near to the date of tiny volcanic glass particles found in a Greenland ice layer (GRIP core), identified by SIMS as originating from the Minoan eruption and dated according to the count of the yearly ice deposition to ±1645 BC.[4] A rapprochement was said to have been a coincidence after the identification of the particles with the Thera eruption could not be proven sufficiently.[5] Nevertheless, after the ice particles were abandoned as an anchor and external proof, the radiocarbon determination for the Thera eruption came down again to c. 1620 BC.[6] A flirt with the 1628/27 BC dendrosignal is not repeated for the time being and this way is good. The high chronology rests now on the strength and weakness of the radiocarbon dating alone.

The alternative to Radiocarbon dating, the Egyptian chronology, is based on a combination of astrochronology (Sothis- and lunar dates), incomplete or corrupted king lists, incomplete regnal data, genealogies of officials and time estimates based on them and even such records as the stelae of the holy Apis bulls, recording their lifespan and the kings under which they were born or have passed away.[7] Such dead reckoning from undisputed dates of the first millennium backwards, such as the conquest of Egypt by Cambyses at 525 BC, is today the preferred method of arriving at a historical chronology of the New Kingdom. Historical Egyptian chronology also relies on the interrelationship with other chronologies such as the Assyrian one,[8] which offers with its eponyms' lists a framework which is considered with-

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1 See Bietak 2003: 23–34.

2 Manning 1999: *passim*; Manning *et al.* 2002: 733–744; Manning & Bronk Ramsey 2003: 111–133; Bronk Ramsey *et al.* 2004: 325–344; last Manning *et al.* 2006: 565–569.

3 LaMarche & Hirschboek 1984: 121–126; Baillie & Munro 1988: 344–346; Manning *et al.* 2001: 2532–2535.

4 Hammer 2000: 35–37; Hammer *et al.* 2003: 87–94.

5 Pearce *et al.* 2004; Pearce *et al.* in this volume showed that the trace elements of the particles of the GRIP core would fit even better to the Aniakchak volcano in Alaska. See also Keenan 2003: 1097, who refutes the identification of the particles in question on statistical grounds. Max Bichler from the Atomic Institute of the Austrian Universities and SCIEM 2000 (personal communication) made it clear that the particles are too small to allow at present a reliable identification with a specific volcano.

6 Manning & Sewell 2002: 264–291; Manning *et al.* 2006: 565–569.

7 Hornung 1964; Bierbrier 1975; Kitchen 1986; 1987; 1996; von Beckerath 1994; 1997. For a recent reappraisal see Müller 2006; Krauss & Hornung 2006.

8 Brinkman 1972: 271–281; 1976: 6–7; De Martino 2004: 38–39.

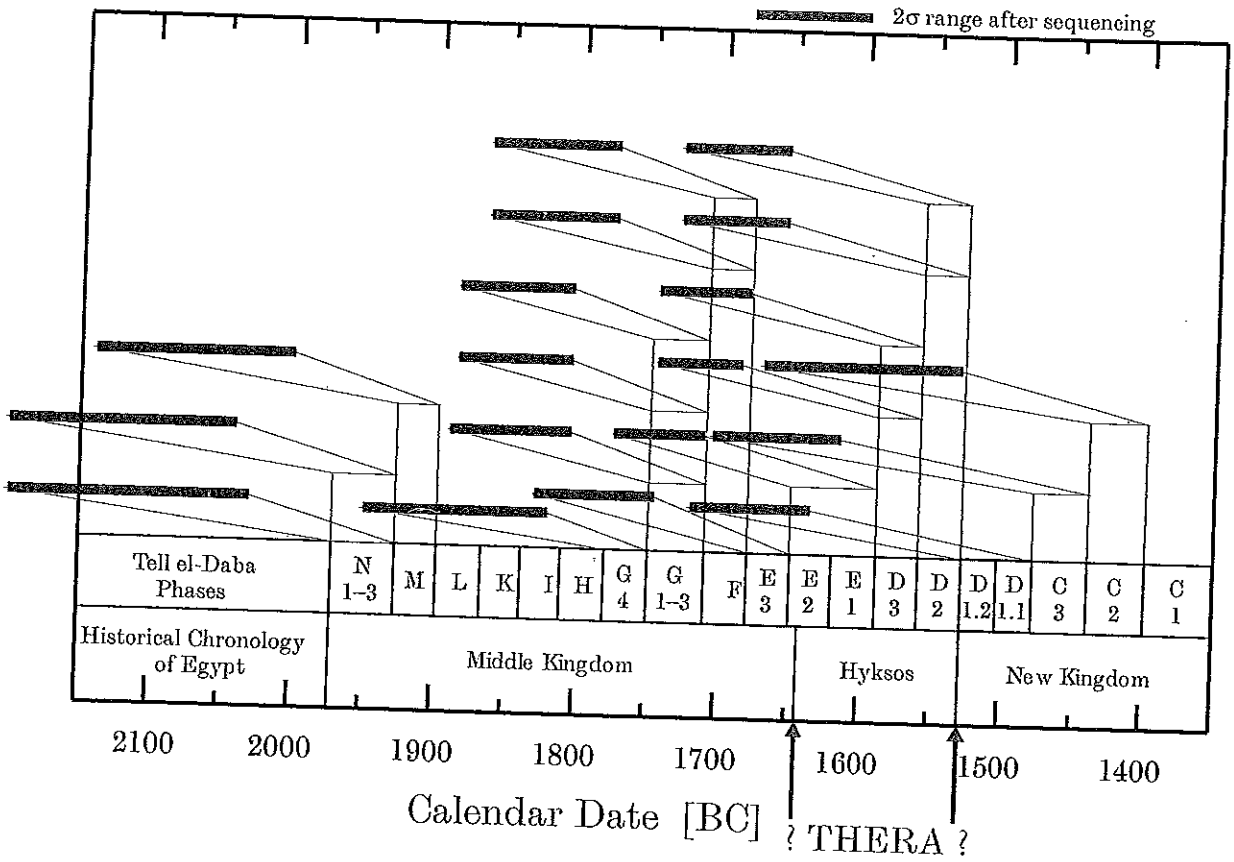


Fig. 1 Preliminary results of radiocarbon dates taken from the stratigraphy of Tell el-Dab^{c}a and their offset towards historical chronology (courtesy of Walter Kutschera)

in minor margins of error fairly accurate. The chronological experts in Egyptology agree on a date for the beginning of the New Kingdom from c. 1550 to 1540 BC. There is also an understanding that the margin of error may be within 20 years both ways, but this would put pressure on the genealogies and on some specific lengths of reign (eg. Tuthmosis II, Tuthmosis IV, Horemheb).

The two systems – the radiocarbon method and the historical chronology – have periods of agreement such as the 14th and 13th centuries BC. It is, however, wrong to claim the time from the 18th century BC backwards as a period of agreement again, thus limiting the disagreement to two to three centuries. For the time before the New Kingdom we don't have such a close control over the historical chronology as we do for the New Kingdom, especially not for the time of the Old Kingdom. The radiocarbon dates obtained from this period are also not consistent.[9] For the Middle Kingdom, we have a disagreement within the historical chronology between a high and a low chronology, which are about 42 years apart. Therefore we are not in the position to say if the radiocarbon dates are in agreement with the historical chronology or not.

On the contrary, the recent investigation of radiocarbon dates from short-lived samples throughout the stratigraphy of Tell el-Dab^{c}a by the VERA laboratory, covering successive strata from the 20th to the 15th centuries BC, shows a series of time consistent dates with an offset between 100 and 150 years higher than the historical chronology when using the high chronology of the Middle Kingdom to cover the first part of this stratigraphy (Fig. 1). The dates of the successive strata are anchored by two historical datum lines to the year 5 of Sesostris III (1868 BC high chronology) and the conquest and abandonment of Avaris c. 1530 BC.[10] Eleven phases of occupation (K–D/2) are sandwiched evenly in between. The space of "flexibility" as demanded by W. Dever, J.

[9] Zdiarsky 2005: 129–158.

[10] Bietak 2002: 28–38, fig. 2.

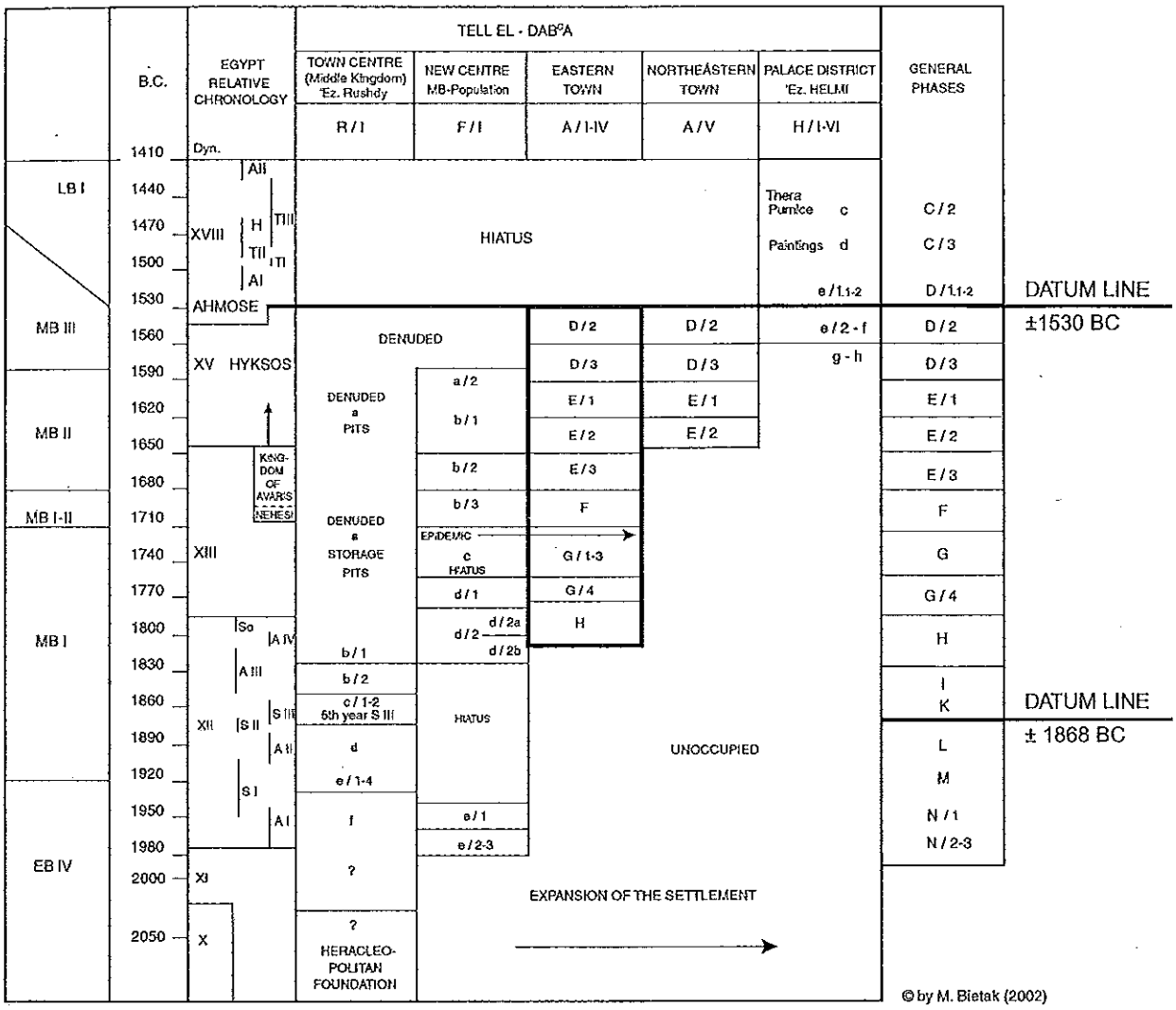


Fig. 2 The phasing, the stratigraphy of Tell Tell el-Dab°a and the two historical datumlines (after BIETAK 2002, fig. 1)

Weinstein and S. Manning,[11] is very limited. If one would lengthen the time span of one stratum one has to squeeze the others to an extent that is not acceptable. Within certain limits, such adjustments have been made from the beginning of the system when sub-phases appeared (ph. G/1–3) (Fig. 2).

Besides this, there are cross dates to other sites such as a combination of ceramic types of the early 13th Dynasty from phase G/4 (allways dated according to pottery seriation to the beginning of the 13th Dynasty) which could be related to the moat between phases 14/13 at Ashkelon with a large number of Egyptian seal impressions of the early 13th Dynasty in the course of a *stratigraphie comparée* project[12] (Fig. 3). Those seals definitely proved the precision of the Tell el-Dab°a chronology which is recognized now largely by specialists of MB research and even by low chronology's strongest critic W. Dever.[13]

The establishment of Avaris as an interregional centre and as the seat of a major kingdom, 108 years (time span of the 15th Dynasty according to the Turin Canon) before the New Kingdom occupation

[11] DEVER 1992: 6–10; WEINSTEIN 1992: 28–32; MANNING 1999: 328.

[12] STAGER 2002: 353–363; BIETAK, KOPETZKI & STAGER forthcoming.

[13] D. BEN-TOR 1994: 11; 1997: 163–64; A. BEN TOR 2004: 52–53 see also the rapprochement with similar chronologies of WEINSTEIN 1992: 38; 1995: 84–90; COHEN 2002: 134–136.

B. C.	TELL EL-DABA	ASHKELON
	D/2	10
	D/3	
1600	E/1	11
	E/2	
	E/3	?
1700	F	12
	G/1-3	13
	G/4	13/14
1800	H	14

Fig. 3 The synchronisation of the phases of Tell el-Dab^{c}a and Ashkelon (after BIETAK, KOPETZKY and STAGER forthcoming)

(c. 1640 BC) can be recognized by the sudden enlargement of the town to c. 250 ha and by the industrialisation of the pottery production during phase E/2 at Tell el-Dab^{c}a.[14] In addition, the seriation of pottery types helps to establish cross relationships to other sites with great precision.[15]

Of course Tell el-Dab^{c}a alone cannot establish interregional chronology, but the above paragraphs on its local chronology should show that the offset between the series of radiocarbon dates from Tell el-Dab^{c}a and the Egyptian historical chronology is indeed real as well as significant. This time difference of ca. 100 years or more repeats the offset betwe traditional (low) chronology (Thera erupti around 1500 BC) and the new radiocarbon-ba high Aegean chronology (middle to second half 17th century BC). Therefore, it would not make se to try to remedy this situation by unilaterally rais the Aegean chronology by 100 to 150 years, claimi that a new proportion of the relationship betwe Egypt and the Aegean has been found.[16] The previc generation of scholars who have established the h torical chronology by comparative methods of p historic archaeology were certainly no fools and ha done their best to establish a timeframe based exports and imports, with all the difficulties such time lags and heirloom effects involved. Even if t mutual exports between Egypt and the Aegean wo are scarce or questionable in the 17th and the 1 century BC, one can successfully work out a relati chronology for the time before and after those ce turies and is able to fill the gap in between by a mut al assessment of Cypriot pottery in Egypt a Egyptian exports to Cyprus.

To keep the unilateral rise of Aegean chronolo versus Egyptian is most difficult and leads repeate ly to results, which would need a lot of explanation be even minutely possible. For example, one has put a MC III-tomb at Arpera Mosphilos with thr Tell el-Yahudiya/Lisht Ware jugs dating to the fir half of the 16th century BC[17] (dangerously near t supposed high Theran eruption date in the seco half of the 17th century BC) to the end of MC III not to the transition to LC I[18] without taking in account the time lag between production, tran portation to northern Cyprus (which is claimed have no connection to Egypt) and the deposition the jug into the tomb. This should however be t time when the LC Bronze Age should have alread started, according to a LC IA2 WS I bowl in pr eruption Thera.[19] Such a chronological scenario very difficult to accept, even if we adjust Phase E/

[14] BIETAK, FORSTNER-MÜLLER & MLINAR 2003: 171–181.
[15] BIETAK 1991: 31–47; 2002: 30–42.
[16] MANNING *et al.* 2006: 565–569.
[17] MERRILLEES 1974: 49, 52, fig. 31/14–16, fig. 38–40. All jugs are of the Levanto-Egyptian group of TY Ware, Piriform 1b and c. no. 14, with kettle rim, and three zones of decoration typologically fall into the Phase F at Tell el-Dab^{c}a and may have been produced in the Levant, no. 15 has a rolled rim and is therefore late in this series, falling into Phase E/3 and no. 16 with a candlestick rim and segmented striped decoration is equally late and typologically anticipates already the Piriform 2 jugs of the Hyksos Period. It has two good parallels in Phase E/3 in Tell el-Dab^{c} which is the period shortly before the Hyksos time, i.e. fir half till middle of the 17th century. The three jugs f together and form an assemblage.
[18] ÅSTRÖM 1957: 197, n. 6, dates the tomb to the middle of t MC III period, in a later publication into mature MC II (ÅSTRÖM 1965: 120, pls. VI; XV: E.11.; MERRILLEES 197 43–77) because of a flattened base of a WP III jug an parallels of a spouted RP III bowl suggests a date in a lat stage of MC III but definitely excludes a LC I date.
[19] On the bowl and its bibliography see MERRILLEES 200 195–202.

when the jug was produced, in a flexible way 20–30 years backwards and squeeze the phases F and G/1–3 towards the rock solid phase G/4. Also such an adjustment would lead to highly unlikely results. One has to inflate the regional development and to explain why specific Middle and Late Cypriot wares would appear first in northwestern Cyprus more than 100 years later in the same succession in south-eastern Cyprus and finally more than 100 to 150 years later in the same succession in Egypt. *Such a time lag may be credible within a shorter delay of 25 years or so, but such a succession of ceramic type groups, which reflects a production and market chronology, cannot be expected to have been kept up after a delay of over one hundred years or more.* This is an entirely unrealistic scenario, especially as we have to assume that exports accommodate the demands of the consumers. It seems that the succession of Middle and Late Cypriot wares, as observed in Cyprus for example at Maroni,[20] can also be found in a very similar succession in the stratification of Tell el-Dabᶜa, Ashkelon and in the new excavations of Peter Fischer at Tell el-ᶜAjjûl (Fig. 4). This would contradict a long delay between production and deposition at the above mentioned sites in Egypt and the Levant.

Trying to make a case for the high chronology, Manning also had to explain without a detailed typological treatment and material analysis that the Theran WS I bowl is of northern Cypriot production, despite leading experts like Karageorghis and Merrillees having different opinions believing it to be from the southern part of the island.[21] Also, the LB Canaanite jars found in Thera must be declared as MB.

Furthermore, one has to deny various strong synchronisms for the Aegean LM IA and LM IB period with Egypt. There are good typological reasons for an early 18th Dynasty date of an Egyptian calcite ointment jar found in a LH I-shaft-grave in Circle A in Mycenae,[22] showing that LM IA (which is more or less contemporary with LH I) must have ended *after* the beginning of the 18th Dynasty in Egypt. In addition to that, the fact that the vessel was reworked to a bridge-spouted jar shows that this import already had a history: it was produced in Egypt, exported to Crete, reworked on Crete, transported to the mainland, used for an unknown period, and then deposited in the shaft-grave.

On the other hand, evidence for LM IA in Egypt is scarce at best, but the transition from LM IA to IB can be narrowed down between the date of the youngest Egyptian object found in a LM IA-context in the Aegean and the first appearance of LM IB in Egypt. There are at least some useful contexts with LM IB material, that have been discovered in Egypt. The dating of the context of the much-discussed LM I-sherd found at Kom Rabiᶜa[23] is part of the contribution of David Aston in this volume. It is sufficient here to state that he provides evidence that the context of that sherd should be regarded as contemporary with strata c or d at ᶜEzbet Helmi and therefore should be dated to the Tuthmoside period.[24] From the Saqqara Teti Pyramid tomb NE 1, there is a LM IB-alabastron and a LH IIA ring-handled cup. Together with the Aegean imports, BR I and RLWM were found, and the Egyptian pottery from this tomb should be dated to the time of Hatshepsut and Tuthmosis III.[25] Other contexts of LM IB pottery are either inconclusive (like Abydos or Sedment) or confirm the first appearance of LM IB in the time of the Tuthmosides in Egypt (e.g. Gurob tomb 245, where a LH IIA-alabastron was found[26]). Therefore, it seems clear to us that the transition to LM IB should be placed around 1480, the time of the early Tuthmosides, considering the unknown time between production and deposition of the above-mentioned, reworked Egyptian jar from Mycenae.

Also, the massive first appearance of Theran pumice in archaeological contexts (thus far nearly 400 samples) in the Late Bronze Age in the Levant and in the Tuthmoside Period in Egypt and not before,[27] would have to be explained as lingering for two centuries on the beaches of Egypt and the Levant before being used, while thus far all pumice found in MB-contexts and in Egypt in the SIP were from other volcanoes. This is mounting evidence in favour of the traditional relative or even lower chronology, which cannot be easily brushed aside.

In toto, there are too many extreme explanations

[20] Cadogan *et al.* 2001: 75–88. See also Manning *et al.* 2006: 471–488.

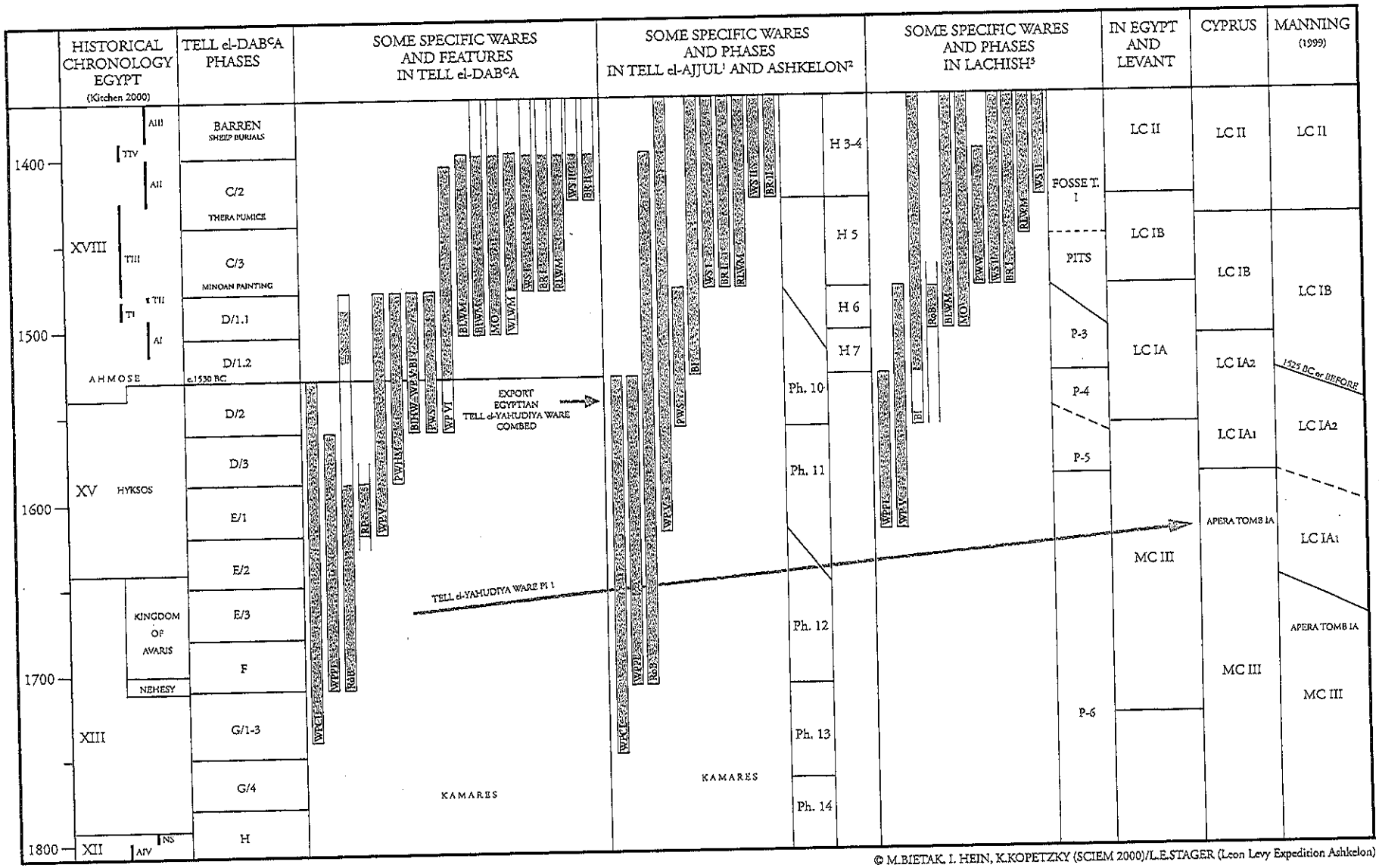
[21] Merrillees 2001: 93; Karageorghis 1990: pls. VI; XV: E 11.

[23] Bourriau & Eriksson 1997: 95–120.

[24] Aston this volume.

[25] See Warren 2006: 311 with references.

[26] Warren & Hankey 1989: 144; Warren 2006: 313.



[1] H3-7 Pottery after Fischer 2002
[2] Bietak/Kopetzky/Stager forthcoming
[3] Ussishkin/Avitz-Singer 2004

Fig. 1. Patterns of occurrencies of Middle and Late Cypriot pottery and other special wares in the stratigraphies of Tell el-Dab°a, Ashkelon, Tell el-°Ajjûl, and Lachish

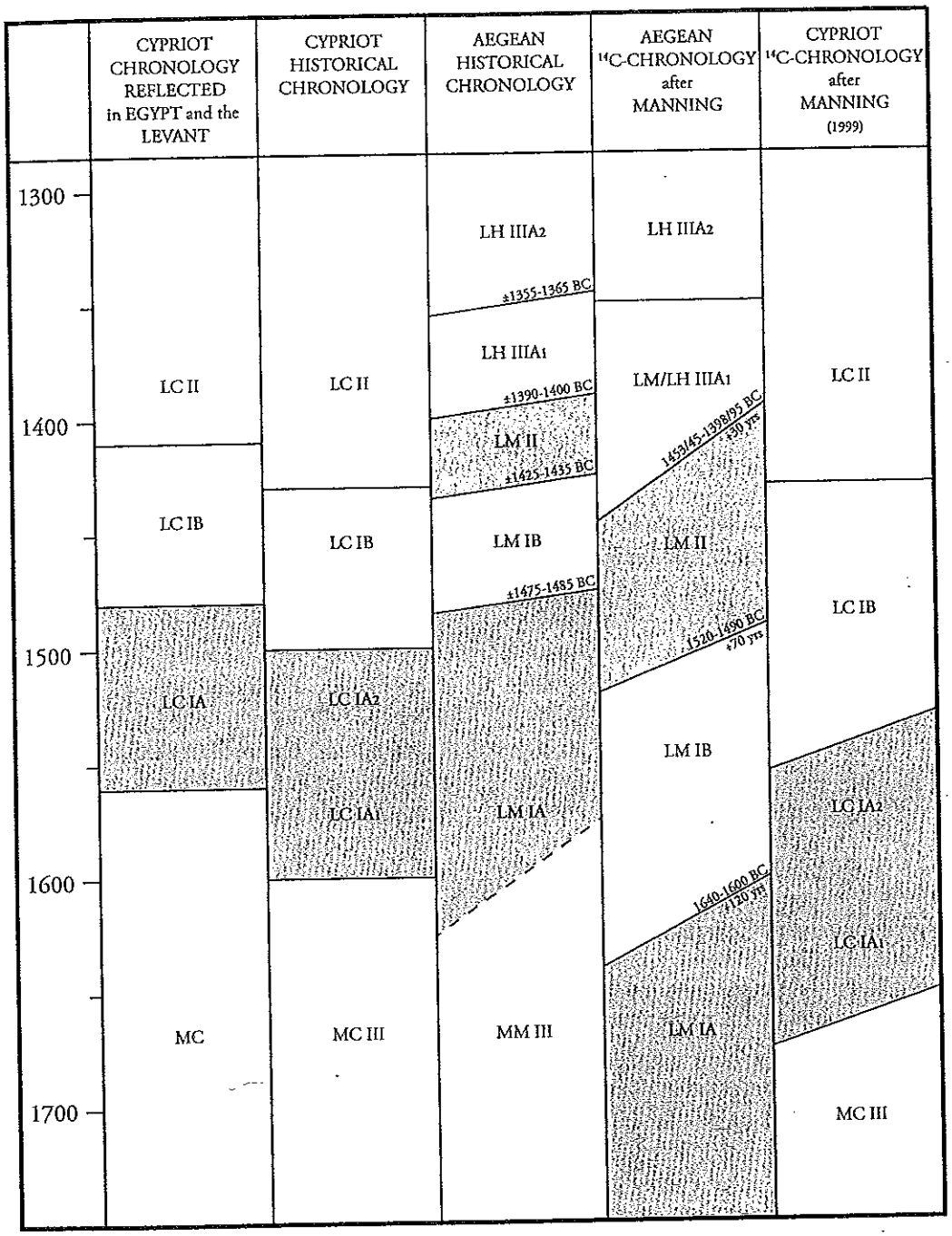


Fig. 5 Differences in the periodisation of the Minoan and Cypriot chronologies based on the historical chronology of Egypt, showing the offset towards the radiocarbon based periodisation

necessary to accept the unilateral rise of Aegean Late Bronze Age chronology. This construction is based only on a large number of implausible situations and is therefore not credible. Such a unilateral rise is also not necessary, as it seems that for the 17th to the 15th centuries the offsets of radiocarbon versus traditional chronology are the same in Egypt and the Aegean. Therefore one can come only to the conclusion that either the radiocarbon chronology or the historic chronology is wrong, or both have a defect. In such a case, the mutual control would not be possible without the help of an independent absolute dating method such as dendrochronology. As we have not yet succeeded in closing the floating dendrochronologies in Asia Minor and in the eastern Mediterranean, we may only compare the results of the two systems starting from a point of reasonable agreement, the dating of the latest ring of the keel of the Uluṛ

Burun shipwreck to 1364+15/–26, using the 2σ-range.[28] As there was also a scarab of queen Nefertity (1353–1341 BC) found in this ship , the lifespan of the ship and of the queen seem to fit perfectly together.[29] Also, the calibrated radiocarbon dates of Tell el-Amarna do not contradict the historical chronology, having no observable offset, as the second half of the 14th century lies perfectly within the margin of error.[30]

Working our way backwards, we can observe an increasingly higher date by the radiocarbon technology versus the historical chronology (see table in Fig. 5). With the end of LM IA we arrive at a dating difference of 120 to 130 years. In order to harmonise the two chronologies, one would be obliged to inflate the regnal years of kings of the 15th and early 14th century. This would be possible with the kings Tuthmosis II and Tuthmosis IV reaching a practically unsupportable maximum of 20 years and creating among the high officials of this time unusually high ages. But, to reach the age of 100 or even more is completely out of the question. This shows that the major reason (or fault) for this offset cannot be blamed on historical chronology. That there is an offset and not a false understanding in the relationship of the Egyptian and the Aegean periodisation (so the thesis of Sturt Manning)[31] is shown by the Tell el-Dabᶜa-series of Walter Kutschera *et al.* (Fig. 1) and by the late first appearance of Thera pumice in the archaeological contexts of Egypt and the Levant i.e. not before the Late Bronze Age in the Levant and not before the Tuthmoside Period, i.e. 15th century in Egypt.[32] This phenomenon cannot be explained by a change in technology, as pumice was also found before, however only in much smaller amounts. The fact that this pumice lay along old beaches of the 2nd millennium BC in North Sinai would explain the sudden and massive appearance at some sites (in addition to Tell el-Dabᶜa, Tell Hebwa and Tell el-ᶜAjjûl) and the sudden availability of large quantities of pumice, which formerly had to be imported.

In summation, the agreement between ^{14}C and historical chronology in the 14th century and the sharp rise of an offset a century earlier of up to 100 to 150 years as well as in the preceding centuries only shows that the calibrated radiocarbon dates presented by Manning, Bronk Ramsey *et al.* cannot be considered as a series of chronometric precision, but as a series where the precision seems to deviate considerably from the 15th century backwards. This conclusion is the more cogent one as within the historical chronology of the 18th Dynasty with its dense network of regnal and genealogical data nobody could claim that a mistake of more than 100 years could have mounted up from the Amarna period to the early Tuthmosides (within a century).

Under such auspices, one has to ask if it would not be worthwhile to investigate if a systemic failure in the Mediterranean ^{14}C evaluation could be discovered, or if the absorption of ^{14}C was, for environmental reasons, different from the 15th century BC backwards. Probably, we do not know enough about what may affect radiocarbon and its evaluation process. For this reason it, would be very important to close the gaps in Anatolian dendrochronology and to do the same with the cedar tree from Lebanon. Such new standards could be used to build up regional calibration.

In the nearer future we may collect more ^{14}C-samples from Tell el-Dabᶜa, especially to see, if the offset slows down in the 14th century, for which we do not yet have strata, as the occupation of the Amarna and post Amarna Period are denuded. The new project of the Oxford University laboratory under Christopher Bronk Ramsey, intending to measure well-dated Egyptian samples, is most important for enlarging the experience with Egyptian samples. The same is true of the project of sampling well-dated papyri by Ezra Marcus. According to our opinion, the relationship between historical dates and ^{14}C-dates of the New Kingdom would be of particular interest in order to see if the offset from the 15th century backwards could be verified also on new material.

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[28] Newton *et al.* 2005: 115–116.

[29] Weinstein in Bass *et al.* 1989: 17–29.

[30] Switsur 1984: 179–188; Hassan & Robinson 1987: 133.

[31] Manning 1999: *passim*; Manning *et al.* 2002: 733–744; Manning & Bronk Ramsey 2003: 111–133; Bronk Ramsey *et al.* 2004: 325–344; Manning *et al.* 2006: 565–569.

[32] The transition between MB and LB is put for convenience sake at 1550 BC because for the destruction of the MB cities for a long time Ahmose was made responsible, who hardly proceeded beyond southern Palestine. Also the Ahmose activities at Sharuhen only happened after the conquest of Avaris c. 1530 BC. In the meantime it became clear that many of those destructions happened later and possibly as late as from the year 22 = 1557 BC of Tuthmosis III onwards (Dever 1992: 14; Bietak 1991: 57–62). In the meantime objects from Egypt, dating into the 18th Dynasty were found in MB IIC contexts at Beth Shean (Mazar 2003: 328, fig. 5) and at Kabri (Black Lustrous Wheelmade Ware in tomb 902, see Kempinski 2002: 117–119, fig. 5.61/8–12).

In Egyptian chronology there are also problems in the first half of the first and the whole second millennium as well as the time before which also have to be worked out in respect to maximal margins of errors. A special conference was organised in Vienna (2005)[33] to address this theme and more work on these issues is being pursued in the meantime.

In respect to a realistic timetable to achieve a breakthrough, archaeologists could continue to refine the regional relative chronologies and establish, with mutual exports and datum lines of first appearances, especially of wide spread artefacts, a general relative chronology of the Eastern Mediterranean. One should do this without being biased by absolute chronologies. One may expect that at least achieving the relative interregional timetables could solve some problems in absolute chronology. Most of the contributions to this conference were parts of this collective endeavour. Above all, it seems to be most important that scientists should take the difference between Radiocarbon and historical chronology as seriously as we do.

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