

## A DATE-LIST FOR BRONZE AGE AND IRON AGE MONUMENTS BASED ON COMBINED DENDROCHRONOLOGICAL AND RADIOCARBON EVIDENCE

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The progress of dendrochronological dating of Bronze Age and Iron Age sites in Anatolia to which Professor Nimet Özgüç has contributed both burned wood and warm encouragement may be listed in tabular order by the year in which the work was accomplished:

- 1977 Completion of an 806 year juniper chronology for the Midas Mound Tumulus at Gordion and dates for other buildings on the City Mound (Kuniholm, 1977). The best estimate for absolute dates was late 16th century B.C. for the innermost rings to the late 8th century B.C. for the outermost rings, all based on stylistic analogies for the archaeological material in the tomb chamber (Young, 1981).
- 1989 Completion of a 677 year (mostly juniper) chronology for the Middle Bronze Age including wood from Kültepe, Acemhüyük, and a preliminary collection from Porsuk (Kuniholm and Newton, 1989).
- 1989 Collection of even longer juniper pieces from the Midas Mound Tumulus at Gordion, making the MMT sequence 918 years long or 112 years longer than the hitherto published 806 year sequence (Kuniholm, 1990).
- 1989 Collection of over 100 more pieces (juniper, pine, and cedar) from Porsuk, making the combined Porsuk chronology 321 years long (Kuniholm, 1990, preliminary report; Kuniholm, Tarter, Newton, and Griggs, in preparation).
- 1989-1990 Completion of work by Dr. Bernd Kromer at the Heidelberg laboratory of 17 radiocarbon determinations of selected decades from the Gordion chronology, thereby allowing us to wiggle-match the Gordion sequence to an end date of  $757 \pm 37$  B.C. (Kuniholm and Kromer, in final preparation).
- 1990 Collection of juniper timbers from the Kızılarkaya Tumulus near Gordion (Saatçı and Kopar, 1991), some of which must have been around a thousand years old at the time they were cut down some time in the 8th century B.C. The Gordion tree-ring sequence is now 1028 years long (Kuniholm, Çanakale Symposium, in press). This extension of the Iron Age chronology allows us to crossdate the Iron Age and Bronze Age chronologies with each other. The combined Bronze Age/Iron Age chronology is 1503 years long, and, since the Iron Age chronology is wiggle-matched to the radiocarbon time-scale, the Bronze Age part of the chronology is now wiggle-matched as well.
- 1990 Collection of a 301 year-long sequence of juniper timbers from Karahöyük-Konya which crossdates with all of the above (Kuniholm, Çanakale Symposium, in press).
- 1973-1990 Collection of wood and charcoal specimens from other sites in the Aegean which crossdate with the new 1503-year chronology (Kuniholm, 1988, 1990).

These results may best be viewed in tabular form (Composite Graph). The span of time covered is  $2259 \pm 37$  B.C., from the innermost ring of the longest lived timber at Kültepe to  $757 \pm 37$  B.C., the bark date or felling year of the timbers in the Midas Mound Tumulus at Gordion. The  $\pm 37$  year error margin will be with us until a complete ring-sequence to the present is established. However, the 1503 year sequence is a whole. That means if one moves one date up ten years or down twenty years to fit an historical or archaeological theory, then all the other dates must move up ten years or down twenty years respectively. The intervals between the bark dates are absolute. The sequence is exactly 1503 years long, not 1502, not 1504. Thus the numbers at the top of the graph refer to counting years, thereby reminding the reader that the dates are not yet fixed to the absolute year B.C. The second line of numbers indicates the years B.C. with the  $\pm 37$  years of tolerance based on the wiggle-matched radiocarbon determinations. Therefore, we may observe the following:

Ring 672 =  $1849 \pm 37$  B.C. More than twenty timbers from the main constructional phase of the Waršama Sarayı at Kültepe-Kaneš are cut. The bark is present. Two pieces which seem to have been repairs were cut some years later, 17 and 61 years respectively, indicating that the building had at least a 61 year life-span before its violent destruction (see *Anatolia and the Ancient Near East: Studies in Honor of Tahsin Özgüç*, Figure 1, page 284. Note that the counting numbers employed therein have been altered to conform to the Gordion counting system. The values from one number to another are the same.)

Ring 730 =  $1791 \pm 37$  B.C. More than thirty timbers from both the Sarıkaya Palace and the Hatipler Tepesi Building are cut. The bark is present. Since bullae from the 10th year of Šamši-adad as well as bullae from other Near Eastern notables are found in the former building, our tree-ring sequence is now tied in with the Assyrian King List and all its attendant problems as well as with the distinctive artistic style of the ivory artifacts.

Ring 736 =  $1785 \pm 37$  B.C. The last preserved ring at Karahöyük-Konya. Since no bark is present, the building's construction may have been a few years later. One goal of this year's excavations will be to find pieces of charcoal that preserve the bark. For the moment all we can say is that the construction date of Karahöyük = Acemhüyük + 6 years +?; or Karahöyük = Kültepe-Waršama + 64 +? Finding the bark will allow us to delete the question marks.

Ring 900 =  $1621 \pm 37$  B.C. Timbers in the inner postern in the west city wall at Porsuk/Ulukışla are cut. The bark is present.

Ring 902 =  $1619 \pm 37$  B.C. The last ring on a wooden bowl (Athens, National Museum, Inventory 890, Karo 891) from Shaft Grave V at Mycenae. Since this is a carved object, an unknown number of rings are missing. This is also a *single piece* of wood and caution must be observed in its interpretation. We also do not know how long the bowl had been around when it was placed in the grave. One of our immediate goals this year or next is to measure additional unworked Shaft Grave wood preserved in the National Museum in Athens.

Ring 931 =  $1590 \pm 37$  B.C. More than twenty timbers in the outer postern in the west city wall at Porsuk/Ulukışla are cut. The bark is present. The outer postern which takes a dog-leg turn between the sets of dendrochronological samples seems to have been a modification and strengthening of the original Hittite fortification built 31 years earlier.

Ring 1129 =  $1392 \pm 37$  B.C. The last preserved ring at Maşat Hüyük in the destruction debris of which were found imported Late Helladic IIIB stirrup-jars. Since no bark is present, the stratum should date some years later. This link with ceramic dating is also of considerable interest. The dating formula is thus:  $1392 \pm 37$  B.C. + ?? lost rings + lifespan of the building = time of LHIIB pottery.

Rings 737-1741 = the several centuries before 780 B.C. More than twenty architectural units on the City Mound at Gordion, the adjacent tumuli, the Büyük Tümülüs at Ankara, and archaic wood from the Athenian Agora fit within this dendrochronological framework (Kuniholm, 1988). They need not be discussed here except that it is worth emphasizing that the other Gordion wood demonstrates both a prolonged period of occupation and wood-cutting at the site.

Ring 1647 =  $847 \pm 37$  B.C. The last preserved ring on Gordion Kızılarkaya Tumulus A (Saatçı and Kopar, 1991) (Kuniholm, Çanakkale Symposium, in press). Since an estimated 100+ sapwood rings are missing, this does not date the tumulus very precisely, but if it had not been for the 911 rings which *were* preserved the link between the Iron Age and Bronze Age chronologies could not have been confirmed.

Ring 1764 =  $757 \pm 37$  B.C. The timbers of the Midas Mound Tumulus at Gordion are cut. Bark is present on several different logs, all on Ring 1764.

The 1503 year chronology may now be thought to have taken on a life of its own. We expect to fit other sites into its framework (for example, the Karahöyük-Konya samples were measured and a relative chronology developed which was then cross-dated with the long chronology in only three weeks), as well as to extend it both earlier (the palace of Naram-sin at Tell Brak, for instance) and later (the Dinar/Tatarlı Tumulus near Afyon and the Parthenon in Athens, for instance). The more links we can establish with other methods of dating, specifically the King-Lists and the ceramic chronologies, the more difficult it will be to move the chronology about. We can then commence the serious business of studying ancient history and archaeology with a time-frame in place that is independent of ideologies and preconceptions, or so we like to think.

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