

AEGEAN DENDROCHRONOLOGY PROJECT DECEMBER 1993 PROGRESS REPORT

CHANGE FROM OUR USUAL FORMAT

A number of our correspondents have suggested it is time for a larger overview than the usual What-We-Did-This-Year report. Since 1993 is the 20th anniversary of my starting measuring tree-rings from Gordion in the basement of the University Museum, here is the overview as requested, both in time and in space. It should serve as a summary of where we think we are after 20 years.

ACCOMPANYING DOCUMENTATION

For all current Patrons of the project, the following information is enclosed with this report: excerpts from Tille 4 and Studia Troica III, the complete volumes of which are to be had from Oxbow Press and Verlag von Zabern respectively. For 300 of you (number limited by availability) we enclose the most recent number of Cornell Plantations.

AEGEAN CHRONOLOGICAL PROBLEMS (AND ARGUMENTS) CONTINUE

Few archaeological problems stimulate as much rancor as chronology, especially that of the Eastern Mediterranean. The following comments are illustrative:

"Chronology is a dangerous subject for study, because it can become an obsession, then a disease. One must learn to distance oneself from emotional self-identification with any given datings, whatever they might be."

--Kenneth A. Kitchen, Times Literary Supplement (21 June 1991)

"The first step, however, is to recognize the depths of our ignorance. To realize how the existing 'chronologies' in different parts of the Mediterranean are bolstered up by circular arguments, where specialists in one area believe that those in other areas must know what they are talking about, and blindly use dating systems which are no better than their own....To my mind there is only one solution: scientific dating, based on the two methods currently available. The first of these is dendrochronology: tree-ring dating."

--Colin Renfrew, foreword to Peter James, et al., Centuries of Darkness (1991)

"I wish radiocarbon was not so messy, either in its statistical uncertainty, or in the intricacies of calibration....More and more we have dendro dates, with the excitement of precision to nearly a single calendar year..."

--Christopher Chippindale, editorial, Antiquity (June 1993)

NATURE AND SIGNIFICANCE OF THIS PROJECT

The work of the Aegean Dendrochronology Project has been and continues to be the building of long tree-ring chronologies for the Eastern half of the Mediterranean with the aim of helping to bring some kind of rational order to Aegean and Near Eastern chronology from the Neolithic to the present. Since

these chronologies are self-standing (i.e., independent of king-lists, generations of potters, etc.), beginning with the tree-rings of the living forests of Turkey, Greece, ex-Yugoslavia, Lebanon, Italy, and Cyprus, extending the sequences back through the rings of timbers collected from medieval monuments, and then continuing as far as the evidence will take us (Neolithic, so far, with Chalcolithic to be filled in), we feel as if we are on track to help sort out some of the problems cited above.

Our long floating dendrochronological sequences (see bar-graph below where they span some 6000 of the last 9500 years)--lacking for the present a link to the long absolute chronologies of the 2nd millennium A.D. but pinned in place by wiggle-matched radiocarbon dates for specifically selected rings--may move up or down a little but not much. Sooner or later we will get to the point where we can move the graphs no further and get down to the serious business of studying the archaeology and history of the Aegean and the Near East with a time control that has hitherto been lacking. The work of the last twenty years has also enabled us to build a wood 'library' by which a number of archaeological, anthropological, historical, or art-historical problems may be solved and to which other scholars may readily refer. This resource is unique for the Aegean and the Near East.

The numbered paragraphs below follow the chronological periods marked on the bar-graph above. The site-map (Fig. 4) shows the location of some of the more significant archaeological excavations from which our dendrochronological material is coming as well as the entire zone within which we have found crossdating among trees.

- 1. NEOLITHIC: In hand and done as of Fall 1993:** We have an almost 700-year set of sequences for Çatal Höyük from the carbonized scraps left over from the MASCA (Pennsylvania) radiocarbon laboratory's analysis of charcoal from J. Mellaart's excavations 30 years ago. (Preliminary notice in the 1992 Annual Report.)
Forthcoming for 1994-1997: Major excavations are to commence in 1995 at Çatal Höyük by Dr. Ian Hodder (Cambridge). Hodder and his group did a preliminary survey in the summer of 1993 and expect to do the same in 1994. Our best estimate for Çatal Höyük, if Hodder excavates on anything near the scale that Mellaart did 30 years ago, is that the internal chronology for this extraordinary site could be worked out within three to five years if all the carbonized wood were to be saved for dendrochronological analysis.
- 2. CHALCOLITHIC: In hand and done as of Fall 1993:** We have a 212-year juniper sequence (also several shorter ones) for Can Hasan 2B, shorter sequences for Kösk Höyük (juniper), Kuruçay (oak), a 247-year Eneolithic oak sequence for Sozopol, Bulgaria, just north of the Turkish frontier, and a sequence for Hacilar still being worked on by Maryanne Newton. The Chalcolithic is, as of Fall 1993, the least well-represented period in our dendrochronological spectrum.
Forthcoming for 1994-1997: However, at Seyitömer Höyük, just northwest of Kütahya in the middle of an enormous open-pit coal mine, stands a settlement mound some 26 meters high. The local coal-mining enterprise is paying for its study and complete removal over the next five years so that a seam of coal, some 15 meters thick, can be mined. A team of 60 archaeologists led by Director Ahmet Topbas (Afyon Museum) puts in a four-month field season each year. The walls on the very top, an exposure already some 5,600 square meters, comprise a Hellenistic settlement from which we collected charcoal in the summer of 1993. By October 1993 these walls were to have been photographed, mapped, and removed. A test step-trench on the far side of the mound showed that immediately below the Hellenistic level is early 2nd millennium B.C. material, then Early Bronze Age and Chalcolithic for the next 26 meters. At least four major destructions in the EBA and Chalcolithic average 1.50 meters of debris each. Since the EBA and Chalcolithic walls at Seyitömer seem to be made almost entirely of mudbrick reinforced with wood, the prospects for significant dendrochronological collection are excellent. Mr. Topbas has promised total retrieval of all dendrochronological material, and we plan not only to visit him regularly but to lend him an excavator or two to superintend the charcoal removal.
- 3. EARLY BRONZE AGE: In hand and done as of Fall 1993:** We have a 224-year pine sequence from Troy I wiggle-matched to 2922-2699 B.C.±15 (galley-proof with wiggle-matched graph from Studia Troica III included in Patrons' copies of this newsletter) along with a

discussion of the 100 new radiocarbon determinations available from Troy I, a 285-year oak sequence from Kiten, Bulgaria, a 139-year oak sequence from Demircihöyük, and a 263-year juniper sequence from the Bent Pyramid at Dashur. Mac North and Maryanne Newton are finishing putting together a 546-year juniper chronology from 68 pieces (possibly 15 trees) from Building Level III in the Northwest Trench at Acemhöyük. At Acemhöyük, an enormous mound (800m N-S x 800m E-W) only a fraction of which has been investigated, excavator Prof. Aliye Öztan (Ankara) thinks that the rooms of the Northwest Trench are service buildings, or kitchens, for the palatial Hatipler Tepesi to the east for which we already have a wiggle-matched dendrochronological date of 1791 B.C.±37 years. Eleven ovens were excavated during the summer of 1993 from this new area.

Although the finds (wheelmade pottery, bullae, bronze objects, *etc.*) are clearly Middle Bronze Age, and the violent destruction which brought the lives of most of the Northwest Trench buildings to an end is thought to be the same destruction that burned Hatipler Tepesi and the Sarikaya Palace some 400 meters to the southeast, the timbers which served as footings for the walls of these buildings do not crossdate at all with the Middle Bronze Age master chronology. As a glance at Fig. 3 below will show, inside an unburned section of mudbrick wall with its two white plastered faces left and right are horizontal stretchers with charred ends, a classic example of reused and recycled material. Indeed, the left and right timbers are joining half-sections of the same tree. The one chronology with which they do fit securely is the 198-year sequence from Levels 6/7 at Konya-Karahöyük which Professor Sedat Alp (Ankara) thinks is contemporary with the Alaca Höyük royal graves about the middle of the third millennium B.C. These stretchers were probably posts in burned EBA buildings which were demolished to make way for the MBA service buildings now being excavated. It is odd, if not out-right distressing, that so far not one single piece of wood from these buildings has a Middle Bronze Age cutting date. If, as now seems likely, we are able to attach the new 546-year Acemhöyük series to the early end of the 1761-year Bronze Age/Iron Age chronology, we should have a continuous chronology well over 2000 years long. This would extend this long sequence back to 2922 B.C., but that depends on a tenuous overlap that has not yet been worked out as of November 1993.

4. **MIDDLE BRONZE AGE/LATE BRONZE AGE/EARLY IRON AGE: In hand and done as of Fall 1993:** We have a 1761-year continuous chronology for this period which runs from 2259±37 B.C. to 498±37 B.C. as mentioned in the 1991 and 1992 newsletters. The significance of this long chronology and additions we are making to it includes synchronizations with well-known pottery classes of the Assyrian Colony Period, Mycenaean, Minoan, Hittite, Phrygian, and Urartian, not to mention the Hittite documentary record (Ortaköy where the archive now exceeds 2000 tablets), the Old Assyrian king-list (Acemhöyük, Konya-Karahöyük, and Kültepe), and the Neo-Assyrian king-list (Ayanis/Agarti), with possibilities also at Bastam, Iran. Finally, the new charcoal expected from Troy VI should be of interest not only to the community of Aegean scholars but to the wider community of scholars who concern themselves with pre-history from Europe to Egypt. Measurement on Scythian wood from the High Altai and elsewhere north and east of Anatolia started in September 1993 after samples were sent to us by the Hermitage Museum in St. Petersburg. All of which is to say that our work impinges on that of a variety of other scholars in a variety of areas.
5. **EGYPTIAN:** Egyptian dendrochronological work has been mentioned in passing for several years. Now that we have found we can crossdate cedar and juniper from the Lebanon, collection from the Egyptological reserve collections of museums of the western world (Metropolitan, Brooklyn, Boston, Field, University Museum, Oriental Institute, British Museum, Louvre, *etc.*) has now become a serious priority.
6. **CLASSICAL/HELLENISTIC/ROMAN: In hand and done as of Fall 1993:** This has always been a "problem" period simply because of the relative scarcity of material, although the 513-year boxwood sequence from Comacchio (6th-1st centuries B.C.) is a significant breakthrough (see account in the December 1991 Annual Report). The Late Antique/Early Byzantine city of Amorium excavated by Dr. Christopher Lightfoot (Bilkent) with several centuries' worth of cedar, pine, and oak chronologies is also going to be very helpful. Continued excavations are planned at Amorium from which we collected almost 100 specimens in 1993 with up to 309 rings (cedar) and 125 rings (oak), several with the bark preserved, with about 20% of

the samples still to be processed. The burned tower from which most of the samples came is thought by the excavator on the basis of coin evidence to date from the late 5th century and to have been destroyed in the Arab attack of A.D. 838. This important site could link a number of our floating chronologies such as Istanbul/St. Sophia, both primary and secondary, St. Eirene repair, various phases of the Kütahya fortress, Sardis/Byzantine Shops, Trilye, Vize, Sv. Donat, Thessaloniki/ Hg. Sophia, Alahan, Dereagzi, and others. Another site with potential for this period is 2nd century Roman Sagalassos where we collected more 2nd century Roman wood in 1993.

7. **MEDIEVAL: In hand and done as of Fall 1993:** The absolute chronology for oak goes back from the present to A.D. 927. The absolute chronology for pine is a little shorter with a possible extension on which we are still working. We have begun writing up for final publication our 135 absolutely-dated medieval or post-medieval sites plus about 100 medieval sites which do not yet fit into the absolutely-dated ring-sequence but about which something dendrochronological can be said. Research Aide Mary Jaye Bruce and I have been at work on this manuscript for a little over a year. We have set June 1, 1995, as a target date for its completion. As of Fall 1993, clean copy exists on 101 Greek monuments and 31 Turkish monuments, rather more than halfway through our list. We still have copy to edit on another 60+ Turkish medieval monuments, plus another 40+ buildings from (the former) Yugoslavia; then we plan a re-working of the entire corpus.

CURRENT (SUMMER) EVENTS

In summer 1993 Mary Jaye Bruce, Kathy Leeper, and Laura Nogelo helped collect about 500 samples from 37 sites. The official sample tally was 329, but since some bags had up to 32 pieces of wood in them, 500 is a conservative estimate. Since more are on the way to Ithaca, N.Y. or promised, we do not append the usual annual sampling list. We traveled 8,600 miles with only one blown-out tire (replaced) and one cavity in one tooth (filled).

LABORATORY OPERATION

Our laboratory operates twelve months a year, with about 12-15 people working from September through May, and 2-4 people working June through August, not including the people in the field. We are usually able to process everything within one year from the time of collection. Of the 1700 samples collected in the past three years 1296 or 76% had been processed as of 1 October 1993. We are unable to use the visual skeleton- plotting techniques employed so successfully at the University of Arizona and instead have to measure every ring under a microscope. My best estimate is that we are now able to accomplish in three weeks what I used to do in a year working alone in the Ankara Museum. The advantage of being able to produce results in a timely fashion and with a continuous interchange of ideas and information means that excavators sympathetic to our needs continue to supply us with material, year after year. At the same time excavators profit from the information we send them: at a recent annual symposium in Turkey, dendrochronological dates were cited in at least seven papers other than mine.

This fall Christine Latini and Maclaren North are working fulltime on the dendrochronology (having spent the summer of 1993 in a massive and long-overdue reorganization of our storeroom), Mary Jaye Bruce fulltime on text, Mark Sanford half- time on systems administration and programming support. Maryanne Newton is back with us, this time as a graduate student in archaeology. She will write her M.A. thesis on the dendrochronology of Çatal Höyük. Twelve students working under the aegis of the Cornell Undergraduate Research Program provide the slave labor. Since dendrochronology is labor-intensive (the bar-graph on page 3 is a synthesis of over 8 million ring measurements), having five second and third-year veterans to help coach the new talent (seven rookies this fall) represents a great optimization of time and effort. The total time logged in each week is over 300 hours.

Hope Kuniholm has moved on to development work in the Cornell Library, and Miles McCredie has moved upstairs where he is in charge of installing and maintaining 350 network connections in several

of the humanities departments. We like to think that we were a guinea pig for academic computing networks in the College of Arts and Sciences.

PUBLICATION AND DISSEMINATION

One final product, and the most important, will be (ideally) a continuous dendrochronological time-line (available both in hard copy and on disk), extending from the present to the Neolithic, against which all workers in the Eastern Mediterranean may date their finds of wood and charcoal. Until that happy day arrives we will have to deal with the time-line in segments. This year 23 absolutely-dated chronologies were submitted to the International Tree-Ring Data Bank in Boulder, Colorado. More will follow in the near future.

Forthcoming

The (real) final product is a book, or, better yet, a set of fascicles--one per millennium--summing up the whole business. Five three-ring binders which we renew practically weekly are filled with clean copy which gets outdated (and therefore is no longer clean) practically daily. Our system administrator has recommended that we move the whole filing system, not to mention several million ring-width measurements, to a PARADOX database, which we installed several years ago for our mailing lists, so that we may more readily corral these sets of data. This conversion is still in gestation as we work out a standard format for the database. A new date for a 14th century church, for example, may have implications for as many as 24-30 other monuments. Until now, we have been doing all the cross-referencing by hand, and it is high time that we changed. The fascicle most likely to appear first is the one on the second millennium A.D. since all the dates therein are already absolute.

We thank the various responsible archaeological services, the clergy (both Muslim and Christian), the foresters, the geologists, the state waterworks engineers, the meteorologists--in short, almost everybody we have approached. We thank a large and growing number of collaborators, both excavators and museum officials, who have at last caught the dendrochronological "bug." But most importantly we thank the National Endowment for the Humanities, the National Science Foundation, the Malcolm H. Wiener Foundation, and some 659 individual and corporate Patrons without whose active support none of this would have been possible.

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