

# Aegean Dendrochronology Project December 1997 Progress Report

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## TRY THIS ON YOUR LOCAL TRAVEL-AGENT:

Fig. 1 or "Zürich to Zürich the hard way" shows you where we went in order to bring you this report. "We" in 1997 were Peter Kuniholm, Eleanor Kuniholm, Mary Jaye Bruce, Laura Steele, Isabel Tovar, and Anne-Marie Compton. Maryanne Newton studied Turkish in Istanbul, and of course there was a much larger group who put in many hours all twelve months in the lab back in Ithaca, N.Y.



## NEW PUBLICATION ANNOUNCEMENT:

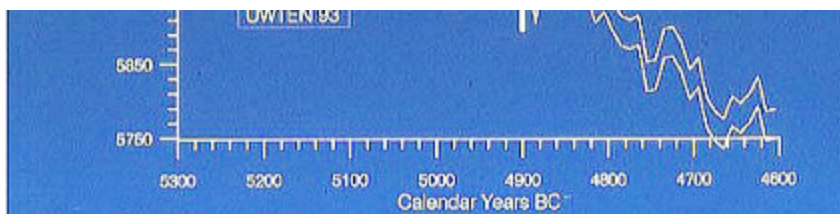
*Acta Archaeologica* Vol. 67 (1996) is out as of last week (late November 1997). It includes a printed version of a report I gave at a meeting in Verona, Italy, in 1994 on Absolute Chronology: Archaeological Europe 2500-500 B.C. The information ties together what has been reported in half a dozen annual reports and articles. The subject matter of the various contributions ranges from Egypt to the Aegean to Europe, so the volume ought to be of fairly broad interest.

## KÖSK HÖYÜK:

One noteworthy addition to the other early material covered in our *Acta* report is from Kösk Höyük near Niğde on the eastern edge of the Great Konya Plain. Opinions, both written and verbal, on its date have ranged from Early Neolithic to Late Chalcolithic, a difference of some 3000 years. Kösk [Tyana, of Black Stone fame] was 'discovered' by engineers building a standpipe above what turned out to be a large Roman water cistern; was then



excavated for a number of years by Dr. Ugur Silistreli; and is now, after his death, being salvaged by Prof. Aliye Öztan (Ankara University) and Director Erol Faydali (Nigde Museum). With exemplary care they have saved 333 charcoal samples



(not counting an additional 62 from summer 1997 not yet measured) which we have combined into a 226 year long floating tree-ring series. Radiocarbon wiggle-matching of the beginning and ending decades of this sequence (Fig. 2) gives us an end date of 4883 B.C.  $\pm$  120 years. The shape of the radiocarbon curve at this point in the fifth millennium makes further attempts to narrow down the date impractical and expensive, but plus/minus 120 years is better than a range of 3000 years.

### OTHER MISCELLANEOUS VERY EARLY SITES:

The lakeside pile-dwellings of Dispilio-Kastoria (Prof. George Hourmouziades, Aristotelian University, Thessaloniki), a hop and a skip from the Albanian border, yielded the very first Neolithic wood from Greece for our project. More wood was sticking out of the mud when we visited in August and should be ready for sampling in 1998. The well-preserved posts fit with nothing at all in our Neolithic inventory, so two samples are now at Heidelberg being radiocarbon dated by Dr. Bernd Kromer. A piece of charcoal from the basal level at Neolithic Asikli Höyük (Prof. Ufuk Esin, Istanbul University), underneath seven levels of aceramic settlement, as well as a slice of wood from a possibly prehistoric dugout monocoque canoe from the Black Sea near Sile (Capt. Muhlis Ergin, Naval Museum, Istanbul) are also being radiocarbon dated in Heidelberg. Eight pieces of charcoal from the new excavations at Çatal Höyük (Prof. Ian Hodder) were mailed to us today from Cambridge.

### INTRIGUING EARLY SITE IN NORTHERN ITALY:



At the end of last summer's fieldwork we had the extraordinary opportunity of spending three days at Lavagnone di Brescia (Prof. Raffaele De Marinis, University of Milan) where the excavators kindly reopened their site for us (last dot in our "Zürich" map above) and helped us collect 90 sections of oak pilings, many with the bark or the waney edge preserved, and with anywhere up to 204 annual rings (rough field count). The site is fascinating: a bog where there used to be a lake, and then pile-dwellings which originally stood on a shallow spit of land extending into the lake, some of which had burned down to the water-level in the early EBA, then had been repaired, then had

all slumped over as the lake level dropped. In the photographs the reader can see burned and unburned pilings, both pre-fire and post-fire, sloping in military alignment.

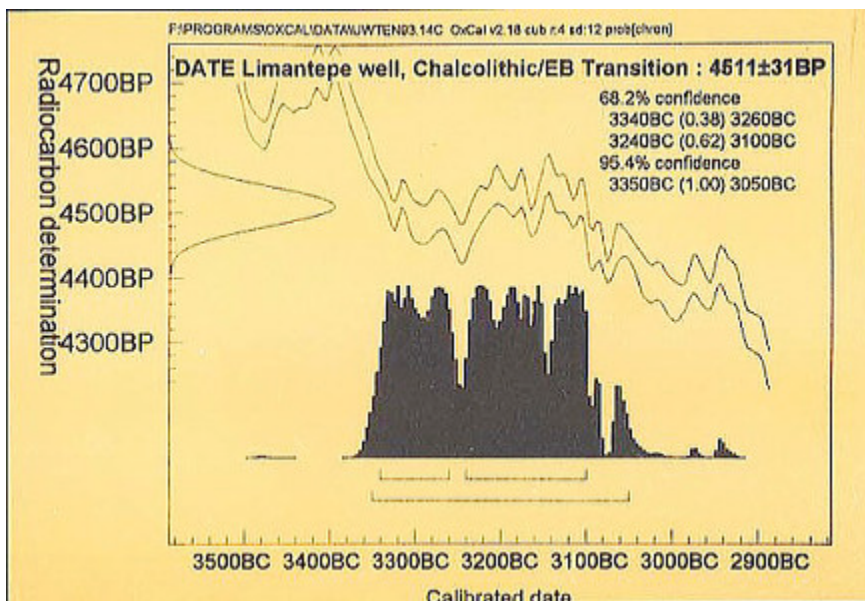
The close-up of excavator Nicola DeGasperi's leg shows one of the earlier posts burned down to the ancient water level. The Lavagnone samples seem to be spread from Lavagnone phases 2 through 7 which means from Early Bronze Age IA through Middle Bronze Age IIA and B, or from about 2100 to 1400 B.C. if I understand the North Italian chronological scheme correctly. This is the site from which came the world's oldest wooden plow. Lavagnone will be the work of the winter term for our old-timers Joanna Eleftheriou, and Christine Groneman, and since the wood is all oak, it should be less problematic than the



larchwood of the similar pile-settlement at Fiavé, even if not as long-lived.

#### FOUR NOT SO EARLY SITES (BUT NOT SO LATE EITHER):

On the nearer end of prehistory an oak branch with 30 rings from the Chalcolithic/EBA transition in a well at Limantepe was not long enough for proper dendrochronological analysis. A radiocarbon date of  $4511 \pm 31$  B.P. sounds pretty good and looks pretty good on the bell curve at the left of the Limantepe calibration figure. However, look at the probability of the calibrated date (the black squiggles on the bottom of the figure). Anything between 3350 B.C. and 3050 B.C. is possible, and the date is sloppy at best. This is why we prefer dendrochronological sequences, when they are available, to bridge the flat places on the radiocarbon curve.



A single charcoal sample from Kilisetepe in Cilicia has a last preserved ring at 1381 B.C. The excavator, Dr. J.N. Postgate (Trinity College, Cambridge), estimates the age of the stratum's destruction at about 1300-1100. Negative thought: singleton samples are a curse! Positive thought: but they are better than nothing at all! We await further material from Kilisetepe (Nicholas, please note).



Last summer Laura Steele found almost a dozen more exterior rings, some only a hair's breadth wide, on the reverse side of the sample from the Kas/Uluburun shipwreck (Dr. Cemal Pulak, Texas A&M), so the last existing ring is now 1305 instead of what has been printed heretofore, i.e., 1316 in the Nature (1996) report which you were all sent. Oh, for a piece of well-preserved hull rather than just the dunnage....(We do have three new pieces--but not planks--from Kas collected last summer.) To give you an idea of what Laura was dealing with, Fig. 6 shows the Kas wood in all its dubious glory, perforated with teredo worm holes about the size of 50-caliber

machine gun bullets. That she was able to measure around all of them is a tribute to her tenacity if not her sanity for even trying it.

Assiros (Dr. Ken Wardle, Birmingham), just north of Thessaloniki, yielded 18 bags of badly-burned charcoal out of some 200 samples through which we searched in late August 1997, and we have put old-timer Ken Harris to work on that. He will be joined next month by Melissa Loewenstern on this material, all of which seems to be from the end of the Late Bronze Age or the very beginning of the Early Iron Age.

#### FIRST MILLENNIUM B.C.-- URARTIAN AYANIS (LAKE VAN):

The monumental building at Ayanis/Agarti shown in previous years' reports turns out to be the temple of King Rusa II and is dedicated to the God Haldi. The inscription emerged the day we were there in 1997, much to the delight of the excavator, Prof. Altan Çilingiroglu, Ege University, Izmir. The layout is reminiscent of the well-known temple at Altintepe. Almost 90 timbers continue to cluster with bark (= felling) dates at 651 B.C., also 652, 653, 654, 655, etc. This demonstrates that timbers were collected at Ayanis and stock-piled until the actual construction of the building. Surges in annual growth during the five years before 651 suggest that the stands of timber were being thinned out as trees were cut down for this or possibly other Urartian building projects. A similar growth-surge phenomenon was observed at Porsuk/Ulukisla when we first sampled there.

We have been classifying the Ayanis timbers into groups of standard sizes. An examination of the techniques of the Urartian carpenters at Ayanis shows that the big timbers in Trench VI can be grouped into five categories, as follows:

- Class A: approx. 13 cm. x 11 cm. 20 timbers
- Class B: approx. 10 cm. x 7 cm. 48 timbers
- Class C: approx. 4 cm. x ? (up to 16 cm) 18 timbers (=4cm.planks)
- Class D: approx. 19 cm. x 19 cm 1 timber
- Class E: approx. 27 cm. x 9 cm. 1 timber

Of these 88 timbers (all *Pinus silvestris* or Scots pine), only 5 (all in Classes A and B) are round unsquared timbers fashioned from the whole tree- trunk. The remaining timbers are all radial or tangential sections cut from much larger trees. The forestation around Van must have been in remarkable contrast to the denuded mountainsides of today. Classes D and E, each a single timber of extraordinary size, probably represent beams with a specific use such as a main roof-beam or truss. We have turned over a set of these observations and measurements, including comments on the nature of wood selection and preparation for each piece, to Professor Çilingiroglu so that he and his architects can compare our data with those taken in the field at the time of excavation. I remember seeing one timber in place that measured 35 cm. x 25 cm. but which was too badly burned to lift. No doubt there were other timbers of these approximate dimensions.

### **NEW URARTIAN CROSSDATE (AS OF TODAY--3 DECEMBER 1997):**

Last summer Prof. Oktay Belli (Istanbul University) gave us carbonized remnants of a plank from the Urartian temple (Room 258) in Upper Anzaf Castle built by King Menua (his conventional dates: 810-786 B.C.). It fits very well against Ayanis with the last-preserved ring at 785 B.C., a year after Menua's death. An unknown number of rings are missing from the exterior. The cautions noted above about singleton samples apply here as well. Presumably the temple had a life that extended beyond Menua's death. We cannot tell dendrochronologically whether the plank is from the primary build or from a repair.

### **MORE ABOUT ROMAN HERCULANEUM:**

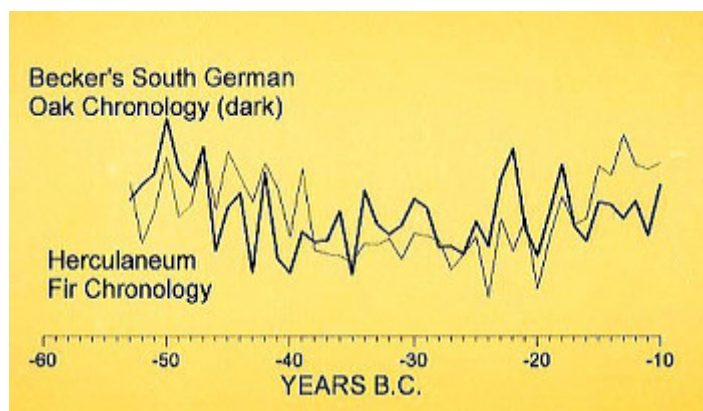
Last year I reported sampling at Herculaneum and Pompeii. Now we have absolute dates, at least for Herculaneum. The scorched wood in the carpenter's workshop at Herculaneum mentioned in last year's report and shown here in has a last preserved ring of A.D. 72, only seven years before Vesuvius's Big Bang. Other timbers in the same pile, some showing signs of use and re-use, were cut up to several decades earlier. Wood from the Roman building in the new excavations by the Villa of the Papii (shown in Fig. 2 in 1996) has a last



preserved ring at 6 B.C. Additional samples collected from this building in 1997 thanks to Soprintendente Dr. Pietro Giovanni Guzzo may refine this date after they are measured this winter.



The dates in the paragraph above deserve explanation. The fit is between fir (*Abies* sp.) from Herculaneum and the South German oak chronology. When we spotted this extraordinarily good match, we tried seeing whether any other fir forests in Italy fit with the Alpine oaks. Starting with forests in Calabria, we looked at fir data from the entire length of the Appennines all the way north to north of Florence, and the result was always the same: zero fit--until we got to the Black Forest south of Munich where the firs and the oaks fit splendidly with each other. So we proposed last spring that what we have at Herculaneum is a population of fir timbers imported from the Alps. Last summer we started our summer fieldwork by visiting the lab at Stuttgart/Hohenheim where these South German chronologies were built, and our colleagues there agreed that the Herculaneum wood is indeed Alpine. Our proposed fit covering the 309 years between 238 B.C.- A.D.72 was confirmed by Messrs. Michael Friedrich and Marco Spurk, University of Stuttgart/Hohenheim, against their new unpublished Alpine fir chronology.



Before we had found these dendrochronological crossdates, we had sent samples to Dr. Kromer in Heidelberg for radiocarbon wiggle-matching. He reported a date for the beginning of our sequence at Herculaneum at 240 B.C.  $\pm 15$  years, only two years earlier than the dendrochronologically-derived date of 238 B.C. The agreement between the two dates is so close that there is no need to perform any further radiocarbon determinations. All of this means that some enterprising Roman timber merchant went north to a seaport like Genoa or Venice and brought wood south from there to

Herculaneum. We have no literary testimony for this specific kind of trade, but here is the mute evidence. The graph shows a section of the fir and oak graphs compared. For people who prefer numbers, the t-score is 6.72, the overlap is 309 years, the trend coefficient is 61.4%, and the D-score is 76.3. There are even higher numbers when one matches the Herculaneum fir against the unpublished Alpine fir chronology.

All of the above is the good news. Now for the bad news: what we have at Herculaneum is Alpine fir, but that does not help us with the BC/AD transition in the Aegean (which is why we went to Herculaneum in the first place). All is not lost, however. There are additional timbers at Herculaneum which do not fit very well with the Alpine curve, and they just might be the local material we wanted all along. We have another 27 timbers to measure from Herculaneum and Pompeii collected in summer 1997. Patience.

## THE LAST TWO MILLENNIA:

**A. Ephesos Harbor:** Some badly-eroded oak timbers from fill in the harbor at Ephesos saved a number of years ago by the Austrians (Dr. Stefan Karwiese, Vienna) have a last preserved ring at A.D. 518 with an unknown number of rings missing from the exterior. What this means is that we now have tree-ring evidence in addition to the inscriptional evidence for the harbor's filling up in the 6th century, effectively cutting off the Ephesians' links to the sea and to maritime trade.

**B. Karaköy Vapur Iskelesi:** At the Istanbul Museum we were given 18 oak logs from a spiked-together grid-section extracted from an enormous harbor construction (apparently a revetment of some sort) of utterly unknown date (Fig. 9). They appeared when foundations for a bank were dug

behind the ferryboat landing in Karaköy in Galata. Another 100 timbers were saved for us in the bank depot in the event that the first 18 proved interesting. (Does one call this a wood bank? data bank?) Anyway, the inch-thick hand-wrought spikes could have been from any pre-industrial-age period. Indeed, in the absence of any pottery, we were told that the date could be anything from the 6th century to the present, and we all rather hoped the wood might be early Byzantine.

Try late Ottoman instead,...most of the wood was cut in 1858. The long timbers match the Black Sea forest profile from near Samsun, and the short cross-pieces match the Thrace profile. None are from the Belgrade Forest, Istanbul's chief local supply of oak. So what we imagine is a huge Ottoman harbor-works project (the plans and photographs we have been given show at least 220 timbers), with ships bringing in wood to the capital from both east and west. There they were spiked together, buried in a clay and gravel fill, and--until now--quite forgotten. It will be interesting now to see whether any of the researchers working in the Ottoman archives can find a reference to construction activities in Karaköy in 1858.

**C. Çanlı Kilise coffin lid:** At Çanlı Kilise near Aksaray an old wooden door was re-used as a coffin-lid at some unspecified time between the 11th century and the 20th and buried in the narthex. Recently some pesky tomb-robbers in search of the inevitable treasure, disturbed the grave, flinging the coffin-lid aside. Since the wood was in fine shape, we borrowed a piece of it from the Aksaray Museum, and the last-preserved ring is 1532. One has to allow some years in which it was used as a door, after which it became a coffin lid. Then there was the burial. Now the dated door/lid is on display in the Aksaray Museum for the edification of the public.

**D. Shipwrecks:** Thirty-seven pieces from the 11th century glass wreck at Serçe Limani (Prof George Bass, Texas A&M) and nine from the Byzantine shipwreck at Bozburun (Dr. Fred Hocker, Texas A&M) are currently being measured. No results to report yet other than that we can see internal crossdating.

**E. Measuring photocopies:** Last winter our friends in the Vakıflar (General Directorate of Pious Foundations) sent us photocopies of wood from an inscriptionless mosque in Hidirlar Village near Kızılcahamam north of Ankara. Photocopies are problematical because one cannot sand them to improve their appearance before measuring. However, the architects in the Department of Monuments had done a fine job of polishing the wood before putting the timbers on the copy machine, and we were able measure the photocopies directly and from them to report a date of 1704 for both the foundation beam and an upstairs window lintel. Last summer we were given the wood and measured it just to be on the safe side. The date is still 1704.

**F. Republic of Georgia, Kakhetia, Batsara, *Taxus baccata* (= yew):** A week in Georgia yielded 51 samples. Noteworthy is some extraordinarily long-lived yew with 455+ rings so far. I had never seen any yew over 307 years (the Elaia sarcophagus which we measured years ago). The Georgian yew crossdates with Turkish pines and junipers which means we have pushed our crossdating zone some hundreds of kilometers eastward. More on this later after we finish measuring. We also look forward to promised Bronze-Age timbers from Martkopi and Trialeti. If the modern wood crossdates, the early Georgian material ought to crossdate as well.



We were able to collect some samples from "the oldest house in Svanetia" from what the Georgians call the feudal period. Imagine a large square stone room with stalls for about forty animals along the sides, with feeding troughs running the length of each wall in front of the stalls. Then imagine a central hearth with no smoke-hole. Blackened roof-timbers and slabs of sooty stone which must have held the heat attest to the fact that the hearth was used regularly. Grouped around the hearth were an elaborate wooden throne for the senior member of the family and one long bench each for the gents and the ladies. Sleeping



platforms ran around the room directly above the stalls where animal heat would have helped warm things up. What it must have smelled like, especially in the winter-time with the

windows shut, is anybody's guess.

**G. Material of utterly unknown date:** In pouring rain and dense fog we slithered to the bog of Agaçbasi on a mountaintop (I think) above Sürmene east of Trabzon. Peat-cutters in the bog had exposed a timber from about 2 meters down with 201 rings. It matches with nothing in our inventory, so we have sent a slice to Heidelberg for a quick radiocarbon test. In Northern Ireland (Loch Neagh, for example) bogs accumulate about a meter every thousand years. I have never heard of a bog on a mountaintop, and I have no clue how old this one might be. We attend Kromer's results. If the timber is old we will go back, maybe this time in the foresters' jeep rather than our poor old bus which barely made it, and see what else the peat-cutters have been able to save for us.

### **THE AEGEAN-EAST MEDITERRANEAN RADIOCARBON CALIBRATION PROJECT:**

This exercise is the brainchild of our collaborator Dr. Sturt Manning, University of Reading. To try to put to rest once and for all the notion of some of our colleagues that the Aegean is a "different" place where the California bristlecone pine calibration and the European oak calibration are not really relevant, we have embarked upon the following:

1. We have cut out 20 decadal samples from well-crossdated and replicated Turkish pine covering a 200 year period from A.D. 1450 to 1649, also a similar set of 22 samples of Turkish juniper from the Middle-to-Late Bronze Age, 1710 to 1491 B.C.
2. Our colleague Marco Spurk at Stuttgart/Hohenheim is cutting out exactly the same decades from German oak.
3. These will be subdivided, and duplicate sets will be sent to the high-precision radiocarbon laboratories run by Bernd Kromer at Heidelberg and Gerry McCormac at Queen's University, Belfast.
4. When all the radiocarbon work is done, we will set about to see whether a) there are any regional differences in the radioactivity, or whether b) there is significant laboratory difference. If there is any laboratory disagreement, we will tap our stock of spare pieces of wood so that they can re-measure and reconcile their differences.

Why do this? If our 'consumers,' the archaeologists in the field and in the museums, have misgivings about what radiocarbon and dendrochronology can do for them, then whatever we do--however much we the 'producers' believe in it--will be subject to nagging doubts, especially when our results do not fit the established ceramic chronologies and king-lists. It is well worth doing, we think.

**DENDROCHEMISTRY:** Another colleague, Dr. John Chiment of Cornell's Department of Geological Sciences, is working on trace-element analysis of individual, precisely-dated tree-rings with which we have supplied him, to see how well he can detect instances of uptake of sulfur and other minerals during years of known volcanic activity world-wide. Once he is done with the volcanoes of known age, he will turn to the volcanoes the dates of whose eruptions are still in dispute to see whether he can identify their effects chemically, thereby dating the eruptions.

### **BACK IN THE DENDRO LAB IN B-48 GOLDWIN SMITH HALL:**

Laura Steele (all year), Jennifer Fine (first half of the year), and Isabel Tovar (second half of the year) have been supervising the activities of some ten to fifteen people per semester. Mary Jaye Bruce continues to produce readable text, keep orderly accounts in seven currencies in six languages [try reading receipts in Georgian some time], and has begun to copy-edit the forthcoming [Science of Oil Paintings](#) by Stan Taft and Jim Mayer (Springer Verlag) our dendrochronological appendix to which is

on our World-Wide Web site at: <http://www.arts.cornell.edu/dendro/>. The web site is being accessed over 1200 times a month, so the effort to build it seems to have been worth the trouble. Moe Arif is our systems analyst/ programmer/ trouble-shooter, in consultation with Miles McCredie who advises us long-distance from Akron, Ohio.

### **SUMMER SAMPLING 1997:**

We came back at the end of August with 319 kilograms (701 pounds) of wood and charcoal from 43 sites, some famous, some not. More samples are en route, so we have plenty to keep us busy until next summer. It was a good year withal.

**END NOTES:** We cannot begin to tabulate everything we saw, heard, or did, but here are some of the more memorable:

- *Eurodrip* water-filter sign in Palladio in N. Greece
- *Simpatih Burgers* in Çanakkale
- *Sans Büfe* or the Chance Buffet, also in Çanakkale
- *Asburgers* in Söke, (no translation available)
- "Traffic is not free!" tunnel tollbooth on the highway to Tbilisi
- "Are you from Cornell?" "Are you a dendrochronologist?" "Are you Herr Kuniholm?" Three consecutive queries from a chance-met stranger at Priene.



**Peter Ian Kuniholm**

CORNELL UNIVERSITY

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