

AEGEAN DENDROCHRONOLOGY PROJECT DECEMBER 1994 PROGRESS REPORT

Highlights of dendrochronological dating results for 1994 are presented below in more or less reverse chronological order. Our total of over 6000 years of tree-ring sequences has been added to mainly in the Early Byzantine centuries and Early Bronze Age. Thus last year's bargraph with its schematic summary sent out in December 1993 is a reasonable facsimile of where we are right now and is not repeated in this report.

Samsun, Kavak, Bekdemirköy, Cami ***Late 15th/early 16th century; and 1876 Bark***

Oh, that **every** period in history might yield wood like this! It took a day and a half to collect,...more than half a millennium a day, and the better part of a semester to measure, but it was certainly worth the trouble.

The small village of Bekdemir is 10 kms E. of Kavak, about 45 kms S. of Samsun at an altitude of 575m. above the Black Sea. Next to the *meydan* or village square is a small, unpretentious wooden mosque which holds about 45 people comfortably.

The mosque is an almost square box, made of large adzed, undecorated (with two exceptions), oak planks, averaging 5cm. thick and ranging from 20cm. to 44cm. high. [When I got back to Ithaca, N.Y., I asked at the local lumber yard how much oak timbers measuring 2" x 15" x 30 feet might cost, and the man just laughed at me.] The average height of a plank is 38cm., although the planks nearer the ground are generally larger than the planks nearer the roof. The first and second story are separated by two extra-wide horizontal planks decorated with a moulding and a row of palmettes carved in relief, painted green and yellow. These wider planks also mark the transition from the mosque proper to the gallery or *kadinlar mahfili*. The floorboards and joists of the latter do not project outside the shell of the building. All planks are lap-joined to one another so that the ends project about 25cm. from the corners. We also saw evidence of vertical dowelling. The mosque is divided halfway down both east and west walls by vertical struts. Only the two decorated timbers span the entire building. The rest of the mosque, punctuated as it is by windows and the vertical struts, is made up of rather short (two to three meter) lengths of planking. To the eye all the exterior planking seems to be about equally weathered, and the preparation of the woodwork seems identical except for the two ornamented courses. There are no obvious signs that this might represent more than one building phase.

Not much is known about the mosque's date. An inscription over the mihrab dates from about 120 years ago. Nobody in the village knows whether the inscription refers to the date of the decoration (*süsleme*) of the mosque, or to the installation of the mihrab and minber, or to the mosque's rebuilding. The timbers of the mosque are said (local folk memory) to have been brought from the former village of Ortaköy near the river below Bekdemir. A 92 year old informant said his 110 year old grandmother told him the mosque was in its present form during all of her lifetime.

We first made rough ring-counts on all sides of the building, marking each plank with a piece of tape. Most planks had 100+ rings; some had 200+; others had 300+. The highest ring-count was 358. At least two timbers had the bark preserved, and we estimated that we should be able to build a chronology at least 400 years long. Over a day and a half, with time out to repair a clutch, Jennifer Fine, Laura Steele, and Mary Jaye Bruce collected 42 samples. We finished with a chronology of 398 years for the first floor and 395 for the second floor. Since the two

chronologies overlapped, although just barely, the final total for the mosque is 789 years from 1088 to 1876.

Of considerable interest is that both the local folk-memory and the tentative inscriptional interpretation of the history of the mosque seem to be correct. The oldest timbers, those nearest the ground and below the ornamental moulding, were cut from trees which were born as early as the 11th century and were felled shortly after the middle of the 15th century. There are no signs of reuse on any of these timbers, so, if the story of a rebuilt mosque is true, the form and dimensions must have been the same for both the old and the new building. Above the ornamental palmette moulding which runs across the building about two meters above the porch floor are timbers which were cut in 1876. The bark is present on two of them.

Several questions remain unanswered. If a mosque was well-enough preserved so that it could be moved to Bekdemir and re-erected, why were there just enough timbers for the lower half of the building? Did Building #1 burn at the old location, thereby rendering half the timbers unusable? If so, there are no signs of burning or other damage on any of the older timbers at Bekdemir. If the whole mosque was moved intact to Bekdemir and then fire or some catastrophe occurred, thereby destroying the upper half, there is neither any folk recollection of it nor signs indicating an incendiary reason for the rebuilding. It is also curious that there is no intermixture of old and new timbers. Downstairs is 100% old wood, and upstairs is 100% new wood.

The Bekdemir mosque and its tree-ring chronology serves as a cross-check or a time-control on the correct chronological placement of some 65 buildings or chronologies ranging in date from the 12th century to the 20th, and ranging as far afield as 1300 kilometers or over 800 miles. The monuments include Islamic structures, Orthodox (both Greek and Serbian) churches and monasteries, civil buildings, and military fortifications. Combining Bekdemir with the forest chronology from Zonguldak Yenice, we now have a Black Sea Oak chronology over 1000 years long. Several distant sea-side monuments whose tree-ring profiles closely match Bekdemir may have been built with oak imported from the Black Sea coast. They include Istanbul Hg. Sophia NW Buttress, Thessaloniki Octagonal Tower 2I, and Çanakkale Hasan Pasa Köskü.

A non-chronological observation may be made here for the one timber whose pith rings at either end may be dated. It took 22 years to grow 6.90 meters or 22'7".

Konya, Karatay Medrese repairs

1832vv

In a much more elegant building than the little mosque at Bekdemir the dating was almost as straightforward. The Karatay Medrese, a religious school dated to 1251, fell into disrepair and at some unspecified time or times was rebuilt, especially along its outer walls shown without hatching in A. Kuran's plan above. The Konya Museum Director was curious as to the specific date, and we have now told him that both these double rows of stretchers are of cedar cut shortly after 1832. Not a scrap is from the 13th century.

Bilecik, Vezirhan

657 Bark

This kervansaray on one of the old silk roads, largely destroyed by fire in 1331 A.H. (A.D. 1912/1913), was a foundation of Köprülü Mehmet Pasa. I am told by colleagues (but have not seen the text myself) that Kâtip Çelebi in the *Cihannuma* gives the date as A.H. 1070 or 1659/1660, a year or two after he died(!) This apparent discrepancy will have to remain a curiosity until I can track down the reference. Kathy Leeper, Laura Nogelo, and Mary Jaye Bruce shown here in the act of collection, are studiously ignoring the wooden stage on which a rock concert had been held the night before.

Afyon, Emirdag, Amorium, Step trench

564vv and mid 1st Millennium vv

Junipers from a mixed (but late) context in a step-trench on the north side of the acropolis at Amorium have a last preserved ring of 1564. How many rings are missing due to fire we do not

know. From Trench AB, a triangular tower on the south side of the city, we have a 226 year cedar chronology put together from several hundred burned fragments. The excavator, Dr. Christopher Lightfoot, estimates that the tower was built in the late 5th century and was destroyed by the Arabs in 838. This cedar chronology does not yet fit anything else we have available from this approximate period. A report on Amorium will appear in the December 1994 issue of *Anatolian Studies*.

Beyşehir, Kubadabad Sarayi

231 Bark

Juniper pilings from the north end of this building excavated by Prof. Dr. Rüçhan Arik and earlier investigated by Katharina Otto-Dorn and Mehmet Önder, were all cut in 1231 during the lifetime of Sultan Alaeddin Keykubad (1220-1236) whose summer palace the Kubadabad Sarayi is supposed to have been.

Sivas, Divrigi, Darüssifasi, Hünkâr Mahfili

240, 1665, 1766

This construction is a real curiosity. In a corner of the Divrigi Darüssifasi, a majestic building famous for its ornate stonework, is an improbably crude platform, or *mahfil*, bearing little or no relation to the intricately carved stonework around it. Modern restoration of the roof at Divrigi was in progress when we arrived--with quantities of new and old timbers heaped on every side--which should have warned us of the possible dangers in interpretation of reused wood from other centuries. Of the five datable timbers in the *mahfil*, two are from the 13th century (1240 or the time of the building's construction); two are from 1665; and one is from 1766. Several timbers show cuttings which serve no current purpose, indicating prior use. Our best interpretation is that the so-called *Hünkâr Mahfili* is a construction of the 18th century or later, incorporating material from the 13th, 17th, and 18th centuries. The *mahfil* at Divrigi is a rare instance of a single construction where the wooden members date from a span of over five centuries. If only the two pieces from the 13th century had been sampled, an entirely erroneous conclusion about the date of the *mahfil* might have been reached.

Bursa, Yildirim Darüssifasi

1400 Bark

This is a late 14th Century hospital/asylum built and endowed by Sultan Yildirim Beyazit, ruined in the earthquake of 1855, later used for a powder magazine, now undergoing restoration. The ensemble covers an area of 30 x 53 meters. Along the façades of the courtyard on three sides is a portico giving access to rooms about 3 x 4 meters each, each provided with a chimney, presumably for the patients and inmates. On the south and north larger spaces were presumably for dining, cooking, and for the work of the medical staff. Toilets were installed in the north-east corner (running water a century before Columbus!) These latrines were supplied with water by an underground canal which passed under the eastern wing of the construction.

According to the *vakfiye* [foundation document] of 1400, three doctors and two pharmacists were attached to the establishment. The text fixes their daily pay as well as the salary of the service personnel including a cook, a baker, and a dozen *serbetci* [literally sherbet-sellers, but probably male nurses]. It indicates as well how the sick were to be fed and notes how the building is to be maintained and provided with the necessary revenues or donations for operation.

Although Albert Gabriel gives the building date as "between 1391 and 1395," the oak timbers in this hospital were cut in 1400, the same year as the date of the *vakfiye*. Although, no doubt, later repairs were made to the monument, none can be attested dendrochronologically. Interestingly, the dendrochronological profile for this building is so similar to that of the Yesil Cami, also a foundation of Yildirim Beyazit, that we believe the trees must have been cut from the same part of the same forest.

Russia, Pazyryk Kurgans

4th/3rd centuries B.C.?

Our colleague Dr. Leonid Marsadolov of the Hermitage Museum in St. Petersburg sent us a box of Siberian larch sections from the Scythian *kurgans* at Pazyryk in the High Altai of Siberia. In

less than three weeks we had them combined into a 255 year floating chronology. It is easy to see how each tumulus dates against one another, but there is no connection yet with anything we have in Anatolia. The 4th/3rd centuries are one of our "gaps", and it may be that Achaemenid wood from Erzurum, for example, may fit. The Altai is so far away, however, that I am not holding my breath for a crossdate.

Gordion, Tumulus Z

977vv B.C.±37

Tumulus Z, partially dug in 1969, was the last Tumulus excavated by Rodney Young. The wood sat on a shelf among bags of pottery at Gordion until the summer of 1994 when it was re-discovered and given to us. Christine Latini took one day to glue it together, a second to sand it, and a third to measure it. On the fourth day she dated it. No sapwood is present, and perhaps a century or more of exterior rings is lacking.

Syria, Tell Brak, Mitannian Palace

1293vv B.C.±37

A single lump of charcoal from the anteroom of this structure dates to 1293vv B.C.±37. An unknown number of rings is missing. The excavator, Dr. Joan Oates, thinks that the building dates from repairs after destructions by Adad-nirari I and Shalmaneser I early in the 13th century.

Çorum, Ortaköy, Large Hittite Building

1304vv B.C.±37

Additional samples recovered from the Ortaköy building in the summer of 1993 thanks to excavator Dr. Aygül Süel allowed us to add fifteen years to the date of 1319vv B.C.±37 reported last year. We still do not have the bark which would give us a felling date, so we await the luck of her spade in forthcoming excavation seasons.

Konya, Karahöyük, Excavations of 1953, Level 1, Room 8:

1927vv B.C.±37

Excavations of 1974, Level 1, Room 4:	1839vv B.C.±37
Excavations of 1990, Trench X, Room 1:	1784vv B.C.±37
Excavations of 1992, Trench X, Room 4:	1782vv B.C.±37
Excavations of 1956(?), Trench C, Level 4:	1956vv B.C.±37

Several Middle Bronze Age rooms excavated by Prof. Dr. Sedat Alp have last preserved rings as shown. Our understanding of the context is that the two rooms in Trench X should be approximately contemporary. In spite of the unequal damage from fire their last preserved rings are separated by only two years. We defer other commentary until all the rooms are published by the excavator.

Nigde, Çamardi, Göltepe

1979vv B.C.±37

One burned piece of wood from this mining site being excavated by Prof. Aslihan Yener has a last preserved ring at 1979vv B.C.±37. (Göltepe 1993, context A26-0100-009, MRN 3635, pit fill.) We have no idea how many rings are missing. We understand from Dr. Yener that the context is probably EB III.

Aksaray, Acemhöyük, Northwest Trench

2671-2169 B.C.±10

Twenty-four juniper timbers (two burnt ones were illustrated in last year's report) excavated by Prof. Aliye Öztan, mainly longitudinal stretchers inside walls near the floor levels of a series of service buildings, form a 503 year long chronology. The associated small finds such as pottery, sealings, and the like, are entirely Middle Bronze Age. Much to our distress, as we reported to you, we were unable to fit this sequence with our existing MBA chronology. So we sacrificed two of the longer pieces and sent them to Heidelberg for radiocarbon wiggle-matching. To our pleasant surprise they fit right into a five century gap in our long third millennium tree-ring sequences from 2671 B.C. to 2169 B.C.±10. Indeed, they may overlap with the 1761 year chronology announced in previous years, but the overlap is not yet long enough for us to prove it on dendrochronological grounds. Several timbers show signs of burning on one end. Thus, we

could have guessed in advance of the 14C results that we had reused material.

We conclude, especially after looking at the distribution of the end-dates, that these timbers must have formed part of perhaps only a single EB III building which was partially destroyed by fire. The wood was recovered and saved for future use. In contrast to the Sarikaya Palace and the Hatipler Tepesi Building nearby where no reused wood at all was employed, these more humble structures (perhaps kitchens?) are built entirely from recycled material. If the Middle Bronze Age tree-ring chronology did not exist with which to compare the dendrochronological results from the Northwest Trench, and if we had not paid attention to the signs of burning, we might have incorrectly concluded that the MBA belongs in the 22nd century B.C. and earlier.

Konya, Karahöyük Early (Levels 6/7)

2181 B.C.±10

One long juniper beam (198 rings) estimated by Professor Alp as coming from his Levels 6/7 crossdates beautifully with the Acemhöyük Early Master Chronology. Its last ring as wiggle-matched is approximately 2181 B.C.

İnegöl, Höyük

2299 B.C.±10

An oak post with some sapwood preserved, exposed by a bulldozer and rescued by a local amateur potter along with Early Bronze pottery (consisting of cups with high-swung loop handles, bichrome dishes, and long-necked grey ware), crossdates with the Acemhöyük Master Chronology. Its last ring as wiggle-matched is approximately 2299 B.C.

Bulgaria, Bourgas, Kiten, EBA Settlement

2715 B.C. ± 10 years

An Early Bronze Age settlement now under the waters of the Black Sea near Sozopol yielded a 285 year oak sequence in five phases, now wiggle-matched so that phase one is 2778±10 years and phase five is 2715 B.C.±10 years. The site is thought by the excavators to date from the middle of the Early Bronze Age, or about the same time as Ezero. Above is Mecki Pohl, now our programmer and systems analyst, celebrating the collection of 104 posts by the Bulgarian divers in 1989 by waving his chainsaw over his head in an altogether reckless manner, and to the left is the neat way in which Dr. Bernd Kromer was able to fit the tree-rings and the radiocarbon together. As with the Bekdemir wood, quantity plus quality yield results that are worth talking about.

Eskisehir, Demircihüyük

705vv B.C.±10

An oak chronology from the Early Bronze Age site of Demircihüyük only 360 kms. to the southeast of Kiten, thought to date some time after 2730 BC (Korfmann and Kromer, 1993), crossdates with Kiten with its last ring ten years after the last ring at Kiten, that is to say at 2705 B.C.±10. There is no convincing crossdate between Kiten and Sozopol, the only other oak master chronology of that approximate period. The only chronology available from EBA Troy is pine (*Pinus brutia*). The other long EBA chronology from Acemhöyük mentioned above is juniper (*Juniperus* sp.) These two conifer chronologies do not crossdate with the Kiten oak.

Publications forthcoming:

Many subscribers to this list should expect reports in the reasonably near future on "Dendrochronology," in P. E. McGovern, ed., "Archaeometry," (*AJA*, 1995:1); "A 513- Year Buxus Chronology for the Roman Ship at Comacchio (Ferrara)," (*Bollettino di Archeologia*, 1995); The Dendrochronology of Panel Paintings," in *The Science of Oil Painting* by W. S. Taft and J. W. Mayer (Academic Press, probably 1995); and "Extensions to the Long Chronologies," in the Theme Volume of the *Proceedings of the 29th International Symposium on Archaeometry* (Ankara, maybe 1995).

Acknowledgments Part 1:

As should be clear from the foregoing, we operate 12 months a year, and thanks are due to a variety of stalwarts. Presiding over the lab in general (and me in particular) and overseeing the measurement and analysis of more than 2000 samples this year has been Christine Latini. Maclaren North shared in this work until June. Maryanne Newton is our first M.A. student and expects to have her thesis wrapped up by summer 1995. Maryanne also went on an extended three-month safari through Anatolia, including a long spell as a staff member at Aceramic Asikli Höyük, after the rest of us had to return for the beginning of classes, and she came back with so much wood and charcoal that the auditor questioned why she had to buy so many suitcases. Mary Jaye Bruce converts numbers into words on a fulltime basis. The 1994 field crew shown in some of the photographs above was Mary Jaye, Jennifer Fine, and Laura Steele. Mecki Pohl has replaced Mark Sanford as our computer programmer and systems analyst, and from time to time he gets useful avuncular advice from Miles McCredie who built much of our system in the first place. Old-timers in the lab, in addition to all of the field crew, are Pat Carr, Kristi Dahm, and Robert Hooker. And then there are the ten rookies this term and nine last semester who were the beginning students in the dendrochronology course. Radiocarbon determinations were performed by Dr. Bernd Kromer, Labor für Umweltphysik, Heidelberg. And finally there are all the people whose work over the years helped produce the summary below. Since the map was drawn last spring, the numbers are already out of date, but it gives you an approximate notion of how we are marching along.

Acknowledgments Part 2:

Feeding this multitude and transporting them hither and yon has been made possible by major multi-year grants from the National Science Foundation which just awarded us one outright for 1994-1996, the National Endowment for the Humanities a gifts-and-matching one for 1994-1997, and the Malcolm H. Wiener Foundation. 307 Patrons sent in gifts ranging from \$5 to \$75,000 totaling \$102,590. To all our thanks!

Summer 1994 Aegean Dendrochronology Project Sample Collection

AMO-46-65	Afyon, Amorium	20
ACM-162-171	Aksaray, Acemhöyük	10
CNL-1-9	Aksaray, Akhisar, Çanlı Kilise	9
ASH-1994-1-15	Aksaray, Asikli Höyük	15
AMS-1-2	Amasya, Samlar Mezarlığı	2
GOR-169-172	Ankara, Polatlı, Gordion, Tumulus Z, etc.	4
GOR-2	Ankara, Polatlı, Gordion, Midas Mound Tumulus	1
KAS-5	Antalya, Kas, Uluburun (more expected)	1
APH-1-4	Aphrodisias, Theater, S. Analemma, Byzantine	4
AYD-1-13	Aydın, İkişdere Köyü, Kocaalan Mevkisi	13
AYI-1-2	Aydın, Merkez, İmambaba Mevkisi	2
ILI-1-4	Bursa, Ilipinar	4
ORT-17-19	Çorum, Ortaköy	3
TUL-1	Elazığ, Tülintepe	1
SOS-1-5	Erzurum, Sos Höyük	5
KIN-1-6	Hatay, Kinet Höyük	6
FKB-4-15	Izmir, Foça, Kaleburnu	12
FOC-27-35	Izmir, Foça, Archaic Gate	9
KLZ-1-3	Izmir, Klazomenai	3
LMT-1-2	Izmir, Limantepe	2
PNZ-1-3	Izmir, Menemen, Panaztepe	3
GLC-2-11	Izmir, Ödemis, Gölcük	10
KUL-59-62	Kayseri, Kültepe, Karum, Level II	4
KAH-1994-1-24	Kirsehir, Kaman, Kalehöyük	24
CTL-16-20	Konya, Çumra, Çatal Höyük	5
INC-1-5	Konya, Ince Minareli Medrese	5
KTY-1-15	Konya, Karatay Medrese	15
KSM-1-2	Konya, Sahipata Mescidi	2

KSS-1-4	Konya, Selçuklu Sarayı	4
AEZ-1A&B	Kütahya, Aezanoi	1
KSO-52-69	Kütahya, Seyitömer Höyük	121
ASL-66-131	Malatya, Arslantepe (200++ lumps)	66
GTK-1-8	Manisa, Alasehir, Gavurtepe	8
GOL-1-5	Nigde, Göllüdag	5
POR-1-9	Nigde, Ulukisla, Porsuk	9
ESK-1-11	Ordu, Ünye, İkizce, Eski Cami	11
IKZ-1994/1-2	Samsun, Bafra, İkiztepe	2
BEK-1-42	Samsun, Kavak, Bekdemirköy, Cami	42
KEL-1-2	Silifke, Kelenderis	2
TRO-144-152	Troy IV and VII	<u>50</u>
40 sites (as of November 1994):		515 samples

Plus: 57 Kgs. of wood from LBA Körçë, Albania, plus promised wood from Greece, plus a box from Aceramic Neolithic Hallan Çemi. Plus???

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modified 19 March 1995 cel