

## **Aegean Dendrochronology Project: December 2008 Progress Report**

### **Italy**

The Roman “Gap” (in terms of wood suitable for Mediterranean dendrochronology) has been a target for the ADP for some time. With this in mind, this year Tomasz Wazny and Sturt Manning went to the excavations of the Portus Project (<http://www.portusproject.org/>) at Portus, near Fiumicino, Italy, where there are large-scale remains of imperial Rome’s great port—first built by the emperor Claudius, and then developed by Trajan. The aim was to investigate the dendrochronological potential of the site. Courtesy of the project directors, Simon Keay and Martin Millett, eight fir planks and two oak posts were collected from one wall of the cellar of one building—and there seems every reason to believe that wood exists elsewhere at the site.



*Tomasz and Sturt excavating the wood samples preserved along one wall of the cellar. Two oak posts (A) with fir planks (B) along the wall.*

Two students in this fall’s dendro course, Rachel Hunter and Kristi Corrado, worked on this material for their project. The fir samples provided a 69-year sequence. There is a tempting possible match in the 1st century AD with our Ravenna sequence, which is in turn dated against Dr. Kurt Nicolussi’s Alpine fir sequence. But we need longer tree-ring sequences to say anything definitive.

### **Crete**

In collaboration again with Jennifer Moody and Oliver Rackham, Tomasz and Sturt returned to Crete to further examine the Cypress trees of the White Mountains. These extraordinary trees at the upper timberline may well be among the oldest in Europe. The downside is they have often very tiny rings, and very individual and often eccentric ring sequences, which makes cross-dating a real challenge. Ring counts indicate some trees to be of 800-1000+ years in age. Tomasz presented a summary of our work at a conference in Athens in September.



*Ancient Cypress tree, White Mountains, Crete.*



To check the potential for new dendro work from these samples, we divided one sample—a slice taken from the stump left when someone had cut a branch off one of these trees—according to our ring count, and tried a radiocarbon dendro-wiggle-match against the standard northern hemisphere radiocarbon calibration curve, and we found a very good match, indicating that our ring count = years calculations are close to correct. This means the branch as a whole probably grew from around the AD 1230s to the AD 1690s. The main tree is of course older. There is major potential here for a millennial-scale chronology. We will see what is possible as we work on this in the coming months.

*Tomasz checking the ring-count on a Cypress stump.*

**Peter Kuniholm and Tomasz mini-fieldtrip, 31 May to 18 June 2008**

We spent a busy two and a half weeks introducing Tomasz to new colleagues in Switzerland, Italy, Greece, and Turkey. In Greece we collected *Pinus leukodermis* on the Katara Pass and discussed other future areas with the Metsovo foresters. The *P. leukodermis* specimens already collected crossdate splendidly with both Italy and Turkey, so the dendroclimatic potential is high.

*Peter— chainsaw at the ready— at Yakub Bey Han,*



*Çardak, with timbers. View of the roof of the building.*

A surprise at the Yakub Bey Han in Çardak, upstream from Çanakkale, was to see a Vakıflar team from Balıkesir renovating this 15th century (H. 867 = AD 1462-1463) caravansaray, from which they gave us 21 fine oak samples. Alexia Margaritis and Clara Ng-Quinn worked on some of this material for their dendro course project, with the rest examined by former lab boss Jennifer Watkins (now Dr. Watkins since the last newsletter). There is a primary phase ending in 1458, and since 20 years of sapwood are present, a date around 1462-63, corroborating the inscription, is most likely. A very strong cross-date was observed with the Kilid ul-Bahir castle, built by Sultan Mehmet at the same time, and so it seems likely that the wood for both structures came from the same source. The later group of samples does not offer such a clear crossdate, and we assume those to be repairs.



*Peter at Yenikapı with Doğan Perinçek.*

In İstanbul we picked up where the ADP had left off at Yenikapı (Marmaray and Metro Projects) in 2007, collecting 319 more oak pilings from specific piers scattered through the first millennium, but several particularly interesting ones bracketing an enormous tsunami (possibly associated with the 557 Marmara earthquake) which left a debris layer about 40cms thick with extraordinary amounts of both land and sea debris. Geologist Doğan Perinçek, 18. Mart Üniversitesi, Çanakkale, provided confirmation and analysis of the stratigraphic sequencing. Radiocarbon dendro wiggle-matching has now placed the Yenikapı sequence reported last year into near-absolute time—

running from approximately the AD 460s to late AD 630s, give or take around 20 years at the 95% confidence level.

At Kalkım Forest, from which we already have a good *Pinus nigra* sequence, we collected recently-felled *Quercus cerris* from Kırse Alanı (altitude 1200 meters, 20km west of Dallık). This is our first oak from this forest and represents the furthest NW modern oak collected in Turkey. One piece may have 324 rings. Others look good, too.

### **Ukraine**

The Akkerman Fortress located in Bilgorod-Dnestrovsky, Ukraine, belongs on the list of the greatest achievements of military architecture in southeastern Europe. Previous research suggested this complex had two main phases: Moldavian (end of the 14th c. to AD 1484) and Ottoman (AD 1484 to the end of the 18th c.). Tomasz visited the site to assess the dendrochronological potential. On site he was assisted by



*Tomasz sampling, and a view of part of the enormous fortifications. For more information on the project and views of the site, see <http://www.akkermanfortress.org>.*

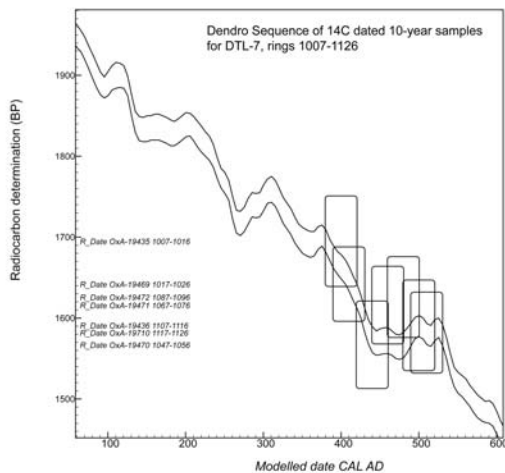


Severin Sahaidak and archaeologist Yuriy Boltryk. Altogether slices and cores from 57 timbers were taken—mainly oak. They will be studied this winter/spring in the lab.

### Israel Dendrochronology Project

PhD student Brita Lorentzen, as part of her dissertation for Cornell’s Department of Geological Sciences, is trying to develop a set of robust tree-ring records from a range of different environmental zones in Israel, using samples from the recent past and from ancient archaeological or heritage sites. Building up the tree-ring database in the southern Levant will provide not only precise dendrochronological dates for archaeological material, but also unprecedented information on long-term climate and environmental trends in the area.

After a short feasibility trip to Israel in mid-January, Sturt, Brita, and Jessica Herlich returned to Israel for a longer sampling trip in mid-July, beginning with seven shipwrecks from Akko and Dor-Tantura Bay. None of the wood from these vessels has yielded a robust crossdate against available tree-ring chronologies, and often the ring sequences are shorter than one would ideally like. Thus we have attempted radiocarbon dating on dendro-sequenced samples to get wiggle-matched dates. For example, working with a *Pinus brutia* timber (a ceiling plank, C2) from Dor Wreck Dor 2001/1, a Byzantine vessel, we get a placement for the last extant ring (no bark) around AD507-527 – suggesting an early to mid-6th century AD date for the ship. Brita is also continuing to work on material from Akko and Dor, as well as wood from the Ma’agan Mikhael ship, which she and Sturt sampled this summer.



**Left.** The dendro radiocarbon wiggle match for the timber DTL-7 from Dor 2001/1, relative tree-rings 1007-1126. The boxes show the 2 standard deviation fit ranges for the dated segments against the radiocarbon calibration curve. Last extant ring c.AD507-527 at 1SD confidence; AD494-535 at 2SD confidence. There are then an unknown number of missing rings to bark— so this is a terminus post quem for the date of the ship. An early to mid 6th century date thus seems likely. We now need some bark! **Right.** Yaacov Kahanov and Brita Lorentzen examine the approximately 2400-year old Ma’agan Mikhael ship prior to sampling a few trial pieces.

Megiddo yielded charred oak from the floor of an Iron I destruction layer as did Tel Rehov, another Iron Age site. At Hebrew University, Ehud Netzer let us sample from his collection of beautifully preserved timbers from Kypros, Herodium, and Masada.

Visits to the forests yielded pine and juniper, and Brita has already developed four modern pine chronologies from this summer’s material alone. Preliminary analysis indicates important regional differences between the tree-ring record in the southern Levant and in sites further north in the Aegean and Cyprus (likely from greater aridity in Israel). We look forward to continuing work on this promising project and will give you more results as they become available.

## Cyprus

Rachel Kulick and Sturt returned to Cyprus, aided especially by Seth Button and Eilis Monahan, to continue the sampling work of previous years in the Troodos area. The aims were to acquire more long-lived juniper trees, more long-lived *Pinus nigra*, and to start to build more *Pinus brutia* chronologies. A group of mixed *Pinus brutia* and *Pinus nigra* from *Doxa Soi o Theos* formed the student projects of John Knecht and Phoo Nyo. A particular interest is to investigate when teleconnections do and do not occur on a wider regional basis, especially for the lower elevation trees.

## Danube and Black Sea

The most promising region with timbers suitable to solve the Roman “Gap” problem is located in the remote provinces of the Roman Empire located between the Lower Danube river and the Carpathian Mountains. This summer, a brave envoy of the Cornell Tree-Ring Laboratory (Tomasz) was shown and sampled very well preserved oak planks at a pre-industrial salt exploitation site currently under excavation at Figa, Transylvania (in cooperation with the Museum of the Eastern Carpathians in Sfintu, Director Valeriu Kavruk, and Exeter University, Anthony Harding); these provided three tree-ring sequences in the period between the 15th and 10th c. BC. Next, he visited the Dobrudja region in the lower Danube basin, taking samples from the Roman fortress in Capidava. The newly established cooperation with the Eco-Museal Research Institute in Tulcea and its Director, Dr. Florin Topoleanu, will open the gate to the Danube Delta with its unique eco-systems and archaeological sites (mainly Roman-Byzantine). Romania and Bulgaria may be the crucial link between the Aegean chronologies and the North-European masters.

## Poland

Meanwhile, on a visit home, Tomasz got involved in an exciting dendro-archaeological-historical discovery. In the search for the tomb of St. Dorothea of Montau buried in the cathedral of Marienwerder in northern Poland (Polish name Kwidzyn), archaeologists discovered a crypt with three wooden coffins



*Grand Masters and wooden coffins in their crypt.*

which contained the bodies of church dignitaries. The details of coats covering the bodies, and the 16th century AD wall painting showing figures of three Grand Masters of the Teutonic Order, suggested that this could be a sensational discovery of their burial site.

Grand Masters were the rulers of the “State” of the Teutonic Order. The state was organized by the Order of the Teutonic Knights of St. Mary's Hospital in Jerusalem, formed at the end of 12th century AD in Palestine. The order moved in 1211 to Transylvania, and finally settled on the right bank of the Lower Vistula river, following the Northern Crusades in 1230. Until now the whereabouts of the Grand Masters' remains have been a mystery. But documents suggest that the crypt could hide the remains of:

Werner von Orseln (murdered in 1330); Ludolph König von Wattzau (died in 1348); and Heinrich von Plauen (died in 1429).

Could dendro help? The partly preserved coffins were made of Scots pine (*Pinus sylvestris* L.). Tomasz studied the wood and found that the coffin from the bottom of the crypt originated from the second quarter of the 14th century (after AD1325), and that a partly preserved plank from the upper coffin

was dated to the first half of the 15th century. These dendro dates provide important support to a case being built from study of the human remains (DNA, anthropology, palaeopathology, and bone chemistry), investigation of the silk coats, and study of the documentary records, to suggest the discovery of three Grand Masters of the Teutonic Order.

### **USA and Mediterranean**

Carol Griggs has been working on tree rings and Mediterranean climate and continuing her research on northeastern North American material. She presented a paper titled “13th to 18th century AD climate extremes across north Greece and Turkey and the role of solar influence based on ADP oak chronologies” at an Athens symposium on Mediterranean climate change. Also this summer she returned to the Bell Creek site, near Fulton, NY, where she had previously collected a fir sample from a log buried horizontally at creek level that dated to 8191±23 14C BP (Hd-26286). In search of samples from the Late Glacial chronozone (pre-10,000 14C BP), Carol went back with excavation equipment and a crew of 6—Charlotte Pearson, Peter Brewer, Bill and Katie Griggs, Adam Zimmer, Todd Grote (soil scientist)—to document the stratigraphy and collect more wood, focusing mainly on samples below the dated log. We returned to the lab with 70 samples, more than 2/3 of them boreal (cooler climate) species, mainly spruce, with some pine and fir.

### **Meanwhile back at the lab...**

The above describes just some of the work of the last 12 months. In addition to field collection, Jennifer Watkins and lab boss Jessica Herlich, assisted by old-timers Kelly Latta and Kayla Altland, have been hard at work prepping, measuring, and chronology-building back at the lab.

### **Dendrochemistry and stable isotope dendroclimatology**

Charlotte Pearson has been working on extracting even more information from our existing chronologies by looking at the multi-elemental chemistry of tree rings using the Cornell Synchrotron and constructing oxygen and carbon isotopic sequences from Mediterranean juniper trees in order to reconstruct changes in temperature and precipitation. Two papers are in review following the first phase of analysis, with some exciting results in the works.

### **Corina 2**

A whole new tree-ring analysis and management package has gone live this Fall thanks to the dedication and hard work of Peter Brewer, Lucas Madar, and Kit Sturgeon.

### **The book!**

The book from “Tree-Rings, Kings, and Old World Archaeology and Environment: Cornell Dendrochronology-Archaeology Conference in Honor of Peter Ian Kuniholm” is nearing proof stage thanks to the Herculean efforts of Mary Jaye Bruce especially. We expect it will be available in earlier 2009. Please stay tuned. Please let us know if you expect you would like to buy a copy (or more!) of this wide-ranging volume. It has everything from data, synthesis to controversy – *bien sur*. We can then e-mail you (so please send us your e-mail), or write to you, as soon as the book is out with ordering details.

Thank you for the essential ongoing support of the patrons and supporters of the Malcolm and Carolyn Wiener Laboratory for Aegean and Near Eastern Dendrochronology and its Aegean (and Near Eastern) Dendrochronology Project.

**Sturt W. Manning, Cornell University**