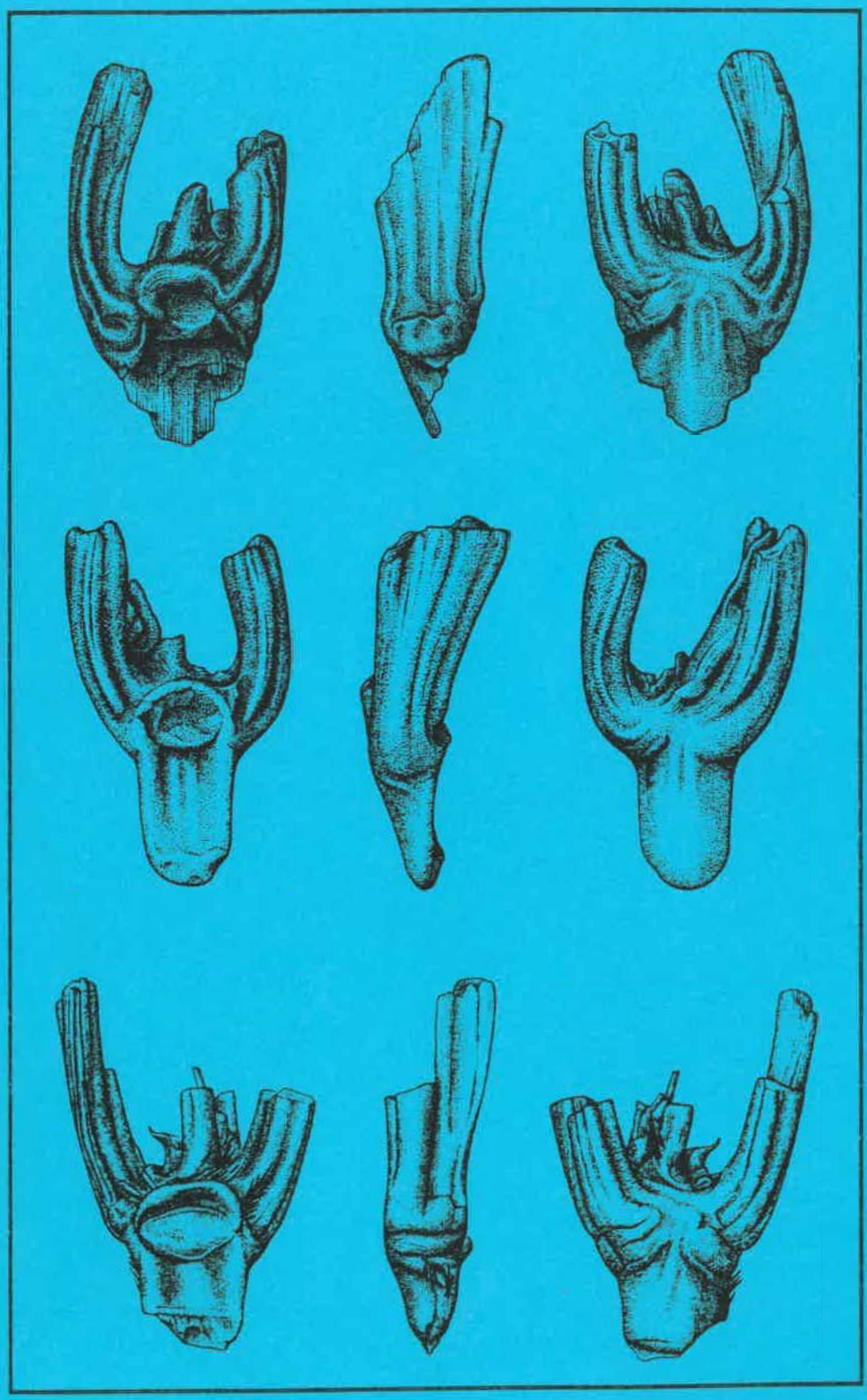
12th Symposium of the

International Work Group for Palaeoethnobotany

Sheffield, UK
17-23 June 2001



Programme and Abstracts

12th Symposium of the International Work Group for Palaeoethnobotany

Sheffield, UK
17-23 June 2001

Local symposium organisers

Dr. Glynis Jones and Dr. Mike Charles

Consultative group

Dr. Sue Colledge
Dr. Allan Hall
Dr. Mark Nesbitt
Dr. Delwen Samuel
Ms. Amy Bogaard
Dr. Marijke van der Veen

IWGP committee

Ms. Monica Badura (Eastern Europe)
Prof. Corrie Bakels (The Netherlands and Belgium)
Prof. Karl-Ernst Behre (Vegetation History and Archaeobotany)
Prof. Stefanie Jacomet (Switzerland and Austria)
Dr. Glynis Jones (UK and Ireland)
Prof. Mordechai Kislev (Near and Far East)
Dr. Helmut Kroll (Germany)
Dr. Naomi Miller (The Americas)
Dr. David Robinson (Scandinavia)
Dr A. Sarpaki (Mediterranean Europe)

Cover: "new type" glume wheat spikelet bases from Greece, drawings by **Jane Goddard**

TUESDAY, 19th June

8.30-9.00 Late registration (Crookesmoore Building)

Historical Archaeology

Chair: Corrie Bakels

9.00-9.25	Helmut Kroll	Agriculture in the 1st millennium BC in northern Germany, illustrated by new finds
9.25-9.50	Orsolya Dálnoki	Late Celtic agriculture based on the first results of an archaeobotanical investigation at Corvin Square, Budapest
9.50-10.15	Angela Kreuz	Could Tacitus have been right in the end? Archaeobotanical evidence for agricultural systems from Germanic, Celtic and Roman sites in Hesse and Mainfranconia
10.15-10.40	Hans-Peter Stika	Miletus: first archaeobotanical results from this long-lasting Greek town on the Aegean coast of Western Anatolia

10.40-11.10 **Coffee**

Chair: David Robinson

11.10-11.35	Laura Motta	Planting the seed of Rome
11.35-12.00	Mark Robinson	Burnt offerings and sacrifices at Pompeii
12.00-12.25	Barbara Zach	Vegetable offerings to Isis from a Roman sacrificial site in Mainz, Germany
12.25-12.50	Stefanie Jacomet	The Romanisation of Switzerland - archaeobotanical evidence

1.00-1.50 **Lunch**

2.30-5.30 ***Laboratory Session***

(Department of Archaeology and Prehistory, Northgate House)

5.30 (6.00) – 7.00 ***Welcome Reception***

(Turner Glass Museum, Sir Robert Hadfield Building, Portobello Road)

Welcome to the University of Sheffield by **Prof. Robin Dennell**, Head of the Department of Archaeology and Prehistory

WEDNESDAY, 20th June

Historical Archaeology

Chair: Hans-Peter Stik

9.00-9.25	Ruth Pelling	Beyond the valleys: Romanisation of Garamantian agriculture
9.25-9.50	Caroline Vermeeren	The embalming of the ancestors of the Dutch Royal Nassau family
9.50-10.15	John Giorgi	Cereals from an Early Medieval hilltop settlement in Central Italy
10.15-10.40	Francis Green	Plant remains from the wreck of the Mary Rose

10.40-11.10 **Coffee**

Chair: Karl-Ernst Behre

11.10-11.35	Jaromir Benes	Archaeobotany of the Old Prague Town defence system: archaeology, macro-remains, pollen and diatom analysis
11.35-12.00	Marlu Kühn	Hay or not hay? Aspects of plant use in animal husbandry Medieval Winterthur, Switzerland
12.00-12.25	Ülle Sillasoo	Plant images in Late Medieval panel paintings in Central Europe
12.25-12.50	Julian Wiethold	Historical and archaeobotanical evidence for plant food consumption in Late Medieval and Early Modern Lüneburg (Lower Saxony, Germany) - a comparison of the sources

1.00-1.50 **Lunch**

2.00-2.20 Group photograph (outside Crookesmoore Building)

Open Session

Chair: Mark Nesbitt

2.20-2.40	Andrew Isaac	Using microsatellites to study the introduction of domesticated emmer wheat into Italy
2.40-3.00	Angela Schlumbaum	Lessons from ancient wheat DNA

3.00-5.00 **Coffee** ***Poster Session***

THURSDAY, 21st June

Consumption: Food, Fodder and Cuisine

Chair: Delwen Samuel

9.00-9.25	Ksenija Borojevic	The use of straw and chaff for building Neolithic houses of South-East Europe and its implications for land-holding patterns
9.25-9.50	Dorian Fuller	Neolithic crops and culinary evolution in Peninsular India: archaeobotanical evidence in theoretical perspective
9.50-10.15	Soultana Valamoti	Food remains from two Bronze Age sites in Macedonia, Greece
10.15-10.40	Nicole Boenke	Plant remains from a Celtic/Medieval salt mine in Bad Dürrnberg, Austria: evidence for human consumption and use of resources

10.40-11.10 **Coffee**

Open Session

Chair: Dorian Fuller

11.10-11.30	Corrie Bakels	Plant remains from Sardinia, Italy
11.30-11.50	Laura Sadori	Crop storing at Arslantepe (Malatya, Turkey) during the Early Bronze Age
11.50-12.10	Susan Allen	Palaeoethnobotany at Late Bronze Age Sovjan, Albania
12.10-12.30	Mark Nesbitt	Mummy wheat and other "miracle" crops: history and legend
12.30-12.50	Mordecai Kislev	Recent advances in storage archaeoentomology in Israel

1.00-1.50 **Lunch**

2.30-5.30 ***Laboratory Session***

(Department of Archaeology and Prehistory, Northgate House)

8.00 ***Conference Dinner***

(Tapton Hall)

FRIDAY, 22nd June

Collecting and Cultivation

Chair: Jan-Peter Pals

9.00-9.25	Maria Hajnalova	Fruits and fruit cultivation in archaeobotanical finds from Slovakia
9.25-9.50	Margareta Tengberg	Collecting and cultivation in ancient Baluchistan (Pakistan)
9.50-10.15	Andrew Fairbairn	In the Basin and beyond: archaeobotany at Neolithic Çatal Höyük
10.15-10.40	Anaya Sarpaki	Invaders, seagoers or previously invisible: the Neolithic economy in Crete appears fully-fledged in 9000 B.P

10.40-11.10 **Coffee**

Chair: Helmut Kroll

11.10-11.35	George Willcox	Charred plant remains from a PPNA kitchen at Jerf el Ahmar (Syria)
11.35-12.00	Lucy Kubiak-Martens	Root foods in pre-agrarian subsistence. Evidence from the Ertebølle (Late Mesolithic) site at Halsskov in Denmark
12.00-12.25	Elena Marinova	New archaeobotanical evidence from the Bulgarian Neolithic
12.25-12.50	Olivier Mermod	The Neolithic settlement of Saint-Blaise/Bains des Dames NE (Switzerland): gathering and cultivation

1.00-1.50 **Lunch**

Chair: Angela Kreuz

2.00-2.25	Aldona Bieniek	Archaeobotanical analysis of the Early Neolithic settlement in the Kujawy region, central Poland, with potential gathering activities emphasised
2.25-2.50	Ursula Maier	The Federsee Reed in Southwest Germany: ecological and economical changes in prehistoric times (ca. 4000 BC – 1000 BC)
2.50-3.15	Otto Brinkkemper	Collecting versus cultivation through the Bronze Age: the Dutch record

3.15-3.35 **Coffee**

Chair: Otto Brinkkemper

3.35-4.00	Christopher Stevens	Subsistence as a way of thinking – who were Europe's first farmers?
4.00-4.25	David Robinson	AGRAR 2000: Danish agrarian landscapes from the birth of Christ to the year 2000. The agrarian economy in prehistoric and early historic times as revealed by archaeobotanical data

4.00-5.00 ***Concluding Session***

Summing up by **Prof. Stefanie Jacomet**

Announcements on publication and the symposium in 2004

SATURDAY, 23rd June

Excursion to York

8.30 am	Depart from Tapton Hall
6.00 pm	Depart from York (arriving in Sheffield c. 7.30-8.00 pm)

Poster Sessions

MONDAY, 18th June

Almuth Alsleben	Archaeobotanical results from Starigard/Oldenburg (eastern Holstein) and its rural hinterland
Gill Campbell	Differential preservation in a deposit from a late Roman Corn Drying Oven, Grately South, Hampshire
Aylen Capparelli	A methodological approach to the study of powdered archaeological plant remains from Argentine sites
Wendy Carruthers	The significance of sedge (*Carex* sp.) nutlets in assemblages of charred plant remains
Mike Charles	The archaeobotanical inference of crop sowing time using the FIBS method
Glynis Jones	Ecological investigation of intensive cereal cultivation in the mountains of Asturias, NW Spain
Carol Palmer	Milk and cereals: aspects of food processing, storage and preparation in Jordan
Eva Schäfer	The archaeobotanic database of the KAL
Wendy Smith	The reticulate cell pattern project: preliminary results
Tamara Vernimmen	Monitoring the quality of botanical remains in wetland sites, in a non-destructive way
Tanja Tenhunen	Macrofossil analysis as a method in archaeology: the research at the Mountain of Aaron, Petra, Jordan

WEDNESDAY, 20th June

Monika Badura	Plant remains from historical Gdańsk as an evidence of environmental conditions, food plants and long-distance trade
Jan Bastiaens	Charred cereals inside the church of Enarne (Belgium)
Jaromir Beneš	Environmental archaeology at the site of the Four Seasons Hotel Prague (1998-2000)
Aylen Capparelli	Wood charcoal analysis from Inka sites at the Hualfin valley, NW of Argentina: the case of El Shincal
Gemma Coccolini	Plants from a storage in Late Bronze Age site in Coppa Nevigata, Manfredonia, Southern Italy
Gemma Coccolini	Floral remains from an Early Bronze Age hut in Coppa Nevigata, Manfredonia, South Italy
Brigitte Cooremans	Plant remains from some Medieval sites in Flanders, Belgium
Philippe Hadorn	A Late-Glacial and Early Holocene environment and climate history for the Neuchâtel region (CH)
Mia Lempiäinen	Macrofossil remains from inhumation burials at the late Iron Age cemetery in eastern Finland, Lappeenranta, Kauskila, Kappelinmäki. A case study from grave no. 22
Daniele Martinoli	The cereal assemblage from Neolithic Çatalhöyük (Turkey)
Dana Stružková	The medicinal and culinary use of the cabbage, onion, garlic and leek in the Bohemian region during the 15th and 16th century
Ursula Thanheiser	Vienna is different: garbage disposal in the Medieval town

Laboratory Session

TUESDAY, 19th June

Sverre Bakkevig	New equipment for wet sieving flotation and sorting of small archaeological and archaeobotanical objects
Jennifer Ramsay	Archaeobotany.com: a work in progress

Palaeoethnobotany at Late BronzeAge Sovjan, Albania

Susan Allen

This report presents preliminary results of analysis of the macrobotanical remains from the Middle and Late Bronze Age levels at Sövjan, a Middle Bronze Age through Early Iron Age (ca. 2,000 - 900 BC) lakeside settlement in southeastern Albania. The macrobotanical remains, which include seeds, wood, and other dense plant parts, are extremely well preserved, due to the abundance of burned and waterlogged deposits. No comparable assemblages have been reported for these periods elsewhere in Albania or the southeast Balkans. The closest comparanda from the region are the botanical assemblages reported from two sites in northern Greece: Assiros Toumba and Kastanas.

Most of the MBA strata are below the modern water table, and many areas preserve both carbonized and non-carbonized plant remains, as illustrated by the successive wooden floor levels of Levels 7 and 8 and an intact carbonized pear found in Level 9. Preliminary analysis of MBA samples indicates the presence of both cultivated and wild species. Both cereal and legume crops are represented. These include *Hordeum vulgare* (hulled barley), *Triticum turgidum* ssp. *dicoccum* (emmer wheat), *Triticum monococcum* (einkorn wheat), and *Vicia faba* (fava bean). In addition, several edible wild species occur, such as *Quercus* sp. (acorn) nutmeats, *Carex* sp. (sedges), *Rubus* sp. (raspberry), *Ficus carica* (fig), and *Pyrus* sp. (pear).

Although the LBA deposits are not waterlogged, plant fossil preservation is still excellent. The burned destruction of 5c preserves abundant carbonized plant remains, and mineralized seeds also occur The small number of samples analyzed to date precludes diachronic comparison at this stage, but some apparent temporal differences warrant further comment. In general, samples from the lower LBA stratum, Level 6, display a wider range of wild and cultivated species than do samples from the preceding MBA levels. Plant species in Level 6 include all crop types found in the MBA as well as wild species such as *Rubus idaeus* (raspberry), *Sambucus* sp. (elderberry), *Malus* sp. (apple), *Ficus carica* (fig), and acorns. In addition to these plants, *Triticum* s.l. *aestivum* (bread wheat), a free-threshing wheat, appears for the first time in the early LBA (Level 6). Although present during the MBA , *Vicia ervilia* (bitter vetch) appears in some quantity for the first time in Level 6. *Olea europaea* (olive) remains also occur.

The rarity of weed seeds in the MBA and earliest LBA deposits may reflect agricultural practices that reduce field weeds, such as plowing or multiple cropping, or alternatively, the storage of cleaned crops. During the later LBA samples from the burned destruction of Level 5c, a greater diversity of taxa and more weedy species occur than in the early LBA. In particular, weeds that are frequently associated with cereal cultivation, such as *Galium* sp., occur more regularly, and *Panicum miliaceum* (millet) appears for the first time.

Archaeobotanical results from Starigard / Oldenburg (eastern Holstein) and ist rural hinterland

von Almuth Alsleben und Dr. Helmut Kroll, Kiel

The hillfort Starigard / Oldenburg (eastern Holstein) was the seat of slavonic princes in Wagria. In the end of the 10th century AD, the settlement was destroyed by a big fire. At this catastrophe, the stored harvest of one year exploded and was dispersed over the hole inner part of the hillfort, forming a layer of charred plant material. All cultivated plants were mixed, more or less. *Secale cereale* was the main cereal followed by *Triticum aestivum* s.l., *Hordeum vulgare vulgare* and *Triticum spelta*. The pulses *Vicia faba* and *Pisum sativum* completed the diet. All these species occured in bigger numbers whereas finds of *Avena* spec., *Triticum dicoccum* and *Panicum miliaceum* were very scarce.

Three open slavonic settlements of the rural hinterland had been investigated archaeobotanically. The evidence of cultivated plants which were extracted from pits and pits under a housefloor, lead to a quite different picture of the susistence of people in the countryside. *Triticum aestivo-compactum* and *Hordeum vulgare vulgare* were the main cereals. The part of *Secale cereale* and *Avena* spec. reached only 10 %, each. The significance of *Triticum dicoccum*, *Tr. spelta* and *Panicum miliaceum* was neglectable.

The evidence of about 10.000 grains and spikelets of *Tr. spelta* in Starigard / Oldenburg facing some single finds of spelt in other northern settlements of the early medieval time, needs an interpretation. The use of spelt, had it been restricted to princes of Wagria? And what was the fact that made the use of spelt so much attractive?

„Plant remains from historical Gdańsk as evidence of environmental conditions, food plants and long-distance trade"

Małgorzata Latałowa, Monika Badura, Joanna Jarosińska, Joanna Święta

Lab. of Palaeoecology and Archaeobotany, Dept. of Plant Ecology, University of Gdańsk, Poland

Archaeobotanical studies in the city of Gdańsk started in 1998. The samples analyzed come from different archaeological features such as latrines, refuge deposits, houses and yards; and date from the early medieval period to 18th century. Over 145 samples, from five archeological trenches located in the former medieval centre of the town and Granary Island, have been investigated so far. Waterlogged plant remains are the most frequent, while charred ones dominate only in the samples from granaries. About 200 species representing cultivated taxa as well as different natural, semi-natural and anthropogenic communities have been identified to date.

The main aim of these studies is to reconstruct some elements of the environmental conditions in the town and in its surroundings and to obtain complementary information about the economic status of the citizens of Gdańsk in medieval and post-medieval times, on the basis of the plant food that they used. Diaspores of cultivated plants are very abundant at each site. Among them several exotic species (*Juglans regia*, *Vitis vinifera*, *Ficus carica*, *Aframomum melegueta*, *Oryza* sp., *Piper nigrum* and *Pimenta officinalis*) were found.

The wild plant species provide information of the past vegetation in/and around the town. The urban character of the sites is expressed in the large number of species from synanthropic communities. These data present a contribution to the knowledge of the history of anthropogenic floras.

The species composition, in relation to the historical period, archaeological context and location of the site within the town, reveals local differences in both the economy and the environmental conditions.

Various historical written sources about life in old Gdańsk provide information on the use of plants in medieval and post-medieval gardens, kitchens and medicine. It is therefore, possible to connect these data with the archaeobotanical results.

Plant Remains from Sardinia, Italy

Corrie Bakels

Sardinia is the second largest of the Mediterranean islands, only slightly smaller than Sicily. The island, along with its northern neighbour Corsica (France), occupies a relatively isolated central position in the west Mediterranean. And even between these two there has been surprisingly little contact, both in the past and in the present.

The excavation at the Nuragic village of Duos Nuraghes-Borore in west-central Sardinia by G. Webster from Penn State University, Mont Alto, Pennsylvania, USA, provided me with botanical material to study the history of crops produced by the inhabitants of this fascinating island. The series spans the site's 3000-year history from ca. 2000/1800 BC to AD 1000.

The leading crop plants are wheat and six-row hulled barley. In the oldest phase the wheat is emmer wheat, but this crop plant was later partly replaced by a tetraploïd naked wheat, presumably durum wheat. Pulses, wild and cultivated fruit, beet and wild herbs were found as well.

The remains from Duos Nuraghes will be compared with other Sardinian sites, analyzed by me and others, after which the results obtained in Sardinia so far will be placed in their west Mediterranean context.

New equipment for wet sieving, flotation and sorting of small archaeological and archaeobotanical objects. (ABSTRACT 30.01.01.)

Sverre Bakkevig, Museum of Archaeology, Stavanger, Norway, box 478, N-4001 STAVANGER, NORWAY. Phone (+47)51846000. E-mail: s.bakkevig@ark.museum.no

In order to increase the efficiency and reduce the costs of archaeological excavations, Museum of Archaeology, Stavanger, has developed three new machines for the examination of soil samples and macrofossils.

The AMS-machine (Advanced Macrofossil Separator) is a flotation and wet sieving machine for both field and laboratory use. Both macrofossils and small archaeological finds are gently separated when soil samples of about 4 litres is put into an ample, water-filled and slowly rotating tube. A continuos water-flow first conducts floating organic material into a fine-meshed sieve. In the next step, wet and heavy organic material follows. Finally, the cleaned mineral fraction and eventually small fragments of archaeological objects like bones, flint, and pottery are deposited into a coarser sieve, which allows sand and gravel to pass through. As the machine runs on electricity and uses pure water, the method is not harmful to the environment and does not affect material for ^{14}C analysis.

The APS-machine (Advanced Particle Separator) is a wet sieving machine especially developed for field separation of archaeological objects less than 25 mm, and replaces the laborious and highly time consuming manual wet sieving. The capacity is about 20 litres of soil, and all particles larger than 3 mm are gently cleaned and separated in three easily observable fractions. By slight modification the machine can also collect particles less than 3 mm.

The ACS-machine (Advanced Charcoal Separator) is a small laboratory machine for the separation of small charcoal fragments from dried macrofossil samples. Traditionally this very time consuming process is done by a stereo microscope, but the machine can in a few minutes remove up to 85% of the charcoal fragments from mixed charcoal/seed samples. This makes the final sorting by stereo microscope a far more easy and rapid task.

Patent applications are made for the AMS- and APS-machines, and a research company is examining the market with respect to commercialisation. The AMS- and the ACS-machines will be demonstrated during the poster sessions of the IWGP-conference.

Charred cereals inside the church of Ename (Belgium)

Jan Bastiaens
Institute for the Archaeological Heritage of Flanders
Branch East-Flanders
Abdijstraat 13-15
B-9700 Oudenaarde
Belgium

Heidi Tency
Archaeological Museum of the Province of East-Flanders
Paddestraat 7
B-9620 Velzeke
Belgium

The village of Ename (province of East-Flanders, Belgium) is situated along the river Scheldt and it is most known for the Sint-Salvator abbey, the woods and the Sint-Laurentius parish church. The three of them are historically well documented and a lot of research is done on them. The parish church dates back to the 11th century. It was a building of outstanding quality in connection with the German emperor, and it has remained very well preserved in its original state.

In the year 2000 the inside of the parish church was completely excavated. During the excavations a layer of burned material was discovered, spread over the church. This layer is linked to a catastrophic fire, which can probably be dated at the end of the 12th century, on the basis of archaeological, dendrochronological, radiocarbon and numismatic evidence.

The archaeobotanical finds comprise in the first place large quantities of charred cereals. *Hordeum vulgare* and *Avena sativa* dominate. *Secale cereale* and *Triticum aestivum* are of lesser importance. *Vicia lens*, *Vicia faba* and *Vicia sativa* are also present.

Among the wild species *Sambucus ebulus* is remarkable. With its rhizomes *Sambucus ebulus* easily invades the arable land from the immediate surroundings, like forest edges and shoulders. The seeds of *Sambucus ebulus* are the only uncharred seeds in the church, though they must have been in the catastrofic fire together with the cereals. Experiments later on are to confirm the differential charring.

Why the cereals were in the church remains a matter of debate, although structural storage seems to be likely. Being a religious and stone building in a merely wooden village the church offered safe conditions for the storage of large quantities of cereals, eg. as tithes. Documentary evidence indeed seems to point out that cereals were stored inside churches, sometimes leading to the dissatisfaction of bishops who wanted to keep the churches sacred and pure.

Also in England and Germany large quantities of charred cereals have been found inside churches, supposed to be tithes.

Jaromir Benes – Jan Kastovsky – Petr Kocar – Romana Kocarova - Klara Kubeckova – Petr Pokorny – Petr Starec

benes@tix.bf.jcu.cz
archeos@pt.bohem-net.cz

Archaeobotany of the Prague Old Town defence system: archaeology, macro-remains, pollen and diatom analysis

Large-scale archaeological and archaeobotanical excavations were carried out in Na příkope street, Prague (Czech Republic), between 1997-2000 (See English translation). The Prague Old Town Fortifications were built after 1230 A.D. A large, dry, medieval moat (up to 7m in depth) and a shallower drainage ditch (2-3m in depth) were picked up at several places in front of a line of stone ramparts.The drainage ditch did not contain any rubbish from the Old Town throughout the 13th century. A radical change in the character of the ditch occured at the beginning of the fourteenth century. However, it continued to serve its original function as a drainage ditch. From the beginning of the 14th century the open drains were contaminated with rubbish.The whole system started to be used as a tip for rubbish produced by the Prague Old Town.

Archeobotanic analysis concentrated on 3 profiles from the drainage ditch and 1 from the main, dry moat of the fortification. The results of the analyses of plant macro-remains , pollen and diatoms clearly demonstrated the development of the drainage ditch from a relatively clean, open synanthropic area into the polluted rubbish tip of the High Medieval town. Macro-remain analysis differentiated the local vegetational cover (the plant community from the initial phase of the sequence is worthy of note) from regional components which are significant for our understanding of the vegetational conditions in the area around Prague. Some previously unregistered types of plant were picked up for the first time within the area of Medieval Prague. Charcoal and wood macro-remain analysis yielded information about the use of various types of wood as fuel and artisans' raw material. Fir was the most frequently used wood in craft production. Lime, which is otherwise liable to rapidly deteriorate, was picked up amongst the charcoal remains.

Pollen analysis concentrated on local and non-local (pollen with a wind-blown range of hundreds of metres to tens of kilometres) components. Anthropogenic components (manure, hay and waste from craft production) were differentiated from the other remains. The difference between the pollen profile deposits permitted the compilation of detailed, developmental diagrams and their mutual correlation. Diatom analysis gave us a detailed picture of the development of the quality of the water in the drainage ditch. The water was relatively clean in the middle ages but in the course of time its quality worsened: a diagram of this development – a so-called saprobity index- was compiled. A detailed comparison of the relative frequencies in the surveyed diatom samples from the individual profiles ascertained the original direction of flow in the disused drainage ditch.

Environmental Archaeology at the site of the Four Seasons Hotel Prague (1998 – 2000)

Jaromír Beneš - Mária Hajnalová - Vlasta Jankovská -Jan Kaštovský - Romana Kočárová - Petr Kočár - Tomáš Kyncl - Petr Pokorný - Petr Starec

The building site lies on the western edge of Prague Old Town. From the 13th to the 16th centuries an extensive rubbish tip gradually grew up behind the town walls on the bank of the river. From the beginning of 1999 the campaign of excavations concentrated on **an anthropogenic mound**, with archaeological finds of a height of around 8m, which was almost exclusively made up of one-time rubbish from the Prague Old Town. The present results from two sections show a very rich collection of plant macro-remains: **around 120 types**. Utility plants are represented ruderal plants, weeds, the natural and half natural vegetation of medieval Prague. Charcoal analysis is also the way to obtain data on the development of the firewood base of Prague Old Town. The pollen annalysis of mound layers showed the typical medieval synantrophic pollen spectrum. The first indication of this is **the minimal representation of wood pollen.**

The system of **wooden channels** in the immediate vicinity of the Vltava river branched out over a length of several tens of metres. The uncovered system of water distribution is completely different from the methods known up to now to ensure water distribution in Prague. One of the gutters which has in the meantime been subjected to dendrochronological dating (*Pinus sylvestris L.*). It was possible to ascertain **the felling date of the tree: 1371.**

The investigated wooden channel was unusually rich in diatomological material. The presence in such a large quantity of phototrophic diatoms clearly shows that we are dealing with part of **an extensive system that was open to a large extent**. The number of types and single plants shows that the whole system covered a relatively large area. On the whole it appears to me to be likely that the investigated channel was the terminal opening of an extensive water distribution system that consisted of at least two sources. One of them at least clearly carried drinking water without organic contamination. Another one carried water that was still of a **sufficient quality for drinking** but in which human interference had made itself more noticable.

The pollen spectra from **three micro-layers in the fill of the water channel** diverge to a certain extent from the usual spectra from archaeological features in medieval towns. The low concentration of pollen grains in the sediment alone is striking as is the relatively marked representation of wood pollen and the relatively **small amount of cereal pollen grains**. The water source had the character of a headwater swamp that was preserved in a semi-natural state. If we compare the composition of the pollen spectra from all three analysed layers of the water-supply trough fill we can observe a steady shift in the character of the layers from the oldest to the most recent. The oldest layer (1546E-C) appeared as the least contaminated by rubbish whereas the youngest (1546E-A) already contained a relatively large amount of pollen grains, which in all probability originated from rubbish material and occasionally from faeces.

Archaeobotanical analysis of the early Neolithic settlement in the Kujawy region, central Poland, with potential gathering activities emphasised

Aldona Bieniek, *W. Szafer Institute of Botany, Polish Academy of Sciences, Lubicz 46, PL 31-512 Kraków, Poland, e-mail*: bieniek@ib-pan.krakow.pl

The Kujawy region was occupied by the Neolithic settlers included into the Danubian circle because of their supposed origin. They belonged to the Linear Pottery culture (ca. 5400-5000 BC cal.) - relatively scarcely represented, and the Lengyel culture of the Brześć Kujawski group (ca. 4400 – 4000 BC cal.). The archaeobotanical material has been obtained from several sites located in the close vicinity of Brześć Kujawski (Guźlin, Konary, Miechowice, Osłonki, Zagajewice). Most of the archaeological features are dated to the Lengyel culture. The occupation was based on farming but also some plant gathering practices must have played a certain role in the economy as well. In the studied material apart from cultivated plants like hulled wheats, barley, millet, flax and pulses many wild plants have been found. Some of them were probably weeds but several taxons having useful properties could have been collected for various uses. Plants like *Bromus arvensis racemosus*, *Fallopia convolvulus*, *Chenopodium album*, *Corylus avellana* and *Vaccinium vitis-idea* were probably collected for food. Feathergrass awns (*Stipa* sp.) were probably used as an adornment supplying some luxury needs. Awn fragments have been found in relatively high quantities - about 70% of all specimens - in two of the studied sites (Miechowice, Konary), in features dated to the Lengyel culture.

INSTITUT DER
KOMMISSION FÜR ARCHÄOLOGISCHE LANDESFORSCHUNG IN HESSEN E.V

Plant remains from a Celtic/Medieval salt mine in Bad Dürrnberg, Austria: evidence for human consumption and use of resources.

Nicole Boenke, Wiesbaden

The foundation for developing a large organisation like a salt mine is a good and steadily access to the required resources. Obviously there is need for a lot of wood for timber and tool handles to built up a mine. On the other hand a large amount of food is needed for the daily providing of the miners. Because of the excellent preservation conditions for organic material in the salt mine it is possible to work on both themes. During the excavations in the last nine years – beneath the expected wooden material and other organic stuffs – more than two hundred remains of coprolites were found. Basing on an analysis of the botanical macro-remains in the coprolites the diet of the prehistoric salt miners should be reconstructed.

Shifting cultivation in prehistoric Europe: evidence from the Hambach Forest experiment

Amy Bogaard

Shifting cultivation has often been invoked to explain changes in settlement pattern or material culture in prehistoric Europe. Ongoing debate surrounding the permanence of crop fields involves topics ranging from the nature of the mesolithic-neolithic transition to the cycles of routine activity practised by ancient farmers. The debate has largely overlooked the most direct evidence available for ancient husbandry practices: the weed seeds recovered with crop material in archaeobotanical samples. The reliable interpretation of archaeobotanical weed evidence, however, requires comparison with modern weed data from relevant husbandry regimes. The Hambach Forest experiment, conducted in the 1970s-80s in an area of long-established deciduous forest near Cologne, provides useful data on the development of weed floras on freshly cleared loess.

New analysis of weed survey data collected during the experiment reveals several weed ecological trends which can be used to assess the relevance of the shifting cultivation model to archaeobotanical weed assemblages. The results have significant implications for the character and continuity of early crop cultivation in western-central Europe.

The Use of Straw and Chaff for Building Neolithic Houses of Southeast Europe and its Implications for Land-holding Patterns

Ksenija Borojevic, Department of Anthropology, University of Alabama at Birmingham, Birmingham, AL 35294-3350, USA; e-mail:borojevi@uab.edu

The remains of cereal chaff and their impressions in house daub have been identified in the Neolithic settlement of Opovo in the Panonnian Plain and many other sites in Southeast Europe. Opovo houses were built using the wattle-and-daub technique. Einkorn and/or emmer chaff and straw were deliberately used temper in clay found as house rubble. Based on local ethno-historic evidence how straw was used for tempering clay, my estimation is that at least 72 kg of straw and chaff might have been added to 16 cu. m of plaster of the idealized wattle-and-daub Opovo house, 6x6 m large. Assuming that straw and chaff were not imported from elsewhere, such a quantity of straw and chaff could have been obtained from sowing cereals on approximately 1,400 sq. m field. The area is larger than the existing space between the houses excavated at the Opovo site and between houses at many other Vinča sites, suggesting that cereals were cultivated outside the settlement, probably in small fields, rather than in narrow spaces between the houses. Thus, the house-and-garden unit, similar to the proposed one for the Linearbandkeramik complex in Central Europe does not seem the plausible model for cereal cultivation even on many flat (non-tell) sites of the Vinča culture. Whether the cultivation of cereals outside the house-and-garden unit, in the nearby fields, reflects communal ownership of productive land remains to be explored.

Collecting versus cultivation through the Bronze Age: the Dutch record.

Otto Brinkkemper

Summary

The role of wild species in Bronze Age nutrition in the Netherlands has been addressed in several archaeozoological and archaeological studies. The archaeozoologist Clason recently concluded that "hunting is no longer of any importance from the Early Bronze Age onward (Clason 1999: 39). Likewise, archaeologist Louwe Kooijmans signalized that "from the Bronze Age onward wild mammals almost disappear in the archaeological record", and proposed several causes for this observation (lack of game, replacement of game by domestic grazers, tremendous increase in population, lack of interest in game for food, ideological restrictions). The Middle Bronze Age people "disregarded the natural resources so much favoured up till the Late Neolithic". (Louwe Kooijmans 1993: 75 resp. 103). According to archaeobotanist De Hingh, however, "the role of gathering (...) is underexposed and underrated". In her (only...) six pages long chapter on the collection of wild plants, she concluded that particular wild plants (*Quercus*, *Corylus*) "must have been an essential element of subsistence economy in the Bronze Age".

Recently, in the track of a freight railway to be constructed in the riverine area in the Netherlands (the so-called Betuweroute), several Bronze Age sites have been excavated, some of which also provide Late Neolithic data. Archaeobotanical research on these sites yield new opportunities to study the role of plant gathering during the Bronze Age in view of the strongly contrasting opinions published to date.

References:

Clason, A.T., 1999: What's new in the Bronze Age? The livestock and gamebag of the Bronze Age farmers in the Western and Central Netherlands. In: H. Sarfatij, W.J.H. Verwers & P.J. Woltering (eds.), *In discussion with the past. Archaeological studies presented to W.A. van Es*, Amersfoort, 35-40.

Hingh, A.E. de, 2000: *Food production and food procurement in the Bronze Age and Early Iron Age (2000-500 BC), Leiden (*Archaeological Studies Leiden University 7), 1-233.

Louwe Kooijmans, L.P., 1993: Wetland exploitation and upland relations of prehistoric communities in the Netherlands. In: J. Gardiner (ed.), *Flatlands and wetlands: current themes in East Anglian Archaeology*, Norwich (East Anglian Archaeology Report 50), 71-116.

"The Vicieae: evidence in the pods"

Dr E. Ann Butler

A study of the fruits of modern members of the vetch tribe (Vicieae) has been undertaken to seek morphological, micromorphological and anatomical criteria which may assist in the identification of the archaeological remains of pods and in particular that may be useful for the diagnosis of their wild or domesticated status. The study included wild and domesticated peas, lentils and common vetch and some of their wild relatives found in the Old World. The results show that the characters most useful for identification are morphological features readily observable at low magnification. They are commonly included in Floras. Anatomical evidence which could separate dehiscent from indehiscent taxa has not been found in the Vicieae. This appears to challenge some of our accepted wisdom.

Differential preservation in a deposit from a late Roman Corn Drying Oven, Grateley South, Hampshire

Gill Campbell[a], Emma Harvey[b], and Dawn Irving[b]

Excavations undertaken at Grateley South, Hampshire, in 1999, as part of the Danebury Environs Project, uncovered the remains of an exceptionally well–preserved corn dryer. A layer of burnt grain was found *in situ* on the floor of the drying chamber. This poster looks at the results obtained from the analysis of this grain layer. The layer was composed almost entirely of spelt wheat, although preservation varied considerably across the drying floor. During its final use, the oven was either being used to parch spelt wheat spikelets to aid the removal of the chaff from the grain, or the crop, either as whole sheaves, or as spikelets, was being dried prior to storage.

[a] English Heritage Centre for Archaeology, Fort Cumberland, Fort Cumberland Rd, Portsmouth, PO4 9LD

[b] Dept of Archaeological Sciences, University of Bradford, Bradford, BD7 1DP

A methodological approach to the study of powdered archaeological plant remains from Argentine sites

Pochettino M.L., Cortella A.R., Correa R. and Cappareili A.

Plant archaeological remains, recovered from different sites of Argentina, are processed at our Laboratory. The methodology used depends on the Sample state and recovery conditions. They can be obtained as vegetal organs, dehydrated or carbonised, entire or in large fragments. In these cases it is enough to resort to observations of external morphology with light microscope or with SEM to identify the sample. Observation of tissue arrangement is possible because of the size of the sample and then identification is made by comparison with reference material. A great issue arises when the material is highly fragmented, powdered and commonly carbonised (for instance, material recovered from pipes and inner parts of recipients), with particle size less than 500 µm, where visualisation of tissue organisation is improbable. Besides, material observation is hindered by dehydration and charring. It is essential to treat these samples with different reagents and solvents. Hard oxidants such as 100V hydrogen peroxide, potassium permanganate, hydrochloric acid mixtures, sodium hypochlorite, as well as reducing agents such as phenol and chloral hydrate were tested. In many cases this treatments were followed by washing with sodium hydroxide, so that a partial discoloration was attained enabling the observation of some histological features and consequently the identification of the sample by light microscopy. For SEM observations the material was firstly washed with alcohol and then with hydrochloric acid to eliminate carbonates, very abundant in samples embedded in substratum or in ashes. Histological elements that were able to be described by such treatments include non glandular trichomes of different morphology, papillae with thick walls, stone cells, interlaced vegetal and animal fibres (commonly dyed, probably remains of a plant container) and pieces of epidermis in which stomata type could incidentally be described. Conservation of Gramineae epidermis was very frequent due to the silica impregnation of its wall cell. Very deterred parenchyma cells could also be observed. Pollen grains were commonly observed, however starch grains were more frequent. These were isolated or in amilaceous parenchyma. Just a few of them were damaged, but much more usually they were very well preserved. To identify this kind of material it is essential to know the internal morphology of those plants that, according with traditional records, were possibly used in those artefacts, and to resort to specific literature and reference material.

IWGP POSTER

The significance of sedge (*Carex* sp.) nutlets in assemblages of charred plant remains

By Wendy Carruthers & Kath Hunter

Sedge nutlets are commonly found amongst charred cereals and crop processing waste in assemblages from British sites. Because they are usually a minor component of a predominantly arable/cultivated/disturbed ground weed seed assemblage, the explanation often given is that they may have grown as weeds of cultivation on wetter soils and in boundary ditches.

However, the analysis of over 600 samples of charred plant remains from the Saxon settlement at West Heslerton, North Yorkshire, has provided evidence for two alternative explanations. Sedge nutlets were particularly widespread and common on this site, although otherwise the assemblages were fairly typical of the period. Charred 'tubers' were found to be closely associated with the nutlets, and some of the 'tubers' at least were identified as being from Cyperaceae (Sarah Mason, Institute of Archaeology). Heath-grass (Danthonia decumbens (L.) DC) and Poaceae were also included in this group.

This poster presents the evidence using GIS distribution plots to suggest that sedge nutlets may more often represent the burning of peat for fuel, and/or the use of turf for walls in structures such as grübenhause.

Wood charcoal analysis from Inca sites at the Hualfin Valley, NW of Argentina: the case of El Shincal

Aylen Capparelli, Stella Rivera and Rodolfo Raffino

Inca people occupied NW of Argentina between the years 1471 dC and 1535 dC. Part of the state settled in villages that had previously been built by local aboriginal partialities. However, when it was required they built up some Administrative Centres similar to those at Cuzco. This was the case of El Shincal, located in the Hualfin Valley, Province of Catamarca.

The main objective of this work is the recovery, identification and interpretation of wood charcoal fragments coming from different activity areas –such as storage, sleeping, processing, among others- of the site.

Many pieces of charred achaeological wood were recovered mainly by the use of a flotation machine. A subsample of 30 pieces was randomly selected for identification from each activity area. Around twelve different types of wood were found, and *Bulnesia*, *Prosopis* and *Schinus* were some of the genus identified. The work was complemented with ethnobotanical research.

It is suggested that Inca people at "El Shincal" used these genus for different purposes –such as cooking hearths, metallurgy, building materials, cooking pottery- depending on the type of the wood. It is also supposed that the environment could have supplied enough woody resources for supporting the state.

The Archaeobotanical Inference of Crop Sowing Time using the FIBS Method

Amy Bogaard, Glynis Jones, Mike Charles and John Hodgson

Phytosociological data on weed communities associated with autumn- and spring-sown crops in Germany are subjected to correspondence analysis and, in addition to a primary separation of communities on acidic and basic soils, the two sowing regimes are clearly distinguished in terms of phytosociological character species. In order to facilitate the archaeobotanical recognition of autumn versus spring sowing on the basis of weed seeds associated with ancient crop remains, an autecological method of analysis called FIBS (Functional Interpretation of Botanical Surveys) is applied to the phytosociological data. Functional attributes relating to seasonality and/or the capacity to regenerate rapidly following disturbance are found to be the best ecological indicators of sowing time; of these, onset and length of the flowering period are the most useful attributes of all. Attributes which relate to the quality of the growth period, which usually indicate soil fertility, are apparently influenced by sowing time in this study. The implication is that, in applying functional attributes to archaeobotanical data, sowing time should be assessed prior to fertility.

PLANTS FROM A STORAGE IN LATE BRONZE AGE SITE IN COPPA NEVIGATA, MANFREDONIA, SOUTHERN ITALY

COCCOLINI, G.B.L. Laboratorio di Paleoecologia Vegetale, Dipartimento di Biologia Vegetale, Università "La Sapienza" - 00185 Roma (Italy).

This investigation concerns with the samples provided by a team of archaeologist of Dipartimento di Paletnologia of the University "La Sapienza" in Rome. The late bronze layers have been sampled in the part of inhabited of Coppa Nevigata in proximity of a megalithic stone wall. This sector called "Area of Circles" takes name after the presence of some circular structures. In such area of the extension of a few m² a pattern made by some ring-shaped models outlined by an edge of stones points out. Each of these arrangement reaches a two meter diameter (Cazzella, Moscoloni, 1987). Plants remains found inside are mostly wood as smashed charcoal and cereal grains. Among small charcoal twigs the presence of Oleaceae, Aceraceae and of Rosaceae has been evidenced. Most likely these taxa took part of the landscape nearby the settlement from where it is assumed these plants have been gathered to be carried to the inhabited site and then used to fill in these structures. The filling did occur once; in fact this event affects just once the deposit, that looks to be homogeneous. The cereals recovered are few crushed caryopses belonging to *Hordeum*. The recovering of same caryopses of *Triticum* sp. and of fragments rachis of *Triticum* cf. *spelta* would establish the presence of wheat however the sample examined is rather small, and it doesn't allow a statistic analysis; excavations in other layers of the deposit have already yielded *Triticum dicoccum* besides *Triticum aestivum/durum*, *Hordeum vulgare*, *Vicia faba*, *Lens* cf. *culinaris* (Coccolini, 1982, 1987) and *Avena* cf.*sativa* grains. From these investigations it is possible to support the archaeologist's hypothesis that these circular shapes could be primary storage rooms of the silo-type.

REFERENCES

Coccolini, G.B.L., 1982 *Resti vegetali carbonizzati, in Magna Grecia e Mondo Miceneo, Nuovi Documenti, XXII Convegno Studi Magna Grecia:* 51-52.

Coccolini G.B.L., 1987 *Studio sui resti vegetali di un abitato dell'età del Bronzo, in Coppa Nevigata E Il Suo Territorio. Test. Archeol VII Al II Mill. a. C.* : 197-199. Roma.

Cazzella A., Moscoloni M., 1987 *La ricerca archeologica. Test. Archeol. VII al II mill. a .C.*:131-145

FLORAL REMAINS FROM AN EARLY BRONZE AGE HUT IN COPPA NEVIGATA, MANFREDONIA, SOUTH ITALY.

COCCOLINI, G.B.L. Laboratorio di Paleoecologia Vegetale, Dipartimento di Biologia Vegetale, Università "La Sapienza" - 00185 Roma (Italy).

An early bronze age hut has come to light during excavations performed by a team of archaeologists leaded by Cazzella, Moscoloni (1987,1995) in southern Italy, Coppa Nevigata near Manfredonia. The deposit pointed out early bronze age layers with a habitational structure longer than larger, about m 5 x 3.5, that had caught a fire. In the ancient hut, the double sloping roof had collapsed and the stored crop fallen to the ground. Also the load-bearing poles burnt and fell down and just some charcoal was left in the pole holes into the hut floor. The charcoal has been identified as belonging to Fagaceae, *Quercus ilex* type. Leafy-branches that covered the roof were burnt to ashes and their twigs turned into charcoal. The botanical analysis carried on charcoal remains by S.E.M. led to the identification of the timber Fagaceae (*Quercus* deciduous group) and Oleaceae (*Fraxinus* sp. The crop stored in the hut showed to be mostly made up by cereals such barley, *Hordeum vulgare*, and wheat, *Triticum dicoccum*, *T.aestivum* s.l. together with some caryopses of rye, *Secale* sp. Among these finds rye looks to be one of the oldest record for southern Italy.

REFERENCES

Cazzella A., Moscoloni M., 1987 *La ricerca archeologica, Testimonianze Archeologiche dal VII al II mill.a.C.*: 109-189.

Cazzella A., Moscoloni M., 1995 *La cronologia dell'insediamento stratificato dell'età del bronzo di Coppa Nevigata sulla base delle datazioni radiometriche, Origini,* 18: 411-423.

Using multivariate analyses in archaeobotany in order to define past land use.

Excavations carried out during the 1994-96 seasons at Tell Brak (in north-eastern Syria) covered a period of four millennia (5^{th}-2^{nd} millennia BC). Archaeobotanical samples, which contained a diverse range of plant taxa, including cereals, pulses, fruits, oil plants and also many wild species, provided an excellent opportunity to study chronological variations in the subsistence economy at the site. Multivariate analysis (e.g. correspondence analysis) undertaken on data sets comprising over 100 samples showed that there were clear trends in the composition of the cereals and the wild or weed taxa. Samples from the earliest periods were associated most closely with glume wheats and field weeds, whereas those from the later periods were allied with barley and free threshing wheat chaff and taxa representative of fallow, steppe or degraded land. It is suggested that the patterns may indicate changes in the use or state of the land surrounding Tell Brak, for example, that in the 3^{rd} millennium BC there was greater use of fallowing, or expansion of fields into the steppe, or deterioration of the land. Of relevance is that there were significant developments in terms of social and economic systems in this region of the Near East at this time.

Sue Colledge

Institute of Archaeology, UCL

Plant remains from some Medieval sites in Flanders, Belgium.

B. COOREMANS, Institute for the Archaeological Heritage of the Flemish Community.

During the past years as much botanical research as possible on so-called archaeological "emergency" excavations was carried out. Some of the results obtained from the medieval and post-medieval period are presented here. A straight forward comparison between these results is not possible due to different factors : often the excavations were on a rather small scale, different periods of time were studied, different soil conditions and different conditions of preservation have to be taken into account, etc.

Roughly the results can be divided into two main groups of data

1. rural sites, mainly dated to medieval times (7th-15th centuries), wich contained mostly carbonised plant remains.
2. non-rural sites such as cities and castles, mainly dated to late-medieval to post-medieval times (15th-18th centuries), containing mainly waterlogged and mineralised plant remains.

The first group contains results from sites on, on the one hand sand and on the other hand loamy sand. As could be expected, rye turns out to be the most important crop on sandy soils, whilst on the loamy sand, there seems to be a tendency to a mixed crop of rye and weath. Historical sources confirm this practice of mixed crops of rye and wheat. So far changes through time couln't be detected due to the lack of data.

The second group exists of sites in cities and castles. Often cesspits and/or waste deposits and ditches were studied. Results from rather big and important cities such as Brugge, Mechelen, Gent and Antwerpen were obtained. Unfortunately only rich contexts could be studied so far. Of course signs if richness were abundant : many different species of fruits and spices, with an important assortment of imported goods, such as graines of paradise, capers and pepper to name only a few. But it would be very interesting to have a look into the kitchen of the "normal" people as well.

Orsolya Dálnoki PhD student
Eotvos Lorand University of Sciences,

Late Celtic Agriculture based on the first results of an archaeobotanical investigation at Corvin Square, Budapest

Preliminary report on the excavations at a Celtic settlement in the Víziváros, Budapest

The Local Government of the 1 District in Budapest was financing a rescue excavation in 1997 and 1998 in order to build an underground parking lot at Corvin Square.

Till now this is the oldest known archaeological site within the area of Budapest. Middle and Upper Palaeolithic layers with stone implements, fossil animal bones and charcoal samples, artefacts from the Copper and Bronze Ages, a Celtic settlement, a rich Roman period cemetery and a long medieval phase (cellars mainly) was preserved.

The monuments of an habitation area that had been established in the middle of the 1st century AD was abandoned during the reign of *Claudius*. The latest finds from this area indicate that, as opposed to previous hypotheses, the Víziváros Celtic settlement had existed for a long time before the Romans arrived.

From a strategic point of view, this settlement was located at a disadvantageous spot. Its short-term existence, however, must have been temporarily justified by the proximity of the Danube and the Castle Hill. The former served as an important line of communication, while the latter was a possible refuge (*refugium*) in case of danger. These points may have been considered when the spot was selected for settlement. The buildings with wooden structures, sunken floors and mud-brick walls were easily destroyed by fire or simply collapsed once they had been abandoned.

The round refuse pits both small and large, are grouped around two major habitation surfaces. Storage pits as well as round, beehive-shaped refuse pits could be clearly recognised in both surfaces. The storage pits had elongated ovoid ground-plans. Their steep walls were usually plastered and fired. All of these can be dated to the Late Celtic (*La Téne D)* Period.

Almost all Celtic pits contained archaeobotanical material According to macrobotanical analysis the most important cultivated grain was the spelt but naked wheat, oat, einkorn, barley and panicle millet were also of great importance. Not only mill - stones that were found here but the great quantity of threshing refuse recovered from soil samples indicate that they processed grain on the spot. Rye and emmer wheat was rare. Cultivated oil-plants were also present here: flax, gold of pleasure and hemp.
A great number of collected fruits suggest that the nearby-forest and river contributed to the daily diet. The other wild plants served as nourishment or medicinal sources and were used for their different parts.

The charcoal remains were analysed by Károly Babos at the ELTE University. Oak (sessile oak, European oak and turkey oak), poplar, hazelnut, beech, cornelian cherry, blackberry and hawthorn were taken from the neighbouring forests.

In the Basin and Beyond: Archaeobotany at Neolithic Çatalhöyük

Andy Fairbairn, Eleni Asouti and Julie Near

Abstract

An intensive programme of flotation recovery at the current excavations of the Neolithic settlement of Çatalhöyük, Turkey (occupied *ca* 7400 BC – 6800 BC), have produced a rich collection of archaebotanical remains. Agricultural production was a major concern at the site and the non-charcoal plant remains are dominated by the remains of cereals, chiefly emmer wheat (*Triticum dicoccum* Schubl.), and a variety of pulses, mainly lentil (*Lens culinaris* Medick.) and bitter vetch (*Vicia ervilia* L.). Fruits, including, pistacia (*Pistacia* L. spp), hackberry (probably *Celtis tournefortii* Lam.) and almond (*Amygdalus* L. spp.) are ubiquitous and there is evidence of the use of a variety of grasses and sedges for basketry and mat production. Charcoal analysis has demonstrated the use of many species to fuel fires at the site, including oak (*Quercus* L.), willow/poplar (Salicaceae), elm (*Ulmus* L.) and a variety of shrubby plant species. Excavations in 1999 also uncovered the remains of dung burning horizons associated with lime-preparation and other activities.

The rich wild-seed flora, especially in these latter samples, combined with the evidence from wood charcoal analysis has shown that the inhabitants of the site utilised the whole range of habitats present in the Konya Basin. Fuel-wood, craft products and possibly fodder were gathered from the riparian marshes and woodlands of the alluvial wetlands on which the site was built. Wood was also gathered from the steppe surrounding the wetlands and there is evidence of grazing on grassy and Tragacanthic steppe vegetation as well as the sand ridges that cross the area. The collection of fruits and wood from fruit trees may have gone as far as the mountains surrounding the Konya Basin.

The location of crop fields is as yet uncertain, mainly because of the lack of unmixed deposits of cereal processing residues and almost clean samples from storage contexts. The seed evidence does, however, suggest that both wetland fringe and rainfed areas on the steppe may have been used. Phytolith analysis may provide an important additional source of evidence to determine field location.

A change from the use of dung-fuel to wood fuel in the later stages of occupation is also apparent at the site. This corresponds with a change in wood fuel species from the dominance of riverine trees and fruit producing species to oak and steppe shrubs. It also corresponds to a change in the seed flora in the middens and dumps from a high to low visibility of steppe and saline species. One explanation for this change could be the location of site trenches and a rigid spatial partitioning of activities on the site; however, closer analysis has rejected this and suggests that the archaeobotanical changes can, at least in part, be linked to wider changes in the environment and fuel-wood availability

Neolithic crops and culinary evolution in Peninsular India: archaeobotanical evidence in theoretical perspective

Dorian Q Fuller
Institute of Archaeology UCL

Archaeobotanical evidence from Peninsular India indicates a combination of crops indigenous to the region and those that must have been introduced from outside the region. By focusing on a comparative analysis of assemblages from the Southern Neolithic and the Malwa-Jorwe Tradition further North, similarities and differences in the food-ways and agricultural practices of peninsular India in the third to second millennium BC will be highlighted. This evidence will then be considered in relation to theoretical models for processes of agricultural spread, including forms of migration and cultural diffusion. It will be argued that the evidence suggests cultural diffusion of crops took place both southwards and northwards, and that these processes were selective. The causes of these adoptions are difficult to explain by ecological or adaptive logic alone, thus implying that other social factors must be involved.

Cereals from an early medieval hilltop settlement in central Italy.

John A. Giorgi

Large quantities of charred cereal grain were recovered from the medieval hilltop settlement of Montarrenti, Tuscany, central Italy. The cereals were mainly retrieved from a 10th-century storage deposit on the summit of the hill. The best represented cereals in the samples were einkorn, free-threshing wheat, hulled barley, foxtail and broomcorn millet and sorghum. There were smaller quantities of chaff and weed seeds in the samples. Extensive sampling of the storage deposit was carried out and results showed that the different grains were mixed in similar proportions in virtually every sample and no significant spatial or vertical variation was noted. Documentary evidence also shows that a wide range of cereals was cultivated in early medieval Italy. Previous archaeobotanical research, however, has consistently shown free-threshing wheat and hulled barley to be the best represented cereals in samples from both early and late medieval excavations with only very small quantities of the other grains. The settlement was probably producing its own grain for its own consumption. Grain storage on the hill may either suggest loose economic control by an elite or the communal storage of grain in a safe place by all the inhabitants. Excavation and the sampling for environmental data from all types of settlements through the medieval period is recommended to try to understand the extent to which the choice of crops may be influenced by social, economic, political or environmental factors.

Plant Remains from The Wreck of the Mary Rose

The Mary Rose sank in the Solent on Sunday the 19th July 1545 whilst protecting Portsmouth from an invasion by the French fleet. The sinking was witnessed by King Henry VIII.

From the earliest stage of the excavation of the ship it was recognised that the preservation of organic materials was quite exceptional. A programme of sampling obvious organic materials was undertaken by the excavators in the hope that future analysis would not only result in the retrieval of biological materials but this would lead to a better understanding of life on board ships in the early 16th century.

An extensive range of botanical materials have been recovered from a very wide range of contexts. The contexts include chests that belonged to the men on board, barrels, packaging materials and even from the clothes of those who sailed on the ship.

The range of plant materials include items rarely located on shore based sites of the period. The material is so well preserved that grape skins have been recovered and many plant materials have retained their chlorophyll and other pigmentation. Black pepper corns (*Piper nigrum)* has been recorded from several locations within the ship and freeze dried pepper corns still retain essential oils and smell of pepper.

Fruit stones and seeds of other fruiting species have been recorded from various parts of the ship and may reflect personal possessions of the sailors rather than general victuals stores.

A wide range of ruderal species has been identified associated with large quantities of rye (Secale cereale)straw and very large quantities of Cytissus scoparius stem and pod fragments. The pods initially gave rise to early reports by the excavators that peas (Pisum sativum) had been present on the wreck. this has certainly not been confirmed by the present work. Later material from beneath and sealing the wreck is of some interest but is not securely dated. Work is progressing on the recovery of plant materials from the original samples along with identification of the botanical material. from only well defined and secure archaeological contexts.

F J Green

Counting Seeds: Graphical Presentation and Interpretation of Quantitative Archaeobotanical Data from the Near East

W. A. Green
Department of Geology and Geophysics, Yale University, New Haven, Connecticut

Like other analytic aspects of archaeology, archaeobotany has been growing progressively more quantitative in the past decades. On one hand this is a sign of the proliferation of increasingly mature and sophisticated methodologies for analysing botanical data. But associated with the sophistication of quantitative methods is their inherent opacity for the unmathematical reader: the value and applicability of anthropological conclusions drawn from quantitative archaeobotanical data is not only limited by the utmost juice that can be extracted from the data by sophisticated statistical tools, but also by the ability of the field archaeologist to appreciate and evaluate such conclusions. Here, we consider the process of data collection from a Near Eastern urban site and evaluate the significance of various types of numerical error that can creep into the final data. Next we compare methods of data analysis in fashion at different times. discuss the kind of anthropological conclusions that can or should be drawn from them. and address the issue of comparability between sets of data. Finally, we apply to archaeobotanical data methods of multivariate analysis suggested by statisticians like Chernoff (1973) and Tufte (1983) and argue that graphical display is a viable alternative strategy for the routine analysis of archaeobotanical data.

Works Cited

Chernoff. H. (1973) The use of faces to represent points in K-dimensional space graphically *Journal of the American Statistical Association* 68(342):361–368.

Tufte, E. R. (1983) *The Visual Display of Quantitative Information* Cheshire, Connecticut: Graphics Press.

A Late-Glacial and Early Holocene environment and climate history for the Neuchâtel region (CH)

Philippe Hadorn[1], Nigel Thew[1], G. Russell Coope[2], Geoffrey Lemdahl[3], Irka Hajdas[4] and Georges Bonani[4]
[1]Service cantonal d'archéologie, Valangines 3, CH-2006 Neuchâtel, Switzerland
[2]Centre for Quaternary Research, Royal Holloway, University of London, Egham, Surrey, TW20 0EX, United Kingdom
[3]School of Bioscience and Process Technology (IBP), Section of Biology, Vaxjo university SE-351 95 Vaxjo, Sweden
[4]Institut für Teilchenphysik, ETH-Hönggerberg, CH-8093 Zürich, Switzerland

Keywords: Lake Neuchâtel (CH), Late-Glacial, Holocene, environmental history, climate change

The site of Hauterive/Rouges-Terres, situated near the north-western angle of Lake Neuchâtel, was discovered in 1992 in the deep construction trench for the A5 motorway. Field investigations were carried out during the summers of 1992 and 1993.
15 profiles covering 120 m of horizontal stratigraphy have been drawn, described and sampled for sediment, pollen, plant macrofossil, insect and mollusc analyses. Careful cleaning of the whole section allowed layers to be followed and correlated between the 15 profiles, permitting lithostratigraphic units to be established for all of the documented sediments.
These deposits formed in an embayment at the margin of Lake Neuchâtel, with lake sediments predominating towards the deeper part of the depression, passing laterally into lake margin and supra-littoral marsh and colluvial deposits.
Pollen analysis on four of the profiles have confirmed field hypotheses that these deposits represent a complex sequence of Late-Glacial to middle Holocene sediments, reflecting changing conditions in the local environment (linked to lake level variations, and phases of stability and instability of the adjoining terrestrial land surface) determined by regional scale patterns of climate change. Despite the variable nature of these sediments, the pollen sequence fits very well with the regional pollen zones published for the Swiss Plateau. An absolute chronology has also been established for these four profiles, based on more than 60 AMS dates ranging from 14,200 to 8,000 BP.
Sediments of the Oldest Dryas biozone were dominated towards the edge of the depression by colluvial gravels with alternating layers of silts and sands. The gravels contained many frost-shattered pebbles. Notable deformation structures (several phases) could be observed, resulting from solifluction and possibly cryoturbation. Low pollen concentrations show rapid sedimentation during the Oldest Dryas biozone but, despite this, the finer sediments were found to contain remarkable concentrations of plant macro-remains, insects and molluscs. The plant material consists of leaves, fruits, seeds, bud-scales and twigs which reflect an arctic and alpine Oldest Dryas flora. Among the identified remains are aquatic species, plants typical of lake shore marshes, alpine meadows and loose rocks, as well as dwarf shrubs *(Betula nana, Dryas octopetala, Salix retusa)*. Insect analyses indicate extremely cold conditions throughout the Oldest Dryas biozone. The molluscs include alpine, arctic and Siberian species.
The insects clearly show a sudden and intense temperature warming at the very end of the *Betula nana* RPAZ, just before the reforestation by juniper and tree birch which marks the beginning of the Bølling biozone. This warming coincided with a change in sedimentation (alternating silts and sands gave way to organic silts) which seems to indicate a rise in lake level, and solifluction ceased. The plant remains show subsequent colonisation by tree birches, willows and poplars. The *Betula* phase of the Bølling was marked by the deposition of silty marls.
A significant lowering of the lake level during the Youngest Dryas biozone (leading to the formation of pebble beaches and sand layers) caused the erosion of all sediments dating from the Allerød biozone, and the formation of loading structures. The insects indicate a return to colder climatic conditions. At the start of the Preboreal an abrupt climatic warming coincided with a major rise in lake level and the subsequent deposition of silty marls, silts and fine sands. The Boreal and Atlantic biozones were marked by sediments rich in oncoliths.

Fruits and fruit cultivation in archaeobotanical finds from Slovakia

Hajnalová Eva*, Hajnalová Mária**

The paper aims to present brief synthesis of systematic long-term archaeobotanical research concentrated on fruits and nuts macroremains in Slovakia. To gain the complex picture of overall development some 176 sites dated to wide span from Neolithic till the modern era were explored. Samples of totally 56 000 items, which are represented by charred as well as uncharred seeds and wood, contribute toward the knowledge of fruit assortment and its development over the ages. Furthermore some finds enable to drawn the indices on character of inter-regional contacts (exotic fruits trade) and the possible consequences for local cultivation (e.g. case of Vitis vinifera cultivation). Accordingly the presentation is to sketch current state of research in Slovakia.

Address:
Archeological institute
Slovak Academy of Sciences
Akademická 2
SK-94921 Nitra
*e-mail: eva.hajnalova@post.sk
**e-mail: maria_hajnal@yahoo.com

Archaeobotanical evidence for tanning

Allan Hall, Environmental Archaeology Unit, Department of Biology, University of York, PO Box 373, York YO10 5YW (biol8@york.ac.uk)

Pits, especially rectangular ones, on urban archaeological sites of medieval and later date are frequently considered by excavators to be related to tanning, though the evidence for this is often merely circumstantial. This contribution presents the results of archaeobotanical analyses of some pit fills and other deposits, from a variety of sites of early medieval to 19th century date from the British Isles, France and Switzerland, for which it *is* thought there is evidence for tanning (through the presence of high concentrations of decayed bark and bark sclereids). Some relevant archaeoentomological results are also considered.

The use of higher taxonomic groups in archaeobotanical interpretation

Alison Hynd

The seeds of non-crop species form a substantial element of most archaeobotanical assemblages, and have the potential to provide a wealth of ecological information. Unfortunately, many species cannot be distinguished by their seeds alone, particularly after charring and many years in the ground. Much archaeobotanical material is therefore identified to the higher taxonomic groups genus and family, rather than to species. This lowers the interpretative value of the material because the higher the taxonomic group, the less specific the ecological information it can provide.

This paper presents a method of overcoming this problem by looking for similarities in ecological adaptation in higher taxonomic groupings - because adaptation is 'constrained' by phylogeny, closely related plants are likely to be similar in some of their ecologically functional attributes. The FIBS in Archaeobotany technique has been used to build a database of functional attribute values for species from archaeobotanically common genera and families. Analysis of these values indicates which functional attributes are constrained across which higher taxonomic groups, and thus which of these groups are suitable for archaeobotanical interpretation. In addition, because phylogenetically constrained attributes have experienced little evolutionary change in recent time, then it is also safe to make uniformitarian assumptions about the relevance of modern measurements of these attributes to studies of past ecologies.

Using microsatellites to study the introduction of domesticated emmer wheat into Italy.

Andrew Isaac

As part of a wider study into the domestication of emmer wheat (*Triticum dicoccum*), we have typed 3 microsatellites in 39 well-provenanced Italian emmers obtained from the IPK Gatersleben and ICARDA collections. It will therefore be understood that these represent modern rather than archaeological material. A preliminary analysis showed the geographical distance between accessions to be strongly correlated with genetic distance, suggesting that there has been little movement of emmers in recent times, and that a genetic structure reflecting ancient biogeography is therefore likely to persist in our sample. Given this initial encouragement, a method of identifying where domesticated emmer first entered Italy was derived.

The present study took the great circle distance (ie linear distance allowing for the curvature of the earth) to a hypothesised founder population as a measure of the severity of the bottleneck that accessions passed through in achieving their observed distribution. We justify the use of this measure by noting that the severity of a bottleneck is proportional to both its duration and the reduction in population size. In our model we treated the reduction in population size as a constant as, *on average*, the number of plants used to establish new populations as emmer spread across the Italian peninsula is likely to have been similar. We took the duration of the bottleneck as proportional to the distance from the founder, this in turn assuming that the spread of emmer across Italy occurred at a uniform rate. It should be realised that these assumptions constitute a model against which we tested our data, and therefore represent a first order approximation to, rather than statement of, past events. In practise our model indicates that the genetic distance between accessions will be proportional to the difference in the great circle distance back to the founding population.

In order to identify where domesticated emmer first entered Italy, we constructed matrices containing the difference in great circle distance back to a series of hypothetical founding populations for each pair of accessions. These hypothetical populations were placed at 30km intervals along Italy's coast and northern border. The Pearson coefficient was obtained in comparing each of these matrices with a matrix containing the genetic distance between accessions.

It is striking to note that the greatest correlation is observed when the genetic distances are compared with matrices representing sites in northern Puglia. Moreover, the significance of the highest correlation is given by a Mantel test as $p < 0.0001$. These results are in precise agreement with the radiocarbon dates for Italy, which indicate that the earliest Neolithic sites are found in northern Puglia. The genetic evidence therefore provides clear support for the archaeological evidence. While alert to the danger of developing a circular argument, we believe that these results lend credibility to the assumptions upon which our analysis is based. We now hope to apply similar methods to regions where the archaeological record is poor and/or dates are unreliable.

12th Symposium of the International Work Group for Palaeoethnobotany
Sheffield UK, 17-23 June 2001

The romanisation of Switzerland - Archaeobotanical evidence

Stefanie Jacomet, Seminar für Ur- und Frühgeschichte, Abt. Archäobiologie, Archäobotanik-Labor, c/o Botanisches Institut, Schönbeinstr. 6, CH-4056 Basel, stefanie.jacomet@unibas.ch

Roman influence in Switzerland in the regions north of the Alps began early. 121 BC, Geneva was incorporated to the province of Gallia Narbonensis. 58 BC Caesar defeated the Helvetians and the related celtic tribes near Bibracte. 44 BC the first coloniae were funded. 15 BC the "Alpenfeldzug" was finished an the incorporation of the whole of the country into the roman empire completed. Most of Switzerland became a part of the province of Germania Superior. From the early phases of roman presence during the Augustean period (ca. 15 BC until 14 AD) only a few sites are excavated, archaeobotanical investigations are even rarer.

Switzerland has only one bigger military site, the legionary camp of Vindonissa, situated in the central Swiss Plateau in the Canton of Aargau. It was founded in early Tiberian times, between 15 an 20 AD by the Legio XIII. It exists only one archaeobotanical study, carried out by Neuweiler in 1908 on well preserved material from the so called "Schutthügel", containig refuse of the legionary camps of the first century AD. But the site of the camp was settled already earlier, before the arrival of the Legio XIII. During 1996-1998, a rescue excavation was carried out on the place of the later Principia, built by the Legio XXI after 45 AD ("Breite"). 5 phases of wooden buildings were excavated, dating in the time span between 15 BC and 20 AD. Therefore, it is possible to study the early phases of romanisation, before the arrival of the Legio XIII. The structures (pits, latrines, burnt layers) were sampled rather systematically, from phase 2 onwards (10 BC). Thousands of carbonised seeds, fruits and other plant parts were identified.

In phase 2 (10 BC until 0), a building was excavated which served probably as a storeroom. Several wooden barrels were digged into the soil and burned in situ, during a catastrophic fire which destroyed the whole building. At the bottom, they contained parts of their original fill. It was a big surprise to find hundreds of pomegranate (*Punica granatum* L.) seeds and pericarp-fragments. Beside pomegranates, other "Exotica" (plants which cannot grow north of the Alps for climatic reasons), were present (e.g. pistacio, stone pine, olive). Lots of fragments of fruit-flesh could not be identified to the species level. We believe that the barrels were stores for imported fruits, because their spectra are very different from the other features of phase 2 and the other phases. However, we can not exclude that they had a different function because the pericarp of the pomegranates was highly fragmented. We cannot decide if this fragmentation happened before or after the catastrophic fire, after which the whole area was levelled out and new buildings erected. Experiments for solve this problem will be carried out.

The main question to answer for the evaluation team is: was this a military or a civil site? or was it a mixture of both? The architecture of the phase 2 building seems to be of a rather mediterranean character. There are lots of imported ceramics from Italy and locally produced dolia (storage vessels). Amphorae with olive-oil came from southern Spain and there are wine amphorae from Rhodos. Also mediterranean fish was imported. Militaria are rare, but present. A comparison of the archaeobotanical data with over 50 early roman sites from the European mainland north of the Alps gave the result that "Exotica" are mainly found in military stations like the legionary camps of Oberaden and Novaesium in Germany. This let us suggest from the archaeobotanical point of view that the site has to do something with the presence of roman officers on the site or nearby. But in the southern part of central Europe, after the defeat at Bibracte, there must be already romanised civil persons who collaborated with the roman army. Most probably, the site seems to be a sort of trading post for luxury goods, but it is not decidable if the people living there were roman officers or civil indigenous, already "romanised" people.

Hagendorn, A. (19987) Neues zum Lagerzentrum von Vindoniaa - Ausgrabungen in der Breite 1996-1998. Jahresbericht der Gesellschaft pro Vindonissa 1998 (Brugg 1999), pp. 23-36.
Neuweiler, E. (1908) Pflanzenreste aus der römischen Niederlassung Vindonissa. Vierteljahrsschrift der Naturforschenden Gesellschaft Zürich 53: 395-407.

Ecological Investigation of Intensive Cereal Cultivation in the Mountains of Asturias, NW Spain

Mike Charles, Amy Bogaard, Glynis Jones, John Hodgson and Paul Halstead

The region around the modern village of Zureda in Asturias, NW Spain is probably unique in Europe in that a cereal crop (spelt wheat) is cultivated on a garden scale using horticultural methods. A floristic survey was made of the weeds in 65 cultivated spelt plots in this region, recording the weed assemblages in each plot. The ecological attributes of the most commonly occurring weed species identified were then measured and compared to an earlier study of the functional characteristics of weeds associated with pulse crops on the Greek island of Evvia. In this earlier study, it was possible to distinguish between plots cultivated intensively on a garden scale and plots cultivated extensively in fields, on the basis of a suite of functional attributes of the weed species associated with the crops. The cereal plots from Asturias were correctly identified as gardens on the basis of the same suite of attributes.

The Asturias plots were also compared to autumn- and spring-sown plots of from Germany, using a different suite of attributes. The Asturias plots were either classified as autumn-sown or were classified ambiguously. This is consistent with the sowing period in Asturias, which is spread over a long period from November into January/(February).

These results demonstrate that the suites of functional attributes identified to distinguish intensive and extensive cultivation, and to recognise sowing time, can be applied in other geographical areas and to other crops. This paves the way for the application of the method in the identification of past agricultural practices from archaeological weed assemblages.

Abstract for the lecture to be held at the 12th IWGP Symposium in Sheffield in 2001

T. Märkle & S. Karg: Continuity and change in plant resources during the Neolithic in Western Switzerland.

The lake dwelling site Concise-sous-Colachoz (Canton of Vaud, Switzerland) is situated at the margin of the lake Neuchatel. The site was excavated on a very large scale over a period of 5 years. An area of 5000 m^2 and a stratigraphy comprising 2000 years of continuous habitation was investigated. Dendrochronological dates for architectural elements from more than 13 occupation phases demonstrate that the site was occupied from the Neolithic period (4400 BC) until the Bronze Age (1579 BC). Cultural layers were detected from most of the occupation phases. As these layers were protected below the present water level, both carbonized and also uncarbonized organic remains are very well preserved.

Which sampling strategy can be applied on such an extraordinary site? Two sampling strategies were followed: during the excavation c.10 liters of sediment from every layer were washed through sieves with a mesh size of 5 and 2mm. The organic residues were kept for further studies. From the same layer a laboratory sample (c.1 liter) was taken. More than 10.000 samples are now available for detailed studies.

One Neolithic layer was studied in detail by Tanja Märkle for her Master Thesis. A broad spectrum of collected food plants were identified. By considering particular species (eg. Cornus sanguinea and Prunus spinosa) and their comparison with other archaeobotanical investigations, differences through time and space are shown.

A preliminary study of the cultivated plants from 7 occupation layers dated to the 4th and 3rd centuries BC focussed on questions concerning the development of agricultural diversity during this time period. The continuity of the cultivation of naked wheat and different glume wheat species will be discussed.

Recent Advances in Storage Archaeoentomology in Israel

Mordechai Kislev and Orit Simchoni

Faculty of Life Sciences, Bar-Ilan University, Ramat-Gan 52900, Israel

Data accumulated over the last twelve years were evaluated, enabling:

1. Identification of new species of local ancient fauna, including major as well as minor insect pests of stored cereals;
2. Identification of their larvae;
3. Application of our approaches to infested fruits;
4. Comparison of pest samples from various sites and from various periods; and
5. Description of the history, origin and extinction of these pests. These results and approaches used in this research should be applicable to other countries as well.

Three new major storage pest beetles were identified: *Cryptolestes ferruginaeus*, *Lasioderma serricorne* and *Tribolium confusum*, as well as 3 new minor pests: *Alphitophagus bifasciatus*, *Coccotrypes dactyliperda* and *Palorus* cf. *subdepressus*. Species of three less defined taxa were also found - cf. *Anthicus*, cf. *Carcinops* and a *Ptinid*. Altogether, the number of species known to us was doubled. We thank Dr. DGH Halstead, formerly of the Storage Department, NRI, Slough, for helping us in these identifications.

Despite their being more numerous, larva remains are less detectable than adults due to their delicate, fleshy body. However, they can be found in well-preserved samples, as well as in freshly broken, charred dates, figs and walnuts.

The early history of the Israeli storage beetle, and perhaps of all Near Eastern storage beetles, can now be roughly outlined. The pioneer pest is the Neolithic *Sitophilus granarius*, which was the only storage beetle for more than 4000 years. In early historical periods - MBIIB, 16-18th C BCE - *S. granarius* started to be accompanied by 3 additional major pests for the next 2000 years: *Rhyzopertha dominica*, *Tribolium castaneum* and *Oryzaephilus surinamensis*. The pioneer pest - *S. granarius* was replaced by *S. oryzae* following the Byzantine period (5-6th C CE).

INSTITUT DER
KOMMISSION FÜR ARCHÄOLOGISCHE KAL LANDESFORSCHUNG IN HESSEN E.V

Could Tacitus have been right in the end? Archaeobotanical evidence for agricultural systems from Germanic, Celtic and Roman Sites in Hesse and Mainfranconia

Angela Kreuz, Wiesbaden

The rural economy in Roman times seems to be determined, on one hand, by „Roman" influence and, on the other, by „native" traditions and responses. It is still unknown how individuals decided to or were forced to use, adapt or reject the influences coming for example from the mediterranean world. Was the choice to change or not change the agricultural practices based on more economic, ecological or ideological factors? Surprisingly little is known about the cultural and other processes which took place, and which in the end were responsible for the formation of the archaeological, archaeobotanical and archaeozoological record. Investigations of botanical macro-remains (on-site data) have been launched to analyze the rural economy and its ecological basis. Results concerning the evidence from celtic, germanic and roman sites within and without the limes-border of Hesse and Mainfranconia will be presented and considered.

Kreuz 1995 Landwirtschaft und ihre ökologischen Grundlagen in den Jahrhunderten um Christi Geburt: zum Stand der naturwissenschaftlichen Untersuchungen in Hessen. Berichte der Kommission für Archäologische Landesforschung in Hessen 3, 1994/1995, 59-91.

Kreuz 1995 Funktionale und konzeptionelle archäobotanische Daten aus römerzeitlichen Brandbestattungen. Berichte der Kommission für Archäologische Landesforschung in Hessen 3, 1994/1995, 93-97.

Kreuz 1999 How to become a Roman farmer' preliminary report of the environmental evidence for the Romanization project. J. D. Creighton, R. J. A. Wilson. Roman Germany: studies in cultural interaction. Journal of Roman Archaeology Supplementary Series 32, 71-98.

Kreuz 2000 *„tristem cultu aspectuque"*? Archäobotanische Ergebnisse zur frühen germanischen Landwirtschaft in Hessen und Mainfranken. In: A. Haffner, S. von Schnurbein (Hrsg.) Internationales DFG-Kolloquium Trier 1998: Kultureller Wandel in den Jahrhunderten um Christi Geburt. Kolloquien zur Vor- und Frühgeschichte 5, 221-241.

Agriculture in the 1st millennium BC in northern Germany, illustrated by new finds

Helmut Kroll

In the last decade, a motorway was built in eastern Germany, in Mecklenburg-Vorpommern, the so-called Baltic motorway (Ostseeautobahn A 20). The archaeological investigation of the motorway alinement resulted in many excavations. These sites would never be found without these investigations. We looked especially for interesting periods with few archaeobotanical information, these are the Neolithic, the Bronze Age, and the pre-Roman Iron Age. Our interest in medieval plant remains is confined to early Slavonic sites, done by Almuth Alsleben, and to the rare rural sites.

Several hundreds of soil samples were washed at central flotation sites. The wet samples are brought to the institute, there they are washed again, dried and analysed. Many samples are empty, many others contain scarce plant remains. Only very few, about 1 per cent, are rich in plant remains and give new and promoting knowledge on prehistoric agriculture. Therefore it is important to do as many samples as possible.

The plant remains from the late Bronze Age and the Iron Age do not match our imaginations of that time agriculture in Northern Germany. Our new finds are rich in species and they conform much better to Poland or central Europe than to northern Germany. New finds of Triticum spelta connect the Polish ones with the old Danish ones which were quite isolated until now.

Root foods in pre-agrarian subsistence. Evidence from the Early Ertebølle (Late Mesolithic) site at Halsskov in Denmark.

Lucy Kubiak-Martens
BIAX *Consult*, Research and Consultancy Service for Biological
Archaeology and Environmental Reconstruction
Roetersstraat 8hs
1018 WC Amsterdam, The Netherlands

Roots and tubers, together with other underground parts of plants such as rhizomes, bulbs and corms are considered as a source of human food. Untill very recently, however, remains of vegetable foods were rarely identified from archaeological contexts. Current advances in the identification of charred remains of vegetative tissues have been successfully applied in a number of archaeological (mainly hunter-gatherer) sites in Europe.

The most recently found example of root foods are charred bulbs of Ramsons (*Allium* cf. *ursinum*) and possibly tubers of pignut (*Conopodium majus*) recovered from the Early Ertebølle site at Halsskov (c. 6130-7230 BP) on Zealand, Denmark. These were collected for food together with hazelnuts, acorns, raspberries and probably also seeds of *Nuphar pumila*.

This new archaeobotanical evidence from the Danish coastal area can contribute to our understanding of the delay in the spread of agriculture throughout southern Scandinavia.

The paper considers other evidence from temperate Europe for root foods used in the pre-agrarian economy and its implications for the role of vegetable food in past human diet.

Cultivated plants, weeds and grassland at the late Bronze Age settlement Rodenkirchen-Hahnenknooper Mühle, Lower Saxony, Germany

Dušanka Kučan, Niedersächsisches Institut für historische Küstenforschung, Viktoriastraße 26/28, D-26382 Wilhelmshaven

During the course of construction work in 1971 at the new Strohauser sluice at Rodenkirchen-Hahnenknooper Mühle, the oldest settlement known to date in the tidal-flat (*Marsch*) region of Germany was discovered. The settlement was established in the late Bronze Age between 900-800 cal. B.C. on the left bank of the river Weser directly on fen peat which has been dated to 1616-1517 cal. B.C.

In the course of excavations, which commenced in 1996 under the direction of Dr. E. Strahl, Niedersächsisches Institut für historische Küstenforschung, well preserved remains of a three-aisled house-*cum*-stall were discovered in the uppermost layers and investigated by making several sections. The excavations yielded much suitable material for detailed macrofossil analyses. The results of these analyses show that at Rodenkirchen, in addition to cattle rearing, limited arable farming was pursued on the river and stream banks. The main crops consisted of hulled barley (*Hordeum vulgare*), spelt wheats (*Triticum dicoccon* and *T. monococcum*), millet (*Panicum miliaceum*), flax (*Linum usitatissimum*) and gold-of-pleasure (*Camelina sativa*) In one layer more than 8 kg of chaff of Camelina were found. It is the first record for the late Bronze Age proving such an early cultivation in the area investigated. It is probable that wild-oat (*Avena fatua*), charred remains of which were recorded, was grown locally. One seed of the broad bean (*Vicia faba*) was also recovered. It is shown that, on the basis of the 23 weed species recorded, the arable economy was based exclusively on summer crops because of winter flooding.

As well as the cultivated plants, remains of plants collected in the wild were particularly abundant. Sloes (*Prunus spinosa*) were often found, and also rosehips (*Rosa* spp.) and hawthorn stones (*Crataegus monogyna*) which suggest that these were readily available in close proximity to the site and were heavily relied on as a source of nutrition. The woodlands of the floodplain provided a suitable habitat for these plants. The nearby existence of such woodlands is attested to by numerous determinations of the wood used as construction timbers from the house. The results show that alder (*Alnus*) dominated, and ash (*Fraxinus*), oak (*Quercus*), hazel (*Corylus*), birch (*Betula*) and willow (*Salix*) were also common.

The non-cultivated plant remains also give valuable insights into the wide transitional vegetation zone that spanned a gradient from brackish to freshwater conditions. Today this vegetation zone does not exist any longer because of building dykes since the 11th. century. Apart from Phragmitetea (16 species), Plantaginetea and Agrostietea (20) and Bidentetea species (4), remains of 13 species of Armerion and saltmarsh communities were recorded. The overall assemblage, which is characterised by salt tolerant plants, is indicative of regular flooding by brackish or saltwater. The following species were identified: *Althaea officinalis, Apium graveolens, Aster tripolium, Carex distans, Juncus gerardi, Puccinellia distans, Scirpus maritimus, Spergularia marina* and *Spergularia media*. Of these, *Apium graveolens* (wild celery) and *Althaea officinalis* (marsh mallow) may have been used for nutritional and medicinal purposes, respectively. There is a distinct possibility that these plants were purposefully collected for human consumption.

Hay or not hay? - Aspects of plant use in animal husbandry in medieval Winterthur, Switzerland.

Marlies Klee, Marlu Kühn
Seminar für Ur- und Frühgeschichte, Labor für Archäobotanik
Schönbeinstrasse 6
CH-4056 Basel
Email:
Marlies.Klee@unibas.ch
Marlu.Kuehn@unibas.ch

Three sites which yielded plant assemblages that quite obviously looked like hay have been analysed. It was expected to get information about the animal diet and the types of grassland used for making hay during the Middle Ages in Switzerland. Furthermore the study of the material should assess possible changes in the combination of taxa in connection with different management systems in different periods.
The sites are located in Winterthur and its surroundings. They are dated from the 11th to the 14th century AD. At first sight the material from each site is composed mainly of vegetative plant remains - especially grass-blades and culms.
The analysis of the seeds and the fruits together with the vegetative plant remains shows that only one assemblage can be interpreted as hay. The other ones in contrast produced a rather high proportion of straw as well as seeds and fruits from plants of fens. These plant remains were more probably intended to be used as litter than as fodder.
The findings will be presented and further possibilities of their origin, their use and their archaeological context will be discussed.

Mia Lempiäinen
Archaeology Department
University of Turku, Finland
mialem@utu.fi

MA graduate thesis

12th Symposium of the IWGP
Sheffield, England 2001

Poster abstract :

Macrofossil Remains from Inhumation Burials at the Late Iron Age Cemetery in eastern Finland, Lappeenranta, Kauskila, Kappelinmäki. A Case Study from a Grave nr. 22.

Kappelinmäki cemetery dates to late iron age/early medieval (1100-1300 AD). There is about 200 individual burials; 68 adult and children burials has been documented so far. Children burials are separated from adults, they are situated on the edge of the cemetery. Orientation of the burials in the cemetery are east-west and north-south, there is pagan and Christian burials. In most cases, there is no artefacts in the graves. In the cemetery there is both decomposed and skeletal graves. Macrofossil samples has been taken from both types of the graves.

Decomposed graves (gravepatches)
Burials where all marks of the deceased has been totally decomposed. The grave distinguishes from its surrounding only as a coloured patch and soil is tacky. From decomposed graves macrofossil samples has been taken from the darkest layer of the grave, presumably that is the level of remains of the deceased.

Skeleton graves
Burials where bones of the deceased has been preserved i.e there is complete skeletons in graves. From skeleton graves macrofossil samples has been taken between the ribs and backbone, from the stomach area.

Grave nr. 22
Most best preserved skeleton in the cemetery. At the area of the deceaseds' stomach there was remarkable amount of seeds, that could also been seen with the naked eyes. Macrofossil analysis showed all the seeds to be rasberry (*Rubus idaeus*) seeds. In one desilitre there is 600 seeds, the sample being 1 litre, total amount in the sample would be about 6000 seeds. What was the last meal of the deceased? Rasberryjam?

The Federsee Reed in southwest Germany: ecological and economical changes in prehistoric times (ca. 4000 BC - 1000 BC).

Ursula Maier

The Federsee reed is one of the largest bogs in Southwest Germany, located 60 kilometers north of the Alps. 18 prehistoric settlements have been discovered there and more than 180 Neolithic and Bronze Age houses have been excavated. Archaeobotanical research in 7 prehistoric sites will be presented, belonging to the Late Neolithic (4100-2400 BC cal) and the Late Bronze Age (1000-850 BC cal). As the cultural layers of all these sites have been waterlogged, carbonized and uncarbonized plant remains are preserved. The analyses show, how agriculture changed during 3000 years. While in the older sites cereal cultivation played an outstanding role, at the end of Neolithic time oil and fibre plants got more and more important. The spectra of field weeds reflect quite clearly the cultivated crop assemblages in different times. Obviously people of the Goldberg III-culture (2800-2400 BC cal) were specialized in the cultivation of flax and poppy. While in all Neolithic sites naked wheats of the tetraploid durum-turgidum-type have been found, the Bronze age people cultivated hexaploid forms of the Triticum aestivum s.l. Finds of excrements and fodder show, that livestock must have been an economic basis of the people at the end of Neolithic time. The specialization on particular plant-products and the intensification of stock farming caused changes in the vegetation and in the ecological system. About 2500 BC cal open land species like plants from meadows, pastures and fallows just as plants growing on pathways increased considerably.

New Archaeobotanical Evidence from the Bulgarian Neolithic

Elena Marinova, Bulgaria

Four Bulgarian Neolithic sites Kovačevo, Slatina, Kapitan Dimitrievo, Karanovo has been investigated. The plant remains were recovered by manual flotation from layers of the Early and the Late Neolithic. The period covers the time span from 5930-5880 to 5450-5200 cal BC

The archaeobotanical material corresponds to the Early Neolithic crop assemblage from the Near East. The main cereal crops were *Triticum monococcum* and *T. dicoccum*. It seems that, at least during the Neolithic, they were sown together. The storages of barley indicate that it was separately cultivated from the wheats. The pulses preserved in the layers and found as storages are *Lens culinaris*, *Pisum sativum*, *Vicia ervilia* and *Lathyrus staivus cicera*.

Kapitan Dimitrievo (Early Neolithic) and Karanovo (Late Neolithic) contained rich storages of wheats and legumes. Some of the cereal storages were found as ears together with leaves and steams. Maybe they represent sheaves, which were destroyed during fire. Apart from the well known weeds from the Bulgarian Neolithic: *Polygonum convolvulus*, *Galium* sp. and *Bromus* sp., in this storages other wild plant species were found e.g. *Ajuga chamaepitys* , *Avena* sp., *Coronilla* sp. *Fumaria* sp., *Teucrium chamaedrys*, etc. These finds rise questions about the methods of harvesting, storing and perhaps the sowing times. Species such as *Ajuga chamaepitis*, *Coronilla* sp. and *Teucrium chamaedrys* occur today in not very well tilled fields, rich in carbonates. Together with *Fumaria* they are indicators for cutting of the straw rather low to the ground.

The rachis segments of naked wheats found in three of the sites indicate that at least some of the naked wheats from the Bulgarian Neolithic were hexaploid.

Several plants species which are new for the Bulgarian Neolithic were recovered. This are *Cicer arietinum*, *Pistatia* cf. *terebinthus* in the Early Neolithic and *Coriandrum sativum* in the Late Neolithic of Kapitan Dimitrievo (South Bulgaria).

The Cereal Assemblage from Neolithic Çatalhöyük (Turkey)

Danièle Martinoli
Seminar für Ur- und Frühgeschichte
Archäobiologie, Labor für Archäobotanik
Schönbeinstrasse 6
CH-4056 Basel
dmartinoli@arso.org

Since 1993 an international and multidisciplinary team has been carrying out new excavations and research at the neolithic mound of Çatalhöyük (c. 7500 to 5500 Cal BC), central Anatolia (known as the Çatalhöyük Research Project, director Prof. I. Hodder).
The palaeoethnobotany is well integrated in the research project and systematic and large-scale flotation procedures have been applied to all excavated structures. This resulted in the recovery of a great amount of plant remains.

This poster focuses on the cereals recovered in a selection of early and late samples from the South part of the site. It is the first specific morphological study of the cereals from Çatalhöyük. The aims of this preliminary study are:

- To assess the identification of the different cereal species present by complete morphological description.
- To present the range of cereals present on-site.
- To detect chronological trends in cereal morphology.

For more information about the Çatalhöyük Research Project and the palaethnobotany of the site, see http://catal.arch.cam.ac.uk/catal/catal.html

Dr. Olivier Mermod
Geobotanisches Institut ETH Zürich
ARCHAEOBOTANIK
Zürichbergstr. 38 CH 8044 Zürich
T 01 632 74 54 F 01 632 12 15
e-mail mermod@geobot.umnw.ethz.ch
http://www.geobot.umnw.ethz.ch

Zürich, 11 Mai 2001

The Neolithic settlement of Saint-Blaise/Bains des Dames NE (Switzerland):

Gathering and cultivation

In this paper archaeobotanical material from the two successive villages of the lakeshore sites of Saint-Blaise, namely Lüscherz (2700-2670 BC) and Auvernier cordé (2640-2450 BC) are investigated.

The aim of the study is to compare the amount, distribution and importance of the cultivated and gathered plants in the two villages.

Both detailed (down to 0.2mm fraction) and less detailed samples (5mm fraction and bigger) were analysed. For the Auvernier cordé we studied 50 samples in detail (48'000 remains) and 489 samples less in detail (22'000 remains). For the Lüscherz we examined 29 samples in detail (12'000 remains) and 234 less in detail (17'000 remains).

For the Auvernier village barley *(Hordeum vulgare)* is the most important cereal, while in the Lüscherz village hulled wheat (*Triticum dicoccon* and *Triticum monococcum*) are better represented. Among the non-cereals for both villages, flax *(Linum usitatissimum)* was frequent whereas opium poppy *(Papaver somniferum)* was of less importance.

Gathering wild fruits, berries and nuts was an important addition to the human diet. For both villages this is shown in the huge amount of *Prunus spinosa* (more than 15'000 remains each). Berries were represented with a high amount of blackberries *(Rubus fruticosus)* and strawberries *(Fragaria vesca)*. Other fruits, berries and nuts were of less importance.

The results of the cultivated and the gathered plant remains suggest that gathering was more important than cultivating. However, if we consider the remarkable quantity of crop weeds found in both villages (species and individuals), cultivation seems to be much more important than shown by the amount of cultivated plants.

Planting the seed of Rome

Laura Motta
University of Cambridge

The foundation of Rome has been hotly debated ever since the Renaissance,yet many archaeological aspects of it remain largely unexplored and inparticular the palaeoenvironmental ones. Recent excavations have finally begun to produce relevant evidence and for the first time a wide ranging archaeobotanical reconstruction is possible. The paper will summarize the results of a long term project carried out by the author on charred macroremains from several key sequences in Rome and its broader hinterland dating between the 9th and the 6th centuries BC. This is the period that witnesses major changes in the structure of the settlement, in its social complexity and in its economic processes leading to state formation and urbanization. Building on recent work analyzing the relationship between the emergence of social complexity and crop processing (as seen through the macroremains), the paper will explore possible evidence for structural changes in Roman archaic society. In particular, issues such as the centralization of food storage and processing or the organization of redistribution will be discussed. Works of this kind may well offer a different perspective about the beginnings of Rome, counterbalancing the traditional emphasis on textual evidence and burial analysis.

Mummy wheat and other "miracle" crops: history and legend

Mark Nesbitt

The belief that ancient seeds retain their ability to germinate, and that the resulting plant has extraordinary properties, has been deeply established in European and North American folklore for at least 150 years and remains strong today. Despite the failure of closely-controlled germination trials by agronomists, botanists and archaeologists, stories regarding regenerated ancient seeds appear regularly in the press, and are a frequent topic of enquiry to archaeobotanists from members of the public.

This type of legend is most frequently associated with "mummy wheat", from ancient Egyptian tombs, but occasionally features the "mummy pea". Accounts of mummy wheat become frequent in the gardening press and local newspapers from the 1840s onwards, reflecting the great rise in popular interest in Egyptology at the time. Even then, reports divide firmly into two groups: poorly provenanced seeds that usually germinate and turn out to be *Triticum aestivum* or *T. turgidum* (both absent or extremely rare in ancient Egypt), and well-provenanced grains of barley or emmer wheat, which do not germinate. However, 150 year years of well-grounded debunking has not reduced the popularity of the mummy wheat legend. The name "mummy wheat" is often also applied to "miracle wheat", a form of *T. turgidum* with branched ears that has been known from medieval period. A modern expression of this concept is "Kamut", a landrace of *T.durum* widely marketed as health food with strong hints of its origin in an Egyptian pyramid.

The history of mummy wheat is not simply an excuse to explore some fascinating folk beliefs, but is also relevant to critical assessment of claims, by mainstream archaeologists and archaeobotanists, of germination of ancient seeds in other contexts.

I would be grateful for reports of mummy wheat (or similar mummy crops), particularly from countries or publications that may be unfamiliar to me.

Dr. Carol Palmer

(School of Archaeology and Ancient History, University of Leicester, Leicester, LE1 7RH, UK)

Milk and Cereals: Aspects of Food Processing, Storage and Preparation in Jordan

Until recently milk and cereals were the essential foods of both Bedouin and farmers in Jordan. This poster focuses on milk processing and the production of storable foods involving milk and cereals. The recognition of these activities in the archaeological record is also considered. The processing of milk and production of milk products is traditionally done by women, who usually also 'own' and are able to sell the products of their labour.

Beyond the Valleys: Romanisation of Garamantian Agriculture

Ruth Pelling

The Garamantes lived beyond the southern limits of the Roman Empire and the Libyan province of Tripoilitania which, with its cultivated wadi system (UNESCO's Libyan Valleys), grew rich on supplying agricultural produce to Rome. While the Classical sources tend to equate the limits of the Empire with the limits of civilization, the archaeological evidence tends to disagree. The Garamantes successfully dominated the Fezzan region of Libya for some 1000 years, largely as a result of successful oasis agriculture, and in so doing developed their own diverse and sophisticated civilization. While remaining outside the limits of the Empire however, the Garamantes did adopt some Roman customs, shown most clearly in the burial practices and associated grave goods. This paper attempts to establish the degree, if any, of Roman influence on the agriculture and diet of the region, possibly a truer reflection of 'Romanisation' than the presence of cultural objects. Alternatively, to what extent can the success of agriculture in the pre-desert of Tripolitania be attributed to the Garamantes? The discussion presented is based on the provisional results from the most recent season of field work by the University of Leicester and the Libyan Society as part of the Fezzan Project.

Demonstration Title: Archaeobotany.com: a work in progress

Jennifer Ramsay
Department of Archaeology
Simon Fraser University
Burnaby, B.C., Canada

This demonstration will provide a preliminary look at the work that has been accomplished to date regarding the online searchable database of comparison plant remains, Archaeobotany.com. This site is being developed in order to provide a more accessible comparison collection of plant remains to researchers worldwide. Archaeobotany.com is a work in progress, however, this demonstration will illustrate the usefulness of the project and how it can be employed as a tool in archaeobotanical research. For example, the database contains valuable information including scientific names, common names, important variations, biome, ecology, habitat, seed shape, seed length, fruit set month, probable origins and digital photos of seeds. As well, the site contains a bibliography, related links and a glossary of botanical terms. The web site also aims to encourage participation from the scientific community in general by providing a method that allows for individuals to contribute material from their own collections. Although the scope of this undertaking is immense, it is hoped that future funding will aid in its continuing growth over the next several years.

AGRAR 2000: Danish agrarian landscapes from the birth of Christ to the year 2000. The agrarian economy in prehistoric and early historic times as revealed by archaeobotanical data

David Earle Robinson & Peter Hambro Mikkelsen

The National Museum, Dept. of Environmental Archaeology and Archaeometry, Ny Vestergade 11, DK-1471 Copenhagen K, Denmark

AGRAR 2000[1] is multidisciplinary project which aims at describing and interpreting the development of the Danish agrarian landscape through the last 2000 years. The project focuses on changes in agricultural area, structure and land-use in 9 study areas comprising the catchment areas of lakes from which there are detailed pollen diagrams. The methods employed include landscape archaeology, archaeobotany, quantitative palaeoecology, archive studies, place-name research, landscape ecology and agro-ecology. Pivotal themes in the study are (semi-) quantitative estimates, regional variation and mechanisms of change.

A broad regional picture of the development of the agrarian landscape through time, woodland versus open land, animal husbandry versus arable agriculture, can be gained through a series of well-dated pollen diagrams from lakes and bogs. A more detailed picture at a local level, on the other hand, requires the analysis of plant macrofossils preserved in archaeological contexts. Remains of cultivated plants and their associated weed seed assemblages give information about the range and relative importance of crops cultivated and about agrarian strategies such sowing season, use of manure and crop rotation. Remains of other plant species give information on human exploitation of wild plant resources in the landscape and the interaction between man and the environment.
By linking the results of pollen and plant macrofossil analyses a detailed qualitative and quantitative picture can be gained regarding the development of the agrarian landscape. Archaeobotany's contribution to AGRAR 2000 is at the level of model building on a regional basis; there are too few archaeobotanical finds from the actual lake catchment areas to use these as a basis for interpretation.
To this end, all available archaeobotanical analyses from Southern Scandinavia, both in published form and unpublished archival material, have been collected and collated. New analyses have also been carried out, primarily on plant material preserved in the slag pits of prehistoric iron smelting furnaces and in the remains of pithouses from the Late Iron Age and Viking Age. The former are a primary source of information about the species composition of prehistoric fields and other components of the prehistoric landscape such as heaths, while the latter provide a very detailed picture of the contemporary use of both cultivated and non-cultivated plant resources.
This lecture will deal with the preliminary results of the research, halfway through the project period.

Further information on all aspects of AGRAR 2000 can be obtained from:
http://www.natmus.dk/Agrar2000

[1] In the project period (1998 – 2002) AGRAR 2000 is funded through The Agrarian Landscape in Denmark, a research programme initiated by four Danish Research Councils (Natural Science, Humanities, Agricultural Science and Social Science). Matching funding is provided by the institutes involved.

Burnt Offerings and Sacrifices at Pompeii

Mark Robinson

Archaeological investigations directed by Professors A Wallace-Hadrill and M Fulford for the British School at Rome, aimed to apply modern techniques of area excavation to the study of pre-AD 79 destruction levels at Pompeii. A major programme of sieving and flotation was undertaken on excavations of the House of *Amarantus* (I.9. 11-12). In addition to the usual finds of charred plant remains representing crop-processing or food waste and mineralised seeds from sewage, numerous small burnt offerings were found in the gardens of the house.

Fruit of *Ficus carica* (fig), cones and nuts of *Pinus pinea* (stone pine) and fruit of *Vitis vinifera* (grape) were particularly common in these cremations but other food plants, including *Phoenix dactylifera* (date), *Corylus avellana* (hazelnut) and *Juglans regia* (walnut) were also present. Non-food plant remains include cone scales of *Cupressus sempervirens* (cypress). There is some change in the plants in the burnt offerings with time and curiously, *Olea europaea* (olive) was hardly ever used even though it is well-represented in other deposits of Roman date on the site. Some of the cremations contain burnt bone, particularly of pig and cockerel. The cockerels were represented by heads and feet, the remainder of the birds presumably being used in the kitchen.

The fruits and pine cones of the cremations are depicted in wall paintings at shrines to the *lares* (household gods), where they are shown as offerings on altars, about to be consumed by sacred snakes. The discoveries thus enable the artistic representation of ritual to be related to finds in the ground.

The burnt offerings have two other important implications. Firstly they resulted in the preservation by charring of fruit etc that are not usually burnt during their processing for consumption. Secondly, reworked charred material from the cremations probably comprised major components of many of the other charred assemblages from the site and this needs to be considered when the full interpretation is made of the charred remains from the site.

These studies are currently being extended to the excavations of the Deutsches Archäologisches Institut Rom in the garden of the House of the *Postumii* (VIII 4, 4.49).

An experimental approach to Neolithic shifting cultivation

Manfred Rösch, Landesdenkmalamt Baden-Württemberg, Fischersteig 9, D-78343 Hemmenhofen, e-mail: roesch.manfred@t-online.de

Archaeological and especially botanical proxi-data from the northern Pre-alpine lake-shore dwellings and their environment gave rise to suggest shifting cultivation with slash-and-burn as common way of land use for the Late Neolithic period from 6300 to 5500 cal B.P.. To test this hypothesis we started with slash-and-burn experiments in southwestern Germany in 1994; at first in the area of the Hohenloher Freilandmuseum Schwäbisch Hall-Wackershofen, later in a forested area of about 10 acres in the vicinity of the town Forchtenberg on the river Kocher, that the forest department of the state of Baden-Württemberg put at our disposal for a period of 20 years. It is a mixed deciduous forest (Stellario-Carpinetum) of high biodiversity in a light loamy soil. The area had been forested continuously for at least more than two centuries. Every year we remove the forest canopy in plots of 30 x 30 m, burn the ground using the dry wood of the felled trees as fuel and grow cereals such as club wheat, emmer and barley. We are allowed to use fire, to graze cattle and to practise all possible methods of forest usage and of removing the forest canopy. Most of the arable fields become fallow after one growing period to initiate a succession back to forest. With a few small plots we continue growing to study the long-term development of soils, vegetation and yields of a permanent arable field without fertilizers and fallow phases. We observe the following sets of data: local meteorological data, aerosol precipitation, state and development of soils, vegetation and fauna, using physical, chemical and biological methods, ergonomic data and yields working with Neolithic farming practices. Members of the work group include specialists from the Landesdenkmalamt and the forest department of Baden-Württemberg, the Max-Planck-Institut of fire ecology Freiburg and from the Universities of Freiburg, Hohenheim and Würzburg (departments of Biology, Agriculture, Geography and Archaeology). The project ist still going on, and as yet we have only preliminary results. Some of the most striking are:

- the first yields after forest clearing are between 3000 up to more than 4000 kg of grains per ha
- very few weeds are in the fields, the yield is more or less free from them
- the weeds are not typical arable weeds but plants of forest, forest corners and clearings
- continuation of cereal growing in a second or further years is difficult because of strong weed development especially of *Cirsium arvense*, *vulgare* and *palustre*, of *Deschampsia caespitosa*, and *Rubus fruticosus*: Burning needs fuel not available at the site, but removing the weeds by hand is very hard
- first attempts of allowing goats to graze has resulted in a more or less complete removal of *Rubus* and other shrubs
- effective burning needs the threefold quantity of branches and twigs than grow at the burned area itself
- even on strongly burned areas felled trees regenerate from tree-stumps after some time, as well as herbs and even mosses
- even in the centre or at the corner of the fields the cereal pollen precipitation is less than 0.5%

Crops storing at Arslantepe (Malatya, Turkey) during the Early Bronze Age

Maria Follieri, Laura Sadori

The excavation of Arslantepe (Malatya) in the Upper Euphrates valley (Turkey) is an important archaeological enterprise in which archaeologists have paid particular care in recovering plant remains. The recovery of the burnt layers is complete, and hundreds of kilograms of material have been processed by dry sieving till 0.5 mm. Extensive excavation of the hill has brought to light large areas of overlapping layers of the fourth and third millennium (from Late Calcolithic to the end of Early Bronze Age) indicating a deep change in the history of the region which gravitated around the "mesopotamic world" till the beginning of third millennium, and later on privileged relations with the north-eastern area of Anatolia.

Charred wood and carpological remains (tens of kilos) coming from fire levels, found in the several archaeological fire strata of Late Calcolithic and Early Bronze Age, constitutes an *unicum* from a botanical point of view. In fact the huge quantity of food plants coming from the archaeological levels will contribute to the setting of a macroremains database for plant crops. The charred wood (both big pieces and small fragments) are from structural elements and hearths.

Fires mark each archaeological stratum, providing a lot of material to study. The digging of the site is still in progress, and up to now the levels of the Late Calcolithic settlements (period VII) resulted rich mainly in charcoals, while the protourban centre of the Early Bronze Age (VI A) with its monumental public and religious buildings provided both charcoals and carpological remains found in storerooms, temples, public rooms and other structures; in this phase the highest civilization of the site is found. In particular the recovery of some *Vitis* pips in this level, radiocarbon dated at the end of fourth millennium (Late Uruk) is noteworthy, but also tens of caryopses of *Triticum dicoccum*, *T. monococcum*, *T. aestivum/durum*, and seeds of *Vicia ervilia*, *Lens* cf. *culinaris*, have been found.

A radical change with respect to the immediately previous period in either the type of structure or the ceramic production, is found in VI B1, always during the Early Bronze Age, when the population lived in small huts.

Another change is found at the beginning of the period VI B2, during the third millennium, when the dwelling structure was a village with small habitations completely burnt when the inhabitants had just stored edible legumes, cereals, and grapes. From this archaeological layer, charred woods and tens of thousands of seeds and fruits have been recovered.

A lot of seeds and fruits were recovered also from VI D stratum, still belonging to the Early Bronze Age, and the big quantity of caryopses and legumes made necessary the establishing of subsampling criteria.

The palaeoethnobotanical analyses have not yet been completed, also because the excavation is still in progress and new material to study becomes available every year. We are still far from having a complete picture of the different maintenance strategies and of the different food storage methods of the various populations at the same site through centuries. The work carried out till now indicates that to each population change corresponds a different land use.

The first aim to achieve in the study of plant remains from Arslantepe is the completion of the data set keeping on with subsampling, counting and measuring seeds and fruits to contribute to the knowledge on cultivation and domestication of food plants of the Near East and of the whole Ancient World.

Invaders, seagoers or previously invisible: the Neolithic economy in Crete appears fully-fledged in 9000 B.P.

Anaya Sarpaki.

Crete is considered to have been one of the islands which seems to have received a fully fledged Neolithic economy very early in the Aceramic period (c. 9000 B.P.) and due to the fact that no prior undisputable habitation of the island has been detected –at least not on a permanent basis- the Neolithic economy is believed to have been introduced.

The archaeobotanical remains of the 1997 rescue excavations will be presented, together with Hans Helbaek's unpublished report of the excavations conducted by J.Evans in the late 1950's. The results of the study of the first settled site of Crete demonstrate an economic maturity unexpected for such an early site. This will be discussed in terms of the Aceramic/Early Neolithic in the rest of Greece and also in conjunction with Crete's neighbours in the east.

INSTITUT DER
KOMMISSION FÜR ARCHÄOLOGISCHE LANDESFORSCHUNG IN HESSEN E.V

The Archaeobotanic Database of the KAL

Eva Schäfer, Wiesbaden

A database was developed (based on access) in order to facilitate the evaluation of the large amounts of botanical and archaeological data, which result from our work in the archaeobotanic department of the KAL. The essential features of the database are presented.

1. Input: We record data on several independent working-places and then add the projects to the central database. In order to minimize input-errors, most archaeological, geological and botanical terms are predefined. During data-input they are available in scroll-down menues. For the identification of taxa we use a system of plant-codes, which we owe to S. Jacomet and her workgroup at the University of Basel. Data exchange with other workgroups is possible, as long as the same plant-codes are used.

2. Evaluation: We have a number of preprogrammed queries, which are used for control and as a base for more detailed queries. Some other queries were designed for routine evaluations, which are made for each archaeological site. They result in diagrams, which give us a general survey of the identified plant-remains.

3. Attributes of the taxa: For the purpose of botanical evaluation a domain of the database is concerned with informations about plant-species. At the moment we have ca 50 parameters which characterize each taxon in terms of ecology, sociology, growth, utilization and others. They can be used in queries in combination with every other defined term.

The basic program is free available. In case of interest please contact A. Kreuz or E. Schäfer.

Concept: A. Kreuz **Program:** H. Fuhrmann **Assistance:** N. Boenke and E. Schäfer

Lessons from Ancient Wheat DNA

Angela Schlumbaum, Robert Blatter, Stefanie Jacomet

Seminar für Ur- und Frühgeschichte, Archäobotanik c/o Botanisches Institut, Schönbeinstr. 6, CH 4056 Basel, Switzerland

The evolution and history of wheat is complex and partly unresolved e.g. in the case of the hexaploid wheat. The use of ancient DNA from archaeological and historical sites appears intriguing to test theories deduced from archaeobiological research or modern genetics.

The talk will summarize our data from charred, desiccated and modern wheats related to the history of hulled spelt (*T. spelta* L.) in Switzerland. Spelt can emerge from a cross of emmer (genomes A/B) with *Aegilops squarrosa* (genome D) in Asia only, or from a cross of emmer with bread wheat, in Asia as well as in Europe, depending on both parents growing in the same area at the same time.

In two Neolithic charred naked wheat samples from Switzerland the detection of *D* genome suggests the presence of hexaploid *T. aestivum*. We also found glutenin genes on the B genome which are similar but not identical to the most commonly found glutenin genes in polyploid wheat such as emmer and bread wheat.

In contrast in one desiccated historical and one modern landrace of spelt the B genome glutenin genes belong to a different lineage, very different to bread wheats and most similar to those detected in a minority of emmer wheats (Brown 1999). At least those two spelts do therefore not derive from the same ancestor as the bread wheat so far analyzed in Europe. This result suggests the possibility of several hybridization events or an independent origin of spelt in Europe. Both scenarios could take place anywhere and anytime but at least 300 years ago.

Unfortunately we have little evidence for the presence of authentic single copy DNA in charred wheat, which prevents to study this interesting conclusions directly so far. We therefore continued with modern spelt accessions.

On the other hand DNA analysis from desiccated plant remains are more reliable. In principle the choice of methods allows to detect single copy genes, genes occurring in multiple copies or several plant species together.

Brown, T. A. (1999). "How ancient DNA may help in understanding the origin and spread of agriculture." Philosophical Transactions of the Royal Society of London B **354**(1379): 89-98.

Plant Images in Late Medieval Art from Central Europe

By Ülle Sillasoo

I will introduce examples of religious art as a source for archaeobotanical investigation. In late medieval religious art, plant images are frequently shown not only in a realistic way, so that they can be recognized, but they are also represented in contexts which indicate their involvement in devotional and/or daily life. Art historians have indicated some reasons for the occurrence of plants in religious images, for example, that these plants used to be anywhere in the artist's work, as justification for certain conditions or characteristics of the landscape, and the material reality of the landscape. However, I would like demonstrate that there are more aspects of showing plants in paintings, and that in addition to the outdoor space, indoor space can be considered. These images are a materialization of both written, spoken and non-spoken word in the form of text, folklore and performance. Plant images verbalized, for example, in the *Bible* and in the *Golden Legend*, are made visual in the paintings according to the material world of the particular reality; they are shown in vases, as potted plants, in hands, lying on the ground, in nature and in the garden. The image does not always have a direct link to reality; the reality is translated within the limits of the cultural background, experience of and nearness to authors, patrons and beholders. I will stress that paelaeoethnobotany necessarily has to consider the use of plants not only for life preserving purposes, but also in their spiritual context and in ritual life.

The Reticulate Cell Pattern Project: Preliminary Results

Wendy Smith
English Heritage Research Fellow
Department of Archaeology, University of Southampton, Highfield, Southampton, SO17 1BJ, UK

This poster presents early results from a pilot project currently underway at the English Heritage Centre for Archaeology. At present, morphologically similar seeds with reticulate cell patterns (a net-like cell pattern, often comprised of irregularly shaped, angular cells) are rarely separated by archaeobotanists. A pilot study was developed to focus on taxa with three different types of reticulate cell patterns, which currently cannot be successfully distinguished by archaeobotanists using standard, low-power microscopy. Individual cells that form a reticulate cell pattern vary in size, from cell patterns that are visible to the naked eye to cell patterns that can only be detected through high-power microscopy.

This pilot study focuses on three examples:

1) separation of blackberry (*Rubus fruticosus* agg.) from raspberry (*Rubus idaeus* L.) (cell pattern visible to naked eye)[i]
2) separation of cultivated from wild species of *Brassica* and *Sinapis* (cell pattern visible with low-power microscopy)[ii]
3) separation of black mulberry (*Morus nigra* L) from white mulberry (*Morus alba* L.) (cell pattern only visible using high-power microscopy)[iii]

The cell pattern on seeds of these taxa was studied using scanning electron microscopy. Early results suggest that the density of individual cells and/or their microstructure appear to form reliable criteria to successfully separate otherwise morphologically similar taxa.

---

[i] The overlap between length and height ratios for *Rubus idaeus* L. (raspberry) and *Rubus fruticosus* (blackberry) is presented in G. Jørgensen and B. Fredskild. 1978. Plant Remains from the TRB Culture, Period MN V, pp. 189-192, in *The Final TRB Culture in Denmark* (K. Davidson ed.), Copenhagen: Akademisk Forlag.

[ii] Previous work on *Brassica* identifications has been published by Pearson, E. and Robinson, M. 1994. Environmental evidence from the villa, in *Bancroft: The Late Bronze Age and Iron Age Settlements and Roman Temple-Mausoleum and Roman Villa. Volume II: Finds and Environmental Evidence* (R. J. Williams and R. J. Zeepvat eds.), The Buckinghamshire Archaeological Society Monograph, 7, 565, 567, 574, 578. Aylesbury: The Buckinghamshire Archaeological Society.

[iii] Previous work on *Morus* identifications was presented in an unpublished poster at the Innsbruck IWGP (1995) by Anaya Sarpaki..

Subsistence as a way of thinking - Whom were Europe first farmers?

Chris Stevens - University of Cambridge

The adoption/transmission of agriculture across Europe marks the starting point from which all later societies across Europe emerged. The nature of this transition is often poorly understood, whether plants spread through migrations of peoples, adoption by local societies or through the union of cultivators and hunter-foragers. The vision of the Neolithic farming spread that started our interest in transitions still has very much as the colonist pioneer approach to lose. Did peoples whom we would recognise and call themselves farmers initially transmit agriculture?

The transition to farming was as much a transition towards a new way of thinking embracing new ideologies as the adoption of new subsistence strategies. The changes no doubt had profound effects on the organisation of social interaction and subsistence activities, a transition of cognition and knowledge, as well as to using the tools of the trade, tillage implements, seed-grain and sickles. The ways in which this transition varied across Europe may potentially reveal much about differences in the ways in which societies were organised and their subsequent development.

The paper presents a theoretical model based on the spatial and temporal distribution of production and consumption activities and the social context in which they are conducted. Essential to this model is a change in Halstead and O'Shea's strategies to deal with occasional uncertainty (mobility, diversity, storage, exchange) to their becoming an integral part daily subsistence. The paper argues that when compiled the archaeological and archaeobotanical evidence shows the initial transition to the cultivation of domesticated resources to incorporate very Mesolithic ways of thinking. The farmer as a independent production unit and specialist cultivator and the farmstead as a nucleated fixed place of subsistence it is argued is only seen in a very general way within the Bronze Age. The transition to this extreme state it is argued is highly variable, perhaps only being reached in the Iron Age, by some societies across Europe

Miletus: first archaeobotanical results from this long-lasting Greek town on the Aegean coast of western Anatolia

Hans-Peter Stika, c/o Institut für Botanik, Universität Hohenheim -210-, D-70593 Stuttgart
e-mail: stika@uni-hohenheim.de

Miletus was one of the most important ancient Greek towns especially in the Archaic period of the eastern Mediterranean antiquity. It was situated at the gulf of Latmos in a natural harbour at the western Anatolian coast of the present-day Turkey, where the river "Büyük Menderes" flows into the Aegean Sea. The location had been favourable to trade till the gulf of Latmos was completely sedimentated in Roman/Late Antique Period so that the harbour could not be used any longer. In the area of the old antique town of Miletus several excavations have been going on for decades (the celebration of 100 years of German excavations in Miletus took place in 1999). Archaeobotanical work in Miletus started in 1992. Owing to new archaeological investigations at the area of Athena Temple, the first trade-based settlement has developed in the Late Chalcolithic Period (2nd half of the 4th millennium B.C.) and was followed by Early Bronze Age (3rd millennium) and Middle Bronze Age (early 2nd millennium) settlements, the latter with some Minoan influence on the resident Anatolian population. In the period of 1700 - 1500 B.C. there is an increasing Minoan influence and the whole cultural spectrum has developed. Upon a destruction layer a Mycenean period followed from the second half of 15th till first half of 11th century B.C. showing Hethite influence in the 12th century. Archaic and Hellenistic layers from the Kalabaktepe and Zeytintepe were investigated and from all sites the Roman Period/Late Antique could be sampled.

The archaeobotanical research yielded a long list of cultural plants. Most remains derived from *Ficus carica* followed by *Olea europaea* and *Vitis vinifera* in numbers of finds. Other fruit trees determinated as macroremains are *Punica granatum* and *Amygdalus communis*. The cereals are represented by *Hordeum vulgare* and the wheats *Triticum monococcum*, *T. dicoccum* and *T. boeticum*. Few hints indicate the presence of *Triticum spelta*, *T. aestivum/durum/turgidum*, *Panicum miliaceum* and *Avena*. The pulses *Lens culinaris*, *Pisum sativum*, *Vicia faba*, *Vicia ervilia* and *Lathyrus sativus* were found. A total of c. 500 samples were taken from the different sites and periods in Miletus, a part of it has been worked out yet. The archaeobotanical investigations aim at a description of the agriculture related to different periods and a reconstruction of its further advance in the course of time.

The medicinal and culinary use of the cabbage, onion, garlic and leek in the Bohemian Region during the 15th and 16th century

D. Stružková and M. Beranová
Department of Spatial Archaeology, Institute of Archaeology of the Czech Academy of Sciences, Letenská 4, CZ 110 00 Prague 1, Czech Republic, email: dana.struzkova@atlas.cz, beranova@arup.cas.cz

Vegetables played as important a role in Prehistory, Antiquity and the Middle Ages as they do today. Although archaeobotanical finds are rare, there are written sources of relevance, and it is true that these are sometimes rather humorous. This contribution considers the application of cabbage (f. *Brassicaceae*), onion, garlic and leek (*Liliaceae*). Uses in the kitchen and in medicine are described; sources include contemporary medical texts (Kopp 1535, Huber 1587 etc.), herbariums with descriptions of plants and their use in health care (Matthioli 1562 & 1596, Černý 1517), and cookery books. The period of the 15th-16th centuries was chosen for the closer characterisation of the named genera in Bohemia, and the knowledge of the time is compared to modern medical opinion regarding selected plants. The cultivation and preparation of cabbage (*Brassica oleracea* L.) is long-lived. Cabbage is divided into several kinds, including kail, which was not always differentiated. According to Matthioli cabbage makes a smooth abdomen, but if boiled for a long time on the contrary makes the abdomen hard. Boiled twice, it helps to improve the eyesight and protect against quaking limbs. Doctor Kopp of Raumental, who wrote translating Krabice of Weitmile, claimed that cabbage soup cleans the belly, but that cabbage alone hardens it. For the stomach, eyes and teeth it is bad, and hurts the womb. To avoid these effects, it is important to boil, wash well, and then re-boil the cabbage in a beefy soup with pork and caraway, and let it seethe. According to Černý it causes abusive blood, bloat and body pains, but applied to the body can heal wounds. Above all, cabbage was very often consumed in Bohemia at this time, for instance boiled, soused, eaten with sugar, butter, cream etc. Today cabbage is known as a good preventative against cancer of the colon, and contains a good amount of vitamin C and some vitamin A. Onion (*Allium cepa* L.) was a very important accompaniment to meat. According to Matthioli, onion with honey causes the gout but mixed with honey, vinegar and salt can treat the bites of mad dogs. The application of cow dung with onion isolates water from the belly, and after onions dreams may be dire! One author, Černý, distinguishes between two types of onion: the forest and domestic varieties. Kopp claims that onion is good only when boiled with meat, not raw; he is also rabid about onion, because *"we Czechs can eat nearly no food without it – its fumes in the head rise, and thus those who eat it frequently usually fall into fantasy!"* Today, medicine sees onion as a vermifuge, diuretic, and antiseptic that lowers blood pressure, stabilises blood sugar, reduces cholesterol etc. Garlic (*Allium sativum* L.) was found by Bohemian doctors to have both good and bad characteristics. Matthioli says that it is more medicament than food, and that those wishing to eat it should grind it with almond to make it more endurable. It is very bad for hot-blooded people, causing them headaches and ear problems, and hurting their kidneys. Generally, however, garlic is very good preventative, driving away all virulence! Peasants and labourers were said to be preserved by it against all sickness after the drinking of any water, even if it was stagnant they could correct all with garlic. A garlic was added into salads, spinach and soups. In modern medicine, garlic is held to lower cholesterol and blood pressure, is an anti-microbial, a diaphoretic, a cholagogue etc. Matthioli says of leek (*Allium porrum* L.) that it was consumed less in Bohemia that in Italy. This vegetable can heat the body, swells the belly, causes horrible dreams and softens the vision, but against hardness and closing of the womb it is excellent to cook green leek tops in salty water with vinegar, and then allow the woman to sit or wash herself with this liquid. Leek roasted in ash helps against mushroom poisoning and inebriation. According to Černý it harms the eyesight, invites headaches, and can root out the wart. Today, medicine accounts leek to contain more proteins and vitamin B1 than onion, and in addition to contain vitamin C, PP and carotene. At this time, Prague was important centre for the promotion of culture and education (Charles University, Central Europe's oldest, having been founded in 1348) and of medicine (the first dissection in Prague took place in 1600), therefore, the accomplishments and knowledge of the scholars named can be taken as valid across Europe.

Collecting and cultivating in ancient Baluchistan (Pakistan)

The archaeobotanical evidence from Shahi Tump and Miri Qalat

Margareta Tengberg

CNRS-UMR 7041 - Archéologies Environnementales,
Maison de l'archéologie et de l'ethnologie, 21 allée de l'Université, F-92023 Nanterre cedex

Abstract

A few years ago an archaeobotanical project was initiated within the French Archaeological Mission to Makran (south-western Baluchistan), directed by Dr Roland Besenval. This project includes the analysis of charcoal and seed material from two archaeological sites, Miri Qalat and Shahi Tump, situated in the Kech Valley and dated to the protohistoric period (*c.* 4000-2000 BC). The region offers rich possibilities to observe traditional agriculture and plant use, and the collection of ethnobotanical data is also part of the ongoing project.

In southern Baluchistan, one of the hottest and most arid regions in the world, human settlement, both past and present, is restricted to the alluvial valleys where the presence of water, arable soils and a wider array of floral and faunal resources makes subsistence possible. The aim of this paper is to show how the ancient populations managed to make the most out of the possibilities offered by their environment, either by cultivation of cereals, pulses and other crops, or by gathering wild plant resources such as fruits and wood. The paper also addresses the question of to what extent these activities, over several millennia, might have had an impact on the surrounding vegetation cover.

MACROFOSSIL ANALYSIS AS A METHOD IN ARCHAEOLOGY:
The Research at the Mountain of Aaron, Petra, Jordan

Tanja Tenhunen

Department of Archaeology
Unioninkatu 38 E
FIN-00014 Helsinki University
Helsinki, Finland
ttenhune@hotmail.com

The Finnish Jabal Harûn Project (FJHP), sponsored by the Academy of Finland and the University of Helsinki, is a comprehesive, archaeological project which investigates past human occupation at the Mountain of Aaron (Jabal Harûn) near Petra, Jordan. The project conducts excavations of the Byzantine (5th-8th century A.D.) monastic/pilgrimage center dedicated to St. Aaron. Simultaneously, the FJHP survey in the environs of the mountain documents extensive agricultural and water conservation installations dated to the Nabataean (ca. 1st century A.D.) and Byzantine periods. Macrofossil analysis is an integral part of the interdisciplinary research carried out by the FJHP, helping to document ancient patterns of dietary practices, and the past environmental changes. On-site collaboration between archaeologists and the palaeothnobotanist, herself a trained archaeologist, is particularly emphasized. All strata at the site are systematically sampled, and their interpretation results from the combination of archaeological data and the macrofossil analysis. As such the macrofossil samples are also treated as archaeological artifacts which help to determine the nature of occupational and depositional processes at the site, and which ultimately contribute in the reconstruction of culture history of the site. The poster introduces the FJHP, its site, work, and preliminary results, and it illustrates the cooperation between archaeologists and the palaeoethnobotanist.

Vienna is different: garbage disposal in the medieval town

Ursula Thanheiser

In a rescue excavation in central Vienna the medieval town wall, a tower and the moat have been discovered. The tower was part of Vienna´s first big defences, built with the ransom money for the English King Richard the? Lionheart. Construction works of wall and tower were commenced towards the end of the 12th century and were completed in the middle of the 13th century. As a secondary use of the tower, the brethren of the nearby Augustiner monastery have used the building as latrine for about 200 years.

For the first time in Vienna a latrine was discovered, excavated and its contents examined. So far no other archaeological evidence of conventional latrines in the houses of burghers have been found. A different method of the disposal of night-soil – possibly temporary in suitable receptacles and subsequent removal and deposition in a central area – would appear plausible.

Food (?) remains from two bronze-age sites in Macedonia, Greece.

Soultana Valamoti

Recent archaeobotanical investigations at neolithic and bronze age sites in northern Greece have yielded numerous charred plant remains consisting primarily of seeds and chaff. Finds of products processed beyond the stage of hand cleaning have, however, been lacking. The recent study of charred plant remains from Archondiko and Mesimeriani Toumba, two sites in the region of Macedonia in northern Greece, may represent the remains of some form of food. A concentration of fragmented cereal grains has been identified at each site with indications that the fragmentation occurred prior to charring. The two concentrations originated in the destruction debris of burnt houses but are derived from different contexts and have morphological differences. A set of charring experiments of various types of fragmented, processed, durum grain (bulgur, taboule, semolina), as well as unprocessed einkorn grain, aims to investigate the effects of processing and charring conditions to the morphology of fragmented grains. The results of these experiments are used to interpret the nature of the archaeobotanical finds.

Both finds are dated to the last part of the Early Bronze Age (2100-1900 B.C.) and represent the earliest remains of processed cereals known from prehistoric northern Greece. Although they could represent food or fodder, the contexts where they have been found may suggest that they were intended for food. The occurrence of 'ground' grain in bronze-age contexts may be fortuitous or may be related to a general tendency for the consumption of processed cereal food during this period, attested from studies of sceletal remains from the region.

The embalming of the ancestors of the dutch royal Nassau family

Henk van Haaster & Caroline Vermeeren (BIAX *Consult*)

During the restoration of the main church in Breda, the city archaeologists G. van den Eynde and F. de Roode, rediscovered the tomb with remains of the ancestors of the dutch royal family.

With special permission from the Queen, research was carried out before the reburial of the remains. Apart from the archaeologists the research team consisted of osteologist G. Maat (Barge's Anthropologica), dendrochronologist E. Jansma (RING) and the archaeobotanists H. van Haaster and C. Vermeeren (BIAX *Consult*). Some subsampled insects were identified by T. Hakbijl.

The combination of historical, osteological and dendrochronological data provided names and dates for 7 of the 8 embalmed bodies. The tomb was used between 1475 and 1526.

Archaeobotanical results could be compared with a recipe for embalming from the same period, written down by the court physician P. van Foreest of king Willem van Oranje Nassau (William of Orange).

Strikingly many macroremains were found where mainly pollen were expected. This could mean the bodies may have been resting on a bed of herbs and spices, but it can also be due to the lack of skill of the embalmers, as the results of the osteologist seemed to suggest.

At least a part of the macroremains was imported from the mediteranean and/or subtropical regions, but some might have been locally cultivated. A complete list of the archaeobotanical finds will be available at the conference.

Monitoring the quality of botanical remains in wetland sites, in a non-destructive way.

Tamara Vernimmen, Spearhead Program *"Wetlands All The Way Down"*
National Service for Archaeological Heritage (ROB), Dept. of Archaeobotany
Amersfoort, The Netherlands

This research was carried out as part of a regional study within the PLANARCH project, which is a research of the possibilities for a better management and the long-term conservation of archaeological sites and also of the cultural landscapes in which they are situated. Subject of this archaeobotanical study are a selected sample of eighteen findspots from several archaeological periods on the former isles of Voorne and Putten, southwest of Rotterdam, province of South Holland, The Netherlands. The idea is that, in the case of these (former) wetland sites, the poor condition or even absence of uncarbonised botanical remains, is a clear indication that the sites as a whole have started to deteriorate. As most of these sites are of high archaeological value (some are even scheduled monuments), and because the archaeobotanical "monitoring" ideally has to be repeated every five or ten years, the botanical sampling had to be done in a non- or less destructive way, i.e. by auger survey. The samples were analysed both in a quantitative and a qualitative manner. To be able to make reliable judgements of the preservation of the samples, it is necessary to work together with specialists from other fields, like soil science, because information on things like groundwatertables, level of oxidation/reduction, percentage of organical/non-organical matter and oxygen content of the groundwater has proven to be very important. One of the results of the analysis is the finding of clear differences in preservation of botanical samples from the same site. There appears to be an important relation between the current groundwatertable and the conservation of uncarbonised botanical remains, but certain formation processes, that sometimes occurred long ago, are equally important. With the results of this study and of other monitoring programmes elsewhere it should also be possible to make some predictive model on which quality to expect in certain botanical samples (without having to dig and analyse first), that can be used by archaeologists. Why? Because different preservational conditions offer different possibilities for the reconstruction of food economics and the natural environment.

Historical and archaeobotanical evidence for plant food consumption in late Medieval and early Modern Lüneburg (Lower Saxony, Germany) – a comparison of the sources

Dr. Julian Wiethold, Institut der Kommission für Archäologische Landesforschung in Hessen,
Schloss Biebrich, Ostflügel,
D-65203 Wiesbaden, Germany

During the 15th and 16th century AD Lüneburg was a rich and wealthy town situated near the banks of river Ilmenau. Salt production and salt trade favoured the development of the town to one of the most important trading centres in northern Germany. It was ruled by a class of rich patricians, owners of salt production sites and wealthy merchants.

During the last ten years urban archaeology in Lüneburg developed. Excavations and rescue interventions gave evidence of urban settlement structures dated to the 15th to 17th century AD. Deep latrines and cesspits are the most interesting structures, being in the focus of interdisciplinary archaeological research. Several excavations of latrines provided rich and extraordinarily well preserved plant remains as well as various other objects of daily life.
Archaeobotanical research focused on cesspits from different town quarters and houses belonging to town inhabitants of different social status. First results show a high frequency of exotic and Mediterranean imports like *Piper nigrum*, *Elettaria cardamomum*, *Aframomum melegueta* and *Oryza sativa* in cesspits of patrician buildings while these taxa are scarcer or missing in other latrines.

The aim of an interdisciplinary research project set up by the town archaeologist is to study the various groups of archaeological objects (e.g. ceramics, glass, bones, plant remains) and to contribute to a social interpretation of archaeological and historical data. Written sources like tax lists, trading and storage books give detailed evidence of long-distance trade and the import of various plant foods. Additionally, the historical record from Lüneburg contains a complete inventory of a pharmacy. The pharmacy was bought by the town council in 1475. This extraordinary record provides additional information concerning the availability and the use of exotic plants. A wide range of medical preparations offered by the pharmacy contained seeds, fruits, leaves, roots, alcoholic and non-alcoholic extracts. Sweet preparations of a mixture of spices and other medical components are the so-called "Latwergen".

Generally, studies of early modern plant remains from urban contexts should be based on the available archaeobotanical data set as well as on excavation results and the historical sources assembled in local and regional archives. The example of Lüneburg can demonstrate that the use of different archives will provide a more detailed picture of vegetal resources and human consumption of plant food.

Charred plant remains from a PPNA kitchen at Jerf el Ahmar (Syria).

George Willcox, CNRS, GREMMO, Jalès 07460 France.

The PPNA site of Jerf el Ahmar dated to the mid 10th millennium BP (non cal.) has produced over 500 flotation samples which are now under study. Here I will describe the results from 28 samples of charred plant remains from a room(2.5 by 3 metres) which had been destroyed by fire. It contained three saddle querns, two flat polished stones (50 cms in diameter), two hearths, and three limestone "basins". These objects were in place and the room appears to represent a food preparation area (kitchen).

Michèle M. Wollstonecroft

The Institute of Archaeology

31-34 Gordon Square

London, WC1H OPY

e-mail: wollston@hotmail.com

The fruit of their labour: plants and processing at site EeRb 140, a prehistoric hunter-gatherer site on the Plateau of British Columbia, Canada.

Abstract

This paper is the interpretation of a plant assemblage from EeRb 140, an open-air site located within the shrubby steppe lands of the Southern Interior of British Columbia. The interpretation of the plant remains from EeRb 140 encompasses a contextual analysis linked with ethnographic analogies. Archaeological components indicate that the site was utilised by hunter-gatherer-fisher groups from the Middle Prehistoric Period (7,200-3,800 B.P.) through to the Late Prehistoric Period (3,800--200 B.P.). The palaeoethnobotanical analysis of Late Period contexts identified 30 taxa from seeds, conifer needles, charcoal and vegetative tissue. According to Plateau ethnographies, most of the identified plants recovered from EeRb 140 were important resources of Plateau First Peoples. Edible plants are the most abundant at EeRb 140, including nine types of "berry foods" and a "root food". Also abundant are taxa that are reported to have been used as fuel for processing foods and/or as raw materials for the manufacture of household items, including grasses, sedges, birch bark, conifer boughs and the wood of Douglas-fir, pine, sage and willow/cottonwood. The floral remains clustered in two 'hearth' features, one of which appears to have served both as a pit-oven and as an open-hearth for drying berries.

Vegetable offerings to Isis from a roman sacrificial site in Mainz, Germany

Barbara Zach

Grabungen in der Mainzer Innenstadt "Lotharpassage" erbrachten verkohlte Pinien, Datteln und Feigen in großer Anzahl aus einem römischen Sakralbezirk. Nach archäologischen Funden wurde er jüngst als Isistempel interpretiert. Die Grabung wurde erst in diesem Frühjahr beendet, die archäobotanischen Untersuchungen sind noch nicht abgeschlossen. Untersucht werden eine Vielzahl verschiedener Befunde: Brandgruben, Deponierungsgruben, Deponierungskisten, eine Latrine und andere, die alle außergewöhnliche Pflanzenreste zeigen. Vor allem Importfrüchte sind zu nennen.

In Deutschland konnten bisher in dieser Qualität noch keine römischen Opferplätze archäobotanisch untersucht werden. Aus Anlaß dieses außergewöhnlichen Fundmaterials sollen erstmals Überlegungen zu Opferriten vertieft werden und Details liefern. Die archäologischen Befunde zeigen eine "Opferstraße", entlang der sich viele verschiedene Opferstellen befanden. Hier sind auch unterschiedliche Spektren von Pflanzen zu finden. Die Interpretation ist allerdings noch nicht abgeschlossen, hier soll nur ein erster Überblick über die bisher entdeckten Besonderheiten dargestellt werden.

Die verkohlt erhaltenen Früchte und Getreide finden in den unverkohlten Arten aus der Latrine eine Ergänzung, die zu Schlußfolgerungen führen soll darüber, ob die Gaben nur geopfert worden sind oder auch verspeist wurden.

NAMES AND ADDRESSES OF PARTICIPANTS

Örni **AKERET**	Service cantonal d'archéologie, Valangines 3, CH-2000 Neuchâtel, Switzerland
Susan **ALLEN**	3 Bay Road, Apt. 4, Newmarket NH 03857, USA
Almuth **ALSLEBEN**	Institut für Ur- und Frühgeschichte, Christian-Albrechts-Universität Kiel, D-24098 Kiel, Germany
Monika **BADURA**	Lab of Palaeoecology and Archaeobotany, Dept. of Plant Ecology, Gdansk University, Al. Legionów 9, 80-441 Gdansk, Poland
Corrie **BAKELS**	Faculty of Archaeology, Post Box 9515, 2300 RA Leiden, The Netherlands
Sverre **BAKKEVIG**	Arkeologisk Museum I Stavanger, Box 478, N-4001 Stavanger, Norway
Rachel **BALLANTYNE**	33 New Road, Sawston, Cambridge CB2 4BN, UK
Jan **BASTIAENS**	Institute for the Archaeological Heritage of Flanders, Abdijstraat 13-15, B-9700 Oudenaarde, Belgium
Karl-Ernst **BEHRE**	Niedersächsiches Institut für historische Küstenforschung, Viktoriastr. 26/28, Postf. 2062, D-26382 Wilhelmshaven, Germany
Jo **BENDING**	Dept. of Archaeology & Prehistory, University of Sheffield, Northgate House, West St., Sheffield S1 4ET, UK
Jaromir **BENES**	University of South Bohemia, Branisovská 31, CZ-370 01 Ceske Budejovice, Czech Republic
Aldona **BIENIEK**	Institute of Botany, Polish Academy of Sciences, Lubicz 46, 31-512 Krakow, Poland
Felix **BITTMANN**	Niedersächsiches Institut für historische Küstenforschung, Viktoriastr. 26/28, Postf. 2062, D-26382 Wilhelmshaven, Germany
Nicole **BOENKE**	Institut der Kommission für Archäologie, Schloss Biebrich/Ostflügel, 65203 Wiesbaden, Germany
Amy **BOGAARD**	Dept. of Archaeology & Prehistory, University of Sheffield, Northgate House, West St., Sheffield S1 4ET, UK
Ksenija **BOROJEVIC**	Dept of Anthropology, University of Alabama, 338 Ullman, Birmingham AL 35294-3350, USA
Abigail **BREWER**	Knockane, Dunmanway, Co. Cork, Ireland
Otto **BRINKKEMPER**	R.O.B., Post Box 1600, NL-3800 BP Amersfoort, The Netherlands

Ann **BUTLER**	Institute of Archaeology, University College London, 31-34 Gordon Square, London WCIH OPY, UK
Janneke **BUURMAN**	R.O.B., Post Box 1600, NL-3800 BP Amersfoort, The Netherlands
Gill **CAMPBELL**	Centre for Archaeology, English Heritage, Fort Cumberland, Fort Cumberland Road, Portsmouth PO4 8DJ, UK
Aylen **CAPPARELLI**	Dpto. Cient. Arq.-Museo Cs Nat. La Plata, Paseo del Bosque s/n, 1900 La Plata, Argentina
Wendy **CARRUTHERS**	Sawmills House, Castellau, Llantrisant CF72 8LQ, UK
Dana **CHALLINOR**	Oxford Archaeological Unit, Janus House, Osney Mead, Oxford OX2 OEJ, UK
Michael **CHARLES**	Dept. of Archaeology & Prehistory, University of Sheffield, Northgate House, West St., Sheffield S1 4ET, UK
Sarah **CLARK**	Dept. of Archaeology & Prehistory, University of Sheffield, Northgate House, West St., Sheffield S1 4ET, UK
Gemma **COCCOLINI**	Dipartimento di Biologia Vegetale, Universita "La Sapienza", P. le Aldo Mora 5, 00185 Roma, Italy
Sue **COLLEDGE**	33 Jenner Road, London N16 7SB, UK
Brigitte **COOREMANS**	Lakenakersstraat 321, B-2800 Mechelen, Belgium
Alison **COX**	7 Loxley Road, Sheffield S10 1QY, UK
Orsolya **DÁLNOKI**	1028 IMOLA U. 3., Budapest, Hungary
Anne **DAVIS**	Museum of London Specialist Services, 46 Eagle Wharf Road, London N1 7EE, UK
Dominique **DE MOULINS**	8 Southwood Mansions, Southwood Lane, London N6 5SZ, UK
Andrew **FAIRBAIRN**	School of Archaeology and Anthropology, Australian National University, A.D. Hope Building, ACT 0200 Australia, Australia
Dorian **FULLER**	Institute of Archaeology, 31-34 Gordon Square, London WCIH OPY, UK
Rachel **GILES**	Holly Cottage, 20 main Road, Goostry, Cheshire CW4 8LL, UK
John **GIORGI**	Museum of London Specialist Services, 46 Eagle Wharf Road, London N1 7EE, UK
Lisa **GRAY**	Museum of London Specialist Services, 46 Eagle Wharf Road, London N1 7EE, UK
Francis **GREEN**	Heritage Officer, Design and Conservation Council Offices, Test Valley Borough Council, Duttons Road, Romsey, Hampshire SO51 8XG, UK

Walton **GREEN**	Dept. of Geology and Geophysics, P.O. Box 208109, Yale Station, New Haven, CT 06520, USA
Pam **GRINTER**	120 Beacon Road, Great Barr, Birmingham B43 7BN, UK
Gardar **GUDMUNDSSON**	Institute of Archaeology, Barugotu 3, 101 Reykjavik, Iceland
Philippe **HADORN**	Rue des Coteaux 25, 2016 Cortalloid, Switzerland
Mária **HAJNALOVÁ**	Acheologicky ustav SAV, Akademicka 2, SK-94921 Nitra, Slovakia
Allan **HALL**	Environmental Archaeology Unit, Dept. of Biology, University of York, P.O. Box 373, York YO10 5YW, UK
Mhairi **HASTIE**	Headland Archaeology Ltd, Albion Business Centre Unit B4, Albion Rd, Edinburgh EH7 5QZ, UK
Christine **HASTORF**	Dept. of Anthropology, University of California - Berkeley, Berkeley CA 94720, USA
Sirje **HIIE**	Institute of History, Rüütli 6, Tallinn 10 130, Estonia
Sabine **HOSCH**	Botanisches Institut, Universität Basel, Schönbeinstr. 6, CH-4056 Basel, Switzerland
Kath **HUNTER**	24 St. Pauls Road, GL1 5AR, UK
Jacqui **HUNTLEY**	Dept. of Archaeology, University of Durham, South Road, Durham DH1 3LE, UK
Alison **HYND**	161 Cundy Street, Sheffield S6 2UP, UK
Andrew **ISAAC**	2 Carr Houses, Mayfield Road, Sheffield S10 4PR, UK
Stefanie **JACOMET**	Botanisches Institut, Universität Basel, Schönbeinstr. 6, CH-4056 Basel, Switzerland
Christiane **JACQUAT**	Geobotanical Institute, Zollikerstr. 107, CH-8008 Zurich, Switzerland
Glynis **JONES**	Dept. of Archaeology & Prehistory, University of Sheffield, Northgate House, West St., Sheffield S1 4ET, UK
Sabine **KARG**	National Museum, NNU, Ny Vestergade 11, DK-1471 Copenhagen K, Denmark
Mordechai **KISLEV**	Faculty of Life Sciences, Bar-Ilan University,Ramat-Gan 52900, Israel
Marlies **KLEE**	Botanisches Institut, Universität Basel, Schönbeinstr. 6, CH-4056 Basel, Switzerland
Ghias **KLESLY**	App. 10, 14 Rue Jean Pierre Laurens, 92260 Fontenay aux roses, France
Eva **KOCH**	Lathyrusvej 3, DK-2970 Hørsholm, Denmark

Marianne **KOHLER-SCHNEIDER** — Institut für Botanik, Universität für Bodenkultur, Gregor Mendel-Str. 33, A-1180 Wien, Austria

Margarethe **KÖNIG** — Rheinisches Landesmuseum Trier,Weimarer Allee 1, D-54290 Trier, Germany

Angela **KREUZ** — Institut der Kommission für Archäologie, Schloss Biebrich/Ostflügel, 65203 Wiesbaden, Germany

Helmut **KROLL** — Institut für Ur- und Frühgeschichte, Christian-Albrechts-Universität Kiel, D-24098 Kiel, Germany

Lucyna **KUBIAK-MARTENS** — Biax Consult,Roeterstraat 8 hs, 1018 WC Amsterdam, The Netherlands

Dušanka **KUČAN** — Niedersächsiches Institut für historische Küstenforschung, Viktoriastr. 26/28, Postf. 2062, D-26382 Wilhelmshaven, Germany

Marlu **KÜHN** — Botanisches Institut, Universität Basel, Schönbeinstr. 6, CH-4056 Basel, Switzerland

Wim **KUIJPER** — Archeologisch Centrum, Ryksuniversiteit, Postbus 9515, 2300 RA Leiden, The Netherlands

Christine **LAURENT** — G.I.E.P., Université Libre de Bruxelles CP 160/13, Rue des Cannoniers 12, B-1400 Nivelles, Belgium

Mia **LEMPIÄINEN** — Käsityöläiskatu 7 A 2, 20500 Turku, Finland

Alex **LIVARDIA** — Dept. of Archaeology & Prehistory, University of Sheffield, Northgate House, West St., Sheffield S1 4ET, UK

Ursula **MAIER** — Landesdenkmalamt Baden-Württemberg, Fischersteig 9, D-78345 Hemmenhofen, Germany

Elena **MARINOVA** — Institut für Paläontologie, Nussallee 8, D-53115 Bonn, Germany

Tanja **MÄRKLE** — National Museum, NNU, Ny Vestergade 11, DK-1471 Copenhagen K, Denmark

Sylvia **MARTINEZ** — Botanisches Institut, Universität Basel, Schönbeinstr. 6, CH-4056 Basel, Switzerland

Danièle **MARTINOLI** — Botanisches Institut, Universität Basel, Schönbeinstr. 6, CH-4056 Basel, Switzerland

Meriel **MCCLATCHIE** — Dept. of Archaeology, University College, Cork, Ireland

Olivier **MERMOD** — Geobotanisches Institut ETHZ, Zürichbergstr. 38, CH-8044 Zürich, Switzerland

Peter **MIKKELSEN** — Moesgaard Museum, DK-8270 Hoejbjerg, Denmark

Naomi **MILLER** — University of Pennsylvania Museum, 33rd & Spruce Sts, Philadelphia PA 19104, USA

Mick **MONK**	Dept. of Archaeology, University College, Cork, Ireland
Laura **MOTTA**	St. John's College, Cambridge CB2 1TP, UK
Mark **NESBITT**	Centre for Economic Botany, Royal Botanic Gardens, Kew, Richmond, Surrey TW9 3AE, UK
Carol **PALMER**	School of Archaeology and Ancient History, University of Leicester, University Road, Leicester LE1 7RH, UK
Jan Peter **PALS**	Amsterdam Archaeological Centre, University of Amsterdam, Nieuwe Prinsengracht 130, NL-1018 VZ Amsterdam, The Netherlands
Rainer **PASTERNAK**	Institut für Ur- und Frühgeschichte, Christian-Albrechts-Universität Kiel, D-24098 Kiel, Germany
Ruth **PELLING**	25 Sunningwell Road, Oxford OX1 4S2, UK
Jennifer **RAMSAY**	414-29 Songhees Rd, Victoria, BC V9A 7M6, Canada
David **ROBINSON**	National Museum, NNU, Ny Vestergade 11, DK-1471 Copenhagen K, Denmark
Mark **ROBINSON**	University Museum, Parks Road, Oxford OX1 3PW, UK
Manfred **RÖSCH**	Landesdenkmalamt Baden-Württemberg, Fischersteig 9, D-78345 Hemmenhofen, Germany
Laura **SADORI**	Dipartimento di Biologia Vegetale, Universita "La Sapienza", P. le Aldo Mora 5, 00185 Roma, Italy
Delwen **SAMUEL**	Institute of Archaeology, University College London, 31-34 Gordon Square, London WCIH OPY, UK
Anaya **SARPAKI**	137 Tsikalaria, 732 00 Souda-Chania, Crete, Greece
Margaret **SCARRY**	CB #3115, Dept. of Anthropology, University of North Carolina - Chapel Hill, Chapel Hill NC 27599, USA
Eva **SCHÄFER**	Institut der Kommission für Archäologie, Schloss Biebrich/Ostflügel, 65203 Wiesbaden, Germany
Angela **SCHLUMBAUM**	Botanisches Institut, Universität Basel, Schönbeinstr. 6, CH-4056 Basel, Switzerland
Ülle **SILLASOO**	Jõe 6-23, 75102 Kose-Uuemoisa, Harjumaa, Estonia
Ellen **SIMMONS**	77 Matlock Road, Sheffield S6 3RQ, UK
Wendy **SMITH**	Dept. of Archaeology, University of Southampton, Highfield, Southampton SO17 1BJ, UK
Andrea **SNELLING**	49 Central Avenue, New Basford, Nottingham NG7 7AG, UK
Sue **STALLIBRASS**	Dept. of Archaeology, Hartley Building, University of Liverpool, Liverpool L69 3BX, UK

Christopher **STEVENS**	McDonald Institute, Downing Street, Cambridge CB2 3ER, UK
Hans-Peter **STIKA**	Perlgrasweg 24, D-70599 Stuttgart, Germany
Joanna **ŚWIĘTA**	Lab of Palaeoecology and Archaeobotany, Dept. of Plant Ecology, Gdansk University, Al. Legionów 9, 80-441 Gdansk, Poland
Edeltraud **TAFEL**	Institut für Ur- und Frühgeschichte, Christian-Albrechts-Universität Kiel,D-24098 Kiel, Germany
Heidi **TENCY**	PAMZOV, Paddestraat 7, 9960 Zottegem/Velzeke, Belgium
Margareta **TENGBERG**	Maison d'archéologie et de l'ethnologie,21, allée de l'Université (boîte 14), F-92023 Nanterre, France
Tanja **TENHUNEN**	Maneesikatu 4 B 62, 00170 Helsinki, Finland
Ursula **THANHEISER**	Institut für Botanik, Universität Wien, Rennweg 14, A-1030 Wien, Austria
Soultana **VALAMOTI**	Ploutonos 33, GR-54655 Thessaloniki, Greece
Liesbeth **VAN BEURDEN**	Biax Consult, Roeterstraat 8 hs, 1018 WC Amsterdam, The Netherlands
Marijke **VAN DER VEEN**	School of Archaeology and Ancient History, University of Leicester, University Road, Leicester LE1 7RH, UK
André **VAN PETEGHEM**	PAMZOV, Paddestraat 7, 9960 Zottegem/Velzeke, Belgium
Patricia **VANDORPE**	79 Bruntsfield Place, Edinburgh EH10 4HG, UK
Caroline **VERMEEREN**	Biax Consult, Roeterstraat 8 hs, 1018 WC Amsterdam, The Netherlands
Tamara **VERNIMMEN**	Vrolikstraat 256hs, 1092 TX Amsterdam, The Netherlands
Nina **WARTENBERG**	Institut für Botanik, Universität Regensburg,D-93040 Regensburg, Germany
Julian **WIETHOLD**	Institut der Kommission für Archäologie, Schloss Biebrich/Ostflügel, 65203 Wiesbaden, Germany
George **WILLCOX**	CNRS Jalès-Berrias,07460 St.-Paul-le-Jeune, France
Michèle **WOLLSTONECROFT**	60 Ivydale Road, Nunhead London SE1S 3BS, UK
Barbara **ZACH**	Archälobotanisches Labor Zach, Clarenbachstr. 190, D-50931 Köln, Germany