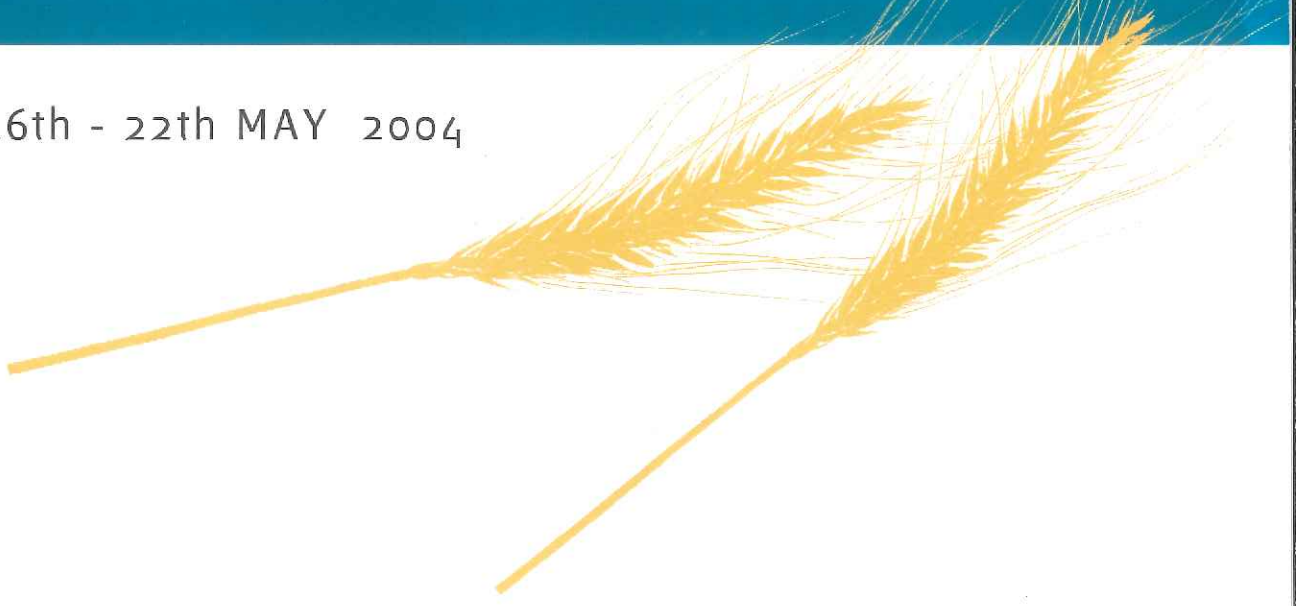
13th SYMPOSIUM OF THE INTERNATIONAL WORK GROUP FOR PALAEOETHNOBOTANY

GIRONA 16th - 22th MAY 2004



Programme and abstracts

13th Symposium of the International Work Group for Palaeoethnobotany

Girona, Spain

16 – 22 May 2004

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Girona
Museu d'Arqueologia de Catalunya

UAB
Universitat Autònoma de Barcelona

Supporting by

MINISTERIO DE CIENCIA Y TECNOLOGÍA

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Departament de Cultura

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PROGRAMME

SUNDAY, 16th May

16.30 – 20.00 **Registration** (Auditori de la Mercè – Centre Cultural de la Mercè, Pujada de la Mercè 12)

MONDAY, 17th May

8.00 – 9.00 **Registration**

9.00– 9.30 **Introductory Session**
Welcome by **Dr. Ramon Buxó** followed by announcements

Analytical Archaeobotany

Chair:	**Allan HALL**	
9.30 – 9.50	Patricia VANDORPE, Stefanie JACOMET	Testing subsample size for the analysis of waterlogged plant remains. The example of roman Biesheim-Kunheim, Alsace, France
9.50 – 10.10	Jean Andreas HARILD *et alii*	New quantitative analyses of the stomach contents of the Grauballe man
10.10 – 10.30	Marlu KÜHN, Philippe HADORN	Pollen and plant macrofossils in ruminant dung from the neolithic lake shore settlement of Arbon Bleiche 3, Switzerland
10.30 – 10.50	Simone RIEHL *et alii*	On the origin of carbonate *Lithospermum* seeds in archaeological sediments
10.50 – 11.20	**Coffee break**	
Chair:	**Michael CHARLES**	
11.20 – 11.40	Gordon HILLMAN	Identifying naked wheats from rachis remains
11.40 – 12.00	Concepción OBÓN *et alii*	Morphometrics and molecular techniques applied to the identification of Archaeological Grapevine
12.00 – 12.20	Jean-François MANEN *et alii*	Microsatellite DNA and the geographic origin of ancient wine cultivars
12.20 – 12.40	Antonio REALES *et alii*	Numerical and molecular approaches to the study of Plumstones (*Prunus*)
12.40 – 13.00	José-Luis ARAUS *et alii*	Past climate and agricultural water management in the Mediterranean inferred from carbon isotope discrimination in archaeological plant remains
13.15 – 14.45	**Lunch**	

Analytical Archaeobotany

Chair:	**Monika BADURA**	
15.00 – 15.20	Amy BOGAARD *et alii*	Inferring crop sowing regime and cultivation intensity: issues of taphonomy
15.20 – 15.40	Dorian FULLER	A new analytical approach to the evolution of arable systems? Parsimony analysis of endemicity applied to archaeobotanical weed flora
15.40 – 16.00	Glynis JONES *et alii*	Distinguishing different crop husbandry practices using weed functional ecology
16.20 – 16.40	Ehud WEISS, A. FAUST	From weeds to world trade, locating ancient wheat fields and tracing 7th century BCE trade pattern with weed assemblages
17.00 – 19.00	**Coffee**	**Poster session**

TUESDAY, 18th May

8.30 – 9.00	**Late Registration**	
		Gathering and Cultivation
Chair:	**Glynis JONES**	
9.00 – 9.20	Diego RIVERA-NÚÑEZ *et alii*	General view of plant domestication and cultivation in Western Asia
9.20 – 9.40	Georges WILLCOX	The distribution of wild cereals and their domestication in the Near East
9.40 – 10.00	Anat HARTMANN	Gilgal I: Reconstructing the evolution of the domesticated fig (*Ficus carica*)
10.00 – 10.20	Alexia SMITH	Bronze and Iron Age agriculture in Syria: a view from the plant remains
10.20 – 10.40	Danièle MARTINOLI	Epipalaeolithic plant economy in SW-Anatolia: the example from Öküzini cave
10.40 – 11.10	**Coffee break**	
Chair:	**Corrie BAKELS**	
11.10 – 11.30	Angela KREUZ *et alii*	A comparison of Early Neolithic crop and weed assemblages from the Linearbandkeramik and the Karanovo culture: differences and similarities
11.30 – 11.50	Mauro ROTTOLI	The development of Neolithic agriculture in Northern and Central Italy: new data
11.50 – 12.10	Leonor PEÑA-CHOCARRO, Lydia ZAPATA	Spread of agriculture in northern Iberia
12.10 – 12.30	Hans-Peter STIKA	Neolithisation in Central Spain, the case study of Ambrona, Prov. Soria
12.30 – 12.50	M. Oliva RODRÍGUEZ, Eva MONTES	Origin and domestication of the olive tree in south Spain
13.15 – 14.45	**Lunch**	
15.00 – 18.00		**Laboratory session**
15.00 – 16.30		Hulled cereals: comparison between hulled wheat (emmer wheat) and the so-called "new glume wheat"
16.30 – 18.00		Naked cereals: distinction between *Triticum aestivum* and *Triticum durum*, with special reference to the use of rachis
19.30	**Welcome Reception**	Museu d'Arqueologia de Catalunya-Girona, Monestir de Sant Pere de Galligants, Plaça de Santa Llúcia, s/n

WEDNESDAY, 19th May

Historical archaeobotany

Chair:	**Angela KREUZ**	
9.00 – 9.20	Mordechai KISLEV	The History of Research on the Origin of Cultivated Barley
9.20 – 9.40	Reinder NEEF	Grain storages in the Hittite Capital Bogazköy
9.40– 10.00	Margareta TENGBERG	Crop husbandry in Early Bronze Age Gaza. First archaeobotanical results from Tell es-Sakan
10.00 – 10.20	Ahmed Gamal El-Din FAHMY	Missing plant macroremains as indicators of plant exploitation in Predynastic Egypt
10.20 – 10.40	Soultana-Maria VALAMOTI	Grain versus chaff: identifying a contrast between grain-rich and chaff-rich sites in the Neolithic of northern Greece
10.40 – 11.10	**Coffee break**	
Chair:	**Klaus OEGGL**	
11.10 – 11.30	Fragkiska MEGALOUDI	Burnt sacrificial offerings at hellenistic Messene (Peloponnese) Greece
11.30 – 11.50	Tzvetana POPOVA	Archaeobotanical analysis of prehistoric material from Hotnitza, North Bulgaria
11.50 – 12.10	Elena MARINOVA	The plant economy of Tell Karanovo in the context of the Bronze Age in South-Eastern Europe
12.10 – 12.30	Felicia MONAH	Fruit deposits in the Chalcolithic tell of Poduri-Dealul Ghindaru, Romania (V-IV millenia BC)
12.30 – 12.50	Jaromir BENES *et alii*	Wells from the Late Roman Iron Age and the Early Medieval Period in Hostivice near Prague, Czech Republic: complex archaeobotanical study and reflection of local landscape development
13.15 – 14.45	**Lunch**	

Historical Archaeobotany

Chair:	**Karl-Ernst BEHRE**	
15.00 – 15.20	Julian WIETHOLD	Exotic species and rice (*Oryza sativa*). Far-distance trading products in Northern Germany. Archaeobotanical records and written sources of medieval and early modern times
15.20 – 15.40	Laura KOOISTRA	The history of agriculture of the coversand area west of Breda (prov. North Brabant, The Netherlands)
15.40 – 16.00	Corrie BAKELS	Farming on sand, farming on loess: a comparison of medieval crops from the Southern Netherlands and Northern France

Open session

16.00 – 17.00	Sabine KARG *et alii*	The Hansa-network Project
17.10 – 19.00	**Coffee**	**Poster session**

THURSDAY, 20th May

Historical Archaeobotany

Chair:	**Stefanie JACOMET**	
9.00 – 9.20	Gillian CAMPBELL	Brewing in England from the Roman period to the Black Death: a review of the archaeobotanical evidence and written accounts
9.20 – 9.40	Marie DERREUMAUX	Fodder and litter examples in the roman site “le Marais de Dourges”, France
9.40 – 10.00	Philippe MARINVAL	A burnt Gallo-Roman bakery in Amiens, Somme (France)
10.00 – 10.20	Manon CABANIS, Philippe MARINVAL	Exceptional preservation of roman plants funeral offerings from Martres-de-Veyres site (Puy-de-Dôme, France)
10.20 – 10.40	Örni AKERET	Plant remains from the Bell Beaker village of Cortaillod / Sur les Rochettes-Est, Switzerland
10.40 – 11.10	**Coffee break**	
Chair:	**Hans-Peter STIKA**	
11.10 – 11.30	Marijke van der VEEN	The Spice Trade
11.30 – 11.50	Laura SADORI, Francesca SUSANNA	Charred plant remains of a Roman settlement (Late Empire Period) from Central Italy
11.50 – 12.10	Laurent BOUBY	Storing food in caves during Late Bronze Age in Southern France. Products, agricultural and social implications
12.10 – 12.30	Marie-Pierre RUAS	Some aspects of the farming from Early Medieval sites in Mediterranean France
12.30 – 12.50	Natàlia ALONSO	Roman and Islamic plant remains from the city of Lleida (Catalonia, Spain)
13.15 – 14.45	**Lunch**	
15.00 – 18.00		**Laboratory session**
15.00 – 16.30		Weeds, pulses, fruits and other plant remains
16.30 – 18.00		Blind test to identify cultivated pulses species
	Ferenc GYULAI, Irwin ROVNER	Applications of Computer Assisted Morphometry: a demonstration
20.30	**Dinner**	Casino de Girona – Albareda, 9

FRIDAY, 21st May

Open Session and Ethnobotanical approaches

Chair:	**Helmut KROLL**	
9.00 – 9.20	Ehud WEISS	The Broad *Spectrum* Revolution: The evidence from the plant remains
9.20 – 9.40	Michèle WOLLSTONECROFT	Post-harvest intensification among Late Pleistocene hunter-gatherers of Southwest Asia: Plant-food-processing as a critical variable in the economic and social shifts that took place during the Epipalaeolithic (20,000-10,250 BP uncal)
9.40 – 10.00	Yoel MELAMED	Water plants as a food resource for ancient man at Gesher Benot Ya'aqov
10.00 – 10.20	Glynis JONES, Soultana-Maria VALAMOTI	*Lallemantia*, an imported oil plant in bronze age Greece?
10.20 – 10.40	Mary Anne MURRAY	Feeding the Town: Archaeobotanical evidence from the complex of the Giza Pyramid builders
10.40 – 11.10	**Coffee break**	
Chair:	**Diego RIVERA**	
11.10 – 11.30	Klaus OEGGL	Reconstructing the Iceman's last journey
11.30 – 11.50	Alexandra SCHMIDL, Klaus OEGGL	Subsistence strategies in the Alpine area during the Bronze Age
11.50 – 12.10	Anna Maria MERCURI *et alii*	The archaeobotanical research at the Terramara di Montale (1650-1200 B.C. - Northern Italy) and its contribution to the Archaeological Park
12.10 – 12.30	Justine WINTJES	Seeing Seeds: Photography, Drawing and Representation
13.00 – 14.45	**Lunch**	

Round Table
Wheat evolution: problematic and relationship between the Mediterranean area and the Central and West Europe

Chair:	**Mordechai KISLEV**	
15.00 – 16.00	Ramon BUXÓ, Michael CHARLES, Stefanie JACOMET, Gordon HILLMAN, Mark NESBITT, George WILLCOX	

Concluding Session

16.00 – 17.30	Summing up by **Dr. Marijke VAN DER VEEN**
	Announcements on publication and the symposium in 2007

SATURDAY, 22nd May

	Excursion
9.00	Depart from Girona
19.30 / 20.00	Arrival to Girona

Field excursion	Lluís VILAR	An overview of the Mediterranean vegetation and the weed flora in the Girona province
Archaeological site: Ullastret	Aurora MARTIN	The iberian settlement of Ullastret
Archaeological site: La Draga	Àngel BOSCH, Júlia CHINCHILLA, Josep TARRÚS	La Draga: an abstract
	Ramon BUXÓ, Raquel PIQUÉ	Archaeobotanical studies in La Draga (Banyoles, Catalonia): an overview of the plant remains from a Neolithic site in the north-east of Spain

LECTURES ABSTRACTS

TESTING SUBSAMPLE SIZE FOR THE ANALYSIS OF WATERLOGGED PLANT REMAINS. THE EXAMPLE OF ROMAN BIESHEIM-KUNHEIM, ALSACE, FRANCE

Patricia VANDORPE[1] & Stefanie JACOMET[2]

While studying plant remains from Roman deposits of the site Biesheim-Kunheim (mainly 1st and 2nd century AD) in the Alsace (France), we were confronted with a plant assemblage of a very rich and diverse nature. The location of the archaeological deposits under the level of the watertable produced excellent conditions for preservation of uncarbonized plant remains. This resulted in the recovery of a very large amount of archaeobiological samples i.e. plant remains. Previously undertaken studies on sample size and quantification of plant remains by Van der Veen & Fieller (1982), have proven a valuable aid for archaeobotanical research. In these studies the problem of determining the sample size in advance has been addressed. A minimum number of seeds was set to be counted to provide a picture of the proportion of e.g. cereal species in stocks within a given accuracy. The results of which were based on the analysis of carbonised plant material. Being confronted with a very different kind of preservation and diversity of plant remains, we decided to test what the minimum number of seeds to be collected is when dealing with waterlogged plant remains. The starting point of our analysis was: to obtain a subsample, which represents the complete sample i.e. which covers all species present in that sample. In practice, ten random subsamples of 10ml and 2ml were taken from the 1mm and 0.35mm fraction respectively. These were sorted, identified and quantified separately. By means of the rarefaction analysis, curves were created to verify whether or not sufficient plant material was collected.

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NEW QUANTITATIVE ANALYSES OF THE GUT CONTENTS OF THE GRAUBALLE MAN

Jan Andreas HARILD[1], David Earle ROBINSON[2] & Jesper HUDLEBUSCH[1]

It was the Danish archaeobotanist Hans Helbaek who investigated the gut contents of the Iron Age bog bodies, Tollund Man and Grauballe Man, shortly after they were discovered by peat diggers in Jutland in the early 1950s. Helbaek's results (Helbaek 1950, 1958), reflect the many months of work he invested in the task and reveal a level of analysis, interpretation and documentation unmatched anywhere in the world at that time. Helbaek's descriptions, drawings and micrographs document the presence of almost 100 plant species. His discoveries also included fungal spores and sclerotia (ergot), parasite eggs and bone splinters.

Why then, in the light of these detailed publications, is it necessary to embark on a re-analysis of Grauballe Man's stomach contents?

The answer lies in the analytical methods which Helbaek employed five decades ago – quite simply they do not allow a quantitative evaluation of the material. As a consequence, several central questions have been left unanswered, resulting in a good deal of speculation and debate over the years. Helbaek claims to have analysed in full the 610 ml of material flushed from Grauballe Man's gut in 1952. The huge size of the sample and the many millions of fragments of crop and weed seeds it contained meant that quantification was impossible. Accordingly, Helbaek employed a subjective four-point system based on perceived abundance. Unfortunately it is impossible to use this to reconstruct the composition of the gut contents and, accordingly, the relative proportions of the components of the last meal or meals; something which is essential if we are to evaluate whether these were ritual meals or just normal everyday food.

There has also been controversy with regard to the presence of ergot in Grauballe Man's gut. Helbaek mentions the presence of a *quantity* of scelerotia, but gives no real indication of amount. There has been great speculation that Grauballe Man may have been intentionally or incidentally under the hallucinogenic influence of ergot when he died. Again it is impossible to assess the likelihood of this without an idea of the concentration of ergot in the gut.

In order to address these problems, and to coincide with a new Grauballe Exhibition at Moesgaard Museum in Aarhus, new quantitative analyses have now been carried out on Grauballe Man's gut contents. These give answers to the questions posed above and provide other new information. Similarly, it has also been possible to compare the data with other Danish finds from the Early Iron Age and place them all firmly in context.

Helbæk, H.(1950)Tollund mandens sidste måltid. *Aarbøger for Nordisk Oldkyndighed* 1950 311-341.

Helbæk, H.(1958) Grauballemandens sidste måltid. *KUML* 1958 83-116.

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POLLEN AND PLANT MACROFOSSILS IN RUMINANT DUNG FROM THE NEOLITHIC LAKE SHORE SETTLEMENT OF ARBON BLEICHE 3, SWITZERLAND

Marlu KÜHN & Philippe HADORN

Pollen, seeds and fruits as well as epiderm fragments of leaves were analysed in potential cow dung from the Neolithic lake shore settlement of Arbon Bleiche 3.

The analysis provided evidence for the existence of winter fodder.

In winter cattle and goat/sheep were kept in or close to the settlement. In summer they grazed further away. This gives evidence for sustainable usage of resources in the surroundings of the settlement: the fields as well as the local vegetation were protected against browsing by domestic ruminants during summer.

Grazing the animals outside the settlement combined with feeding of cultivated plants and twigs was common husbandry practice.

For the first time feeding the ruminants with leaves of deciduous trees like oak (*Quercus*) and alder (*Alnus*) was verified by the determination of epiderms from leaves and leaf stalks. Leaves and twigs of deciduous trees and silver fir (*Abies alba*) were obviously stored as winter fodder. Leaves and twigs of the evergreen species ivy (*Hedera helix*) and mistletoe (*Viscum album*) as well as twigs with catkins of alder and hazel (*Corylus avellana*) probably were collected at the end of winter when fodder stores were used up.

This investigation showed that cattle management differed only slightly - if at all – from the keeping of ovicaprids in the settlement of Arbon Bleiche 3. Only the higher frequency and amount of macrofossils of cultivated plants may indicate a better quality of fodder for cattle.

ON THE ORIGIN OF CARBONATE *LITHOSPERMUM* SEEDS IN ARCHAEOLOGICAL SEDIMENTS

Simone RIEHL, Konstantin E. PUSTOVOYTOV & Siegfried MITTMANN

Uncarbonized fruits of the Boraginaceae occur widely in cultural layers of archaeological sites of the Mediterranean and the Near East. To date, interpreting their origin remains problematic. *Lithospermum* fruits extracted from archaeological sediments can be optically very similar to modern comparative material appearing greyish or whitish in colour, and their real age cannot be recognised. The problem of potential contamination by modern material arises frequently, especially when the fruits are present in high numbers, therefore it is difficult for archaeobotanists to tell whether such fruits were deposited as part of the cultural layer of a site or introduced into it post-depositionally.

Radiocarbon dating has not been applied to fossil *Lithospermum* nutlets before. We present here the results of ^{14}C dating of carbonate fruits of *Lithospermum* from five archaeological sites in the Aegean region (early Bronze Age Kumtepe, middle Bronze Age Troy), the Near East (early Bronze Age Hirbet ez-Zeraqon) and Central Asia (Bronze Age Kermen-Tolga and Shakhovskaya in Kalmykia).

The radiocarbon ages of 19 *Lithospermum* samples suggest that they mainly originate from plants that grew around the time of occupation, and demonstrate for assemblages occuring in high numbers the necessity of dating such fruits.

Including large amounts of prehsitoric *Lithospermum* seeds into the interpretation of the data from archaeological sites, new light is cast on early plant production and environment.

IDENTIFYING NAKED WHEATS FROM RACHIS REMAINS

a repeat of the paper presented at IWGP Groningen 1983, but never published.

Gordon HILLMAN

Historical note

The full version of this paper (+ its photos) remains precisely as prepared for the IWGP Symposium in Krakow in 1974, which hepatitis prevented me attending. I eventually presented this same paper at IWGP Groningen in 1983. There I emphasized key criteria (hereafter the 'classic criteria') for distinguishing extreme forms of *T. durum* from the classic forms of *T. aestivum* (includinges), and also outlined a range of other, more subtle, diagnostic criteria. Afterwards, I decided to defer publication until I had added a set of line-drawings (only now being drawn!). Nevertheless, as a 'stop-gap', I agreed to produce a rough, ballpoint-pen-drawn, 2-page handout outlining some of the 'classic criteria'. Copies of this 2-page handout were widely circulated in 1984-5, and the criteria successfully applied in re-identifying wheat remains both in Europe and the Near East. Growing familiarity with these classic criteria was thereafter ensured by their publication in Jacomet's invaluable *'Prähistorische Getreidefunde…'* (1987) and by Maier's important 1996 paper, and is now reinforced by Zohary & Hopf publishing the criteria as an insert prepared by me for their 3rd edition of *'Domestication of Plants in the Old World'* (2000).

Justification for a repeat presentation

Given this familiarity, why present the same paper a second time? Answer: because (a) few archaeobotanists are, as yet, fully familiar with the pattern of occurrence of even these 'classic criteria' across the entire range of traditional wheat 'species'; and (b) few are aware of the existence of **several other commonly-occurring rachis-types** which were introduced in this paper, and even fewer know their diagnostic features. This is unsurprising, as they have yet to be published, and few of those present at the Groningen meeting will recall much from my rushed presentation of these details back there in 1983.

Examples of the other common rachis types that remain unfamiliar to most archaeobotanists include a range of small-eared *durums* with rachises which (i) lack the classic 4x features outlined in the 2-page handout, (ii) superficially appear intermediate between 4x an 6x wheats, but which (iii) nevertheless exhibit certain subtle features unique to themselves. These are the 'intermediate *durums*'.

Equally unfamiliar to European archaeobotanists is the aberrant tetraploid *T. carthlicum* and its diagnostic rachis criteria. In all the more obvious rachis features it resembles a lax-eared *aestivum*, although there are 4 subtle features described in the paper which nevertheless allow the two wheats to be distinguished. (Despite this, the '*carthliciform aestivums*' present a real problem.) The assumed irrelevance of the Transcaucasian *carthlicums* to European archaeobotany is also now challenged by remains from sites in northern Europe producing the diagnostic *carthlicum*-type infrared spectrum. Also introduced in my paper but unfamiliar to most archaeobotanists are the '*speltiform aestivums*' and the '*dicocciform durums*'.

Abstract

With the help of photos of rachises excised from living ears, the paper explains how, in the wheats, features of rachis morphology allow the identification of all the biological species, ± all the classical

“species” and at least some of the problematic recombinants from past inter-ploidy crosses. The paper describes how these features were selected after detailed studies of >thousand samples, most of which I collected from diverse landrace populations under traditional systems of management in various parts of Turkey and Syria. It outlines how each 5-ear sample was identified mainly from glume morphology, but also had its ploidy checked by my germinating 2-3 grains from each and doing chromosome counts on colchicine-treated root-tip squashes. Detailed studies of the rachis and glume-base morphology of *Aegilops squarrosa,* the D-genome donor, also played a central role in my selection of the core diagnostic features of the 6x^{s}.

MORPHOMETRICS AND MOLECULAR TECHNIQUES APPLIED TO THE IDENTIFICATION OF ARCHAEOLOGICAL GRAPEVINE

Concepción OBÓN[3], Diego RIVERA[4], Encarnación CARREÑO[2]

José Antonio PALAZÓN[5], Bárbara MIRALLES[1] & María Dolores CARMONA[2]

Grapevine is represented in archaeological contexts in form of seeds, stems, and products of wine-making. The more frequently reported materials are seeds from wild or cultivated grapevines. Differences in shape and dimensions of the findings have been interpreted in terms of degree of domestication or wilderness of the original plant or alternatively related to the main purpose of use (wine-making or table grapes). Systematics of *Vitis vinifera* is still controversial. Ampelographic and ampelometric techniques used for recognition of cultivars and cultivar groups much rely in the vegetative parts of the plant, especially leaves. These are unlike to be found in archaeological layers. Therefore the alternative approach is the morphometric study of seeds. We have recently performed a multivariate analysis of seeds from 170 samples of recent wild and cultivated grapevines. The clusters obtained do not support the existence of clear separation between *V. sylvestris* and *V. vinifera* on the base of seed morphology. Recent molecular studies covering a representative sample of cultivars and wild populations of grapevine from the Mediterranean and West Asia suggest the polyphylethic origin of cultivated grapevine with, at less, two gene centres around the Mediterranean. Combining molecular, biogeographical and morphometric evidence could assist the identification and interpretation of archaeological grapevine remains.

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MICROSATELLITE DNA AND THE GEOGRAPHIC ORIGIN OF ANCIENT WINE CULTIVARS

Jean-François MANEN, Laurent BOUBY, Orsolya DALNOKI,
Philippe MARINVAL, Meral TURGAY & Angela SCHLUMBAUM

Six charred or waterlogged archaeological samples of *Vitis vinifera* seeds from France and Hungary were tested for the PCR amplification and the characterisation of microsatellite markers. In two waterlogged and one charred sample, the markers VV2S, ZAG21 and ZAG62 were found. Through comparison with a microsatellite database of modern cultivars the Hungarian *Vitis vinifera* sample from the Roman site Aquincum Kaszásdülö (2nd - 4th cent. AD) was assigned with high probability to Italian and Croatian populations based on three microsatellites. In the two samples from France two microsatellites were amplified, which were sufficient to narrow down the regional provenance. The *Vitis vinifera* from a Greek city in Marseille (5th cent, BC) were assigned with high probability to Austria/Germany and to a lesser extent to Croatia. The ones from an Iron Age site at Gailhan (5th cent AD) originated with higher probability from France than from either Austria/Germany or Italy. These preliminary data show that microsatellite sequences of archaeological *Vitis vinifera* seeds can be used to investigate the origin and history of ancient cultivars

NUMERICAL AND MOLECULAR APPROACHES TO THE STUDY OF PLUMSTONES (*PRUNUS*)

Antonio REALES[6], Diego RIVERA[1], Concepción OBÓN[7], Laura MARTÍNEZ[1], José Antonio PALAZÓN[8]

Correct identification of plant remains in archaeological findings is essential for a better archaeobotanical reconstruction and insight. Numerical Taxonomy can help improve the capability of identification by providing with appropriate data about the diversity of a given botanical group and the relevant characters to be taken into account. Regarding plum stones (genus *Prunus* section *Prunus*), a deep morphological study has been carried out in order to select highly informative characters of the stones surface for a taxonomic classification of plum species. Both living specimens and archaeological samples have been studied, belonging to 11 species of plums (*P. domestica*, *P. salicina*, *P. cerasifera*, *P. insititia*, *P. spinosa*, *P. ramburii*, *P. divaricata*, *P. ursina*, *P. brigantina*, *P. sogdiana*, *P. ussuriensis*), and one species of cherry (*P. avium*) used as outgroup. DNA extraction has been attempted in a selection of both types of material, in order to compare morphological and molecular markers.

Numerical Taxonomic Analysis has been performed using *R* package. Concerning the molecular aproach, chloroplast DNA has been amplified and sequenced for a phylogenetic analysis with PAUP.

Concerning archaeological material, stones from Central European sites have been studied that were tentatively assigned to *P. spinosa, P. insititia, P. domestica* and *P. cerasifera.* The same set of characters used for recent stones have been measured in archaeological samples. A combined multivariate analysis of recent and ancient material was performed.

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PAST CLIMATE AND AGRICULTURAL WATER MANAGEMENT IN THE MEDITERRANEAN INFERRED FROM STABLE ISOTOPE DISCRIMINATION IN ARCHAEOLOGICAL PLANT REMAINS

J.L. ARAUS[9], J. BORT[1], J.P. FERRIO[10], J. VOLTAS[2] & R. BUXÓ[11]

In this presentation, we will discuss how the study of stable isotopes on plant remains (charcoal, seeds) can provide valuable information about climate and crop water status. From such kind of data, it is possible to get a picture of water availability and its management in the beginnings of agriculture, when any other data is not available. Thus carbon isotope discrimination ($\Delta^{13}C$) from wood remains may help to reconstruct changes in various climatic variables, including humidity and precipitation. Similarly $\Delta^{13}C$ from fossil seeds provides information on the water status during critical periods of the crop, and serves to elucidate whether climatic (i.e. natural) or anthropogenic (e.g. through irrigation) factors are involved. Due to the strong dependence under Mediterranean climate condition of grain yield to water conditions, $\Delta^{13}C$ of fossil grain may also provide an indication of crop yield in the past. Information on other stable isotopes such as oxygen, although more preliminary, may provide insight on air temperature, therefore complementing information from $\Delta^{13}C$. Different case studies using remains recovered from different archaeological sites in the Near East and Iberian Peninsula will be presented.

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INFERRING CROP SOWING REGIME AND CULTIVATION INTENSITY: ISSUES OF TAPHONOMY

Amy BOGAARD, Glynis JONES & Michael CHARLES

The seasonality (autumn or spring sowing regime) and intensity (e.g. 'garden' or 'field scale') of crop cultivation relate to a range of archaeological concerns, including the productivity, location and organisation of crop production. Previous work by Jones (1992) suggests that crop processing significantly reduces the ratio of root/row-crop 'garden' weeds (Chenopodietea) to winter field weeds (Secalinetea) through the sequence, from winnowing to fine sieving. Whereas the general phytosociological groupings of Chenopodietea and Secalinetea could relate to cultivation intensity and/or to sowing regime, recent work on modern weed floras using functional autecology has identified distinctive weed characteristics associated with different sowing regimes and cultivation intensity levels (Jones et al. 2000; Bogaard et al. 2001). The aim of this paper is to consider how far crop processing can be expected to bias the representation of these functional weed characteristics, with particular reference to two commonly represented crop processing stages, fine sieve products and by-products.

A NEW ANALYTICAL APPROACH TO THE EVOLUTION OF ARABLE SYSTEMS? PARSIMONY ANALYSIS OF ENDEMICITY APPLIED TO ARCHAEOBOTANICAL WEED FLORA

Dorian FULLER[12]

This paper will explore an analytical technique, new to archaeobotany, that has the potential to provide insights into broad patterns in the evolution of arable ecology and the diffusion of arable species, especially arable weeds. Parsimony Analysis of Endimicity (PAE) is an analytical approach that has been employed in zoogeography increasingly over the past 15 years, as well as in paleontology. Rather than cluster analysis or multivariate analysis by conventional means it uses a cladistic approach, of grouping datasets into an explicit historical tree based on parsimony. Its potential strength lies in the potential to cope with datasets of very different sampling and recording, as it relies on presence/ absence data. A first application of this approach will be presented on the basis of data compiled from a wide swathe of the Old World, based on selected archaeobotanical datasets across Europe, the Near East, Egypt, North Africa and northern India, from the Neolithic to the Roman period. This analysis will be aimed at eludicating patterns of regional "endemism" in weed flora development through time, as well as periods and directions of major weed diffusion. Rather than explaining patterns in the evolution of arable environments this technique should highlight key regions and periods in which important changes in arable ecology occurred in Eurasia/North Africa, and which require further focused local analysis.

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DISTINGUISHING DIFFERENT CROP HUSBANDRY PRACTICES USING WEED FUNCTIONAL ECOLOGY

Glynis JONES, Mike CHARLES, Amy BOGAARD & John HODGSON

Potentially, the weed species in ancient crop samples can act as indicators of past crop husbandry practices. This is because husbandry practices, to a large extent, determine the ecological conditions in which the crops grew. Phytosociology and autecological indicator values both have drawbacks in this respect as they rely primarily of field observations and are concerned with the where plants grow (and what they grow with) rather than the ecological reasons for why species occur where they do. Functional ecology on the other hand is concerned with the plant characteristics which enable a species to thrive under particular ecological conditions and so provides a means of understanding the relationship between these conditions and species occurrence.

By measuring the functional attributes of weed species associated with a range of different crop husbandry regimes (different levels of irrigation, fallowing and rotation; intensive and extensive methods of cultivation; spring and autumn sowing), it has been possible to identify species that belong to different 'functional types' each with their own shared suite of adaptive characteristics and each characterising a different set of husbandry practices. These studies have also demonstrated the complexity of the ecological relationships between weed species and their environment. For example, similar attributes may be indicative of different practices (if these practices create similar ecological conditions) and species may adapt to particular conditions in different ways. In addition, the interaction of ecological factors and the inherent characteristics of some functional types have unpredicted effects on the relationship between husbandry practices and weed composition.

FROM WEEDS TO WORLD TRADE: LOCATING ANCIENT WHEAT FIELDS AND TRACING 7TH CENTURY BCE TRADE PATTERNS WITH WEED ASSEMBLAGES

Ehud WEISS[13] & Avraham FAUST[14]

The Philistine city of Ashkelon, situated on Israel's southern shoreline, was destroyed by the troops of the Babylonian king Nebuchadnezzar in 604 BCE. Beside reconstruction the ancient diet by its plant assemblage, we employed the weed species not natural to the Ashkelon area as markers for locating wheat fields farmed in the city's hinterland. We found that a portion of the wheat came from the east, as far away as the Judean Hills and the northern Negev; while another portion was shipped from the northern part of the country. The identified plant remains agree well with our knowledge of 7th century B.C.E. Ashkelon as a major commercial center. It also indicates the sweep of activities related to the storing of food before the city came under Babylonian siege.

Triggered by the find of Judahite wheat in Ashkelon, and of other archaeological, historical, economical, and political data, we reconstructed the 7th century regional economy, in light of Von Thunen's model and the local geographical conditions.

Ashkelon was at the heart of the local economic system, its immediate vicinity was used mainly for the production of the most profitable economic activity of the time – wine. The Shephelah, farther to the east and best represented by Ekron, was used mainly for the production of olive oil. Judah and Negev were the third and fourth circles of production (grains and grazing). The growing needs for these products being the reasons behind Judah's expansion to these, previously un/under-exploited regions. The driving force behind this complex economic system was the Phoenician maritime trade, transporting merchandises to the Egyptian market.

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GENERAL VIEW OF PLANT DOMESTICATION AND CULTIVATION IN WESTERN ASIA

Diego RIVERA[15] & Concepción OBÓN[16]

West Asia is the cradle of a particular type of spring-crop agriculture based on winter and spring growing cereals and pulses. The importance of this centre of origin and diversity is recognised since the seminal work of A. De Candolle, which was followed by Vavilov, Harlan, etc. The area is referred in the literature under different names: Fertile Crescent, Levant, West Asia, Near East. This ambiguity is not only terminological, as a concept it behaves as a "Black Hole", because depending on the matter it is expanded by the authors to include the Mediterranean (not only Eastern) or even Central Asia. expThe preexistence of a substantial number of wild species of Gramineae, Leguminosae and others was crucial for the start and development of agriculture here.

This area received transcultural influences (techniques and germplasm) from abroad in different periods historic and prehistoric. Those from Central Asia (fruit crops), Caucasus and Pontus (potherbs), Mediterranean and East Africa / Arabia are especially relevant.

When comparing the ethnobotanical and archaeobotanical data available for the area stretching from Eastern Mediterranean to the deserts of Iran and from the Caucasus - Caspian Sea to the Arabia Desert coincidences and contrasts are detected that merit further investigation from a multidisciplinary approach.

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THE DISTRIBUTION OF WILD CEREALS AND THEIR DOMESTICATION IN THE NEAR EAST

George WILLCOX[17]

Archaeobotanical data from charred plant remains recovered by flotation show that, at early farming sites in the Near East, the inhabitants took into cultivation local wild cereals growing near the sites rather than introducing “cultivars” from a “centre of origin”. This conclusion is based on the fact that, during the early 10th millennium (BP non cal.), each region had a specific cereal assemblage which coincides broadly with the modern distribution of wild cereals that we see today. Morphological domestication (appearance of a semi-solid rachis) appears at different times during the 10th and early 9th millennia when, in each region, these same cereals present the first signs of domestication. This shows that there was at least one independent domestication event for each of the four cereal taxa (barley, emmer, einkorn and rye).

Thus in the southern Levant region, where only barley and emmer occur naturally, it is not surprising to find evidence that they were domesticated there, while rye (although probably much later) and einkorn, absent in the south, were domesticated in the north. Barley and emmer occur in both areas, and indeed may have been domesticated more than once. These conclusions are supported by evidence from DNA analyses of modern populations as well as by the archaeobotanical data.

In some cases the nearest wild cereals may have been collected at some considerable distance from the sites. For example, sites such as Zad 2, Mureybet, and Jerf al Ahmar occur well outside the natural habitats of progenitors and in areas where they could not have appeared naturally, even taking into account climatic change. This implies the importation and/or introduction from the region of their original habitats. The first diffusion of cultivars from areas where cultivation and perhaps domestication, was already established can be seen at late 10th millennium sites on Cyprus, and at the same time in the Euphrates valley where emmer appeared at Dja’dé.

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GILGAL I: RECONSTRUCTING THE EVOLUTION OF DOMESTICATED FIG (*FICUS CARICA*)

Anat HARTMANN[18]

The inhabitants of Gilgal I (10,000-9,700 BP uncal.), a PPNA site at the Jordan valley, Israel, were hunters-gatherers. No fragments of domesticated plants have been found at this site or at similar sites from this period.

Several broken fig fruits were found at Gilgal I. They are the oldest figs found to date in archaeological excavations. Even in diggings from later historic periods, the majority of the fig finds are nutlets and not fruits. Fertile nutlets were found that contained young embryos. We concluded that these figs were borne on female trees. However, an examination of the internal side of the ostiole in one of the fig fruits revealed that there was no trace of male flowers where these should have been found. This phenomenon is compatible with the domesticated figs of today.

We suggest that the wild fig was trioecious and contained trees that bear syconia with only female flowers, as well as trees which bear bisexual syconia. The figs from Gilgal thus represent a new variety, a wild female fig that we intend to name *F. carica* var. *foemina* (var. nov.).

F. carica var. *foemina* may therefore be regarded as the missing link between *F. carica* var. *caprificus* and *F. carica* var. *domestica*. This new variety bearing wild female figs facilitates the understanding of the transition from wild to cultivated figs.

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BRONZE AND IRON AGE AGRICULTURE IN SYRIA: A VIEW FROM THE PLANT REMAINS

Alexia SMITH

Many studies have examined ancient agriculture in Syria, but most of these have concentrated on the beginnings of farming. Our understanding of Bronze and Iron Age agriculture is more fragmented than that of earlier time periods, yet the nature of subsistence patterns forms a dynamic component of economies within complex societies. While relatively little attention has been paid to post-Neolithic agriculture, sufficient site-based archaeobotanical studies have been conducted to begin looking at regional patterns in cultivation in Syria during the Bronze and Iron Ages. In this paper, I present preliminary results from my analysis of plant remains from Tell Qarqur, a multi-period site that lies on the Orontes in northwest Syria, and then consider these results in a broader regional context, providing an overview of the available data. A synthesis of published archaeobotanical data from Bronze and Iron Ages sites in Syria is presented, together with a brief discussion of the advantages and problems of synthesizing published data.

EPIPALAEOLITHIC PLANT ECONOMY IN SW-ANATOLIA: THE EXAMPLE FROM ÖKÜZINI CAVE

Danièle MARTINOLI[19]

The cave sites of Öküzini and Karain B in southwest Anatolia were both recently re-excavated after about 30 years of inactivity. Both yielded traces of Epipalaeolithic occupations dated between 16.500 to 12.000 uncalBP, respectively around 17.000 uncalBP. Simple flotation methods have been used to recover for the first time, for that period and area, fragile organic remains for purpose of archaeobotanical analyses, but also for dating and anthracological investigations.

This paper will focus on the seeds, fruits and other plant parts found, apart from wood. Their identification showed that the inhabitants of both caves used wild plants like nuts (including *Amygdalus*, *Pistacia* and *Quercus*), fruits (including *Pyrus*, *Vitis*, *Rosa*, *Crataegus*) and underground organs, assumingly in priority for food. These resources were easy to collect, fairly predictable, partly ready for consumption and storable. Some of them would need processing to become palatable. Their contribution to the diet will be discussed according to current nutritional knowledge and ethnological parallels. The variations among the plant finds observed throughout the occupation levels, as well as seasonal data from the plants (and bone) remains, enabled us to make hypotheses about the subsistence and settlement patterns.

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A COMPARISON OF EARLY NEOLITHIC CROP AND WEED ASSEMBLAGES FROM THE LINEARBANDKERAMIK AND THE KARANOVO CULTURE: DIFFERENCES AND SIMILARITIES

Angela KREUZ[20], Elena MARINOVA[21], Eva SCHÄFER[1], Julian WIETHOLD [1]

The spread of arable and stock farming reached Central Europe during the second half of the 6th millenium cal BC. The earliest agricultural finds are of the Early Neolithic Linearbandkeramik culture (LBK). Archaeological and botanical evidence points to Western-Hungaria as the centre of its origin. This Hungarian LBK culture was strongly influenced by the preceding Starcevo-Köros-Cris complex of Eastern Hungaria, Serbia and Romania.

The first "station" of the spread of early agriculture on its way to Central Europe *outside* the Mediterranean is represented by the Karanovo culture (about 6.000-4.900 cal BC) in Bulgaria. Probably the early agricultural system brought in from Greece and Turkey has been adapted to the European climate here. New archaeobotanical evidence is now available from modern excavations of this area. It allows for the first time to compare agricultural data from the Early-Neolithic Karanovo I/II culture of around 500 years *before* the beginning of LBK, with those of the Late-Neolithic Karanovo IIIetc. and the contemporaneous LBK culture in Germany and Austria.

Some aspects concerning the importance of the crop species and the possible origin of the potential weeds will be considered as signals for different agricultural systems.

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THE DEVELOPMENT OF NEOLITHIC AGRICULTURE IN NORTHERN AND CENTRAL ITALY: NEW DATA

Mauro ROTTOLI[22]

Over the past years, archaeobotanical research has allowed to modify the different hypothesis and theories on the origins and development of agriculture in Italy.

The period between 1971-1987 witnesses the beginning of major research into the subject. Even if, at the time, data were very scarce, researchers suggested an early neolithization of the most southern part of the Italian Peninsula starting from Puglia, and a slow acculturation phase which involved the Mesolithic population from northern Italy. Whereas southern Italy showed a well-developed agriculture characterized by barley (*Hordeum vulgare*), emmer (*Triticum dicoccum*), einkorn (*Triticum monococcum*) and naked wheats (*Triticum aestivum/durum)*, the northern part witnessed a slow introduction of barley, emmer and einkorn. Naked wheats turned up only later on. On the other hand, the role of legumes for the whole of the Italian Peninsula remained unknown

In a later phase (between 1988-2000), new archaeobotanical data from north-eastern Italy together with the growing number of C-14 dates from the area have opened new avenues for research. In fact, based on the available data, scholars have suggested an early and very rapid neolithization of northern Italy. Although there are a few differences regarding quantity of cereals cultivated, a clear similarity between agriculture from both the northern and the southern part has been recognized. Free-threshing wheats appear well represented in northern Italy from ca. 6500 BP and the role of legumes starts to become more comprehensible. Conversely, the numerous findings of hazelnuts, previously interpreted as an evidence of the continuity between Mesolithic and Neolithic, start to loose importance.

During the last few years, a more detailed analysis of the data suggests a common substratum for all the peninsula but, once more, it also highlights the differences between north and south and the eastern and western coasts. What is more, it becomes clear that there are also regional differences throughout the Neolithic period. Data are still limited to describe these differences and to be able to match both agricultural aspects and cultural processes. New excavations and more systematic sampling will certainly help to throw some light into the origins and development of agriculture in Italy.

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THE SPREAD OF AGRICULTURE IN NORTHERN IBERIA

Leonor PEÑA-CHOCARRO[23] & Lydia ZAPATA PEÑA[24]

Although analyses of plant macro-remains are still very scarce in the North of the Iberian Peninsula, recent archaeobotanical data allow us to readdress traditional assumptions. Coastal northern territories in Iberia have traditionally been considered culturally marginal and isolated. It was assumed: a) a continuity between the Mesolithic and the Neolithic, with a long duration of hunting-gathering practices, and b) a difficulty in the adoption of cereal agriculture due to the geographic conditions which would be more appropriate for pastoralism. Historical and ethnographic information along with archaeobotanical data have only recently started to reject these assumptions. Recent bioarchaeological information shows that domestic elements, both plants and animals, were present by the coast of the Bay of Biscay from at least c 5200-4700 cal BC. First agriculture here still shows a delay when compared to other Iberian regions but this might only be due to the lack of archaeological information for the VI millennium cal BC. There might have been a long period, during the Vth millennium cal. BC where wild resources –red deer hunting, molluscs and plant gathering- play an important role in human subsistence. The Chalcolithic sees an increase on the frequencies of cultivated plants which is tentatively connected to a progessive agricultural development.

We will readdress basic questions about the chronology and significance of early agriculture in this region under the light of new archaeobotanical data from: a) the cave of El Mirón (Cantabria) in the northern Atlantic Valleys and b) Los Cascajos (Navarre), an open air site in the Upper Ebro Valley.

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NEOLITHISATION IN CENTRAL SPAIN, THE CASE STUDY OF AMBRONA, PROV. SORIA

Hans-Peter STIKA[25]

The small village of Ambrona, close to Medinaceli on the river Jalon, is well known as a Palaeolithic site where early humans hunted Interglacial wood elephants, a species which has become extinct. Since the late nineties, field campaigns has been started by the Departamento de Prehistoria de la Universidad de Valladolid and the German Archaeological Institute, Madrid, excavating several Neolithic sites there. C-14 dated with carbon from pine and deciduous trees, the sites “La Lámpara” and La Revilla del Campo” are very old, dating around the middle of 6th millennium cal BC. The collective grave mound of “La Peña de la Abuela“ dates around 4000 cal BC and is definitely much younger than the early Neolithic sites. Archaeobotanical sampling was carried out on a large scale. In 5600 litres of sediments, only 2689 finds of botanical remains (including 267 imprints in ceramics and daub fragments) were determined of which 508 derived from cultivated plants. In the early Neolithic settlement sites *Triticum monococcum* and *T. dicoccum* were found as charred grains and chaff as well as imprints of both. Single finds of two rachis fragments were determined as *Hordeum vulgare*. One seed of *Papaver somniferum* s.l. (La Lámpara) and two capsule fragments of *Linum usitatissimum* (La Revilla del Campo) were unearthed in early contexts. The ceramics from “La Lámpara” were intentionally tempered with chaff from hulled wheats as well as some fragments of daub from “La Revilla del Campo” site. The few finds of wild plants are referring to poor sandy soils, the former conditions around “La Revilla del Campo” seems to have been better than around “La Lámpara” site. The collective grave mound of “La Peña de la Abuela“ has not shown any finds from cultivated plants. Finds of more than thousand needles of pine trees (*Pinus* sp.), dozens of cupulae of oak (*Quercus* sp.), and one seed of juniper (*Juniperus* sp.) might indicate green burial gifts.

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ORIGIN AND DOMESTICATION OF THE OLIVE TREE IN SOUTHERN SPAIN

Mª Oliva RODRÍGUEZ-ARIZA[26] & Eva MONTES MOYA[1]

Remains of *Olea europaea* in archaeological contexts in the south of the Iberian peninsula can be found from the Epipalaeolithic levels of Cueva de Nerja (10.860±160 BP). The massive occurrence of charcoals and sometimes seeds after the Copper Age in coastal areas of the southeast suggests that the species was part of the Thermomediterranean vegetation level, and that it has been harvested since then. However, Olea does not occur in Mesomediterranean level until Roman times. Olea charcoal and stone remains become widespread after the Ist ct. A.D., associated with structures for their transformation to oil.

The frequent occurrence of remains (charcoals and stones) of olive trees, wild or not, in Roman sites of Andalusia provide a significant number of samples. Stones from four archaeological sites, 3 Roman and 1 Calcolithic, were used for identification of wild and cultivated varieties. A reference checklist of wild olive (*Olea europaea* var. *oleaster*) endocarpics from 6 different points in the province of Jaén was previously collected. Each was measured for variables like lenght and width, and surface and shape indexes. These proved useful as measurement variables and also as a reference of the shape and surface. The archaeological samples were also measured and the results were analysed statistically for comparison with the ones in the checklist.

The resulting figures indicate that the wild olive endocarpics and the Roman endocarpics differ, although not significantly. The Calcolithic samples are clearly of wild olive tress. We therefore believe that an intermediate variety of olive tree was cultivated in the Ist ct. A.D. in the south of the Iberian peninsula. The variety was still not fully cultivated and thus lacked some of the features expected from cultivated varieties, but it no longer was a wild variety either, that is, it was a cultivated variety still genetically close to the wild variety.

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THE HISTORY OF RESEARCH ON THE ORIGIN OF CULTIVATED BARLEY

Mordechai KISLEV[27]

The search after the first cultivated plant species, as well as the where and when of the beginnings of agriculture, has been less than 200 years in progress. In the beginning of the 19th century, the origin of most of our cultivated species was unknown. In 1807, Alexander von Humbolt (1807, p. 28) candidly expressed the level of scientific knowledge: “The origin, the first home of the plants most useful to man, and which have accompanied him from the remotest epochs, is a secret… We do not know what region produced spontaneously wheat, barley, oats and rye.”

Later, in the mid-1800s, Alphonse de Candolle summarized the advances in the field and noted that 44 edible species out of 196 cultivated plants of the Old World should be regarded as of very ancient cultivation (more than 4000 years). Half of them were annuals, including barley, wheat, one-grained wheat, spelt and millets, but they did not include oats and rye. Later he added that: “At the present day… we know at least most frequently, from what country they first came.” (Candolle, 1855, p. 986f; 1886, pp. 436-450).

Nikolai Vavilov (1926) further developed these investigations in theory and practice. “The problem of origin,” he wrote, “was usually solved with reference to the whole plant or to all its species and genetic groups – to all cultivated barleys, flaxes, oats, etc. The home of the cultivated barleys would be the Abyssinian mountains and SE Asia.”

Hans Helbaek (1953) processed early Neolithic botanical material from Jarmo, Iraq and stated that: “Wheat and barley were the first cereals to be cultivated.”

During the lecture I would like to discuss why barley was the best candidate as the first cultivated crop.

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GRAIN STORAGES IN THE HITTITE CAPITAL BOGAZKÖY

Reinder NEEF

Boğazköy (Hattuscha) lies ca. 150 km east of Ankara in the heart of Anatolia. From the 17th to the 12th century BC it was the capital of the Hittite kingdom, which was than one of the main powers in ancient west Asia. During the excavations at Bogazköy in 1998/1999 a large storage complex from the 16th century BC was excavated. This building is around 118 m long and between 33 and 40 m wide. The complex has a total of 32 almost rectangular rooms/silos, measuring about 13-16 m by 6 m, which are lined up in two rows of 16 rooms each. The stone-based loam walls of the complex are up to 1.5 m thick and reach a height of 2m. Most of the complex must have been subterranean. A total of 7000-9000 m³ of grain could be stored in the building. Twelve storage rooms were destroyed by fire and in at least five rooms still large quantities of carbonised grains were preserved. In the excavated parts of the building a total of ca. 4 tons of carbonised material was systematically sampled. Four rooms contained two-rowed hulled barley (*Hordeum distichum*) and one room mainly einkorn, (*Triticum monococcum*) stored as spikelets (one- and two-seeded form). In the silos still layers of 0.8 to 1.2 m of grains were preserved. The soundings and corings in the silos showed that probably several hundreds of tons of grains are still buried, but they will stay there for the next generations.

The preservation of the material reaches from white ash to a minor fraction of remarkably well preserved material of einkorn spikelets or hulled barley grains with many weed diaspores. In the case of einkorn it is interesting to notice in terms of taphonomy, that the bulk of the material was less good preserved, consisting of mainly loose grains, spikelet forks, glume bases and a few badly preserved weed diaspores.

In the many cuneiform texts found, Hittite agriculture is barely referred to. The king was in absolute power, with a large class of nobles and dignitaries, possessing large manors, each with a contingent of paysants, who held their tenements on condition of payment of rent in the form of labour or products, like grain. The material in this, probably royal, storage building is very homogeneous. After the analysis of many sub-samples nothing points to imports from different climatic regions and one can argue that the grain stored represent the taxes of the paysants, who had their fields in a wide range around the city.

CROP HUSBANDRY IN EARLY BRONZE AGE GAZA. FIRST ARCHAEOBOTANICAL RESULTS FROM TELL ES-SAKAN

Margareta TENGBERG[28]

The site of Tell es-Sakan is located 5 km south of the present city of Gaza and immediately to the north of the small river with the same name. After a short first season of soundings, large-scale excavation was carried out at the site during the autumn 2000 by a French-Palestinian team under the direction of P. de Miroschedji and M. Sadeq. The levels exposed through three trenches (A, B and C) date to two distinct phases of the Early Bronze Age, covering almost a millennium (*ca* 3300-2300 BC). The first occupation, entirely Egyptian in nature, was followed, after a period of abandon, by a settlement belonging to a local Canaanite culture.

The archaeological project at Tell es-Sakan includes, alongside other environmental studies, an archaeobotanical investigation aiming at reconstructing both the natural environment of the site and the exploitation and use of wild and cultivated plant resources during the two distinct occupational phases.

During the first season of excavation, a little more than 2800 litres of sediment were floated, resulting in 210 samples. The totality of the botanical material is carbonised and mostly in a good state of preservation. Contrary to the assemblages from many other sites in the Near East, charcoal was virtually absent from the samples, thus consisting of almost «pure grain». This phenomenon and its possible causes will be considered in the paper.

The main cereal taxa found on the site is hulled barley (*Hordeum vulgare*), followed by emmer wheat (*Triticum dicoccum*). Several pulses are also identified, notably lentil (*Lens culinaris*), pea (*Pisum sativum*), chick-pea (*Cicer arietinum*) and horse-bean (*Vicia faba*).

The importance of the «classical» Mediterranean fruit species - fig (*Ficus* sp.), grapevine (*Vitis vinifera*) and olive (*Olea europaea*) – seems to increase during the Canaanite period. The presence of grapevine is particularly interesting and can be related to the numerous Palestinian wine jars found both in Egypt and at Tell es-Sakan. Indeed, Gaza has been renowned since antiquity as an important wine-producing area.

Finally, much more numerous than any of the cultivated taxa in practically all the samples are the remains of several species of wild Poaceae and Fabaceae. The reasons for their massive integration in the archaeobotanical samples will be discussed.

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MISSING PLANT MACROREMAINS AS INDICATORS OF PLANT EXPLOITATION IN PREDYNASTIC EGYPT

Ahmed Gamal-El-Din FAHMY[29]

Rhizomes, leaves and mericarps are underrepresented plant remains in most archaeological sites whether due to their tissue softness or small size and fragility. Remarkable preservation status of organic material retrieved from archaeological sites in arid regions across the world, e.g. Egypt, increases the possibility to screen such missing botanical material. The more resilient and hard cereal refuses, drupes, seeds and grains are frequent within most archaeological records.

Significance of the Predynastic period (5000 - 3000 BC) in the Egyptian history is attributed to its crucial role in the development of Egypt before emergence of the Pharaonic civilization.

The present study will discuss results of analysing contents of a basket recovered within the context of cemetery HK 43 in Predynastic Hierakonpolis in Upper Egypt (3600 BC). It was placed next to the hands of burial 333.

Botanical contents of the basket are remains of sedge tubers (*Cyperus*), dill mericarps (*Anthemis graveolens*) and drupes of balanites (*Balanites aegyptiaca*) as well as narrow slivers of coniferous wood and other types of plant remains. In addition, archaeological artifacts found inside the basket includes a pallet, a needle, combs, and small statues. In terms of palaeoethnobotanical investigations, the major question to be answered in this paper is what could this basket present and represent for our knowledge. To answer this question, ethnographical parallels from Africa and Arabia as well as translated papyrii of ancient texts will be used. Also, the study suggested that the inhabitants adopted a subsistence strategy based on cultivation of cereals and gathering of wild fruits and tubers as well as herding of livestock.

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GRAIN VERSUS CHAFF: IDENTIFYING A CONTRAST BETWEEN GRAIN-RICH AND CHAFF-RICH SITES IN THE NEOLITHIC OF NORTHERN GREECE

Soultana-Maria VALAMOTI

Recent archaeobotanical investigations of Late Neolithic sites in northern Greece has revealed a pattern as regards the crop parts represented at each site. Some sites appear to be dominated by chaff, mainly glume wheat chaff, while other sites are mainly characterised by grain, cereal and pulse. This pattern could be the outcome of various factors: a. post-depositional (e.g. erosion, type of features sampled), b. depositional and therefore related to the type of activity represented at the excavated contexts and the use of space in relation to plants, c. pre-depositional (e.g. differential treatment of crops selecting for one category of plant remains to arrive at the site). These alternative factors are considered in light of the preliminary results of the archaeobotanical investigation of nine Late Neolithic (5500-4500 BC) sites from northern Greece.

It is suggested that the type of plant remains represented at the different sites is not an outcome of sampling biases or erosion, but a reflection of particular uses of space involving plants (storage, processing/food preparation, refuse disposal). These particular ways of organising space in relation to plant use is related to aspects of the socioeconomic organisation of the settlements. Thus, the archaeobotanical evidence is placed in the wider context of discussion concerning settlement type, economy and society during the Late Neolithic in Northern Greece.

BURNT SACRIFICIAL OFFERINGS AT HELLENISTIC MESSENE, PELOPONNESE, GREECE

Fragkiska MEGALOUDI[30]

The ancient city of Messene situated on the highlands of Messenia, on the SW slopes of mountain Ithome, was one of the best fortified sites of the Greek world. The city was funded in 369 BC by Epaminondas, after the liberation of Messenia from Spartan rule.

During the 2001 campaign large numbers of carbonised fruits were recovered from a sacrificial context, dated to the end of the 3rd century BC. The fruits did not occur in vessels or storage pits, but were picked up, by the archaeologists, from the exposed surface when they were observed with the naked eye. This material, although haphazardly collected, is very rich thanks to the remarkable preservation of the plant remains.

Cones and seeds of stone pine (*Pinus pinea*), olives (*Olea europaea*), grape (*Vitis vinifera*) and whole almond nuts (*Amygdalus communis*) were present in the samples. A particularly interesting find was the presence of 5 whole chestnuts (*Castanea sativa*): the species is recorded for the first time archaeobotanically in Greece; it is also the oldest archaeological evidence of its presence in Europe.

The Messene finds shed new light to the composition of sacrificial offerings and provide for the first time sufficient information of the rituals that took place on the site.

In this paper, the symbolism of plants in sacrificial contexts will be also discussed.

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ARCHAEOBOTANICAL ANALYSIS OF PREHISTORIC MATERIAL FROM HOTNITZA, NORTH BULGARIA

Tzvetana POPOVA[31]

Carbonized plant material from the Hotnitza settlement tumulus dated back to the Eneolithic period has been examined.

The archaeobotanical material consists of charred fruits and seeds, charred wood fragments, burnt parget from lodgings walls and floors. The amount of the material is enormous. The major cultivated plants have been: *Triticum monococcum*, *Triticum dicoccum*, *Hordeum vulgare* var. *nudum*; of the leguminous cultivated plants *Vicia ervilia*, *Lens culinaris* have been found.

Based on all of the examined material we come to the conclusion that the entire set of cultivated plants is characterized by its resistance to various ecological conditions. We should underline that polyculture farming was practised in the Hotnitza settlement during the Eneolithic period.

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THE PLANT ECONOMY OF TELL KARANOVO IN THE CONTEXT OF THE BRONZE AGE IN SOUTH-EASTERN EUROPE

Elena MARINOVA[32]

Tell Karanovo is one of the most important for the studies of prehistory of Bulgaria and to some extend of the adjacent regions site. Its is situated in the Thracian plain in the southern part of the country.

The only archaeobotanical evidence from the Bronze Age of the Tell till the recent study was from a storage find. The here presented results are based on the archaeobotanical study of collected during the excavation seasons 2002 and 2003 archaeobotanical material by means of flotation of about 600 l sediment from 8 archaeological context belonging to the last third of the Early Bronze Age in Bulgaria (ca. 2800-2650 BC).

The studied settlement layers are rich in remains of cultivated and wild plants. From the cereal crops the prevailing is the einkorn (*Triticum monococcum*) followed close by the quite numerous and typical for the European Bronze Age barley. In Tell Karanovo the prevailing is the hulled barley (*Hordeum vulgare* var. *vulgare*). The emmer (*Triticum dicoccum*) is frequent but usually presented with few grains. No sure evidence of spelt and naked weeds were found till now.

The dominating pulse crops are bitter vetch (*Vicia ervilia*) followed by the lentils (*Lens culinaris*). The pea (*Pisum sativum*) and grass pea (*Lathyrus sativus/cicera*) are presented with few seeds.

In a big (26 m long) apses house numerous finds of (*Carthamus* sp.), a potential oil and dyeing plant, were established. They are too fragmentised to be determined more precisely.

Considering the obtained results it seems that there is no great change in the composition of the cultivated plants in tell Karnaovo between the Late Chalcolithic and the Early Bronze Age.

The comparison with the sites in other Early Bronze Age sites in Thrace and surrounding regions it seems that the results from Tell Karanovo fit good in the general picture for the Early Bronze Age agriculture.

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WELLS FROM THE LATE ROMAN IRON AGE AND THE EARLY MEDIEVAL PERIOD IN HOSTIVICE NEAR PRAGUE, CZECH REPUBLIC: COMPLEX ARCHAEOBOTANICAL STUDY AND REFLECTION OF LOCAL LANDSCAPE DEVELOPMENT

Jaromir BENES[33], Veronika KOMÁRKOVÁ[1], Katerina MIKOLÁSOVÁ[1] & Tomas KYNCL[34]

In the year 2002 and 2003 nine late prehistoric and early medieval wells were investigated during rescue activity in Hostivice near Prague airport under leading of archaeologist I. Pleinerova and P. Sankot. Wells represent good possibility for complex paleoenvironmental investigation. Wood as construction material was well preserved, allowing dendrochronological measurement. Three of wells from the year 2002 were synchronised only and dated by AMS 14C between 250-584 AD. Two wells, excavated in the year 2003, were absolutely dated due to standard chronology of South Germany (B. Becker). The oak wood for well 2534 was felled 271/72 AD and oak wood for well 2562 was felled down after 686 AD. Results of dendrochronology is very value for the Czech Republic, because before this dating dendrochronology went back at the year 539 AD only. Infillings of wells are suitable material for studying macro and micro-remains. Analysis of macro-remains provided around 130 taxa of about 11 000 diaspores. The anthropogenic component contains wide sortiment of useful plants like cereals, fruits, and some oil-and fibre-yielding species. Amount of diaspores of cornfield and garden weeds was found as well. The natural component represented by ruderal plants, species of drier habitats, grassland and forest vegetation, but mainly species of swamp communities. Result shows, that there were no differences between layers in a specific well and therefore it seems, that they were filled quickly with relatively homogeneous material. Also pollen analysis has been done. Resulting pollen spectrum shows similar trends as analysis of macro-remains. Pollen analysis enables reconstruction of surrounded vegetation in larger scale.

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EXOTIC SPICES AND RICE (*ORYZA SATIVA*). FAR-DISTANCE TRADING PRODUCTS IN NORTHERN GERMANY. ARCHAEOBOTANICAL RECORDS AND WRITTEN SOURCES OF MEDIEVAL AND EARLY MODERN TIMES

Julian WIETHOLD[35]

During the last ten years urban rescue archaeology made huge progress, especially in the former Hanse-towns Rostock, Greifswald and Stralsund in Mecklenburg-Vorpommern, north-eastern Germany. Archaeobotanical work focused on several medieval and early modern latrine fillings which provided extraordinary well preserved subfossil plant material. Remains of rice and imported exotic spices like pepper (*Piper nigrum*), cardamom (*Elettaria cardamomum*) and melegueta-pepper (*Aframomum melegueta*) are giving evidence of the far-distance trading contacts of these important harbour towns at the Baltic.

The paper will present the recent archeobotanical evidence of these expensive trading products in northern Germany, especially Mecklenburg-Vorpommern. One of the key questions for further interpretation is: Were these products available to everybody or can we connect their records to households of higher social status and economic power? The social status of households, streets or complete town quarters can only be traced by interdisciplinary archaeological research. Household inventories, tax and warehouse lists, pharmacy offers and early cookery books provide additional information on the trade, handling and use of these imported products. The economic value, far-distance trading connections and the different use of rice and imported exotic spices for human alimentation will be discussed, based on archaeobotanical, archaeological and historical sources. Nevertheless, also the different local development of urban archaeology, the preservation of the plant remains and determination problems of small chopped or chewed remains may have influenced the archaeobotanical evidence.

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THE HISTORY OF AGRICULTURE OF THE COVERSAND AREA WEST OF BREDA (PROV. NORTH BRABANT, THE NETHERLANDS)

Laura I. KOOISTRA[36]

Botanical research at archaeological sites west of Breda (The Netherlands) yielded much information on landscape and land use between 2000 BC and AD 1500. Palynological research has indicated that the deforestation of the coversand area started already in the beginning of the Bronze Age (approx. 2000 BC). Nevertheless patches of woodland extended until the Early Medieval Times. On contrary to results found elsewhere in the coversand area in the southern part of the Netherlands the earliest heathlands did not occur until Early Medieval Times. In Late Medieval Times (from AD 1100) the influence from the sea becomes apparent. The occurrence of parsley water-dropwort (*Oenanthe lachenalii*), sea arrowgrass (*Triglochin maritima*), and marine mites confirms the historical data already known.

The picture about agriculture is to a very large extent based on analyses of the plant macro remains. The late prehistoric agriculture does not differ from that of the other research regions in the coversand area. During the Bronze Age barley (*Hordeum*) and emmer wheat (*Triticum dicoccon*) was grown, whereas during the Iron Age millet (*Panicum miliaceum*) and spelt wheat (*T. spelta*) were also cultivated. Spelt and millet disappeared again during the Roman Period. The agriculture during the Roman Period closely resembles the one during the Late Iron Age. No typically Roman indicators have been found, as elsewhere in the Roman frontier province of *Germania inferior*. Agriculture during the Early Medieval Times differs fundamentally from that during the Roman Period. Rye (*Secale cereale*) then becomes the most important crop (grown as winter crop). During the Late Medieval Times an increasing amount of arable weeds of the *Sclerantho annui-Arnoseridetum* appeared. This indicates an increasing intensity of land use. Around AD 1500 the arable fields were permanently in use, almost exclusively for growing rye. Fertilization in this period has only been achieved by organic material. Plaggen soils did not exist yet.

[36] BIAX *Consult*

FARMING ON SAND, FARMING ON LOESS: A COMPARISON OF MEDIEVAL CROPS FROM THE SOUTHERN NETHERLANDS AND NORTHERN FRANCE

Corrie BAKELS

In this contribution some twenty rural sites will be presented. All of these are situated in the former realm of the Franks or early kingdoms and principalities arisen from this realm. The period covered is the sixth to thirteenth century AD. Some sites lie on sandy soils, others on loam, mainly loess. The kinds of crops grown are related to the type of soil. The ultimate aim of our investigation is to find out to what extent the difference in crops has affected the social development of the two regions.

HANSA-NETWORK PROJECT

THE HANSA-NETWORK PROJECT: DESIGN AND REALIZATION

Sabine KARG[37], Terttu LEMPIÄINEN[38], Kari HJELLE[39], Karin VIKLUND[40], Sirje HIIE[41], Ülle SILLASOO[42], Almuth ALSLEBEN[43], Joanna JAROSINSKA[44], Monika BADURA[45], Malgorzata LATALOWA[9]

Keywords: Northern Europe, Medieval Age Period, Trading activities, Food supply, Archaeobotany.

A new network of scientists working with archaeological finds of food remains from the Medieval age and Hanseatic period (13th - 17th century AD) has been established in 2001 at the Natural Science Unit of the Research Department of the National Museum of Denmark and by finacial support of the Nordic Council of Ministers. During the last 10 years extensive research on plant remains from many different archaeological excavations of the above mentioned time has been carried out in the countries around the Baltic Sea (Northern Europe). But most of the research activity has been performed in isolation in each respective country and the resulting data has rarely been compared and never synthesized. The need of a network was therefore obvious. All these countries were influenced during the Middle Ages and the Early Modern times by the Hanseatic League, a confederacy of traders originating from Germany. The huge datasets of archaeobotanical research from each country deliver the basic informations about the nutritional habits of the local inhabitants. Which plants were cultivated, how important was the use of wild species? But also which foodstuffs were already imported from foreign countries. Extensive information about the activities of the Hanseatic traders is available from archaeological and historical research. The main goal of the Hansa-network project is to combine the knowlegde from the different sources and to connect the changes in nutrition revealed via archaeobotanical research with the influences of imports by the Hanseatic League. This totally new multidisciplinary approach will also enable to answer the question whether the imported goods were accepted by the local people and how they were integrated in their daily menu. Acceptance or refusal of innovations reflects the openness of a society towards the outside world, but may also reveal the need to satisfy specific requirements and demands. By publishing the newly created knowledge we hope to promote a better and deeper understanding of the culture and society of the participating countries.

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HANSA-NETWORK PROJECT

ARCHAEOBOTANICAL APPROACH TO HANSEATIC FOOD INVESTIGATION IN ESTONIA

Ülle SILLASOO & Sirje HIIE

The main contribution of archaeobotanical investigation into the research of Hanseatic food is that it offers physical evidence of plants involved in the consumption. This evidence always slightly different from written evidence since the particularities of the sources. Archaeological evidence proves the importance of rye and barley as the main staples, because only these grain storage deposits have been found from medieval towns. Some staples of secondary importance have been discovered including buckwheat, millet, lentils and beans. Millet was imported and not cultivated as well as rice. Concerning vegetables, according to written sources, onions reached the uppermost importance. Its cultivation as well as the cultivation of many Mediterranean vegetables in medieval Livonia was certainly promoted by the trade activities of Hanseatic merchants. Other influences appeared in food market when political situation changed at the end of the period. Spices and their use are best documented in written sources, and archaeobotanical data only offer a few more names. We suppose that the consumption of poppy and hemp seeds in late medieval Livonia food is something characteristic to Hanseatic period. Concerning archaeobotanical data, wild fruit was consumed three to four times more than cultivated fruit. Supposedly, wild berries and nuts were something less depending on bad harvests than fruit that cultivation was restricted to small garden areas. Written sources mention the use of imported dried fruits such as dates and raisins in festive meals; figs, instead, were representative gifts of ambassadors together with spices. In archaeological deposits figs appear to form a part of the general middle-and upper class food. The Hanseatic trade certainly influenced the food consumption in towns, but it also left its traces on the rural population, as much manorial landlords and the network of “friends” (“söbbers”) among peasants are concerned.

HANSA-NETWORK PROJECT

GARDENS AND ORCHARDS IN GDANSK (N POLAND) FROM THE 15TH TO THE 18TH CENTURY IN THE LIGHT OF ARCHAEOLOBOTANICAL AND HISTORICAL DATA

Joanna JAROSINSKA[46], Dagmara MACIOCH, Monika BADURA,
Joanna SWIETA, Malgorzata LATALOWA

Throughout the 15th to 18th centuries garden planning in Gdansk played an important role in the development of the urban landscape as well as in the social and artistic life of its citizens. Written sources include descriptions of location, owners, structure and function of gardens and orchards in the town and its vicinity. Moreover they yield information on garden plants both native species as well as imported ones.

Archaeobotanical investigation in Gdansk started in 1998. The analysis of botanical materials, dated to the 15th-18th centuries, coming from various archaeological features excavated in different parts of the town has revealed the presence of 115 species of cultivated plants. Local cultivation of 53 of those taxa are confirmed by written sources. Among them vegetables, spices and plants producing edible fleshy fruits are the most numerous. Some species represent medicinal herbs and ornamental plants.

Worth mentioning is the presence of remains of exotic species which have been cultivated by monks and well-off inhabitants of the town. These are *Capsicum annuum*, *Cucumis sativus*, *Juglans regia*, *Morus alba*, *Persica vulgaris*, *Vitis vinifera* and *Ficus carica* which is reported in written sources to have been given fruits. The development of gardening of exotic species was supported by the world-wide contacts within the Hanseatic League.

The archaeobotanical and historical data enable us to study development of horticulture in Gdansk through the centuries.

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BREWING IN ENGLAND FROM THE ROMAN PERIOD TO THE BLACK DEATH: A REVIEW OF THE ARCHAEOBOTANICAL EVIDENCE AND WRITTEN ACCOUNTS

Gill CAMPBELL

Archaeobotanical evidence for brewing comes in two forms:

1) Deposits of malted cereal grain, where many of the grains show evident signs of germination, with the sprouts reaching over half the length of the grain.

2) Detached sprouts and chaff ('comings') which can represent the remains of the waste produced by the removal of the sprouts and chaff from the malted grain.

Records of these types of assemblages dating from the Roman through to the medieval period are reviewed. Problems of interpretation and bias in the record are discussed.The types of cereal grain, and other plant remains found archaeobotanically are compared with written sources.

The evidence suggests that spelt wheat (*Triticum spelta* L.) was the only ceral grain used to make been in the Roman period, where as by medieval times a wide range of cereals and other 'seeds' were being used.

FODDER AND LITTER EXAMPLES IN THE ROMAN SITE « LE MARAIS DE DOURGES », FRANCE

Marie DERREUMAUX

The romano-gallish relay of Dourges (France, Nord-Pas-de-Calais) allows us to study an archaeological fodder example.

The cereals (bread wheat and emmer) form 26% of the sample. Most of these grains show evidence of germination, which can be the germ itself or its print on the back of the grain. To obtain germinated grains, the cereals had to be humidified.

The rest of the sample is made of by-products of the crop treatment. Firstly, the components coming from the cereal treatment represents 66% of the whole; they are emmer glumes, bread wheat rachis, beard of either and autumn germinating weeds. The beard's presence determines from which step of the treatment the by-products are issued: the first threshing-winnowing. Secondly, residues from the leguminous plant treatment (peas and lentils that were probably intended for human consumption) complete the sample.

These by-products of the crop treatment must have been soaked with the cereal to make them more easily digestible.

The great food value of this fodder and some archaeological evidences found on the site make us believe that this blend was intended for horses, animals whose alimentary canal is quite delicate.

Then, another sample, coming from a burnt building, thought to be a stable, has been studied. The sediment where the botanical remains have been found forms the ground of this structure made of light materials. Horse's hooves are print in this stratigraphic unit. This is this archaeological context that leads us to identify the botanical remains as litter. Indeed, animals are not let to trample on their fodder, as it is laid on the ground only during meal time.

However, the ingredients of this sample, being too full of cereal do not suit with a litter. We have 60% of cereals (emmer), 32% of crop treatment by-products including small size grains (6%), chaff (19%) and weeds (7%), and with an added 8% of straw. But the preservation state of plant remains could solve this problem. Indeed, the grains show an important degradation due to the charring, incompatible with the presence of fragile components as glume and spikelet bases. The cereal could come from of stock of grain located on top of the stable which fell down on the ground during the fire. As the hooves 'print don't cover the entire floor, it might have been difficult for the diggers to distinguish the different burnt layers. The cereals could also come from dung but most of them are still complete and don't seem to have been chewed and there is too many of them for dung.

A BURNT GALLO-ROMAN BAKERY IN AMIENS, SOMME (FRANCE)

Philippe MARINVAL

Key Words:

Gallo-Roman, carpology, bread, bakery, Somme, France

Summary:

During the excavations of a Roman house (*domus*) in the city of Amiens (Somme-France) several levels destroyed by the fire, dated from the end of IIth century after Christ, were discovered in one outbuildings of the dwelling.

This building corresponds to the particular bakery of the house which included in particular: a domestic oven, a grindstone with grains. The burnt levels delivered great quantities of carbonised seeds. The carpological analysis showed that the samples were essentially, constituted by spelt (*Triticum spelta*).

Some hulled barley (*Hordeum vulgare*) also appeared like some pea seeds (*Pisum sativum*). The cereals were obviously threshed and winnowed carefully, very few chaffs remain. The grains, undoubtedly, were also sieved. Besides the traces of a sieve made in wood were found (single discovery in the Roman world!).

Bakery also provided about ten carbonised breads whose three specimens are well preserved. We could study their composition (analyses biochemical) like their technology.

These breads are of a very great technical quality comparable so that one can make best today. The know-how of the bakers of the time is completely remarkable.

EXCEPTIONAL PRESERVATION OF ROMAN PLANTS FUNERAL OFFERINGS FROM MARTRES-DE-VEYRES SITE (PUY-DE-DÔME, FRANCE)

Manon CABANIS & Philippe MARINVAL

Key Words:
Burial, roman time, plants offering funeral, Puy-de-Dôme, France, palaeoetnobotany

Martres-de-Veyres site in Puy-de-Dôme (France), excavated by Audollent in 1929, have revealed six roman wood coffins. These burials are dated IInd and IIIrd century after Christ. The organic artefacts attracts attention because of a very good preservation: “body, textile, hair, woods, seeds and fruits”. Some seeds like coriander (*Coriandrum sativum*) conserved smell traces. These preservation conditions would be linked to strong carbonic gases emissions in this volcanic region.

The topic of this communication is the revision of the presentation of vegetal origin food offerings. No paleoetnobotanist has analysed these botanic rests.

Four graves out of six would have been containing plants remains. A cup with walnuts (*Juglans regia*) and nuts (*Corylus avellana*), a grape (*Vitis vinifera*) and apples or pears (*Malus* spp. or *Pyrus* spp.) in a wicker basket; a vase with aromatic corianders (*Coriandrum sativum*), a black ceramic vase with tartlet or apple compote, a cup with nuts, grape and little apple or little pear, a medlar (*Mespilus germanica*) bowl and an apple in the young buried woman’s hand have been found.

We have been able to revise, deepen, verify and replace this rich assemblage of taxons in a regional and national context. This discovery permits to dispose informations about the funeral plants offerings. We will be able to compare theses offerings in burials and in cremations. So, history of belief and mentality will be tackled.

PLANT REMAINS FROM THE BELL BEAKER VILLAGE OF CORTAILLOD / SUR LES ROCHETTES-EST, SWITZERLAND

Örni AKERET

Bell Beaker remains are found in an area from Portugal to Poland, and from Morocco to the British Isles. Despite its wide range, this Late Neolithic period is still largely unknown from an archaeobotanical point of view. Therefore the discovery of the village of Cortaillod/Sur Les Rochettes-Est raised hope to find out more about this time. The excavation produced the ground plans of seven houses. Archaeological material was only conserved in postholes. These were systematically sampled for macrofossils. 5080 carbonised plant remains could be identified. The composition of the cereal spectrum is dominated by hulled wheats and notably by spelt. *Triticum spelta* is absent or very rare in nearby sites of the region of the preceding archaeological period (Auvernier cordé). This raises the question, where that cereal species came from.

THE SPICE TRADE

Marijke van der VEEN

The import of spices and other food plants from South-East Asia and the Far East into Europe started in the Roman period with the establishment of two ports on the Red Sea coast of Egypt (Quseir and Berenike). Both functioned as ports for the trade with India and beyond, Berenike during the Ptolemaic to late Roman period and Quseir during the 1st-3rd and 12th-15th centuries AD. New foodstuffs such as black pepper, rice, coconut, cloves, nutmeg and ginger made their way to Europe via these ports. The analysis of the plant remains from Quseir is part of a wider research project starting in Leicester ('Long-Distance Trade and Agricultural Development') that will record and analyse the introduction of exotic foods into Europe during the Roman and medieval periods and analyse the differential access to these foods enjoyed by different groups of the population. The programme will include the construction of a database of published archaeobotanical records for exotic food plants in the Mediterranean, North-West and Eastern Europe dated to the Roman and medieval periods (c. 100 BC - AD 1500). Assistance will be requested from colleagues in these regions.

CHARRED PLANT REMAINS OF A ROMAN SETTLEMENT (LATE EMPIRE PERIOD) FROM CENTRAL ITALY

Laura SADORI[47] & Francesca SUSANNA[1]

The site of La Fontanaccia (Allumiere) is located 50 km northwest of Rome, few kilometres from the Tyrrhenian sea, in a hilly landscape of volcanic origin, at an altitude of around 600 m a.s.l. The investigated settlement of Late Roman Empire Period consisted in a very simple house with one single room built using an old wall of a previous luxurious villa of the Early Roman Empire Period.

The historical background of the site refers to the well known economical-political crisis of the late Roman Empire Period, also due to the continuous barbarian invasions from either north or south, from either sea and land. Just in the years of the settlement of La Fontanaccia, archaeologically dated at the half of V century A.D., Vandals, coming from Africa, invaded the region of Rome, landing in the Tyrrhenian coast in 455 A.D. and provoking misery and famine through fires and pillage.

It is not possible to state if the fire which destroyed the hut was accidental or caused by invaders.

The macroremains are mainly legumes and cereals; seeds of *Lathyrus sativus*, of *Vicia faba*, caryopses of *Hordeum distichon*, *Triticum aestivum* s.l. have been identified. Many entire acorn kernels and acorn cotyledons and few grapevine pips complete the list of seeds and fruits.

The analysed charcoals, used both for the hut structure and furnishings, allowed the reconstruction of the environment, a mixed-oak forest with deciduous oaks and other mesophilous elements as the identified wood are of chestnut, elm, and maple. Palynological data of the period indicates that forests with deciduous oaks prevailing were widespread, while chestnut, favoured by prehistoric populations since about one millennium B.C. culminated during the Roman Period and Middle Ages.

The finding of oak acorns, of primitive barley caryopses, of small horsebean seeds, and of a big amount of grass pea seeds, confirms the well known regression and state of misery in which the late Roman Empire populations used to live.

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STORING FOOD IN CAVES DURING LATE BRONZE AGE IN SOUTHERN FRANCE. PRODUCTS, AGRICULTURAL AND SOCIAL IMPLICATIONS

Laurent BOUBY[48]

Carbonized fruits and seeds have been recovered in many occasions from prehistoric caves of Southern France. Large concentrations of seeds have sometimes been regarded as underground vegetal food storages. Unfortunately, most of these sites have been anciently studied: sampling and methodologies are not always perfectly suitable to analyse the nature of the archaeobotanical assemblages and the ancient agricultural and crop processing practices.

Samples were available to reconsider two of these caves dated from the late Bronze Age (Bronze final II-IIIa), Baume Layrou (Trèves, Gard) in the southern margin of the Massif Central, and Balme Gontran (Chaley, Ain) in the south of the Jura mountain, near the Rhône river.

In spite of the lack of sampling strategies we intent to characterize the nature and organisation of the products in the caves and the state of processing of the cultivated plants. Different plants were stored in both caves: *Hordeum vulgare*, *Panicum miliaceum*, *Triticum dicoccum*, *T. spelta* and perhaps *T. aestivum/turgidum* and *Vicia faba* in Baume Layrou, at least *P. miliaceum* and *T. spelta* in Balme Gontran. Other domesticated plants are probably only contaminants.

It is argued that if the stored millet grains were hulled, other cereals were largely threshed and dehusked, especially hulled wheat species, even if small storages of hulled grains possibly existed also for the same species. Caves do not appear to be very favourable to store cereals, especially dehusked grains. In Baume Layrou, a small proportion of the grain germinated during storage.

Considering archaeobotanical evidence and other archaeological information we raise the question of the nature and function of such storages during late Bronze Age.

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SOME ASPECTS OF THE FARMING FROM EARLY MEDIEVAL SITES IN MEDITERRANEAN FRANCE.

Marie-Pierre RUAS[49]

This paper presents a review of archaebotanical finds (seeds and fruits) in some early medieval sites, which are located in the Mediterranean area of south France (Low-Languedoc, Roussillon, Provence and Corsica). Studies of carbonized seeds and fruits assemblages show that the main plants cultivated between the VIth and Xth centuries are *Triticum aestivum l. s.* and *Hordeum vulgare*. *Avena sativa* appears in the third place of the cereals. *Secale cereale* and *Panicum miliaceum* are sporadically founded. Species of hulled wheat oft are not clearly identified (*T. dicoccum/spelta and T.* cf. *monococcum*). Besides cereals pulses (*Vicia faba* var. *minor, Pisum sativum*, *Lathyrus cicera*) and flax (*Linum usitatissimum*) are locally more or less attested. Since the end of Roman period seeds of *Lens culinaris* became rarely present in the sites and never numerous. *Cicer arietinum* occurs limited in assemblages of this area. Fodder could be attested by residue of processing crop (chaff cereals and weeds) and perhaps by pulses as *Vicia sativa* (one record) or mixture with cereals (oat ?).

Vitis vinifera is the most common fruit of the medieval french sites as well at the previous centuries. But written sources from Catalunya or Languedoc and preventive archaeological excavations indicate that the form of its culture had changed with regard to the Gallo-Roman period. Others species of fruits are few represented (*Olea europaea, Prunus dulcis, P. domestica, P. avium* and *P. cerasus, P. persica, Pinus pinea,Morus nigra, Ficus carica, Juglans regia*…). The nature of activities of inhabitants in the excavated part of the sites is probably the cause of the poor representation of this group in the find. Remains from weed flora compared with written sources light the agricultural pratices.

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ROMAN AND ISLAMIC PLANT REMAINS FROM THE CITY OF LLEIDA (CATALONIA, SPAIN)

Natàlia ALONSO[50]

The urban archaeological excavations carried out in Lleida city (western Catalonia, Spain) have allowed us to coordinate an interdisciplinar project focused on the ancient landscape, agriculture and feeding of the area. Although it is admitted that the place was inhabited at least since the iberian period (*Iltrida*), the urban structure appears for the first time documented in the Roman time (*Ilerda*). Afterwards the city became an important Islamic town (*Medina Larida*). In this paper we will present the results of the archaeobotanical study of seeds and fruits of this project, focused on the Roman and Islamic stages of the city, between Ist century B.C. and XIth century A.D., with around ten systematically sampled archaeological interventions.

With regard to the Roman period most of the remains of seeds and fruits recovered corresponds to levels of filling and rubbish dump, which have an heterogeneous origin, principally domestic but also agricultural, especially in marginal zones of the city. The cereals identified as the principal crops are mainly naked wheats (*Triticum aestivum/durum*) and hulled barley (*Hordeum vulgare*). This characteristic follows the guidelines already known during the recent Prehistory of the area and also is in concordance with the data of other deposits of the same period in the western Mediterranean. The punctual presence of other new cereals as rye (*Secale cereale*) is also observed from the c. IIIrd A.D. Some pulses go with these cereals, as lentil (*Lens culinaris*) and horse bean (*Vicia faba*), but both in little quantity and frequency.

The importance of vineyard (*Vitis vinifera*) and fig (*Ficus carica*) is also worth highlighting. They have a very high frequency, similar or superior to that of cereals, and also a considerable quantity of remains. Their role in Roman diet and also in agriculture is important because they have been identified also in charcoal and palinological analyses. This spread of the vineyard culture, as well as also in certain degree of arboriculture, reflected by some seeds of apple (*Pyrus malus*) and of peach (*Prunus persica*) is one of the basic contributions from the Roman world to the protohistoric agriculture of western Catalonia.

During the Islamic period there is a great quantity of crops identified. As cereals, apart from hulled barley and naked wheats, we should also add compact type (*Triticum aestivum/durum* type *compactum*) and millet (*Panicum miliaceum*). Lentil is also documented and is important the increase of the fruit species: melon (*Cucumis melo*), walnut (*Juglans regia*), almond (*Prunus dulcis*), and the already known as for instance grape, fig or apple, some of them recovered now in big quantities. Flax (*Linum usitatissimum*) and false flax (*Camelina sativa*) have to be added also, as well as celery (*Apium graveolens*), fennel (*Foeniculum vulgare*) and stone pine (*Pinus pinea)*.

It is important to consider the increase of cultivated and consumed plants which contrasts clearly with the known ones for the previous periods in western Catalonia, during which cerealistic agriculture had prevailed until the Roman time.

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THE BROAD *SPECTRUM* REVOLUTION, THE EVIDENCE FROM THE PLANT REMAINS

Ehud WEISS[51]

The beginning of agriculture is considered one of the most important developments in the course of human history with enormous consequences, paving the way for settled life and ultimately complex society. It is not surprising than that the last 40 years have seen extensive research into the origins of agriculture. Much of it has been stimulated and guided by the "broad spectrum revolution" (BSR) hypothesis proposed by Kent Flannery (Flannery 1969). According to the BSR the transition from foraging to farming entailed a period during which foragers broadened their resource base to encompass a wide array of foods that had not been used in earlier periods. However, nearly all BSR hypothesis-inspired research has focused on animal rather than plant foods, since bone perseveres so much better than plant materials. This paper is an effort to balance our picture of the broad spectrum with a botanical perspective. We will show here that a new approach to the analysis of botanical remains from the recently excavated Upper Palaeolithic discovered site Ohalo II, and comparing its results with other well-known Early Neolithic sites a major diet shift is evidenced between two periods of human history. The reliance on caryopses of small-grained grasses as major food article during the Upper Palaeolithic was abandoned in favor of large grain cereals that became the subject of domestication during the Early Neolithic.

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[51] Harvard University

POST-HARVEST INTENSIFICATION AMONG LATE PLEISTOCENE HUNTER-GATHERERS OF SOUTHWEST ASIA: PLANT-FOOD-PROCESSING AS A CRITICAL VARIABLE IN THE ECONOMIC AND SOCIAL SHIFTS THAT LOOK PLACE DURING THE EPIPALAEOLITHIC (20.000-10.250 BP UNCAL)

Michèle WOLLSTONECROFT[52]

This paper discusses food processing as a significant influence on the changes in hunter-gather settlement, subsistence and social systems that took place during the Epipalaeolithic of Southwest Asia. It argues that developments in food processing and preservation methods in this period constitute *postharvest intensification*. It discusses postharvest intensification in terms of the conditions, technology and knowledge necessary to convert raw plants to edible and/or storable crops, and/or to convert individual plant parts into several different forms of food. This paper further proposes that our definition of *food production* be revised to include hunter-gatherer innovations in the processing and preservation of wild edible plantes.

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WATER PLANTS AS A FOOD RESOURCE FOR ANCIENT MAN AT GESHER BENOT YA'AQOV

Yoel MELAMED

Many remains of edible seeds and fruits from the Lower Paleolithic period were found at the archeological site in Gesher Benot Ya'aqov, Israel. The material was contained in a sequence of lake sediment aged between 700 and 800 thousand years B.P. The exposed lake-sediment formation, known as the Benot Ya'aqov formation, follows the banks of the Jordan River between the Golan Heights and Korazim. The exposed layers of this formation contain remnants of the human Acheulean culture.

Remnants of 59 edible taxa were identified, 11 of which are immersed or floating water plants: *Ceratophylum demersum, Euryale ferox*, *Myriophyllum spicatum, Nuphar luteum, Nymphaea alba/candida, Potamogeton crispus, P. distinctus*, *P. pectinatus, Najas delilei*, *Trapa natans* and *Sagittaria* cf. *sagittifolia*. These species supply several types of vegetative foods (some of them supplying more than one type). These include nuts (2), rhizomes (7), leaves and young shoots (7), and seeds (1). These water plants, together with another 11 species living in wet habitats that surrounded the Hula Lake, were an attractive source of vegetative food.

During the dry season the range of available plant food was reduced and humans had to find an encampment that would be accessible both to sites of plant food as well as to those of hunting. During the summer, men inhabiting the Benot Ya'aqov site enjoyed a rich plant diet that included water species as well as swamp species. Availability of plant food during the entire year helped human maintain a balance between his consumption of meat and of plants. The site area was a constant source of vegetables, especially starch-rich roots, and was an attractive place for both humans and animals during the dry period. The importance of the site is apparent from the recurring presence of humans for tens of thousands of years. It was, in a way, a permanent site of activity, at least during some part of the year, probably during the summer and autumn months.

LALLEMANTIA, AN IMPORTED OIL PLANT IN BRONZE AGE GREECE?

Glynis JONES & Soultana VALAMOTI

This paper reports on seeds of *Lallemantia* sp. found at Bronze Age sites in northern Greece. At several of these sites, the seeds were found in significant concentrations in storage contexts, suggesting that they were deliberately stored for use by the inhabitants. Oil from the seeds of *Lallemantia* can be used for a variety of purposes, including food, lighting and medicine. This genus is not native to Greece, the nearest modern occurrences being in Turkey and the Ukraine from where it extends further East as far as Iran. To date, it has not been found in Neolithic deposits in Greece, despite significant archaeobotanical research, especially in northern Greece. This suggests that it first appeared in Greece in the Early Bronze Age, and indicates long distance contacts with communities to the east or north at this time. It is difficult to establish whether its continued use indicates that seeds of this species were repeatedly brought into Greece throughout the Bronze Age or that the species was introduced in the Early Bronze Age and then locally cultivated. The presence of seeds, however, may suggest that *Lallemantia* was locally cultivated, as it would have been perfectly possible to import it in the form of oil. The appearance of a new import or introduction at this time adds to the evidence for external contact in the Early Bronze Age.

FEEDING THE TOWN: ARCHAEOBOTANICAL EVIDENCE FROM THE COMPLEX OF THE GIZA PYRAMID BUILDERS

Mary Anne MURRAY

In an area of low desert about 400 meters south-southeast of the Sphinx, excavations by the Giza Plateau Mapping Project (Univ of Chicago/Harvard Univ) have uncovered the worker's settlement associated with the building of two of the three monumental Pyramids at Giza, those of Khafre (2520-2494 BC) and Menkaure (2490-2472 BC). The site is dated to the 4th Dynasty of the Old Kingdom and spans some 75 years of the Pyramid building complex. The 5,500 square meters of the site excavated so far comprises bakeries, silos and other storage facilities, four sets of long galleries and their associated gate houses, a hypostyle hall, a manor house, three main streets, a royal administrative building and a settlement known as the Eastern Town. In all, about twenty distinct areas of the site have been distinguished.

To date, approximately 1600 archaeobotanical samples have been analysed from across the Giza complex. The results from the site overall and many of the areas will be discussed, as will their interpretation, in terms of the main goal of the project, which is to uncover evidence of the social and economic structures that supported the Giza Pyramid building complex.

RECONSTRUCTING THE ICEMAN'S LAST JOURNEY

Klaus OEGGL[53]

Since more than ten years the incomparable discovery of a Neolithic human body in the glacier region of the Tyrolean Alps represents a challenge for archaeological scientists. The excellent preservation of the body with all his weapons and many artefacts establishes a possibility not only to get a very detailed insight into parts of the daily life during the Neolithic period, but also to find explanations for this sensational find assemblage in such a remote area. Since the very beginning the enigma - what was the Iceman doing on a glacier and how did he perish - were central matters for the scientific community. Recently the radiological-forensic finding of an arrowhead in the left shoulder region of the mummy adds new facts about his fate and suggests that his death appears to result from a vascular injury of the missile (Gostner & Egarter-Vigl 2002). This discovery of the arrow head with the fresh wound in his left shoulder supports also the "disaster" hypothesis, which places the isolated find in a social context. It says, that the Iceman returning from the high alpine pastures to his native village came into a severe conflict with his kinship group that he had to flee from his community to the highland pasture regions familiar to him (Spindler 1996). Most of this explanation is based on pure speculations, but recent investigations compile more and more details about the life circumstances of the Iceman and attach more importance to this theory. Another latest published paper confirms not only Ötzi´s southern origin, but also sheds new light on the migrations of the Iceman by isotopic tracing (Müller et al. 2003). The Sr-Pb-O isotopes indicate that he was born in a more eastern area than he was found: near the confluence of the Eisack and Rienz, and only his adulthood he spent in the lower Vinschgau and Etsch valley. The study deals mainly with long-term migrations of the Iceman, but also considers short-term movements, such as the Iceman was involved in transhumance between valley bottom sites and high altitudinal ones (Bortenschlager 2000). Whereas the isotopic composition of the Iceman's enamel and bone represents a long-term signal, a proxy signal for his very short-term movements is needed to elucidate the events of the Iceman's last days. Such a short-term proxy is enclosed in the food residue of the Iceman's gut: airborne pollen is consumed unintentionally during the ingestion. This so-called background pollen reflects the environment, in which the eating took place. By serial sampling of food residues from different locations of the digestive tract a chronology of events is gained. The results of these analyses and the consequences for the interpretation of the complex find assemblage are given.

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SUBSISTENCE STRATEGIES IN THE ALPINE AREA DURING THE BRONZE AGE

Alexandra SCHMIDL[54] & Klaus OEGGL

Recent archaeobotanical investigations contribute essential information to the knowledge of subsistence strategies and husbandry regimes in the Alps during the Bronze Age. The extensive data sets of charred seed assemblages derive from two new reference sites: Ganglegg, located south of the main Alpine range, and Friaga, situated north of the main Alpine range, both hilltop settlements. The principal crops are hulled barley (*Hordeum vulgare*), emmer (*Triticum dicoccum*), broomcorn millet (*Panicum miliaceum*) and horse-bean (*Vicia faba*). Beside these field crops also wild plants were still gathered and contributed considerably to the daily diet. This implies a complex pattern of plant resource utilisation in the Alpine area.

In comparison with other archaeobotanical studies from contemporaneous inner Alpine settlements in Austria, Switzerland and Italy the variety and different distribution of crop plants is represented. There exist distinct differences between north and south of the main Alpine range, as well as the Eastern Swiss Alps. Emmer, foxtail millet and lentil show a pronounced preference to the South. In Northern Italy they occur much more frequently than in the other adjacent areas, e.g. the lentil is found at all only south of the main Alpine range. Broomcorn millet occurs in the whole area, but is restricted only to the low altitudes in Switzerland. These different patterns in the geographical distribution is determined by climatic and topographic factors, e.g. temperature, precipitation and elevation of arable farm land, which also have an influence in the husbandry regimes of the Alpine area.

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THE ARCHAEOBOTANICAL RESEARCH AT THE TERRAMARA DI MONTALE (1650-1200 B.C. – NORTHERN ITALY) AND ITS CONTRIBUTION TO THE ARCHAEOLOGICAL PARK

A.M. MERCURI, C.A. ACCORSI, M. BANDINI MAZZANTI, G. BOSI, M. MARCHESINI, G. TREVISAN GRANDI [55]

The “Terramara di Montale” (44°34' N; 10°55' E, 97 m a.s.l.) is one of the key sites for Bronze Age in the Po Plain. Its importance has led to set up the homonymous Archaeological Park and Open Air Museum (Director: Andrea Cardarelli), based on multidisciplinary researches. The Park covers 23,000 mq and includes the archaeological area and some exhibition structures. During the archaeological excavation, a systematic archaeobotanical research (pollen, seeds/fruits and wood/charcoal) has been carried out since 1996. Aim of the research was to reconstruct the vegetal environment and the plant-human relationship, also providing the botanical background for the Park. The present paper presents data obtained from 34 pollen samples (stratigraphic profile 1), 1.200 carpological samples and 360 xilo-antracological records. Pollen diagram (ca 200 taxa) shows, at the bottom, a thick forest with more conifers than afterwards and its decrease just before the onset of the Terramara. Then, a patchwork of mesophilous oak woods (mainly *Quercus* deciduous and *Carpinus betulus)* and open areas prevailed. A number of food plants were testified by pollen (e.g., Cerealia, *Castanea, Juglans*, *Vitis, Olea*). Seed/fruit assemblages (ca 50 taxa) were characterised by food plants, with the dominance of caryopses (mainly *Triticum* and *Hordeum*), joined by some legumes, *Cornus, Vitis* and *Quercus.* The records of *Carpinus betulus* nuts matched the pollen abundance of this tree. Wood/charcoal records (one dozen taxa) testified trees of the local vegetation (*Quercus* deciduous, *Acer, Alnus, Carpinus, Corylus, Fagus, Fraxinus, Populus, Ulmus*). *Quercus* deciduous was the prevalent wood used for the piles. Household articles and hunting instruments were made of *Acer, Corylus, Populus* and *Quercus* deciduous*.* Archaeobotanical data provided the basis to build up examples of pile dwellings and of the past cultural landscape as well as clues and materials for educational exhibition.

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SEEING SEEDS: PHOTOGRAPHY, DRAWING AND REPRESENTATION

Justine WINTJES[56]

There exists a prevailing idea in scientific circles about photography: that it is the most objective, realistic, precise, indeed scientific, way of recording and representing an object.

This idea is both easy and convenient: it is tempting to award optimal objectivity to photographic representation due to the direct physio-chemical relationship between the photographed and the film, and this concept combined with the ease with which one can simply push the shutter release to generate a detailed image in an instant makes photography a more attractive option than the laborious task of illustration.

But photography cannot replace drawing as a scientific tool. More than simply an indifferent imprint of an object in a frozen moment in time, a drawing is a process of scientific analysis, the product of which is a descriptive and demonstrative document which can constitute a more valuable tool with which to pass knowledge and experience on to others. With reference in particular to the seed analysis of a Late Iron Age site in the southern part of the Netherlands, and in general to botanical illustration, my paper will discuss the virtues of drawing as a form of scientific representation versus those of photography, and that, all the functions of drawing considered, it is in fact the more valuable and scientific of the two.

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MA Archaeological Science 2003 (Universiteit Leiden, the Netherlands)

POSTER SESSION

MONDAY, 17th May

Analytical archaeobotany		
	CHARLES, M. *et alii*	Identifying ancient land use through the functional ecology of crop weeds
	CHARLES, M., VALAMOTI, S.	Distinguishing food from fodder throught the study of charred plant remains: an experimental approach of dung-derived chaff
	CARRUTHERS, W., HUNTER, K.	The under-representation of legumes in archaeobotanical assemblages: a case study from Hamwic, a Saxon town in Southampton, Southern England
	BITTMANN, F., WOLTERS, S.	*Urtica kioviensis* Rogow – 1st fossil evidence from Brandenburg, Eastern Germany
	HAJNALOVÁ, M. *et alii*	Statistical and spatial analyses of plant macroremains from a Bronze Age settlement in Central Bohemia
	SZABO *et alii*	DNA recovery and RAPD, SSR its analysis of cantalupe (*Cucumis melo* L) from the middle ages
	GYULAI *et alii*	Ancient DNA analysis of common millet (*Panicum miliaceum* L.) from the 4th and 15th centuries
	POLLMANN, B. *et alii*	Roman fruit growing in Switzerland: ancient DNA from waterlogged *Prunus* species
	ALLUE, E. *et alii*	An interdisciplinary contribution to palaeoethnobotany: the study of the Bronze Age deposit from El Mirador (Sierrra de Atapuerca, Burgos, Spain)
	PRECIOSO, MªL. *et alii*	Numerical taxonomy applied to the study of tardo-roman olive stones in SE Spain
	FIGUEIRAL, I., JORGE, S.O.	Castelo Velho (NE Portugal): seeds of uncertainty
Gathering and Cultivation		
	SAVARD, M. *et alii*	Late Epipalaeolithic / Early Aceramic Neolithic charrd archaeobotanical remains from the Northern Fertile Crecent
	HERVEUX, L.	Preliminary results of the archaeobotanical study at Rawda, a Bronze Age settlement on the margin of the Syrian arid zone
	HALD, M.M., CHARLES, M.	Crop Storage in the Fourth Millennium B.C. at Tell Brak, Syria
	BIENIEK, A., MITKA, J.	Neolithic people in the eyes of plants (Kujawy, central Poland)
	BOGAARD, A. *et alii*	Early Neolithic crop husbandry in the Great Hungarian Plain: evidence from the Körös site of Ecsegfalva 23, Co. Békés
	McCLATCHIE, M.	Arable agricultural systems of Bronze Age Ireland
	MARTIN, L.	Plant economy of a Neolithic Alpine site: preliminary results of the archaeobotanical study of "Le Chênet des Pierres" in Bozel (Savoie, France)
	AURA, E. *et alii*	Fruits and Pulses in Santa Maira (Alacant, Spain) ca. 12.000-9.000 BP
Historical archaeobotany		
	GILES, R.J., BROWN, T.A:	The origins and evolution of *Triticum aestivum* L.
	THAW, S., BROWN, T.A.	Origins of Cultivated Einkorn
	HEISS, A., OEGGL, K.	The oldest evidence of black cumin (*Nigella sativa* L.) and its possible introduction in Europe
	CARREÑO, E. *et alii*	Paleogeography of *Vitis vinifera* s.l. and the origin of cultivar groups
	BOENKE, N.	Food and Wood - The analysis of plant remains from an Iron-age mining place
	HARVEY, E. *et alii*	Origins of Agriculture in Northern and Eastern India

POSTER SESSION

WEDNESDAY, 19th May

Historical archaeobotany

POKORNY, P. *et alii*	Archaeobotanical insight to the Life on a Prehistoric Hillfort (Vladar, Czech Republic)
POKORNY, P. , BIENIEK, A.	Massive Find of *Stipa* Macrofossils in Early Bronze Age Storage Pit in the Czech Republic: Possible Interpretation in Central European Context
KOMARKOVA, V. *et alii*	The well from Old Town of Prague: comparison of macro-remains and pollen analysis
K. BERZSÉNYI, B.	Palaeoethnobotanical Investigation of Human Activity within a Bronze Age tell settlement in Hungary. Different Crop Processing Activities at Százhalombatta-Földvár
DALNOKI, O., JACOMET, S.	Charred grain assemblages from Late Iron Age storages in Hungary
BADURA, M., ZURAWSKI, Z.	Plant remains from the roman age site in Tczew, N. Poland
BIENIEK, A. *et alii*	Plant remains found in the medieval layers of the new archaeological site from Kraków, Poland
LEMPIÄINEN, M.	Archaeobotanical investigations in Late Iron Age and Medieval Inhumation cemeteries in Finland
BENDING, J.	The Norse settlement of the North Atlantic Islands - Waterlogged plant macrofossils from archaeological and environmental sites
BRINKKEMPER, O. *et alii*	Rare and luxurious food plant remains from the Netherlands in medieval and subrecent contexts, with a focus on identification criteria
MÄRKLE, T.	Medieval latrines from Überlingen, Lake Constance
CARRA, L.	Agriculture and subsistence economy in the Reggio area during prehistory: A preliminary Palaeo-ethnobotanical study of the Neolithic settlement at Bazzarola (Reggio Emilia, Italy)
COTTINI, M.	Food plant offerings in Northern Italian necropolis between the Iron Age and the Roman period
LUCIANI, P.	Food remains from the “House 2” of the Etruscan-Celtic settlement of Monte Bibele, a Palaeoethnobotanical study
BOSI, G. *et alii*	The plant remains from the Etruscan-Celtic village (IV-IIth cent. B.C.) of “Pianella di Monte Savino” -Monte Bibele (Northern Italy)
MATTERNE, V.	Funeral burnt offerings from the Vesonii tomb at the Porta Nocera, Pompeii: First Results
CASTIGLIONI, E., RETTORE, E.	The presence of *Cicer arietinum*, *Vigna unguiculata* and *Lathyrus sativus/cicera* in Medieval Italy
MOTELLA, S., LEONI, L.	Agriculture and diet at the Medieval site of Peveragno loc. Castelvecchio (Cuneo, Italia)
BOSI, G., MAZZANTI, M.B.	Seeds and fruits of Ferrara (Northern Italy) from Medieval to Reinassance age (X-XVI cent. AD)
SCHAAL, C.	A Neolithic house and seed accumulations ? Archaeobotanical study of station 19 layer HK of Chalain (Jura, France).
PREISS, S. *et alii*	Archaeobotanical study of a gallo-roman necropolis at Faulquemont (Moselle, France)
RUAS, M-P. *et alii*	Crop storage practices in a granary of the XII th century in South-West France
ALONSO, N.	Crop evolution at the basin of St. Cugat Stream (Cerdanyola del Vallès, Barcelona) between 2000 ANE and c. VI A.D.
LÓPEZ-SÁEZ, J.A. *et alii*	The wild olive (*Olea europaea* susp. *europaea* var. *sylvestris*) in the C-W of the Iberian Peninsula during the neolihic times:a pluridisciplinary approach
CAPPARELLI, A. *et alii*	Introduction of European crops (wheat, oat and peach) in Andean Argentina during the 16th century: archaeobotanical and ethnohistorical evidence

	OLISZEWSKI, N.	Archaeobotany of Archaeological sites from Northwest Argentina (200-500 AD)
	AALTO, T.	The Plant Macrofossils from the Pre-Columbian sites in the Bolivian Amazonia
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	RÖSCH, M., FISCHER, E.	Human diet and land use in the time of the Khans – Archaeobotanical research in Qara Qorum, Mongolia
	KAJALE, M.	Palaeoethnobotany of Mahurjhari and its Significance for Farming System in Central India
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POSTERS ABSTRACTS

IDENTIFYING ANCIENT LAND USE THROUGH THE FUNCTIONAL ECOLOGY OF CROP WEEDS

Mike CHARLES, Glynis JONES, Carol PALMER & John HODGSON

A study of weed functional ecology in relation to present-day traditional crop cultivation methods has demonstrated that different cultivation practices can be distinguished on the basis of weed functional attributes. Following from this research, work is underway to measure and create a database of functional attributes for c. 400 of the weed species which occur in archaeobotanical samples throughout Europe and Western Asia, and to investigate geographic variability in weed functional ecology. The resulting database will allow archaeobotanists to interpret their data using functional ecology.

This poster displays the functional attributes that are measured, their ecological significance and their relationship to the habitat condition created by different cultivation practices. The weed functional types which characterise different practices, and the suites of attributes they possess, are also displayed.

DISTINGUISHING FOOD FROM FODDER THROUGH THE STUDY OF CHARRED PLANT REMAINS: AN EXPERIMENTAL APPROACH OF DUNG-DERIVED CHAFF

M.P. CHARLES & S. M. VALAMOTI

Distinguishing food from fodder in the archaeobotanical record is a particularly difficult task. To a large extent these categories are culturally defined and therefore not self explanatory from the plant species represented in archaeological samples, while context, such as storage area or container is not necessarily distinctive for each category. Grain can be consumed as either food or fodder, depending on the particular needs of a given society. Chaff on the other hand, by being something unsuitable or less suitable for human consumption can be considered more appropriate for other uses, fodder being one of them. The presence, among the archaeobotanical assemblages from three Late Neolithic sites in northern Greece (Makriyalos, Arkadikos and Makri), of glume-wheat chaff, in samples representing in all likelihood the remains of dung, called for the investigation of the origin of this chaff: a. whether it had been mixed with dung in order to form dung cakes or as spent fuel, or b. whether it was a component of dung itself, representing thus the digested remains of glume wheat spikelets consumed intact. Our contribution presents the results of a feeding experiment carried out in the Mani region of southern Greece (Peloponnese). The experiment also involved observations on the effects of digestion on figs consumed intact in order to interpret the origin of fig chunks found in some of the chaff-rich samples. The experiment involved the feeding of two goats with (a) einkorn glume bases and loose einkorn grain and (b) einkorn spikelets. The contents of the modern pellets analysed suggest that spikelets fed to goats appear as glume bases and cereal fragments. This has implications for the interpretation of samples rich in glume wheat chaff: they need not necessarily represent the tedious and time consuming process of spikelet dehusking performed when the glume wheats are to be used as food rather than fodder. Further work needs to be carried out on the morphology of the glume bases found in the experimental dung; it is also recommended that the experiment is repeated with different animal species.

THE UNDER-REPRESENTATION OF LEGUMES IN ARCHAEOBOTANICAL ASSEMBLAGES: A CASE STUDY FROM HAMWIC, A SAXON TOWN IN SOUTHAMPTON, SOUTHERN ENGLAND

Wendy CARRUTHERS & Kath HUNTER

Because on most archaeological sites in the British Isles the preservation of plant material is by charring, it is difficult to obtain an accurate impression of the importance of the non-cereal components of the diet, such as fruits, spices and legumes. In the case of legumes, the situation is not even helped by the examination of anaerobic deposits, as legumes are rarely preserved by waterlogging. Mineralised faecal deposits, however, can help to redress the balance, especially since pea and bean hilums are readily identifiable.

Even where the conditions necessary for mineralization to take place are present, archaeobotanists are lucky to find more than one cess pit to sample, making it impossible to know how representative the information is for the population as a whole. In 2001 excavations by Wessex Archaeology at the site of the new football stadium in Southampton provided an opportunity to examine mineralised plant remains from twenty-one cess pits originating from the Middle Saxon settlement of Hamwic.

This poster shows how comparisons between the charred, waterlogged and mineralised assemblages have provided much more accurate information about the diet. The mineralised remains of peas and Celtic beans were present in 81% of the pits and frequent in 62% of them, but accounted for only c. 1% of the charred plant remains. A fairly monotonous diet, probably including plenty of ‘pease pudding’ all year round, is envisaged. If this site is typical of the period, our view of the Saxon diet in southern England needs to be adjusted.

URTICA KIOVIENSIS ROGOW – 1ST FOSSIL EVIDENCE FROM BRANDENBURG, EASTERN GERMANY

Felix BITTMANN & Steffen WOLTERS[57]

During the excavation of the Mesolithic site Friesack 4 in 1978-1989 (Rhinluch, Brandenburg, eastern Germany) samples for pollen and macrofossil analysis were taken (Gramsch 2000). Although the pollen analytical results were published in 1987 (KLOSS 1987a,b), investigation of the macroremains was not started until 2002. Numerous ^{14}C-data gave a Preboreal to Atlantic age for the different layers.

Amongst the material *Urtica* fruits were found which differed markedly from *U. dioica* and *U. urens*. Comparison with all recent *Urtica* species from Middle Europe led to its identification as *U. kioviensis*, a sub-continental species growing in reed communities along rivers and their bank-side marshes.

The fruits of *U. kioviensis* are very similar to fruits of *U. dioica*, but are at least 1.5x longer while of the same width. Thus their shape is more like a spindle, in contrast to the oval shape of *U. dioica*, also recorded from the material.

The samples analysed spanned the period from 11.110 cal. B.P. to 10.038 cal. B.P. in which *Urtica kioviensis* was present at high frequencies and was therefore indigenous in Brandenburg, at least from the end of the Preboreal.

The total species range found was typical of the phytosociological units Nymphaeion, Phragmition and Bolboschoenion with species like *Nuphar*, *Nymphaea*, *Typha* spp., *Sparganium* spp., *Schoenoplectus* spp. and *Cladium*, which are also typical of the environment of *U. kioviensis* today. In addition to species of the hydrosere, several ruderals were found which might indicate human activity at the mesolithic site. A number of possible anthropogenic indicators were found, amongst which were *Chenopodium album*, *Erodium cicutarium*, *Atriplex* spp., *Valerianella locusta*, *Plantago major* and *Urtica dioica*, this latter being not only a ruderal.

The evidence of *U. kioviensis*, growing exclusively in reeds, shows that increased percentages of *Urtica* pollen do not necessarily indicate human impact. The same holds true for higher percentages of Chenopodiaceae. In addition to *Chenopodium album*, C*h. glaucum*/*rubrum*, *Ch. ficifolium* and *Ch. polyspermum*, which are natural species of river banks, were also recorded.

Other notable findings were cuticle fragments from *Viscum* leaves (10.038 cal. B.P.) and charred seeds of *Nuphar* (11.110 to 10.038 cal. B.P.), probably linked with human activity at this site.

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STATISTICAL AND SPATIAL ANALYSES OF PLANT MACROREMAINS FROM A BRONZE AGE SETTLEMENT IN CENTRAL BOHEMIA

Mária HAJNALOVÁ, Petr KOČÁR, Petr KOVÁČIK, Ladislav ŠMEJDA, Pavel VAŘEKA

The total sampling of the excavated area of a Knovíz culture settlement at Praha- Hostivař has yielded cca. 1400 environmental samples. The obtained macro botanical data has been used as a core data matrix for various stratigraphic, spatial, functional and multivariate analyses verified by other statistical methods. A *factor analyses* was used to test whether the groups of plant species generated from their ecological attributes crate spatially distinctive structures (features) and whether those can be used for functional interpretation of the areas within the excavated settlement. Consequently, a GIS drawn model has been constructed to show the spatial and functional organisation of the settlement. Further, the plant remains were studied for the taphonomic processes and the archaeological models concerning the palaeoeconomy of the site were applied. Ecological attributes of the species has been used for the receonstruction of the palaeoenvironment and landuse.

DNA RECOVERY AND RAPD, SSR ITS ANALYSIS OF CANTALUPE (*CUCUMIS MELO* L) FROM THE MIDDLE AGES

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Cantaloupe seeds were recovered from the 15th century layer of the Buda Hill excavation in Budapest, Hungary (Nyekhelyi 2003). Ancient DNA (Buxo 1997) was extracted from the seeds after surface sterilization and aseptic tissue culture incubation to exclude bacterial or fungal infected seeds. DNA from non-infected seeds of this ancient sample and also a number of modern cantaloupe varieties was analyzed by RAPD, SSR, and ITS PCR probes. Twelve of the 48 RAPD primers (25%) amplified polymorphic bands (44 out of a total of 105 bands) in the modern varieties and the 'middle ages cantaloupe' ('*mac'*) sample. Genetic similarity was calculated by a cluster analysis programme (Syntax-II) on the basis of presence/absence of PCR fragments. Using RAPD analysis, '*mac*' showed the highest similarity with the current variety *Magyar Kincs*. However cluster analysis based on eight SSR probes showed *Muskotaly* to be the closest current variety to '*mac'*. Cluster analysis based on ribosomal rDNA derived ITS (internal transcribed spacer) markers grouped '*mac'* with the modern varieties *Fortuna, Muskotaly, Gali-F1, Hogolyo* and *Tetenyi Csereshеju* and separated them from another group comprising *Topaz, Jav-Zentai, Magyar-Kincs, Sweet-Ananas* and *Ezüst-Ananas.* Further sequence analysis of '*mac*' fragments is in progress.

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ANCIENT DNA ANALYSIS OF COMMON MILLET (*PANICUM MILIACEUM* L.) FROM THE 4TH AND 15TH CENTURIES

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Ancient DNA was extracted from seeds of common millet (*Panicum miliaceum* L.) preserved in the layers of the 4th (Ulan Bator, Mongolia) and 15th (King's Palace of Budapest, Hungary) centuries (Nyekhelyi 2003). Seeds were surface sterilized thoroughly by commercial bleaching of NaOCL (20%) and kept in aseptic tissue culture on media F6 (Gyulai et al. 2003) for three months to exclude bacterial or fungal infection of seeds. Ancient DNA of non infected seeds (0.1 gr) in each case was extracted. The undiluted genomic DNA samples were subjected to fAFLP analysis. The amplified DNA fragments were visualized after separation on 4.5% polyacrylamide gels using silver staining. Agarose gel electrophoretic analysis suggested that extensive DNA degradation had occurred in the fourth century sample. This was confirmed in the AFLP analysis, in which only 2 fragments were observed. In contrast, the DNA from the Middle Ages millet ('*mam*') sample (15th century) was much less degraded with high molecular weight DNA still present. Consequently, 158 AFLP bands could be detected. However, this was still substantially less than the 265 AFLP bands, that we detected in the contemporary millet variety '*Topaz*'. Our results allow us to rescue and save common millet DNA sequences recovered from the Middle Ages.

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ROMAN FRUIT-GROWING IN SWITZERLAND: ANCIENT DNA FROM WATERLOGGED *PRUNUS* SPECIES

Britta POLLMANN[66], Angela SCHLUMBAUM[67] & Stefanie JACOMET[68]

Prunus species include wild *Prunus spinosa* and many cultivated species such as *Prunus domestica*, *P. insititia*, *P. cerasus*, *P. avium* or *P. persica*. Most of the cultivated fruits were brought to the Northern Alpine region by the Romans. However, when and how early fruit-growing and horticulture started in the northern provinces of the Roman Empire is unknown.

A matter of interest is the diversity of cultivated *Prunus* species and their morphological identification. For these investigations we used fruit stones found abundantly at the Roman settlement Tasgetium (Switzerland). Measurements and index values of the fruit stones show a group of *Prunus* cf *spinosa*, which cannot clearly be identified. The extraction and analysis of ancient DNA from waterlogged fruit stones is a new way to achieve a more precise identification.

So far fragments of the trnL-trnF region (chloroplast DNA) and of the its1 region (nuclear DNA) were sucessfully PCR-amplified. The sequence of the trnL-trnF fragment of *Prunus* cf *spinosa* is identical with the sequence of *P. spinosa*, while the sequence of *P. insititia* differs in one base.

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AN INTERDISCIPLINARY CONTRIBUTION TO PALAEOETHNOBOTANY: THE STUDY OF THE BRONZE AGE DEPOSIT FROM EL MIRADOR (SIERRA DE ATAPUERCA, BURGOS, SPAIN)

Ethel ALLUÉ[69], Francesc BURJACHS[1], Dan CABANES[1], Itxaso EUBA[1], Isabel EXPÓSITO[1], Patricia LLÀCER[1], Anna RODRÍGUEZ[1]

The aim of this poster is to put together the methodological sources for the different approaches of palaeoethnobotanical research and how they agree. At the workgroup of archaeobotany from the *Àrea de Prehistoria de la Universtiat Rovira i Virgili*, we deal with different disciplines such as carpology, palynology, phytolitology, and charcoal and coprolite analyses. The main approaches are based on the study of human and animal feeding, fuelwood exploitation, agriculture practices and its evolution through history. El Mirador is a Holocene sequence which offers a continuous deposit from the early Neolithic to the Bronze age. The Bronze age sequence (3040±40 BP-3.400±40 BP C14 AMS) has three archaeological levels (MIR3, MIR4 and MIR5) containing burial and habitation deposits and the remains of animal stabling activities due to the use of the cave as sheepfold (Vergés *et al.,* 2002). This type of deposits yields, with a high degree of preservation, macro and micro remains such as seeds, fruits, charcoal, pollen, coprolites and phytoliths. The flotation of the sediments has yielded a carpological record mainly formed by *Triticum aestivum/durum, Triticum diccocum* and *Hordeum vulgare* as well as a few remains of Leguminosae. Concerning charcoal remains, also abundant in the sequence, it seems that the exploitation of wood is directed to a few species among which the most important is *Quercus* sp. The study of these materials on the basis of a single approach leads us to the understanding of human behavior during this period. More precisely the aim of the study is to explain the socio-economic organization of the groups of shepherds and farmers that lived in the area on the basis of agriculture, pasturing activities and forest exploitation.

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CASTELO VELHO (NE PORTUGAL): SEEDS OF UNCERTAINTY

Isabel FIGUEIRAL & S.O. JORGE

The archaeological site of Castelo Velho (Freixo de Numâo, NE Portugal) is situated in the ridge of a hill top dominating the sorrounding region. The walled site was occupied during c. 1500 years, between c. 3000 BP and 1300 BP, during which four building phases have been identified.

The complexity of the monumental structures, their specific location, the reduced dimensions of the enclosed area, the abundance of entrance ways, the rich artefact assemblage and especially the intentional closure of a certain number of structures (not to be used again) are particulary striking. These features clearly indicate that his is not a fortified settlement in the normal sense of the term, but instead an impressive monument, build to be seen, whose real significance must stay, at least for the moment, a matter of speculation.

But what inferences can we made from the analysis of its plant remains?

Charred plant remains have been recovered in some areas of the site, while others were practically sterile (maybe partly as a consequence of erosion). During excavation work the finding of abundant charcoal fragments at least in some areas, contrasted with the scarcity of seed - fruit remains. However, Layer 3 (second construction phase) stands out as a case apart. No seeds or fruits were recovered until the finding of a single structure containing literally thousands of seeds, in association with fragments of at least six vases; the type of deposition suggests that this is not just a case of "vases with seeds". In fact the vase fragments appear to have been broken intentionally and disposed smong the seeds as if dividing them in several distinct layers. The explanation of this plant assemblage becomes delicate as it may reflect the symbolic use of plants rather than conditions of agricultural production, nutrition or economy.

LATE EPIPALAEOLITHIC / EARLY ACERAMIC NEOLITHIC CHARRED ARCHAEOBOTANICAL REMAINS FROM THE NORTHERN FERTILE CRESCENT

Manon SAVARD[70], Mark NESBITT[71] & Martin JONES[72]

Archaeobotanical remains from Late Epipalaeolithic and early aceramic Neolithic sites in Western Asia are very scarce. This is especially true for the northern part of the Fertile Crescent, where sites from this period with published plant remains are limited to Jerf el Ahmar, Abu Hureyra and Mureybet, in northern Syria, and Çayönü in Southeast Turkey. This ongoing PhD research on early aceramic Neolithic subsistence strategies in the northern Fertile Crescent is based on the study of the charred archaeobotanical assemblages of four Late Epipalaeolithic and early aceramic Neolithic sites: Qermez Dere (Watkins, 1995) and M'lefaat (Kozlowski, 1998), in northern Iraq, and Hallan Çemi (Rosenberg and Redding, 2000) and Demirköy (Peasnall, 2001), in Southeast Turkey. This research is doubling the number of sites for which plant remains have been studied in the northern Fertile Crescent and expanding the limited archaeobotanical dataset for this key period of environmental and subsistence change. Moreover, the four sites under study are located along an ecological transect, from the steppe to an open oak forest, an important asset in evaluating environmental determinism.

This poster will present the preliminary archaeobotanical results of this ongoing research and discuss how these results are already contributing to challenge current views on the origins of agriculture and sedentary hunter-gatherer's plant diet, particularly the importance of the so-called "wild cereals" and "weeds" in the assemblages. New AMS radiocarbon dates available for Hallan Çemi and Demirköy will also be presented.

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PRELIMINARY RESULTS OF THE ARCHAEOBOTANICAL STUDY AT RAWDA, A BRONZE AGE SETTLEMENT ON THE MARGIN OF THE SYRIAN ARID ZONE

Linda HERVEUX

The archaeobotanical program started in 2002 and pursued in 2003 on the site of Rawda, North-West Syria, is part of a larger program studying Bronze Age societies of the arid margins of the Fertile Crescent. The aim of this program is to characterise adaptations, subsistence and production strategies in a steppic environment, through the study of the exploitation of the vegetal resources. We here expose the preliminary results of the archaeobotanical research undertaken at Rawda. Analysis of seeds and charcoal gives us an image of the wide range of vegetal resources exploited by the inhabitants of the site at the end of the 3rd millennium BC.

The results of the first season's archaeological study show that Rawda offered a real hydrological potential, that was well known and exploited by the inhabitants through various hydro-agricultural installations. This is reflected in the archaeobotanical samples by the presence of a great diversity of carbonised remains. Farming seems to have been based on the cultivation of barley (more than 50% of the samples). As today, some garden horticulture was also practised as is shown by the presence of pulses of which lentil and chickpea are the most common. Several fruit species, wild and cultivated, have been identified: grapevine, olive, almond and pistachio. Some seeds of safflower were also noted but it has not been possible to establish with certainty if these belong to the cultivated dye plant, *Carthamus tinctoria*, or to a wild counterpart, for example *Carthamus persicus*, currently growing around the site. Several wild species were present in the samples, both weeds of cultivated fields and genuinely wild taxa, from the surrounding vegetation. Finally, the seed analysis gives some indications of irrigation practices. For example, grapevine, olives and peas, if cultivated locally, would have necessitated some type of irrigation system. This is further corroborated by the presence of two weed taxa, indicators of irrigation: *Carex* and *Phalaris*.

The study of charcoal reveals that a great diversity of wood species was used at the site. Three different formations seem to have been exploited: the surrounding steppe formations, a riverine forest situated at some distance from the site and, finally, more distant mediterranean type forests from which cedar wood was imported.

In conclusion, the 3rd millennium BC inhabitants of the semi-arid zone of Rawda seem to have benefited from the same vegetal resources as the populations living along the Euphrates or the Khabur rivers. This can be explained by a relatively favourable agricultural potential on the one hand and by exchanges on the other, facts attested also by contemporary texts from Mari, Ebla and Qatna.

CROP STORAGE IN THE FOURTH MILLENNIUM B.C. AT TELL BRAK, SYRIA

Mette Marie HALD[73] & Mike CHARLES

Tell Brak is a large multi-period settlement mound in north-east Syria (northern Mesopotamia). The present research concentrates on the archaeobotanical remains dated to the fourth millennium BC, a period in the Near East from which there is overall very little published archaeobotanical material. The continuous sequence of occupational layers from Tell Brak, spanning almost the entire millennium, has produced the most substantial body of archaeobotanical evidence for the region. The period saw the beginnings of urbanisation in northern Mesopotamia, and Tell Brak appears to have been a major part of this development - growing rapidly to a city of some 110 ha by the middle of the millennium. The plant remains from the site provide a unique opportunity for the study of the agricultural economy at this critical time in the development of urban civilisations.

An extensive sampling of charred plant remains has been carried out at Tell Brak with material being recovered from a variety of contexts within several excavation areas on- and off-site. Large quantities of stored crops have been found in two types of houses: small, possibly private houses and a large building thought to have had a public function. The manner of crop preparation and storage at a large urban centre are considered from the following perspectives:

- What are the major crops stored at the site and how were they processed prior to storage and consumption?
- Are there variations in the type of crops stored in socially differentiated buildings?
- Is there any evidence of influence on crop growing patterns from outside the region?
- What are the sources for the seeds of non-crop weeds? Do they represent crop weeds, wild plants collected for food or animal dung?

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NEOLITHIC PEOPLE IN THE EYES OF PLANTS (KUJAWY, CENTRAL POLAND)

Aldona BIENIEK[74] & Józef MITKA[75]

Neolithic settlements in the Kujawy region are represented by several archaeological sites, which have botanical material, archaeologically dated to the Linear Pottery culture, the Lengyel culture and the Funnel Beaker culture. Traces of Lengyel settlement (the Brześć Kujawski group) are the best represented. Numerical analysis of the botanical contents of 34 archaeological features dated to the Lengyel culture (ca. 4400 – 4000 cal. B.C.) from 7 sites (Guźlin 2, Konary 1, Konary 1a, Miechowice 4, Miechowice 4a, Osłonki 1, Zagajewice 1) has been carried out. There are three types of archaeological features from which the botanical material was sampled: pits, clay pits and house foundations. The botanical material was divided into four groups:

1 – grains of Cerealia

2 – chaff remains (calculated to the glume basis)

3 – fruits and seeds of wild growing plants

4 – *Stipa* sp. awn fragments

The differences between archaeological features and groups were displayed with the use of dendrograms based on the UPGMA method and Euclidean distance (STATISTICA package).

Archaeological features are clearly divided into 3 categories. The first one contains two storage pits, the second contains features with high percentage of *Stipa* awn fragments and the third contains features where *Stipa* is scarcely represented or absent but chaff remains are quite frequent. The numerical analysis showed that fruits and seeds of crops and wild plants are generally found together. The inedible remnants like chaff and awns are preserved in different features, as a rule separately. The aim of the presentation is a trial explanation and interpretation of such classifications.

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EARLY NEOLITHIC CROP HUSBANDRY IN THE GREAT HUNGARIAN PLAIN: EVIDENCE FROM THE KÖRÖS SITE OF ECSEGFALVA 23, CO. BÉKÉS.

Amy BOGAARD, Joanna BENDING & Glynis JONES

The aim of the poster is to summarise and interpret an important assemblage of archaeobotanical remains from Ecsegfalva 23, an early Neolithic site in SE Hungary (Körös culture, *c*. 6000-5500 BC). Ecsegfalva was excavated from 1999-2001 in an Anglo-Hungarian project led by Professor Alasdair Whittle (Cardiff University). Systematic sampling and flotation of archaeological deposits produced an assemblage of charred plant remains of considerable significance for scholars studying the spread of agriculture across Europe and the nature of early crop cultivation. The importance of this assemblage can be summarised as follows:

- The early Neolithic Körös culture of the Great Hungarian Plain appears to play a pivotal role in the spread of farming across Europe. It has been hypothesised that the adjustment of Near Eastern/Mediterranean agriculture to a temperate climate took place in the Hungarian Plain, where there was an apparent 'pause' of *c*. 500 years prior to the onward spread of agriculture to central, western and northern Europe.
- Due to a lack of large-scale sampling and recovery programs for charred plant remains at other sites, no assemblages of charred crop and weed remains from the Körös culture have been studied and published. Only impressions of crop seeds in pottery or daub have been reported from other sites.
- The charred crop remains (grains and chaff) and especially arable weed seeds from Ecsegfalva provide a unique insight into the form of crop cultivation practised in a critical 'transition zone'.

ARABLE AGRICULTURAL SYSTEMS OF BRONZE AGE IRELAND

Meriel McCLATCHIE[76]

This poster will investigate arable agricultural systems of Bronze Age Ireland, based primarily on evidence from the macro-remains of cultivated plants. Limited research has been previously carried out in this area, usually focussing only on the types of crops that were cultivated. Previous studies have suggested that barley was the dominant crop of this period, with wheat playing a very minor role in arable economies at this time. Arable agriculture has been interpreted, or often merely assumed, as being carried out on a localised subsistence level, while inter-community arable production and trade was not seen to be a significant element of farming-based economies at this time. Much of this evidence was based on seed impressions in ceramic vessels. The collation of data by the author on plant macro-remains from Bronze Age sites represents the first study of arable agricultural systems in Bronze Age Ireland based mainly on actual plant macro-remains. Data from most of the sites were obtained from previously analysed, but mostly unpublished, assemblages. Plant macro-remains have also been examined and identified by the author from a small number of additional sites. Using this newly expanded database, this poster will examine the types of crops that were being cultivated, as well as exploring issues relating to how crops were being cultivated and who they were being cultivated for.

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PLANT ECONOMY OF A NEOLITHIC ALPINE SITE: PRELIMINARY RESULTS OF THE ARCHAEOBOTANICAL STUDY OF "LE CHENET DES PIERRES" IN BOZEL (SAVOIE, FRANCE)

Lucie MARTIN[77]

The archaeological site « Le Chenet des Pierres » in Bozel is located in a valley adjacent to the Tarentaise, in the Vanoise Mountains, at an elevation of 950 metres. Situated at the foot of a north-east exposed slope dominated by a beech-fir formation, the deposit has been formed by a succession of terraces, mostly occupied during the middle Neolithic, between 4500 and 3500 cal B.C. The anthracological analysis shows that during Neolithic times, the vegetation was more open and juniper was dominant (S. Thiébault, unpublished).

Since 2000, the dig has been concentrating on one sector (S3) of about 30 m^2, located between two large schist boulders. Several thousand sherds, flints and quartz, grinding stones and ornamental pieces attest to an intense human occupation, but the settlement's function is not yet clear. As for they, the archaeological sediments are composed of a highly organic silt.

We present here the preliminary archaeobotanical results from a small layer (d21) of 5 m^2 that was excavated in 2001, permitting an initial evaluation of the abundance and preservation of the seeds and fruits, all charred.

Cultivated plants are represented by cereals, mainly naked wheat (*Triticum aestivum/durum/turgidum*) and barley *(Hordeum vulgare/distichum*), and by pulses, in particular pea (*Pisum sativum*). There were large amounts of grains/seeds present, but no chaff remains so far.

The other species are comprised principally of weeds, trees and shrubs, which could have constituted the gathering resources, such as hazel (*Corylus avellana*), apple (*Malus sylvestris*), raspberry (*Rubus idaeus*), elder's fruits (*Sambucus nigra/racemosa*), and maybe acorns (*Quercus sp*.).

These first results are very encouraging and quite exceptional for an open-air site in a mountain context. Further analysis will be undertaken to determine the site's precise function and gather more information about how the human communities took advantage of the vegetation in this kind of environment.

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FRUITS AND PULSES IN SANTA MAIRA (ALACANT, SPAIN) CA. 12.000-9.000 BP

E. AURA[78], V. CARRIÓN[1], E. ESTRELLES[79] & J. PÉREZ JORDÀ[1]

Santa Maira Cave belongs to a complex net of karstic channels, which give rise to some cavities over Famorca gorge.The best known cavity to the moment, with triangular plant, has 30 meters long and nearly 10 meters wide. The acces from outside is organized throught three open cavities.

The most part of materials obtained in the latest fielwork cames from the west cavity and is nowadays being analized by a multidisciplinar team. Our study is based in this material, as well.

The west cavity has shown an interesting sequence with several layers from Final Magdalenian, Epipaleolíthic and Mesolithic, untill Neolithic. The main objective of the fieldwork is to set cultural, environmental and chronostratigraphic phases of this sequence in order to define economical behaviour of last hunter-gatherers in a “complex mountain environment”. Our study takes part of an archaeological and ethnographical project about middle mountain dwellers and the use of caves and rockshelters as stockyard.

The transition from Late Pleistocene to Early Holocene doesn’t show substantial changes of species presence, but there is a gradual, slight replacement of plant formations. In the end of Late Glaciar, *Juniperus* presents a high percentage, as an echo of colder periods. In the Early Holocene, *Quercus* percentage shows a steady rise, to the detriment of *Juniperus*. Those probably began spreading from the bottom of the gorge, where they might had taken refuge during glaciar periods.

Sediment samples from the cavity have offered an important amount of seeds and fruits. Pulses show the highest percentage, but it has been impossible to identify the species throught the electronic microscope because the ornamental surface isn’t preserved in any case. The remains might belong to the genus *Vicia* or *Lathyrus*; on the bases of the documented vegetation, they could be *Lathyrus latifolius*, which developpes mainly along woodland edges.

In addition to pulses, there are also some acorns and fruits of Rosaceae, identified as *Sorbus* in some cases. All of them could be eaten by human groups that occupied the cave, though they could have been brought by animals living in the cave during periods without human presence, as well.

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THE ORIGINS AND EVOLUTION OF *TRITICUM AESTIVUM* L.

R.J. GILES and T.A. BROWN

Triticum turgidum and *Aegilops tauschii* have been identified as the progenitors of hexaploid wheat (*T.aestivum* L.) however uncertainties remain regarding the birthplace of the species. This study utilises single nucleotide polymorphisms present at the promoter region of the high-molecular-weight glutenin Dy locus to compare variation in 160 *T.aestivum* landraces and 100 *Ae.tauschii* accessions. The existence of two shared alleles, TAE1 and TAE2, suggests that *T.aestivum* originated at least twice. Differences in distribution patterns of these ancestral alleles in *T.aestivum* indicate that the two lineages are unlikely to have originated at the same time. TAE2 represents the most successful origin, as it is frequent and widespread in *T.aestivum*. In contrast TAE1 has a limited distribution suggesting it may have originated later, perhaps once wheat agriculture had spread eastwards from its point of origin.

Analysis of the HMW glutenin gene in *Ae.tauschii* has revealed that the scattered populations present in the Fertile Crescent are very likely to be part of an ancient spread rather than a recent adventive spread as has been suggested. Therefore contact between the two progenitors of *T.aestivum* could have occurred earlier than thought, which would account for the early appearance of hexaploid wheat in the archaeological assemblages of Neolithic farming sites in the Near East. The presence of both ancestral wheat alleles in *Ae.tauschii* populations of the Fertile Crescent provides further evidence to support this theory.

New molecular evidence has found that the origin of hexaploid wheat was very likely accompanied by a ‘burst’ of evolution resulting in the formation of new alleles and traits. This evolutionary process has probably been accelerated by occasional cross-species hybridisation with the end result being a modification of the genepool and the origin of the different sub-species.

ORIGINS OF CULTIVATED EINKORN

Susan THAW[80] and Terry BROWN

Understanding where agriculture arose is necessary for understanding early human culture. For each of the crops that were domesticated we can ask whether its wild progenitor was taken into cultivation only once or if there were multiple domestication events. Distinguishing between these scenarios can help to answer questions concerning the origins of agriculture in the Fertile crescent belt.

Previous work at UMIST investigated the origins of emmer wheat. It was demonstrated that cultivated emmer is not monophyletic and was domesticated on more than one occasion and at different geographic locations in the fertile crescent.

The demonstration that cultivated emmer has diverse origins provides evidence in favour of the hypothesis that the transition to agriculture in SW Asia was a necessary response to a changing environment rather than the result of a chance discovery. However, it has been suggested that einkorn, not emmer, was the first wheat to be domesticated. According to this scenario, cultivated emmer is genetically diverse because it was taken into cultivation by established and geographically dispersed farming communities only after the spread of einkorn from a unique origin. The genetic diversity of einkorn therefore becomes the critical test for distinguishing between the alternative hypotheses for the origins of agriculture.

This study used microsatellite markers distributed throughout the entire einkorn genome in order to assess genetic diversity in over 400 accessions of wild and cultivated einkorn. The results were used to infer the domestication history of einkorn.

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THE OLDEST EVIDENCE OF BLACK CUMIN (*NIGELLA SATIVA* L.) AND ITS POSSIBLE INTRODUCTION IN EUROPE

Andreas HEISS & Klaus OEGGL[81]

In the central part of the Alps copper ore deposits of capital importance are located, as in Schwaz (Tyrol, Austria) and Mitterberg (Salzburg, Austria). After the beginning of metal processing at the transition from the Neolithic to Bronze Age, dynamic impulses from Near East propagated further knowledge of ore mining and smelting in Central Europe. The oldest traces of copper mining in the Schwaz deposits derive from the early to middle Bronze Ages. An investigation of a middle to late Bronze aged slag-washing site (1390-930 BC) in the area revealed a seed of black cumin (*Nigella sativa*) together with single other food plants. The plant remains became incorporated in the slag sediments by chance and preserved themselves in an excellent state because of the poisonous copper salts. Black cumin as a Mediterranean plant is traditional as a bread condiment and healing herb in Southern Europe and the Near East, but has never grown in the wild in Central Europe. Until now, there is no evidence whatsoever of prehistoric large-scale cultivation of black cumin in the Central Europe. This leads to two possible conclusions: the finding may either indicate an existent exchange of goods from the Mediterranean, or an introduction by immigrant population from this area in the course of ore exploitation. Implicating the latter alternative together with the archaeological context of an ore processing site, suggests an introduction of *Nigella sativa* to the Alps by foreign ore miners during Bronze Age.

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PALEOGEOGRAPHY OF *VITIS VINIFERA* S. L. AND THE ORIGIN OF CULTIVAR GROUPS

Encarnación CARREÑO[82], Diego RIVERA[1], Concepción OBÓN[83], María Luisa PRECIOSO[1], José Antonio PALAZÓN[84], María Dolores CARMONA[1]

Grape seeds are highly polymorphic. Some authors denoted the paper played by morphologic characteristics of the seed in the taxonomy of *Vitis* or to determine cultivar groups within *Vitis vinifera* L, as well as ascertaining its assignation as cultivated grapevines or wild. The grapevine berries have one to four seeds (usually zero in the seedless cultivars). Grapevine seeds are often found in archaeological contexts, therefore archaeobotanists deal much in seed characters for identifying the materials as wild or cultivated.

The purpose of this work is to compare the morphometric parameters of archaeological samples of grape pips, from Western Mediterranean and Syria with the results of a previous multivariate analysis of seed morphology from 130 different *Vitis vinifera* L. Cultivars (mainly Mediterranean, but also from Central Europe and Asia) and wild populations of *V. sylvestris,* and other *Vitis* species. We try to discern the position of present cultivars and archaeological material in the different clusters according to a series of quantitative morphological parameters, -useful both for taxonomic and archaeological research, and to discuss it within the palaeogeographical context.

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FOOD AND WOOD – THE ANALYSIS OF PLANT REMAINS FROM AN IRON-AGE MINING PLACE.

Nicole BOENKE

Besides stable cultural and political structures, the availability of resources is essential for the organization of a complex project such as the mining of rock-salt. In this context the analysis of botanical plant material plays an important role, because, in contrast to later societies, prehistoric people were much more dependant on organic materials and their natural occurrence. The archaeobotanical analysis of findings from the mine concern mainly two points: the analysis of wood (timber and tools) and the investigation of human faeces (miners diet, plant cultivation and trade). Both are in an excellent state of preservation due their being embedded in salt.

More than 5,000 analysed samples of timber and tools show up that certain species were used for certain purposes. If one compares the used wood species with the expected composition of the Alpine forest, it is clear that the Dürrnberg miners selected the most common species. Quite probably, the miners' timber needs could all have been met from the surrounding area, without the need for any long-distance timber transportation.

The other important aspect of the archaeobotanical work has been the analysis of seeds and fruits contained in human faeces. In contrast to a settlement analysis the investigation of more than hundred faecal samples allows an insight into real consumption. It shows a rich diet based on cereals, legumes and fruits. The most commonly consumed dish was a kind of soup or stew. Changing percentages of plant material allows to differentiate a range of dishes.

Additionally to the presentation of the used plants the poster will offer a short overview on economical and social aspects concerning the supply with food and wood, questions of agriculture and trade, production and imports.

ORIGINS OF AGRICULTURE IN NORTHERN AND EASTERN INDIA

Emma HARVEY, Dorian FULLER, Rabi MOHANTY & Kishor BASA

The emergence of agriculture is a fundamental question in archaeobotany. Few studies of this nature have focused on India and many areas within the Indian sub-continent lack empirical data making a synthesis of agricultural origins difficult. This paper focuses on Northern and Eastern India, which both offer the potential to make a significant contribution to our understanding of the early farming systems. These two areas are within the extent of wild rice populations and wild populations of red gram are present in Southern Orissa. Systematic sampling (bulk and phytolith samples) and flotation has taken place at a number of prehistoric sites in these regions and both contain evidence of ancient rice, small millets (*Brachiaria ramosa*, *Panicum sumatrense*, *Setaria verticillata*), and pulses (*Cajanus cajan, Macrotyloma uniflorum, Vigna radiata*). The wild millets present in Northern and Eastern India could represent weeds of rice or could be cultivated crops. All the sampled sites represent sedentary settlements and already contain a full complement of likely crops (rice and pulses), therefore signify the end of the process of agricultural origins rather than the initial development. The North Indian sites also contain evidence of the introduction of a crop package (wheat and barley) later on in their occupation, presumably coming from the Northwest.

Another aspect of this project is an investigation of the problems associated with the identifcation of rice and millets. Rice and millets are particularly challenging because of a lack of clear criteria for species level identification. A number of morphometric methods are being compared to determine the most accurate way of identifying rice species and new methods are being developed for identifying millet phytoliths using multi-celled panels.

THE PRELIMINARY REPORT OF ARCHAEOBOTANICAL STUDIES IN THE 1ST SEASON OF EXCAVATION IN TOLLE BASHI; A NEOLITHIC SITE IN IRAN

Masoumeh KIMIAIE

Archaeobotanical studies play an important role in archaeological research since they can help to understand the complex relations between humans, plants and the environment. They allow the reconstruction of ancient vegetation and the understanding of agricultural systems and other economic activities. Archaeobotanical sampling and analysis were carried out during the first season of excavation in 2003. The major objective of these studies was the recovery of evidence for cultivation of plants in Tolle Bashi, a Neolithic site and a registration species currently available in the vicinity. The most important shape of preserving the plant remains is carbonized form which is most common in Near East.

In Tolle Bashi, which is in Ramjerd Plain in Fars province (southern Zagros) three major vegetation groups can be distinguished:

1- Studying the present vegetation cover around the site.

2- Collecting soil samples and analyses of plant materials recovered by manual flotation.

I divided the vegetation cover to three groups:vegetation of mountains,vegetation of plain and vegetation of bank river. The second part of archaeobotanical programes was analyses the materials which all of them were carbonized. The identifiable remains are seeds and other parts of plants except wood charcoals. Since penetration of sediments and alluvium materials into the cells of wood charcoals and making them deformed, it was not possible to identify even with the radial and transversal cuts. The identifiable materials were wheat, barley and some wild graminae with different part of spike and rachis segments.

IDENTIFICATION OF PPNB PLANT REMAINS FROM TELL EL-KERKH, NORTHWEST SYRIA

Ken-ichi TANNO[85]

Tell el-Kerkh is an Early-PPNB site situated in the Rouj basin, on the northern edge of the Ghab valley. Its location between the Euphrates valley and the coast is of particular interest because no sites of this period have been excavated in this area. Early-PPNB sites are known on Cyprus and in the Euphrates valley. Thus archaeobotanical finds from this area may help us to understand the spread of agriculture during the Early-PPNB.

The plant remains from el-Kerkh included diverse species of pluses. Chick Pea (*Cicer arietinum*) is of particular interest because only a few records are known for this plant in Early-PPNB period and the range of its wild species is now limited to a small area in south-east Turkey. Compared with the pulses, cereal crops were very rare but Einkorn wheat (*Triticum monococcum*) was present. The stones of Hawthorn (*Crataegus* sp.) were also very common at Tell el-Kerkh although these finds are rare on other sites of the same period. These archaeobotanical finds appear to be rather unique but we do not have any other sites in this area for comparison.

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ARCHAEOBOTANICAL DATA FROM A SETTLEMENT OF THE EARLY BRONZE AGE-2 AT ARSLANTEPE (MALATYA, TURKEY)

Laura SADORI[86] & Francesca SUSANNA[1]

Arslantepe is a tell located in eastern Turkey, 6 kilometres north of the town of Malatya and 15 kilometres south of the right bank of the Euphrates River. The tell, which is about 30 m high, was far the largest in the Malatya plain from the fifth millennium to the Neo-Hittite age. Excavation of several archaeological strata from fire levels ranging from Chalcolithic to Bronze Age provided an excellent sample series to investigate temporal and spatial patterns of plant use in the site. The totality of the recovered plant remains, preserved by charring, consisting in woods, fruits and seeds of quite only domestic plants, was collected on a grid system. The excavations on the SW area at Arslantepe revealed an important change in the settlement patterns during the two main levels of the VI C Period of the site (Early Bronze Age-2, 2750-2500 years BC). The earliest level comprises a series of short-lasting mudbrick houses cut by several storage pits. The latest level corresponds to a solidly founded village whose layout lasted for centuries well into the following EB3. This continuity was not broken even by a violent fire destroying some houses and all their content, leaving a huge quantity of charred plant remains.

The archaeobotanical data so far obtained from the house A607, the richest one in macroremains, on which our efforts have been concentrated first, give us a lot of data about the exploitment of the surrounding land. No weeds were found excepting few achenes of *Polygonum*, indicating that the crops were pure. The prevailing taxon among cereals is *Hordeum vulgare* of which were found thousands of hulled caryopses, while only some hundreds were attributed to *Triticum*, with *Triticum aestivum* s.l. more common than *T. dicoccum*. *Cicer arietinum* is the most abundant legume with thousands of charred seeds identified. Only a few seeds of *Pisum sativum* and *Lens culinaris* were found. Among charcoals, woods of deciduous *Quercus*, *Populus*, *Alnus*, *Fraxinus*, *Juniperus*, *Pinus* as well as remains of monocots were found. The new archaeobotanical investigation so far carried out on the Early Bronze-2 at Arslantepe adds new data on the local subsistence economy changing from a semi-nomadic pattern to a quite sedentary one.

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CHARRED PLANT REMAINS FROM BRONZE AND IRON AGE TEL KINROT AT SEA OF GALILEE (ISRAEL)

PRELIMINARY RESULTS

Marlies KLEE & Marlu KÜHN

Tel Kinrot is situated on the northwestern shore of the Sea of Galilee in Israel. It was permanently inhabitated from the Early Bronze Age until Ottoman periods. First botanical investigations were carried out during the excavation in 2003. Bronze Age and Iron Age layers showed a considerable number of charred plant remains. Chaff remains of emmer wheat, fragments of olive stones, nutlets of fig, grape pips as well as seeds of pulses, mainly bitter vetch were found. The crop assemblage suggests the importance of cereals, pulses and fruits in the diet.

COMPARATIVE ARCHAEOBOTANICAL STUDIES OF SANCTUARIES FROM LOWLAND AND MOUNTAINOUS SITES IN BULGARIA

Tzvetana POPOVA[87]

The problems of cult have been a matter of scientific reserarch for 20 years. Clear differences have been established between the cult practices of Thracian tribes who lived in mountainous regions and those from the plains. The cult places in the plains were usually pit-fields situated along rivers while those in the mountains occupied prominent peaks and were normally surrounded by defensive ditches. The functions of the cult places were highly dependent on their situation. Archaeobotanical investigations give an opportunity to identify the nature of cult offerings.

This paper presents the results from studying the archeobotanical material from several mountainous and pit sanctuaries in the territory of Bulgaria. The discussed sanctuaries date from the Early Iron Age (10th century BC) utntil the end of the Roman period (5th century AD). The studied material includes vegetation prints on pottery vessels, burnt seeds and fruit remains from ritual pits, which contain sacrifices.

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CEREALS, FRUITS, AND WEEDS: CHARRED PLANT REMAINS FROM THE MEDIEVAL FORTRESS OF RAS IN SERBIA

Ksenija BOROJEVIC[88]

Structures dating to the 12th and 13th century containing charred cereals were excavated during the systematic archaeological research of the medieval complex of Ras in southeast Serbia. The cereal supplies had been burnt in a sudden conflagration probably connected with the distruction of the fortress in 1233. This is a period when the fortress was abandoned by the Byzantines and became a stronghold of the territory where the first Serbian state was formed. Twelve macro botanical samples were collected by the investigators (1972-1984) from the fortress situated at the hilltop and from a settlement below. This study presents the results of the first archaeobotanical examination from a medieval site in Serbia. The analysis has shown that the main staple was bread wheat, followed by rye, barley, oats, and millet grains. Exceptional finds include a piece of carbonized round bread, a cereal content of a pot, and peach pit fragments. The weeds, including ruderals, were represented by many taxa. Corn cockle (*Agrosthemma githago*) was the main contaminant of the cereal fields. Previous information about the agriculture and food in the medieval Serbia was based solely on the written documents that were either later or not pertinent to the region; thus, this is the first direct evidence providing information about agricultural activities and food supplies of the inhabitants of the territory that was to become the center of the newly formed Serbian state.

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FUEL AND DEFORESTATION: CHARCOAL ANALYSIS OF SEVERAL PREHISTORIC SITES IN THE CZECH REPUBLIC

Jaromír BENES[89], Jan NOVÁK & Veronika PETRLÍKOVÁ

Charcoal analysis is rather rare used archaeobotanical methods. Poster presents four examples of charcoal analysis from prehistoric sites in Bohemia. Criterion for site choice was more as 1000 charcoal determination as well as certain level of archaeological importance. The first site is the Neolithic settlement at Bylany, where structure of charred wood fragments reflects typical Atlantic oak woodland. The second site embodies Late Bronze Age phase of Hostivice settlement near Prague (cf. paper about wooden wells on this conference) with typical structure of wood with strong human impact. The third example represents the Late Bronze Age and Early Iron Age cemetery of Radčice near Plzen as interesting example of charcoal taxa structure determined by burial customs. The last example offers use of charcoal analysis in context of long-term environmental change in Lovosice region in the Iron Age and Early Medieval Period. Results of all analysis reflect of near woodland, character of local fuel consumption and changes of both factors through time. Data are compared with changes of forest canopy structure recorded in pollen analysis.

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FRUIT DEPOSITS IN THE CHALCOLITHIC TELL OF PODURI-DEALUL GHINDARU, ROMANIA (V-IV MILLENIA BC)

Felicia MONAH[90]

Any archaeologist dreams of discovering deposits because they usually offer more information than common discoveries do. From this point of view archaeobotanists make no exception. Discovering vegetal macro-remains allows us often to reconstruct the structure of cultivated fields and establish some ritual ceremonies. The *tell* of Poduri is an exception in the context of the chalcolithic in the region situated east to the Eastern Carpatians, as here there has been discovered an important number of deposits containing vegetal macro-remains wich are well conserved.

During 25 years of research there have been discovered important quatities of wheat and barely wich represented the provisions of the community. Cereal deposits were kept in big pots, in adobe „boxes" and adobe silos. Quit remarkable are the silos with a sawn-off cone shape, a capacity of about 0.5 m^3. There have also been discovered fruit deposits coming from aromatis plants (*Coriandrum sativum*) and mixtures of fruits wich seem to signal the making of aromatic drinks or sauces.

Very interesting are the ritual deposits. In one case there has been discovered a human skull lying at the centre of a lens carbonised cereals; in another case in a pit there was a big pot, decorated with incisions and paintings, containing a glass painted in three colours with fruits of *Lithospermum officinale*. Around the glass several artefacts were laid on a stratum of red ochre. We will analyse in our paper the botanical composition of the most representative fruit deposits discovered in the *tell* of Poduri.

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ARCHAEBOTANICAL INSIGHT TO THE LIFE ON A PREHISTORIC HILLFORT (VLADAR, CZECH REPUBLIC)

Petr POKORNÝ[91], Miloslav CHYTRÁČEK[1], Ladislav ŠMEJDA[92] & Kateřina MIKOLÁŠOVÁ[93]

An extensive hilltop archaeological site Vladař, together with its surrounding landscape, has been subjected to multidisciplinary investigations during the last years. Archaeobotanical and palaeoecological methods played a crucial role in this effort. They involve: analyses of pollen, green algae, Cladocera and other microfossils, plant macroremains (incl. charcoal and wood), and chemical analyses. Two main groups of material have been used for the analyses: traditional archaeological layers, and continuous sedimentary record preserved in an artificial water pond situated directly on top of the hillfort acropolis. Oldest sediments of this water cistern has formed at the La-Téne period (ca. 400 yr. BC according to radiocarbon analyses) and sedimentation continued up to present times. Using above-mentioned methods, this high-resolution record yielded vast amount of information relevant to the reconstruction of the chronology of site occupation, environmental reconstructions at individual time-slices including the degree of human impact, and reconstruction of different human activities (grazing, crop production).

During La-Téne period we may distinguish two important phases on the basis of environmental data: 1) Phase of an intensive occupation that continued up to ca. 270 yr. BC that is characterised by surprising degree of deforestation and human impact. In this period, Vladař hillfort appear to be a settlement centre of a great importance. 2) Phase of less intensive human impact dated between ca. 270 and 50 yr. BC. Over entire La-Téne period studied we may distinguish prominent fluctuations in the amount of cereal pollen and indicators of grazing that both show complementary trends. The nature of such changes (in 7 individual phases) is still the matter of discussion.

After ca. 50 yr. BC the hillfort, together with surrounding landscape, has been completely abandoned by people and natural vegetation succession took place. New signs of human activities appear only after ca. 600 yr. AD, and accelerate during High Medieval period.

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MASSIVE FIND OF *STIPA* MACROFOSSILS IN EARLY BRONZE AGE STORAGE PIT AT THE CZECH REPUBLIC: LOCAL IMPLICATIONS AND POSSIBLE INTERPRETATION IN CENTRAL EUROPEAN CONTEXT.

Petr POKORNÝ [94]& Aldona BIENIEK [95]

Massive find of *Stipa pennata* s. l. macrofossils in a storage pit dated to the Únětice culture of the Early Bronze Age forms the basis to the question concerning the use of this plant during the prehistory, as well as the question of its Holocene history in Central Europe. Pollen record from dry, subcontinental Central Bohemia contributes to the second question. An important prehistoric phase of human impact in the study area is dated to the Early Bronze Age. In this period, xerothermic grassland vegetation expanded, being formed by many native as well as introduced plant species. Several species of the genera *Stipa* ranges between the most characteristic dominants of such habitats.

In the Neolithic Lengyel culture of Kujawy (central Poland) *Stipa pennata* has been found in more than half of studied archaeological features. It was represented by fragments of the lower part of awn and fragments of grains. Kujawy region is located out of the continuous range of *Stipa pennata* s.l.

Abundance of *Stipa* remains in the material dated to the Middle Neolithic from Kujawy and its presence in the storage pit dated at Vliněves site to the Early Bronze Age were most probably connected with gathering of this plant. Grains of *Stipa* are edible, whole plant could have been used as insulation, for making mattresses etc. Nowadays spikelets of *Stipa* are used as an adornment. They are dangerous for herbivores and the plant can play a role of a pasture weed (Dobrokhotov 1961).

The find from the storage pit at Vliněves confirms the possibility of the use of *Stipa* grains as a food. But as usual, when we try to explain archaeobotanical find we cannot exclude other interpretations, e. g.

1) Usage of easy burning *Stipa* awns for disinfection of a storage pit before the deposition of cereal grains,

2) usage of the clump of *Stipa* awns for the protection of crop storage against soil moisture (insulation of the storage pit walls).

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THE WELL FROM OLD TOWN OF PRAGUE: COMPARISON OF MACRO-REMAINS AND POLLEN ANALYSIS

Veronika KOMÁRKOVÁ[96], Katerina MIKOLÁSOVÁ[1], Jitka JAFRÁNKOVÁ[1] & Petr STAREC[97]

In historical core of the Old town of Prague (the Czech Republic) a well from the Medieval Period was excavated. The stone well found in rich medieval house was constructed in the 14th Century, but infilling is dated in the 16th Century, when stone object has been transformed into cesspit. Archaeobotanical samples from well provided around 70 taxa of macro-remains among over 5 000 diasporas, including 40 useful plants. In sum of total amount diasporas represented useful plants over 90%. The most interesting finds were medlar (*Mespilus germanica*) and black mulberry (*Morus nigra*). Rare is also find of pepper (*Piper nigrum*). Weeds, ruderal plants, but also grassland species were well represented. Interesting is a comparison by means of two different analysis-macro-remains and pollen. Results of pollen analysis generally correspond with macro-remains, interesting are some of specific observations. Except pollen grains also parasite's eggs were found (*Trichuris trichiura*). Pollen spectrum was rich and pollen grains were well preserved. Archaeobotanical data reflect in particular the Early Modern Prague house holding of 16th Century and its natural milieu and social setting.

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PALAEOETHNOBOTANICAL INVESTIGATION OF HUMAN ACTIVITY WITHIN A BRONZE AGE TELL SETTLEMENT IN HUNGARY. DIFFERENT CROP PROCESSING ACTIVITIES AT SZÁZHALOMBATTA-FÖLDVÁR

Brigitta K.-BERZSÉNYI

Introduction

During the last 30 years the archaeological interpretation of the Bronze Age tell sites in Hungary has left a number of questions still unanswered:

- How did the inner settlement structure look like?
- What are the functions of the different house structures?
- What kind of activities were carried out at the different parts of these sites?

To answer these questions a new project started in 1998 at Százhalombatta-Földvár within the framework of the 'Emergence of European Communities Project' (Kristiansen 2000), which is a Europe wide investigation into the origins of Bronze Age settlement systems and later urbanisation.

Proposed research

Százhalombatta-Földvár can be found in the central part of the Carpathian Basin on the right bank of the Danube, 30 km south of Budapest. The research area forms part of the Great Hungarian Plain Forest zone (Eupannonicum) more specifically the Danube zone. Most of the area was covered by steppe or close gallery forest vegetation.

My main target is to identify the function of different areas and the activities that took place in them. I will use the data that can be gained from plant remains because these remains from the different parts of the site are likely to result from specific human activities.

One part of my questions relate to the fonction of structures

- How can different plant manipulation reflect the function of the excavated structures?
- How can data provide information on the categories of the site? Is it possible to prove that the investigated area was used by difference social groups
- Do different processing activities provide evidence of weather changes?

Second part of my questions relate to the pre-harvesting and harvesting methods and crop processing stages:

- What kind of plant remains can give information on sowing times and weedings?
- How can data refer to the different crop processing stages?

To answer these questions I use ethnographic models and experimental work. Some questions can be answered by means of ethnographic models.

A grid system is used to reveal the macrofossils. Samples are taken within 2x2 m units through the whole excavation surface and further samples are collected from all the features: house, pit, posthole, street and hearth.

My previous archaeobotanical studies suggest that einkorn and emmer wheat were the staple crops for more than 500 years (K. Berzsenyi 1997).

CHARRED GRAIN ASSEMBLAGES FROM LATE IRON AGE STORAGES IN HUNGARY

Orsolya DÁLNOKI[98] & Stefanie JACOMET[99]

In the summer 2002 a pit was discovered near some Late Iron Age house remains in Zamárdi, Kútvölgyi-dülö, at Lake Balaton, Hungary. Its shape already indicated that it was a storage pit. On its bottom a layer of an average 5 cm charred plant material, mainly consisting of cereal grains, was found. One goal of the archaeobotanical analysis was to find out if the filling was an antique waste or a grain-storage. Only one sample was taken from the pit, a full bucket of ca. 8 liters of „soil" from the burnt layer at the bottom. The flotation resulted in ca 2 kg of pure carbonized plant remains, mainly composed of mostly well preserved charred cereal grains and chaff, some carbonized weed seeds and charcoal.

The analysis of a randomly selected subsample of 20 grams yielded a result very similar to a previously investigated Celtic assemblage, the grain storage and refuse material from Corvin Square, Budapest (Dalnoki & Jacomet 2002). Both settlements, similarly dated to the last phase of the La Téne Culture (Late Pre-Roman Iron Age), indicate that the inhabitants favoured glume wheats: spelt (*Triticum spelta* L.) seems to be the most important cereal, followed by emmer (*Triticum dicoccum* Schübl*.)* and einkorn (*Triticum monococcum* L.). The main difference between the new site and the Corvin square site is that at the latter broomcorn millet (*Panicum miliaceum* L.) was also found in larger amounts, in Zamárdi however this species is lacking. Barley (*Hordeum vulgare* L.) and oat (*Avena sp.)* are almost totally missing here. Rye (*Secale cereale* L.) and naked wheat (*Triticum aestivum/durum/turgidum* L./Desf./L.) were only present with a few grains in Zamárdi. The material also contained large amounts of cereal chaff and the typical weeds belonging to cereals but no traces of pulses or fruits.

The analysis shows that the new material from Zamárdi represents rather storage than a waste. How the material got carbonized and arrived in the pit is unclear. Perhaps it represents an accidentally carbonized material from a kiln-dry/roasting process or leftovers of the original filling, which was burnt intentionally because of spoilage.

Despite the presence of typical chaff remains of the glume wheats; spelt, emmer and einkorn, the identification of the hulled wheat grains caused problems. Especially challenging was the distinction of spelt grains from emmer. There were large amounts of intermediate forms, and also frequently grains from one-grained spikelets, at first sight they looked like einkorn. Therefore, it was not possible to identify most of the grains more precisely than „*Triticum* spec."

The other puzzle is the pit itself, since in Hungary up till now real cereal storage pits were thought to be found only from the Roman Period onwards. After the new findings it seems that also in the pre-Roman Iron Age such storage pits exist in Hungary, like in other parts of Europe.
Plant remains from Late Iron Age settlements in Hungary were not frequently investigated until now. Thanks to some new findings, we hope to answer the question of cereal storage for this time period in the future.

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PLANT REMAINS FROM THE ROMAN AGE SITE IN TCZEW, N POLAND

Monika BADURA[100] & **Zbigniew ZURAWSKI**

Excavations carried out during 2000-2001 in Tczew (N Poland) exposed the Roman Age settlement. Archaeologists identified more than 90 objects with many interesting relics. Fragments of pottery, bronze, amber and clay articles were found as well as zoological materials (bones, remains of fish).

The archaeobotanical investigations concerned materials from 6 features described by archaeologists as a "stove", "wells", "latrine" and "storage pit". The aim of the botanical analysis was to show the origin and function of the features and to compare them with the archaeological descriptions. In the studied samples apart from few remains of field weeds and ruderals, many aquatic, wetland and wet meadow species were found. The list of taxa includes as for example: *Alisma plantago-aquatica*, Characeae, *Sparganium erectum*, *Galium palustre*, *Juncus articulatus*, *Juncus bufonius*, *Lycopus europaeus*, *Ranunculus flammula*, *Scirpus sylvaticus*, *Thalictrum* cfr. *lucidum*, *Bidens tripartitus*, *Hypericum tetrapterum*, *Lychnis flos-cuculi*, *Rorippa palustris*, *Chenopodium* sp., *Fallopia convolvulus*, *Lapsana communis*, *Euphorbia heioscopia*, *Solanum nigrum*. Also single seeds of *Petrorhagia prolifera*, *Potentilla norvegica* and *Arenaria serpyllifolia* were identified.

Preliminary results of archaeolobotanical work show that in the most cases the archaeological features were used as wells. In the absence of lack of cultivated and collected plant remains we can exclude hypothesis on such purposes as for latrine or a storage pit.

The data on species composition of the samples afford new information on the environmental conditions around the site and contribute to the knowledge on history of vegetation in the Vistula River valley.

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PLANT REMAINS FOUND IN THE MEDIEVAL LAYERS OF THE NEW ARCHAEOLOGICAL SITE FROM KRAKÓW, POLAND

Aldona BIENIEK[101], Agnieszka WACNIK[1], Zofia TOMCZYŃSKA[1] & Emil ZAITZ[102]

Small-scale, archeological and archaeobotanical research has been carried out at 17 Kanonicza street recently. The site under study is located in the centre of the oldest, Early Medieval settlement in Kraków (Cracow).

With regard to the oldest Early Medieval phase, a few historical dates are of interest. In 9th century, Świetopełk, Duke of Grand Moravia, occupied the Małopolska (Little Poland) region. In the first half of 10th century, Boleslav the Cruel, the ruling Czech Duke, established Czech rule here. Kraków was mentioned for the first time in an account by Ibrahim-Ibn-Jacub, a merchant from Cordoba (965/966). At the end of 10th century, Kraków was incorporated into the Polish state and probably from 11th century became the capital of Poland. In 10th and 11th centuries the first stone edifices such as Wawel castle, pre-Romanesque churches and the cathedral were built.

In 9th century, the duke's castle on Wawel Hill and a settlement ("Okół") were fortified with a palisade and an earth wall. The material examined was taken from the "Okół" area, near the defence walls. The medieval layers found there have been archaeologically dated to the period between 9th and 12th centuries.

The results from plant macro-remains (including charred, waterlogged and mineralized seeds, fruits and wood) and pollen analyses illustrate the development of the local, mostly synanthropic, vegetation and environmental changes. On the basis of palynological results, we assumed that the area was covered by only small groups of oak trees and *Salix*, *Alnus*, *Betula* as well as *Populus* on more humid locations.

In the samples from 9th and 10th centuries, the pollen frequencies of trees, shrubs and indicators of wetland communities were higher than in later samples. The amount of anthropogenic indicators (crops, weeds and ruderals) increased through time. The differences between the layers reflect changes in human activities carried on in this part of the borough.

Cultivated plants were represented by only a few charred macroremains (cf. *Avena* sp., *Hordeum vulgare*, *Panicum miliaceum*, cf. *Pisum sativum*, cf. *Secale cereale*, *Triticum aestivum*) but their presence in pollen spectra was usually significant (additionally cf. *Cannabis sativa*), suggesting that the crops had not been stored in that part of the borough but that they were probably cultivated in the neighbourhood. Pollen of wind-pollinated rye was scarcely represented, which supports previously known evidence for the late introduction or intensification of rye cultivation, probably between 12th and 13th centuries.

The list of weeds and ruderal plants is long. Many of the wild plants found in the studied material are also reported as useful medicinal plants (twice as many as non-medicinal ones). Some of them could have been collected for medical purposes (i.e. *Atropa belladonna* or *Hypericum perforatum*).
The site is important because it has undisturbed sediments from 9th century onwards, hither to not described from Kraków.

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ARCHAEOBOTANICAL INVESTIGATIONS IN LATE IRON AGE AND MEDIEVAL INHUMATION CEMETERIES IN FINLAND

Mia LEMPIÄINEN[103]

Archaeobotanical investigations has been done in several cemetries in Finland during last years.
This paper presents the results from three different cemetries; Chapelhill cemetery in Lappeenranta, Saint Laurentius ruinchurch in Hämeenkoski and Saint Michaels ruinchurch in Pälkäne.
Chapelhill cemetery in Lappeenranta dates back to 1100-1300 AD. The plant remains were taken from over 40 inhumation graves in archaeological excavations during the years 1999-2000. Macrobotanical analysis yielded numerous uncharred material and some charred material. Uncharred material consisted mostly on species of *Bryophyta sp., Carex sp, Chenopodium suecicum* and of *Rubus idaeus*, which was the most dominant and was present in every analysed grave. One well preserved grave yielded over 600 seeds of *Rubus idaeus.* Charred material consisted of needles from *Picea abies* and *Pinus sylvestris*, but also seeds of *Arctostaphylos uva-ursi* and *Fallopia convolvulus* were foud.
Saint Laurentius ruinchurch in Hämeenkoski dates to 1510-1530 AD. Archaeobotanical material was taken in excavations being held in 2003. Over 20 inhumation graves were examined and most of the analysed plant material was uncharred, but also charred material was found. Uncharred material consisted species of *Bryophyta sp., Equisetum sp., Alchemilla sp., Chenopodium album, Trifolium medium, Urtica dioica* and *Ranunculus acris.* Most dominant in uncharred material was *Sambucus racemossa*, which was present almost in every grave. From the charred material was identified the grains of *Hordeum vulgare* and seeds of *Vestuca pratense, Poa annoa, Rumex acetosella* and *Polygonum aviculare.*
Saint Michaels ruinchurch in Pälkäne dates to 1470-1530 AD. During the excavations in 2002 and 2003 nearly 50 inhumation graves has been examined. Archaeobotanical material from the graves mostly consisteded species of *Chenopodium album* and *Rubus saxatilis.* Any charred material has not been found.
My aim of the study is to examine, is it possible to identify plants used in funeral rituals or plants that could have been used in constructing the grave. So far, the material I have examined from inhumation graves, does not give any straight answers to these questions of usage of plants in graves.

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THE NORSE SETTLEMENT OF THE NORTH ATLANTIC ISLANDS - WATERLOGGED PLANT MACROFOSSILS FROM ARCHAEOLOGICAL AND ENVIRONMENTAL SITES

Joanna BENDING[104]

The settlement of the North Atlantic Islands by the Norse, beginning in the 8th century A.D., is generally believed to be responsible for dramatic changes in the environment of the islands, notably forest clearance and erosion. A major interdisciplinary project, 'Landscapes circum Landnám', has been set up to investigate these changes in more detail. The project is a collaboration between researchers from several universities (including the University of Aberdeen, University of Edinburgh, University of Stirling, UCL and CUNY), and is funded by the Leverhulme Trust. The interpretation of waterlogged plant macrofossil assemblages from archaeological sites will shed light on the use of plant resources by the settlers, as well as living conditions at the site. 'Environmental' sequences from peat bog monoliths will indicate changes in the landscape. The results of research at the farmstead site of Toftanes on the Faroe Islands, and preliminary results from monoliths in Reykholtsdalur, Iceland, will be presented.

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RARE AND LUXURIOUS FOOD PLANT REMAINS FROM THE NETHERLANDS IN MEDIEVAL AND SUBRECENT CONTEXTS, WITH A FOCUS ON IDENTIFICATION CRITERIA

O. BRINKKEMPER[105], H. van HAASTER[106], W.J. KUIJPER[107] & C.E. VERMEEREN[2]

The poster presents interesting archaeobotanical finds from Dutch medieval and younger sites.

The archaeological context, dating, centre of origin and identification characteristics are presented for the following taxa:

Allium sativum (leek)

Arachis hypogea (peanut)

Calendula officinalis (Marigold)

Capparis spinosa (Caper)

Capsicum annuum (Cayenne pepper / paprika)

Citrus spec. (Citrus fruits)

Coffea arabica (Coffee)

Cucurbita pepo (pumpkin)

Gossypium spec. (cotton)

Myristica fragrans (nutmeg)

Solanum melongena (aubergine / eggplant)

Theobroma cacao (cacao)

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MEDIEVAL LATRINES FROM ÜBERLINGEN, LAKE CONSTANCE

Tanja MÄRKLE

Überlingen is in south Germany on the north shore of Lake Constance. In the center of the town lies the site of the former hotel “Krone” (crown), situated next to the cathedral and close to two medieval traderoutes. In 1996 excavations in the courtyard of this building revealed nine high medieval latrines. Because of the large number of latrines and their differences in construction the archaeologists proposed that the lot was originally divided between several landlords. Seven of the latrines could be investigated archaeologically and archaeobotanically. They provided altogether 18571 uncarbonised, carbonised and mineralised remains. A wide variety of cultivated and wild plant taxa could be identified, for example at least five different cereals (*Hordeum vulgare/distichon, Panicum miliaceum, Secale cereale, Triticum monococcum and T. spelta*), oil plants like *Linum usitatissimum* and *Papaver somniferum* and an assortment of legumes and spices (e.g. *Pisum sativum, Anethum graveolens, Apium graveolens*). The most important fruits were *Fragaria vesca, Pyrus malus* and *Vitis vinifera*.

Triticum spelta was discovered in all latrines and appears to be the most common cereal, while findings of *Panicum miliaceum* occurred only in samples from three pits. *Secale cereale* probably played only a minor role in the nutrition of the people at Überlingen. Spelt seemed to have been a staple food as in neighbouring Switzerland in high medieval times and therefore this site lies south of the so-called “*Secale cereale-Triticum spelta* border”. Weeds like *Vaccaria pyramidata* and *Agrostemma githago* were in all samples and show the significant problem they provided for the medieval farmer.

AGRICULTURE AND SUBSISTENCE ECONOMY IN THE REGGIO AREA DURING PREHISTORY: A PRELIMINARY PALAEO-ETHNOBOTANICAL STUDY OF THE NEOLITHIC SETTLEMENT AT BAZZAROLA (REGGIO EMILIA, ITALY)

Maria Letizia CARRA[108]

Since summer 2000 the Neolithic site of Bazzarola, few kilometres south-east of Reggio Emilia, was investigated by archaeological excavations. The prehistoric site is characterized by three different Neolithic horizons, giving evidence of a Neolithic occupation which succeeded continually for about two thousand years: the "*Ceramica Impressa*" culture, the "*Fiorano*" culture and the "*Vasi a Bocca Quadrata*" culture. The poster presents the results of archaeobotanical analysis of samples from nine of the investigated features. The main focus of archaeobotanical research is the investigation of the relationship between man and his environment.

Generally the plant macro-remains are fragmented and not very well preserved, but they clearly reflect agriculture as the main food supply during Ancient and Middle Neolithic times. Even if the data could be partly distorted by the huge amounts of indeterminable grain fragments, cereals seem to be constantly present. The recorded cereals are *Hordeum vulgare* L. and two different glume wheats: *Triticum monococcum and Triticum dicoccum.* In the samples from the occupation of the "*Fiorano*" culture and in the "*Vasi a Bocca Quadrata*" culture pulses are only minor components. Furthermore, in the latter high quantities of recovered acorn receptacle fragments give probably evidence of a developed livestock. Acorns can have been an important part of the fodder for domesticated animals. Nevertheless, we should also consider human consumption of acorns.

The natural environment of the Neolithic site is reflected by typical plants of forest margins, for example elder, hazel, cornelian cherry and several wild fruit trees of the Rosaceae family: *Malus sylvestris* Miller, *Pyrus pyraster* Burgsd. and *Prunus spinosa* L.. The presence of these species may point to a landscape influenced by relatively strong human impact.

Among the herbaceous plants, several crop weeds and ruderals are recorded (*Papaver rhoeas* L., *Verbena officinalis* L., *Valerianella dentata* (L.) Pollich, *Atriplex* spec. L., *Capsella bursa pastoris* (L.) Med.) as well as some species of humid environments (*Luzula multiflora* (Ehrh.) Lej., *Ranunculus sardous* Crantz, *Epilobium* spec., *Carex* gr. c*ontigua* Hoppe). They give evidence of a palaeo-channel just near the settlement which is underlined by the archaeological finds.

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FOOD REMAINS FROM THE "HOUSE 2" OF THE ETRUSCAN-CELTIC SETTLEMENT OF MONTE BIBELE, A PALAEOETHNOBOTANICAL STUDY

Paola LUCIANI[109]

In the Late Iron Age the Etruscan-Celtic village of "Pianella di Monte Savino" (Monte Bibele, Bologna, Italy) was destroyed by fire. This event has allowed a good preservation of a large amount of charred plant remains. The poster presents the results of the archaeobotanical examination of 13 samples which were recovered inside one of the buildings ("house 2"). It is very probable that most of the recorded food plants were locally cultivated since the environmental conditions and the adjacent land were suitable for the agriculture.

Cultivation of crops seems to be an important activity in the life and in the economy of the community settled at Monte Bibele. The two main components of the stored food supply and maybe also of the agricultural economy were both cereals: free-threshing wheat *Triticum aestivum* - *durum* s. l. (most frequent in the samples) and hulled lax-eared six-row barley *Hordeum vulgare* ssp. *vulgare* (the most abundant in percentage). In the range of cultivated plants *Linum usitatissimum* and *Vicia faba* var. *minor* were also relevant. Of minor importance in the food plant assemblage are: *Triticum dicoccum, Triticum monococcum, Triticum spelta, Avena* sp. and *Vitis vinifera* ssp. *sylvestris*.

Archaeobotanical analysis gave evidence of the storage practices used at Monte Bibele. Most of threshed and partially processed crops were preserved in storage vessels which were found clearly associated with the carbonized plant remains. Some of these damaged storage containers revealed furthermore a particular concentration of one cultivated species, so it could be suggested that *Linum usitatissimum* and *Vicia faba* were kept separately. *Triticum aestivum* - *durum* s. l. and *Hordeum vulgare* ssp. *vulgare* were most probably mixed during the fire by accident.

Very little evidence is coming from the recorded weeds in the assemblage but they seem to indicate that hulled barley was sown as spring crop while free-threshing wheat was most probably a winter crop.

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THE PLANT REMAINS FROM THE ETRUSCAN-CELTIC VILLAGE (IV-IITH CENT. B.C.) OF "PIANELLA DI MONTE SAVINO" - MONTE BIBELE (NORTHERN ITALY)

Giovanna BOSI[110], Carla Alberta ACCORSI[1], Marta Bandini MAZZANTI[1] & Luisa FORLANI[111]

The "Pianella di Monte Savino" site (525-562 m a.s.l.), on the Monte Bibele massif - Emilian Apennines, is a village dated to the middle of IVth cent. B.C. It was inhabited by Etruscan and Galli Boi people which lived together in an extraordinary case of integration. The village had its apogee in the IIIth cent. B.C. and was destroyed by fire at the beginning of IIth century B.C. At that time it consisted of ca 40-50 houses connected by a network of little roads (Vitali, 1983 & 1991). The archaeobotanical research (pollen, seed/fruit and charcoals) mainly involved three houses, one crop store (House 19) and two homes (House 20 and House 24). Pollen spectra (6 archaeological layers, ca 80 taxa) showed that the village was in a open area with pastures and little fields of cereal and pulse. Forest mainly consisted of oak woods, as confirmed also by charcoals (155 records; *Quercus* deciduos and *Ulmus*). Seeds/fruits (more than 10,000 charred records; 15 taxa) showed the dominance of pulses (*Lens culinaris*, *Lathyrus sativus*, *Vicia faba* var. *minor*, *Pisum sativum* in order of importance), especially in House 20. Among cereals, *Triticum aestivum*/*durum* prevailed upon *Hordeum vulgare*. Moreover, the records of *Sorbus domestica* found in House 24 suggested that this tree was probably cultivated. Seeds/fruits were in part carefully stored in pottery. A number of pots contained records belonging to almost only one species (e.g. *Lens*). Biometrical/statistical data from 2,500 records showed that these seeds/fruits were often the largest and suggested that they had probably been selected to be sown. Other pots contained cereals and pulses, in mixtures which appeared ready to prepare food (e.g. soups and breads, may be according to original etruscan-celtic recipes?)

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FUNERAL BURNT OFFERINGS FROM THE VESONII TOMB AT THE PORTA NOCERA, POMPEII: FIRST RESULTS

Véronique MATTERNE

This study is taking part in a research programme dealing with the reconstruction of the Roman funerary rituals, according to antique accounts, archaeological material and organic residues. The programme is led by the *Cnrs*, the *University of Picardy*, the *Ecole Française de Rome* and the *Soprintendenza di Pompei*. The general supervisors of the research are S. Lepetz and W. Van Andringa.

The first excavation campaign has been carried out in 2003, on a family funeral enclosure, the Vesonii Tomb. A part of the enclosure has been dug into, revealing very well preserved individual cremations and soil levels. Samples have been taken for anthracological, palynological and macro remains studies. The samples are coming from the soil levels, the funeral pits and the urns.

Sieving and sorting were processed on the site. Many species have been preserved by carbonization: Figs (*Ficus carica*), the main species, but also date (*Phoenix dactylifera*), grape (*Vitis vinifera*), olive (*Olea europea*), pomegranate (*Punica granatum*), hazelnut (*Corylus avellana*), chick pea (*Cicer arietinum*), pea (*Pisum sativum*), bitter vetch (*Vicia ervilia*), wheat (*Triticum aestivum* and *T. dicoccum*) and cypress cones (*Cupressus sempervirens*).

Cette intervention archéologique s'intègre dans un programme d'étude visant à reconstituer les rituels funéraires romains à partir des témoignages écrits et des vestiges matériels. Il est co-dirigé par S. Lepetz (Cnrs) et W. van Andringa (Université de Picardie Jules Verne), en collaboration avec la Surintendance de Pompéi et l'Ecole Française de Rome.

La première campagne de fouillé, réalisée en 2003, portait sur un enclos funéraire familial, la tombe des Vesonii. Une partie de l'enclos a été dégagée, révélant des tombes et des niveaux de circulation intacts. Des prélèvements carpologiques, mais aussi anthracologiques et palynologiques, ont été effectués dand les niveaux de sol entourant les stèles, dans les fosses funéraires et à l'intérieur des urnes.

Le tamissage et le traitement des échantillons carpologiques s'est déroulé sur place. De nombreuses espèces végétales sont attestées, sous forme carbonisée: principalement des figues, mais aussi datte, raisin, olive, pomme grenade, noisette, pois chiche, pois, ers, blé et cônes de cyprès.

THE PRESENCE OF *CICER ARIETINUM*, *VIGNA UNGUICULATA* AND *LATHYRUS SATIVUS/CICERA* IN MEDIEVAL ITALY

Elisabetta CASTIGLIONI, Elena RETTORE

The role of legumes in Medieval economy in Italy has been often underestimated. Even if archaeobotanical data prove their existence (although abundant remains have been only recovered in a limited number of sites), legumes appear scarcely documented in the numerous texts of economic history.

Like in the case of cereals, legumes appear represented by a large variety of species. In this poster we present an updating of medieval findings *Vigna unguiculata*, *Cicer arietinum*, and *Lathyrus cicera/sativus* from Italian sites. *Lathyrus cicera/sativus* appears represented more frequently whereas *Cicer arietinum* e di *Vigna unguiculata* are more rarely found.

Data come from published papers and reports as well as from new non-published studies carried out by members of the Laboratorio di Archeobiologia of Como.

AGRICULTURE AND DIET AT THE MEDIEVAL SITE OF PEVERAGNO LOC. CASTELVECCHIO (CUNEO, ITALIA)

Sila MOTELLA DE CARLO[112] & Laura LEONI MARZORATI

Peveragno loc. Castelvecchio (III-VI sec. d. C.) si trova in Italia settentrionale, nel Piemonte meridionale, in provincia di Cuneo, a quota 843 m s.l.m. Le campagne di scavo condotte tra il 1993 e il 1996 dalla Soprintendenza Archeologica del Piemonte, sotto la direzione della dr.ssa Egle Micheletto, hanno portato alla luce resti carpologici da unità stratigrafiche dell'abitato e anche dai riempimenti di una fossa-silos.

Gli abitanti di Peveragno coltivavano diverse specie di piante erbacee e arboree per assicurarsi regolarmente il nutrimento lungo tutto l'arco dell'anno. Con riferimento ai dati archeobotanici, i cereali sono le piante coltivate più abbondanti in base al numero di resti rinvenuti: domina, per numero di cariossidi presenti, *Triticum aestivum*/*compactum*, seguito da *Secale cereale* e da *Hordeum vulgare*; è presente anche *Triticum dicoccum* e *Setaria italica*. Oltre ai cereali, sono documentati semi di *Vicia faba minor*, *Vicia sativa,*e *Pisum sativum* e *Linum usitatissimum.*

L'uso delle leguminose, ricche di proteine, doveva essere esteso anche alla loro mescolanza con i cereali, in particolare il "grano vecciato", come mescolanza di cereali e vecce.

La presenza di *Malus sylvestris* (i frutti rinvenuti hanno diametro massimo di 28 mm e quindi ricadono nella forma spontanea) ripropone l'utilizzo di frutti spontanei, secondo una tradizione che risale alla preistoria. Alcune piante erano oggetto di raccolta e, in qualche caso, di semicoltura e di protezione; il loro prelievo poteva servire a integrare l'alimentazione, ricuperando una quota di amidi e di grassi, per esempio, attraverso la frutta secca fornita dall'introduzione del noce (*Juglans regia*) e del castagno (*Castanea sativa*), dal nocciolo (*Corylus avellana*) e dalla quercia (*Quercus sp.*).

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SEEDS AND FRUITS OF FERRARA (NORTHERN ITALY) FROM MEDIEVAL TO REINASSANCE AGE (X- XVI CENT. AD)

Giovanna BOSI[113] & Marta Bandini MAZZANTI

Due to the co-operation between the "Soprintendenza Archeologica" of Emilia Romagna and our Laboratory of Palynology and Palaeobotany, the archaeobotanical research in the medieval city of Ferrara has been carried out since the beginning of 1990. Ferrara is situated in the Emilia Romagna Po plain (10 m a.s.l.). The city reached the apogee of its development under the rule of the Este Family, i.e. from the second half of the XIV to the XV cent. AD. Archaeological excavations revealed abundant and well preserved seed/fruit assemblages from many different deposits. The sites more closely studied were four: a) "Porta Reno – via Vaspergolo" (floors, layers, holes, rubbish dump, lavatories, sewers, cistern): second half of X cent. - end of XV cent.; b) "Piazza Castello" (holes, sewers): end of XIII cent.; c) "Piazza Ducale" (jugs, cistern of Palazzo Ducale): second half of XV cent.; d) Monastero S. Antonio in Polesine (jugs, cistern): XV –XVI cent. About 1,000,000 carpological records have been examined so far, and about 300 species/carpological types were identified in ca. 50 samples. The Anthropogenic Indicator group prevailed in all spectra covering around or more than 90% of each spectrum, and including a variety of cultivated woody plants (e.g., *Morus nigra*/*alba*, *Olea europaea* L., *Pinus pinea* L., *Platanus orientalis* L., *Punica granatum* L., *Ziziphus jujuba* Miller, *Mespilus germanica* L., *Prunus avium* L., *Prunus cerasus* L., *Prunus spinosa* L., *Sorbus domestica* L.), vegetables, spice and/or medicinal crops (*Brassica rapa* L. subsp. *rapa* / subsp. *sylvestris* (L.) Janchen, *Cucumis melo* L., *Papaver somniferum* L., *Foeniculum vulgare* Miller, *Petroselinum sativum* Hoffm.), fibre and oil crops (*Cannabis sativa* L., *Linum usitatissimum* L.), cereals, pulses and many wild synanthropic plants. Seed/fruit data supplied much information on the domestic life of people from the Late Middle Ages to Reinassance, and interesting historical conclusions were inferred from both archaeocarpological and archaeological studies.

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A NEOLITHIC HOUSE AND SEED ACCUMULATIONS ? ARCHAEOBOTANICAL STUDY OF STATION 19 LAYER HK OF CHALAIN (JURA, FRANCE).

Caroline SCHAAL[114]

The extensive excavation of station 19 layer HK at Chalain allows us to establish a large archaeological map of a late Neolithic lake-dwelling dated to 3060-2970 BC. Distinct areas can be observed into the prehistoric dwelling. First, a western zone is characterised by high piles density which indicates several successive constructions. Second, an eastern zone shows only one house rebuilt at the same location throughout 3060-2970 BC and a large midden related to the house. The remains discovered in this zone are remarkable: terracotta weights from a vertical loom, a large flint dagger, a net, a wooden sledge and a horn yoke probably used as animal harness. Moreover, the density of the wet diaspores in the layer HK is remarkably high at the house location, and reaches 350 000 diaspores per 1 kg sample of the concentrations. So, which factors could explain the accumulation of the organic residues?

Twelve samples of archaeological layer were analyzed; on the whole, 22 000 seeds were counted and 85 taxa were identified. The zone of the single house and the large midden is clearly distinguished from the other part of the village. In the fact that few plant assemblages have been identified. Dominant taxa are crop plants (poppy and corns), wild plants with edible fruits (blackberries, strawberry and winter cherry), and St. Johnswort (*Hypericum perforatum*).

The architectural elements at the base of the single house could limit the handing-over in suspension of the seeds caused by successive lake-level variations. The zones of rubbish heap, such as specific surfaces of treatment and storage of harvests, could have been well-preserved. The diaspores assemblages related to the daily domestic rejections, and could indicate specific human practice. The high concentration of fruit seeds could be related to dyeing of the textile fibre. These palaeobotanical data suggest specific activities associated with the eastern zone of Neolithic village.

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SUMMARY OF A ARCHEOBOTANICAL STUDY OF A GALLO-ROMAN NECROPOLIS AT FAULQUEMONT (MOSELLE, FRANCE)

Sidonie PREISS, Véronique MATTERNE, F. LATRON

In this report, we aim to approach the gallo-Roman funeral rites through the study of seeds and fruits associated with cremation remnants discovered in the pits of Faulquemont «Almert's» necropolis in La Moselle, France. Artefacts including glass, ceramic, precious metals, textiles, nails, human and animal bones are dated to the third century AD. Associated with the remains are plant materials comprising cereals, pulses, dried and fleshy fruits as well as fragments of bread. Among these, it is necessary to emphasise the exceptional occurrence of flowers, and the date and the olive, two imported foodstuffs. The organic material underwent varying levels of carbonisation, which seems related to their mode of deposition. Some were consumed (only the olive pits and the hazelnut shells were present) and others were not (eg. bunches of grapes). Through the study of this exceptionally well preserved material, and in conjunction with archaeological data, Roman texts and comparable sites, we were able to formulate a hypothesis that reconstructed a part of the ceremonies carried out during the funerals.

CROP STORAGE PRACTICES IN A GRANARY OF THE XIITH CENTURY IN SOUTH-WEST FRANCE

Marie-Pierre RUAS[115], Laurent BOUBY[116], Vanessa PY[117] & Jean-Paul CAZES[118]

The excavated village of “La Gravette” in l’Isle Jourdain is situated 30 km to the east of Toulouse in the Gascony plain. In the richer residential area of the village a granary was burned in the first quarter of the 12th century and fossilised thousands of seeds and much charcoal. The building measuring 7,60 by 5,60 m, had wooden and mud walls, and was covered probably with perishable materials (thatch? boards? other?).

Systematic samples were taken by 50 cm squares and sub-samples were studied (39 for carpology and 15 for anthracology).

The study of thousands of carbonized seeds preserved on the occupation surface of the store gave a spectrum of 15 cultivated taxa and a few wild plants. Grains of bread wheat (*Triticum aestivum* l. s.) are predominant (86% of seed volume) followed by grains or spikelets of *Hordeum vulgare*, *Avena sativa*, *Secale cereale* and *Triticum monococcum*. A few remains of *Panicum miliaceum*, *Setaria italica*, *Pisum sativum, Vicia faba*, *Lathyrus cicera* and *Linum usitatissimum* probably represent a residue of previous stock or culture. Vestiges of grapes (marc) represent the only fruit stored, the other(s) (remains of fruits) fruit remains are (consumption refuse) household waste.

Charcoal analysis attest 12 taxa. *Quercus* deciduous probably *Quercus pubescens* (73,6%) and *Fagus sylvatica* (8%) are the principal species. Several fragments of sticks or twigs of Rosaceae-Prunoideae, Rosaceae-Pomoideae and *Corylus avellana* suggest remains of light structures.

The comparison of the spatial distribution of seeds and charcoals and their species (allows to discuss) introduces discussion about presence of storage structures or separation (shelves, partitions), and storage practices.

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CROP EVOLUTION AT THE BASIN OF THE ST. CUGAT STREAM (CERDANYOLA DEL VALLÈS, BARCELONA) BETWEEN 1000 ANE AND c. VI AD

Natàlia ALONSO[119]

A considerable extension of the *Sant Cugat* stream passes over *Cerdanyola del Vallès* township (Barcelona, Catalonia, Spain). Several archaeological sites are in relationship with this course of water and they have been object of archaeobotanical sampling. This project allows us come up with a broad picture of crops and agriculture of the area between the First Iron Age and Late Roman period.

In spite of the fact that we have some information about cereal culture during the Bronze Age in this area, the information that we possess nowadays starts to be documented principally in the First Iron Age, and it is recovered especially in the structures of *Sitges de la UAB* excavation.

The most documented crops are hulled barley (*Hordeum vulgare*), by far, and naked wheats (*Triticum aestivum/durum*), together with different grasses that accompany them, mainly darnel (*Lolium temulentum*). These crops indicate a prevalence of a culture of winter cereals from this period. Other secondary cereals appear, as for instance naked barley (*Hordeum vulgare*var. *nudum*) or emmer wheat (*Triticum dicoccum*); there is also a considerable frequency of broomcorn millet (*Setaria italica*), although with a minimum quantity of remains. In this deposit there is, besides, a varied representation of pulses, as lentil (*Lens culinaris*), pea (*Pisum sativum*), horse bean (*Vicia faba*) and common vetch (*Vicia sativa*).

As for the Iberian period, the sites that contribute to archaeobotanical data are more abundant: Iberian structures of *Sitges de la UAB, Can Xercavins, Facultat de Medicina* and *Turó de ca n'Olivé*. During this phase a continuity is observed with regard to the First Iron Age. The most represented crops are still hulled barley and naked wheats, with similar frequencies but with a higher quantity of remains of the first species. Other species of cereals are cultivated like in the previous stage: emmer wheat, naked barley and millets (now also *Panicum miliaceum*), although very secondary. Nevertheless a difference is detected, due to the discreet presence of pulses, which takes us to consider them as a complementary crop.

However, the decrease of these species can correspond perfectly to taxonomical differences among the samples of every period and not to variations in the real values of these plants in the diet and the agriculture of the area. The presence of grape (*Vitis vinifera*) is also constant, although very scant.

Unfortunately, ther is a lack of information corresponding to the Roman period, and it is not until the VIth century A.D. that *Els Mallols* site provides us with archaeobotanical remains. In spite of the elapsed time, the identified species are still approximately the same ones as in previous periods: naked wheats, in this case the main cereals, with the complement of hulled barley, emmer wheat, vineyard (now in a larger quantity) and a wide range of pulses as horse bean, lentil, pea, common vetch and grass pea (*Lathyrus sativus*). Other less important cereals have been also identified, as for example naked barley, broomcorn millet and rye (*Secale cereale*), without excluding the possibility of the presence of cultivated oats (*Avena sativa*). The plants used, are not, therefore, essentially different from those of Protohistory; nevertheless it is important to bear in mind the innovations of the vineyard and the introduction of rye.

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THE WILD OLIVE (*OLEA EUROPAEA* SUBSP. *EUROPAEA* VAR. *SYLVESTRIS*) IN THE C-W OF THE IBERIAN PENINSULA DURING THE NEOLITHIC TIMES: A PLURIDISCIPLINARY APPROACH

J.A. LÓPEZ-SÁEZ[120], E. CERRILLO[121], A. GONZÁLEZ[122],

P. LÓPEZ-GARCÍA[1], A. PRADA[123] & A. BERVILLÉ[124]

The problematic biogeographical origin of *Olea europaea* in the Iberian Peninsula it has been approached from different paleobotanic points of view, and as much the anthracological and palaeopalynological studies have demonstrated the presence of this taxon in the mediterranean area of the Iberian Peninsula from the Pleistocene and beginnings of the Holocene, generally associated to the thermomediterranean vegetation unit.

In the present communication we analyze the palynological evidences on the identification of pollen of wild olive tree in diverse neolithic archaeological sites of Extremadura (Los Barruecos, Cerro de la Horca) and Castilla y León (Río Fortes).

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INTRODUCTION OF EUROPEAN CROPS (WHEAT, OAT AND PEACH) IN ANDEAN ARGENTINA DURING THE 16TH CENTURY: ARCHAEOBOTANICAL AND ETHNOHISTORICAL EVIDENCE

Aylen CAPPARELLI, Verónica LEMA, Marco GIOVANNETTI & Rodolfo RAFFINO

By the second half of the 15th century the Andean Norwest of Argentina was part of the *Kollasuyu*, the southern quarter of the *Tawantinsuyu* Inka Estate. However, Inka occupation lasted least than a century. In 1536 Almagro was the first Spaniard who passed through this region going to Chile. After that, and until the 18th century, Spaniards from Peru and Chile competed between them and fought versus the local aborigines for appropriating their land, important source of precious metals. The first three villages founded by Spaniards were Barco (1550 AD) in the modern province of Tucumán, Santiago del Estero (1553) in the modern province of the same name; and Londres de Quimivil (1558) in the modern Province of Catamarca. In this context, this paper will intend to analyse the routes that the first European crops could have followed in this region, and also when and from which place they came from, who brought them and where were they harvested by the first time. This approach will be made by comparing ethnohistorical sources with the first archaeobotanical evidence for this area: wheat, oat, and peach found at El Shincal (distant 6 km to Londres de Quimivil) and dated 1640 AD. After being a strategic Inka Administrative Center, El Shincal continued being an important point of meeting for local aborigines during the Colonial era. It is proposed in this paper that these European crops were brought from Chile (and not from Peru), to Santiago del Estero by Spaniard soldiers during 1556, and to Londres in 1558. These crops were manipulated by local aborigines during the period of the *encomenderos* (Spaniards who appropriated and cultivate the land through the exploitation of the aborigines) and used to carried out a *pachamanca* (local religious festivity) at El Shincal during a *Diaguita* Rebellion.

ARCHAEOBOTANY OF ARCHAEOLOGICAL SITES FROM NORTHWEST ARGENTINA (200-500 AD)

Nurit OLISZEWSKI

Based on the analysis of archaeobotanical macrorremains, this work studies the interrelations between the human groups who lived in Campo del Pucará (Andalgalá, Catamarca) between *ca*. 200 and 500 AD, and their vegetal resources. The archaeological sites at Campo del Pucará are currently considered ceremonial centers of high ritual complexity. They are attributed to the Condorhuasi-Alamito culture, which is defined as a facie of Condorhuasi.

The study was carried out under the theoretical-methodological framework of Archaeobotany, a discipline which combines the approaches of Archaeology and Botany, whose purpose is to analyze plants related to Man.

The archaeobotanical macrorremains were recovered from anthropic mound structures at various archaeological sites of the area under study, through several techniques (excavation, screening and flotation).

The taxonomic identification which was made considering external and internal morphological characters, allowed to determine the presence of three families (*Poaceae*, *Cucurbitaceae* and *Fabaceae*) and one Subfamily (*Mimosoideae*). The identified species and/or genres are the following: *Zea mays* var. *minima*, *Cucurbita maxima*, *Acacia* sp., *Prosopis* sp., *P*. *nigra* or *P*. *alba*, *P*. *torquata*, *Phaseolus* sp., *P. vulgaris* var. *vulgaris*, *P*. *v*. var. *aborigineus* and undetermined *P*. *vulgaris*.

The interpretation of the information facilitated determining possible catchment areas and the functioning and discarding of the various vegetal species that were identified. Additionally, we identified procurement strategies, the seasonal cycle of the group of vegetals, and their importance in relation to the comprehension of Campo del Pucará Archaeology.

THE PLANT MACROFOSSILS FROM THE PRE-COLUMBIAN SITES IN THE BOLIVIAN AMAZONIA

Tanja AALTO[125]

The subject of my master's thesis is plant macrofossil analysis of material sampled from the archaeological sites in the Bolivian Amazonia. The soil samples for macrofissil analysis were collected during archaeological excavations in 2001-2003 from two sites in Las Piedras (El Círculo and La Fortaleza), and one site in Las Palmeras. These rural settlements are situated in northeastern Bolivia.

La Fortaleza, the fortress of Las Piedras, is situated precisely at the former confluence of the Madre de Dios and Beni rivers. The architectural features and potsherds found indicate that the site was the work of the Incas, or at least that the Incas visited the site. Las Palmeras and El Círculo sites are ancient habitation sites of the local rain forest dwellers. Same kind of circular sites are known from current Amazonian Indian tribes.

The examination of soil samples and identification of macrofossil remains is yet unfinished. Thus far the soil samples have yielded approx. 2200 remains of seeds and fruits. Some of the remains have already been classified into different plant taxas. For example, the identified palm remains belong under the families (*Attalea* sp., *Astrocaryum* sp., *Oenocarpus* sp.) which are generally utilized by Amazonian indigenous groups.

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HUMAN DIET AND LAND USE IN THE TIME OF THE KHANS - ARCHAEOBOTANICAL RESEARCH IN QARA QORUM, MONGOLIA

Manfred RÖSCH & Elske FISCHER[126]

Qara Qorum was the capital of the Mongolian empire from its foundation by Cinggis Qayan at 1220 A.D. until 1264 A.D., when Qubilai Qayan moved the residence to Beijing. The town in the Orchon valley at the north-western border of the Changaj Mountains, located about 350 km west of Ulan Bataar, covered an are of more than 2 km^2 and was constructed by Chinese craftsmen. The Wilhelm von Rubruk, A Franciscan monk, who came to visit Mongolia as an envoy of the French king Louis the Holy, described the town, their people and economy. The town was completely destroyed in the 15th century. Since 2000 there have been excavations, organized by the Mongolian Academy of Science, the German Archaeological Institute, Kommission für Allgemeine un Vergleichende Archäologie, and by the University of Bonn. The excavations take place in the Qayan's palace and in the town-centre where the craftsmen and tradesmen used to live. Rubruk's reports about cereals available at the town's market and the discovery of "celtic fields" near the town were the reasons for botanical investigations. We collected about 60 soil samples during the summers of the years 2002 and 2003. Coring for pollen analysis in the Orchon valley was not successful, but pollen analysis of profundal cores from the Lake Ogoj Nor, about 50 km noth of Qara Qorum, are in preparation. The climate of Qara Qorum, situated 1000 m a.s.l., is continental and semiarid, with short, hot and dry summers and very cold winters. Therefore, two main questions need to be answered: Did people manage local agriculture without irrigation? Has the present steppe been made by climate or by man and his grazing animals? Present observations of forest-steppe patterns and grazing support the second hypotheses. Due to summer dryness and low winter temperatures, uncarbonized plant material is preserved without waterlogged conditions. According to our results, people consumed a lot of cultivated plants, mostly known from European medieval towns. The most common cereals are *Hordeum vulgare* var. *vulgare*, *Panicum miliaceum*, and *Triticum aestivum*. *Avena sativa*, *Setaria italica* and *Hordeum vulgare* var. *nudum* also occur. *Triticum monococcum*, *Triticaum dicoccum* and *Secale cereale* are seldom. Other cultivated plants are *Camelina sativa*, *Lens culinaris*, *Pisum sativum*, *Vicia faba* and perhaps *Glycine max*. From the European point of view fruits and nuts are more exotic: Besides imported species such as *Vitis vinifera* and *Ficus carica* regional species such as *Pinus sibirica* and some Asian *Prunus* species are very common, as they are today as well. A 15th century sample from the palace contained *Corylua avellana*, *Juglans regia* and *Prunus dulcis*. The occurrence of cereal chaff, straw and grains as well as the dominance of summer crops seems to confirm the theses of local production. On the other hand traditional Mongolian nomadic people imported cereals as complete plants and did the crop processing themselves, using chaff and straw as fodder or for other purposes even in the 20th century. Therefore the presence of chaff and straw is no proof of a producer site.

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PALAEOETHNOBOTANY OF MAHURJHARI AND ITS SIGNIFICANCE FOR FARMING SYSTEM IN CENTRAL INDIA

Mukund D. KAJALE[127]

The paper deals with basic results of palaeoethnobotanical study carried out at the site of Mahurjhari (Lat. 21 14 N: Long. 79 30 E), district Nagpur, Maharashtra State. This important bead manufacturing site of South Asia is being excavated for the last two field season by Dr. R.K. Mohanty who very kindly entrusted the botanical investigations to me.

The author has applied dry and wet sieving (water separation) procedures concurrently with excavations with an aim to recover data useful for understanding development of ancient farming system in the hot, semi-humid ecogeographical terrain and to also visualise socio-economic differentiation and changing Man-Plants-Environment interrelations, subsistence system (s) in various occupational areas as well as cultural phases.

The rich botanical wealth comprises about 30 species of cultivated and wild plants ranging in age from c. 400 B.C.-500 A.D. retrieved from the Megalithic habitatation deposits (2002-2003 season) and Historical deposits represented by trenches A.B.C.(2001-2002 season) E, F G, H (2002-2003 season). The important cultigens includes-

(1) Rice: *Oryza sativa*.Linn.; *Oryza* sp.

(2) Wheat: 3 Morphotypes - *Triticum sphaerococcum* Perc. ,

Triticum vulgare Host., *Triticum* sp.

(3) Barley: *Hordeum vulgare* Linn. ; *Hordeum* sp.

(4) Kodo millet: *Paspalum scrobiculatum* Linn.

(5) Sorghum millet: *Sorghum bicolor* Moench.

(6) Italian millet: Setaria italica (L.) Beauv.; *Setaria* sp. cf. & *glauca*

(7) Panicum millet (Little millet): *Panicum miliare* Linn.

syn. *Panicum sumatrense* Roth.

(8) Pearl millet: *Pennisettum typhoides* Stapf. & Hubbard

Syn. *Pennisetum glaucum* (L.) R.Br.

(9) Browntop millet ? : ? *Brachiaria racemosa* (L.) Stapf.

(10) Lentil: *Lens esculenta* Moench.

(11) Pea (Common pea): *Pisum arvense* Linn.

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(11) Black gram: *Vigna mungo* (L.) Hepper

(12) Green gram: *Vigna radiata* (L.) Wilczek.

(13) Horse gram: *Dolichos uniflorum* Lam.

Syn. *Macrotyloma uniflorus* (Lam.) Verdcourt

(14) Hyacinth bean (Indian bean): *Dolichos lablab* Linn.

Syn. *Lablab purpureus* (L.) Sweet

(15) Pigeon pea (Bengal gram): *Cajanus cajan* Millsp.

(16) Gram (Chick pea): *Cicer arietinum* Linn.

(17) Sesame: *Sesamum indicum* Linn.

(18) Cucurbitaceae types: *Cucumis* sp.; *Cucumis melo* ?, *Citrullus* sp.

(19) Linseed ?: ? *Linum usitatissimum* Linn.

(20) Lemon type ?: ? *Citrus* sp.

The prominent wild elements included species such as-

(21) Indian jujube: *Zizyphus jujuba* Lam. Syn. *Zizyphus mauritania* Lam.

(22) Solanaceae type: *Solanum* sp.

(23) Chenopodiaceae type: *Chenopodium* sp.

(24) Malvaceae type: *Abutilon* sp.

(25) Cyperaceae type

(26) Polygonaceae

The detailed analysis is expected to refine the diagnosis and also add to the basic archaeobotanical results which are being studied from the viewpoint of intra-site distribution and also in relation to similar finds from Protohistoric and Historical sites in parts of Madhya Pradesh, Vidarbha and Deccan Chalcolithic for appreciating change and continuity of plant economy from c. 1000 BC to the late Historical times. The paper gives an overview of archaeological plants of Mahurjhari in relation to published results from Navdatoli, Chichli, Khaparkheda, Adam, Bhagimohari, Naikund, Tuljapur Garhi, Bhatkuli, etc. for wider appreciation of the history of farming system, seasonality of cultivation and occupation, and food habits in the region and its interconnection with other cultural phenomenon like second urbanization and subsequent cultural deterioration during c. 500- 1000 AD with palaeoenvironmental perspective.

THE ARCHAEOBOTANY OF BEDOUIN HEARTHS

Carol PALMER & Phil AUSTIN

This poster summarises an analysis of charred plant macrofossils recovered from hearths at modern bedouin campsites in the Wadi Faynan (Feinan), southern Jordan. It is part of a broader study assessing site formation processes and pastoral campsite visibility in the longer term. Hearths were found to be one of the most enduring aspects of abandoned campsites. Furthermore, there are differences in the arrangement of hearths between the public/male area of the tent, where guests are received, and the domestic sphere, which is dominated by women's activities. The most important families tend to have the largest, most elaborate hearths in the public/male area.

The analysis to aimed to identify what fuels are used and ascertain whether or not differences exist in botanical composition between hearths used for hospitality in the male/public area of the tent and those used for routine cooking activities. Both charcoal and charred fruits and seeds were identified. On the whole, locally collected desert shrubs dominate the charcoal assemblage. Charred fruits and seeds derive from the use of dung as fuel and from the discard of date, olive and *Ziziphus spina-christi* stones. One hearth, constructed to cook a celebratory meal, was distinct from the rest.

ARCHAEOBOTANY OF OLIVE STONES: AN EXPERIMENTAL APPROACH

Evi MARGARITIS

Archaeobotanical data from the historical periods in Greece appear to have been neglected, although its contribution to other areas and periods has been a major factor in the understanding of human culture.

Textual evidence and various inscriptions of the Classical and Hellenistic period are focused on the large cities while information on the economic and social value, along with the status and the character of the rural landscape, is very sparse.

New significant archaeobotanical material retrieved from farmhouses consists of thousands of olive stones and shed light on the economical systems and agricultural practices of the Hellenistic period in Greek Macedonia.

A few areas in Greece where non-mechanised agricultural practices are still in use also provide an opportunity to look at major fruit crops such as the olive tree and elucidate the processing sequence from harvest to the consumption of the fruits or the production of olive oil. In this poster, I bring together archaeobotanical data, ethnographic studies and laboratory experiments to develop model pathways for olive processing and olive oil production with special reference to Hellenistic Greece.

AN ARCHAEOBOTANICAL DATABASE FOR AFRICA: A PRESENTATION

Dr. Hala N. BARAKAT[128]

The ongoing research in archaeobotany in Africa has and is continuing to provide a growing wealth of information about ancient plants in the continent. It is becoming difficult for archaeobotanists to grasp, interpret and relate this information to their own research. The compilation and organization of all available information into databases is becoming essential and of high priority. The presentation aims at suggesting a way through which such database could be created and maintained. It involves the content as well as the technical aspects involved in such project. It also presents an application: the flora of ancient Egypt database, an ongoing project carried out at the Center for Documentation of Cultural and Natural Heritage (CULTNAT), Egypt.

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FIRST ETHNOBOTANICAL INVESTIGATIONS IN THE ATLANTIC COAST OF NICARAGUA

J.A. LÓPEZ-SÁEZ[129], I. CLEMENTE[130], E. GASSIOT[131] & L. MERCEDES GALEANO[132]

Our research on the Atlantic Coast of Nicaragua has been developed through two research projects carried out since 1998, which have taken account both of surveys and archaeological excavations. The original aim was to excavate one of the coastal sites (Karoline, KH-4, 340 BC-350 AD) to determine the levels of evolution and development of the prehistoric societies that populated this Caribbean region. Written ethno-historical sources for the Misquito Coast from the 17th-19th centuries, suggested that this was a society composed of small groups, basically devoted to hunting/fishing and gathering, probably with incipient subsistence agriculture. However, the recent discovery of the site of El Cascal de Flor de Pino (KH-31, 750 BC-340 AD) seems to indicate the possibility of a society with a rather more complex level of social organisation.

These recent archaeological discoveries have meant that our initial hypotheses, coinciding with the ethno-historical data indicating the existence of small, probably nomadic social groups devoted to hunting/fishing and gathering, and possibly incipient agriculture according palaeopalynological and ethnobotanical data, had to be modified.

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APPLICATIONS OF COMPUTER-ASSISTED MORPHOMETRY I: FUNDAMENTALS

Irwin ROVNER[133], John C. RUSS[134] & Ferenc GYULAI[135]

Considerable development in computer digital imaging has occurred in archaeological studies emphasizing acquisition, processing, enhancement and display. However, the equally robust and widely applicable capabilities of computer assisted morphometry applied to digital images is poorly understood, and little used, if not widely ignored in archaeological analysis. Morphometry is the science of quantifying, i.e. measuring, 2-D and 3-D aspects and parameters of object morphology, including size, shape and tomography. Conventional measurement is based on a very limited range of ruler or caliper (i.e. manual) measurements which is laborious, time-consuming, prone to systematic errors and notorious for lack of replication accuracy and precision. Computer-assisted morphometry is enormously (exponentially) faster, more efficient and cost effective. Replication accuracy and precision is tremendously enhanced, As in any human driven system, errors are possible, but they are more easily discovered and corrected..

The superiority of computer-assisted morphometry derives from its method of achieving measurement from a digital image. Morphological parameters are measured on the number of size-calibrated pixels (picture elements) enclosed within the margin of an object. Thus, object shape is irrelevant -- geometrically regular or irregular objects are measured with equal facility and accuracy. Moreover, the ≥real≤ morphology of an object is measured, whereas in conventional measurements, the object measured is actually the nearest Euclidian geometric form similar to the object -- an approximation at best. Computer-assisted morphometry deals with ≥true≤ sizes, and ratios of size parameters to calculate parameters of ≥real≤ shapes, many of which are, in fact, quantitative measures of the degree of departure of an irregular object from its closest Euclidian form.

The applicability of computer assisted morphometry in archaeology is profoundly simple. The overwhelming array of the objects and images studied is geometrically irregular. Conventional methods devolve into the established of arbitrary, artificial and subjective ≥types≤ which serve only to obscure the range and scope of morphological variation in the assemblages of objects were study and compare. Typology remains convenient in simplifying morphological complexity to purposes of journalistic communication, but it is a poor basis for precise and accurate morphological analysis.

Todayπs typical personal computer systems are capable of supporting a host of powerful morphometric software programs without special hardware enhancements. Several software programs, ranging from freeware to drop-in to stand alone programs, are commercially available at reasonable cost. There is no reason to continue to rely on inferior, obsolete manual methods of morphological analysis.

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APPLICATIONS OF COMPUTER-ASSISTED MORPHOMETRY II - MACROBOTANY: MORPHOLOGY AND TAXONOMY OF SEEDS

Ferenc GYULAI[136] & Irwin ROVNER[137]

Computer-assisted morphometric analysis has been applied to the classification and taxonomic identification of macroscopic archaeobotanical systems, e.g., seeds .The initial intent was to explore applications of computer speed and efficiency inasmuch as conventional identification of plant remains, e.g. seeds, is typically a slow,tedious and inefficient process. Conventional methods, usually manual or ≥eyeball,≤: assess seeds one at a time, which are identified using subjective memory and experience of the observer and/or recourse to artificial taxonomic keys. Manual measurements are usually limited to three dimensions of size,, i.e. length width, and thickness, again a slow and tedious process which additionally fails to differentiate the wide range of morphological variation effectively.

This test of computer-assisted morphometry to differentiate seeds use 20 different measurements of size and shape. Measurements were taken simultaneously on groups of seeds, typically 20 to 50, provided literally thousands of quantitative measures of morphology requiring only minutes of operator effort. Our initial goal was to enhance the speed, precision and cost-effectiveness of morphological analysis and taxonomic identification of archaeological and fossil plant remains, starting with seeds, as an adjunct to conventional methods. The result, still preliminary, is the largest morphometric data base ever assembled, including over 1300 taxa, more than 150,000 individual seeds and an estimated 3 million measurements. Generation of the data required four months of effort while analysis of that data is still on-going after four years.

The results have taken this project far beyond its original goal. Through initial quantitative analysis of the data, we have assessed protocols and assumptions of conventional taxonomic classification and seed identification based on typological procedures. We have found that many fundamental assumptions of conventional typological classification are false; that standards for ≥representative≤ reference seed types and control populations are weak, misleading and inadequate; and that considerable conventional wisdom and interpretation of fossil and archaeobotanical seeds in culture history and paleoecology is highly suspect. Many of these flaws can be overcome using computer morphometry and quantitative analysis.

Once a morphometirc reference data base is established, automatied assistance in taxonomic identification of unknown seeds, i.e. development of a ≥smart system,≤ is easily created using existing soffware.

In addition to seeds, computer-assisted morphometry is applicable to the analysis of the full range of macroscopiic bioarchaeological materials.

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APPLICATIONS OF COMPUTER-ASSISTED MORPHOMETRY III - MICROBOTANY: MORPHOLOGY AND TAXONOMY OF PLANT OPAL PHYTOLITHS

Terry B. BALL[138], Irwin ROVNER[139] & John C. RUSS[140]

Computer-assisted morphometric analysis has been applied to the classification and taxonomic identification of microscopic archaeobotanical systems, e.g., plant opal phytoliths .The initial intent was to explore applications of computer precison and accuracy to the bewildering assemblages of ceullar-shaped forms and their variation.. Conventional methods, usually manual or ≥eyebal,l≤ assess particles one at a time, using subjective memory and experience of the observer and/or recourse to artificial taxonomic keys. Manual measurements are usually limited to a very few dimensions of size,, i.e. length and width, again a slow and tedious process which additionally fails to differentiate the wide range of morphological variation effectively. Complex variation was arbitrarilyt reduced to artificial,idealized and subjecive idealized fomrs or types, notroiously lacking preciision or repliation.

Current taxonomic identification of plant opal phytoliths from archaeological contexts based on typological classifications is beset with pervasive systematic error. Computer-assisted morphometry can classifiy and differentiate microfossils uses 20 or more different measurements of size, shape, textsukre and tomograpy. Our initial goal was to quantify several morphological parameters of size and shape to plot variation and its distribution among and between phytoltih assemblages from related taxa to enhance taxonomic identification of archaeological and fossil plant remains Initial results have provided promising results in the identificaiton of phytoliths from cultivated Triticum (wheat) in the Old World and Zea mays (maize or Indian corm) in the New World. Morphometric analysis is clearly superior in accuracy, precision and efficiency compared to conventional typological methods

In addition to opal phytoltihs, computer-assisted morphometry is applicable to the analysis of the full range of archaeobotanical microfossils including pollen, spores and diatoms.

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