14th Symposium of the International Work Group for Palaeoethnobotany

Kraków, Poland

17-23 June 2007

Local symposium organisers

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Organisation

W. Szafer Institute of Botany, Polish Academy of Sciences, Kraków

Institute of Archaeology, Jagiellonian University, Kraków

The Committee on Botany, Polish Academy of Sciences

Supported by

President of the City of Kraków
Professor Konrad Jażdżewski Foundation for Archaeological Research, Łódź
W. Szafer Foundation for Polish Botany, Kraków

Programme

17th Sunday

16.30 − 20.00		Registration (Institute of Botany, Lubicz 46)

18th Monday

8.00 − 9.00		Registration (Pałac Larischa, Bracka 12)
9.00 − 9.30		Introductory Session – Welcome by Zbigniew Mirek followed by announcements
		Ethnobotany and Open session
		Chair – David E. Robinson
9.30 − 9.50	Carol Palmer	Lucjan Turkowski's account of agricultural life in 1940s Palestine
9.50 − 10.10	Mariá Hajnalová, Pavol Elias	Einkorn under traditional cultivation in Romania: arable practices and weeds
10.10 − 10.30	Hong-en Jiang et al	A consideration of the plant remains of *Coix lacryma-jobi* L. (Poaceae) in the Sampula Cemetery (2100 years BP), Xinjiang, China
10.30 − 10.50	Mukund Kajale et al	Ancient plant economy from Medieval site of Sanjan, western India
10.50 − 11.20	Coffee Break	
		Crops and Crop Cultivation
		Chair – Janusz K. Kozłowski
11.20 − 11.40	Daniel Zohary	The role of self-pollination at the initiation of agriculture in the Near East
11.40 − 12.00	Manon Savard, Martin K. Jones	Plant exploitation and sedentism: which plants really made a difference?
12.00 − 12.20	Michele Wollstonecroft et al	Plant food processing as an avenue of subsistence change: bioaccessibility and implications for ancient diet and health
12.20 − 12.40	George Willcox at al	Early Holocene cultivation before domestication in northern Syria
12.40 − 13.00	Andrew Fairbairn et al	Plant use at ninth millennium BC Pınarbaşı, Central Turkey
13.00 − 15.00	Lunch	
		Crops and Crop Cultivation
		Chair – Stefanie Jacomet
14.40 − 15.00	Ehud Weiss	Domestication: conscious or unconscious?
15.00 − 15.20	Mordehai Kislev	The fig domestication: afterthoughts
15.20 − 15.40	Yoel Melamed et al	Pre-domesticated small-seeded pulses in the early Neolithic period
15.40 − 16.00	Anat Hartmann	Agriculture at Early Neolithic Gilgal I, Jordan Valley, Israel

16.00 − 16.20	Harriet Hunt et al	Corridors across the Eurasian steppe: the ancestry and Neolithic record of broomcorn millet (*Panicum miliaceum* L.)
16.20 − 16.40		
16.40 − 17.00	Coffee break	
17.00 − 19.00		**Poster session (Ethnobotany, Methods and Analytical Archaeobotany, Crops and Crop Cultivation)**

19th Tuesday

8.30 − 9.00		Late registration
		Crops and Crop cultivation
		Chair - Corrie C. Bakels
9.00 − 9.20	Welmoed Out	Living in a borderland: delayed introduction of crop cultivation in Dutch wetlands
9.20 − 9.40	Lucie Martin et al	"Le Chenet des Pierres" in Bozel (Savoie, France), a Neolithic Alpine site, and the question of crop cultivation in a mountain context
9.40 − 10.00	Anaya Sarpaki	Revisiting the visibility of the olive in Greek Prehistory
10.00 − 10.20	Francesca Susanna, Laura Sadori	Crop storing and processing in a village of Early Bronze Age at Arslantepe (Malatya, Turkey)
10.20 – 10.40	Julian Wiethold	The history of buckwheat (*Fagopyrum esculentum* Moench.) in northwestern Europe. The archaeobotanical and historical evidence – a critical review
10.40 − 11.10	Coffee break	
		Crops and Crop cultivation
		Chair – Angela Kreuz
11.10 − 11.30	Mark Nesbitt, Elena Marinova	The origins of spelt wheat: Asia or Europe? A re-evaluation of the archaeological evidence
11.30 − 11.50	Margareta Tengberg, Claire Newton	The early history of oasis agriculture in the Middle East and Egypt
11.50 − 12.10	Mary Anne Murray	Tadmakka/Essouk – Medieval plant remains from the Malian Sahara
12.10 − 13.10	Marijke Van der Veen et al	Long-distance TRADE of foods – changes in foodways and agriculture
	Marijke Van der Veen, Alison Cox	Changing foodways: watermelon in Roman and Islamic Quseir, Egypt
	Alexandra Livarda	Dispersal of and social access to coriander and fennel in North-West Europe
	Jacob Morales	Changes in agriculture: tropical summer crops introduced into the Eastern Mediterranean
13.10 − 15.00	Lunch	
15.00 − 18.00		**Lab session** (Institute of Botany, Lubicz 46)

	Irwin Rovner and Ferenc Gyulai	A New Quantitative Method for Distinguishing Wild and Domesticated Seed Populations using Computer-assisted Morphometric Analysis (abstract see posters)
19.30		Welcome Reception (UMK, Pl. Wszystkich Świętych 3/4)

20th Wednesday

		Methods and Analytical Archaeobotany
		Chair - Dorian Fuller
9.00 − 9.20	Gill Campbell, Derek Hamilton	Recovering archaeobotanical remains from deposits rich in clay: the effect of various pre-treatments on preservation and speed of processing
9.20 − 9.40	Otto Brinkkemper	Botanical macroremains and the preservation of archaeological sites
9.40 − 10.00	Allan Hall	Compiling a regional archaeobotanical flora: potential and pitfalls
10.00 − 10.20	Federique Durand, Manon Cabanis	Autecological method apply to archaeobotanical data from pits in Central and Southern France
10.20 − 10.40	Jacqui Huntley	Detailed identification of seeds in the developer-funded world: best value or un-necessary cost?
10.40 − 11.10	Coffee break	
		Methods and Analytical Archaeobotany
		Chair - Felix Bittmann
11.10 − 11.30	Dušanka Kučan, Helmut Kroll	Looking for plant remains in Neolithic Okolište, Bosnia and Hercegovina. A comparison of field methods
11.30 − 11.50	Angela Kreuz, Eva Schäfer	The Iron Age hillfort Glauberg - settlement or cult place? Archaeobotanical considerations concerning the question of agricultural producer and consumer sites and the kind of agricultural production
11.50 − 12.10	Jaromír Beneš et al	Changing settlement areas and landscape: possibilities and limits of archaeobotany in late prehistory of Central Europe
12.10 − 12.30	Soultana Valamoti et al	Prehistoric cereal grain treatment in Greece and Bulgaria: experimental cereal processing and charring to interpret archaeobotanical remains
12.30 − 12.50	Girolamo Fiorentino, Valentina Caracuta	Microstratigraphical and bioarchaeological strategies for analysing a Middle Bronze Age “midden” at Tell Mardikh – Ebla (Syria)
12.50 − 15.00	Lunch	
		Regional Archaeobotany
		Chair - George Willcox
15.00 − 15.20	Simone Riehl	Climate and agricultural decision-making: Environmental constraints and economic development in Near Eastern sites

15.20 − 15.40	Katleen Deckers et al	The “dung-as-fuel-model” tested at archaeological sites in Syria
15.40 − 16.00	Maka Bokeria et al	Archaeobotanical evidence from the West Georgia (South Caucasus)
16.00 − 16.20	Elena Marinova et al	Chick pea (*Cicer arietinum*) in the Neolithic and Chalcolithic of Bulgaria and its implications for the contacts with the neighbouring regions
16.20 − 16.40	Ksenija Borojevic	Plant use at the cave of Grabak on the island of Hvar in the Adriatic Sea
16.40 − 17.00	Coffee break	
17.00 − 19.00		**Poster session (Regional Archaeobotany)**

21th Thursday

		Regional Archaeobotany
		Chair - Krystyna Wasylikowa
9.00 − 9.20	Maria Lityńska-Zając et al	Early Neolithic Plant Remains at Moravany (Eastern Slovakia)
9.20 − 9.40	Ursula Maier	Uncarbonized plant remains from three Bandkeramik wells in Sachsen, Germany
9.40 − 10.00	Monika Hellmund	Neolithic plant remains from archaeological sites in Sachsen-Anhalt, Germany
10.00 − 10.20	Marlu Kühn et al	The role of animal fodder in the subsistence economy of Neolithic and Bronze Age lake shore settlements in the Alpine range and its palaeoecological implications
10.20 − 10.40	Lucy Kubiak-Martens	Neolithic farmers and gatherers on the Dutch North Sea Coast C. 3500 cal BC - archaeobotanical evidence from Schipluiden-Harnaschpolder
10.40 − 11.10	Coffee break	
		Regional Archaeobotany
		Chair - Mariá Hajnalová
11.10 − 11.30	Nicole Boenke, Petr Pokorný	Agriculture and vegetation at an Iron-age hillfort in Western Bohemia – Indicators for its economical status?
11.30 − 11.50	Anita Caneppele, Marianne Kohler-Schneider	Plant remains from the La-Tène settlement Sandberg-Roseldorf, Lower Austria
11.50 − 12.10	Laura Kooistra	Food supply to the Roman army in the Rhine delta in the first century AD, archaeobotanical evidences
12.10 − 12.30	Andreas Heiss	Plant remains from Iron Age burnt-offering sites in the Alps – macrofossil evidence on ritual practice and land use
12.30 − 12.50	Philippe Marinval	Vegetable offerings in Roman necropolis: regional comparison: Gaul, Italy, North Africa
12.50 − 13.10	Manfred Rösch	Waterlogged material from Migration Time sites in Southwestern Germany
13.10 − 15.00	Lunch	
		Lab session (Institute of Botany, Lubicz 46)

15.00 − 18.00	Rene Cappers, Reinder Neef	The digital seed atlass project: a contribution to an identification standard in archaeobotany
19.30	Dinner	(Pałac Krzysztofory, Rynek Główny)

22nd Friday

		Regional Archaeobotany
		Chair – Helmut Kroll
9.00 − 9.20	Cristina Bellini et al	Plant gathering and cultivation in prehistoric Tuscany (Italy)
9.20 − 9.40	Christoph Brombacher et al	Development of plant use and environment in the "Regio Basiliensis" since the Neolithic, based on on-site data
9.40 − 10.00	Klaus Oeggl, Andreas Heiss	The plant remains from the Iceman´s Discovery site and its taphonomic implication
10.00 − 10.20	Hans-Peter Stika	Plant remains from Early Iron Age in western Sicily (Monte Polizzo, Salemi, and Selinunte)
10.20 − 10.40	Meriel McClatchie	Arable crops and social organization in Bronze Age Ireland
10.40 − 11.10	Coffee break	
		Regional Archaeobotany
		Chair - Sabine Karg
11.10 − 11.30	Maciej Karczewski et al	Plant remains from the Roman Period cemetery in Paprotki (the Great Masurian Lakes District). Palaeobotanical and cultural interpretations
11.30 − 11.50	Libor Petr et al	Economy and subsistence strategies of Medieval villages in woodland areas in Bohemia – archaeobotanical evidence
11.50 − 12.10	Kerstin Griffin	Analysis of urban sediments with main focus on plant remains to reconstruct environmental changes over time and around a Medieval town in southeast Norway
12.10 − 12.30	Małgorzata Latałowa et al	Reconstructing environmental changes in Gdańsk, N Poland (10^{th}-18^{th} c.) according to archaeobotanical data
12.30 − 12.50	Joanna Jarosińska	Synanthropisation of flora and vegetation in urban areas: preliminary results of archaeobotanical investigation in historical Gdańsk (N Poland)
12.50 − 13.10	Monika Badura, Beata Możejko	Useful plants in archaeobotanical and historical sources from Gdańsk, N Poland (14^{th}-16^{th} c.)
13.10 − 15.00	Lunch	
		Regional Archaeobotany
		Chair - Ramon Buxo
15.00 − 15.20	Natalia Alonso et al	Archaeobotanical studies on first Iron Age and Iberian agriculture in Western Catalonia: the fortress of *ELS VILARS D'ARBECA* (Northeast Spain)
15.20 − 15.40	Lydia Zapata	Early Medieval agriculture and woodland use in northern Iberia
15.40 −16.00	Sidonie Preiss	Macro-remains analysis from a Medieval site in North of France: the castle of Boves (Picardie, France)

16.00 − 16.20	Roman Hovsepyan	The earliest finds of cultivated plants in Armenia: archaeobotanical investigations of the Aratashen and Aknashen Neolithic settlements
16.00 − 16.20	Aldona Bieniek et al	Kraków in archaeobotanical studies, a review of current research
16.20 − 16.40		Concluding Session chaired by Jan Peter Pals

23rd Saturday

Excursion

8.00 Depart from Kraków

Overview of landscape pattern along the Vistula river and the Nida river. Natural, seminatural and anthropogenic communities of loess uplands, river valleys and basins, developed in various ecological conditions.

Visit at Mediaeval stronghold Stradów

20.00 Arrival to Kraków

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LIST OF ORAL PRESENTATIONS ACCORDING PROGRAMME ORDER

LUCJAN TURKOWSKI'S ACCOUNT OF AGRICULTURAL LIFE IN 1940S PALESTINE

Carol PALMER

Lucjan Turkowski (1905-1976) was a Polish exile who served in General Anders' Polish army in Palestine, 1943-47. Originally trained as an ethnographer, in his spare time he set about recording the daily life of the *fellaheen*, Palestinian peasants or farmers, concentrating on the Bethlehem area. He recorded farming practices in the arable field and irrigated garden and tree cultivation on terraces, as well as animal husbandry. He also recorded food preservation techniques, everyday meals and feast foods, and the gathering of wild herbs. He collected a large vocabulary of rural terms and carefully sketched the material culture of *fellaheen*. Indeed, his overall aim was to compile a comprehensive study of all material culture in its local context. In this, he was ably assisted by a local teacher from Beit Jala, near Bethlehem, Miss Heleny Abu Roumman, who was trained in the Russian Orthodox Mission and therefore fluent in both Arabic and Russian.

After demobilization, Turkowski lived for the rest of his life in London. He was intimately involved with the Polish University Abroad or Polski Uniwersytet Na Obczyźnie (PUNO), a largely voluntary organization, attaining the rank of Professor of Ethnography towards the end of his career. During these years, working to maintain a living in a sausage factory and then in offices, he struggled not only to complete his study of Palestinian *fellaheen*, but also to reconstruct his PhD thesis on folk weaving in eastern Poland, which was burnt on the printing press in Warsaw during the German invasion of Poland in September 1939.

It was only during the latter part of the life that he found the opportunity to start publishing this research on Palestinian *fellaheen*, supported by the Palestine Exploration Fund. After a further gap, more than thirty years after his death, the translation and final editing of his work is approaching completion. The resulting study represents an unparralled insight into a past way of life.

EINKORN UNDER TRADITIONAL CULTIVATION IN ROMANIA: ARABLE PRACTICES AND WEEDS

Mariá HAJNALOVÁ, Pavol ELIAS (jun.)

Ethnobotanical survey of traditional cultivation methods and processing techniques of einkorn (*Triticum monococcum*) in sub-mountain region of Transylvania and its relevance to archaeobotany is presented.

Floristic composition of 38 different fields of einkorn in Hargitha region has been studied and 67 records of weed flora were taken in 2005 and 2006. In total 167 flowering plant species were recorded to accompany the einkorn at the time of harvest.

Floristic composition of the fields is statistically tested against various environmental factors {sowing time, tillage methods, slope, exposition, altitude...}. The aim of this testing is to define whether management applied affects the floristic composition, and thus whether particular species combinations can be used in archaeobotany for reconstruction of past arable practices.

A CONSIDERATION OF THE PLANT REMAINS OF *COIX LACRYMA-JOBI* L. (POACEAE) IN THE SAMPULA CEMETERY (2100 YEARS BP), XINJIANG, CHINA

Hong-en JIANG, Xiao LI, Bo WANG, Yu-Fei WANG, Cheng-Sen LI

Fruit remains of *Coix lacryma-jobi* var. *lacryma-jobi* L. (Job's Tears) were excavated in the Sampula Cemetery (nearly 2100 years old) of Xinjiang, China. In the room numbered 84LS I M49, a package of mixture including caryopsises of *Panicum miliaceum* (common millet), *Hordeum vulgare* var. *nudum* (naked barely) and *Coix lacryma-jobi* var. *lacryma-jobi* were unearthed. Moreover, three clusters of necklaces made of fruits from *C. lacryma-jobi* var. *lacryma-jobi* together with glaze/glass balls were also excavated. The decorative and cereal value of the fruits from *Coix lacryma-jobi* var. *lacryma-jobi* were deduced to be utilized by the ancient Sampula people around 2100 years before present.

IMPORTANCE OF PLANT REMAINS FROM EXCAVATIONS (2003-2004) AT MEDIEVAL SITE OF SANJAN ON WEST COAST OF INDIA

M.D.KAJALE[1], R.BANDHOKAR, V.SHOBHA

The paper deals with cultural and eco-biogeographical significance of systematically recovered by the presenter (MDK) through dry and wet sieving techniques and critical visual examinations on the anthrosols, concurrently with the excavations carried out on behalf of Indian Archaeological Society, New Delhi and World Zoroastrian Organisation, Mumbai at the ancient port site of Sanjan on west coast of India.

The Sanjan is supposed to be the most important and sacred occupational site of *Parsis* (Zoroastrians from Iran).It has been considered and proved to be a flourishing trade settlement, spanning c. 8th to 14th century A.D. on the basis of stratigraphy and ceramic typology.

The plant economy comprised of more than 20 plant species including three cereals, four millets, seven legumes, two oil seeds, three edible fruits, a few wild grasses and weed seeds. The most prominent being domesticated wheat, barely, and gram, which are presently, not cultivated in the nearby coastal region of Gujarat and Maharashtra states of western India. Holistic appreciation of archaeobotanical remains is being attempted.

Thanks to the Drs. H. Dhala (WZO) S.P.Gupta(IAS),Drs. Kurush Dalal (Field Director), Roxana Nanji, Abhijit Dandekar for their excellent field co-operation.

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THE ROLE OF SELF-POLLINATION AT THE INITIATION OF AGRICULTURE IN THE NEAR EAST

Daniel ZOHARY[1]

Several scores of wild, annual, grain-bearing plants, that look attractive for domestication, thrive in the "Fertile Crescent" belt of the Near East. About half of them are cross-pollinated, while the other half are predominately self-pollinated. In contrast, all the eight founder crops (emmer wheat, einkorn wheat, barley, lentil, pea, chickpea, bitter vetch and flax) that started Pre-Pottery Neolithic B (PPNB) agriculture in this geographic area are predominantly self-pollinated. So are their wild progenitors. The absence of cross-pollinated PPNB grain cultigens strongly suggests that at the start of agriculture in this nuclear area, self-pollinated plants were better fit for domestication than their cross-pollinated counterparts. The following reproductive biology and genetic features, associated with self-pollination, further augment this assumption: (1). Self-pollination automatically structures the genetic variability into homozygous, true-breeding lines. It is an effective mating system for keeping the identity of attractive cultivars year after year. (2). The units of selection in self-pollinated plants are not only the individual genes, but also the various inbred lines, each carrying its specific, tightly "linked", allelic combination. (3). Self-pollination acts as a unique reproductive isolation barrier that isolates the various inbred lines from one another and sets them on independent evolutionary tracks. (4). Vital domestication traits (such as the shift from wild-type seed dispersal to domesticated seed retention) are frequently controlled by a single *recessive* mutation, or by two such recessive mutations. The conclusion was reached that in each of the eight Near Eastern founder crops, the shift from wild-growing, seed-dispersing plants to human-dependent, seed-retaining crops could have been a quick process. After the transfer of the wild progenitors into cultivation, and the appearance (in the planted plots) of the critical recessive "domestic-type" mutations, this transformation could have been achieved in a time span of several scores of generations.

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PLANT EXPLOITATION AND SEDENTISM: WHICH PLANTS REALLY MADE A DIFFERENCE?

Manon SAVARD[1], Martin K. JONES[2]

Sedentism has often been regarded as an essential precursor to the origins of agriculture. Many theoretical models and scenarios on the origins of agriculture posit that wild grasses, particularly the wild progenitors of cereals, were as important for sedentary hunter-gatherers as domesticated cereals were for early farmers, and that their exploitation may have had a critical role in enabling sedentism. Such an emphasis on wild grasses arises from a number of factors. First, the morphological traits directly associated with domestication are well studied and recognised in grasses. Second, the first Natufian sites discovered were located among dense stands of grasses, including the wild progenitors of cereals. Third, and perhaps most significantly, sedentary hunter-gatherer sites are most often studied not for what they were, but for what they were to become. Archaeobotanical research and experiments on early crop husbandry have thus focused on the so-called “wild cereals”. In this paper, and by reference to a number of recently examined sites, we shift the focus away from grasses to other elements of the ecosystem.

The archaeobotanical research considered here has been conducted on five sedentary hunter-gatherer sites located in the Northern Fertile Crescent: Hallan Çemi and Demirköy located in South-East Turkey, M’lefaat, Qermez Dere and Nemrik located in Northern Iraq. Results and their comparison with published data from broadly contemporary sites lead up to suggest that at most Epipalaeolithic or Early Neolithic sites occupied by sedentary hunter-gatherers, the wild progenitors of cereals may have only played a minor role in subsistence strategies.

Explanations for sedentism must therefore be sought elsewhere, and are likely to involve several factors. In as much as particular plants were driving the process, evidence suggests that they were from vegetation stands in valley bottom environments.

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PLANT FOOD PROCESSING AS AN AVENUE OF SUBSISTENCE CHANGE: BIOACCESSIBILITY AND IMPLICATIONS FOR ANCIENT DIET AND HEALTH

Michèle WOLLSTONECROFT[1], Peter ELLIS[2], Gordon HILLMAN[3], Ray MEARES

This paper discusses how Late Pleistocene advances in food processing may have influenced the metabolism and health of stone age hunter-gatherers. The paper is focused on how food processing can promote *bioaccessibility,* which is the proportion of a nutrient that is released from a food matrix and is potentially available for absorption. Bioaccessibility is an important part of *bioavailability*, which can be defined as the rate and extent of absorption of a specific nutrient in the gastrointestinal tract of humans and is deemed to be biologically active. A critical aspect of nutrient bioaccessibility is the chemical and physical state of the food ingested (e.g. raw or processed). A case study, using a range of microscopy techniques, is presented on the effects of pulverizing and thermal treatment on the tissue of the tubers of sea club-rush (*Bolboschoenus maritimus*).

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EARLY HOLOCENE CULTIVATION BEFORE DOMESTICATION IN NORTHERN SYRIA

George WILLCOX[1], Sandra FORNITE[1] and Linda HERVEUX[1].

Charred plant remains from the sites of Tell Qaramel, Jerf el Ahmar, Dja'de and Tell 'Abr situated in northern Syria and dated to the 10th and 9th millennia cal B.C. demonstrate that a wide variety of wild pulses, cereals, fruits and nuts were exploited. Five lines of evidence suggest that cultivation was practiced at three of the sites. 1) Wild einkorn, wild rye and lentils occur outside their natural habitats. 2) The founder crops barley, emmer and single-grained einkorn appear at different times. 3) An assemblage of weeds of cultivation was identified. 4) There is a gradual decrease in gathered plants such as small seeded grasses and *Polygonum/Rumex*. 5) Barley grains increase in breadth and thickness. Morphological domestication did not become established, perhaps because seed stock was regularly collected from wild stands. Charred rodent droppings indicate large-scale grain storage.

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PLANT USE AT NINTH MILLENNIUM BC PINARBAŞI, CENTRAL TURKEY

Andrew FAIRBAIRN, Eleni ASOUTI, Douglas BAIRD

Pinarbaşi is located near Karaman in Central Turkey at the edge of the Karasag massif, some 20km south of the famous Neolithic site of Catalhoyuk. Occupied intermittently from the Epipalaeolithic to the Byzantine period, it contains the remains of a sedentary site dated to the Ninth Millennium cal BC. This is the earliest known post-glacial occupation site in Central Anatolia, predating Aşikli Hoyuk. Analysis of seed and fruit remains has provided information about the environment of the site during its Ninth Millennium occupation, indicating the presence of a freshwater wetland that was used by the population for gathering of fuel and possibly foods. Preservation of clear plant food remains is very poor, but evidence suggests that the site's inhabitants utilized almonds (*Amygdalus* sp.) and terebinth (*Pistacica* sp.) on the basis of scanning electron microscopy of the fruit remains. Cereals and other crops are wholly absent form the macrofossil record, a fact that concurs with the phytolith record. Though preservation is undoubtedly poor, we believe that the site assemblage provides strong support for a sedentary, gatherer based economy immediately preceding the development of farming as seen at Aşikli Hoyuk. The significance of this observation will be discussed.

DOMESTICATION: CONSCIOUS OR UNCONSCIOUS?

Ehud WEISS[1,2]

There are two suggested mechanisms describing how plants are domesticated under human hands: conscious or unconscious selection. “Conscious selection” is the deliberate, intentional, selection of traits by the early farmer, who sowed the seeds of plants with the selected trait year after year, thereby generating a field in which this trait prevailed. ”Unconscious selection” is the opposite situation: here, the early farmers routinely sowed and harvested their fields with no intention to select any specific trait. The supporters of unconscious selection, also called “automatic selection,” believe that the repeated annual sow-and-harvest cycle inevitably leads, at some point, to the strengthening of domesticated traits in the field. For various reasons, most scholars assume that unconscious selection is the more probable mode of selection. However, recent discoveries indicate that conscious selection would best explain the development of certain domesticated crops. In this lecture, we will present this new evidence and evaluate its impact on our understanding of the domestication process.

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THE FIG DOMESTICATION: AFTERTHOUGHTS

M. E. KISLEV[1]

Our article on fig domestication, published in Science Reports last year has several implications. 1. We are not sure anymore that one of the cereals, the most important staple food, was the first to be domesticated. This is because the ancient farmers need scores if not hundreds of years to achieve a domesticated field from a single mutation of a barley plant. 2. The relevant question now is which plant is suitable for a quick domestication. A reasonable answer is: the branch cuttings of an attractive fig tree are very easy to plant, just stick them in a wet ground and wait 2-3 years for the sweet fruit you had chosen. 3. If an ancient human had planted one time a parthenocarpic fig, he was the first to distinguish between sexes in plants. 4. The relations between sedentism and planting trees raise the question: why we search the beginning of agriculture in so late period such as early Neolithic and not in the more ancient Natufian period? The fig discovery raises very important and interesting challenges to investigate in the near future.

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PRE-DOMESTICATED SMALL-SEEDED PULSES IN THE EARLY NEOLITHIC PERIOD

Yoel MELAMED [1], Mordechai KISLEV[1] & Uzi PLITMANN [2]

A rechecking of 1173 unidentified legume-seeds together with 226 Vicieae seeds from the PPNA site Netiv Hagdud, led to identification of hundred of Rambling vetch (*Vicia peregrina*) seeds – an uncommon archaeobotanical find. The charred seeds are all peeled off by the fire. However, the hilum or its depression on the cotyledons, the radicle as well as the depression that was left under the lens (the convex chalazal area) can be recognized in several seeds. The size of the peeled seeds is 1.83-3.25 mm. in diameter. A single seed was identified as one of two Sainfoin species (*Onobrychis crista-galli/squarrosa*).

The updated list of the legumes remains of Netiv Hagdud includes Bitter vetch (V*icia ervilia*), Bur clover (*Medicago polymorpha*), Lentil (*Lens* sp.) Rambling vetch, Serrate-leaved rest harrow (*Ononis serrata*), Small medick (*Medicago minima*), Vetchling (*Lathyrus* sp.), Violet-milk-vetch (*Astragalus* cf. *callichrous*), Two-flowered caterpillar (*Scorpiurus muricatus*) as well as seeds of two Fenugreek species (*Trigonella* cf. *sibthorpii* and *T. arabica/schlumbergeri*). Except the lentil and the Rambling vetch that have hundred of seeds, all the other species are represented only by a few seed.

We suggest two explanations for the presence of numerous seed of *Vicia peregrina*, as well as for those of the Lentil: First, These plants were weeds among the cereal (*Hordeum spontaneum*) and were brought with them from the fields. Second, these seeds were especially collected as food. The first suggestion is supported by the data of the Herbarium of the Hebrew Universty Jerusalem (HUJ) – one third of the *Vicia peregrina* herbarium sheets were collected from fields (34%) or cereals fields (9%). Considering the second explanation, it is suggested that the *Vicia peregrina* seeds are a result of a cultivation trial that was later abandoned, while the lentil seeds are part of a successful experience.

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AGRICULTURE AT EARLY NEOLITHIC GILGAL I, JORDAN VALLEY, ISRAEL

Anat HARTMANN[1]

The PPNA site Gilgal I, dates between 11,400 and 11,200 cal. BP, is located on a small ridge in the lower Jordan Valley, 7 km west of the Jordan River, 13 km north of Jericho, and some 230 m below sea level. We reconstruct Gilgal I as representing a community of the first agriculturalists.

Thirty-two species of plants along with 6 other genera that were not characterized to the species level were identified. Most of these were found in House 11, a major structure that referred to as a granary. The main finding was hundreds of thousands of grains of two wild cereals – wild barley (*Hordeum spontaneum*) and wild oat (*Avena sterilis*). Also, edible fruits of other plants were identified, including acorns of local edible oak (*Quercus ithaburensis*), fragments of fig (*Ficus carica*) fruits and drupelets, and wild pistachio (*Pistacia atlantica*). Each of these latter plants was represented at least by tens of itemss. Other species were found mostly in smaller quantities.

Gilgal I inhabitants were apparently involved in a variety of agricultural activities that took place in the field as well as in their village – from growing to collecting, and from food preparation to storage. They also domesticated the fig. Thus they were not hunter-gatherers, but rather hunter-farmers. The large quantities of wild barley and wild oat are clear evidence that the site's inhabitants were involved in sowing seeds. Other agricultural activities that we were able to identify include, threshing and separating out the chaff, as well as sorting and storage of the grains in an assigned area of a structure. Such findings are particular signs of diverse agricultural activities.

We think that man's exploitation of his natural surroundings – plowing (hoeing), sowing or the planting of shoots – along with the preparation of the vegetative food sources for storage and consumption should be designated as one of the important early stages in the development of agriculture. In looking at the early history of agriculture, we should not consider the domestication of cereals – important as this is – as the starting point of this human activity. Prior to this development, mankind had already taken many steps that took him out of the hunter-gatherer phase of human survival.

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CORRIDORS ACROSS THE EURASIAN STEPPE: THE ANCESTRY AND NEOLITHIC RECORD OF BROOMCORN MILLET (*PANICUM MILIACEUM* L.)

Harriet HUNT, Xinyi LIU, Giedre MOTUZAITE-MATUZEVICUITE, Martin JONES

One approach to understanding the emergence of agriculture and sedentary societies in the Neolithic is to trace the origins and spread of individual domesticates. *Panicum miliaceum* L. (broomcorn or proso millet) is an ancient crop, important in prehistory, with an unusual geographical distribution in the archaeobotanical record. Early Neolithic sites, dating to the 6th millennium BC, with *Panicum* macrofossil evidence are known from both northern China, and from the Black Sea region in Eastern Europe and the Caucasus. This distribution could reflect multiple independent domestications by early farmers at the eastern and western ends of the Eurasian steppe zone, or a unique domestication followed by rapid spread across this region.

We are exploring the domestication geography of *Panicum miliaceum* through a multidisciplinary project which brings together archaeobotanical, genetic, isotopic and ecogeographical studies. Archaeobotanical work is being carried out in three regions: Inner Mongolia in northern China, the Severskiy Donets river basin in eastern Ukraine, and at Lake Baikal in Russia, to establish a secure chronology for *Panicum* cultivation and explore morphological evidence for domestication traits. Genetic analysis is developing polymorphic markers and genotyping landraces to reveal phylogeographic patterns. Carbon isotope analysis is focusing on collagen samples from a series of sites in Inner Mongolia, China, to assess evidence for millet in human and animal diets between 6000 and 4000 BC. The geography of specific sites and of the steppe region of a whole is being considered in relation to the ecophysiology of *Panicum miliaceum*, to understand environmental considerations that may have shaped its domestication. Data from these four project strands will be combined to build a well-supported picture of broomcorn millet domestication within the context of nascent agricultural societies across the Eurasian steppe.

LIVING IN A BORDERLAND: DELAYED INTRODUCTION OF CROP CULTIVATION IN DUTCH WETLANDS

Welmoed A. OUT[1]

Details of the Neolithisation process in the Netherlands after arrival of the LBK culture in the Dutch loess region (5300 cal BC) are still poorly understood. This paper aims to reconstruct the introduction of crop plants in the remaining parts of the Netherlands. Questions that are considered in relation to crop cultivation are: what, when and where? This study is based on a literature study of three clusters of Dutch wetland sites dating to 6000-3500 cal BC, belonging to the Swifterbant culture and the Hazendonk group. The wetland sites show us some insights in the Neolithisation process because of the good conservation of organic material. It remains unclear whether the wetland sites are representative for upland sites.

The Neolithisation of the Dutch wetlands was a very gradual process, characterised by separate introduction of pottery, domestic animals and finally crop plants. Emmer (*Triticum dicoccum* Schübl.) and naked barley (*Hordeum vulgare* L. var. *nudum*) are the most common crop plants, found at least from *c.* 4300-4000 cal BC onwards. Local crop cultivation at the wetland sites remains a subject of debate since the environment of the sites, located in marginal areas, does not appear to be very suitable for crop cultivation. The available evidence for local crop cultivation depends on site function and is different for each of the three studied regions.

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"LE CHENET DES PIERRES" IN BOZEL (SAVOIE, FRANCE), A NEOLITHIC ALPINE SITE, AND THE QUESTION OF CROP CULTIVATION IN A MOUNTAIN CONTEXT

Lucie MARTIN[1,2], Stefanie JACOMET[1], Stéphanie THIEBAULT[2]

The archaeological site of "Le Chenet des Pierres" in Bozel (Savoie, France) is located in a valley adjacent to the Tarentaise, in the Vanoise Mountains, at an altitude of 950 metres. The site lies at the foot of a north-east exposed slope dominated by a beech-fir formation.

Since 1999, the excavation, directed by P.-J. Rey (UMR 5204, EDYTEM, University of Savoie), has concentrated on one 30 m^2 sector (S3) located between two schist boulders. Human presence is attested by a complex stratigraphy, composed principally of highly organic silt. According to several radiocarbon dates, the occupation can be dated to between 4500 and 3500 cal. B.C., i.e. of Middle Neolithic I and II. Cultural influences are numerous, such as Square mouthed pottery (VBQ) and Lagozza from northern Italy, and Rhône valley Chasséen and Saint-Uze.

According to the anthracological analysis, at the period of occupation the vegetation around the site was characterised by open mixed-oak woodland, but the most frequent species in the samples is juniper (Juniperus sp.), that could have been collected for specific purposes. In spite of a large quantity of artefacts, like sherds, flints, quartz, grinding stones and ornaments, the settlement's function is not yet clear.

The archaeobotanical study concerns a total volume of about 440 litres of sediment. This paper will focus on cereals, which are predominant on the site and can be counted in thousands.

They are represented by naked wheat (*Triticum aestivum/durum/turgidum*), barley (*Hordeum vulgare/distichum*), einkorn (*Triticum monococcum*) and emmer (*Triticum dicoccum*), in the form of grain or chaff. Our aim is to understand on one hand distribution and use of each species, and on the other hand whether people cultivated crops around the site or brought in cereals from lower valleys. Our interpretations will also be supported by other data, including archaeobotanical evidence from different neolithic sites in the Alps as well as ethnological and historical documents.

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REVISITING THE VISIBILITY OF THE OLIVE IN GREEK PREHISTORY

Anaya SARPAKI[1]

Many articles and books have been written on the beginning of olive cultivation in Greece and its importance for the formation of stratified society. Yet, we still feel that we are on the edge of potential knowledge and have barely scratched the surface.

For this “exploration” archaeobotanical finds from Greek Prehistory are re-examined in view of clarifying this aspect. Nevertheless, although archaeobotanists and even archaeologists working in Greece have had the “gut” feeling that the olive was an all-important tree and its products of utmost significance for the formation of stratified societies, its visibility has always remained rather low. Discussion will evolve on why this is actually happening so far. Obviously, this rarity must be attributed to some factors which, it is believed have to do with the way its products are extracted, our method of taking samples and the recycling of its by-products.

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CROP STORING AND PROCESSING IN A VILLAGE OF EARLY BRONZE AGE AT ARSLANTEPE (MALATYA, TURKEY)

Francesca SUSANNA[1], Laura SADORI[1]

The site of Arslantepe is a *tell*, an artificial mound 30 m high, formed by the overlapping deposits of many settlements, built for millennia, from the Chalcolithic to the Islamic age, in the same place. 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.

In the present work we will focus on the final phase of Early Bronze I (Period VI B2, around 2800 BC), when the settlement was a village, formed by small multi-rooms houses (built by mud bricks), with streets and courtyards for various activities (slaughtering animals, metallurgical activities). The rooms had, in the center, a circular hearth with a small central cavity for the ashes, benches around the walls, platforms, basins and plastered pits for processing cereals and other domestic activities. The village stood on the slopes of the ancient mound, and even if the public buildings have not so far come to light , the recent finding on the top of the hoyuk of a large mud brick wall, six meters thick, built on stone foundations, induce to think that the village could be outside a kind of citadel or acropolis.

The totality of the plant remains (huge quantities of woods, seeds, fruits) recovered were preserved by charring. Plant remains samples were always collected on a grid system. Water separation method was not applied for deterioration of charred plant remains. There was a domestic management of agricultural crops and the inhabitants stored cereals and pulses inside their own houses, probably in masses on wooden beam floors inside the habitations themselves, or on the roofs. The crop storing was differentiated in the single houses, being cereals more abundant and widespread than legumes. Hulled *Hordeum vulgare distichum* caryopses are found in all houses and constitute the more abundant crop. *Triticum dicoccum* and *T. monococcum* are also very common, and rachis fragments of both glume wheats are abundant, while *T. aestivum*/*durum* is found rarely and in low quantities. Pulses (*Pisum sativum*, *Cicer arietinum*, and *Lens culinaris*) are found in only five environments, suggesting a differentiated crop storing in the various houses. Small pieces of charred material with a thin bubble structure (crumbs?) are possibly referred to bread pieces. Few vine pips and oat caryopses were preserved too. Slight traces of wild taxa consist in few *Medicago* and *Aegilops* remains.

The Excavation of the VI B2 level is not yet completed, and will be the subject of the next archaeological campaigns.

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THE HISTORY OF BUCKWHEAT (*FAGOPYRUM ESCULENTUM* MOENCH.) IN NORTHWESTERN EUROPE. THE ARCHAEOBOTANICAL AND HISTORICAL EVIDENCE – A CRITICAL REVIEW

Julian WIETHOLD[1]

In north-western Europe buckwheat (*Fagopyrum esculentum* Moench, Polygonaceae) is a typical crop of the late medieval and early modern period. The annual species was mainly cultivated on poor sandy or peaty soils but sometimes also included in the normal field rotation after the fallow year. Centres of buckwheat cultivation were situated in the Netherlands, in north-western and north-eastern Germany and Poland. In eastern Europe some buckwheat records date back to the Iron Age and early and high medieval times.

First written sources from northern Germany report buckwheat cultivation from 1380 onwards. The written evidence is generally scarce. In late medieval times buckwheat was mainly cultivated for local consumption of the rural society. Therefore it was not included in the taxes on agricultural products set up by the landowners. So it does not appear in most of the tax lists and registers of agricultural products. Archaeobotanical records are mainly restricted to the resistant fruitscales, which had to be removed before grinding and consumption. The scales can quickly burn totally, so carbonised buckwheat remains are extremely rare. Nevertheless, waterlogged sediments of latrines and wells provided well preserved uncarbonised buckwheat scales. In northern and north-eastern Germany and Poland Buckwheat is frequent in latrines dated to the early modern period (16^{th}/17^{th} c. AD) while late medieval records from the 14^{th}/15^{th} century AD are still scare and the number of recorded buckwheat remains is lower. Buckwheat pollen can easily be distinguished and separated from the similar Tartarian buckwheat (*Fagopyrum tataricum* [L.] Gaertn. In pollen diagrams buckwheat is considered a primary settlement indicator.

A hypothesis may explain the scarcity of late medieval buckwheat records. In late medieval times buckwheat was mainly a local crop of the rural society. It was considered a crop of the poor with little economic value. Cultivation was risky due to the climate conditions which had huge influence on the yields. In early modern times the crop became more important and buckwheat was also transported and sold to the local markets. It was also more frequently distributed to the cities where it was used to produce buckwheat groat and dark brown pancakes.

The history of the introduction of buckwheat is still not yet completely known. The origin of buckwheat is estimated in the steppe region north of the Black See where some records can be dated to the Iron Age. In eastern Europe buckwheat records from the Iron Age and early and high medieval times are frequently recorded and more reliable than the isolated pollen records from France which lack the verification by macrofossil remains. Therefore the few single Neolithic or Iron Age buckwheat pollen records from western France should be critically reconsidered. Maybe they were caused by vertical pollen transport in the drainage system of the studied peat bogs or by contamination during coring, sampling or laboratory work.

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THE EARLY HISTORY OF OASIS AGRICULTURE IN THE MIDDLE EAST AND EGYPT

Margareta TENGBERG[1], Claire NEWTON[2]

The domestication of fruit species, notably grapevine and olive, has been the focus of important research programs during the last few years. Despite its importance in traditional economies of the arid Middle East and North Africa, the date palm (*Phoenix dactylifera* L.) has not yet received the same attention from scholars working in the archaeobotanical field. Indeed, the early history of date palm cultivation still remains quite obscure.

The most ancient date remains found so far in archaeological contexts consist of carbonised seeds found at the sites of Dalma (United Arab Emirates) and Sabiyah 3 (Kuwait) and dated by AMS to the late 6th millennium BC. It is unsure if these fruits had been collected from the wild or resulted from an early cultivation of the species, either in eastern Arabia or in southern Mesopotamia. No precise morphological criteria allowing the distinction between wildly growing or cultivated date palms have yet been established.

Date palm remains (fruits, seeds and primary xylem) become frequent on archaeological sites all over the Middle East from the late 4th and early 3rd millennia BC. They are often associated with other plant species, such as cereals and pulses, indicating the existence of date palm gardens or oasis agrosystems.

It is still uncertain if the practice of date palm cultivation was indigenous to Egypt or inspired by early Middle Eastern experiences. However, the species seems to have become increasingly important during the New Kingdom (second half of the 2nd millennium BC) as shown by both archaeobotanical and iconographic evidence.

The present paper summarises our knowledge of the evolution of oasis agriculture in the Middle East and in Egypt from the early 3rd until the 1st millennium BC. The main objectives of an interdisciplinary project (*ANR-Phoenix*) investigating the evolution of *Phoenix dactylifera* under cultivation will equally be exposed.

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TADMAKKA/ESSOUK – MEDIEVAL PLANT REMAINS FROM THE MALIAN SAHARA

Mary Anne MURRAY

The settlement of Essouk was often cited in the works of Arab historians from the 9th century AD onwards as the major Trans-Saharan trade city of *Tadmakka* (meaning 'this is Mecca' in Berber). The settlement was the southern most Saharan staging post on the earliest known Trans-Saharan trade route to West Africa. The documentary evidence from the medieval period indicates that the southern Saharan trading sites were dominated at this time by the northern Islamic culture and that *Tadmakka* was the regional centre of Islam in this part of the Sahara though the Arab documents also indicate a more southern Berber strain of Islam at *Tadmakka*/Essouk.

Essouk is located near Kidal, the capital of the Tuareg autonomous region which occupies most of the Malian Sahara. Early Arab records make an association between the ancestors of the Tuareg and the early occupants of Essouk. The Tuaregs themselves also consider it as their ancestral capital at the time of the arrival of Islam in the region.

Despite the great importance of the 'urban ruins' of Essouk, this is the first major archaeological and archaeobotanical investigation of the site. The charred plant remains from the site include cotton (*Gossypium*), free threshing *Triticum*, millets (*Pennesetum, Echinochloa*), melon (*Citrullus)*, *Ziziphus*, a variety of wild/weed plants, as well as animal dung presumably used as fuel. Together, the material culture and archaeobotanical evidence from the settlement are important for their potential to shed light on the development of Trans-Saharan trade, the early influence of Islam in the Malian Sahara and the possible origins of the Tuareg tribe.

LONG-DISTANCE TRADE OF FOODS – CHANGES IN FOODWAYS AND AGRICULTURE

Marijke VAN DER VEEN[1], Alison COX, Alexandra LIVARDA, Jacob MORALES

Introduction by Marijke VAN DER VEEN

This session will present some preliminary results of a large research project currently underway in Leicester. The project aims to understand the fate of foods newly introduced into North Africa and North-West Europe during the period AD 1-1500. In particular we try and assess the interplay between factors such as changes in the trade of these foods, their incorporation into local cultivation, and changes in the social structure of society. Methodological matters are highlighted.

This project analyses archaeobotanical data recovered from Quseir al-Qadim, a Roman and Islamic port of trade on the Red Sea coast of Egypt. The port was developed for the trans-shipment of foods (especially spices) obtained from India, China, Arabia and Africa. It also analyses where these foods go, both in North Africa and in NW Europe and who had access to them. As the introduction of certain spices (e.g. black pepper) into NW Europe was accompanied by a range of other food introductions (herbs, fruits and vegetables) these are also studied. Chronological, geographical/environmental and social patterns are noted and analysed.

Changing foodways: watermelon in Roman and Islamic Quseir, Egypt

Alison COX and Marijke VAN DER VEEN[1]

The seeds of watermelon (*Citrullus lanatus*) are often found on archaeological sites, especially in North Africa. Large numbers of these seeds were recovered at Quseir al-Qadim. Analysis of the seeds has produced differences between the Roman and Islamic periods. Methodological issues are discussed, and the differences are interpreted in terms of changes in foodways, suggesting cultural rather than agricultural change.

Dispersal of and social access to coriander and fennel in North-West Europe

Alexandra LIVARDA[3]

The dispersal histories of two condiments, coriander and fennel, will be used as examples of the research currently underway. The presence of a wide range of food plants was recorded for sites dating to the Roman and medieval periods, drawn from all available excavation reports from the region. Three parameters were recorded: site type (rural/urban/etc.), social status (elite/non-elite), context (secular/military/ceremonial/religious), and preservation (waterlogged/carbonized/mineralized). In addition, geographical location and dating evidence were noted. Analysis of the data suggests the presence of two very distinct patterns of dispersal that highlight the social/cultural significance of the foods in question.

Changes in agriculture: tropical summer crops introduced into the Eastern Mediterranean

Jacob MORALES [4]

Apart from spices the eastern trade introduced a range of other foodstuffs into Egypt and North Africa, especially during the Islamic period. Many of these were summer crops from India and tropical Africa, such as rice, cotton, aubergine, sorghum, and sugarcane. Their introduction in a region previously growing predominantly winter crops represents a major agricultural innovation. Watson (1983) saw this innovation as responsible for the economic, cultural and political success of the early Islamic period (c. AD700-1100), but several archaeobotanists have since contested this thesis. Here the summer crops recovered from Quseir al-Qadim are discussed.

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RECOVERING ARCHAEOBOTANICAL REMAINS FROM DEPOSITS RICH IN CLAY: THE EFFECT OF VARIOUS PRE-TREATMENTS ON PRESERVATION AND SPEED OF PROCESSING

Gillian CAMPBELL[1], Derek HAMILTON[2]

Flotation of clay rich deposits for the recovery of charred plant remains is often difficult. Clay does not break up well in water and even when it is eventually broken down any charred plant material in the deposit may either fail to float or be damaged by over rigorous processing. This sometimes necessitates undertaking a second flotation of the partly dried residue in order to recover more charred plant remains with the possibility that the material will damaged as a result of re-wetting.

Over the years various practitioners have tried to both improve recovery of charred plant remains and break up any clay by subjecting samples from deposits rich in clay to a variety of pre-treatments. However, the effect of these pre-treatments the preservation of charred plant remains and any improvement in the speed of processing samples has not been examined. In addition, the question of whether chemicals such as Calgon and Sodium Carbonate used to pre-treat samples can lead to the contamination of any charred remains with 'old' carbon has not been tested.

This paper will report on an experiment undertaken to investigate these issues. Charred spelt wheat and hulled barley grain from a large deposit of charred grain found on the floor of 3rd to 4th century AD Roman corn drying oven at Grateley in Hampshire and sealed by the collapsed roof of this structure was added to a locally sourced clay-rich deposit to forma a series of 'test' samples. These samples were then subject to various pre-treatments. The time needed to process each sample was recorded and the preservation of the grain both before and after processing was recorded. In addition, grains from each test sample were radiocarbon dated to see if any contamination by 'old' carbon had occurred.

Some pre-treatments had little effect on the overall time taken to flot a sample while others nearly halved the time needed to process a sample. All the pre-treatments, as well as flotation using water alone had a detrimental effect on the preservation of the charred grain. Surface layers were lost and some specimens were broken. The effects were worst with some pre-treatments than with others.

The results from radio-carbon dating were not entirely consistent, but suggest that contamination with 'old' carbon is not an issue.

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BOTANICAL MACROREMAINS AND THE PRESERVATION OF ARCHAEOLOGICAL SITES

Otto BRINKKEMPER

Since organic material is a source of food for fungi and bacteria, non-carbonised (waterlogged) botanical macroremains are highly sensitive to biological decomposition processes. Given the fact that they also occur in relatively large number, they are an ideal object of research for establishing preservation conditions at archaeological sites for the purposes of preservation in situ.

Every archaeobotanist experienced with waterlogged samples will have noticed differences in taxonomic richness (number of different taxa) between samples. These differences might have depositional causes, but post-depositional effects as biological decomposition may also play a role.

For pollen, experimental studies have revealed that different pollen types differ in their resistance to decomposition and other types of degradation in soils. Such experimental studies have never been conducted for botanical macroremains.

In an attempt is made to quantify the vulnerability of different species of botanical macroremains for decomposition, the assumption was made that samples with low taxonomic diversity only contain corrosion-resistant species. On the basis of the fifteen Dutch publications with the highest number of records of waterlogged botanical macroremains, a rank list was created for resistance to corrosion. Species that often occur in poor samples reach a high resistance score, species that only occur in rich samples are considered as vulnerable.

This list can be used to evaluate the record of waterlogged botanical macroremains in archaeological sites *in situ*, from which samples have been taken by corings. The presence of vulnerable species makes a site more valuable for future research.

COMPILING A REGIONAL ARCHAEOBOTANICAL FLORA: POTENTIAL AND PITFALLS

Allan HALL[1]

Work is currently under way to augment and enhance the *Archaeobotanical Computer Database* compiled initially in the early 1990s by Philippa Tomlinson. It will be used as the basis for a regional synthesis of archaeobotanical records. This *Archaeobotanical Flora* will primarily provide 'biographies' of individual taxa whose remains have been recorded as macrofossils in archaeological deposits and should therefore be of interest both to archaeobotanists and neobotanists with an historical perspective. This paper will briefly outline the main problems encountered in making such a compilation and discuss some of the decisions which are being made with regard to data collection and incorporation.

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AUTECOLOGICAL METHOD APPLY TO ARCHAEOBOTANICAL DATA FROM PITS IN CENTRAL AND SOUTHERN FRANCE

Frédérique DURAND, Manon CABANIS

One of the main purposes of archaeobotany is to reveal palaeoenvironment. If palynology and anthracology specialize in this field, seed analysis could also bring information about past environment.

Pits are chosen for the analysis because they provide good conditions of conservation thanks to the wet atmosphere. Wet contexts birth to a wide range of wild plants which show less human impacts on archaeobotanical samples than dry contexts where carbonization is the most frequent way of conservation and which induces human interference.

Two methods can be used to environment reconstruction. First, phytosociology based on plants associations seek to rebuild environment. That method requires more data than archaeological contexts can provide. Actually, seeds are preserved thanks to incidents which didn't allow germination or decay, which is why very few pieces of existing vegetation "survive" in samples. Moreover, in some places, human beings add a selection degree choosing plants they bring in to their settlements. For that particular reason autecology seems to apply more to archaeobotany.

That second method is based on the study of plant needs. H. Ellenberg summed up those needs with indicator values in 1979. He used 6 values, 3 to describe climatic conditions: light, temperature, continentality and 3 about edaphic conditions: soil humidity, soil reactivity and soil richness. That method is quite simple to use and with a minimum of taxa we are able to provide data on palaeoenvironment. The main inconvenient of autecology is the standardization of ancient climate due to the lack of local data.

Of course the two methods don't give the same information, but both have limitations due to use of current data in archaeology: climatic variations, extinctions and appearances of species. Autecology seems to be more suitable to palaeoecology than phytosociology because plant ubiquity makes phytosociology hardly applicable to archaeological samples where seeds often come from different contexts.

Through some examples of Iron Age pits, autecology is used to obtain data on past environment of those settlements.

The aim of the work is to wonder about palaeoenvironment methodology surrounding the limits of each method rather than to provide great environment restitution.

DETAILED IDENTIFICATION OF SEEDS IN THE DEVELOPER-FUNDED WORLD: BEST VALUE OR UN-NECESSARY COST?

Jacqui HUNTLEY

In Britain today, much Archaeobotany is done under the aegis of the planning system – the developer-funded world; this is a world of significant time and financial constraints. Typically, samples are taken and assessed with subsequent recommendations for full analysis of a selection. An overview of work from sites in northern England suggests that these recommendations often rely simply upon richness of plant remains and not necessarily to the research objectives of the excavation. Thus “more of the same” is often being recommended. This paper will look at the value of results from detailed examination and identification of *Carex* nutlets from selected samples from a site on Hadrian’s Wall following assessment of a large number of samples. It will argue that, providing adequate assessment is undertaken to ensure that pre-existing knowledge is confirmed, full analysis should focus tightly upon specific questions only thus maximising results from a finite resource. It will also recommend that an overview of existing knowledge is necessary as this is essential to assist the younger generation of contract archaeobotanists gain the necessary skills for evaluation of the samples in the first place.

LOOKING FOR PLANT REMAINS IN NEOLITHIC OKOLIŠTE, BOSNIA AND HERCEGOVINA. A COMPARISON OF FIELD METHODS

Dušanka KUČAN[1], Helmut KROLL[2]

Okolište is a site in central Bosnia, on the alluvial plane of the river Bosna, some 50 kilometres downstream from Sarajevo. This site is a tell of the Butmir culture and related Neolithic cultures (5200-4500 BC; Butmir is now a suburb of Sarajevo near the international airport). The river Bosna flows to the North into the river Sava, the river Sava flows to the East into the Danube at Belgrade.

The Roman Germanic Commission of the German Archaeological Institute started the investigation of this site together with the authorities of the Bosnian National Museum in Sarajevo and with Johannes Müller, then University of Bamberg in Bavaria, now University of Kiel in Northern Germany. Dušanka Kučan did the sampling, sieving and determination of plant remains in the first years (2002, 2004, 2005). Now she has retired and Helmut Kroll in Kiel took over the task.

The main aim of the excavations is to prove the results of the geophysical survey by digging. The houses and pathways of the uppermost layers of the settlement, the walls and ditches of the fortification are well known by these preliminary researches. Digging up these houses stays always in the uppermost layers. The fertile soil of the site is now arable land, intensively cultivated and sown with maize, cereals, vegetables, and fodder plants. The roots of these crops and of the weeds go down into the archaeological layers. Therefore, the archaeological plant remains in the upper layers of the Neolithic period are scarce and very badly preserved.

Dušanka Kučan started a wet sieving program with three sieves: coarse, medium, and fine. The soil is completely dissolved with some chemical help, and the sieve contents consist of plant remains and of the anorganic part of the soil, gravel, and sand. – In contrast, I prefer a simple flotation method - just water, some buckets and a fine sieve. This is a method that can be used everywhere. Flowing water is best, water from a river or a lake does it also, even marine water can be used. The method is a simple combination of flotation and decanting, I do it until the soil is dissolved. If the soil is very hard, I stop the procedure after at least half an hour, so the sieve content in the end is what the soil gives me in half an hour, it is not the total content of plant remains in the sample. – We now have the opportunity to compare these methods on the same site.

The site lies in the Bosnian mountains, its climate is a central European mountain climate with warm summers and cold snowy winters, quite different from the mediterranean climate of the Adriatic coast and also different from the eastern European climate of the Pannonian basin with its hot summers. The Neolithic settlers had some cereals: emmer,. Einkorn, and barley, some pulses: lentil, bean, grass pea. Some wild fruit were gathered e. g. hazelnut and cornelian cherry.

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THE IRON AGE HILLFORT GLAUBERG - SETTLEMENT OR CULT PLACE? ARCHAEOBOTANICAL CONSIDERATIONS CONCERNING THE QUESTION OF AGRICULTURAL PRODUCER AND CONSUMER SITES AND THE KIND OF AGRICULTURAL PRODUCTION

Angela KREUZ[1], Eva SCHÄFER [1]

Archaeobotanical investigations at the Glauberg, Hesse/Germany, a possible “central place“, are part of the Priority Programme of the German Research Association (DFG) on centralization-processes in Central Europe and related social developments between 800 and 500 BC. The long ridge formed by the Glauberg rises as a basalt spur of the Vogelsberg on the eastern edge of the Wetterau landscape north of Frankfurt/Main. With its impressive hillfort and famous princely graves, the Glauberg is one of the most important archaeological monuments in Hessen. Its rampart and ditch system extends for at least 3,25 km enclosing an area of at least 1,5 km². The aim of the project is the investigation of the relationship of the Glauberg to its Hinterland.

Archaeobotanical results from the Glauberg mountain plateau and its surroundings can be interpreted in comparison with diachronical data from other sites situated in loess landscapes of Hesse and neighbouring areas. The rich spectrum of cereals, pulses and other cultivated and collected plants points to a functioning supply of the Glauberg site with plant alimentation. But the number of charred plant remains per litre of soil gained from structures having been used as waste-pits is very low as compared to other Early-Latène settlement features.The archaeobotanical results from the area of the “annex-walls” on the mountain plateau stand in line with those from Roman military “consumer-sites” rather than with those from normal settlements with agricultural production. Results and methods will be presented and discussed with regard to the function of the Glauberg in the 5th century BC.

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CHANGING SETTLEMENT AREAS AND LANDSCAPE: POSSIBILITIES AND LIMITS OF ARCHAEOBOTANY IN LATE PREHISTORY OF CENTRAL EUROPE

Jaromír BENEŠ[1], Věra ČULÍKOVÁ[2], Veronika KOMÁRKOVÁ[1], Jan NOVÁK[1]

In last decades community settlement areas theory basically influenced archaeology of Central Europe. A model of palaeoeconomical autonomy of prehistoric community spacial units has been broadly accepted. Archaeobotany, which integrates mainly macro-remains analysis and anthracology, can approach to understand of local palaeoeconomy and palaeoecology of those spatially distinctive settlement areas.

For solution of representativity of archaeobotanical data three examples of settlement areas have been chosen. Every three areas fulfill the condition of high amount of archaeobotanical determinations for macro-remains as well as for charcoal. Every area reflects different Central European lowland environments. First's area of Lovosice, known as the Iron Age trade center and river port lies on Labe (Elbe) in the Northern Bohemia. Second area Hostivice is situated in Central Bohemian landscape. It is typical the Bronze and the Iron Age agricultural site located on flat platform with local rich sources of water (value finds of wooden Iron Age wells). Third area of Klimkovice is located in Southern Silesia in the Czech Republic and represents internal periphery of agricultural Early Iron Age landscape.

Every settlement areas were subjected by multi variable data analysis. Results show broad differences in macro-remains and charcoal data structure, reflecting very local human impact. Human activity was affected by large scale of palaeoecological conditions, beginning by presence of important river as long distance trade route over relatively good situated agricultural area to poor internal landscape periphery. Archaeobotanical material is represented in studied areas by local vegetation and products (Hostivice, Klimkovice); however, structure species in Lovosice is enriched by imports (*Ficus carica, Armeniaca vulgaris*, *Sorgum* sp.)

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PREHISTORIC CEREAL GRAIN TREATMENT IN GREECE AND BULGARIA: EXPERIMENTAL CEREAL PROCESSING AND CHARRING TO INTERPRET ARCHAEOBOTANICAL REMAINS

S. M. VALAMOTI, D. SAMUEL, M. BAYRAM, E. MARINOVA

Recent archaeobotanical investigations in northern Greece have identified the presence of charred cereal fragments resulting from the grinding of cereal (wheat and barley) grain, found among the destruction debris of end of 3rd millennium B.C. houses in northern Greece at the sites of Archondiko and Mesimeriani Toumba. Unpublished similar finds have been identified at the Neolithic site of Kapitan Dimitrievo and Karanovo in Bulgaria, dated to the mid 6th millennium and 5th millennium B.C. respectively. These archaeological finds of processed cereals are compared to experimentally produced cereal fragments of einkorn and barley grain, resulting from a variety of known processing treatments such as boiling in water and milk, and their subsequent charring. The comparison is carried out both macroscopically, using a stereomicroscope, as well as with the aid of S.E.M. photography. This investigation is intended to contribute towards developing a methodology that will enable the archaeobotanical recognition of ancient, cereal based, recipes.

MICROSTRATIGRAPHICAL AND BIOARCHAEOLOGICAL STRATEGIES FOR ANALYSING A MIDDLE BRONZE AGE "MIDDEN" AT TELL MARDIKH – EBLA (SYRIA)

Girolamo FIORENTINO[1] , Valentina CARACUTA[1]

Middens, very common in archaeological contexts, represent meaningful sources of information about human diet and domestic/productive activities. Despite their importance, some interpretative problems, regards generative activities, manner, and cyclical patterns in middens use, still persist.

In order to shed light on these questions we analysed the microstratigraphy and plant assemblages derived from an explorative 2 mt square test sounding carried out on a dump of domestic debris found on Ebla eastern rampart, dated to the Middle Bronze Age.

More than seven depositional events were point out through the microstratigraphical observations while seasonal pattern of seeds remains led to distinguish summer fire practises activities *in situ* from autumnal secondary discharge of burnt debris.

First, encouraging, results are here propose as possible tools in midden furthers interpretation models.

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CLIMATE AND AGRICULTURAL DECISION-MAKING: ENVIRONMENTAL CONSTRAINTS AND ECONOMIC DEVELOPMENT IN NEAR EASTERN SITES

Simone RIEHL[1]

The potential of archaeobotanical data for investigation of environmental change is examined with a multi-site approach to tracking changes in crop husbandry in the Near and Middle East. Archaeobotanical data of crop plants from 138 sites in the Levant, Syria and northern Mesopotamia is investigated with presence, proportion and ubiquity values throughout a sequence spanning from the Early Bronze Age to the Iron Age (5000 – 2500 cal. BP) for developmental patterns related to the palaeoclimatic history of the region, modeled climate parameter, anthropological facts and the bioclimatic properties of the crop species.

Although there are considerable methodological problems, the overall patterns emerging from this large data set demonstrate how agricultural decision-making was influenced by climate change in the past.

While a relatively favorable degree of available moisture can be recognized in the crop assemblages of Early Bronze Age sites, with the cultivation of numerous crops with comparatively high water-requirements particularly in northern Mesopotamia, the impact of the 4200 BP event, with an increased aridity after 4000 BP latest, is reflected strongly in the reduction or absence of drought-susceptible crop species in the Middle Bronze Age, especially in northeastern Syria.

The general pattern of crop proportions and ubiquities during the Late Bronze Age implies a further, although slight, increase in arid conditions, particularly in northern Syria. However this is much less marked than that for the Early to Middle Bronze Age transition. Regional variation is large for some crops, and an increase in arid conditions is not indicated by the patterns of crop production for the southern Levant. The patterns during the Iron Age suggest a similarly slight decrease in aridity.

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THE "DUNG-AS-FUEL-MODEL" TESTED AT ARCHAEOLOGICAL SITES IN SYRIA

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It is sometimes assumed that many carbonized weed seeds and cultigens on archaeological sites in the Near East originate in dung used as fuel. Therefore, the mean ratio of seed to carbonized material is used as an indicator of the availability of wood. In large parts of Syria little is known about the palaeovegetation and deforestation history because of general poor pollen preservation. Although there are a lot of hearths and tannurs at archaeological sites in the Near East, their contents are often not systematically investigated by consideration of various components like seeds, wood charcoal, dung pellets and phytoliths. Apart from the lack of knowledge on the wood taxa primarily used as fuel, the factual former dung content of such contexts is not evaluated. This paper aims to contribute to the question by an interdisciplinary carpological, anthracological and phytolith study at several sites in Syria.

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ARCHAEOBOTANICAL EVIDENCE FROM THE WEST GEORGIA (SOUTH CAUCASUS)

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Analyses of plant remains from the Nokalakevi settlement Kolcheti, West Georgia), is performed. The cultural layer was just began evaluated in October 2006, during a multidisciplinary research project Nokalakevi in the I Millennium and earlier" founded by the Swiss National Foundation.The first archaeobotanical data was available from the excavated site dating from the 8 century B.C. and covering along the period up to the 2 nd century B.C. The concentration of plant remains is not so rich. Following species are presented: Calla palustris, Carex sp.,Agrostis gigantean, Hor- deum vulgare, Triticum spelta, Elusine indiuca, Setaria italica, Ranunculus sardous, Papaver somniferum, Persicaria capitata, Vitis vinifera, Hypericum androsaemum, Linum bienne, Oxalis stricta, Vicia sp., Pisum sativum, Prunus sp., Ficus carica. The most samples of the archaeobotanical remains were carbonaized, except of mineralized flax seeds, which is frequent. It is very important fossil evidence of figs and grapes. These archaeobotanical data is compared and will be presented with the results of our previous investigated Esheri Site (Kolcheti, West Georgia). The very high density of carbonaized seeds of Linum bienne (for the first time in the studies of the antiquities of the Caucasian Black Sea coast) and Triticum sp. have been discovered in the cultured strata of this settlement (I-II century B.C.). Both settlements situated in Kolcheti - a region were cultural and economic activities of prehistoric and historic people have been highly concentrated. Agricultural practices could be reconstructed on the use of cereals: weat, barley and millet, that had been predominant in this area. The archaeological findings and manuscripts emphasize that weat, millet and also grape were cultivated from the ancient time in the West Georgia. The fossil seed collection of the Linum bienne from the both settlements is also significant, especially notable that flax is known also to have been cultivated in the ancient time and fibre flax was the subject of commercial exchange with Byzantine and Black Sea countries.

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CHICK PEA (*CICER ARIETINUM*) IN THE NEOLITHIC AND CHALCOLITHIC OF BULGARIA AND ITS IMPLICATIONS FOR THE CONTACTS WITH THE NEIGHBOURING REGIONS

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Until recent it was supposed that chick pea (*Cicer arrietinum*) did not reached further to the north than the modern territory of Greece. Latest finds from the Bulgarian Neolithic and Chalcolithic shows distribution of this crop outside of the Mediterranean into area with temperate climate. It seems that chick pea did not appears in the archaeobotanical record during the first stages of the Bulgarian Neolithic period, but in the second half of it or even later. The earliest finds if chick pea from the modern territory of Bulgaria come from the end of the Early Neolithic of the site Kovacevo, SW Bulgaria. From the same region the most Neolithic finds of *Cicer* were recorded. In the Thracian plane until now only in a site strongly related from cultural point of view to SW Bulgaria finds of chick pea came out. The last are considered to belong to the last third of the Early Neolithic and originate from structures dated to 5870-5730 cal BC. During the Chalcolithic of Bulgaria *Cicer* appears also to the north of the Balkan Mountain in the site Hotnica. The spread of *Cicer arietinum* in the prehistoric period of SE Europe gives some patterns of contacts and interactions with Thessaly and further Anatolia witch we would like to explore in our paper.

PLANT USE AT THE CAVE OF GRABAK ON THE ISLAND OF HVAR IN THE ADRIATIC SEA

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This study presents the results of an archaeobotanical analysis from Grapčeva Spilja (the Cave of Grabak) on the island of Hvar in the Adriatic Sea, Croatia. Forty-one floatation samples and eleven hand-picked macro-botanical samples were collected from a 1 x 2 m control trench during renewed archaeological excavations in 1996. Dr. Timothy Kaiser, one of the project's excavators sent already-floated samples to the author for analysis. The samples were taken from various contexts in each stratigraphic layer, dating from the Early Neolithic to the Middle Bronze Age (ca. 6000 – 1500 B.C.). Sixteen radiocarbon dates were obtained from wood charcoal coming from the same stratigraphic units as the floatation samples, providing precise dating of the samples. The highest density of plant remains occurred in the Neolithic layers. The most abundant plant remains were oak acorns (*Quercus* cf. *ilex*). Finds of charred berry cones of Phoenician juniper (*Juniperus phoenicea*), mineralized berry cones of another juniper (cf. *Juniperus excelsa*), various parts of gymnosperm cones, in addition to the cypress seeds and leaves, indicate that the Mediterranean evergreen woodland was exploited during the occupation of the Cave. Juniper berries could have been gathered for some kind of ritual/medical purposes, and/or remained on branches collected and burnt as fuel.

Remains of cultivated plants are rare. A small number emmer grains (*Triticum dicoccum*), were recovered from the Neolithic layers, as well as a few *Triticum* sp. grains from later horizons. Remains of typical Mediterranean fruits were also scarce and were all identified as wild. They include several almond nut shell fragments (*Amygdalus communis* subsp. *spontanea*), one grape pip (*Vitis vinifera* subsp*. sylvestris*), and one fig pip (cf. *Ficus carica*). These finds indicate that the occupants of Grapčeva utilized processed crops, but even more commonly products gathered from the wild for food, fuel, and perhaps ritual/medicinal use.

Fourier Transform Infrared Spectrometry (FTIR) analysis was performed on seven specimens in order to clarify the depositional and taphonomic processes that resulted in different preservation types, i.e., charred vs. mineralized juniper berry cones and some seeds.

This study provides the first evidence regarding plant use during the occupation of a major stratified cave in the eastern Adriatic, a recently well-dated sequence, previously best known for its distinctive Neolithic pottery which defined the Hvar Culture.

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EARLY NEOLITHIC PLANT REMAINS AT MORAVANY (EASTERN SLOVAKIA)

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This paper presents the results of analysis of macrofossils plant material from the Neolithic site Moravany (near Michalovce, Slovakia). During the fieldwork two kinds of plant samples were collected: burnt clay pieces and charcoals. Plant material comes from the Eastern Linear Pottery culture features, dated to the second half of VI millennium cal BC.

141 samples of burnt clay were examined from the material retrieved in Moravany. The most abundant remnants belong to emmer wheat *Triticum dicoccon.* Two other cereals found were einkorn wheat *Triticum monococcum* and barley *Hordeum vulgare.* Remains of unidentified cereals and/or wild grasses *Cerealia* indet. vel Poaceae indet. were found in 10 features. The materials described above are generally represented by impressions and charred or drayed fragments of chaff and leaves.

All the charcoal fragments from Moravany were examined. On the basis of charcoal, 13 plant taxa have been recognized; belonging to both conifers and dicotyledons. The most common genus is oak *Quercus* sp. Among the conifers, one taxon is identified as scotch pine *Pinus sylvestris*, whereas another one can belong to the genus of spruce or larch *Picea* sp. vel *Larix* sp. The other taxa are represented by maple *Acer* sp., alder *Alnus* sp., birch *Betula* sp., hazel *Corylus avellana*, ash *Fraxinus excelsior*, willow or/and poplar *Salix* sp. vel *Populus* sp., elm *Ulmus* sp. and undefined trees or bushes from rose family Rosaceae. Early presence of hornbeam *Carpinus betulus* and beech *Fagus sylvatica* is also indicated.

Archaeobotanical and chronological data referring to the Moravany settlement demonstrate that full farming economy was practiced in Eastern Slovakia as early as the mid-sixth millennium BC. The structure of identified charcoals reveals that typical early Atlantic forest communities with predominance of deciduous trees and bushes constituted the environmental context of the first Neolithic settlers. Wood of aforementioned species was used for construction and utilized as a fuel as well.

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UNCARBONIZED PLANT REMAINS FROM THREE BANDKERAMIK WELLS IN SACHSEN, GERMANY

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In the Leipzig area (Central Germany) near Plaußig and Eythra three Bandkeramik wells were excavated between 1993 and 2002 by the 'Landesamt für Archäologie'. The well constructions made of oak beams were dendrochronologically dated between 5250 und 5080 cal BC. In an interdisciplinary projekt financed by the German Research Fund during 2004 and 2005 the wells were archaeozoologically and archaeobotanically investigated.

Because of the constant waterlogged conditions under groundwater level the lower parts of these wells contained big amounts of uncarbonized plant remains. After the sensationel findings in the well of Erkelenz-Kückhoven, which K.-H. Knörzer presented at the 9th IWPG-Symposium in Kiel 1992, this is the second time that waterlogged uncarbonized plant material from the Bandkeramik can be investigated.

Out of 300 litres of sediment nearly 290 000 mostly uncarbonized macroremains belonging to 180 different plant species were identified. Remains of cultural plants were quite rare; only about 5% of the findings are from cereals, pulses, oil- and fiberplants. Former investigations can be confirmed, that in the Elbe/Saale-region Emmer has been the main cereal and that Einkorn, barley and naked wheat also have been cultivated. A considerable quantity of hulled wheat spikeletforks could not be identified, but are similar to the emmer-like hulled wheat, that Marianne Kohler-Schneider had described for the Late Bronze Age 'Stillfried an der March' (Austria). Lens culinaris and Pisum sativum were rare, but big quantities of seeds, capsule- and stemfragments of Linum usitatissimum were found. While remains of wild fruits and nuts principally were scarce, a large number of Physalis alkekengi-seeds appeared in one of the wells.

The majority of the macroremains were from weeds, perennial ruderals and grassland species. While the ruderals probably were growing inside the Bandkeramik villages near the wells, the 38 grassland species, from which nearly 15.000 seeds and fruits were found might come from the open pine-mixed forests or from fallow land. These remains also could derive from animal fodder.

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NEOLITHIC PLANT REMAINS FROM ARCHAEOLOGICAL SITES IN SACHSEN-ANHALT, GERMANY

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The southern und the middle part of Sachsen-Anhalt represents landscapes, which were settled by men since the Early Neolithic period, the oldest phase of the Linienbandkeramik. There are some well known sites of the early Neolithic to be mentioned like Eilsleben, Ldkr. Bördekreis, Westeregeln, Ldkr. Aschersleben, and Wahlitz, Ldkr. Jerichower Land. A part of the discovered plant remains from these sites were already investigated in the 1950s by Rothmaler/Natho and 1980s by Schultze-Motel. The middle Neolithic period is distinguished in different subsequent cultures. Many of the so called type-localities are situated in the above mentioned region. Most of these cultures are defined by their graves and the deposited ceramics. Carbonised plant remains from graves are rarely preserved. For this reason the knowledge of anthropogenic flora during the middle and the late Neolithic period is mostly fragmentary. Older and further recently collected plant material from different Neolithic sites in Sachsen-Anhalt is presented and discussed.

In the Nordharzvorland a Stone chamber grave of the “Bernburger” culture was excavated in the vicinity of Ditfurt, location Kreienkopp, Ldkr. Quedlinburg, in 1990. The grave was used in the second half of the 4th millennium BC. At least it was burned. The fact that the fire burned under low-oxygen conditions led to carbonised material. This phenomenon caused an extraordinary plant material for the site of Ditfurt. Both, remains of cultivated and collected plants are observed, whereas most of the remains originate from plants of the ruderal vegetation. Diaspores from *Onopordum acanthium* and *Hyoscyamus niger* are proofed, their occurrence presumably indicates a ritual use of certain plant species in the past.

In Burgliebenau, Ldkr. Merseburg-Querfurt, mass finds with carbonised cereals were excavated in 1916. In the 1950s Rothmaler and Natho investigated this material and classified it as Neolithic. In spite of recent investigations the mentioned site can be placed in the period “end of the middle Neolithic to the beginning of late Neolithic”. Actual ^{14}C-dates are available. The cereals from Burgliebenau are identified as *Triticum dicoccum* and *Triticum monococcum*. Both, two-grained *Triticum monococcum* and one-grained *Triticum monococcum,* are reported from here. A specific characteristic of Burgliebenau is the find of some weed species. An extraordinary singularity is the record of *Claviceps purpurea* already described by Natho (1957). So far known, the “oldest” record for *Agrostemma githago* in Sachsen-Anhalt originates from this place. But finds of *Agrostemma githago* are also known from other Neolithic sites, e. g. from Hohenwarsleben, Ldkr. Ohrekreis, a locality of the “Schönfelder” culture, and furthermore from Quedlinburg, Ldkr. Quedlinburg, and Ilberstedt, Ldkr. Bernburg, both sites of the “Schnurkeramik”-culture.

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THE ROLE OF ANIMAL FODDER IN THE SUBSISTENCE ECONOMY OF NEOLITHIC AND BRONZE AGE LAKE SHORE SETTLEMENTS IN THE ALPINE RANGE AND ITS PALAEOECOLOGICAL IMPLICATIONS

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Animal husbandry, in particular the keeping of ruminants, was an important economic factor in most prehistoric societies. Sheep, goats and cattle can be used in many different ways by people. However, their husbandry requires time and a sophisticated management of the resources in the surrounding landscape.

The most conclusive evidence on what the animals fed hence how and where they were kept can be obtained by a multidisciplinary analysis of ruminant dung: seeds/fruits, vegetative plant remains, pollen, phytoliths, fungal spores, insects, parasites, micromorphology. Untill now coprolithes could be studied only from single sites in an interdisciplinary way. The investigation of ruminant dung from more Neolithic and Bronze Age lake shore settlements in the alpine range will make a more precise and representative data set available. A new research project started in autumn 2005 to establish the data.

Detailed results are expected concerning

1. the specific characteristics of each site:

- Were the animals kept inside the settlements or in the surroundings during the whole year?

- Which type of fodder was used in the different settlements?

- In what kind of environment were the animals grazing?

- Is it possible to estimate the intensity of influence of ruminant keeping on the environment?

2. the differences between sites:

- Are there differences in the animal husbandry between sites of the same period?

- Is there a chronological change?

- What could be the reasons for differences between sites and/or for chronological changes?

In the paper first results of our work will be presented.

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NEOLITHIC FARMERS AND GATHERERS ON THE DUTCH NORTH SEA COAST C. 3500 CAL BC - ARCHAEOBOTANICAL EVIDENCE FROM SCHIPLUIDEN-HARNASCHPOLDER

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The hunters only slowly evolved into farmers. Analysis of plant macro-remains, including cereals, seeds and fruits, along with roots and tubers from the Middle Neolithic settlement at Schipluiden indicate complex pattern of plant resources and plant exploitation in the Dutch coastal dune area. The plant food subsistence activities included cereal cultivation and gathering. The high salt marsh and possibly low dunes in the surroundings offered possibilities for small-scale agriculture. Emmer and naked barley were the two cultivated crops. Besides these cereals, the diet comprised a broad spectrum of gathered wild fruits and berries. The study of charred parenchymatous tissues indicate a different direction in the local subsistence system, towards the gathering of starch-rich underground plant parts, such as roots, bulbs and tubers. They expand the range of used plants and plant parts, but also demonstrate that much available evidence might be missed in archaeobotanical record if only standard recovery and identification methods are applied.

The remains of charred processed emmer food and other food residues recovered from Schipluiden are very unique. They allow significant advances in our understanding of the local diet and ways of food preparation at Schipluiden, but they also provide detailed insight into European Neolithic subsistence in general.

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AGRICULTURE AND VEGETATION AT AN IRON-AGE HILLFORT IN WESTERN BOHEMIA – INDICATORS FOR ITS ECONOMICAL STATUS?

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The large fortified hilltop site Vladař (NW Bohemia, Czech Republic, 50º05´ N, 13º13´ E) has been studied intensively during recent years by way of environmental archaeology, in which palaeoecological methods play a crucial role. The oldest fortification on the Vladař is dated to the Middle Bronze Age. During the 6th and 5th centuries BC the fortification had significantly expanded, most likely to a total length of 18 km - this is what is seen today as the remnants of the walls. The site became partly abandoned by the end of the 3rd century BC and completely abandoned around 0 BC/AD. The presentation focuses on archaeobotanical material from 6th to 3rd century BC. At that time there was an important settlement on top of the hill, which probably hold the position of a Central Site for the whole adjacent region. Contemporary a network of those nobility centres had developed over most of Central Europe. In the ongoing archaeological discussion about the function of these places e.g. as political and/or religious centre, early towns, market places and so on, archaeobotanical research is getting more and more important. Especially the question of consumer and producer sites is gaining relevance to appreciate the relationship between so called Central Sites and other settlements.

While for other regions of Central Europe the assemblages of species cultivated during the Iron-Age period are quite well known, from Bohemia only little is published. Now, different preservation circumstances at the Vladař hillfort offer a broad collection of plant remains to discuss the subjects mentioned above based on a variety of data sources: macrofossil analysis and pollen analysis, charcoal and wood as well as seeds and fruits. Charred plant material from settled areas of the hillfort can be compared with charred and subfossil remains from an Iron-Age, artificial cistern at the lowest part of the plateau which contained an appreciable chaff layer. Beside cultivated plant remains the cistern also contained a lot of residues reflecting the vegetation of the surrounding area. The latter also shows distinct signs of a changing density of settlement activities on the hilltop during the last centuries BC.

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PLANT REMAINS FROM THE LA-TÈNE SETTLEMENT SANDBERG-ROSELDORF, LOWER AUSTRIA

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The La Tène-settlement of Sandberg-Roseldorf (3rd century BC) is located in the loess-hill country of northern Lower Austria, consists of several hundred houses and covers an area of 20 ha. Archaeobotanical results from two special features within the settlement – a granary and a sanctuary - are presented in this paper, based on the analysis of charred plant remains. The granary contained an almost pure assemblage of very well preserved cereals (200 litres of charred grain), while samples from the ditch-enclosure of the sanctuary yielded a rich spectrum of cultivated and wild plants. Together, the plant remains from the two structures provided insights into the agricultural practices and land-use patterns of the celtic settlers. The cereal assemblage in the granary consisted of two distinct units: a mixed store of einkorn *(Triticum monococcum)* and spelt *(T. spelta)* and a store of barley *(Hordeum vulgare),* with admixtures of wild oat *(Avenua fatua).* Both stores obviously had been cleaned from weed-seeds and may have been intended as sowing material. Judging from the few remaining weed species, the einkorn-spelt mixture had been grown as a winter crop (occurrence of *Agrostemma githago* and *Bromus secalinus*) while the barley store was a summer crop (occurrence of wild *Paniceae*). The stores had been kept in wooden boxes. The plant material from the sanctuary, which was found together with deliberatly damaged metal goods, with numerous animal bones and even some human body parts probably represents the remains of offerings. This ritual discard contained not only the above mentioned cultivated plant species, but also relatively numerous finds of rye *(Secale cereale)* and common millet *(Panicum miliaceum),* some naked wheat *(Triticum aestivum),* as well as single seeds of gold of pleasure *(Camelina sativa)* and opium poppy *(Papaver somniferum).* The most remarkable find was a pip of grape vine *(Vitis vinifera),* showing typical features of the cultivated form. Whether this provides a further hint to early wine-growing in southeastern central Europe or only additional evidence for the exchange of goods with the mediterranean region cannot be decided yet. In any case, it fits the context of valuable offerings made within the sanctuary. Wild plants from the sanctuary included many grassland species, deriving from three possible sources: from mesic meadows in the valley bottom below the settlement (e.g. *Poa pratensis, Phleum pratense, Trifolium pratense, Ajuga reptans*), from dry pastures on the loess-soils of the settlement hill (e.g. *Stipa sp*., *Salvia nemorosa, Acinos arvensis, Teucrium chamaedrys)* and – most remarklably – from pastures on the acidic soils of some granite outcrops, located at a distance of at least 6 km from the settlement (e.g. *Scleranthus perennis, Trifolium arvense, Festuca ovina*). The large number of grassland species points to the importance of animal husbandry, which is reflected by numerous finds of sheep and cattle bones.

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FOOD SUPPLY TO THE ROMAN ARMY IN THE RHINE DELTA IN THE FIRST CENTURY AD, ARCHAEOBOTANICAL EVIDENCES

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In 2004 a research project was set up in the Netherlands, which is titled: “A sustainable frontier? The establishment of the Roman frontier in the Rhine delta?”. The primary aim of this project is to synthesise the history of the limes section from Vechten to the North Sea in the period of c. AD 40-140. The aspect of food economy of this project has been addressed to the interdisciplinary team of researchers, including dr. Chaira Cavallo and Monica Dütting (archaeozoology), M. van Dinter (physiclal geography) and the author (palaeobotany). The research project is supported by NWO, the Netherlands Organisation for Scientific Research.

One of the objectives of this project is the issue of food supply to the Roman army. In the Lower Rhine delta a closely spaced series of military fortifications were founded on the southern levees of the River Rhine. In the Roman Period this area was quite wet, which put some limitations on both military and agrarian activities of the inhabitants. Only the western and eastern part of the research area contained a certain amount of dry grounds suitable for habitation. Namely, to the west there were the coastal barrier ridges and old dunes and to the east there were the levees of the River Rhine and the highest stream ridges of former rivers.

It is generally agreed that the Roman army was strongly dependent on food transport over long distances. There is good archaeobotanical evidence for transport of cereals such as Triticum aestivum and T. spelta along with diverse fruits. From the end of the 1st century and in the 2nd century AD, however, cereals such as Hordeum, and T. dicoccon, and vegetables and kitchen herbs may have been also grown just south of the River Rhine.

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PLANT REMAINS FROM IRON AGE BURNT-OFFERING SITES IN THE ALPS – MACROFOSSIL EVIDENCE ON RITUAL PRACTICE AND LAND USE

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Since their first archaeological description in 1966, burnt-offering places (*Brandopferplätze*) in the Alps have been thoroughly investigated by archaeologists and archaeozoologists. However, botanical analyses from these ritual sites have been scarce up to now, not least because of the bad preservation conditions for plant material in the sacrificial fires.

Nine burnt-offering places, ranging from LBA until Roman times, were now analysed in a supra-regional project for their carbonised plant macrofossils: Wartau-Ochsenberg (CH), Feldkirch-Altenstadt (A), Pillerhöhe (A), Pfaffenhofen-Trappeleacker (A), Ganglegg (I), Maneidtal-Grubensee (I), Schlern (I), Ulten/St. Walburg (I) and Sölkpass (A).

The two sites with the richest plant material show a dominance of hulled wheats (*Triticum monococcum* and *T. dicoccon* at Feldkirch) and broomcorn millet (*Panicum miliaceum* at Ulten) respectively, both with a minor presence of hulled barley (*Hordeum vulgare*) and foxtail millet (*Setaria italica*). The other sites resulted in singular cereal finds. Pulses (*Vicia faba*, *Lens culinaris* and *Pisum sativum*) could only be found at the three sites located around the region of Vinschgau/Val Venosta (namely Ulten, Ganglegg, and Grubensee), maybe indicating a characteristic of local ritual practice. Exceptional finds, regarding the unfavourable preservation contidions, were the oilseeds flax (*Linum usitatissimum*) and opium poppy (*Papaver somniferum*) from the Ulten site. Although seeds/grains of cultivated crops were scarce in general, all investigated ritual sites resulted in considerable amounts of fragmented bread/porridge material (usually several hundred fragments per site). This is considered a possible new diagnostic trait for a *Brandopferplatz*, besides the intentionally destroyed pottery and the calcinated animal bones.

Charcoal analyses of the fuel wood from the investigated *Brandopferplätze* revealed taxon spectra with a wide variation between the sites. Taking into account the supposed former local vegetation (inferred from both the modern potential vegetation, and from the pollen record), the fuel wood seems not to have undergone a specific selection in any of the ritual sites. However, basing on dendrological parameters, there is evidence on a selection for wood of lower diameters, and on a certain degree of wood decay. Consequently, the main fuel for the sites investigated most probably originated from gathered wood.

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VEGETABLE OFFERINGS IN ROMAN NECROPOLIS :REGIONAL COMPARISON : GAUL, ITALY, NORTH AFRICA

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Untill few years, the studies of food offerings in Roman graves have increased. The palaeoethnobotanic analyses are now directly integrated in necropoles studies (for example, necropolis of Vindonissa Switzerland, *Porta Nocera* at Pompei, or *Leptiminus* in Tunisia…). They relate now many countries of the Roman Empire. The most abundant data come from Italy, Germany, France, Hungary, Switzerland... New analyses from Croatia, Great Britain, Tunisia were recently recorded.

All type of graves are excavated (*bustum*, *olla*, *mausoleum*…). Some are particularly rich in vegetable offerings, others, on the contrary, are very poor.

The first multivariate statistical studies permit to highlight differences according to chronology, age of death, sex, and also regional distinctions between Mediterranean area and Rhône valley (in France).

The richness and the variety of these data allow to consider the vegetable food offering during Higth Roman Empire time in large aspects. This analysis highlight differences but also a great number of convergences .

Moreover, there is also documentations on funerary offerings from other cultures: Greek, Celtic, Iberic, Punic…an intercultural comparison is possible.

Following the recent studies on the Roman beliefs, we will try to explain the reasons of food offerings and the plant symbolism.

WATERLOGGED MATERIAL FROM MIGRATION TIME SITES IN SOUTHWESTERN GERMANY

Manfred RÖSCH[1],

A.D. 260 the Alamannic tribes invaded the so-calles „agri decumati“, the region between Upper Rhein, Upper Donau and Main, which was former part of the Roman provinces Obergermania and Rhaetia and protected by a fortified border, the Limes. The Alamanni settled there, first as independent tribes, since the 6th century A.D. as a part of the Frankish empire. In these first centuries written sources about them are very rare, consisting or Roman reports about wars. So we have very sparse information about their organization, economy and daily life. The archaeological sources are also sketchy and lopsided, based mainly on graves. Therefore we know how tall they are, what weapons and jewellery they had and that they were heathens, but nothing about their daily life. This situation was improved a little bit by means of two recent excavations. The first is in Aalen, at the north-eastern border of the Schwäbische Alb, were in a small valley settlement structures were wet preserved in a more or less large area. The second is Langenau, near the south-eastern border of the Schwäbische Alb, where the filling of a wood-framed well was wet preserved. According to the archaeobotanical results they grew several cereals, *Hordeum*, *Triticum dicoccon*, *Triticum spelta*, *Secale cereale*, *Triticum monococcum*, *Triticum aestivum*, *Avena*, and *Panicum miliaceum*. *Hordeum* was most frequent. It occurs as Naked and as Hulled barley. In a grave with wet preservation of the 6th century in Trossingen also *Hordeum distichon* was present and more frequent than *Hordeum vulgare*. They had the oil- and fibre plants *Linum usitatissium*, *Papaver somniferum*, *Cannabis sativa*,.and *Brassica rapa*, as well as the pulses *Lens culinaris* and *Pisum sativum*. More surprising were finds of vegetables and spices. Among them *Juniperus communis* and *Humulus lupulus* are most probably gathered in the wild, but *Coriandrum sativum*, *Apium graveolens*, and *Satureja montana* must be cultivated in gardens. In Langenau only wild gathered fruits and nuts are found, but in Aalen in addition to wild gathered material also *Pyrus*, *Malus*, *Prunus avium*, and *Ficus carica* did occur, which most probably were grown in orchards or even imported. Therefore the Alamanni not only were farmers growing cereals and other field crops, but also had gardens and orchards were they grow vegetables, spices and fruits. Most probably they learned this from the Romans when they had left their former homelands in North-East Germany and settled near the border of the Roman Empire.

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PLANT GATHERING AND CULTIVATION IN PREHISTORIC TUSCANY (ITALY)

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In Italy, traces of plants in foodstuffs during the Palaeolithic and Mesolithic are generally scanty, and Tuscany is no exception to this general pattern. However, a recent archaeobotanical study in Northern Tuscany added new information regarding the use of wild plants, ca. 25,000 years ago. During the Neolithic, the beginning of agricultural practices is shown by the sudden appearance and abundance of different cereals. We can hypothesize that the higher fitness of the less productive species of *Triticum* in microclimates of this region is the reason why these varieties persisted even after the introduction of the high production varieties. In Tuscany, the archaeobotanical Bronze Age storages are characterized by an increasing assortment of cultivated plants, particularly legumes. These plants appear to play an ever more important role in the diet of the local people throughout the Iron Age. The Etruscan diet is an example of the selective use of pulses. Recent excavations near Florence brought to light a probable food storage pit with well-preserved archaeobotanical remains, and offered the opportunity to integrate the results of pollen, seed and fruit analyses. Throughout the ages, the practice of gathering wild fruits and seeds was never abandoned. For instance, the use of cornel (*Cornus mas*) drupes is known from the Neolithic to the Iron Age and later. A special consideration is reserved for *Vitis*, a plant which was part of the local vegetation before human settlement in the territory. First traces of *Vitis* use come from the Northern coastal area where high pollen percentages were interpreted as the result of management practices favouring grapevines. Grapevine pips recovered in many Tuscan archaeological sites (Neolithic – Bronze Age – Iron Age) testify to the use of this plant in the diet although no archaeological evidence hints to a precocious winemaking activity. The morphology of the recovered pips varies in time, suggesting the appearance and the contemporary presence of different grapevine varieties. With the aim to clarify the genetic correlation between these different varieties, DNA analyses on grapevine pips from the different archaeological sites will be performed. Finally, all archaeobotanical investigations suggest a long-lasting diffusion of wetlands in Tuscany correlated to a human exploitation of the territory for agricultural practices.

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DEVELOPMENT OF PLANT USE AND ENVIRONMENT IN THE "REGIO BASILIENSIS" SINCE THE NEOLITHIC, BASED ON ON-SITE DATA

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The archaeobotanical research group at Basel University investigated since over 25 years the plant remains of many archaeological settlements in the "Regio Basiliensis". This region is geologically and climatologically very diverse and is located in Central Europe, outside the range of most of the quaternary glaciations. The region lies partly in Switzerland (NW), partly in SW-Germany (Baden-Württemberg) and partly in France (Alsace). Beside the Upper Rhine Plain (Oberrheinische Tiefebene) with an average height of 250 m asl and a rather dry and warm climate the region also encompasses mountainous areas (the Jura (limestone) and the Black Forest and the Voges-mountains (siliceous rocks)) with heights until 1400 m asl and a wet and much colder climate. Between both hilly areas are spread. In the Upper Rhine plain as well as on some of the hills like the Sundgau fertile soils on Loess are prevalent. In general most of this region is excellently suited for agriculture. The river Rhine, one of the main streams of Europe, forms an important line of communication.

The region was settled since the Lower Palaeolithic. Our investigations however encompass around 90 sites since the Late Neolithic. Very rich spectra came to the light from the Late Iron Age (Latène Period), the Roman period and the Middle Ages. During the latter two, different settlement types could be investigated (rural sites, smaller villages, larger towns, military fortifications). Most of the settlements lie on dry ground; therefore mostly carbonised, rarer also mineralised materials are preserved. There are however also very rich waterlogged spectra, mainly from the Roman period.

We will present developments of the useful plant spectra as well as of the diversity of the wild plants from the Neolithic to the Middle Ages. The latter will show the development of the cultural landscape in the "Regio Basiliensis". We intend also – where possible – to analyse the spectra in different structures, preservation and settlement types. The latter should show how these parameters influence the spectra of plants.

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THE PLANT REMAINS FROM THE ICEMAN´S DISCOVERY SITE AND ITS TAPHONOMIC IMPLICATION

Klaus OEGGL, Andreas G. HEISS

After more than a decade of painstaking research on the body and the archaeological findings of the Neolithic glacier mummy “Ötzi” the cause for his death is still ambiguous. The original suggestion that he possibly had died from exhaustion and hypothermia has now been seriously opposed by the recent discovery of a fresh shot wound in his back, the arrowhead still trapped between the rib cage and the left shoulder blade it had perforated. This severe injury indicates a trauma of the large axilla (armpit) vessels caused by the arrow, the resulting bleedings leading to death within a short time. Where this aggression had taken place – either in the gully at the Tisen pass or elsewhere – is still subject of speculation. Anyway, knowledge of the taphonomy of the find assemblage can contribute data to clarify whether the find positions of the corpse and the other findings correspond to their original positions at the time of Ötzi’s death, and thus provide cogent evidence of the last moments in his life. Archaeobotanical studies have been carried out on the complete amount of plant remains retrieved from the high alpine discovery site of the Neolithic Iceman “Ötzi” in 3,210 m a.s.l. of the Ötztal Mountains. The results show a huge diversity of species (121 taxa) mainly originating from lower regions, and having been transported to the Tisen pass site by many vectors. Spatial modelling has been carried out for the part of the plant remains unequivocally assignable to the Iceman. The resulting patterns indicate post-depositional displacement processes having affected the material, and even the mummified body itself. It is demonstrated that the influence of cross-contamination resulting from the recovery attempts preceding the excavations can be ruled out by thorough selection of sampled areas and layers. The archaeobotanical results, together with current data from other research fields, strongly suggest that the Iceman had died in an area about five metres south-west of the position where he was discovered in 1991.

PLANT REMAINS FROM EARLY IRON AGE IN WESTERN SICILY (MONTE POLIZZO, SALEMI, AND SELINUNTE)

Hans-Peter STIKA[1], Andreas G. HEISS[2], Barbara ZACH[3]

During early Iron Age in western Sicily three different ethnic groups were settling in close vicinity: the indigenous Elymians as well as Greek and Phoenician/Punic colonies. Within the EU-project "Emergence of European Societies" and together with American universities (Stanford University, Northern Illinois University) Elymian sites on Monte Polizzo and in Salemi were excavated. The long term excavation project of the Greek town of Selinunte was undertaken by the Rome Department of German Archaeological Institute (DAI). All three excavations were sampled for archaeobotanical analyses, sediment samples were locally processed by flotation.

At the Elymian sites three cereals were the main crops: hulled multi-rowed barley (*Hordeum vulgare*), emmer (*Triticum dicoccum*), and free-threshing wheat (*T. aestivum / T. durum*). Another important crop for alimentation was faba bean/field bean (*Vicia faba*). The oil containing crops linseed (*Linum usitatissimum*) and poppy (*Papaver somniferum*) are proofed by finds as well as following fruits and nuts: fig (*Ficus carica*), grapevine (*Vitis vinifera*), and almond (*Amygdalus communis*). To compare the Elymian crops with those of the contemporaneous Greek town of Selinunte: free-threshing wheat was the dominant cereal of the Greek, while hulled barley was common but less important and emmer was unimportant there. The pulses lentil (*Lens culinaris*) and bitter vetch (*Vicia ervilia*) are listed for Selinunte but faba bean is missing. While Selinunte provided plenty of finds of fruit stone fragments from olive (*Olea europaea*), this type of finds was missing on Iron Age Monte Polizzo. However, charcoal analyses detected the use of olive tree wood for timberwork there. Chemical analysis of an amphora from Monte Polizzo resulted in animal fat as a content of a vessel. These results might suggest a difference of the food systems: Greek olive oil versus Elymian animal fat as well as the use of different cereals and pulses. The Greek town of Selinunte might have imported free-threshing wheat from the indigenous Elymians who have based their own nutrition mainly on barley and emmer.

As charcoal analyses of early Iron Age site of Monte Polizzo have shown, huge beams of evergreen oak (*Quercus* subgen. *Sclerophyllodrus*) and deciduous oak (*Quercus* subgen. *Quercus* and *Q*. subgen. *Cerris*) were used for roofing. Consequently, tall oak trees must have been available to the inhabitants as construction timber. As up to now the charcoal record has not provided any evidence on pioneer taxa (e.g. *Pinus*), a rather undisturbed climax vegetation at Iron Age Monte Polizzo can be assumed. The local deciduous oak species are restricted to higher elevations and surely must have derived from the mountain itself. The results of an unpublished pollen profile from Mazara del Vallo (W. Tinner, University of Bern) between Selinunte and Monte Polizzo are supporting both assumptions: widespread late Bronze/early Iron Age undisturbed climax vegetation in western Sicily and the import of crops by the Greek town of Selinunte.

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ARABLE CROPS AND SOCIAL ORGANIZATION IN BRONZE AGE IRELAND

Meriel McCLATCHIE[1]

This presentation will investigate arable crops and farming systems of Bronze Age Ireland, considering evidence primarily from the macro-remains of cultivated plants. Earlier studies suggested that barley (*Hordeum vulgare* L.) was the predominant crop of this period in Ireland, with wheat (*Triticum* spp.) playing a very minor role in farming economies. These early studies relied heavily on evidence from plant impressions on ceramic vessels. The more recent collation of unpublished data as part of my PhD research represents the first study of crops based mainly on plant macro-remains from Bronze Age deposits in Ireland.

Based upon the newly-collated plant macro-remains evidence, it seems that previous hypotheses relating to the relative significance of various crops during this period are incorrect. Wheat is far more significant in faming systems of Bronze Age Ireland than previously assumed, and the study has also provided evidence for the regular presence of oat (*Avena* sp.) at this time and an early occurrence of rye (*Secale cereale* L.). The clear contrast between evidence from plant impressions on ceramic vessels and evidence from plant macro-remains demonstrates the danger in relying solely on plant impressions when attempting the reconstruction of cereal economies.

In the case of Bronze Age Ireland, the association of certain cereal types with ceramic vessels may be better viewed as representing a relationship between ceramic vessel production and activities associated with the processing of these cereals. By linking crop production and use with activities such as ceramic manufacture, this study demonstrates the potential of using archaeobotanical evidence in the consideration of social organisation, particularly with regard to the deployment and scheduling of labour.

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PLANT REMAINS FROM THE ROMAN PERIOD CEMETERY IN PAPROTKI (THE GREAT MASURIAN LAKES DISTRICT): PALAEOBOTANICAL AND CULTURAL INTERPRETATIONS

Małgorzata KARCZEWSKA[1], Maciej KARCZEWSKI[2], Aldona BIENIEK[3], Katarzyna CYWA[3], Ewa PIROŻNIKOW[4], Zofia TOMCZYŃSKA[3]

The cemetery of Bogaczewo Culture in Paprotki is situated in the centre of the Great Masurian Lakes District (NE Poland). Here, for the first time in the history of archaeological research of the West Baltic Tribes' cemeteries, investigations of macrofossil plant remains have been carried out on an equal footing with archaeological excavations. Up until 2000, excavations at over 100 cemeteries only detected the presence of charcoal in grave pits; no other plant remains were noted.

Since 2000, plant remains have been found in several graves in the cemetery at Paprotki. These are both charred and uncharred and they represent a wide range of species; they found their way into the pits in different ways and for several reasons.

The purpose of this paper is to discuss methods of searching for plant remains in graves and to present the possibilities for their interpretation in a palaeobotanical and cultural perspective.

The most frequent remains were uncharred seeds of *Chenopodium*. This genus is usually the most common (modern/later) contaminant in archaeobotanical samples. A few uncharred seeds of *Urtica dioica* and other plants were also found. In some graves there were charred grains of *Triticum* sp., *Hordeum vulgare*, *Setaria verticillata/viridis* and *Digitaria* sp. One charred specimen of *Ranunculus* cf. *acris* and a few fragments of hazelnuts were also found. The composition of the plant macrofossil assemblage suggests that the plant remains entered the graves as a consequence of ritual burning. However, it is also possible that they arrived there by chance. Further investigations are necessary in order to enable a better understanding of their presence.

One of the most important questions relating to the cultural (anthropological) interpretation of plant remains discovered in the grave pits concerns their stratigraphical position and the route of their deposition. Their state of preservation (charred or uncharred) seems to be insufficient as a main indicator of primary deposition or subsequent contamination of the sample. In this paper results of charcoal analysis, as well as anthropological studies of funerary rituals and ecological knowledge of modern plant cover, are used as tools in explaining the origin of the plant remains.

The cultural (anthropological) interpretation of plant remains from grave pits can follow two main directions: to give an insight into funeral rituals and/or as indicators of the nature of the surrounding landscape.

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ECONOMY AND SUBSISTENCE STRATEGIES OF MEDIEVAL VILLAGES IN WOODLAND AREAS IN BOHEMIA – ARCHAEOBOTANICAL EVIDENCE

Libor PETR[1], Petr KOČÁR, Pavel VAŘEKA

Most recent research of deserted Later Medieval villages in Bohemia 13th – 15th centuries) situated in woodland areas have produced an extensive archaeobotanical dataset. Three types of evidence have been combined: a) test pits and small scale excavations of ponds providing pollen profiles as well as archaeological artefacts (including organic material), b) macroremain analysis of excavated deposits within villages and c) documentary evidence (the 14th – 15th century written records). These data enable to reconstruct the later medieval environment, vegetation changes, agricultural and other human activities (esp. forest crafts, e. g. charcoal and tar production) and their long – term impacts. Comparison of the archaebotanical evidence from various types of landscape (West and the Middle Bohemia) shows great differences that can be interpreted as divergent economic models and subsistence strategies.

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ANALYSIS OF URBAN SEDIMENTS WITH MAIN FOCUS ON PLANT REMAINS TO RECONSTRUCT ENVIRONMENTAL CHANGES OVER TIME AND AROUND A MEDIEVAL TOWN IN SOUTHEAST NORWAY

Kerstin GRIFFIN

Environmental changes in and around a medieval town are studied based on plant remains from urban sediments. The plant material is extracted from soil samples from five archaeological excavations located within the medieval ground of the town of Tønsberg in SE Norway. Special emphasis will be given to the introduction of plants into Norway in medieval time, especially cultivated plants and their accompanying weed flora.

RECONSTRUCTING ENVIRONMENTAL CHANGES IN GDAŃSK, N POLAND (10TH-18TH C.) ACCORDING TO ARCHAEOBOTANICAL DATA

Małgorzata LATAŁOWA[1], Joanna ŚWIĘTA-MUSZNICKA[1], Anna PĘDZISZEWSKA[1]

Gdańsk belongs to the cities currently intensively excavated due to the political and economic transformation of the early 1990s, in Poland. The old historical city-centre, not properly rebuilt after the Second World War hostilities, now is a subject of far-going modernization. This enables uncovering of archaeological features, objects and culture layers harking back to the beginning of this town. Since 1998, studies of plant remains, carried out by the Laboratory of Palaeoecology and Archaeobotany at the University of Gdańsk, have accompanied the ongoing archaeological investigations in the oldest districts of the town. Archaeobotanical data have been collected in 20 sites of various types, affording information on 1- different aspects of plant utilization, 2- natural conditions in the town and 3- synanthropisation of the local flora and vegetation. These topics are currently investigated within the three separate projects. This paper focuses on the environmental aspects.

The aim of this project is:

to provide evidence for reconstructing changes in vegetation in Gdańsk and in its surroundings from the period of the early medieval occupation to historical times;

to provide new ecological data supporting reconstruction of the local hydrological net in different historical periods;

to characterize ecological conditions in the town in different periods (waterlogging, eutrophization).

The project involves both off-site and on-site pollen analysis supplemented by non-pollen microfossils recorded in pollen slides, and analyses of plant macro-remains. The uppermost parts of the pollen diagrams from two sites lying in the immediate vicinity of Gdańsk provide an important background for interpretation of archaeobotanical data from the town. Samples for plant macro-remains and pollen were taken from culture layers of different origin, from moats, ditches and other water-courses and from the layers situated beneath archaeological features, i.e. presumably originating from a period preceding occupation of a site.

We will present an outline of the project, its background and selected results.

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SYNANTHROPISATION OF FLORA AND VEGETATION IN URBAN AREAS: PRELIMINARY RESULTS OF ARCHAEOBOTANICAL INVESTIGATION IN HISTORICAL GDAŃSK (N POLAND)

Joanna JAROSIŃSKA[1]

The archaeobotanical study in Gdańsk, carried out by the Laboratory of Palaeoecology and Archaeobotany at the Gdańsk University, started in 1998. The numerous botanical samples coming from different parts of this town and various archaeological features, objects and culture layers (including yards, houses, refuge deposits and others) revealed mostly waterlogged remains and sometimes mineralized or charred. They afford the long list of species representing useful plants as well as those from natural and anthropogenic vegetation spreading in the town. The presence of the latter one is addressed to the ongoing project that deals with synanthropisation of flora and vegetation of the town in medieval and historical times. This project will take advantage of the data concerning ecological conditions in the town in particular periods (see Latałowa at all in this volume), data from the literature and historical herbaria made between 1825-1941 and the results of investigation of synanthropic flora of Gdańsk and its neighbouring areas in 1967. The comparison of the archaeobotanical data with historical sources allows to:

- determine the influence of the urban and the economic development of the town on differences in species composition in medieval and historical times

- indicate the patterns in dynamics of flora and vegetation changes in the history of anthropogenic disturbances

In this paper, the historical dimension of the floristic changes within the town (possibilities of spread and decline of native and alien species) are presented.

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USEFUL PLANTS IN ARCHAEOBOTANICAL AND HISTORICAL SOURCES FROM GDAŃSK, N POLAND (14TH-16TH C.)

Monika BADURA[1], Beata MOŻEJKO[2]

The archaeobotanical investigations in Gdańsk are conducted in the Laboratory of Palaeoecology and Archaeobotany, University of Gdańsk since 1998. They involve a wide scale of botanical and historical problems.

Materials come from various archaeological features, including latrines, cesspits, houses and culture layers of indefinable origin. Most of plant remains are very well preserved in waterlogged conditions. Exception to this is the large quantities of charred grain from Granary Island (the 14th to 18th century).

The long list of useful plants recorded in the material from the town represents locally cultivated plants, those imported due to regional and long distance trade and a number of species collected from the wild including herbs, spices, edible fleshy fruits and berries, nuts and other.

The available literature about plants in historical Gdańsk is very rich and comprises written laws, merchants' registers, health books and diaries dated from the 14th century to Modern Times. The analysis of this kind of sources runs in Department of Medieval History of Poland and Allied Studies, University of Gdańsk.

In the present study we intend to compare archaeobotanical information with historical sources for the period of 14th-16th century and discuss the problems related to presence and consumption of plant foods in the town during different historical periods.

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ARCHAEOBOTANICAL STUDIES ON FIRST IRON AGE AND IBERIAN AGRICULTURE IN WESTERN CATALONIA: THE FORTRESS OF *ELS VILARS D'ARBECA* (NORTHEAST SPAIN)

Natàlia ALONSO, Emili JUNYENT, Angel LAFUENTE, Joan B. LÓPEZ

The fortress of Els Vilars d'Arbeca was built in the mid-8th century cal. BC and abandoned shortly after 350 BC. So it was inhabited during the First Iron Age and the Iberian period. It is an exceptional archaeological site mainly by its defensive system: eleven solid towers, a five-metre thick rampart which was at least four or five metres high and a thirteen-metre wide and three metre deep ditch surrounded and protected the fortress. On the inner slope of the ditch and at the foot of the walls, there was a standing stone field, the oldest and best preserved in Europe.

Since 1988 it were subject to a systematic archaeobotanical sampling. There are not large differences among the data obtained about its several phases. The same proportions of remains and frequencies are maintained practically during all the sequence. The agriculture is based on winter cereals, *Triticum aestivum/durum* and *Hordeum vulgare*, with a complement formed by spring cereals, *Panicum miliaceum* and *Setaria italica*, and few pulses, *Vicia faba* and *Lens culinaris*.

The fortress was the residence of a leader, the expression of a power that was exhibited ostentatiously on the territory and the neighbouring communities. This fact pose an interesting question about if the inhabitants of Els Vilars were the direct crop producers or if they were benefited of their relations with the farmers of its territory.

On the other hand the data of Els Vilars do not differ of the known in the peninsular northeast. Catalonia is the best known in all the Iberian world for its agriculture, and its crops especially, since more than half of the archaeobotanical studies carried out have been concentrated there. All considered, in spite of occasional singularities which can be observed in certain periods and areas, the archaeobotanic register of Catalonia correspondig to the First Iron Age and Iberian Period is currently fairly homogeneous. At this time the importance of the binomial *Hordeum vulgare* - *Triticum aestivum/durum* were strengthened in front of other cereals as *Triticum dicoccum* or *Hordeum vulgare* var. *nudum*, and the presence of millets and vineyard were generalized.

EARLY MEDIEVAL AGRICULTURE AND WOODLAND USE IN NORTHERN IBERIA

Lydia ZAPATA[1]

The cathedral of Vitoria-Gasteiz, in Northern Iberia, is undergoing a big project of restoration and excavation (www.catedralvitoria.com). An important objective of the general project is to know the history of the area before the construction of the cathedral. The early economy, subsistence and landscape are a main area of research so an intensive sampling programme of environmental materials has taken place for all the sequence.

The cathedral is located on the top of a hill which overlooks the Álava plane. Sancho VI of Navarre established the villa of Victoria in 1181 AD, as a fortified location of the kingdom, on a previous occupation which used to be called Gasteiz. The archaeological sequence starts with some isolated Roman remains. There is a hiatus in the Late Antiquity and from the 8th-9th centuries AD there is a continuous occupation until nowadays. In this work we will focus on the period from the 8th-9th centuries until the conquest of the village by the kingdom of Castile in 1200 AD, a period with extremely limited written records. Archaeological work in the area next to the Cathedral shows different features: pits, silos and remains of domestic architecture made with perishable materials. The early occupation of the village of Gasteiz at the 8th-9th centuries AD, along with other habitats from this period that are starting to be excavated, shows the development of episodes of aggregation of the habitat which is interpreted by historians as a process of expansion and colonization of the region by farmers.

Plant macro-remains for the 8th-12th century show an agriculture based on naked wheat (*Triticum aestivum/T. durum*), hulled barley (*Hordeum vulgare*) and millets (*Panicum miliaceum* and particularly *Setaria italica*). *Legumes* and *Linum usitatissimum* are also important crops. Evidences of gathering and arboriculture are limited.

The analysis of wood charcoal shows a high variety of taxa during the 8th-9th centuries (*Acer, Cornus, Corylus, Fagus, Fraxinus, Ilex aquifolium, Quercus subg. Quercus, Quercus ilex/Q. Coccifera, Rosaceae, Salix, Ulmus*). Progressively the fuel used in the village focuses on deciduous *Quercus* and *Fagus sylvatica*. This may show the development of an organized use of the forests in the vicinity of Vitoria-Gasteiz related to a restricted and managed exploitation of mountain and woodland resources.

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MACRO-REMAINS ANALYSIS FROM A MEDIEVAL SITE IN NORTH OF FRANCE: THE CASTLE OF BOVES (PICARDIE, FRANCE)

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The castle of Boves is located in the region Picardie in northern France near Amiens city. It is a medieval feudal site, which is investigated since 1996 by an interdisciplinary research program. The site is excavated by the Laboratory of Archaeology and History, Jules Vernes University of Amiens.

The castle of Boves was a very important medieval site with a long term occupation. It was built in the tenth century and used during thousand years without major interruption.

The aristocratic residence has been founded, fortified and owned by the lords of Boves. Between the tenth and the fourteenth century these aristocratic family constructed various buildings and fortifications.

The archaeobotanical study is part of the interdisciplinary research project with the aim to investigate the castle and its surroundings. During the excavation the archaeological structures were systematically sampled for archaeobotanical analysis. The samples produced mainly mineralised (75 %) plant macro-remains. Despite the taphonomical constraints of mineralised plant assemblages, archaeobotanical analysis revealed valuable information on the diet of the inhabitants, their agricultural and horticultural production and the use of animal fodder during the high and late medieval period.

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THE EARLIEST FINDS OF CULTIVATED PLANTS IN ARMENIA: ARCHAEOBOTANICAL INVESTIGATIONS OF THE ARATASHEN AND AKNASHEN NEOLITHIC SETTLEMENTS

Roman HOVSEPYAN[1]

Aratashen and Aknashen (Khatunarkh) two Neolithic sites dated by the end of VII – VI millennia BC, are the earliest agricultural settlements in Armenia where archaeobotanical studies have been carried out. The sites are situated in the Ararat valley at an altitude of 850 m asl. The region of the sites is arid with an annual rainfall of 200-300 mm. The archaeobotanical material from Aratashen and Aknashen consists of impressions of plant tempering in pisé, carbonised and mineralised seeds and charcoal. Impressions consisted mainly of cereal chaff (glumes and spikelet bases), lentil pods and alyssum capsules. Major crops at Neolithic Aknashen were cereals, pulses, oleaginous plants and grapevine. The following cereals are recovered: free-threshing wheat (Triticum aestivum/turgidum), emmer (T. dicoccum), einkorn (T. monococcum), naked six-rowed barley (Hordeum vulgare ssp. vulgare convar. coeleste) and hulled barley (H. vulgare). Free-threshing wheat, naked barley and emmer predominated. Pulses, small-seeded lentil (Lens culinaris ssp. microsperma), bitter vetch (Vicia ervilia) and probably common vetch (Vicia sativa type) were identified. Desert alyssum (Alyssum desertorum) and little-pod false flax (Camelina microcarpa) were very frequent suggesting that they were used, possibly for oil extraction. Indeed the high frequencies suggest that these plants may have been cultivated. Einkorn, hulled barley grains and common vetch seeds occurred only at Aknashen, and grape (Vitis vinifera) pips only at Aratashen. Common weed taxa at both sites were Lithospermum, Rumex, Amaranthus and Chenopodium. Mineralised stones of hackberry (Celtis) were also present.

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KRAKÓW IN ARCHAEOBOTANICAL STUDIES, A REVIEW OF CURRENT RESEARCH

Aldona BIENIEK, Cezary BUŚKO, Dariusz NIEMIEC, Krystyna SKAWIŃSKA-WIESER, Zofia TOMCZYŃSKA, Agnieszka WACNIK, Krystyna WASYLIKOWA, Marcin WOCH, Emil ZAITZ

Kraków was an important political, economical, religious and cultural centre in Mediaeval times. The location of the city under Magdeburg law took place in 1257 but before that, from 10th century onward, Kraków was one of the capitols of Poland „sedes regni principales" and the base of diocese.

Large scale archaeobotanical studies were performed in Institute of Botany PAS in the middle of last century. During last 3 years eight new archaeobotanical sites dated to Mediaeval times were studied in different parts of today's Kraków. Most of the remains come from the Main Market square which started its commercial role in the middle of 13th century.

The composition of plants slightly differs at various sites. The most common are synanthropic plants (cultivars, weeds and ruderals) but also plants of meadows, water shores, rushes, xerothermic grasslands, clearings and various woodlands are represented in the sites.

The aim of this presentation is to show the current results of the last archaeobotanical studies with useful and alien plants highlighted.

ABSTRACTS OF POSTER PRESENTATIONS

ANALYTICAL ARCHAEOBOTANY

SIGNIFICANCE OF RESEARCH INTO THE CONTEMPORARY VASCULAR FLORA OF OLD SETTLEMENTS

Zbigniew CELKA[1]

This work presents the results of the studies on the modern flora of vascular plants occurring in sites of former settlement and their importance for naturalists and archaeologists. The vascular flora of old earthworks, castles, hamlets and other archaeological structures is specific and highly diversified. Its large diversity manifests in taxonomic, geographic and historic as well as sociological and ecological, and life forms composition. The distinguishing feature of the flora is, on the one hand, occurrence of numerous alien taxons and on the other, the presence of a substantial group of threatened, rare and law-protected species. The significant share have also species used by man for medicinal, cultivation and ornamental purposes as well as the representatives of ecological groups, such as nitrophilous, segetal, ruderal and rock species.

The research on the former settlement sites plant cover delivers, on the one hand, knowledge of species stability in their localities and on the other, information on plants spreading. Archaeological structures provide refuges for some species of plants and for others are the places of their invasion into the natural environment. Among the plants living on archaeological sites, the most important group constitute relicts of cultivation (i.e. *Malva alcea, Lavatera thuringiaca, Allium scorodoprasum*). In many cases, a statement of their presence enables retracing the old settlement sites in the area or even finding new ones. Those species could be called the phytoindicators of former settlement. The studies on relict plants extend also our knowledge of crop taxons which at present stay beyond man's practical interest. Moreover, the research on the contemporary flora of archaeological sites allows to solve the essential geobotanical problems, among others, of taxonomic, phytogeographic and ecological nature.

The studies on the vascular flora of former settlement sites meet those carried out by archaeologists and paleobotanists, and thanks to that, create new possibilities of interdisciplinary investigations. The results of floristic research deliver information on former crop plants and man triggered changes in the natural environment as well as provide knowledge of the archaeological structures themselves, allowing for their better protection.

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FROM SLAG TO SEEDS: ARCHAEOBOTANICAL STRATEGIES FOR ANALYSING METAL WORKING AREAS (SOUTHERN-EASTERN ITALY)

Giampiero COLAIANNI[1], Girolamo FIORENTINO[1], Milena PRIMAVERA[1]

A new methodological approach, based on archaeobotanical investigation and slags characterization, is here proposed in order to define the functional practises connected to the metallurgical production in south-eastern Italy, from Hellenistic period to Medieval Age.

The taxonomical identification of charred plant remains, charcoal and seeds/fruits from P.za Epulione, P.za Castromediano and Vagnari, shed new light on forge fuel composition in relation to the natural resources exploitation.

Metal working techniques were analysed through slags morphological characterization, while functional areas identification resulted from slags and ashes distribution and thermal alteration traces.

Our investigation results suggest the usefulness of an integrated approach to improve metal working regional patterns.

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GRAPES (*VITIS VINIFERA* SSP. L.) FROM TWO ARCHAEOLOGICAL SITES IN SLOVENIA: WILD OR CULTIVATED? – TESTING WITH A DNA METHOD

Tjaša KORENČIČ[1], Zora KOROŠEC-KORUZA[2], Jernej JAKŠE [2]

We carried out different biometric studies on grape seeds from Eneolithic pile-dwelling settlement Hočevarica (Ljubljansko barje, Slovenia), dated to the 36th century BC (Velušček 2004), which are considered to be the oldest seeds of grape (*Vitis vinifera* ssp. L.) from Slovenian archaeological sites, and from a Roman settlement in Vrhnika (Slovenia), dated to the 1st century AD (Horvat, Mušič 2006), which are assumed to be cultivated. The morphologic characteristics of the seeds from the Roman site are different from the pile-dwelling seeds and from the recent cultivated seeds. Namely, the range of Stummer's index for the Roman grapes is somewhere between the wild and the cultivated grapevine and consequently, the identification of subspecies is questionable (Korenčič, Korošec-Koruza, Velušček in press).

To find out whether our archaeological finds belong to wild or cultivated *Vitis vinifera*, the classical botanical methods (ampelo-morphological measurements) would be completed with molecular (DNA) methods. With a microsatellite or SSR fingerprinting (molecular markers) the origin and genetic distance between the recent and the archaeological grape seeds could be determined (Halász et all 2005). As DNA was extracted mainly from young leaves of naturally grown shoots, it should be compared also to DNA isolated from seeds. As we do not have pure natural wild grapevine (*Vitis vinifera* ssp. *sylvestris*) because of the extended viticulture in Slovenia, we propose the comparison with recent wild grapevine found in the Danube plane (Regner et all 2004; Sefc et all 2000).

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INTRASPECIFIC AND INTERGENERIC MICROSTRUCTURAL VARIABILITY IN CONTEMPORARY AND FOSSIL *PANICUM MILIACEUM* AND *SETARIA ITALICA*

Romuald KOSINA[1]

The microstructure of the abaxial epidermis of lemma and palea in the 18 varieties of *Panicum miliaceum* and 27 varieties of *Setaria italica*, together with the 6 fossil forms of millet was described. In the literature, the discrimination of these grasses is based on the caryopsis shape and traits of the epidermis. Morphogenesis of epidermis in these crops differs qualitatively. Short cells developed in form of papillae are typical only for some varieties of *Setaria*. Analyses of varnish epidermal replicas proved that the following characters can be used as discriminatory in the study of variation of contemporary and fossil plants: shape of cell, amplitude and length of wave of the wall sinusoid, irregularity of the sinusoid, distinctness of the wall replica. Differences between the *Setaria* varieties additionally appear in morphogenesis of papillae and stomata. Such a morphogenesis determines a qualitative difference between both crops. Length of wave of the sinusoid in *Setaria* is so short that a replica of the wall is visible as a net. Only in some varieties of *Setaria* this sinusoid is well recognizable. The morphogenesis of papillae occurs in different parts (basal, middle or upper) of lemma or palea. Development of stomata is realized only in upper, more leafy area of lemma. A pattern of papillae morphogenesis is various in both, lemma and palea. Variation of papillae morphogenesis in palea and lemma, respectively, is as follows: ++, + -, - -. The differences of papillae diameter in various parts of glumellae and between the varieties are an additional discriminatory feature in *Setaria*. Extreme shapes of epidermal cell in *Panicum* were noted for convarieties *compactum* and *effusum* but shape of glumellae was similar in both. Epidermal replicas of fossil forms of *Panicum* are easy to read like in the contemporary examples.

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MORPHOLOGICAL AND MOLECULAR ANALYSIS OF ANCIENT COMMON MILLET (*P. MILIACEUM*) SEEDS

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Common (syns.: broomcorn-, hog-, hershey-, yellow- and white-) millet *(Panicum miliaceum*) as one of the most ancient cereal crop, with the lowest water requirement of any grain crops. Seed size is about 3-mm long and 2-mm wide with variation in color from white to black. Spikelets of *Panicum* have 2 flowers, the lower floret is sterile and the upper is fertile and hardened. Similar to all monocots, millet 'seed' is a *caryopsis* which is enclosed within a hard shiny hull (lemma and palea).

The oldest historical reports of common millet ('*su*') are from China 5000 – 3200 B.C., where field agriculture and animal domestication apparently begun. In the ancient Chinese 'Book of Poetry' (Shih Ching), written about 1000 – 500 B.C., nine poems mention c. millet ('*shu*' or '*tsi*'). Later, *Panicum* became typical foods of the Sumer and Northern India together with barley (*Hordeum vulgare*) in about 2500 B.C. As the most drought-resistant crop with extremely short ripening time common millet was optimal for the semi-nomadic tribes such as Celtics Hungarians or Turks (2000 BC) living in the Steppes making two harvests in one year. (*Lágler et al. 2005, Euphytica 146:77-85*). Common millet spread from the Steppes through Europe via tribes of the Celts, Huns, Avars, Hungarians, and Turks and also through the region of 'Fertile Crescent' and Africa. It was the *milium* of Romans. Recently common millet is frequently cultivated in warm temperate and sub-tropical zones as a late-seeded, short-season summer catch crop with several cultivars.

aDNA samples extracted from grain remains of common millet and excavated from the 4th cent. (3rd grave, Darhan, Mongolia, 1969, Mongolia) (*Tseveendorj D, L Sugar, 1994, Hanguk Minjokhak Yön'gu. In.: The review of Corea Anthropology Institute 2, pp. 91-110., Dankook University, Seoul Korea*) and 15th cent. A.D. (8th well, Mansion Teleki, King's Palace at the Castle of Buda, Budapest, Hungary) were analyzed (seed were kindly provided by F Gyulai, 2005). Aseptic seed remains were ground in aseptic mortars with liquid nitrogen in a laminar air flow cabinet according to Gyulai *et* al. (2006, *Seed Science Research, 16:179-191*). Isolated DNA samples were processed in WGA (Genomplex *Whole Genome Amplification*, Sigma WGA-2) with a 95-12.9 fold amplification rate of total genomes. AFLP *(amplified fragment length polymorphism) analysis* revealed that extensive DNA degradation in the 4th cent. millet resulting in only 2 (1.2 %) AFLP fragments (98.8 % degradation), compared to the 15th cent. millet with 158 (40.0 %) fragments (60.0% degradation) and modern millet cv. *'Topáz'* with 264 fragments (100 %). Microsatellites were amplified at four SSR loci *(gln*4*, sh*1*, rps*28 and *rps*15*)* and sequenced (642 bp in total). All the results indicate an extremely stable millet genome compared to watermelon (*Citrullus*) and melon (*Cucumis*) (*Szabó et al. 2005, Euphytica 146:87-94*) analysed from the same site.

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TAXONOMIC IDENTIFICATION OF *CUCURBITA* SPECIES THROUGH SEED COAT MICROMORPHOLOGY: IMPLICATIONS FOR DRY AND CARBONIZED ARCHAEOBOTANICAL REMAINS

Verónica LEMA[1], Aylen CAPPARELLI[1], María Lelia POCHETTINO[2]

Studying archaeobotanical macro remains can be a difficult task. One of the problems we usually deal with is how well preserved the remains are since diagnostic features are highly dependent on conservation. Fragmentation usually happens and as a result we do not have the entire organ (seed, fruit, root) but part of it. In this last case identification by means of a general external morphology is not useful. Instead, the characteristic, disposition, size and shape of tissues that compose the organ can be the only path to reach a species level identification. Carbonisation is another common factor altering diagnostic morphological features, because in seeds, for example, it changes both quantitative and qualitative characteristics.

Up to now *Cucurbita* seeds have been identified at a specific level taking into account only their external morphology, particularly colour, margin and funicular attachment. These features are not always appropriate for the identification of charred material. Indeed an additional problem of this genus is that it has taxa closely related, such as *C. maxima*, *C. maxima* ssp. *andreana* and *C. moschata*, which can also be found together in the same archaeological context. The analysis of their seed coat micromorphology is a suitable way to confirm or achieve taxonomic identification at a specific level. Disposition of the tissues at the seed margin, shape and size of epidermic cells, quantity and disposition of cells at the hypodermic layer and shape and size of sclereids can be combined to identify South American *Cucurbita* species.

Being affected by carbonisation as most archaeobotanical macro remains, differences in the diagnostic features of the seed coat tissues between charred and not charred seeds will be analysed. Differences between aerobic and anaerobic atmosphere were also tested. Finally the potential of these micromorphological characters to identify differences due to domestication between *C. maxima* ssp. *andreana* and *C. maxima* will be discussed.

Key words: seed coat, taxonomic identification, *Cucurbita*, archaeobotany.

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EXPERIMENTS ON THE EFFECTS OF CARBONIZATION ON SOME CULTIVATED PLANT SEEDS

Tanja MÄRKLE, Manfred RÖSCH[1]

Seeds and fruits of plants have varying chances for getting carbonized in archaeological contexts. This can depend on the use of each plant, that is, some plants are more likely to get into contact with fire than others such as when they have to be roasted or cooked before eating. On the other hand carbonization also depends on the consistence and texture of the seeds themselves which carbonize under different circumstances. Some experiments on the performance of cereal grains and weeds have already been conducted by different researchers but these were predominantly targeted to determine alterations of form and weight of the seeds. Oil seeds and millets have to date not yet been carbonized under standardized conditions. This is especially regrettable given that these species show big differences in their representation in archaeological settlements in carbonized and uncarbonized state.

The aim of the present experiments is to systematically note the behaviour of *Setaria italica, Panicum miliaceum, Papaver somniferum, Linum usitatissimum* and *Cannabis sativa* during carbonization. For this purpose 100 seeds of each species were put in small crucibles. To get both reducing and oxidizing conditions one of two crucibles containing the same species was covered with aluminium foil. The crucibles were subsequently placed for 1-4 hours in a muffle furnace with temperatures of 180℃ to 640℃.

Some interesting results include:

1. Compared with oxidizing conditions, reduction usually enlarges the temperature range in which seeds carbonize without getting destroyed. However broomcorn millet behaves exactly the opposite as expected: seeds in covered crucibles were destroyed at temperatures around 320℃, while under oxidizing conditions they withstand temperatures as high as 400℃. This means that circumstances under which most other plant remains have better chances for getting charred are disadvantageous for *Panicum miliaceum*.

2. Papaver somniferum has little chance for getting carbonized at all because the temperature range in which this happens is very small, approximately around 50℃: 350℃ to 400℃ under oxidizing conditions and slightly higher under reducing conditions.

3. In contrast, *Linum usitatissimum* has a good chance of reaching the carbonized state without being destroyed . This is especially the case under reducing conditions where *Linum usitatissimum* gets carbonized at 350℃ and can stand more than 600℃.

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ULTRASTRUCTURAL AND DNA ANALYSIS OF PALAEOBOTANY CELLS FROM ITALIAN TIBER VALLEY

Claudio MILANESI[1], Adriana MORONI[1], Rita VIGNANI[1], Fabrizio CIAMPOLINI[1], Claudia FALERI[1], Mauro CRESTI[1]

Gorgo del Ciliegio is an Holocene site located in the Tiber Valley, Tuscany central Apennines. The sedimentary succession material was stored and analysed after including study for avoiding contamination. With this method based on filtration, progressive sieving and percoll-gradient sedimentation to concentrate fossil cells, we combined ultrastructure microscopy and DNA analysis of palaeobotany cells. Cytoplasm to be sufficiently preserved has to be distinguished by fluorescence and transmission electron microscopy. Analysis of fossil DNA involved PCR amplification. The DNA and consensus sequences obtained from the same PCR amplification fragment, were analysed by BLAST search and CLUSTAL W multiple alignment software.

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HISTORY OF THE OLIVE IN THE EASTERN MEDITERRANEAN BASIN: FIRST RESULTS FROM GEOMETRIC MORPHOMETRICAL STUDIES

Claire NEWTON[1], Jean-Frédéric TERRAL[1], Sarah IVORRA[1], Linda HERVEUX[2]

A first synthesis on the history and the biogeography of the domestication of the olive (*Olea europaea* subsp. *europaea*) in the western Mediterranean was produced, based on the geometry of olive stones as compared to genetic and molecular data (Terral *et al.* 2004). Since then, this synthesis has been enriched through the integration of additional oriental varieties in the initial reference model.

Studies pertaining to the eastern basin began on modern material and on archaeological material from Egypt (Newton *et al.* 2006), and continued on additional archaeological material from Egypt and the Near East (Gaza, and from northern Lebanon to northern Syria / south-central Turkey). The first results seem to point to continuity in olive cultivation in Egypt, from the last quarter of the second millennium BC until the beginning of the Islamic period at least. Two groups of oriental varieties and one group comprising occidental varieties were identified in the archaeological material.

In the Near East, analysis of Bronze Age and Iron Age material, including outside the present distribution area of the wild olive attest to the presence of morphotypes comprising occidental varieties, similar to those found on the western side of the Mediterranean at the same period. A group of oriental varieties was also identified within the same material.

Since the middle of the first millennium BC at least, another group of varieties seems to be cultivated in Egypt. This typically oriental group of probable Levantine origin is morphologically close to varieties growing nowadays in the Kharga oasis and in the Nile valley. This type has not been identified in archaeological material from Bronze Age and Iron Age (~3100-500 BC) near eastern sites.

We will discuss the implications of these results on the palaeobiogeography and on the history of the olive in the Mediterranean basin, in relation to past environments and cultural connexions.

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RECOGNISING FUNGAL DISEASE IN CHARRED CEREAL REMAINS – PRELIMINARY RESULTS FROM EXPERIMENTAL STUDIES

Jackaline ROBERTSON[1], Julie BOND[2] and Gill THOMPSON[2]

Fungal infections are likely to have contributed to significant cereal crop losses in the past, but evidence for crop disease is rarely noted in the archaeobotanical record. This poster presents the results of charring experiments on healthy and infected cereals. In modern, uncharred specimens, fungal diseases are recognised through their distinctive colouration, size, odour, texture and surface distortion. The aim here was to establish the potential for accurately identifying cereal diseases in charred material. The fungal infections examined were ergot (*Claviceps purpurea*), blight (*Fusarium graminearum*), loose smut (*Ustilago hordei*, *U. tritici* and *U. avenae*) and bunt (*Tilletia caries* and *T. foetida*) affecting barley (*Hordeum vulgare*), wheat (*Tricitum aestivum*), oats (*Avena sativa*) and rye (*Secale cereale*). Samples were analysed before and after charring at 250℃ and 400℃. Low power microscopy, scanning electron microscopy and thin sectioning were used to determine whether residual evidence of fungal disease remained recognisable in charred specimens. The infected cereal samples charred at 250℃ all retained some distinct ive morphological features which meant that each fungal type could be identified. However, the cereals charred at 400℃ were highly distorted and although it was possible to identify ergot and blight, it was much more difficult to confidently recognise loose smut and bunt. This preliminary work demonstrates that there is great potential for the study of fungal disease in archaeological cereal remains.

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A NEW QUANTITATIVE METHOD FOR DISTINGUISHING WILD AND DOMESTICATED SEED POPULATIONS USING COMPUTER-ASSISTED MORPHOMETRIC ANALYSIS

Irwin ROVNER[1], Ferenc GYULAI[2]

Rrecent computer-assisted morphometric analysis of reference and replicate seed populations has exposed quantitative inconsistencies that question the accuracy and credibility of conventional quantitative methods in seed analysis.

Computer-assisted image analysis provides a powerful suite of accurate size and shape (morphometric) measurements, most beyond the ability of conventional (manual) methods to accomplish. Computer speed and efficiency allows rapid measurement of large populations creating large data bases with minimal time and effort. Recent analyses of measurement data of natural seed populations revealed that morphological variation is not normally distributed; thus, parametric tests are inappropriate assessments in (archaeo-) botanical populations subjected to Darwinian Natural Selection. Moreover, basic descriptive statistical parameters, e.g. mean and modal values, are unstable in replicate populations and may be unreliable as standards for comparisons of archaeological populations to determine wild versus domesticated seed populations. Increase in mean size alone may not be a completely reliable indicator of domestication of seed plants and seeded flora.

Histograms of variation of measurement plots of wild versus domestic seed populations showed discernibly different shape patterns. However, conventional statistics were insensitive to these critical patterns of difference in distributions, failing to distinguish size variation in wild versus domestic seed populations consistently. Clear quantitative differences were obtained when these distribution patterns of size variation were subjected to computer-assisted shape analysis. Conventional statistic analysis proved inadequate while computer-assisted image analysis provided quantitative data revealing critical parameters in the analysis of archaeobotanical populations of seeds as derived from wild versus domesticated taxa.

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ANALYSIS OF THE ROMAN IRON AGE WELL FROM DRAŽKOVICE (EASTERN BOHEMIA) – COMBINATION OF DIFFERENT ARCHAEOBOTANICAL METHODS

Radko SEDLÁČEK[1], Alžběta ČEJKOVÁ[2], Tomáš KOLÁŘ[2], Veronika KOMÁRKOVÁ[2], Tomáš KYNCL[3], Jan NOVÁK[2], Kateřina NOVÁKOVÁ[2], Jaromír BENEŠ[2]

The extensive archaeological excavations took place during the highway construction. The poster deals with a well from the site 1 – feature 368. The feature is situated in the north-east part of the locality in the northern slope of a river terrace. The place is extremely convenient for building of a water-source. The well pit, approximately of the funnel profile, was unhinged in the past by the amelioration; the timber itself was broken only minimally and was successfully used for dendrochronology.

Only several archaeological finds were found inside the timber. The infilling of the well pit seems to be as a much richer, which rendered pottery dated to the Roman Iron Age period. Also dendrochronological and ^{14}C analysis applied on the material of the tree used for the construction in the year 190 AD. The well from Dražkovice is an essential contribution to the local palaeoenvironmental reconstruction.

Macro-remain analysis determinates 61 species with 11 species of useful plants, typical for agricultural village environment of the Iron Age and local synanthropic vegetation. Pollen analysis defined differences of local and extra local vegetation in two main stratigraphic positions, where bottom of well represents open woodland landscape with strong influence of human activity, whereas data from infilling reflects stage of forest regeneration.

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THE LEAR ARCHAEOBOTANICAL DATABASE

Maria A. SOCRATOUS[1], Gaetano DI PASQUALE[2]

Within the wider objectives of the investigation related to the" Medieval Landscapes" research program, run by the University of Siena, the project aims to develop a database (LEAr DB) suitable for the management of the archeobotanical remains and the seed reference collection. The Database is designed in a way in which it can be plugged into the existing multi-database system in the field of medieval archaeology of the University of Siena.

The LEAr Database is an electronic compilation of information about macroremains of plants -seeds and fruits- from archaeological deposits related to other information such as country name, site name, context types, period, US, samples etc. The database currently contains information only throughout the sites that have been excavated by the University of Siena, but one of our aims is to create a unique instrument for the Mediterranean region. The database is divided into five main tables: Site table, Recovery Method table, Archaeobotanical table and Taxonomic data table.

The LEAr DB provides information about origins-provenance of the remains, including plant part, quantity and condition of preservation. Users will be able to explore aspects of the database enabling queries by taxa, site, period and context. Furthermore they will be able to view the archaeobotanical evidence distribution through the GIS platform map of the escavation. The same system enable access to a secondary data base, which handles the management of the seed reference collection.

Our goal is to develop and improve a unique instrument that supports and manages the recording and analysis of archaeobotanical data coming from different archaeological context or sites.

The LEAr Archaebotanical Database will be particularly useful to those interested in archaeobotany and plant remains. The database is designed to be flexible, accessible and extensible.

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MORPHOLOGICAL AND MOLECULAR ANALYSIS OF ANCIENT GRAPES (VITIS VINIFERA) EXCAVATED IN HUNGARY

F. GYULAI[1] , G GYULAI, R LAGLER, Z TOTH, Z SZABO, L KOVACS, and L HESZKY

Domestication of grapevine (Vitis vinifera; 2n = 4x = 38; 0.475 – 0.5 x 109 bp) began with the wild grapes thousands of years ago. Genus Vitis consists of about 60 inter-fertile species including about fifteen species of breeding importance (This et al. 2006, Trends in Genetics, 22:511-519). Of them, V. vinifera is the only species which is indigenous to Eurasia. The wild dioecius, ancestor form V. vinifera ssp. silvestris (syn.: V. silvestris) co-exists with the cultivated, hermaphrodite flower form of V. vinifera ssp. vinifera (syn. sativa) in Eurasia and North Africa.

The oldest seed remains of domesticated grapes, from about 8,000 BP, were excavated in Georgia and Turkey. The earliest evidence of wine production was found in Iran (Hajji Firuz Tepe site in the Zagros Mountains) about 7,400 – 7,000 BP. Grape cultivation gradually spread to Mesopotamia, Assyria, and Egypt (about 5,500 – 5,000 BP), and further west along the Mediterranean to Phoenicia, Greece, North Africa, Italy, and then to the entire Roman empire, including present-day Hungary. Viticulture also spread eastward along the Silk Road and it reached China and Japan in 3,200 BP. *V. vinifera* was introduced to the Americas by European colonists starting from the 16th cent. It was introduced to the West Coast of North America first by Spanish missionaries and later viticulturists like Ágoston Haraszty who is considered the father California's grape-growing industry. Haraszty imported 200,000 grape cuttings from Europe, including grape varieties from his native Hungary. With the passing of time, he turned over half a million California acres to viticulture, making wine growing second only to orange production in the state's agricultural economy. In recognition of his merits Haraszty was named California's State Commissioner of Viticulture (*Stephen Sisa, 2006, The Spirit of Hungary, Huddleston, VA, USA*)**.**

In the study presented ancient grape seed remains were analyzed. Seeds were excavated at three different sites. These included a Roman Villa at Aquincum, Budapest, Hungary (2nd - 4th cent. AD), a vineyard site at Győr, Ece, Hungary (11-12th cent.), and the King's Palace at the Castle of Buda, Budapest, Hungary (15th cent) (*Manen et al. 2003, Archaeological Sci 30:721-729; Gyulai et al. Seed Sci Res 16:179-191*; *Lágler et al. 2005, Euphytica 146:77-85*; *Szabó et al.2005, Euphytica 146:87-94*).

Based on seed morphology ancient seeds were compared to current grape varieties of similar seed size, shape and anatomy. DNA samples were also extracted successfully and analyzed using the following primers: vvmd32-37; vrzag64; scu8-10 (*Halász et al. 2005, Vitis 44:173-180*). Molecular and morphological data were clustered and phenotypic reconstructions were recorded.

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IDENTIFYING DOMESTICATION FROM CHARRED *TRITICUM* SPIKELETS FROM EARLY FARMING SITES IN THE NEAR EAST

Ken-ichi TANNO[1] and George WILLCOX[2]

Charred spikelet bases provide the best evidence for distinguishing wild from domestic varieties of wheat and barley on early agriculture sites. In wild populations spikelets separate naturally when ripe at the abscission layer, in domestic varieties they break when threshed at the same point, but leave a jagged surface. However, identification criteria for abscission scars, based on a large sample from early Neolithic sites in the Near East have not been fully established. In this study we identified four types of scar for charred wheat spikelet bases from archaeological sites in the Near East. These include wild, domestic, possibly domestic and unidentifiable. The latter was the most common type and resembled the damaged scars produced experimentally by pounding of both wild and domestic varieties. This unidentifiable type with a 'tear off scar' may have been wrongly identified as domestic in some publications.

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MORPHOLOGICAL AND MOLECULAR RECONSTRUCTION OF 15TH AND 18TH CENT. WATERMELONS (*C. LANATUS*)

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Ancient water melon (*Citrullus lanatus lanatus*) seeds excavated from two 15th cent. sites (Debrecen; and Buda, 8th well, Mansion Teleki, King's Palace at the Castle of Buda, Budapest, Hungary) (*Gyulai et al. 2006, Seed Science Research 16:179-191*) and a herbarium sample (Pannonhalma, Hungary, 1836) were analyzed. Ancient samples were compared to current watermelon varieties. For comparative seed morphology we applied the main markers used by archaeobotanists, as *C. lanatus* seeds have a characteristic grooves at the base of the seed with verrucosus seed coat surface compared to *C. colocynthis* (*Wasylikowa and van der Veen, 2004, Veget Hist Archaeobot, 13:213-217*). In the molecular analysis presented nuclear (*Jarret et al. 1997, Genome 40:433-441*) and chloroplast specific primers (*Chung and Staub 2003, Theor Appl Genet 107:757-767*) were applied. Sequence analysis of ancient samples compared to current varieties revealed a $(CT)_3$ deletions at the $(CT)_{26}$ nSSR locus, and an adenin deletion at the cpDNA Clp-12 locus.

Linneaus described the domesticated watermelon as *Cucurbita citrullus* in his binary system in Species Plantarum (1753) by renaming the *Citrullus folio colocynthidis* of the Swiss botanist Bauhin (1651, Bauhin & Cherler plate, Hist. Pl. 2: 235. 1651) (*personal communication of Jens Klackenberg, e-mail klack@nrm.se;* and *Mark Spencer, The Natural History Museum, London, marks3@nhm.ac.uk*). The current name of watermelon is *Citrullus lanatus* (Thunberg, Matsumura & Nakai) (1916, *Cat. Sem Spor. Hort. Bot Univ. Imp Tokyo 30, no. 854*). Watermelon comprises two subspecies / varieties as the cultivated watermelon (var. *lanatus*) and its ancestor wild citron (syns.: citron melon, Kalahari tsamma), which still grows in Africa (var. *citroides*). There are three other species in genus *Citrullus* as *C. ecirrhosus* (Cogn.), C. *colocynthis* (L., Schrad.) and *C. rehmii* (De Winter).

Watermelon was grown by the ancient Egyptians, nevertheless its old names in Arabic, Berber, Sanskrit, Spanish and Sardinian are all unrelated linguistically, indicating the great antiquity of its culture in lands around the Mediterranean and west of Africa (*Dane et al. 2004, Theor Appl Genet 108:958-966*). Watermelon cultivation were introduced to Europe by either the Moors during their invasion of Spain in 711 AD (led by Tarik ibn Ziyad) with records from Córdoba in 961 AD AD and Seville in 1158 AD (*Clement-Mullet, 1864 In: Sauer, J.D. 1993, CRC Press, Boca Raton, Florida*), or crusaders during 11th-13th centuries AD, e.g. the 5th crusaders (1228-1229) led by Endre II. Hungarian King (1205-1253) (*Fischer 1929, Mittelalterliche Pflanzenkunde. München: Verlag der Münchner Drucke*). The Moor D`Ibn-Al-Awam of Seville, Spain, in his '*Book of Agriculture*' written in 1158, describes six kinds of melons, one of which appears to fit two varieties of watermelon: the one has a black seed and the rind of this one is very dark-green passing to black; the other one has a pure red seed and the green color of it`s rind passes to yellow (*Clement-Mullet, 1864; translation in Blake 1981, Ethnobiology 1:193-199*).

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CROPS AND CROP CULTIVATION

FIND OF PEELED GRAINS OF BARLEY FROM LATE BRONZE AGE IN TURNOV (NORTH BOHEMIA)

Alexandra BERNARDOVÁ[1], Veronika KOMÁRKOVÁ[1], Jan PROSTŘEDNÍK[2]

During the archaeological research in “Maškovy garden” in Turnov in Eastern Bohemia (dated to the Late Bronze Age (1200 – 700 BC)) many fragments of predominately naked, six–row barley *Hordeum vulgare* var. *hexastichon* were found. Such kind of archaeobotanical evidence is rather unique in our country; there are no references in previous research.

Grains were found in a three pits of various size (30-100cm at average) and depth (7-40cm). The grains were fragmented prior to charring and did not have shiny appearance which could indicate previous treating with water. Another species (*Triticum monococcum, T. dicoccon* and other) occurred only in a few pieces. Fragments could be sorted out, according to their size, into the three groups: whole grains, grains about 2-4 mm and grains smaller than 2 mm. The total number of fragments was about 10600. Such amount of fragments piece approximately 3000 whole grains.

These finds resembles to fragmented cereal grains found in northern Greece that mark prehistoric origin of wheat bulgur – a foodstuff widely used in Mediterranean cuisine (Valamoti 2002). The advantage of bulgur (fragmented wheat soaked in water before treatment) is requirement of little fuel to preparation. Similar reason could be in case of peeled barley.

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CROP HUSBANDRY DURING IRON AGE IN LIMAGNE (AUVERGNE, FRANCE), MACROFOSSIL EVIDENCE

Manon CABANIS[1], Béatrice PRAT[2]

This poster is a knowledge synthesis on the landscape agro-pastoral and husbandries evolution during the first and the second Iron age in plain of “Grande Limagne d’Auvergne” (Massif-Central, France)

Over the past five yars, archeobotany has increased been more and more sollicited in the field of rescue archeology, a synthesis allows on a unit of nine sites and more than forty carpology samplings on a fifty kilometers scope around Clermont-Ferrand city.

On a brief chronological from fifty to a hundred years, from the seventh millenium to the first millenium before Christ, we can observe an evolution in cereal cutting height, sowing seasonality, ecological affinities.

From the first Iron age on, plant remains have included cereals and pulses common over the French territory. The cereals from these sites include hulled and naked wheat, hulled barley, oats, more than five kinds of cultivated and wild millets. Pulses are *Pisum sativum* (pea), *Lens culinaris* (lentil), *Vicia sativa* (common vetch), *Vicia ervillia* (bitter vetch) and *Vicia faba* (celtic bean).

These nine archeobotanical studies, allows us to understand rhythms and ruptures of crop husbandry and the progressive installation of agro-pastoral systems during Iron Age.

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THE BASES OF RICE DOMESTICATION IN LOWER YANGZTE, CHINA: FIFTH MILLENNIUM SPIKELET BASES AND NUT REMAINS FROM TIAN LUO SHAN

Dorian Q FULLER[1], Ling QIN[2], Zhijhun ZHAO[3] and Gouping SUN[4]

A complete revision to dating of early agriculture in the Lower Yangzte region of China is now necessary. Since its discovery in the 1970s the Neolithic culture of Hemudu has been synonymous of developed rice agriculture in the Lower Yangzte valley. However, at the time it was excavated, systematic archaeobotanocal investigations were not carried out. Reassessment of published data especially grain morphometrics and phytolith data, suggested that rice domestication might be a process that took 1000-2000 years and was only completed ca. 4000 BC in this region. This hypothesis has been tested, and largely supported by new archaeobotanical work at the nearby site of Tian Luo Shan (Early 5th Millennium BC), focused in particular on 1,126 preserved rice spikelet bases which allow separation of *rufipogon-sativa* complex rices into domesticated type, wild type, and immature (wild/domesticated) type, as well as a few *Oryza officinalis* type. These data indicate that rice was undergoing domestication in terms of population level genetics changes selected under conditions of human cultivation and harvesting. It was perhaps 1/3 nearly halfway through the domestication process. The broader assemblage suggests that rice cultivation was part of an economy focused on specialized nut collection, including from oak woodlands and from marshland environments, which was supplemented by the use/cultivation of rice in the marshes. The rather limited range of 32 species (with >28,000 specimens) suggests that these were specialized collectors rather than broad-spectrum foragers. And find contexts on site indicate the extensive storage of nuts (and probably rice), indicating delayed return hunter-gatherers. Amongst the small seed material was a significant proportion of sedges (Cyperaceae), which have provisionally been identified into 7 different species. It is plausible that these seeds represent early weeds of rice cultivation. From the limited number of available acorn recepticles the predominance of “Qinggang oaks” *Cyclobalanopsis* spp. Together with some *Lithocarpus* spp. is inferred; this is tropical oak genus endemic to Southern China. In addition, fruit finds include wild peaces and seeds of persimmon (*Diospyros*), some falling in the size range of the modern domesticated form (*Diospyros kaki*). This could indicate that some human selection (and cultivation) has already taken place on some persimmon trees. While the evidence for the process of rice cultivation can be seen to parallel Near Eastern evidence for the slow rise to dominance of domesticated cereal forms, the Chinese evidence for focused nut-collectors also suggests an important difference from the Near Eastern model of cultivation emerging amongst Broad-spectrum foragers.

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IMPRINTS IN POTTERY AND DAUB FROM SITE 3-6 AT RUDA NEAR GRUDZIĄDZ, N POLAND AS A SOURCE OF INFORMATION ABOUT PLANT USE IN THE LATE BRONZE AGE AND EARLY IRON AGE

Irena GLUZA[1], Aldona BIENIEK[2], Anna REMBISZ[3]

The site at Ruda was excavated in 2000-2002 by the Scientific Team for Motorway Research based at the Institute of Archaeology University Nicolas Copernic in Torun. Traces of a Lusatian Culture settlement (ca. 1000–683 BC) were discovered over an area of ca. 10 ha on a flat hill located close to the River Vistula.

The site was subjected to multidisciplinary investigation, but this presentation will deal solely with data derived from studies of the imprints. Eighty potsherds from various locations and 86 daub fragments from two archaeological features were analysed. The most abundant imprints were of unidentified straw fragments but grains of hulled six-rowed barley (*Hordeum vulgare*) and spikelets of spelt (*Triticum spelta*) were quite frequently encountered. We also found imprints of gold of pleasure capsules (*Camelina* cf. *sativa*), horsetail (*Equisetum* sp.) lateral branches and unidentified grass (Poaceae) caryopses. One portion of daub contained charred remains – mainly grains of wheat and barley but also grains of oats (*Avena* sp.) and seeds and fruits of various weed species: *Fallopia convolvulus*, *Chenopodium album* type, *Polygonum* sp. and others.

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FOOD FOR THE PEOPLE OF NAGAR: FARMING IN LATE CHALCOLITHIC NORTHERN MESOPOTAMIA

Mette Marie HALD[1], Mike CHARLES[2]

Excavations at the Late Chalcolithic settlement at Tell Brak, Syria, have uncovered large quantities of charred plant remains from a variety of processing, storage and discard contexts. An archaeobotanical study has identified the major crops and investigated how they were processed and stored. The long period of occupation at Tell Brak provides evidence for the ways in which the northern Mesopotamian population on this site dealt with political and economic changes through several thousand years.

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LATE ROMAN WINEPRESSES IN THE VALLEY OF RIVER MOSEL/GERMANY – MULTIFUNCTIONAL INSTALMENTS?

Margarethe KÖNIG[1]

In the period of time from 1986 until 2003 ten late Roman winepresses in the valley of river Mosel, situated in the western part of Germany, could be investigated. The buildings are dated in the period from middle of the third until the beginning of the fifth century. As expected there were found grape pips but also further plant material which at first was considered as plant remains due to chance caused. But by discovery of further late Roman winepresses which brought a large number of species the presumption was forced that here aware intentional acts are based.

Apart from Vitis vinifera in all winepresses occur remains from other cultivated but also collected plants, weeds and representatives of the local vegetation. The composition of cereals, pulses, cultivated fruits, grape inclusive, collected fruits, synanthropic species and wild-growing plants occurs regularly in the samples. Oil-plants and walnut are represented in several winepresses. Against this background the questions appear how this combination was created and which the way these assemblages can be interpreted.

It is conceivable that the solid constructed buildings were used as collecting places and storerooms for the products of the country estates which were surrounding in the period when the winepresses didn't work. The products of the agricultural centres were logically transported to the nearest winepress to collect them and store them there for a limited time. From these collecting places which are situated traffic-wise best on the waterfront of the river Mosel the food was transported by ships and boats on waterway to the metropolis Treveris/Trier which was dependent on supply. The presented thesis could be examined by a comparison with the results of archaeobotanical investigations of the surrounding country estates.

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GENETIC ANALYSIS OF CEREAL LANDRACES AIDS IN UNDERSTANDING THE SPREAD OF AGRICULTURE ACROSS EUROPE

Diane LISTER Hugo OLIVEIRA, Mim BOWER and Martin JONES

The field of plant genetics has shown the potential to play a key role in our understanding of the domestication of crops and the subsequent spread and establishment of agriculture. The *Domestication of Europe* consortium project has been exploring the spread of agriculture across Europe by the genetic analysis of European landraces of tetraploid wheat species (emmer, durum and rivet; *Triticum turgidum* subspp.) and barley (*Hordeum vulgare*). Historical cereal landrace material that pre-dates industrial agriculture and modern plant breeding has been included to determine the extent of "overstamping" of ancient genetic patterns and to fill in geographical gaps where modern landraces are not available. Material has been collected from a number of sources across Europe, including herbarium collections, museums and historic buildings. Our analysis of this material has shown that "historic" DNA, in contrast to "ancient" DNA from archaeological specimens, is less fragmented and therefore more useful for analysis with a wider range of genetic markers.

We present the results of the analysis of both chloroplast and nuclear markers in modern and historic cereal specimens. These markers include ones linked to ecological adaptation such as the *Ppd-H1* photoperiod response gene in barley, that has shown genetic variation distributed along a latitudinal cline. The analysis of such markers will help us to elucidate the role of crop adaptation versus human assimilation of agricultural practices in the stop-go pattern of Neolithic agricultural spread observed in parts of Europe. The distribution of chloroplast microsatellite haplotypes in tetraploid wheat species in Mediterranean Europe and North Africa has been examined to identify other potential routes of agricultural spread into Europe.

THE USE OF *CARTHAMUS* IN NEAR EASTERN AND EUROPEAN PREHISTORY AND HISTORY

Elena MARINOVA[1], Simone RIEHL[2]

Carthamus (safflower) is a crop of minor economic importance today, with different varieties used as oil or dying plants.

Comparatively little is known on the origin, spread, use and importance of safflower in ancient agriculture. It is thought to have its center of origin in central Syria. In Near Eastern and European archaeological sites, where it appears during the Bronze Age, finds of the genus are usually interpreted as being related to dyeing, based on textual evidence from Egypt of the second millennium BC.

The authors present some recent finds of safflower from a Neolithic site in Bulgaria and Bronze Age sites in Bulgaria and Syria as case studies helping to understand the economic use, spread and its cultural backgrounds in the study region.

The crop is present in a number of Bronze Age sites in northern and central Syria, amongst them at Tell Mozan (3000-1800 BC). Comparing its distribution pattern In the Near East to flax the striking exclusiveness of the two crops becomes apparent, with flax being restricted to the Levantine and Iranian sites. This may reflect the contrasting requirements of the two crops, with safflower being well adapted to arid conditions, with a strong tolerance to drought and salinity. At the same time the geographically complementary evidence may be indication of a similar use of both crops.

The finds from Bulgaria originate from the tell site Karanovo and could be attributed to the last third of the Bulgarian Early Bronze Age (2800-2650 BC), mainly originating from a storage context. Considering these finds, together with published data from Greece and Serbia it seems that this crop became wide-spread in the Old World already during the Bronze Age and was probably connected with the far-reaching cultural and economic changes during this period.

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WEED REMAINS AS AN INDICATOR OF AGRICULTURAL PRACTICE FOR RICE AND FOXTAIL MILLET CULTIVATION IN THE CHENGTOUSHAN SITE, CENTRAL CHINA

Hiroo NASU[1], Arata MOMOHARA[2], Yoshinori YASUDA[3]

Crop weeds have been successfully used for evaluation of farming practices in archaeological sites and reconstruction of the environmental condition. In rice (*Oryza sativa*) agricultural sites in East Asia, however, a few studies of crop remains have been attempted. We evaluated the crop husbandry based on plant macrofossils including crop grains and weed seeds in the Chengtoushan site, Hunan Province, central China, which is one of the oldest rice agricultural sites around the Yangtze River Basin.

Chengtoushan archeological site is located on the loess terrace which juts out above the alluvial plain of the middle of Yangtze River basin. This site is known as one of the oldest cities of the Yangtze River Civilization in China. The moat and fortification surrounding the site, which has a maximum diameter of 360m, belong to the Qiujialing culture (ca. 5300-4500 cal years BP). Within and stratigraphically below the Qiujialing fortification, three pairs of older fortifications and moats that belong to three stages of the Daxi culture (ca. 6400-5300 cal years BP) have been excavated. Macrobotanical analysis was completed on sediments from these three stages of moats of the Daxi culture.

A total of 18,500 cm^3 of moat deposits were washed in water and total of 121 grains of foxtail millet (*Setaria italica*), 155 carbonized grains of rice and 100 perilla (*Perilla* sp.) fruits were found. In addition to these cultivated crops, we found a lot of accompanying weeds from same samples. The weed assemblages shows farmland and ruderal weeds increased from early stage to the end of Daxi culture. These results indicate that rice agriculture was started on the alluvial plain surrounding the site from early Daxi culture, and millet agriculture was probably started from middle of Daxi culture (ca. 5800 cal years BP) on the loess terrace in this site. Millet cultivation on the loess terrace is practiced possibly against natural disasters as flood from Yangtze River. Co-cultivation of millet and rice caused sustainable food supply for people living around the site.

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NEW INFORMATION ABOUT ARCHAEOBOTANICAL *VITIS* FROM GEORGIA

Nana RUSISHVILI

Archaeological discoveries in the Middle East confirmed the ideas regarding the place of the Near Eastern centre as the earliest centre of cultivated plant origins. Plants domesticated in this region include wheat, barley, some legumes and grapevine.

Geographically, Georgia is an indivisible part of Asia Minor and, from this point of view, palaeobotanical data from Georgia are highly relevant to studies on the origin of wheat and grapevine.

The most reliable information on this is provided by fossilized pips found in various archaeological excavations. The pips, in comparison to other parts of the vine, are better preserved and are characterized by more conservative morphological properties.

The grape pips found during archaeological excavations in Georgia provide a great deal of data which is in need of systematic presentation. The wide chronological range of the excavated sites – Neolithic, Bronze, Antique, Feudal periods - enables the study of grapevine expansion in the territory of Georgia.

As evidenced by the archaeological data, viticulture was widely spread over Georgia in the Bronze, Antique and Feudal ages. This allows us to conclude that this cultivation was continual. The existence of cultivated grapevine in the Stone Age (VI-IV millennia BC) points towards the primacy of this center of origin, since, according to current data, it is the earliest.

It should also be mentioned that discovery of table varieties in the Bronze Age indicates the next stage of civilization.

In spite of the early domestication of the grapevine, the wild grape species in the Kolkheti forests is still important, since its collection continued even in the Antique period.

ETHNOBOTANY

COMPILATION OF PLANTS INVOLVED IN THE USE OF SOUTH AMERICAN PIPES: A CONTRIBUTION TO ARCHAEOBOTANICAL CONTRAST

Diego ANDREONI[1], Aylen CAPPARELLI[1]

Pipes are common in American archaeological record. The knowledge of plants consumed in pipes may contribute to establish their prehistoric significance and functionality, which are still poorly defined. Identification process of plant charred material from each pipe is time consuming because of the nature of the material and because of there are commonly a complex of several species involved. This paper proposes to generate a data base of those plants that were traditionally and archaeologically involved in the use of pipes and "incensarios" (cencers)-a kind of artefacts where certain substances were burnt for ritual purposes- in South America. Data comes from documentary and from the very scarce archaeological direct evidence. It is thought that these data will facilitate a exponential development of direct evidence identification in the future. Not only taxa, but also plant part and mode of use were registered. More than thirty taxa from approximately ten families were recorded including *Nicotiana*, Anadenanthera, *Berberis*, *Latua pubiflora*, *Eugenia pitra*, *Aristotelia maqui, Dortenia brasiliensis, Trichocline*, *Polygonaceae*, *Ulmaceae*, *Solanaceae*, *Schinus, Tessaria dodoneaefolia, Sapium haematospermun, Ilex, Erythroxilum coca*, *Aloysia citriodora*?, among others. It is concluded that the spectrum of taxa involved in the use of pipes and "incensarios" in South America is wider than that commonly thought by investigators-that with alkaloid presence such as *Nicotiana*, *Trichocline* or *Anadenanthera*-. Much other species are used complementary as flavouring, filtering, lightening and substitutes, depending of the study area and cultural perceptions. Microscopic features of these taxa must be kept in mind at the time to analyse direct evidence from this artefacts.

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PLANT GATHERING AMONG HUNTER-GATHERERS: THE EXAMPLE OF SELKNAM FROM TIERRA DEL FUEGO

Marian BERIHUETE AZORIN

In many areas of the world, plants are, together with animals, the main resource for human beings for food and raw materials. Nevertheless, plant gathering among hunter-gatherers is often undervaluated. This fact, and the idea that plant remains do not survive in the archaeological record, make many times to not look for them. However the application of adequate techniques leads to a better knowledge of these societies, helping us to have a more complete vision of its way of subsistence.

Selknam inhabited the central-north part of the Isla Grande of Tierra del Fuego until the earlier decades of the 20th century. Having as frame an ethnoarchaeological project, we have excavated two huts dated by dendrochronology in 1905. Some references make us consider one of the structures (Ewan I) as a ritual hut, and the other (Ewan II) one as a housing one. Sediments of both sites were processed by flotation and charred plant remains were recovered in the following sorting.

At Ewan I, 2952 seed remains and at Ewan II were 527. Because of some difficulties (it is one of the first works in the area and we haven't still a good comparative collection), we could only distinguish 4 species between the 13 families we identified. Some general conclusions can be extracted: at first that plant remains do exist in hunter-gatherers sites and that they can be recovered by the application of accurate techniques. Second, that the study of these species gives us some clues about plant resources obtaining and exploitation among these societies. In addition we could learn more about the Selknam group, not only about plants gathering, but also about social question as is the ritual, by comparing the remains of both structures.

WILD AND DOMESTICATED PLANTS IN ANDEAN ARGENTINA FOOD ECONOMICS: ETHNOBOTANICAL EVIDENCE FOR ARCHAEOBOTANICAL CONTRASTATION

Aylen CAPPARELLI[1]

The main goal of this work is to registered wild and domesticated plants used as edible, flavouring and fodder resources at the Andean Argentina: Hualfín Valley, Catamarca Province. An specific objective of the research is to contrast ethnobotanical information with the archaeobotanical data from El Shincal Inka site for evaluating continuity or not in traditional food practices. Plant organ, mode of use, byproducts and discard products were registered from 21 wild species and from four cultivated ones. However, emphasis is made to the study of three of them: *Prosopis chilensis* and *P. flexuosa*-commonly named as white and black algarroba respectively-, and maize, which are the most important food plants along the prehistory of the area.

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MALVA ALCEA L. AS A RELICT OF PREHISTORIC AND MEDIAEVAL CULTIVATION IN CENTRAL EUROPE

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This work presents the results of research on *Malva alcea*, the species rated among relicts of prehistoric and mediaeval cultivation. In broad meaning, this group includes both alien and native species which occur in flora as a result of former, abandoned cultivation practices. They are the remains of old cultures. In our times, some of them are met exclusively in sites of former cultivation while others have spread, mainly over anthropogenic localities.

Malva alcea is an old crop plant, used by Slavs in the ancient and Middle ages, mostly for medicinal, food, dyeing, ornamental and magic purposes. Its main applications derive from the high content of mucilage and tannins, which act as protective, expectorant and anticoughing agents.

The main distribution range of *Malva alcea* encompasses Middle, South and, partially, Western Europe as well as south Scandinavia. The detached localities are distributed also in many other places in Europe. *Malva alcea* grows in dry, warm sites with calcareous, rich in nitrogen soils. Most frequently it occurs in places of former settlement, at roadsides, in ruderal areas and on sunny slopes.

On the lands which in the Middle Ages where occupied by Slavs, *Malva alcea* was cultivated in the sites of their settlement (mainly on the grounds of fortitified towns, hamlets and castles). After ceasing the cultivation, it went wild, but it still has its optimal occurrence at archaeological sites. The increase in road network density in 19th and 20th century and enhanced anthropopression are responsible for the spreading of *Malva alcea* over localities connected with communication routes. As has been shown by the detailed studies carried out on over 230 archaeological structures in the Wielkopolska region (western Poland), *Malva alcea* occurs in almost half of them. This stands for about 30% of all localities of this species in Wielkopolska. Similar results have been reached in Meklemburgia (north-east Germany) and other regions of Poland. *Malva alcea* has been registered also in the excavations in Poland, Germany and Czech Republic.

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THE ETHNOBOTANY OF WILD FOOD PLANT USE IN THE KONYA BASIN: A QUANTITATIVE AND ETHNOARCHAEOLOGICAL APPROACH

Aylan ERKAL TSETSEKOS

The main goal of this research was to understand the possible uses, processing techniques and social significance of wild food plants in the Neolithic Period in Central Anatolia through an in depth ethnobotanical research in modern villages. Most of the plants investigated in the ethnobotany of the area were present in the archaeological evidence from the Neolithic sites of the Konya Basin. To investigate the research, an ethnoarchaeological approach was adopted for the archaeological implications of the importance of wild food plants and their dietary uses. The study was based on the indigenous knowledge of the modern villagers of Konya and Karaman of managing wild food plant resource in their surroundings. This knowledge was explored through ethnobotanical research strategies. The study was limited by both the research subject and the area for a better focus on the research. The geographical borders were limited to Central Anatolia as one of the best studied areas with several Neolithic sites and as a region encompassing different types of vegetation zones. Neolithic and Early Chalcolithic were the time periods selected to be examined in this study as important changes about the diets and subsistence strategies of human groups occurred in these periods. Here, the importance of wild food plants still continuing in these periods with their certain need by the past communities was addressed. Because it was possible to study similar environments today in the Konya Basin, nine modern villages to collect ethnobotanical data were chosen from three different environmental zones in this area, which included wetland, forest and steppe zones. The wild fruit, nut and tuber species recovered from the archaeological excavations were selected for study in their current natural environments. The different strategies of harvesting, processing and storage local people used for the consumption of each plant species provided useful implications to archaeological recoveries, including the effect of these strategies on the survival of these plant parts and the roles of environmental circumstances as well as cultural factors in the diet and the techniques used in processing plants.

USAGE OF PLANTS IN RURAL SOCIETIES IN KNYSZYŃSKA FOREST LANDSCAPE PARK (POLAND)

Piotr KLEPACKI[1]

The project aims at studying the uses of plants (wild and garden species) by rural residents. The studies focused on species affecting natural and cultural environment of Polish villages. The study areas are Knyszyńska Primeval Forest Landscape Park, where industrial and urban development to date has not been intensive helping the traditional uses of plants to survive. Also important is the influence of Eastern ethnic group – Belarussian people, which retained their separate cultural and religious identity.

The studies are to provide information on uses of plants, e.g. as medicines, food, commercial crops and sacred items (blessed for later use), as well as variable household uses (repelling insects, weaving baskets or making brooms, applying for decorative purposes).

The rural communities undergo major cultural and social changes with traditional values and ways of life being replaced. The knowledge of plant species and their uses might help to preserve a vanishing part of rural culture.

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ARCHAEOBOTANICAL INVESTIGATIONS IN THE ROMAN GARDENS OF PRIVERNUM, CENTRAL ITALY

Laura SADORI[1], Marco GIARDINI, Francesca SUSANNA

Privernum was a Roman town located 60 km southwest of Rome, founded by Volsci. It was an important Roman municipium and finally became a colony of Roman citizens.

The city plain can be subdivided in a residential district, with important and rich republican *domus*, and in a public one consisting in the *forum*, the theatre, the temple, the *tabernae*.

Some republican houses, characterized by rich mosaic floorings and by plans centred on grand *atria* and *peristylia* imitate models and schemes of the luxurious Hellenistic houses. Domus of Soglia Nilotica, a house built during the republican period is characterized by a rich mosaic threshold representing a landscape along the Nile river, and by an original plan centred on gardens. The domus was renovated with a succession of building stages during the imperial age. The archaeobotanical investigations focused on the green areas and related architectural structures archaeologically and radiocarbon dated at the second half of II century A.D.

The remains of a charred basket found in the filling (II century A.D.) of the *euripus* of the republican *domus* have been studied. The analysis of the materials used to make the interlacement of the basket has been carried out using a reference collection of living plants. The carpological and wood remains contained in the basket were analysed and identified too. The weaving was made with leaves of the grass *Ampelodesmos mauritanica* (Poir.) T. Durand et Schinz; probably for the bottom and the handle of the basket wood of evergreen oaks (*Quercus ilex* / *Q. suber*) and ash (*Fraxinus*) was respectively used; fragments of elm charcoal were found as well. The basket contained both seeds and cone scales of *Pinus pinea* L. as well as stone fruits of *Prunus persica* (L.) Batsch. Two samples of the soil contained and underlying the basket were pollen analysed, showing very low pollen contents with few grains of pine and hazel.

The soil contained in a small draining pipe, in a small well, and in parts of the house with different functions in times (latrine / kitchen) has been processed for macro- and microremains. The seeds results indicate the presence of either spontaneous ruderal or weed flora elements such as *Sinapis* sp., *Agrostemma* cfr. *githago* L., *Euphorbia helioscopia* L., typical of human settlements areas and crops. The pollen rain found in the pipes is represented by ruderal herbs and weeds (e.g. *Plantago*, Cruciferae, Chenopodiaceae, *Centaurea*) and trees such as chestnut and pine.

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RELICTS OF CULTIVATION IN VASCULAR FLORA OF CASTLES OF THE KRAKOWSKO-CZĘSTOCHOWSKA UPLAND

Radosław SAJKIEWICZ [1], Ewa WITKOWSKA [2]

The aim of this work was gaining knowledge about relicts of former cultivation of 14 fortified structures situated on the Krakowsko-Częstochowska Upland (south Poland). In total, 568 species of vascular plants were found on the grounds of castles and watchtowers of this region. In the flora of the Upland castles and watchtowers, a numerous representation of relicts of former cultivation was recorded, including, among others, Allium scorodoprasum, Origanum vulgare, Malva alcea and Viola odorata. The group of species mentioned above may stay in direct connection with the places of old settlement or gradually increase their range of distribution. Undoubtedly, they constitute one of the most characteristic groups of species for archeological structures, including former strongholds, at the same time, distinguishing them from their adjacent surroundings. The issues concerning the connections of modern floras with the old settlement sites and the problem of relicts of former cultivation – the mechanism of their spreading or remaining in the specific localities – require further studies. Their explanation demands cooperation with the representatives of other science disciplines: archeologists, historians, archaeobotanists and genetists, who might throw a new light on the raised questions.

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THE CROWBERRY CONNECTION. CULTURAL/ETHNICAL CATEGORIZATION ON THE BASIS OF ARCHAEOBOTANICAL DATA

Karin VIKLUND[1]

Traditional cooking among the Sami in Northern Fennoscandia includes the use of a variety of plants, game and other food stuffs, prepared and consumed in ways other than the neighbouring farmers. These cooking practices and traditions can be traced at archaeological sites, primarily in the form of plant remains, bone material and other environmental data.

The paper gives some examples of how such data from a non-agrarian, North Swedish context may be used for ethnic categorization of archaeological features in Northern Sweden. Focus is on archaeobotanical finds of Crowberry, *Empetrum nigrum*, a plant strongly tied to northern and Sami culture and cooking, according to historical sources. Also the Sami use of Spruce. *Picea abies*. and Scots Pine, *Pinus sylvestris*, is discussed.

The theoretical point of departure is the cultural implications of cooking and food habits and the praxis by which these are transmitted through the generations, often despite societal and economic changes. It is argued that Environmental Archaeology can prove fruitful for interpretations of cultural features and ethnic affiliations in past societies.

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REGIONAL ARCHAEOBOTANY

PRELIMINARY REPORT OF POTTERY NEOLITHIC MACROREMAINS FROM TELL EL-KERKH, NORTHWEST SYRIA

Chie AKASHI[1], Ken-ichi TANNO[2]

The north Levant is one of the centres of early farming. Although numerous excavations have concentrated on the Euphrates Valley encouraged by salvage projects associated with dam construction, few sites have been excavated in northwest Syria between the coastal region and the Euphrates Valley.

Tell el-Kerkh is a huge tell complex located in the Rouj Basin, midway between the coastal region and the Euphrates Valley. A Japanese-Syrian team has been excavating Pre-Pottery Neolithic B (PPNB) and Pottery Neolithic (PN) layers in the northern Tell “Ain el-Kerkh” since 1997. Botanical remains from the PPNB levels were reported at the last IWGP, including rare findings of chickpeas and broad beans, as well as thousands of pieces of wild fruit such as *Crataegus* sp. and *Pistacia* sp. This paper presents preliminary results of the PN levels which may represent more intensive agriculture.

The cereals identified as the principal crops were mainly emmer wheat (*Triticum turgidum* ssp. *dicoccum*/*dicoccoides*) and barley (*Hordeum vulgare* ssp. *vulgare*/*spontaneum*). A remarkable find was a concentration of emmer wheat from a presumed storage structure. They were stocked not as spikelets but as dehusked grains. Although apparently normal, this contrasts with later finds from the Egyptian Dynasty period by Nesbitt and Samuel where emmer appeared as spikelets. The purity of this concentration was high with only a few weeds rachis fragments inter-mixed. The other crops such as einkorn wheat (Triticum monococcum), lentil (Lens sp.) and chickpea (Cicer arietinum) were also found.

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THE WOOD OF THREE ROMAN SCHIPWRECKS AND OTHER MACROREMAINS IN *NEAPOLIS*' ANCIENT HARBOUR (SOUTHERN ITALY)

Emilia ALLEVATO[1], Gaetano DI PASQUALE[1]

The Roman harbour of Naples was recently discovered during excavation works for the development of a new subway line. Three Roman shipwrecks (I-III Cent. A.D.), wharfs and docks poles and other botanical macroremains were found. Two shipwrecks were medium tonnage ships, the other was a fishing unit or a boat for harbour duties.

This work is aimed to identify the tree species used as timber in Mediterranean shipbuilding to point out the ancient technological knowledge in maritime industry at Roman time.

We assessed the relationship between wood technology and functional role of each structural component. Furthermore we compared our results with knowledge deriving from other Roman shipwreck found in Mediterranean sea and from classical literary sources.

Coniferous woods (*Abies, Cupressus* and *Pinus*) were extensively found in all ships, in agreement with several previous founding in Mediterranean areas; broadleaved species were also found (i.e. *Juglans regia*, *Quercus* deciduous type, *Quercus* evergreen type), though heterogeneously distributed on the three ships. Hard wood from evergreen shrubs (i.e. *Phyllirea - Rhamnus*, *Arbutus unedo*) and from *Olea*, was employed as wooden pins.

Our results point out that timbers were selected for their technological performance and local availability of tree species.

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EARLY MEDIEVAL FOOD ECONOMY AT THE SOUTHERN BALTIC: A COMPARATIVE STUDY OF CENTRE-HINTERLAND-RELATIONS

Almuth ALSLEBEN[1]

Some aspects of a long-time project supported by the Academy of Science and Literature Mainz will be discussed in this paper. The aim of the project was to gain an adequate basis of fossil plant remains from slavonic locations of economical or central power (stronghold, trading centre) as well as from their agricultural hinterland. The investigation focussed on slavonic settled area at the southern Baltic coast extending from Eastern Holstein in northern Germany to North-west Russia and spanning a periode of time from the 8th/9th up to the 11th-12th century AD when the German Landnahme started in the western Baltic region.

Besides of the study of cultivated plants used by the slavs and a common development of agriculture (i.e. the introduction of winter cultivated rye *Secale cereale*) the archaeobotanical results can be seen with regard to early urbanisation in the north which manifested itself during late slavonic period (10th to 12th century AD). An increasing population had to be provided with food and this leads to the question if authorities in urban centres organized economy and by which means this could be fixed archaeobotanically. Three possible features are discussed here: burnt storage deposits, the pollution of fields with weeds and specific inventories of used plants of the centre respectively of settlements in the rural hinterland.

Suitable crops for storing are rye and millet *Panicum miliaceum* which both were found in large numbers in the fossil material and which can be used as indicator for different storing practices. The mass production of special weed species (the amount of *Agrostemma githago* seeds can reach 10% of the weight of winter-sown cereal) gives a clear hint of diminishing care in treatment of fields caused probably by large fields. This, and the development of typical plant communities of the winter-cultivated crops and of, for example, lin fields in late slavonic time, mark a significant change in crop production required by the growth of population. Not least the demonstrated different crop collections in one region needs an explanation. On one hand we find in all centres along the Baltic coast a more or less equal inventory of cereals with rye as main crop. On the other hand regional assemblages differ extremely and reflect local particularities. The detailed study in two of the investigated regions – Starigard/Oldenburg and Novgorod – delivered good archaeobotanic material to give answers on this complex of questions.

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PLANT REMAINS FROM THE NAPATAN SETTLEMENT IN THE WADI UMM RAHAU (THE 4TH CATARACT REGION, SUDAN) – PRELIMINARY REPORT

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The Laboratory of Palaeoecology and Archaeobotany, University of Gdańsk, started cooperation with the Gdańsk Archaeological Museum Expedition (GAME) in 2006 in the area near the 4th Cataract region of N Sudan. One of the latest discoveries is a small HP736 Napatan (1000 BC) settlement located in the Wadi Umm Rahau. Preliminary archaeological results suggest traces of an early agrarian community. Excavations revealed rounded structures which appeared to be houses built of stones. Each structure incorporates one or more rooms of varying size. Some of them were apparently used as storage places (an assumption pased on the presence of many fragments of large storage jars found *in situ*).

The archaeobotanical samples were obtained from five structures. They include a lot of mineralized seeds and fruit remains as well as animal coprolites (sheep/goats). We didn't record the cultivated plants. The analysis of plant materials revealed the presence of glumes *Panicum turgidum,* one of the most important grasses gathered for food across the Sahara. Also glumes of *Brachiaria* sp., *Echinochloa* sp., *Urochloa* sp., fruit of cfr *Arnebia hispidissima,* Cyperaceae and *Citrillus colocynthis* seeds were found. These plants were probably collected by people living in the settlement as food or animal fodder.

A preliminary analysis of coprolites offers important information about animal fodder.

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TWO LATE MESOLITHIC SITES ALONG THE RIVER SCHELDT (DOEL, BELGIUM): FOCUS ON WOODLAND AND THE USE OF *VISCUM ALBUM* AND *HEDERA HELIX*

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Over the past few years several investigations (pollen seeds, charcoal) from both archaeological contexts (Swifterbant, late Mesolithic) and natural deposits along the river Scheldt (Belgium) have revealed new information on the late Atlantic vegetation and the use by man of *Viscum album* and *Hedera helix*.

Seeds and charcoal from the Swifterbant sites have resulted in a list of shrubs and trees, which, although at a first glance seeming to originate from very different habitats, could fit well into one overall but very local picture. The species can be met in present-day hardwood riverside woodlands (*hardhoutooibossen*, *Hartholzauenwälder*). This is in accordance with the geomorphologic setting of the archaeological sites. The resemblance between current hardwood riverside woodland and the archaeological record could be an indication of the stability of this vegetation type over thousands of years.

Striking is the presence in the Swifterbant sites of charred twigs of *Viscum album* and charred seeds of *Hedera helix*, both in large quantities. This is in contrast to the sparse finds of charred twigs of *Viscum album* en charred seeds of *Hedera helix* elsewhere in northwestern Europe, and indicates a deliberate harvesting. Possible explanations for the use of the evergreen species *Viscum album* and *Hedera helix* are explored (ritual use, animal fodder in wintertime …).

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ARCHAEOBOTANICAL RESEARCH OF THE CHRIST CAVE, NORTH BOHEMIA

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Small archaeological excavations of Christ cave in Bohemian Paradise nature reserve started at year 2005 on area of 3 sq m. Archaeological layers from basement to surface belongs to the Mesolithic period, the Late Bronze Age and La Tène period. The youngest layers belong to the Early Modern period. The Mesolithic period is presented very well by discovering remains of fireplaces from different archaeological periods. Amount fragments of charcoals and some macro-remains (for example *Corylus avellana*) were founded. Evidence about environmental change influenced by local site occupation is based on study of charcoal. Anthracological analysis recorded rich spectra of local woodland species in long time span reaching from the Mesolithic until the Early Modern period. Changes in tree species composition reflects gradual change of local woodland canopy from almost natural (expected in sense of local geobotany) species structure during hunter-gatherers occupation towards synanthropic forest under strong human influence. Interesting evidence was made by pollen analysis of leaf litter, enabling reconstruction of local woodland character in the Late Bronze Age.

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ARCHAEOBOTANICAL STUDIES AT THE ATSKOURI SETTLEMENT (SE GEORGIA, 1ST MILL BC) - PRELIMINARY RESULTS

Aldona BIENIEK[1], Vakhtang LICHELI

This 1st millennium B.C. settlement is located on the right bank of River Mtkvari (ancient Ciros), in the village of Atskouri. This religious and administrative centre of the ancient Samtskhe (South Georgia) was probably connected with the arrival of Apostle Andrew in Georgia, as supported by written sources and archaeological evidence of strong Greek influence. The archaeological investigations, which began in 1988, were aimed at excavating and studying the settlement dating from the pre-Christian period. Six trenches were dug at different locations within the presumed settlement. Archaeobotanical samples were taken from trench TN6. Cultural layers dated to the 1st millennium BC are covered by a thick (2-4 m) sterile layer of loam as a result of accumulation from the upper strata of the southern slopes of the Meskheti Ridge. The architectural remains are represented by various foundations built with cobblestones and ashlars, allowing the distinction of two different types of structure: one rectangular, the other circular. It should be noted that chronologically, circular structures are characteristic of the 5th -4th centuries B.C., while in the subsequent period only rectangular buildings occur. Archaeobotanical samples were taken from the layer with rectangular buildings.

The ceramic material falls into three groups: native local, local imitations and imported. The local pottery is represented by Colchian (Western Georgian), Iberian (Eastern Georgian) and Samtskian (South Georgian) wares. A separate group is an imitation of Greek pottery (2nd century B.C). The assemblage of Greek pottery dated to the 6th – 1st centuries B.C. (Ionian cup, attic kylikes, lekithos, black-glazed pottery from Asia Minor red-glazed Pergamian plate) is unique not only for Georgian hinterland, but also for all of Transcaucasia. Some part of painted pottery belongs to the Achaemenid world.

Twenty soil samples were taken from TN6 in 2005. Samples of known volume were mixed with water and the floating fraction was poured through sieves with a 0.5 mm mesh. The heavy fraction was sieved with coarser sieves. Ca. 30 litres of soil were processed in total. The material contains both charred and uncharred remains, but the latter are considered to be recent contamination. Remains of hulled barley (*Hordeum vulgare*) and millet (*Panicum miliaceum*) are the most numerous. Wheat is less abundant; a few grains are similar to bread wheat (*Triticum* cf. *aestivum*) but all the spikelet bases found in the material belong to glume wheats (cf. *Triticum monococcum/T. timopheevi*). Fragments of cf. *Cornus mas* endocarp and pip of *Vitis* sp. were also found. Most of the diasporas are poorly preserved but specimens of *Chenopodium album*, *Ch. hybridum*, *Fallopia convolvulus*, *Polygonum aviculare*, *Polycnemum* sp., *Bromus* sp., *Hordeum spontaneum/bulbosum*, *Galium* sp. *Veronica* sp., Poaceae indet., Malvaceae indet., Fabaceae indet., Lamiaceae indet. and others were noted.

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ARCHAEOBOTANICAL INVESTIGATIONS AT THE MESOLITHIC SITE FRIESACK IV / EASTERN GERMANY

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Extensive archaeological excavations have been carried out at the Mesolithic-Neolithic settlement site near Friesack (Havelland, eastern Germany) by the Museum für Ur- und Frühgeschichte at Potsdam, between 1977 and 1989. The site has been known for more than 100 years and first palaeobotanical investigations were already made in the first half of the 20th century to estimate the age of the cultural layers. Today the age of the layers is known in detail based on numerous radiocarbon dates. Accordingly the multi-stratified sequence of sediments, consisting of sands, humous sands and peat muds indicating many Mesolithic occupations, dated between about 9,250 and 5,550 B.C., thus from the Preboreal to the Atlantic. In the course of the excavations, samples for pollen and macrofossil analysis were taken. Whereas results of pollen analysis have been published in the late 1980's, macrofossil analysis did not start until 2002 and is still under way.

In 47 samples of the Friesack site a total of about 70,000 botanical macro remains were recorded and have been assigned to more than 150 different taxa. The dominating species range found was typical of floating-leaved communities and bank reed swamps (Nymphaeion, Phragmition and Bolboschoenion) with taxa like *Nuphar*, *Nymphaea*, *Stratiotes*, *Typha* spp., *Sparganium* spp. and *Schoenoplectus* spp. as well as sedge reed communities (Magno-Caricion) with mainly *Carex riparia* and *Carex pseudocyperus*.

The Boreal vegetation of the region is characterised by pine dominated forests. Therefore – not surprising – the majority of woody remains belongs to *Pinus* (plenty of charcoal, wood and bark, some seeds but very few needle fragments). Further macro remains of woody species which were recorded regularly originate from *Betula* spp., *Salix* sp., *Populus* sp., *Quercus* sp. and *Corylus avellana*. Some of the rare finds comprise cuticle fragments from *Viscum* sp., seeds of *Rhamnus frangula* and kernels of *Cornus sanguinea* as well as *Viburnum opulus* which provide valuable information on the early Holocene immigration of such shrubs in eastern Germany.

In addition to the species of the hydrosere and the woodland communities, some plant remains were found which might point to human activity at the Mesolithic site and are linked with nutrition. These are first and foremost collected taxa such as strawberry (*Fragaria vesca*) and blackberry/raspberry (*Rubus* spp.) as well as hazelnut (*Corylus avellana*), the latter often recorded by means of charred nutshell fragments. Highly interesting are the records of charred seeds of *Nuphar lutea* and *Nymphaea alba*, which are possibly linked with nutrition in terms of an important source of starch and known also from some other Mesolithic sites. Among the recorded taxa are possible anthropogenic indicators implicated with ruderal habitats such as *Chenopodium album* agg., *Erodium cicutarium*, *Atriplex* spp., *Valerianella locusta*, *Plantago major* and *Urtica dioica*.

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A STORAGE PIT WITH THE REMAINS OF ANIMAL FODDER? CASE STUDY FROM A BRONZE AGE SITE AT LIPNIK, SE POLAND

Wojciech BLAJER[1], Aldona BIENIEK[2]

Site No. 5 at Lipnik is located near Przeworsk, in the western part of Podgórze Rzeszowskie, SE Poland. It lies on the north slope of a loess hill (ca. 275-280 m a.s.l.), elevated about 30 m above the base of the nearest stream valleys. The site was excavated in 1998-2006, uncovering an area of about 4400 m^2. A few traces of an unspecified Neolithic culture and some finds of the Early Bronze Age Mierzanowice culture were noted. About 70 features (mainly pits) dated to the Trzciniec culture (Early/Middle Bronze Age, ca. 1500-1300 BC) were also discovered, but most of the features present (about 400) are described as cremation graves dated to the Tarnobrzeg Group of the Lusatian culture (ca. 1300-500 BC).

The pit subjected to archaeobotanical study (pit 302) was trapezoid in section and 130 cm deep. The basal deposits (at a depth of 110-125 cm) comprised a layer of charred remains (5-15 cm thick). On the basis of the potsherds it contained, the pit is dated to the late Trzciniec culture or the early Tarnobrzeg group of the Lusatian culture (Poz-19925: 3015 ± 35 BP, 1390 BC (95,4%) 1120 BC). It also contained a Neolithic obsidian tool.

Two sub-samples were analysed from the pit. In one of them a large quantity of acorns (*Quercus* sp.) was visible to naked eye. Both samples were processed by flotation. All the remains were charred and no modern contamination was noted. The most numerous plant macrofossils were grains of millet (*Panicum miliaceum*); other cultivated plants (*Hordeum vulgare*, *Triticum spelta* and *Triticum monococcum*) were represented by very few grains and/or spikelet bases. Typical weed species were scarce. The material also contained many caryopses of small-grained grasses, some in the form of unripe florets, several species of *Chenopodium*, *Polygonum*, *Fallopia convolvulus*, *Medicago lupulina*, small-seeded Fabaceae, *Astrantia major*, *Malus* sp. and many others. There were also numerous buds and some flowers. The composition of the assemblage and the nature of its preservation support the suggestion that the pit contains the rests of animal fodder, but other origins for the plant material are also possible.

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MUTINA AND THE PLANT REMAINS OF ROMAN AGE IN EMILIA ROMAGNA (ITALY)

Giovanna BOSI[1], Marta BANDINI MAZZANTI[1], Anna Maria MERCURI[1]

A small Roman channel has been discovered in the '80 in the centre of Modena, a city of the Emilia Romagna region, in Northern Italy. Preliminary seed/fruit analyses of its filling reported approximately 100.000 records belonging to 130 taxa. This large amount of seeds/fruits, found in an historical centre of a city, located fairly far from Rome, and in layers dated to the Imperial Age, has a large potentiality to inform about plant presence and uses at the Roman period in the region. Interesting data have already been obtained: 1) The "Emilia-Romagna's archeocarpological Flora" was enriched by new taxa; 2) Exotic species were identified which are evidence of the cultivation in the region of exotics at the Roman age; 3) Other food plants were surely imported, such as pine (seeds of *Pinus cembra*).

Moreover, in the small channel, there were a high number of species used for food, such as many largely cultivated fruit plants (*Prunus avium*, *Prunus persica*, *Prunus cerasifera*, *Cucumis melo*, *Citrullus lanatus*, *Pinus pinea*, *Prunus dulcis*, *Ficus carica*, *Juglans regia*, *Pyrus communis*, *Morus nigra*, *Diospyros lotus*, *Punica granatum*, *Vitis vinifera* subsp. *vinifera*), or fruits picked in the wild (*Rubus fruticosus* s.l., *Prunus spinosa*, *Corylus avellana*), or even fruits which, as suggested by the abundance of records, were cared for (*Cornus mas*, *Fragaria vesca*). Also, *Olea europaea*, a number of aromatics/spices (e.g., *Coriandrum sativum*, *Satureja hortensis*, *Thymus vulgaris*, *Brassica nigra*, *Pimpinella anisum*), and some vegetables (*Beta vulgaris*, *Brassica napus*, *Lagenaria siceraria*, *Allium cepa*, *Portulaca oleracea*) were recorded. Among cereals, *Triticum dicoccum* was the most important wheat, and this confirms a well-known use by Romans. Also *Sorghum bicolor* was present. Two pulses, *Vicia faba* var. *minor* e *Lathyrus sativus*, were found.

The small channel also contained traces of wet environment herbs, which probably lived in and around it (e.g., *Potamogeton* sp.pl.), mixed with synanthropic plants. This suggested that the small channel was possibly used to irrigate.

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ENVIRONMENT, AGRICULTURE AND FOOD FROM THE BRONZE AGE TO THE MEDIEVAL PERIOD IN THE DELEMONT BASIN (JURA, SWITZERLAND)

Christoph BROMBACHER[1], Marlies KLEE[1]

The Delémont basin is situated in NW-Switzerland on an altitude of 400 – 500 m asl. It encloses an area of about 70 sq.km and is surrounded by ranges of the Jura Mountains, which reach altitudes of 900 to 1300 m asl.

Within motorway construction in this area, several archaeological sites were discovered and analysed in the last 20 years. Thereby plant material from different sites was taken and analysed.

The archaeobotanical investigation was accompanied by a series of other scientifical investigations (eg. sedimentology, micromorphology, palynology, malacology, archaezoology).

The sites cover the periods of the Late Bronze Age up to the early medieval period. In addition material of alluvial deposits of a palaemeander was analysed. It also contained botanical remains, dating back to the same period as the archeological sites of the surrounding area.

Analysis of alluvial deposits showed the first distinct traces of agricultural activity during the period of the Bronze Age. In this age a palynologically recognizable and significant woodland clearance appeared, which came along with increasing processes of erosion recognisable by means of micromorphological investigations. Besides many cultivated plants, the range of the plant species of the four archaeological sites showed quite a number of wild plant species. Two sites with partly waterlogged sediments particularly showed a rich spectrum of wild plant species. The most important cultivated crop species during the Bronze Age were Hordeum, Triticum monococcum, Triticum dicoccum, Triticum spelta and Panicum miliaeceum. Plant variety during the Iron Age seems to have changed little, although the importance of Triticum monococcum and Triticum spelta increases and Avena occurs for the first time - even though only in small quantities.

The richest spectra of plant remains originate from the site of Develier-Courtételle (early medieval period). Besides nine different species of cereals found at this site, a lot of finds of Linum usitatissimum and also Cannabis sativa point out the great importance of textile manufacture.

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PLANT MACROREMAIN AND POLLEN ANALYSES AS A SOURCE OF INFORMATION ABOUT THE STONE AGE HUMAN DIET IN LUBANA PLAIN, EASTERN LATVIA

Aija CERINA, Laimdota KALNINA, Gunta GRUBE

Plant macroremain and pollen analyses have been carried out at the archaeological sites of the Lubans Lake area since 1960ties. Large number of plants has been included in the list of food resources of the Stone Age man. However, the location of the Stone Age sites in the ancient Lubans area are not favourable for exact estimation of plant belonging to food resources or it is just plant naturally growing in the area of settlement. The clearest records can indicate by charred hazelnut and water chestnut shells.

According paleobotanical data water chestnut has been grown since the beginning of the Atlantic Time. *Trapa* sp harpoon has been find in the 10th sample of the Zvidze settlement cross section (year 1982, place B, A profile, Kv. e), but in the 11th sample from the same section - 5 nut fragments. The depth interval of the samples 10 and 11 correspond to the interval of pollen zone AT1 divide by Jakubovska I. in 1997, where pollen of *Trapa natans* have been find.

Both charred and just fossil *Trapa natans* nut shells have been found in the samples from the Zvidze settlement cross section. Since cultural layer has been formed on the sediments (gyttja, grass peat) in the coastal area of lake, it is very difficult to determine: are no charred *Trapa* nuts remains gathered by people or were growing at the site during sediment formation.

Pollen of *Trapa natans* has been found in the sediments of Bog Lielais, where shallow lake was bays during the Atlantic Time. *Sphagnum-Scheuchzeria* peat started to form during the Subatlantic Time, what suggest on raised bog formation in this former bay of the Lubans Lake. The pollen of *Trapa natans* have been found in almost all analysed deposit sequences (Malmuta mouth, Eini settlement etc.). In the deepest basin sediments (Eini Lake) *Trapa natans* pollen have been found at the end of the Atlantic Time and beginning of the Subboreal.

The only charred *Trapa natans* and *Corylus avellana* nuts is clear evidence of the gathering and used for food, which remains have been found in several settlements - Zvidze, Abora I, Ica. The *Trapa natans* charred remains have been found at the settlements Piestina and Abora.

The cultural layer of the Ica settlement has been formed on the sandy sediments at the small island, therefore both remains of charred and fossil *Trapa natans* nuts found at the settlement can be considered as resource for food. The number of no charred nuts remains is 4 - 5 times larger than charred, but water chestnut was not growing on the island. It seems that nuts have been gathered from the lake nearby.

Pollen data reflect human activities in the Lubans Plain is since end of the Boreal, when in the composition of the herb pollen appear indicators of the man's impact such *Rumex*, Ranunculaceae, Brassicaceae, and Plantaginaceae. The first remarkable presence of *Cerealia* pollen (probably, *Hordeum*) accompanied by weeds, ruderals, etc. (*Viola tricolor* L., *Polygonum aviculare*, *Rumex acetosella*, Chenopodiaceae, *Cannabis, Urtica, Vicium*, etc) suggest possible start of agriculture about 5500 years ago.

ARCHAEOBOTANICAL ANALYSIS AT TAS-SILĞ SANCTUARY (MALTA ISLAND) FROM TARXIEN CEMETERY PHASE TO PHOENICIAN PERIOD

Giampiero COLAIANNI[1], Cosimo D'ORONZO[1], Girolamo FIORENTINO[1]

The archaeobotanical investigations carried out in the northern area of Tas-Silğ sanctuary, since 2000, shed new light on plant use in Malta Island since Tarxien phase (IV millennium BC) until Roman period (II century AD).

First archaeological excavations highlight the function of the contexts.

The Megalithic Temple of Tarxien, Proto-historic phases, preserves traces of hearth structures with cereal remains (*Triticum dicoccum*, *Hordeum* sp. and Leguminosae) connected to religious practices.

The Astarte Temple, Phoenician phase, is characterized by archaeobotanical remains (seeds and charcoals) related to sacred gardens and trees planted holes.

The Hera Temple, Roman period, reveals sacred pits full of carbonized wood tissue.

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MACROBOTANICAL RESEARCH IN THE MEDIEVAL AND POST- MEDIEVAL TOWN OF AALST (EAST-FLANDERS, BELGIUM)

Brigitte COOREMANS[1]

Archaeobotanical research on pits, cesspits, ditches and agricultural layers dating from the second half of the 12th up to the 18th century has provided some information about diet, agriculture and urban organisation of Aalst in medieval and post-medieval times.

There is evidence for the use of pulses, spices, fruits and nuts. To this respect the presence in post-medieval cesspits of grain of paradise, cucumber and tobacco is certainly worth mentioning, though in general, signs of extreme high status are scarce.

Rye and bread wheat seem to have been the most important cereals. Oats and barley also make regular appearances, be it in lower frequency and lower numbers. Possibly the importance of bread wheat only rose at the onset of the 13th century, as evidence for this cereal mainly appears from this period onwards. But due to the limited investigation of the period preceding the 13th century so far, this development may be purely coincidental. The simultaneous occurrence of rye and bread wheat is often interpreted as an indication for the growing of so-called “masteluin”. The presence of charred lumps of grains of rye and bread wheat melted together, may represent a more substantial proof for this practice which is regarded as typical for the region.

The consistent presence of chaff of the free threshing species rye and bread wheat, found in high numbers at each site throughout the periods investigated, indicates that these cereals were grown locally, probably even on grounds within the town walls built in the 13th century with the expansion of the town. As illustrated by the assemblage of wild plant species, some of the open spaces may also have been used as pastures, gardens and orchards.

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INTERESTING ARCHAEOBOTANICAL FINDS FROM ARCHAEOLOGICAL SITUATIONS DATING FROM THE EARLY MIDDLE AGES UP TO THE EARLY MODERN TIME FROM THE CADASTRAL AREA PRAHA 1 – MALÁ STRANA, HRADČANY (PRAGUE – LESSER TOWN, HRADČANY)

Věra ČULÍKOVÁ[1]

There are presented the new, so far not published, interesting finds of seeds and fruits comming from the 10th to the 14th centuries of the settlement situations under Kolovrat Palace (Valdštejnská Str.) at the Lesser Town as well as from the buildings dated to the post-medieval time (16 th – 17 th Cent.) in Hradčanské Square (analyzed in 2005 – 2006). The archaeobotanical analyses of anthropogenic sediments from Prague we have been carrying out at the specialised workplace in Opava.

The volumes of 22 samples excavated under Kolovrat Palace was only 0.15 – 3 l, number of diasporas contained in them was not high, but the spectrum of Taxa was very varied. Some of samples contained remains of as many as 180 species of herbs in additions to woody plants and mooses. Most of them had a seminatural charakter. Besides the synanthropic plants, i.e. cultivated ones and above all ruderals and field and garden weeds a long series of hydrophytes and hygrophytes has been documented. These are the indicators of wetlands and water streams of the Lesser Town (creeks, dead channels of the Vltava River): *Lemna gibba/trisulca, Typha latifolia/angustifolia, Alisma plantago-aquatica, Eleocharis palustris, Scirpus sylvaticus, Cyperus fuscus, Carex* sp. div*., Myriophyllum spicatum, Ceratophyllum submersum, Schoenoplectus tabernaemontanii, S. palustris, Lythrum salicaria, Rorippa palustris, Zanichellia palustris* subsp. *pedicellata, Batrachium* sp., *Juncus* sp., *Luzula* sp. etc.). The presence of wetland biotopes is confirmed by green algae (*Chara, Nitella*) and animal residues (fish scales, molluscs, *Daphnia, Amoeba*).

Two post-medieval samples (volume 2.2 l; 4,5 l) from the silt on the bottom of a wooden tunel from Hradčanské Square and one also post-medieval sample fom the sump in object 12/60 from Hradčanské Square drew attention. Besides usual species of weeds and ruderals mainly the remains of fruit, vegetable, oil plants, savoury herbs, especially spices and medical herbs were present. Most of them had evidently multiple use. Probably these are the remains from households within the castle area, supplied by utility plants of domestic origin (*Fagaria vesca, Juniperus communis, Rubus idaeus, Vaccinium myrtillus, Ribes rubrum, R. nigrum*) or of foreign origin (from Asia, Mediterran) – *Morus nigra, Apium graveolens, Petroselinum hortense, Majorana hortensis, Satureja hortensis, Coriandrm sativum, Foeniculum vulgare*). *Piper nigrum, Ficus carica, Cucumis melo* are considered imported items. Some of them have not been known from archaeological situations so far not in Bohemia (*Majorana hortensis, Foeniculum vulgare*) or in Czech Republic (*Lepidium sativum*) and in central Europe (*Ocimum basilicum, Phytolacca americana*). Besides *Phytolacca* – a stout plant of American origin - the occurence of one seed of *Nicotiana rustica (*our second archaeobotanical find in central Europe*)* in the same sample we consider unique.

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FOOD PLANTS USE IN LATE MEDIEVAL CITIES OF TUSCANY (ITALY)

Gaetano DI PASQUALE [1,2], Domizia DONNINI[3], Sabrina PIGNATTELLI[1], Mauro Paolo BUONINCONTRI[2]

The archaeological research recently developed in Florence, 100 m to the right bank of the Arno river, near Palazzo Vecchio, has revealed interesting Late Medieval layers. Until the end of XII century the area was structured in fields located eastern of the city wall near a moat.

Seeds and fruits were founded inside the fillings of three pools (XIII century). Archaeobotanical analyses brought informations about diet and helped the archaeological interpretation by showing pool's uses as dung-pit and latrine. The discovering of many non-carbonized little seeds of eatable fruits, often eaten in lunches, reveals the presence of coprolites, probably human ones. Our data could suggest the selection of cultivated and wild resources. We find cereals (hulled *Hordeum vulgare*, *Triticum aestivum*, *Triticum spelta/dicoccum*, *Triticum turgidum*, *Panicum* cfr. *miliaceum*), wooden fruit plants (es. *Ficus carica*), vegetables (es. *Citrullus lanatus*, *Cucumis sativus*), and wild, natural and anthropic ones used in order to provide wood and fruit (es. *Rubus* cfr. *ulmifolius*, *Corylus avellana*). Carpological remains seem to confirme the presence of an anthropic rural area (orchards and vegetable gardens), where we can find some species of weeds, typical of settlements, cultivated and uncultivated fields and river beds (es. *Artemisia* cfr. *vulgaris*, *Amaranthus* sp., *Stellaria* cfr. *media*, *Galeopsis tetrahit*, *Saponaria officinalis*).

The restoration of the Carmine Convent in Siena (first half of XIII century) permitted us to find archaeobotanical remains, perfectly preserved in sealed spaces of building vaults.

Preserved seeds and fruits revealed us some faces of diet and production of vegetable garden areas linked to the Convent. There are cultivated and possibly cultivated species like cereals (es. *Triticum monococcum*, *Triticum spelta*, *Triticum turgidum*, *Secale cereale,* also like treshing remains), wooden fruit plants like *Juglans regia*, *Corylus avellana*, *Castanea sativa*, *Prunus persica*, *Vitis vinifera*, vegetables (*Cucumis melo*, *Citrullus colocynthis*) and spices (*Crocus sativus*, *Coriandrum sativum*). Inside this context the remains of saffron tunics gain a particular interest, especially cause they suggest us saffron manufacturing.

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FEEDING AND LANDSCAPE IN MEDIEVAL TUSCANY COUNTRYSIDE: THE *CURTIS* OF MIRANDUOLO (SIENA - CENTRAL ITALY)

Gaetano DI PASQUALE[1,2], Mauro Paolo BUONINCONTRI[2], Giuseppe DI FALCO[2], Daniela MOSER[2]

Recent archaeological excavations of the Miranduolo's *curtis* (Siena) revealed a huge layer of carbonised seeds inside a medieval warehouses. This work presents the first results of seeds and charcoals analysis founded in a warehouse located in a defended area under the control of the local lord. The study of this context is particularly important cause provides information about agriculture, local vegetation, diet and storing processes (mainly about lord's produces) related to a little known epoch in central Italy.

The warehouse was linked to the crops storage: mainly naked grains (*Triticumaestivum/compactum/durum/turgidum*) and moreover *Secale cereale*, hulled *Hordeum vulgare*, *Triticum monococcum* and occasionally *Triticum dicoccum* and *Panicum miliaceum*. Pulses, except *Vicia faba* var. *minor*, are not common. Carpological remains of wooden fruit plants like *Castanea sativa*, *Juglans regia*, *Prunus persica* e *Vitis vinifera* are also sporadic. Infesting weeds are scarcely represented, so we can suppose that crop's fields were carefully cleaned and crops well selected. The spatial distribution of the carpological remains shows inside the granary specific areas linked to the crops (cleaned from lemmas) storage.

Charcoals analysis shows a preponderance of *Quercus* deciduous, *Ostrya carpinifolia*, *Castanea sativa* and *Fraxinus*; the spatial distribution of charcoals remains reveals the common use of decidous *Quercus* as the main timber of the granary's structure, while *Castanea sativa* and *Fraxinus* were utilized for particular structure's elements. It's useful to underline the presence of *Castanea sativa* as fruit and as construction wood for this period in central Italy. This *datum* can be read like a sort of continuity with the classical age activities, or at least like a resumption of the chestnut cultivation in the first life phases of the site.

Currently, analyses of more warehouses of the same site are in progress, while a further develop of the research is trying to locate the various working activities in the territory.

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VEGETAL ECONOMY IN SOUTHERN GAUL DURING IRON AGE

Frédérique DURAND and Philippe MARINVAL

Untill the 80's archaeobotanical analysis were specific of Chalcolithic and Bronze Age caves in Southwestern France after then analysis extended on more recent contexts and different settelments such as oppidum or farming places. The main interest of that area is its heterogeneity whaterver it deals with climates, reliefs or cultural influences.

The analysis is based on 20 settelments dated from 6th century BC to the end of the 1st century BC. It proposes to observe the evolution of diet, society and agrarian know-how during Iron Age through eaten taxa. The comestibility of wild fruits don't allow to pretend that they were eaten. The association of those fruits with food, the way of their preservation (carbonization or wetness) and the archaeological context are many ways to answer to this question.

At the 1st Iron Age (800-480 BC) most of the species cultivated during Iron Age are known. Diet is based on cereals such as *Hordeum vulgare*, *Triticum dicoccum*, *Triticum spelta*, *Triticum monococcum*, *Avena sp.*, *Panicum miliaceum*, *Setaria italica*, *Triticum nudum* and *Secale cerealia*. *Secale cerealia* and *Avena sp*. could be cereals and weeds. In that case, archaeological context can once again help to make differences like species proportions and assemblages. Some pulse can be add : *Vicia faba* , *Vicia sp*., *Pisum sp*., *Lens culinaris* and *Lathyrus cicera*. *Corylus avellana*, *Prunus spinosa* and *Sambucus ebulus* are found. The last one cannot be eaten but it was possibly gathered to be used as a dyeing plant. One taxa of cultivated fruit is also known. It is about a only find of *Ficus carica* next to a trade road. That discovery is probably related to an importation.

At the end of the Millennium, naked wheat is the main crop whereas spelt disappears. There is not much changes with pulses except the first mention of *Cicer arietinum*. Fruits are more numerous: there is more cultivated fruits like *Vitis vinifera*, *Prunus insititia* and more gathered fruits like *Quercus* sp., *Rubus fruticosus*, *Vitis vinifera sylvestris* and *Sambucus nigra*. This phenomenon is the symbol of diet changes and above all the adoption of fruit production related to the roman Provicia foundation in 121 BC.

ARCHAEOLOGICAL EXCAVATIONS AROUND COMPOUND GRINDING TOOLS AT EL SHINCAL INKA SITE: IDENTIFICATION AND INTERPRETATION OF ARCHAEOBOTANICAL REMAINS

Marco GIOVANNETTI[1]; Aylén CAPPARELLI[1]

Multiple grinding complexes, known in the archaeological bibliography as “communal mortars”, have been scarcely investigated at the Argentinean North West. They are usually found close to archaeological sites or even inside of them, being in general related to societies with agrarian economies. At the surrounds of El Shincal archaeological site (Catamarca, Argentina) several multiple grinding complexes have been found related to this Inka site.

The aim of this paper is to expose some of the results of the excavations made near the multiple grinding complex denominated EGP. Through flotation technique great quantity of carbonized vegetable macrorremains were recovered. Preliminary results of taxonomic identifications reveal the presence of wild and domesticated taxa. The recovering of *Prosopis* sp. (“algarrobo”) and *Geoffroea decorticans* (“chañar”) remains confirm the practice of gathering and grinding their fruits. Maize (*Zea mays*) macroremains are not surprising since their kernels are usually processed with this kind of artifact. Nevertheless maize varieties which do not need this kind of processing for their consumption were found and another explanation beyond grinding must be found. Finally the presence of barley (*Hordeum* sp.) gives us interesting data regarding this multiple grinding complex chronology.

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THE FIRST DATA OF PLANT MACROREMAINS FROM THE STONE AGE SETTLEMENT SITES AT THE BURTNIEKS LAKE AREA, NORTH-EASTERN LATVIA

Ilze GOROVNEVA, Aija CERINA, Laimdota KALNINA

Paleobotanical investigations have been carried out at the northern part of the Burtnieks during last years in the frame of the international multidisciplinary project “Archaeological complex Zvejnieki”. Data of plant macroremains and pollen analyses demonstrate gradual overgrowing of the Burtnieks paleolake and ancient man presence in the area since the Preboreal. Pollen of the anthropogenic indicators like *Plantago major/media, Rumex acetosa/acetosella, Chenopodium alba, Urtica* has been found in several sites investigated in the northern part of the ancient Burtnieks area, which point on the presence of the Stone Age man in the area.

The first investigations of the plant macroremains at the Zvejnieki site reveal dominance of the *Chenopodium album* L. seeds and charred fragments of *Corylus* nuts, which were found in the cultural layer of the Neolithic settlement.

At the Pantene site, where archaeologists found the Stone Age artefacts, 7.6 m long sediment sequence of clay, silt with ostracodas and shell fragments, gyttja and fen peat has been investigated. Seeds of *Najas marina* L., *Nymphaea alba* L., *Nuphar* sp., *Potamogeton perfoliatus* L., *Schoenoplectus lacustris* (L.) Palla, have been found in the gyttja layer (2.3-2.5 m). In the depth interval 2.0-2.3 m gyttja was covered by well decomposed sandy fen peat with charcoal, charred hazel nut *Corylus avellana* L. shell fragments, as well as fen (sedge, bogbean), coastal and aquatic plant *Schoenoplectus lacustris* (L.) Palla, *Trapa natans* L., *Nymphaea alba* L. seeds.

Brown, medium decomposed grass peat in the depth interval 1.35-1.8 m contains mainly fen peat plant remains (*Menyanthes trifoliata* L., *Lycopus europaeus* L.) and only few aquatic plants (*Potamogeton* sp*., Schoenoplectus lacustris* (L.) Palla*, Typha* sp.) remains.

The cultural soil layer (dark fen peat with charcoal, fish bones, molluscs, and charred hazel nut and water chestnut shell fragments) with *Betula* sect. *Albae* and *Urtica dioica* L. achenes has been found in the depth interval 0,3 – 1,35 m. Cultural layer is covered by dark brown well decomposed peat with charcoal and limonite pieces, as well as bone fragments, birch, alder and rush, but most of all *Urtica dioica* L. achenes and wood fragments. Both, wild gathered and cultivated plant remains have been found in the sediments of cultural soil layer including the charred nuts of *Corylus avellana* L. and *Trapa natans* L. which point on the possibility to use them as food. The charred *Triticum* grains have been found at the upper part of the layer (0.3-0.5 m), which point on the start of crop growing. The findings of *Cerealia* and *Trapa natans* pollen confirm distribution of these plants during sediment layer formation, but charred macroremains point on possible use them as food by the Stone Age man. The composition of plant macroremains and pollen indicate the start of the agriculture besides gathering.

CHARRED SEEDS AND FRUITS FROM MEDIEVAL PIT HAUSES OF COURTEDOUX-CREUGENAT (CANTON OF JURA) SWITZERLAND: FIRST RESULTS

Dominique HECKER[1]

The site of Courtedoux,Creugenat is situated in the north-western part of Switzerland, in a dry valley on the Jurassic plateau. Nearby is to be found the estavelle of Creugenat which fills and overflows during periods of heavy rain, thereby becoming the source of a sporadic river called the Creugenat. The site was discovered in 1999 during preliminary surveys related to the construction of the A16 motorway; systematic excavations were carried out between 2000 and 2002 on a site covering approximately 7500M2. The remains of several buildings that had been levelled to the ground came to light, especially 13 pit houses, from which sediments were collected and analysed. The C14 results and the typological study of the artefacts date the site between sixth and ninth century AD. Situated in a dry environment, the plant finds were limited to charred remains and were in a very variable state of conservation. First results demonstrate a variety of taxons (179) representing mainly plants of open grazing land and pastures, and cultivated plants, basically cereals along with their accompanying crop weeds. The study will be followed up by analysing layer by layer the results for each of the pit houses with the aim of establishing their original use.

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ARCHAEOBOTANICAL INVESTIGATIONS ON THE BRICKS OF KILN FROM OROSHÁZA, HUNGARY

Katalin HERBICH[1]

Orosháza is located in the Carpathian basin on the southeastern part of Hungary, on the Great Hungarian Plain. From this mediaeval archaeological site turned up two kiln made of brick. The bricks are appropriate to examine for archaeobotanical aims, since they made of adobe and vegetable matter. The latter is residue after spreading and winnowing, sorting of the cereal. If the brick burns out, the vegetable material is preserved in many ways, depending on the temperature and burning conditions. If the temperature is high and oxidative, the organic matter burns away, but it leaves its imprints. Among reductive conditions the organic material remains in charred state. For the sake of the archaeobotanical examination I made silicon rubber molds from the imprints in the bricks, and classified this molds and the found carbonized seeds as well. On the grounds of the charred seeds and imprints, they grew mainly common wheat (*Triticum aestivum*) and rye (*Secale cereale*). Among weeds was for example rye brome (*Bromus secalinus*), corn-cockle (*Agrostemma githago*), hedgenettle (*Stachys annua*), black bindweed (*Fallopia convolvulus*) and creeping thistle (*Cirsium arvense*).

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NEW ARCHAEOBOTANICAL INVESTIGATIONS IN NEOLITHIC WETLAND SITES IN SOUTHWEST GERMANY (FEDERSEE, LAKE CONSTANCE)

Christoph HERBIG

Archaeobotanical investigations in 30 neolithic wetland settlements (4.000–2.500 BC cal) in Upper Swabia and at Lake Constance provide new information about ecology and economy in this region. The waterlogged conditions are very favourable for preservation. About 260 samples contained nearly 1.000.000 plant remains from more than 130 species.

On the one hand this poster shows the development and change of the crop plants assemblages and gives insights into the weed vegetation during the investigated period. On the other hand the wild species from all of the sites are compared. They are analysed under the aspects of plant population ecology and dispersal ecology with references to plant traits for functional ecology.

High amounts and regular findings of plants, especially annuals and perennials, which were originally not widespread in the natural vegetation (apophyts) respectively new arrivals (archaeophyts) were recorded. For these species manifold ways for dispersal and establishment were created during the neolithic. As a result of human activities many new habitats for short-lived plants (ephemerals) were caused indirectly in and around the settlements. For these groups of spatially separated populations neolithic metapopulations are postulated. The dominance of synanthropic species in the spectra shows that the neolithic farmers, their domestic animals and of course the wild animals were dispersal agents between safe sites (e.g. fields/fallows). Furthermore these taxa have advantages concerning dispersal and reproduction over most of the indigenous species (e.g. woodland species).

ARCHAEOBOTANICAL INVESTIGATIONS IN THE SUBURBAN AREA OF MEDIEVAL TARTU (ESTONIA)

Sirje HIIE[1], Kersti KIHNO[1,2], Ülle SILLASOO[3]

In years 1990–1995 extensive archaeological rescue excavations were carried out in the suburban area of medieval Tartu. Two pollen cores and several soil samples were taken from archaeological layers for palynological and plant macrofossil analyses to reconstruct the local environment before and during medieval and early modern habitation of the area as well as to get an overview of the exploitation of plant resources. Plant macrofossil material was the richest in 14th–15th century layers; a few pre-urban, 13th-14th, 16th-17th and 17th-18th samples were also analyzed. The composition of plant species in medieval layers was typical to medieval towns. A few remains of cultivated plants were found including hemp (*Cannabis sativa*), buckwheat (*Fagopyrum esculentum*), barley *(Hordeum vulgare*), flax *(Linum usitatissimum)* and rye (*Secale cereale*). The remains of fig (*Ficus carica*), opium poppy (*Papaver somniferum*) and hop (*Humulus lupulus*) were found. The group of wild fruit included hazelnuts (*Corylus avellana*), raspberry (*Rubus idaeus*), wild strawberry (*Fragaria vesca*), bilberry (*Vaccinium myrtillus*), cranberry (*V. oxycoccos*) and cowberry (*Vaccinium vitis-idaea*). The layers were rich in finds of meadow plants, weeds and ruderals. A deposit of charred rye (*Secale cereale*) with a small number of barley grains *(Hordeum vulgare*) and weed seeds was found from an early modern hearth; the weeds (*Agrostemma githago, Centaurea cyanus, Bromus secalinus*, *Rhinanthus sp*. and *Poaceae*) may be associated with a winter crop. Long term landscape changes are documented by two pollen diagrams indicating a transformation of the landscape type from natural to urban one. The ratio of arboreal pollen (AP) to non arboreal pollen (NAP) reflects a development trend to deforestation at least in the 14th century. The proportion of NAP is 5% in lower sub-samples of both cores, gaining its maximum values (95%) in the upper samples of the core B from the profile R 2/h at the level 36.25 m a.s.l. The high value of NAP in this core is mainly attributable to *Poaceae* (60% of total pollen). The variety of NAP other than *Poaceae* is high as well reaching up to 50 taxa. Among cultivated plants pollen of *Cerealia* and *Fagopyrum esculentum* were found, as well pollen of *Humulus lupulus* which was classified as collected plant. Weeds and ruderals are represented by pollen of Cichoriaceae and Asteraceae, *Rumex acetosa/acetosella* t., *Plantago major/media* t., *Plantago lanceolata*, *Centaurea cyanus*, *Chamaenerion* and others. The results show that the development of the suburban area is in good correlation with the foundation of the town in the 13th century and that eating habits of the inhabitants of the suburban plots do not differ much from those of the central quarters of the town.

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PRELIMINARY DATA ON THE HISTORY OF BARLEY CULTIVATION IN ARMENIA

Roman HOVSEPYAN[1]

Barley (Hordeum vulgare) remains were found from a number of archaeological sites in Armenia. The oldest finds of barley come from the Neolithic settlements of Aratashen and Aknashen in the Ararat valley and are dated to the VI millennium BC. The history of barley cultivation can be divided into two phases. First phase includes Neolithic and Eneolithic periods, and the second phase includes all later periods, from the beginning of the Early Bronze Age, the end of IV mil. BC, to the present. Naked six-rowed barley (Hordeum vulgare ssp. vulgare convar. coeleste) was common during the first phase; hulled barley was rare. During the second phase hulled varieties of two- and six-rowed barley (H. vulgare ssp. vulgare convar. vulgare and H. vulgare ssp. distichon convar. distichon) dominate; the two-rowed barley was more common than the six-rowed. Barley was more common than wheat in the beginning of the second phase, particularly in the Bronze Age when barley became the major cereal. This phenomenon was also seen in the mountain zones for example the Aragats.

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INVESTIGATIONS ON THE INDO-DANISH FOOD CULTURE IN TRANQUEBAR, SE INDIA: INTERACTIONS AMONGST THE INDIGENOUS CUISINE AND NEW FOOD ELEMENTS DURING THE 17TH-19TH CENTURY A.D.

Sabine KARG, Mukund KAJALE

Food represents an essential part of our daily life and hence the history of food and nutrition is a central element of our cultural heritage. In this pilot project, we want to understand the interplay of food traditions amongst European traders (who subsequently became rulers) and the local residents in Tranquebar (Southeast India). Were the newly arriving food elements, the Danish and the other foreign ones, accepted and later integrated into the local cuisine? When and how quickly did the traditional food including spices found their way into the Danish kitchens in India and subsequently in Europe?

The primary sources for our studies, plant macrofossils and food residues from the Danish period at Tranquebar (1620-1845 A.D.) are being searched. In the initial phase of the project, we focussed on literary sources yielding information on culinary ingredients, practices and import from the traders. These sources are located in several archives in Germany, Denmark, Southern and Western India. Information for our project was obtained from reports of the former missionaries affiliated to the German “Hallische Mission”. The items of various ship cargos of the Danish traders travelling to Tranquebar, kept in the Royal Archives in Copenhagen, delivered information about the European food items that were imported into India. The huge collection of written documents and books in the Sarasvati Mahal Library of the former Kings of the Maratha dynasty (late 18th century) in Thanjavur (Tamul Nadu State) yielded information. From this Royal Court, the place where the traders had to pay the taxes, it is known that two separate kitchens were maintained: one for the King himself and the other for the foreigners in which dishes were prepared with their own imported food. Additionally we were culling information from ancient culinary books from both continents.

Thus, systematic search for archaeobotanical evidence of food and their corroboration with archival records in India and Europe is being attempted for the first time.

NEW LIGHT ON THE CHARRED REMAINS OF THE LINEARBAND-CERAMIC SETTLEMENT ROSDORF, SOUTHEAST LOWER SAXONY, GERMANY

Wiebke KIRLEIS[1]

Archaeobotanical analyses of charred plant remains from pits and post holes of the Linearband-ceramic settlement Rosdorf close to Goettingen at the northernmost extension of the Linearband-ceramic culture (LBK) are now completed, more than 35 years after the site was excavated. At their time, the early 1960s excavations were at the cutting edge of archaeological research regarding scientific analyses like archaeobotany and soil sciences, but the plant material awaited terminal study so far. Then, about 52 LBK houses were discovered. A chronology for the settlement was implemented following the typology of houses according to Modderman. This showed that there are no typical eldest LBK houses, but one house is dated to the transition from the eldest to the elder LBK whereas others originate from younger LBK phases.

The plant spectrum of the preliminary archaeobotanical investigation by Willerding (1965) is now extended by 29 weedy and 18 wooden species, furthermore a noticable amount of glume bases was detected which add a new kind of artefacts to the Rosdorf material. In comparision to the preliminary investigation that comprised 380 plant remains, more than 35.000 charred fruits, seeds and glume bases from cultivated and collected plants as well as from weeds have been recovered. In addition, more than 1.300 smallest particles of charcoal from 169 pits and post holes have been classified. The spectrum of the plant remains proves typical for the LBK settlements of Lower Saxony.

Most of the carbonised plant remains belong to pits and post holes that are dated to the transition from the eldest to the elder LBK. Material from the elder LBK at Rosdorf allows to assume that the cultivation of *Pisum sativum* was introduced in this younger phase during which *Hordeum vulgare* appears as well.

The archaeobotanical results of Rosdorf are verified by the pollen diagram ‘Luttersee’, a site approximately 15 km away from Rosdorf (Beug 1992), which shows a particularly high temporal resolution concerning the early Neolithic.

On a regional level it is now possible to detect changes of subsistence strategies that occurred over time, when compared to the strongly reliable data from the LBK settlement Eitzum (Kreuz 1990) which date from the eldest LBK. As one part of the Rosdorf material originates from the shift from the eldest to the elder LBK and another part stems from the elder LBK, it is possible to fix a chronology of the early Neolithic agriculture for Lower Saxony.

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RECONSTRUCTION OF ENVIRONMENTAL VARIATIONS IN THE AREA OF VILNIUS ROYAL CASTLE SINCE THE 5 TH CENTURY AD, ON THE BASIS OF PALAEOBOTANICAL DATA

Dalia KISIELIENĖ[1], Miglė STANČIKAITĖ[1], Povilas BLAŽEVIČIUS[2], Jonas MAŽEIKA[1]

Development of ecosystem in the surroundings of the Vilnius Lower Castle archaeological monument has been investigated using plant macrofossils, pollen and dating methods. According to data obtained sedimentation began at the 5th – 6th century A.D. and continued up to 12th century. Results of palaeobotanical analysis show the complexity of the deposited layers. The complex of natural vegetation reflects marshy character of local environment mostly determined by physical-geographical conditions. Sedges and crowfoots were most abundant in the communities of wet meadows and pine forest predominated in the surroundings. The composition of plant macrofossils and pollen spectra reflects close connection with human activity. Some periods (dated to the 7th and 9th centuries A.D.) with a sudden increase of diasporas of cereal, cornfield weeds and ruderals were distinguished in the culture layers. It reflects an intensive farming activity during these periods. The finds of cultivated (*Panicum miliaceum, Secale cereale, Linum usitatissimum, Fagopyrum, Cannabis*), exotic (*Ficus carica*) and other collected (*Corylus avellana* and etc.) plants demonstrate character of economy and lifestyle of inhabitants.

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PLANT REMAINS FROM THE ABU SIR BURIAL GROUND (EGYPT, OLD KINGDOM)

Petr KOČÁR[1], Miroslav BÁRTA[2]

Archaeological site of Abu Sir – South offers a rich assemblage of material suitable for the research of former environment in the vicinity of burial grounds. During the season 2004, our research focused primarily on archeobotanical remains gathered by field sampling. In archaeological situations, biological remains were separated by floatation. The data set obtained allows us to study past environmental conditions and, in connection with changes in spectra of agricultural species, also economical conditions in the Nile alluvium during the Old Kingdom Period.

The results of archaebotanical analysis carried out from a tomb complex of Quar and Inti provides a basis for several interpretations of agricultural technology and environmental changes. As for utility species, following ones were recorded: emmer, barley, fig tree, Christ's thorn, pea/vetch, lentils, flax, and probably also common purslane. These results augment so far sporadic knowledge of utility plants in the Old Kingdom. The botanical evidence from Abu Sir – South clearly demonstrates environmental conditions out of studied locality in the Nile alluvium, where mud-bricks and wall plaster were made.

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THE PROGRESS IN ARCHAEOBOTANICAL RESEARCH OF THE BRONZE AGE PERIOD IN THE CZECH REPUBLIC

Romana KOČÁROVÁ[1], Petr KOČÁR[2]

Little is known about archaeobotany of the Bronze Age in the Czech Republic because no systematically collected archaeobotanical data have been available until now from this period.

Recent archaeobotanical investigations of carbonised plant remains from ten Bronze age settlements contribute essentially to the knowledge of subsistence strategies, husbandry regimes and taphonomic processes operating on archaeological sites in the Czech Republic. Our results were obtained by sampling of localities in central Bohemia - Hostivař, Záběhlice, Zdice, Vliněves, Kněževes, Liboc and in central Moravia – Slavonín, Kroměříž, Hulín 1, Hulín 3.

The principal cereals were *Triticum dicoccon* and *Hordeum vulgare*. These cereals are accompanied by some legumes (*Pisum sativum*, *Lens culinaris, Vicia faba)*. The abundance of *Triticum spelta*, *Panicum miliaceum* and the occurrence of *Papaver somniferum* (the oldest find in the Czech Republic) in Late Bronze Age represents a fundamental change of field crop composition at the end of this period. Other significant changes in this period can be seen also for example in proportions of spring and autumn weeds. We interpret these changes as results of a fundamental change of husbandry regime on the turn of the Middle and Late Bronze Age in the Czech Republic.

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PLANT REMAINS FROM BRONZE AGE TOUMBA THESSALONIKIS

D. KOTSACHRISTOU[1], S. VALAMOTI[1], M. MANGAFA[2]

This presentation concerns the plant remains from the Bronze Age settlement of Toumba Thessalonikis. The site is an imposing tell close to the hills surrounding the small coastal plain of the inner Thermaic gulf in Central Macedonia, northern Greece. Excavation of site, carried out since 1984 by the Aristotle University of Thessaloniki, have uncovered deposits dating between the Early Bronze Age and the fourth century B.C. During the Late Bronze Age, a dense settlement pattern has been identified, with multi-room buildings, implying some form of centralized activity and the existence of a powerful community playing a central role in regional hierarchies. The middle and late bronze age archaeobotanical data from Toumba Thessalonikis is linked to the detailed archaeological information available from the site in a preliminary investigation of aspects of everyday life such as use of space, agricultural practice and food habits.

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PALAEBOTANICAL REMAINS FROM THE 1ST CENT. AD PALACE OF DEDOPLIS GORA (GEORGIA)

Eliso KVAVADZE[1], Iulon GAGOSHIDZE[2]

Dedoplis Gora is a fairly high (34m) hill which is situated in Shida Kartli, almost in the geographical center of Georgia, on the left bank of the left tributary of the Kura – the Prone. Ruins of an ancient palace were excavated on the top of the hill. According to the archaeological evidence confirmed by radiocarbon datings the palace was destroyed at the end of the 1st cent.A.D. The palace was ruined by a strong fire.

17 samples of organic formations taken from different rooms of the palace were first studied by the palynological method. Among cultural plants *Triticum, Cerealia* type, *Vitis vinifera, Juglans regia, Corylus, Prunus* and *Pyrus* have been identified. The analysis showed that in that period grain-crops and beans had a dominant role in the man's ration. The man of that time gathered *Cornus, Rhamnus* and *Elaeagnus* fruit. Probably *Fagus orientalis* seeds were also used for food. This is evidenced by the fact that in the remains of a mouse hole of that time also containing excrements of a house mouse high amounts of beech pollen usually present on seeds was found. The pollen of *Cedrus libany* might also have got to the mouse hole by this way. The cedar seeds were probably brought from the Near East for production of valuable technical oil.

In the investigated samples rather diversified wild forest elements were revealed. This is the pollen of *Abies, Picea, Pinus, Juniperus, Betula, Ulmus, Tilia, Quercus, Carpinus, Fagus, Alnus* and *Rhus*. The pollen of broad-leaved species is predominant, which indicates their growth in the river flood-plains and on mountain ridges.

Rather interesting is the composition of the group of non pollen fossils. These are fibres of fabric threads and parenchyma cells of wood. The pollen spectra of the organic remains from room N18 which was probably a spinning or textile workshop exhibit large quantities and variety of fibres. Here macroremains of mineralized and charred yarn are also present. On clay bricks there are visible fossil imprints of the fabric itself. According to the structure of microfibres it was established that the most part of them (58%) belong to cotton. 28% of the revealed fibres were identified as the remains of flax textile. Very interesting is the discovery of remains of silk fabric whose fibres amount to 8%. This first so early find of silk confirms the assumption that the Caucasus, including Georgia, was undoubtedly connected with the Great Silk Road.

Barns, chests, furniture and other wooden constructions were primarily made of pine. The juniper wood was also used.

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POLLEN, SEEDS, FRUITS AND FLOWERS FROM TSITSAMURI GRAVE (IV-VI CENT. A.D., ENVIRONS OF TBILISI)

Eliso KVAVADZE[1], Luara RUKHADZE[1], Vakhtang NIKOLAISHVILI[2]

Tsitsamuri burial N101 is a stony family sarcophagus of a big tribal semetery revealed not far from Mtskheta, the old capital of Georgia, in the place under the name Tsitsamuri. According to the found archaeological inventory, excavated burial N 101 is dated to the Early Feudal Ages (IV-VI cents. A.D.).

On the very bottom of the stony sarcophagus of burial N101 a layer of organic matter was found from which samples for palynological and carpological analysis were taken.

The results of palynological investigation showed that the most part of the spectrum belongs to anthropogenic indicators where 33% are the elements of agriculture, 12% - indicators of grazing and 42% - ruderal elements of man's dwelling. According to palynological (59 palynomorphs) and carpological (51 species) data it was established that here, in the Early Feudal period, grain-growing, flax-growing, horticulture and viticulture was developed. It should be noted that the shape and structure of a *Vitis vinifera* seed is so ampelographically perfect, that the fact of development of viticulture is beyond question. Pollen grains of *Vitis vinifera* also have all features distinguishing them from the pollen of wild grape. The development of viticulture is indicated by seeds of some weeds characteristic for vineyards (*Heliotropium europaeum L., Ajuga chia Schreb,* etc.).

In the palynocomplex a group of pollen fossils is of great interest. These are flax and cotton textile fibres, ascospores, including spores of coprophilous fungi. Here are many microremains of mites (*Acaris*) and other invertebrate animals. Beside textile fibres which are remains of the decomposed clothing of the deceased, in seeds a piece of brown fabric was found. The microscopic analysis of thread fibres of this fabric showed that it was flax.

Based on the fact that in the investigated material marcoremains of *Trifolium campestre Schreb*. flowers blooming in the first half of summer were found, it can be assumed that the burial ceremony took place precisely in this period. The summer burial is indicated by a big amount of remains of mites and underdeveloped forms of land shelled mollusks which are active only in this period (as identified by L.Mumladze).

The results of our investigation suggest that the bottom of the stony sarcophagus was covered by a relatively thick layer of fresh herbs with flowers gathered near the road or in the yard. Precisely this fact explains this rich palynological and carpological composition of herbaceous plants. Fauna and spores of various fungi also fell within the sarcophagus with herbs.

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SEGETAL WEEDS IN ARCHAEOLOGICAL SITES IN POLAND

Maria LITYŃSKA-ZAJĄC[1]

The history of segetal plant communities is presented on the basis of macroscopic plant remains coming from 198 sites on the territory of Poland, dated from the Neolithic to the end of Early Medieval Period. Subfossil segetal flora contained 153 species, which were grouped according to their present-day phytosociological attachment. In the list of weeds, 60 species were included in *Centauretalia cyani* order and 31 species in *Polygono-Chenopodietalia* order. Both orders were represented by species belonging to various alliances. Nowadays associations of *Centauretalia cyani* order grow in corn-fields and are most fully developed in winter crop. Associations of *Polygono-Chenopodietalia* order are first of all connected with root-crops, although some of them may grow also in summer cereal cultivations. Both groups of weed species occur in samples containing cereal grain since the Early Neolithic period. This may indicate that communities similar to those growing today in root-crop cultivation were formed very early. This fact is contradictory to our knowledge of crop species cultivated in prehistoric times. The presence of numerous species of root-crop weeds may be connected with the use of specific agrarian methods, or with sowing of spring cereals.

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THE PROTOHISTORICAL AGRICULTURE IN THE NORTHEAST OF THE IBERIAN PENINSULA: ARCHAEOBOTANICAL STUDIES IN THE ARCHAEOLOGICAL LOCATION OF TURÓ DE LA FONT DE LA CANYA (BARCELONA, SPAIN)

Daniel LÓPEZ REYES[1]

This paper presents the archaeobotanical results of the archaeological site of the Turó de la Font de la Canya (Avinyonet del Penedès, Barcelona). The site is found situated in the central coast of Catalonia, to the south of the province of Barcelona and presents a chronology that covers the last phase of the First Iron Age and all the Second Iron Age or Iberian period (650-180 B.C.). It is a specialized settlement in the production, the control and the accumulation of farm surpluses or "field of silos", well known in the septentrional center area of the Catalan coast during the Iron Age. 90% of the surface of the Turó de la Font de la Canya is composed by silos to store cereal, with more than 300 documented. These deposits turn into waste tips when they stop having its their primary function and provide an extraordinary archaeobotanical registration. The archaeological excavations proves that the native population maintained trade relationships with colonizing cultures of the Mediterranean one as the Phoenicians and Punics, who cause the appearance of this type of archaeological sites.

The archaeobotanical studies carried out prove the practice of a combined cereal agriculture with the growing of the legumes and provide new data on the beginnings of the arboriculture through the introduction of the growing of the vineyard. Among the cereals *Hordeum vulgare* and *Triticum aestivum/durum* are the better documented taxa. Other cereals have a secondary role as *Triticum dicoccum*, *Panicum miliaceum* and the *Setaria italica*, scans it, but with important frequencies of appearance. The pulses of more success are specially formed by the *Lens culinaris* and *Vicia faba* and in smaller degree the *Lathyrus sativus* and the *Vicia* cf. *sativa*.

Among the fruits it stands out the appearance of one big I number of seeds of grape of the cultivated variety (*Vitis vinifera* ssp. *vinifera*) pertaining to the oldest phase. Their study helps us to know the beginnings and the subsequent development of the viticulture in the peninsular northeast and the consequences that their growing behaves during the Iberian period.

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ARCHAEOBOTANICAL RESEARCH ON A 17TH CENTURY DITCH AT DAMME (WEST-FLANDERS, BELGIUM)

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In 2006 a project has been carried out to reconstruct the northern part of the 17th century ramparts of Damme. Samples were taken from all layers of the ditch filling in which each layer represents a different stage in the landscape history. A multidisciplinary approach (seeds and fruits, pollen, diatoms, charcoal and molluscs) has been used, which resulted in a clear view on the evolution of the ditch itself (depth, clearness, pollution, vegetation), the local and regional vegetation, as well as the food economy and –consumption within the city of Damme.

In the context of the 14th symposium of the International Work Group for Palaeoethnobotany the results of the analysis of seeds and fruits are highlighted.

This analysis showed a wide spectrum of used plants (for instance hemp (*Cannabis sativa*), cultivated flax (*Linum usitatissimum*), weld (*Reseda luteola*)), garden plants (for instance box (*Buxus sempervirens*), cape gooseberry (*Physalis alkekengi*), tomato (*Solanum lycopersicum*)) and a lot of fruits and vegetables consumed by the citizens of Damme.

In addition, the attested seeds and fruits of wild plants gave a good picture of the history of the ditch itself as well as the evolution of the landscape in the immediate surroundings. Water plants, pioneers, grassland, shrubs and trees were registered and it was possible to determine differences in the occurrence of these ecological groups through time.

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ANALYSIS OF WEEDS OF ANCIENT GREEK SETTLEMENTS ON NORTHERN PONTOS

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Palaeoethnobotanical investigation have anabled a reconstruction of the assortment of plants were utilised by the Greek colonists on the Northern coast of the Black Sea from Y – III centuries BC to XIII centuries AD. The assortment consisted of cereals: naked wheats *Triticum aestivum s.l.,* hulled barley *Hordeum vulgare,* and legumes *Pisum sativum, Lens culinaris, Vicia ervilia, Lathyrus sativus.* Hulled wheats and millet, rye and naked barley were also present, although in significantly less quantities. The examination of the samples has made it clear that the plant remains are generally of mixed origin. They originated from various types of domestic activities and could not provide indications on the nature of the plant remains (storage products, kitchen refuse). It should be taken into consideration that the burning must have affected the composition of the charred remains.

Relatively few plant taxa are represented by weeds and vegetation of wild plant types. Weeds of cornfields such as *Galium aparine, Fallopia convolvulus, Fumaria officinalis, Chenopodium album, Astragalus sp. Euphorbia sp., Silene dichotoma*. All of them were weeds blocking grain-crops or growing at the edges of fields and roads or in the gardens. A few species characterise ruderal habitats: *Ballota nigra, Euphorbia helioscopia, Malva neglecta, Rumex acetosella, Sambucus edulus, Trifolium repens.* Some from the listed plants are common weeds in fields and simultaneously occures in disturbed habitats in the vicinity of the site as well as steppe vegetations. For example, *Rumex acetosella* L. is the important indicator of anthropogenous influence. It is usual weed of crops, but can meet also on dry open places, in places the broken vegetative cover, rich mineral substances.

Representatives of genus *Astragalus* occur particularly in steppe vegetations, but field weeds include also verious *Astragalus* species. In Crimea 28 species of this genus are known. They wide spread on various dry places, steppe stony slopes, cretaceous rocks, on pastures, waste grounds, lengthways roads.

A number seeds of Boraginaceae are represented. It were seeds *Anchusa* sp., *Buglossoides arvense, Buglossoides officinale.Anchusa sp*. is remarkably well represented and show high values sometime (2000 seeds in content of vessel of Byzantine Chersonesos, 13th century). Five species *Anchusa* meets in Crimea now. All of them are grassy plants in height from 30 up to 80 sm. They grow on dry stony and steppe slopes. *Anchusa italica* Retz. meets on fields, at roads, waste grounds, in gardens. It was used as painting, melliferous, food and an ornamental plant. *Anchusa leptophylla* Roem.et Schulb. meets mainly in mountainous Crimea and possesses painting properties.

Now *Buglossoides arvense, Buglossoides officinale* grow by all Crimea on various dry places, steppe stony slopes, and on fields. Nutlets of both kinds are found at washings contents of Chersonessos.

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NEOLITHIC PLANT REMAINS FROM ANDALUCÍA (SPAIN): NEW DATA FROM CUEVA DE NERJA, BAJONCILLO Y HOSTAL GUADALUPE (MÁLAGA)

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Research into early agriculture in Southern Spain is still at its early stages. Very few studies have been carried over the past 20 years and our knowledge of the first farming communities is limited. Recently, some emergency excavations have uncovered Neolithic deposits of charred plant remains allowing to investigate the subsistence of these communities. In addition, the possibility of studying the plant remains from old excavations sitting in museums has allowed to throw new light into the range of plants Neolithic communities used. This poster focuses on the preliminary results of the analysis of plant remains from several Neolithic sites from Southern Spain: Cueva de Nerja, Cueva de Bajondillo and Hostal Guadalupe in Málaga province. The dominant cereal in all sites is naked barley (*Hordeum vulgare ssp nudum*) but Nerja includes also wheat (*Triticum aestivum*), several legumes such as broad beans (*Vicia faba*) and *Vicia* spp. as well as olive stones (*Olea* sp.) and acorns (*Quercus* sp.). Comparison with other contemporary sites in the region will allow to offer a more complete picture of an area little known from the archaeobotanical point of view.

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NEW ARCHAEOBOTANICAL DATA FROM NORTHERN ITALY: PRELIMINARY RESULTS FROM THE BRONZE AGE SITE OF LAVAGNONE (DESENZANO DEL GARDA, BRESCIA)

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The pile-dwelling of Lavagnone (119 m a.s.l.), nowadays a drained peat-bog, is located in northern Italy, 3 km south of Desenzano del Garda, Lombardy. This former lake formed during one of the most recent Quaternary glaciations as an intermorainic basin isolated from the main hydrographic network. The Garda region is characterized by a submediterranean climate due to the milding effect of the lake, with low precipitation (800–1000 mm/y) and hot and dry summers (annual temperature mean: 12 – 14 ℃). The present vegetation in the surroundings of Lavagnone is mainly composed by crop fields, vineyards and olive stands. Residual wood and bush are dominated by *Quercus cerris*, *Q. petraea*, *Ostrya carpinifolia*, *Fraxinus ornus*, *Prunus mahaleb*, and *Cotinus coggygria*. *Fraxinus ornus*/*Ostrya carpinifolia* coppice with understory of *Ruscus aculeatus* is the most common wood in the area, while xero-thermophilous seminatural grasslands are widespread on sunny slopes of morainic hills.

Neolithic industries have been found along the northern and eastern edges of the former lake. The lake was continuously inhabited since the earliest phases of the Early Bronze Age (EBA), till the end of Middle Bronze Age (MBA) (2077-1400 BC). Thanks to a huge archaeological stratified deposit, Lavagnone is a main reference site defining the chronological periodisation of northern Italian Bronze Age.

We present here an overview of the preliminary archaeobotanical results on EBA samples of sector A of the excavation (Stratigraphic Unit 338: a detritus gyttja deposited under the oldest pile dwelling). These botanical remains were deposited in a waterlogged environment and their preservation is excellent. Cultivated plants are mainly represented by flax (*Linum usitatissimum*) and cereals, mostly emmer (*Triticum dicoccum*), barley (*Hordeum vulgare*), and the “new glume wheat”. This latter requires a more detailed morphometric and biometric analysis. The other identified *taxa* include weeds, aquatic and wetland plants, trees and shrubs, and a huge amount of gathered plants such as *Rubus fruticosus*, *Fragaria vesca, Cornus mas, Corylus avellana, Quercus* sp., *Ficus carica, Pyrus sp., Malus sp.* and *Vitis vinifera* subsp. *sylvestris*. Also goat and sheep coprolites were found in the archaeological layers and are currently under investigation.

Considering the high biodiversity of the plant macrofossil assemblage, our future efforts will be addressed to reconstruct the palaeoeconomy and the palaeoenvironment of the site, integrating our data with the pollen record.

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MEDICINAL PLANTS IN ARCHAEOBOTANICAL AND WRITTEN SOURCES FROM GDANSK, N POLAND

Katarzyna PIŃSKA[1], Monika BADURA[1]

Using plants as medicines was important aspect of pharmacy through past ages and still is in present time. The presentation concerns archaeobotanical and historical evidence for developing pharmacy in Gdansk (N. Poland) since early medieval to modern times.

In recent years intensive archaeobotanical researches have been carried out in this area and a large botanical data-set was obtained. Numerous, mainly waterlogged remains of potential medicinal plants were recorded from latrines and rubbish deposits.

In the present paper we concentrate on typical herbal species (e.g. *Hypericum perforatum*, *Salvia glutinosa*, *Verbena officinalis*) avoiding those used for both – medicine and food. The archaeobotanical data for selected species have been confronted with their meanings in the local, old pharmacy. We gathered information about medicinal problems and plant cures in Gdansk in the past. Data from pharmacopoeia (ig. *Despensatorium Gedanense*) and old pharmaceutical registers were studied to obtain list of plant species used in medicine and the ways of their preparation. Old illustrations and recipes are presented.

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A FOUNDATION OFFERING ON THE GALLO-ROMAN PORT OF *LATTARA* (LATTES, FRANCE): THE VEGETAL REMAINS

Núria ROVIRA[1], Lucie CHABAL[2]

Excavations and sampling conducted on the ancient city of *Lattara* (Lattes, France), occupied from the end of the 6th century B.C. to the 2nd century A.D., have revealed a foundation offering in a small pit situated in a storage room of the Gallo-Roman port of the city. This offering, dated around 25-60 A.D., consists of pottery recipients, oil lamps, a coin, a hairpin (made out of bone), an egg and several vegetal products. Some mammal and fish bones also appeared while sieving the sediment of the pit, but the fact that they were not burnt lead us to presume a different origin.

The archaeobotanical remains presented in this work are charred seeds and fruits, and charcoal. The first aim of this study is to analyse whether the vegetal taxa documented are unusual or the same that appear in the contemporaneous domestic contexts of the city, in order to assess a particular use of the plants related to, for instance, their symbolic value.

Among the main species attested by the fruits and seeds remains, we can distinguish several fruits (*Phoenix dactylifera*, *Pinus pinea*, *Vitis vinifera*), cereals (*Hordeum vulgare Triticum dicoccum*, *Triticum aestivum/durum*), pulses (*Lens culinaris*, *Lathyrus sativus*) and oil plants (*Linum usitatissimum*). The study of the charcoal remains is in progress, but the first analysis notes already some differences between the vegetal taxa of this sample and the current wood used in domestic contexts.

The discovery of domestic or public burnt offerings is scarce in the Mediterranean areas of France during the Roman period, especially those containing vegetal and/or animal remains. For this reason, our results are compared with others coming from other geographical areas.

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PLANT ECONOMY AT EARLY BRONZE AGE TEL YARMOUTH (ISRAEL)

Aurélie SALAVERT[1]

Tel Yarmouth is an important Bronze age site in the south Levant. It was occupied from the Early Bronze Age I (EBI, mid 4th millenium BC) until the EB IIIC (2300 BC). Samples collected from sites B, C and J, belong to the EB II and EB III periods (2700-2300 BC).

The vegetal economy of Tel Yarmouth is based on winter crop. Indeed, emmer wheat (*Triticum dicoccum*), hulled barley (*Hordeum vulgare*) and lentils (*Hordeum vulgare*) dominate among the cultivated plants. Several fruit species have also been identified such as grape (*Vitis vinifera*), pistachio (*Pistacia* sp.), fig (*Ficus carica*) and olive (*Olea europea*). Olea is represented by numerous endocarp fragments. The importance of this species at the site is further corroborated by the large amount of olive tree charcoals.

This study of the Tel Yarmouth archaeobotanical remains demonstrates the importance of the olive tree in the vicinity of the site and the production of olive oil.

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PRE-URBAN AND URBAN SETTLEMENT IN TWO NORWEGIAN MEDIEVAL TOWNS: TRONDHEIM AND STAVANGER

Paula Utigard SANDVIK[1]

Eight Norwegian towns originate from the medieval period. Today parts of these towns are defined as automatically protected cultural heritage sites. The extent of anthropogenic sediments on these sites is our most important source to the knowledge about the settlements in the past.

This paper presents results from investigations in two of the Norwegian medieval towns: Stavanger and Trondheim. The analysis of plant remains, studies of the stratigraphy, dendrochronology and ^{14}C-datings together have made it possible to trace the development of Trondheim from a pre urban to a urban settlement. In Stavanger many archaeological and palaeoecological investigations which have been executed through the last seven years have yielded quite a lot of information about the settlement in the past despite a remarkable lack of organic remains in the anthropogenic sediments.

The aim for the further work is to establish some more general criteria to distinguish between pre urban and urban anthropogenic sediments by means of analysis of plant remains.

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DEVELOPMENT OF THE FARM AND THE CULTURAL LANDSCAPE THROUGH 6000 YEARS AT KVÅLE, SOUTHWEST NORWAY

Eli-Christine SOLTVEDT, Lisbeth PRØSCH-DANIELSEN

This poster will focus on the earliest documented post-built houses in SW Norway. The human impact, utilisation and economy as concerns this early society will be presented. The Museum of Archaeology in Stavanger surveyed an area with house remains, burial mounds, clearance cairns, lynchets and other traces of cultivation in the landscape. This find led to an interdisciplinary excavation in the period 2001-2002. The excavation revealed finds of two-aisled houses from the transition Late Neolithic/Early Bronze Age (2000-1700 BC). Two of the houses were built on the same plot telling about a high degree of sedentary settlement. The house and household size increased through the settlement period.

Carbonised cereals were found in pits and structures on the settlement site. Samples for pollen and macrofossils were analysed from clearance cairns, lynchets and traces of cultivation nearby the houses. The results of the analysis and ^{14}C-dates give information of changes in land use and cultural landscape from Mesolithic to Medieval time.

PLANT REMAINS FROM A PREHISTORIC WELL AT HAJNDL (SLOVENIA)

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The archaeobotanical samples analysed derive from a well-preserved well dated to the Early Iron Age (Hallstatt). Archaeobotanical samples originate from the layers of the well in which remnants of the pottery from Early Iron Age also were found. The results of the analysis show that the earliest inhabitants of the site of Hajndl (by Ptuj, Slovenia) were engaged in animal husbandry, agriculture and gathering activities. As for cultivated species, the preserved remains of millet (*Panicum miliaceum*), flax (*Linum usitatissimum*), poppy (*Papaver somniferum*) and possible false flax (*Camelina sativa*) were found in the samples, together with a large number of characteristic weeds. There are also a large number of ruderal, nitrophilous species, as well as elements of grass and scrub vegetation, which reflect human influence on the vegetation of the prehistoric site.

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SETTLEMENT PATTERN AND SAMPLE COMPOSITION IN THE NEOLITHIC OF SOUTHEASTERN EUROPE

Soultana M. VALAMOTI, Elena MARINOVA, Ksenija BOROJEVIC

In a recent archaeobotanical investigation of sample composition and site type in northern Greece, a correlation between chaff-rich samples and flat extended sites on one hand, and grain-rich sites and tell sites on the other, was noticed. The sample, however, was rather small, prohibiting generalisations as regards site type and archaeobotanical composition. This paper brings together archaeobotanical material from neolithic sites from Greece, Bulgaria and former Yugoslavia, in an attempt to investigate a) the relationship between site-type and archaeobotanical composition in the Neolithic of southeastern Europe and and b) whether the pattern observed in northern Greece is also true for regions further north. The sites considered here are Makriyalos (5300-4800 B.C., Apsalos (5800 B.C.), Mandalo (4300-4100 B.C.), Sitagroi (XX), Arkadikos (5th millennium B.C.), Dikili Tash (4400-4100 B.C.), Makri (second half of 6th millenium B.C.) – Greece, Bâlgarčevo (6th-5th millennia B.C.), Kovacevo (6100-5500 B.C.), Kapitan Dimitrievo (5900-5660 cal BC), Ohoden (ca. 5400 cal BC), Slatina (5810-5650 cal BC) - Bulgaria, and Opovo (4700 B.C. – 4500 B.C.) in Serbia. The factors underlying archaeobotanical composition at these Neolithic sites are investigated and discussed in terms of intra-settlement use of space, site formation processes, land-use and the production and storage of surplus.

ZOSTERA AS A SOURCE OF SALT?

Wouter VAN DER MEER

Up until the 1930's, before the closing of the Zuiderzee and a mysterious fungal epidemic, Eelgrass (*Zostera maritima*) and Dwarf Eelgrass (*Z. noltii*) were commonly found along the dutch coast. Literary sources show extensive use of the plant from the early modern age on. Best represented is the use as a shock absorbent for seadykes and as a packaging and filling material.

Previously unknown in dutch archaeology, excavation data now also shows different uses of Eelgrass: as a fill for elevation levels, possibly as a filtering agent, and finally, as a source of salt. This poster will explore the recent find and possible use of both Eelgrass species in these different archaeological contexts from the Netherlands.

THE PRESENCE OF *CARTHAMUS TINCTORIUS* IN THE ROMAN CIVIL SETTLEMENT OF OEDENBURG/BIESHEIM-KUNHEIM, ALSACE (F)

Patricia VANDORPE[1]

The plant macro remains from the 1st and 2nd C AD Roman civil settlement Oedenburg/Biesheim-Kunheim yielded a rich and diverse plant spectrum including many economic plants as well as wild plants. The main reason for the very rich and diverse plant assemblage are the excellent conditions of preservation encountered in the Roman civil settlement. The greater part of the structures is located under the current water level. In total 288 plant species could be identified through the study of seeds and fruits. The majority of plant macro remains were found in an uncarbonised waterlogged state of preservation, carbonised and mineralised plant remains constituted only small amounts of the total assemblage. In this poster we would like to highlight the findings of uncarbonised waterlogged safflower seeds (*Carthamus tinctorius*). They were found in a very organic and well-preserved archaeological layer located within the course of a palaeochannel. In this layer other uncarbonised plant macro remains, mainly seeds, are plentiful and very diverse. They compile an extensive list of species of which the economic plants form the largest share. The majority of safflower seeds was found complete with just a small hole on the side. Safflower is native in the Near East and Central Asia and is a plant used for dyeing (from the flowers) and oil extraction (seeds). Their presence in Roman Oedenburg is not clear. One hypothesis is that the safflower seeds are part of a seed transport for the initiation of local cultivation. So far other archaeological findings of safflower North of the Alps are unknown to us in the Roman period.

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