I.W.G.P. 7th SYMPOSIUM

CAMBRIDGE 6-12 APRIL 1986

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CONFERENCE PROGRAMME

Sunday 6th April

2.00-6.00 p.m. Registration

6.00-7.00 p.m. Wine Reception in New Hall S.C.R.

7.00 p.m. Dinner

N.B. ALL TIMES OF LECTURES ARE APPROXIMATE AND MAY BE ALTERED

Monday 7th April

9.15 a.m. Introduction - Jane M. Renfrew

Far East

9.45 a.m.	F.A. Lone	Some Recent Palaeoethnobotanical Investigations in India
	M. Kajale	Current Status of Indian Palaeo-ethnobotany
10.45 a.m.	Coffee	
11.15 a.m.	G.M. Buth	Palaeoethnobotanical work on the Neolithic Settlements in Kashmir
12.00-12.30		Discussion
12.30-2.15 p.m.	Lunch	

Egypt

2.15 p.m.	R. Germer	The Schweinfurth Collection in Berlin
2.35 p.m.	P.Rowly-Conwy	Sorghums from Qasr Ibrim
3.10 p.m.	Gordon Hillman; J. Hatherend E. Madeyska	The Late Palaeolithic diet at Wadi Kubbaniye in Upper Egypt: charred tubers and faeces
3.50 p.m.	Tea	
4.15 p.m.		Discussion

E. Mediterranean

4.30 p.m.	C. Haldane	The recovery and analysis of plant remains from shipwreck sites
4.45 p.m.	J. Hansen	Palaeoethnobotany in Cyprus - recent research
5.00 p.m.	D. Kucan	Botanical macrofossil analysis from the 6th-7th century sanctuary of Hera on Samos

6.00-7.00 p.m. Wine Reception in Heffer's Bookshop

7.30 p.m. Dinner

Tuesday 8th April

Method and Theory

9.15 a.m.	M. Kislev	Archaeobotany and Storage Archaeo-entomology
9.55 a.m.	M. Robinson & V. Straker	Silica skeletons of macroscopic plant remains from ash
10.15 a.m.	D. Kucan	A new method of conserving uncarbonized plant remains
10.30 a.m.	G. Wainer	Identification of wild wheat seeds and spikelets

10.45 a.m. Coffee

11.15 a.m.	K.-H. Knorzer :	Kopro-analyse, ein neuer Beitrag zur Geschichte der Ernährung
11.30 a.m.	U. Korber-Grohne:	The determination of fibre plants in textiles, cordage and wickerwork
11.50 a.m.	F. Kuhn	Problems of identification of seeds and fruits of spelt wheat, oats and legumes

12.10-12.30 Discussion

12.30- 2.15 p.m. Lunch

2.15-4.15 p.m. : Demonstrations in Lecture Room

3.45 p.m. Tea

4.15 p.m.	P. Tallantine	Some thistles amongst the corn
4.30 p.m.	G. Wilson and D.Haddon-Reece	The use of Fishers Index of Diversity, alpha, in palaeoethnobotanical studies
5.10 p.m.	A. Milles	Models : Theory and practice
5.25 p.m.	F. Lone	Archaeological plant remains: collection, retrieval and methods of identifcation
5.40 p.m.	R. Mathewes	Connections between palaeoenvironments and palaeoethnobotany in coastal British Columbia
7.00 p.m.	Dinner	

Wednesday 9th April

9.30 a.m.	Departure by coach from New Hall for whole day excursion to East Anglia
6.30 p.m.	Bar opens in New Hall
7.30 p.m.	Conference Dinner in New Hall, Bar open after Dinner

Thursday 10th April

9.15 a.m.	Ann Butler	: The Vicieae: problems in identification
9.30 a.m.	R. Kosina	Variation of fossil and contemporary nuts of Coryens avellana
10.00 a.m.	G. Willcox	Shortugai : plant remains from Central Asia

N. Europe

10.15 a.m.	K. Griffin	Recent developments in palaeoethnobotany in Norway
10.50 a.m.	Coffee	
11.15 a.m.	O. Foldoy	Mosses from Archaeological Excavations in Medieval Towns in Norway

11.30 a.m.	M. Aalto	Water Chestnut Trapa nataus in Finland - Stone Age man's potato?
11.45 a.m.	R. Engelmark	Palaeoethnobotanical research in N. Sweden
12.00 noon	H.A. Jensen	Macrofossils and their contribution to the history of the Spermatophyte flora in S. Scandinavia from 13,000 BP to AD 1536
12.40-2.15 p.m.	Lunch	
2.15 p.m.	H.A. Jensen	Seeds and their diaspores in soil samples from Danish town and monastery excavations AD700-1536
W. Europe		
2.30 p.m.	C. Bakkels	Tracing Crop Processing in the Bandkeramik Culture
3.10 p.m.	P. Marinval & M.P. Ruas	Recent developments in Palaeocarpology in Western and Southern France
3.30 p.m.	R.de Ceunynek	A find of charred grains and Acorns at the Iron Age site of Evergem Ralingen (Belgium, Oost-Viaanderen
3.45 p.m.	Tea	
4.15 p.m.	S. Jacomet	Archaeobotanical work in the Swiss Neolithic lake dwellings in the last years
4.30 p.m.	P. Reynolds	Underground storage in silos
5.15 p.m.	J. Greig	Understanding past British Weed communities: do phytosociological arrangements help?
5.30 p.m.	Allan Hall	Problems of recovering, recording and interpreting plant macrofossil remains from urban archaeological sites - some recent experiences in York
7.00 p.m.	Dinner	

Friday 11th April

E. Europe

9.~~15~~ a.m.	K. Wasylikowa	
9.45 a.m.	I. Gluza	Late Roman plant remains from Lesko, S.E. Poland
10.00 a.m.	E. Lange	Mittelalterliche Pflanzenreste aus Magdeburg und dem Zisterzienser-kloster Seehausen bei Prenzlau
10.25 a.m.	Z. Tempir	
10.45 a.m.	Coffee	
11.15 a.m.	E. Hajnalova	
11.30 a.m.	Z. Janushevich: N. Rusishivti N. Kuzminova	
12.30-2.15 p.m.	Lunch	

Great Britain

2.15 p.m.	J.& C.Dickson	Botanical Studies from Orachian Brochs
2.45 p.m.	P. Murphy	Early Crop Production and wild plant resources in the coastal area of Essex, England
3.25 p.m.	F. Green	Landscape archaeology in Hampshire, the plant macrofossils
3.45 p.m.	Tea Lunch	
4.15 p.m.	M.van der Veen :	Evidence for agriculture in the Roman Fens: the plant remains from Stonea
4.55 p.m.	M. Monk	Crop Plants in Early Christian Ireland
5.15 p.m.	Tim Holden	The gut contents of Lindow Man
5.30 p.m.	G.V. Robins	An examination of the contents of Lindow Man's stomach with Electron Spin Resonance Spectroscopy
6.00 p.m.		Concluding Address
7.00 p.m.	Dinner	

SOME RECENT PALEOETHNOBOTANICAL INVESTIGATIONS IN INDIA

Faooq A. Lone and Maqsooda Khan

In the recent years a considerable amount of work has been accomplished on the study of plant remains cultivated or utilized by man in ancient times, and that have survived in the archeological contexts. In the present paper we present some results of our recent palaeoethnobotanical investigations at Banawali, Haryana (29°37'5" N lat; 75°23'6" E long); Burzahom, Kashmir (34°10' N lat; 74°54' E long) and Semthan Kashmir (33° 48' N lat; 75°9' E long). The Harappan levels at Banawali (c. 2300 B.C.) revealed grains of Triticum aestivum; Hordeum vulgare and seeds of Phaseolus mungo. The Neolithic I levels at Burzahom (2325 B.C.) revealed grains of Triticum aestivum; T. sphaerococcum; Hordeum vulgare (hulled); seeds of pulses Pisum sativum; Lens culinaris; endocarps of fruit stones of Prunus persica, Juglans regia and weed seeds Lithospermum arvense, Galium trichornae, Vicia/Lathrys sp. and Medicago sp. The pre-N.B.P. levels at Semthan (1500 B.C.) revealed grains of Oryza sativa, Triticum sphaerococcum, T. aestvium, Hordeum vulgare; seeds of Phaseolus aureus and Lens culinaris; endocarps of Prunus armeniaca, Juglans regia and Celtis australis.

Their archaeobotanical signficance in relation to the global finds in general and findings from Indian subcontinent in particular are discussed. Some interesting observations on the domestication of some food and fruit yielding plants are revealed and discussed. The notion by the earlier workers that Burzahomians were food gatherers and not cultivators is refuted. The probable palaeoethnobotanic uses of the various finds are discussed.

THE SCHWEINFURTH-COLLECTION AT BERLIN

Renate Germer

The famous German botanist and Africa-traveller Georg Schweinfurth stayed in Egypt for many seasons at the end of the 19th century. He was the first to recognize the importance of plant-material coming from ancient Egyptian tombs by excavations in those days. He compiled the most important collection of ancient-Egyptian plant-material outside Egypt in Berlin. Fortunately this collection survived two wars and is now prepared for publication.

THE RECOVERY AND ANALYSIS OF PLANT REMAINS FROM SOME MEDITERRANEAN SHIPWRECK SITES

Cheryl Haldane

From the earliest excavations, nautical archaeologists working in the Mediterranean have reported finds of plant remains on shipwreck sites. Systematic efforts to recover and analyze archaeobotanical material from four shipwrecks located off Turkey's soutern shore have succeeded in producing a wider and more elaborate record of ancient cargoes and their contaminants then previously imagined possible. The recovery of plant remains from underwater sites is fairly simple and quick, yet this source of information has not been readily exploited by archaeologists. The potential contributions of underwater archaeobotany to shipwreck archaeology are just beginning to emerge.

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PALAEOETHNOBOTANY IN CYPRUS: RECENT RESEARCH

Julie Hansen

Since the 1960s the study of botanical remains from excavations in Cyprus has kept pace with similar studies in the rest of the Eastern Mediterranean. Sites ranging in age from the earliest Neolithic around 6,500 B.C. to the Classical period have yielded plant material from a variety of contexts. During 1984 and 1985 work on several different sites has added new information to the existing data. This paper is a summary of past work and an analysis of the current state of palaeoethnobotany in Cyprus.

In the earliest Neolithic sites of Khirokitia, Kalavasos-Tenta, and Cape Andreas Kastros Triticum dicoccum, T. monococcum, Lens culinaris, Pisum sativum, and Vicia spp. were cultivated. In addition, a variety of wild plants such as Pistacia sp, Olea sp, and Vitis sp. were collected. The large size of the olive pits found in the excavated material from Khirokitia is intriguing in terms of the evidence for domestication of this plant and this problem is discussed in some detail. In the later Neolithic site of Ayios Epiktitos-Vrysi Triticum aestivum and Secale cereale are added to the cereals and Cicer sp. appears among the legumes. New edible wild plants include Prunus amygdalus, Celtis sp, and Malus/Pyrus sp. From our information for the Chalcolithic through Middle Cypriot periods at Kalavosos-Ayious, Phaneromeni, and Sotira-Kaminoudhia, there appear to be no changes in the major species cultivated or collected. By the end of the Bronze Age botanical remains from the sites of Kalapsidha, Apliki, and Hala Saltan Tekke provide us with a somewhat changed picture. By the time grapes, and olives are definitely cultivated and bread wheat has become the dominant wheat species. Barley, lentils and the other legumes are still cultivated as well, while Punica granatum is identified for the first time among the wild species exploited at Hala Sultan

Tekke. No change is seen in the Cypro-Archaic levels at Idalion and it is not until the 4th century B.C., among the funeral pyres at Salamis, that we find examples of new plants such as Rosa sp., Corylus sp., and Lotus sp.

Although the evidence suggests that agriculture was brought to Cyprus fully developed, as it does appear that a large number of indigenous wild plants were exploited.

PLANT MACROFOSSIL INVESTIGATIONS FROM THE SEVENTH/SIXTH CENTURY B.C. SANCTUARY OF HERA AT SAMOS, GREECE

Dusanka Kučan

Archaeological excavation, under the direction of Prof. H. Kyrieleis, has been in progress since 1976 at Heraion on the Greek island of Samos. From permanently wet strata, which date to the seventh century B.C., non-carbonised plant remains including wood, have been recovered in a well preserved state. Well preserved material such as this is seldom found in Greece.

Investigations, to date, are not sufficiently progressed to provide a definitive evaluation of the role of plants in nutrition at the site; however, it is possible to draw several preliminary conclusions from the available results. Fruit was a very important element in the daily diet. Among the more important were Vitis vinifera s.l. and Ficus carica. Other species recorded include Cucumis melo, Punica granatum and Morus sp. The stones of Olea europaea were particularly frequent in the samples. These indicate that the whole fruit was eaten; otherwise, the stones would not have been present in the sample material. The possibility is not thereby excluded that the olive was also used as a source of oil.

With regard to nuts, which have a high nutritive value, remains of Amygdalus communis have been recorded as well as the occasional specimen of Pistacia terebinthus. That spices were used to improve the flavour of food is indicated by the finds of Coriandrum sativum and Apium graveolens.

In comparison with fruit, relatively few remains of cereals have been found. There is a small number of records of Hordeum vulgare and pieces of the caryopsides of Triticum spec. The possibility that vegetables and lettuces were eaten is suggested by the finds of the fruit of ± Apium graveolens and Lactuca serriola (?). Furthermore, the remains of the following, which were collected in the wild, have been recorded: Corylus spec., Quercus spec., Rubus fruticosus and Rosa spec. with many prickles.

In all samples the greater part of the botanical remains consisted of fruit and seed of non-cultivated plants. A phyto-sociological analysis showed that a variety of habitats

are represented. Species of meadows and pastures as well as reeds and species of weed and ruderal communities were present. If one attempts to reconstruct the vegetation of the area, it is clear that during the period in question, a transition from salt to freshwater conditions occurred. The presence of the particular species combination undoubtedly results from the locally prevailing habitat conditions. The south eastern part of the Hera sanctuary lies in the estuary of the small river Imbrasos at a short distance from the coastline.

The macrofossil analyses revealed halophyte species in all samples e.g. Salicornia spec., Cochlearia danica, Oenanthe lachenalii, Juncus gerardii and Scirpus tabernaemontani. Species ascribable to brackish reedswamps or with a certain degree of tolerance to saltwater include Scirpus maritimus, Apium nodiflorum, Coronopus squamatus, Zannichellia palustris, Eleocharis palustris?, Odontites rubra and Ranunculus sardous. The samples also contained seeds and fruits of glycophytes, i.e. species which grow in freshwater areas only, e.g. Lycopus europaeus, Potamogeton natans, Mentha arvensis/aquatica, Typha spec. and Chara. On the other hand, some of the arable weeds and the pastural and ruderal species recorded are known not to be sensitive to limited saltwater influence.

Of particular interest are the frequent records of the fruit of Vitex agnus castus, with its four seed. This is a 2 to 4 m tall shrub which in southern Europe and in Greece grows wild, especially on river banks and at the coast. It has been used in the past as a substitute for pepper.

Of similar interest are the finds of the fruit of Lactuca serriola. This species is considered by some botanists as the parent of Lactuca sativa. The non-cultivated plant belongs to the weed communities of rubbish heaps in elevated areas and in the lowlands of southern and central Europe. It is thermophile.

ON THE BEGINNING OF FRUIT GROWING IN THE OLD WORLD

Maria Hopf

Remains of grapes, figs, olives, dates are the oldest fruit material in archaeological sites in the Near East and the Mediterranean basin; apples/pears, plums and berries will follow later.

The pips, stones or nutlets of wild and cultivted forms of these plants do not differ significantly in shape and size.

Olea grows wild around the Mediterranean sea; Vitis is also found in the subtropical regions, reaching a bit further north; figs belong to the subtropical belt in the Near East; date palms are restricted to the more southernly, warmer territories. - So all of them are indigenous in the area from which the

oldest fruit finds are known. Archaeological material from outside this natural distribution area may give some indications as to when and where fruit trees will have been taken into cultivation. Reliable, though comparatively young evidence comes from representations or written sources.

Typical for all the cross-pollinated fruit trees, when propagated by seed, is a segregation into a wide variety of normally less productive or less tasty F1 individuals.

The maintenance of special qualities of a plant in the next generation can only be achieved by either cloning, i.e. planting cuttings or suckers of the mother tree, or by the more complicated method of grafting.

These techniques are considerably younger than the initial sowing of annual, mainly self-pollinating field crops. But horticulture must have been well developed in the Bronze Ages, judging by the presence of numerous presses as well as containers for oil and wine.

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ARCHAEOBOTANY AND STORAGE ARCHAEOENTOMOLOGY

M.E. Kislev

Storage archaeoentomology (the study which deals with food pests in archaeology) is still a widely neglected field of investigation. The estimated 30% loss of agricultural produce due to insect infestation - from damage both in the field and during storage provides ample evidence of the economic seriousness of this problem in ancient times. Apparently the best preserved pests in archaeological deposits are store-grain beetles, which develop within the grain and may considerably damage stored grains. Since these beetles are found only among and inside grains and seeds, such as cereals and pulses, it is the archaeobotanists who first become aware of their existence during processing their samples. Cooperation between botanists and storage entomologists may, therefore, lead to a better understanding of the agriculture and economy in ancient times. Analysis of the countries of origin of some important stored-grain insects suggests regions and periods which should be investigated in order to trace their dispersal. The beetles belonging to the bruchid family are described in detail as a prototype.

SILICA SKELETONS OF MACROSCOPIC PLANT REMAINS FROM ASH

Mark Robinson and Vanessa Straker

Macroscopic silica remains can survive when plant material is burnt under fully oxidising conditions. They can be used

sometimes to assist estimation of bias in charred assemblages resulting from differential combustion. The composition, structure and origin of silica in plants is discussed, and attempts to reproduce conditions causing silica skeletons showing plant structure to survive are described. Suggestions for retrieval of silica skeletons from archaeological deposits are made.

A NEW METHOD FOR FIXING NON-CARBONISED PLANT REMAINS

Dusanka Kučan

Non-carbonised fruits and seeds from wet habitation layers retain their form if they are not allowed to dry out. When dried prior to photographing, they often split open and shrivel so that they become unrecognisable. These undesirable changes can be avoided by treating the fossil non-carbonised remains with polyethyleneglycol. This procedure has been used for a considerable time in the conservation of wet timbers. Water soluble polyethylene with a molecular weight of 4000 is used in the fixing process. The material is then dried. Fruits and seeds treated in this way retain their natural form and colour and are suitable for documenting by photography. Fossil material from wet situations may also be treated in this way for reference collections and for exhibition purposes.

COPRO ANALYSIS, A NEW CONTRIBUTION TO THE HISTORY OF NUTRITION

Karl-Heinz Knörzer

The subfossil contents of latrines give the best information about the former composition of human food. By comparing the results of the analyses of deposition originating from various, well dated periods, it becomes possible to recognize the varying composition of food. Such a method corresponds to the pollen analysis in many respects and we propose the term "copro analysis" for such a method of analysis.

Two copro analyses of two towns of the Lower Rhine will be demonstrated and the results as well as the difficulties connected with the procedure will be discussed:

1) KÖLN: 1st to 18th century A.D., 4 steps
2) DUISBERG: 9th to 18th century A.D., 9 steps

As the contents of the Cologne latrines were mixed with the refuse of different origin, the lists had to be reduced in order to make them interpretable from the quantitative point of view, too. In the course of the copro analysis from Duisburg which

had been executed in more steps, the first appearance or the disappearance of specimen of food plants and weeds could be more exactly registered temporarily.

THE DETERMINATION OF FIBRE PLANTS IN TEXTILES, CORDAGE AND WICKERWORK

Udelgard Körber-Grohne

The plant taxa are identified from finds from archaeological excavations, dating from the Neolithic to the Middle Ages. It is also shown how this was done, and which characters to look out for. In some cases the processing and manufacturing methods are discussed. The bibliography of the finds includes only representative examples, so it is not comprehensive.

PROBLEMS OF IDENTFICATION OF SEEDS AND FRUITS OF SPELT WHEAT, OATS AND LEGUMES

F. Kühn

In carbonized grains, it is often difficult to distinguish grains of Triticum sestivum and T.spelta. Some prehistorical findings of broad wheat grains determined as Triticum aestivum can be grains of Triticum spelta. Both species have mostly broad grains with broad ovate embryo. With certainty can be determined samples, in which parts of spikes or spikelets are present. In samples of grains of T.spelta often no remains of spikelets are preserved. Grains of T.spelta have sometimes on their bases edges. T.spelta can be determined from rectangular, thick upper ends of he glumes. The base of the spikelet and the rhachis are broad. The link of the rhachis is adpressed to the inner side of the spikelet, but the links are often not preserved. For the determination of T.aestivum, remains of though spike rhachis are important. In burned loam with impressions of glumes. T.spelta can be often easily recognized by the same marks. Often impressions of whole spikelets can be found. In T.dicoccon the links of the rhachis, if present, are in the elongation of the spikelet, and have a thin base, and te glumes are pointed.

In oats, the problem is to distinguish Avena strigosa, A.fatua and A.sativa. The naked grains are in A.sativa often broad/often 2.5-3mm. In thinner grains, grains of A.sativa are on the base comparatively blunt, in A.strigosa sharper/under 45°. The grains of A.strigosa are thick, almost cylindrical, and smaller, 6-7, 8mm long. A.sativa has flattened grains. The sticks of spikelets of A.strigosa have the rhachis above the base of the glumes 1mm long. A.sativa shorter. The differences

between naked grains of A.sativa and A.fatus are small. Broad grains 2.5mm and more belong to A.sativa. In thinner grains, the distinguishing will be certain only if the bases of lemma with horse-shoe or fraction or semiabscission can be found.

In legumes, the problem is to distinguish seeds of lentil and of Vicia sativa v. lentisperma. If the seed coat is preserved, the hilum of lentil is very short, the hilum of Vicia sativa longer, 1/5-1/6 of the circumference. The plumula and its impression on the cotelydons is in lentil longer than 1/2 diameter, in Vicia sativa 2/5 of the diameter.

Spherical seeds of Pisum sativum can be distinguished from seeds of Vicia spp. and Lathyrus spp., if the seed coat with a very short hilum is preserved. If spherical seeds are 5mm in diameter or greater with two hemispherical cotyledons, the seeds are of Pisum sativum.

THE USE OF FISHER'S INDEX OF DIVERSITY, ALPHA, IN PALAEOBOTANICAL STUDIES

D.G. Wilson and D.E. Haddon-Reece

In a seminal paper written in 1943, Sir R.A. Fisher developed a truncated version of the negative binomial distribution, which he called the negative logarithmic series, to compare and quantify assemblages of trapped insects. This series is characterized by an 'Index of Diversity', alpha. It has been applied to various collections of data, not all biological, and, with no justification at all, to fossil seed assemblages. This paper publishes the first empirically derived justification of its applicability to plant macrofossil assemblages. Some ways in which it may be used are shown: e.g. in sub-sampling tests.

In Britain, where the use o formal phytosociological groups is unsuitable for fossil seed assemblages, Fisher's alpha can be used to check the aptness of ecological groupings determined on an ad hoc basis. Data from the fen margin site of Fengate, near Peterborough, is given in the form of a chronological sequence of shifting ecological groups: some half million plant macrofossils are represented in this diagram. The numerical and ecological implications are briefly discussed.

MODELS: THEORY AND PRACTICE

Annie Milles

The paper will discuss the extent to which it was possible to apply models based on ethnographic work to two Scottish sites:

Scord of Brouster (Shetland), a small farming settlement occupied from 2500 to 1500 bc, and Dunadd (Argyll), a Dark Age defended site with royal associations.

"SOME THISTLES AMONG THE CORN"

P.A. Tallantire

A few words of caution on the present state of botanical macrofossil work. Identifications to species level are more and more being made and published simply as lists, with few illustrations and even less in the way of discussion of the criteria employed. If this is because the Palaeoethonobotanist is only an appendix to the archaeologial report, then he/she should prevent appendicitis by publishing details eslewhere.

Interpretations of finds should be left to ecologically-trained botanists. In palaeoethnobotany the tail should wag the dog, not vice-versa. Any particular plant may be, or have been, utilised by man; find context is all-important in reaching a decision. Prehistoric, and even historic, man reacted to climatic change, like the local and regional fauna and flora, often even quicker, and to a greater degree the more ecologically marginal the habitat.

Some consideration must be given to the possible causes of the absence of any species from any assemblage, before final conclusions are reached concerning farming practices, or the composition of past plant communities.

ARCHAEOLOGICAL PLANT REMAINS: COLLECTION, RETRIEVAL AND METHODS OF IDENTIIFICATION

Farooq A. Lone, G.M. Buth and Maqsooda Khan

In order to make palaeoethnobotanical studies more reliable and informative careful attention must be paid towards the collection and retrieval of plant remains from archaeologial excavations. Careful collection must be made from every phase of the site and contamination within the succeeding phases avoided at any cost. Though flotation is one of the most reliable retrieval procedures yet it has been observed that some charred plants get distorted and deformed when immersed in water. Thus in such instances it is suggested that flotation be preceded by mesh screening through various mesh sizes in order to retrieve the larger enough materials without getting mutilated.

The technique of identification of carbonized plant remains is

based on careful comparison of minute details of morphology and anatomy with their extant counterparts. Recent developments in scanning electronmicroscopy have proven very useful in this direction. Our recent SEM studies on extant and carbonized caryopses of Triticum (10 species); Hordeum (5 species); Oryza sativa and Avena sp. have shown that surface patterns, cell alignment and relief can be used as the basis for cell alignment and relief can be used as the basis for comparison and identfication of ancient cereals upto species level. Further size statistics involving various proportional indices can also be helpful in confirming the identification upto species level. Details of SEM and statistical studies are discussed in the paper.

"THE VICIEAE: PROBLEMS IN IDENTIFICATION"

Ann Butler

Many species of the four main genera of the tribe Vicieae have been significant as food resources since the beginnings of cultivation. Apart from the single species of Pisum, and possibly two species of Lens, over a dozen species each of Vicia and Lathyrus are known to have made important contributions since historic times. In the more distant past the numbers may well have been greater. Thus the repertoire of species from amongst which one might need to identify pulse seeds from archaeologial contexts is lare. Over three hundred species comprise the tribe.

The close similarity between the seeds of many of the species can make identification difficult, even in modern material. This problem is far more pronounced in the pulse components of archaeobotanical material, which is charred and frequently has lost many surface features. Identification traditionally has been based upon the size and shape of the cotyledons relative to modern comparatives, less commonly on the surface texture of the testa and morphological characters of the hilum where sufficienly well preserved, and rarely using cell anatomy, all employing observations made under low-power microscopy.

Publications of studies by SEM of the seedcoat in leguminous seeds of recent origin have highlighted the distinctive features in certain species and indicated that high resolution microscopy of seed anatomy might be a technique that could resolve some of the earlier difficulties in idenification.

In this study, a number of morphological and anatomical charcaters of the testa and hilum recorded under optical microscopy and SEM are critically examined for their potential in the separation of seeds of the Vicieae. A more precise identification than as hitherto been possible may be achieved by analysis of an array of such observed characters.

MOSSES FROM ARCHAEOLOGICAL EXCAVATIONS IN MEDIEVAL TOWNS IN EUROPE

Ola Foldøy

Based on analyses of moss layers from medieval excavations in Tonsberg and Trondheim, Norway, a series of different ecological collection habitats can be recognized.

Rich mixed forests, meadows and medium rich fens are well represented. Ombotrophic Sphagnum bogs do not seem to have been utilized at all.

Moss analyses from other Norwegian towns have shown that the same dominant species have been collected everywhere, but a number of less abundant species are local, partly due to climatic factors.

The moss layers are in most cases interpreted as latrine remnants, but the same moss species have been used as insulation material in houses up to modern times.

PALAEOETHNOBOTANICAL RESEARCH IN NORTHERN SWEDEN

Roger Engelmark

During the last years macrofossil analyses of mainly Iron Age house foundations have been carried out at the University of Umea in northern Sweden. The main interest has been focused on the spatial distribution of carbonized plant material within the houses to get an idea of the activity areas i.e. the rooms of the houses. The weed seed composition has been studied for the interpretation of the nature of the crop production. In order to increase the knowledge of, and to test hypotheses on the prehistoric agriculture in the Taiga zone an experimental research farm based on information obtained from excavations of Iron Age settlements in N. Sweden is under construction.

SEEDS AND OTHER DIASPORES IN SOIL SAMPLES FROM DANISH TOWN AND MONASTERY EXCAVATIONS, DATED 700-1536 AD

Hans Arne Jensen

Archaeologically dated soil samples from five localities in Denmark were analysed for content of seeds and other diaspores: Ribe, 9 samples of 8th century date and 14 from 1100-1500 AD:

Om Monastery, 1 sample 1422-1450 AD; Viborg, 8 samples Late Viking - 1200 AD; Kolding, 2 samples 13th century 1500 AD; Black Friars' Monastery, Odense, 8 samples Pre-Medieval 16th century AD.

The analysis results are presented in table 1-9 giving the identified species/genera, the number of "seeds" identified, the percentage of the total sum, and a grouping according to assumed origin of the seeds.

Several samples contained a rather large number of species. The maximum number of seeds was, for all species 6325/litre, and for single species, (Urtica urens) 3776/litre. Table 10 compares the seed record from the sites examined. Among the 215 taxa recorded, 16% were weeds, 13% originated from bogs, swamps and wetlands and 12% from grasslands, 11% were cultivated or collected, 9% were from ruderal soil, 5% from forests and hedges, 3% from heaths, 3% from ponds and lakes, and 2% of maritime origin.

Table 11 summarizes the analysis results, arranged in four periods: 700-799, 80-1049, 1050-1199, 1200-1536 AD. The finds of 45 taxa are the oldest recorded for Denmark. 35 of these were identified to species level. These finds are specifically discussed in the paper.

KEYWORDS: Palaeobotany, macrofossils, oldest finds, cultivated plants, collected plants, weeds, ruderal soil, grasslands, bogs, swamps, forests, heaths, lakes, maritime areas, Germanic Iron Age, Viking Age, Middle Ages, Ribe, Viborg, Øm, Kolding, Odense.

MACROFOSSILS AND THEIR CONTRIBUTION TO THE HISTORY OF THE SPERMATOPHYTA FLORA IN SOUTHERN SCANDINAVIA FROM 13,000 B.P. TO 1536 A.D.

Hans Arne Jensen

Through several years information on finds of macrofossils has been assembled. The results occur in the publication: Catalogue of late- and post-glacial macrofossils of Spermatophyta from Denmark, Schleswig, Scania, Halland, and Blekinge dated 13,000 B.P. to 1536 A.D. Danm. Geol. Unders. Serie A, Nr. 6 (1985).

"The catalogue summarizes published finds of macrofossils from 551 taxa of Spermatophyta originating from 505 sites in Denmark, Schleswig, Scania, Halland, and Blekinge and dated to periods between 13,000 B.P. and 1536 A.D. The information is arranged in one map and three tables. The map shows the position of each find. Table 1 presents the sites by number and name, where the finds are published, their age, the dating method applied, and the media examined. Table 2 lists the finds of macrofossils in

pollen assemblage zones I-IX and the periods Pre-Roman Iron Age, Roman Iron Age, Germanic Iron Age, Viking Age, Early Middle Ages, and Late Middle Ages. Table 3 summarizes by family the finds of macrofossils in these periods."

The information assembled has been rearranged to show the importance of medium examined, life-forms of recorded taxa, assumed origin of the macrofossils, and time of introduction. Factors of importance for the recording of macrofossils will be discussed.

TRACING CROP PROCESSING IN THE BANDERAMIK CULTURE

Corrie Bakels

So far 88 soil samples containing the carbonized remains of plants discarded by the Dutch and Belgian representatives of the Banderamik culture have been analysed. The fairly large number of samples suggests the availability of enough material to allow a reconstruction of some crop processing activities of these early agriculturists. This appears to be only just possible.

Only a few samples contain suitable concentrations of carbonized matter. The data can be split into three categories. The first is a mixture of emmer and einkorn that has not yet been dehusked. The second is composed of chaff. Large quantities of ripe and unripe seeds of Chenopodium album characterize the third category.

The assemblage of data can be reinforced by adding data from the adjacent Rhineland. This results in the same three categories.

The categories hulled wheat and chaff are similar in weed content and weed composition. The chaff must be the result of the dehusking and cleaning of the grain. The wheat may have been carbonized during parching. The chaff may have been burned as fuel or just as undesirable waste. The Chenopodium seeds may be the result of the cleaning of vegetables.

The samples with relatively small amounts of carbonized matter look like "diluted" members of the above-mentioned categories. This implies that, despite the scarcity of samples with high densities of carbonized material, the mentioned practices were very common.

ARCHAEOLOGICAL WORK ON SWISS NEOLITHIC AND BRONZE AGE LAKE DWELLINGS OVER THE PAST 10 YEARS

S. Jacomet

Since 1976 the archaeobotanical laboratory in Basel (Switzerland) has undertaken systematic analyses of plant macrofossil remains from Neolithic and also some Bronze Age lake-shore sites in the context of diverse research projects. Our most important investigation district is the region of the city of Zurich, where several large salvage excavations have taken place over the past 10 years. This area was densly settled during the Swiss "Lake-Dwelling-Neolithic" and some stages of the early and late Bronze Age.

Botanical investigations were also carried out on material from lake-shore sites in other areas of the Swiss plateau, e.g. Lake of Bienne (sites: Twann, Port-Studeli), Lake of Zug (sites: Cham-St.Andreas, Zug-Vorstadt), Lake of Constance (site of Sipplingen-Osthafen) and Lake of Greifensee (site of Storen-Wildsberg; see map).

Our main research goals are as follows:

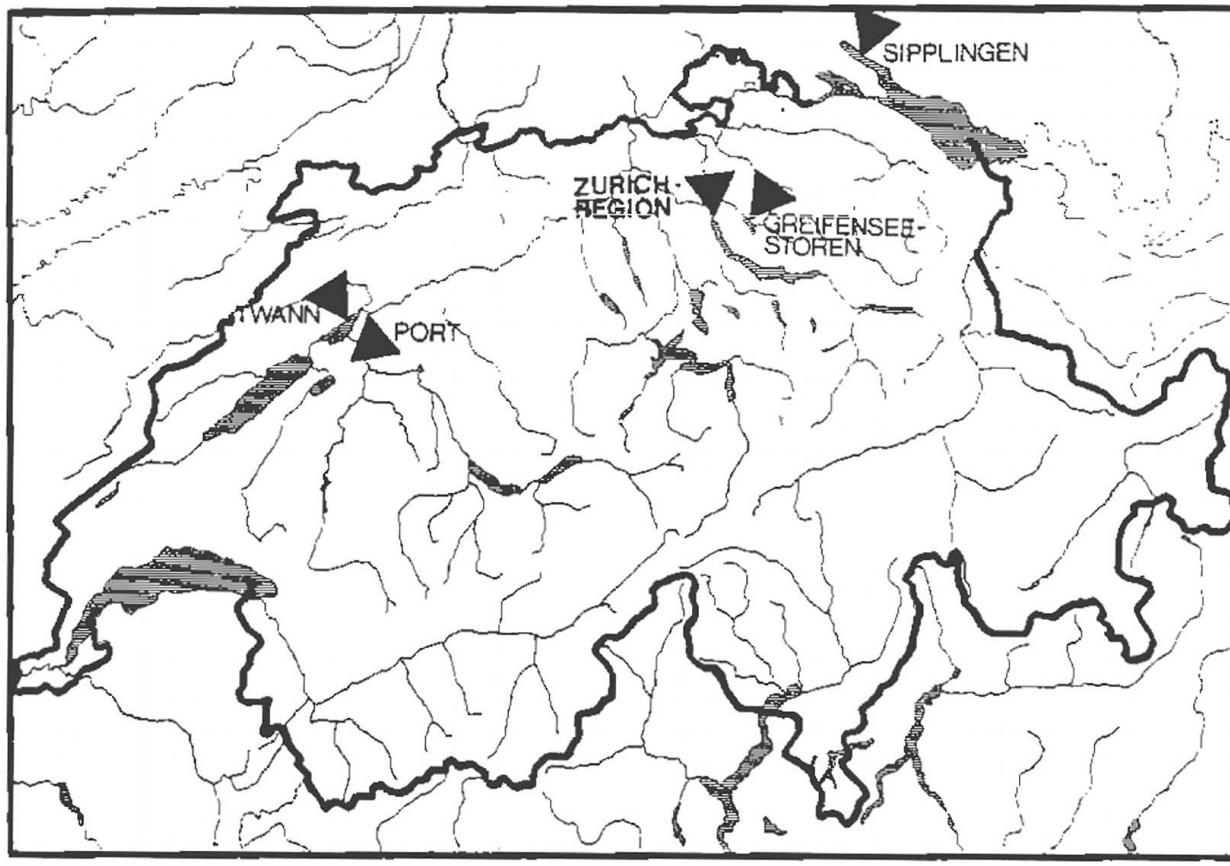
1. Investigation of the economic basis of the sites.
2. Investigation of the formation of the cultural levels.
3. Investigation of the post-glacial lake level oscillations.
4. Examination of the morphology of the plant macrofossils.

The state of preservation even of the uncarbonised plant material in the sites' waterlogged sediments is generally excellent. So, the research possibilities on many of the above mentioned points are much better than for sites above the ground water level.

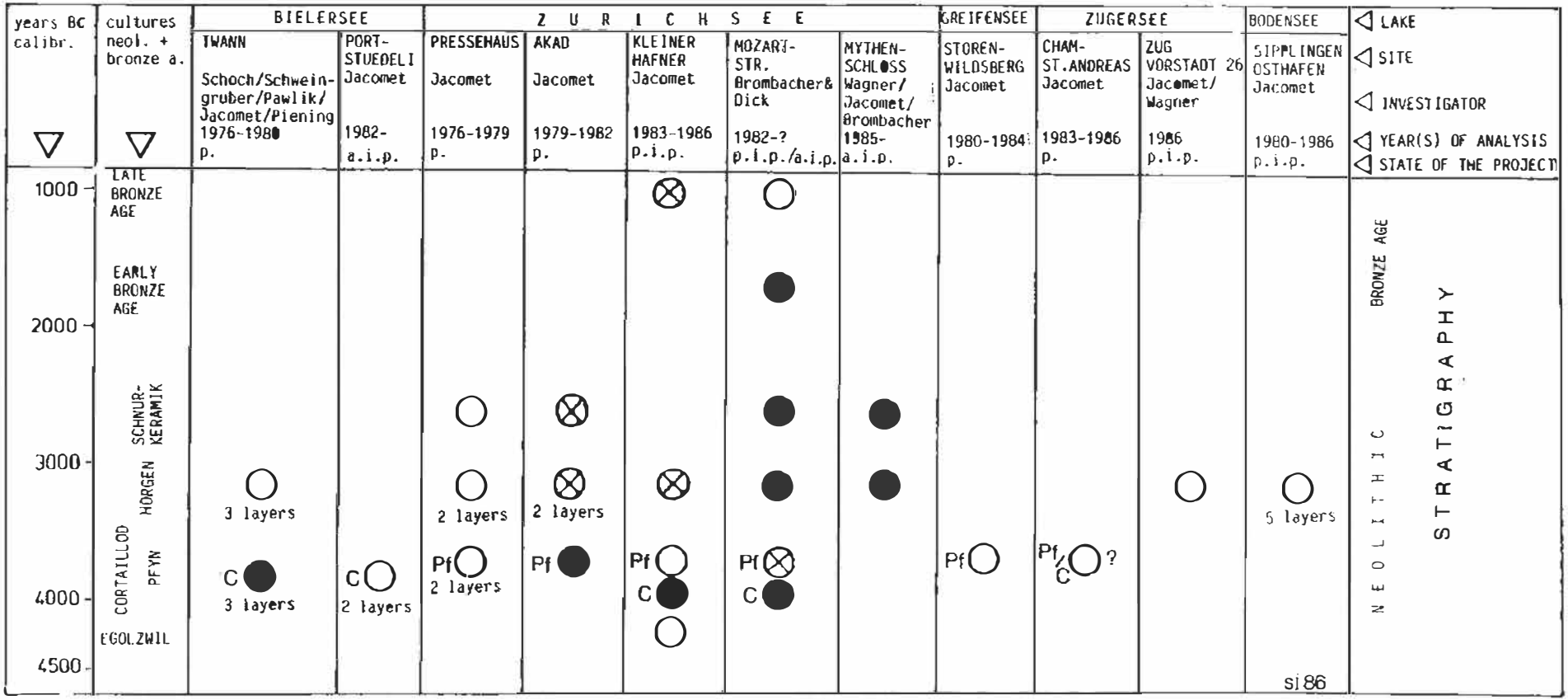
We are gradually amassing information about the way of life of our Neolithic ancestors in the Swiss plateau region. Up to now, we have investigated 11 sites with over 30 cultural levels (see illustrations), involving the analysis of over 1000 samples which have yielded over 400 plant species. Prior to our investigation ca. 18'000 cereal remains had been analysed from modern (post-war) excavations at Swiss lake sites; today the figure is in close to 200,000, which gives an idea of the breadth of our research.

However, there are still large gaps in our knowledge, as nearly each new excavation of a site yields in some respects new and surprising results. Therefore, it is very important to continue the sysematic botanical examinations of lake dwelling levels that are very rich in plant remains. Although there are no permanent positions for archaeobotanists in Switzerland, we are optimistic that we can continue our work by means of limited

LOCATION OF THE BOTANICALLY INVESTIGATED SITES IN SWITZERLAND



SITES AND CULTURAL LEVELS THAT HAVE BEEN THE OBJECT OF BOTANICAL ANALYSES IN BASEL UP TO THE PRESENT



caption:

Pf.: Pfyn-culture / C. : Cortaillod-culture / p.: results published /

p.i.p.: publication in preparation / a.i.p. : analysis in progress /

⊗ = level not investigated

● representative investigations; over 50 samples analysed, from various parts of a site; generally from large excavations.

○ : not representative investigations; only a few or very small samples analysed due to:

- bad state of preservation in the sediments
- only a limited salvage excavation without the possibility of taking more samples
- other difficulties....

The points (● and ○) give only an idea of the approximate (and not the exact) dating of the investigated levels.

Cortaillod and Pfyn cultures: The so called "classic"-Cortaillod-culture is "typical" for the western part of Switzerland; only the very early stages of Cortaillod-material culture are found in the region of Zürich, which are the eastern-most Cortaillod-sites in Switzerland. In the easter part of Switzerland, as in the Zürich-region, early Cortaillod-sites are followed by Pfyn-culture sites

contracts from various archaeological agencies.

Project directors: Prof. Dr. H. Zoller, Dr. Stefanie Jacomet
Collaborators: Christoph Brombacher, Martin Dick, Christian Wagner

Labor fur Archaobotanik
Botanishes Institut der Universitat
Schonbeinstrasse 6
CH-4056 BASEL

English translation: Patrick Vaughn

THE UNDERGROUND STORAGE OF GRAIN - PRINCIPLES, PRACTICES AND IMPLICATIONS

Peter Reynolds

Since 1962-3 a continuous programme of research has been in train exploring the technology of the storage of grain in underground silos replicating the evidence of Iron Age pits. The principle objectives have been to determine whether it is possible to store grain in this way in the current climate, determine the parameters for successful storage and to attempt to determine the potential period a pit can remain functional. The analysis of the storage micro-climate with post storage analysis of fungal infestation and germinability have been utilised to determine success and failure. Similarly functional traces in so far as such may affect the interpretation of archaeological data concerning both the stored material and the container have formed a major focus of the programme. Variables examined include different geologies, pit shapes and linings, pre and post storage pit treatments and grain types stored. An overview of the last twenty years of research will be presented with conclusions and implications drawn from the data as sustainable at this time. This is an ongoing research programme at the Butser Ancient Farm Project Trust in Hampshire.

EARLY CROP PRODUCTION AND WILD PLANT RESOURCES IN THE COASTAL AREA OF ESSEX, ENGLAND

Peter Murphy

Two aspects of the palaeoethnobotany of this area are discussed: evidence for changes in staple crop production through time, and the role of plant products in the coastal economy. Neolithic to Middle Bronze Age production seems to have been based on Triticum dicoccum, T.aestivum and Hordeum sp. Triticum spelta and Vicia faba var minor are first recorded from the late Bronze Age, but T.dicoccum remained an important crop until the Middle Iron Age. The earliest recorded seeds of Pisum sativum came from an Early Iron Age context. Cultivation of glume wheats continued into the Early Saxon period, but by Saxo-Norman times these crops had been replaced by free-threshing wheats and Secale cereale. Evidence is presented for the exploitation of salt marsh and mudflat plants and for the use of crop-cleaning waste in the salt-producing industry. Assemblages of plant remains from a prehistoric coastal settlement site are discussed in detail, and the economic function of the site is assessed.

PROBLEMS OF RECOVERING, RECORDING AND INTERPRETING PLANT MACROFOSSIL REMAINS FROM URBAN ARCHAEOLOGICAL SITES - SOME RECENT EXPERIENCES AT YORK

Allan Hall

Urban archaeological deposits are often very rich in plant remains, but there are considerable problems in deciding a strategy that will provide the maximum amount of information archaeological and botanical - for the minimum amount of effort, given limited funding. Work at a number of recent excavations at York, England suggests that detailed analyses of samples, involving accurate counts of numbers of fossils, may be unnecessarily time-consuming and limits the number of samples that can be examined. A more extensive, semi-quantitative approach to recovery and recording is advocated, on the basis of work on some 500 archaeological contexts at the Coppergate site. Some preliminary results, including computer-drawn distribution maps of palaeobotanical finds, are presented for the Anglo-Scandinavian deposits from Coppergate, together with a brief discussion of some problems of interpreting the observed evidence.

UNDERSTANDING PAST BRITISH WEED COMMUNITIES: DOES PHYTOSOCIOLOGICAL ARRANGEMENT HELP?

James Greig

European archaeobotanists have often arranged their plant lists in likely plant communities according to phytosociological grouping. Most of the weed taxa concerned have also been found in Britain, and this paper explores the usefulness of this approach to British results.

Large and diverse weed floras, charred and waterlogged, have been found in Roman wells at Tiddington, near Stratford-upon-Avon in the English midlands. These have been arranged phytosociologically into communities.

This system provides a useful framework for studying such weed communities, particularly as the continental phytosociologists have considered the past as well as the present plant communities. Few plants, however, grow in rigidly defined habitats, and with the uncertainty about the exact conditions that there were on archaeological sites, a flexible and cautious approach is necessary. Some of the most ubiquitous weeds are just that.

THE RESULTS OF A PRELIMINARY ANALYSIS OF THE GUT CONTENTS OF THE LINDOW MAN FOCUSING ON THE IDENTIFICATION OF WATERLOGGED CEREAL BRAN FRAGMENTS

T.G. Holden

The body of the Iron Age man was discovered during peat cutting operations at Lindow Moss, Cheshire, England. The preservation of this corpse was such that, not only were the external features preserved but also a length of the intact gut comprising of the stomach and the upper small intestine. The contents of these were removed and examined. The meal was found to be composed in the main, of finely ground cereal chaff fragments and bran. No whole cereal caryopses were recovered so identification of these tiny fragments of bran had to be based on the arrangements of cells within the layers and on the relative orientation of cells seen in adjacent layers. On the whole the transverse cells often seen in charred archaeological specimens of cereals were not present, identifications therefore had to be based on the layers of the spermoderm and the persiperm. By using these techniques it proved possible to identify wheat/rye, barley, oats and brome grass however more work is required in order to study the full extent of variation between different populations of these species and any areas of overlap between the different species.

CROP PLANTS IN EARLY CHRISTIAN IRELAND: THE EVIDENCE FROM CHARRED PLANT REMAINS

M. Monk

Until recently, a relatively small amount of archaeobotanical work has been carried out on crop plant remains from Irish archaeological sites. This situation is now changing, particularly for the Early Historic period (400-1200 AD). The paper begins by providing possible explanations for the pastoral bias in the perception of Irish agriculture for this period, then proceeds to outline the archaeobotanical evidence for crop husbandry to suggest a more balanced view.

The preliminary results of the speaker's intensive sampling programme in a ringfort in N. Co. Cork are discussed to further put the general evidence into perspective but also to demonstrate the necessity for more such detailed studies from Irish sites.

AN EXAMINATION OF THE CONTENTS OF LINDOW MAN'S STOMACH WITH ELECTRON SPIN RESONANCE SPECTROSCOPY

G.V. Robins

We have already described how electron spin resonance (esr) spectroscopy can be applied to the thermal profiling of archaeolgical cereal grains and we now report an extension of this method to samples of grain and chaff obtained from Lindow man. A comparison of the esr parameters of chaff obtained from the stomach and modern chaff samples heated to various temperatures suggest that the grain was eaten in the form of bread rather than porridge or gruel, and that the bread was in the form of an unleavened griddle cake rather than leavened bread. Similar data from grain derived from Graubelle man are also discussed.

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CONNECTIONS BETWEEN PALAEOENVIRONMENTS AND PALAEOETHNOBOTANY IN COASTAL BRITISH COLUMBIA

Rolf W. Mathewes

Western red cedar (Thuja plicata) was technologically the most important plant for Northwest Coast indian tribes. Bark, roots, and fine branches were fashioned into clothing and implements for hunting, fishing, and gathering; but the straight-grained, rot-resistant wood was the basis of the most conspicuous and celebrated components of the Pacific Northwest Coast cultures. The presence along the coast of tall and massive red cedar trees ultimately led to the development of "massive woodworking" technology, employing whole logs for construction of seafaring canoes, massive house posts, totem poles and mortuary posts. Split cedar planks and adzed beams were widely used for construction of large habitations. Until recently, the environmental setting for the development of these cultural traditions was poorly known. Postglacial pollen and plant macrofossil studies during the last decade now allow a comparison of cedar history, artifact chronologies, and paleoclimatic changes.

A strong correlation exists between the immigration and expansion of red cedar (6000 to 2500 B.P. and the evolution of massive woodworking technology as suggested by artifact records. Specialized woodworking tools such as adzes do not appear until after 5000 years ago. The first direct evidence of large wooden habitations occurs about 3000 years ago. Full-scale massive woodworking, characterized by mauls together with antler and wood wedges is well established by 2500 years ago, when large, mature cedar trees were probably common.

The absence of red cedar between deglaciation and about 6000 B.P. is probably due to climatic factors. An early Holocene xerothermic interval with increased fire frequency has been defined between 10,000 and 7000 B.P. Cedar is very fire-susceptible, and was thus largely prevented from expanding its range during this interval. The period of cedar expansion after 6000 B.P. correlates with evidence of climatic deterioration, leading to extensive paludification along the central and northern coast of British Columbia. Radiocarbon dating and pollen analysis of peats on the Queen Charlotte Islands confirm the spread of blanket bog between 5000 and 4000 years B.P. A cultural change from the "Moresby Tradition" to the "Graham Tradition" occurs during this period of climatic change.

It thus appears that climatic factors controlled the spread of western red cedar trees in coastal British Columbia, and that the availability of this basic resource in turn constrained the development of the famous woodworking cultures of the Pacific Northwest.

PALAEOETHNOBOTANICAL STUDIES IN NORWAY - WITH SPECIAL REFERENCE TO MEDIEVAL CITY EXCAVATIONS

Kerstin Griffin

During the last 15 years there has been an increasing interest in Norway in the environmental aspects of the living conditions of medieval people. Deposits of medieval age or older are protected by law. Before a destruction the deposits (or sites) have to be properly excavated. In connection with several excavations in medieval towns analyses of soil samples have been done. A general description of the sample as to its content of sand, gravel, wood, plant debris, animal remains, etc. has been done. Plant macrofossils have been used especially for classification of organic material, such as latrine deposits and dung. Important results of the botanical analyses are:

1. Documentation of the presence and introduction of the common cultivated plants during the medieval period in Norway; these include wheat, oats, rye, barley, horsebeans, peas, flax, hemp and hops. Accompanying these plants were also many field weeds and other ruderal plant species.

2. Documentation of imported plant products, such as figs, grapes (raisins), walnuts, spices, and also cereals; bear witness to an extensive trade.

3. Analyses of refuse layers and latrine deposits document the extensive use in the diet of local wild fruits and berries like hazelnuts, cherries, rowanberries, sloeberries, raspberries, cloudberries, bilberries, red whortleberries, and rosehips.

4. Aid in the interpretation of deposits (latrine deposits, dung) and the use of constructions (stables, living quarters, etc.).

REMARKS ON THE VARIATION OF THE FOSSIL AND CONTEMPORARY NUTS OF CORYLUS AVELLANA

R. KOSINA

A general question reads: does Corylus avellana demonstrate a continuous polymorphism or are there populations characterized by a discontinuous variation caused not only by a spatial isolation but also by existing in this species a cross-incompatibility. Comparative investigations are based on a nut morphology. It was described by measurements of twenty characters made for one mesolithic sample, one medieval sample , several samples from individuals/ trees/,several samples from the natural populations in Poland as well as for the materials demonstrating a range of variation of the present-day hazel and sent by various Botanic Gardens and Aboretums in Europe. It may be proved that two fossil samples are representative of two localities.

A small variation / V < 10% / was ascertained for the nut characters i.e. length, width, width of of cicatrix carpica, shape of nut, shape of cicatrix carpica. The populations in relation to the individuals showed the greatest increase of variation in characters i.e. dimensions of cicatrix perigonii, nut shape and cicatrix carpica shape. Character relationships were studied by means of Pearson's and Spearman's coefficients of correlation as well as of Hotelling's principal components. The dimensions of cicatrix carpica as well as a width of its characteristic rim are strongly correlated with the nut dimensions. Such correlations are not demonstrated by the cicatrix perigonii dimensions. The character loadings in two principal components after Varimax rotation are presented grapically for the mesolithic sample and for the sample from natural population in Wroclaw. The informative value of the nut characters was estimated for the fossil and separately for the contemporary materials by means of multiple regression analysis. The sets of eleven and twelve characters were selected for the presentation of the investigated materials among two canonical variates. Using the Wilks's lambda the greatest discriminative value was stated for the following characters i.e. nut shape, length of cicatrix carpica. width of cicatrix perigonii, width of cicatrix carpica rim, shape of cicatrix perigonii. Along the axes of two canonical variates the great differentiation for the separate trees as well as the significant differences between the means of canonical variates for three samples: mesolithic medieval, and contemporary were ascertained. However, the variation of the last three samples covers itself in a large extent. The present-day forms/trees/demonstrate the large differentiation in respect of the cicatrix perigonii dimensions and the width of cicatrix carpica rim while the contemporary

populations do the same in a gibbosus height and width of cicatrix carpica rim. In a small degree it suggested the discontinuity of populations. It seems proper to establish the nut features linked with the self- and cross-incompatibility genes such as it was stated by Thompson for the red pigmentation of nut. However, some characters are slightly accessible in fossil material e.g. the dimensions of cicatrix perigonii.

MITTELALTERLICHE PFLANZENRESTE AUS MAGDEBURG UND DEM ZISTERSEISERKLOSTER SEEHAUSEN BEI PRENZLAU

Elsbeth Lange

Karten mittelalterlicher Pflanzenfunde weisen das Gebiet der DDR besonders hinsichtlich der Obst- und Gemüsearten als praktisch fundleeren Raum aus. Mit der Bearbeitung des Materials von Magdeburg und Seehausen ist nun der Anfang gemacht, diese Fundlücke allmählich schließen zu können.

Die Stadkerngrabungen in Magdeburg (vom Ende der 40er bis in die frühen 70er Jahre) erbrachten verkohlte Funde von Kulturpflanzenarten (9 und 10 Jh., in denen je viermal Triticum aestivo-compactum, Secale cereale bzw. Pisum sativum dominieren, wahrend Avena sativa nur in einem Fund vorherrscht und Hordeum vulgare lediglich in einigen dieser Fundkomplexe in geringer Kornzahl enthalten ist.

Aus jüngeren Straten (11. bis 13./14. Jh.) stammen unverkohlte Steinkerne kultivierter Prunus-Arten und von Junglans regia sowie Kerne von Malus cf. domestica und Vitis vinifera. Unter den Sammelarten sind Corylus avellana, Prunus spinosa und Sambucus nigra häufiger belegt als Humulus lupulus und die Rubus-Arten. Aus einem in die Wende des 12./13. Jh. zu datierenden Schnitt liegen drei unverkohlte Samen von Cucumis sativa vor.

Aus der Uferone vor dem Kloster Seehausen sind von Tauchern in großer Zahl Gefäße geborgen worden Prunus-Arten, Cornus mas, Mespilus germanica und Juglans regia. In den Sedimenten des Klosterbrunnens konnten Samen von Ficus carica nachgewiesen werden.

CURRENT STATUS OF INDIAN PALAEOETHNOBOTANY

M.D. Kajale

This is an attempt to review the recent work on Indian archaeological plant remains occurring in the form of carbonised and uncarbonised grains, husks, impressions, etc. The materials have been recovered from sites ranging in age from c. 3rd millennium B.C. to the Late Historical period. They span various cultural periods such as pre-ceramic and ceramic Neolithic, pre-Harrapan, mature Harappan and post-Harrapan, Deccan Chalcolithic, Northern Chalcolithic, Megalithic, Satavahana and Early Historical phases. The author has recovered a major amount of data by applying different forms of laboratory and field flotation techniques and a sitewise catalogue of Indian archaeological plant remains is being prepared. It spells out more than sixty plant species distributed over more than eighty sites. Besides enabling us to understand the phytogeograpical distribution of different wild and cultivated species in ancient India it also provides a factual evidence for the development of India's highly diversified agricultural system. This system has evolved capacity to accommodate not only indigenously domesticated plant species but also the ones introduced from Western Asia, Africa, Southeast Asia. and South America.

LANDSCAPE ARCHAEOLOGY IN HAMPSHIRE: THE PLANT MACROFOSSILS

F.J. Green

The paper will concern itself with the specific project work that is currently being undertaken by the Test Valley Archaeological Trust, in respect of examining the medieval rural landscape from the evidence of plant remains recovered from sites of the Saxon period.

Material from all Saxon rural settlement sites so far excavated in Hampshire will also be considered, along with the implications of projected future work. This will be contrasted with the body of available data from the urban centres of Winchester and Hamwic (Southampton).

BOTANICAL STUDIES FROM ORCADIAN BROCHS ESPECIALLY HOWE OF HOWE

Camilla Dickson and J.H. Dickson

Excavations at Howe of Howe (National Grid Reference HY 2760 1093) revealed a complex series of settlements which spanned the whole of the Iron Age period and which were preceded by two phases of Neolithic activity (Carter et al. 1984).

Neolithic

Phase 1. Tomb of Orkney - Cromarty type.

Phase 2. New Tomb similar to Maes Howe but smaller.

Iron Age

Phase 3. Early activities; settlement. 2405 75, 2420 55

Phase 4. Settlement rebuilt. 2305 60

Phase 5. Roundhouse and ring-fort. 2380 50, 2405 70

Phase 6. Later roundhouse or early broch.

Phase 7. Broch tower and village. 2070 50, 1670 65

Late Iron Age/Pictish Period

Phase 8. Early settlement. 1565 45, 1450 50

Nearly 500 samples were examined for plant remains; most were of carbonised material floated and sieved at the site, 36 samples were sieved in the laboratory. this detailed sampling has produced more than 80 taxa of flowering plants and mosses allowing the palaeoethnobotany to be reconstructed in more detail than from any other comparable site in Scotland.

Pollen analyses show that the local scrub woodland was largely cleared and pastoral farming established before Phase 2.

Hordeum (barley) was recorded from the earliest settlement (Phase 3). Certain evidence for H. vulgare var. nudum (naked six-row barley) dates from the roundhouse occupation (Phase 5)

and continues through to the end of the Pictish settlement (Phase 8). The ears of naked barley were probably plucked, dried and hand-rubbed. Whole ears were recovered from the early Phase 7 fire in the broch tower where grain was dried and parched and ground into flour or meal. Some grain was cooked whole in broth or gruel. From late Phase 7 H. vulgare var. vulgare (hulled barley) partly replaced naked barley and was probably used as flour or meal. Avena fatua (wild oats) was found in Phase 7 contexts and Avena (oats) may have been cultivated by later Phase 8. Linum usitatissinum (flax) seeds were recorded from early Phase 8 onwards. Fruits or Empetrum (crowberry) Vaccinium uliginosum or V. vitis-idaea (bog whortleberry or cowberry) were collected in later Phase 8. Plants with ancient medicinal uses are Rumex (docks), Ranunculus ficaria (lesser celandine), Juniperus (juniper), cf.Scutellaria galericulata (cf. skull-cap) and cf. Lamium (cf. dead nettle).

The main roofing timbers were probably of conifer driftwood; Larix (larch) and Picea (spruce) were identified. Turf may have been used for gable ends and straw thatch was probably used in whole or in part. Salix (willow) was used for smaller roofing wood and for furnace fuel. Betula (birch), Fraxinus (ash) and Alnus (alder) may have been used in building and part of a container made of alder was recovered. A striking decrease in wood after Phase 7 is tentatively linked with exploitation for industrial use. A Calluna (heather) basket was found and heather was commonly used probably for a variety of purposes.

Brackish water sea-shore plants were collected, perhaps for animal bedding and fodder. Water supplies from Phase 7 onwards were probably from a loch or a pond. Burnt dung indicates that milk-fed animals were housed in the SW and S buildings during part of early Phase 7; the SE building was domestic. More tentatively, it is suggested that the early Phase 7 broch tower and early Phase 8 stalled buildings were used by both man and animals.

Reference

Carter, S.P. et al. 1984. Interim report on the structures at Howe, Stromness, Orkney. Glasgow Archaeological Journal 11,61-73.

RIVERINE PLANT FOOD ECONOMY AT LATE PALAEOLITHIC WADI KUBBANIYA IN UPPER EGYPT

Gordon Hillman, Ewa Madeyska and Johnathan Hather

The cluster of Middle and Late Palaeolithic sites in Wadi Kubbaniya achieved particular prominence through the excavators' publication of their finds of domesticated cereals and pulses which were suggested to be contemporaneous with wood charcoals and artifacts of Palaeolithic date. Work by the present authors has since revealed that a) the cereals were uncharred and recent, and that b) genuinely charred specimens previously identified as domesticated pulses are,in fact, wild species of food plant which were likely to have been gathered from local natural Nilotic vegetation.

The charred remains of these wild plant foods were recovered both as loose specimens and as constituents of charred fragments of coprolites of apparently human origin. They were concentrated in and around the ancient camp fires of sites on dune-tops overlooking what was a large Nilotic lagoon, and they were accompanied by high concentrations of wood charcoal, fish bones, charred remains of waterfowl faeces and by stone tools which included heavy grinding equipment. All were set amongst calcified fossil stumps of Nile-bank trees, shrubs and, lower down the dunes, swathes of fossil Phragmites stalks.

The plant and bone remains appear to reflect a typical riverine/lacustrine pattern of subsistence, and they include a range of those charred parenchymatous plant foods so rarely recovered from archaeological sites outside the arid zone. Most abundant were charred tubers of a member of Cyperaceae. Detailed anatomical studies of both the ancient specimens and a broad spectrum of equivalents have confirmed the tubers to be of Cyperus rotundus, though with perhaps with some tuber fragments of a second member of Cyperaceae (Scirpus maritimus?) which has not been distinguishable from morphological examination alone. Charred fragments of several other types of parenchymatous tissue have been found in the same samples, and anatomical / histological reference studies of modern specimens are being undertaken (by J.H.) to try and resolve the problem of their identity. These histological studies have begun with edible tissues from the rhizomes, corms and tubers of indigenous taxa such as Phragmites communis which ethno-historical records reveal to have been important foods amongst non-agrarian peoples exploiting swamp and river-bank resources in recent times.

Other plant food remains include a charred receptacle of a

possibly extinct member of the Nymphaceae, charred fragments of the sugary pulp of the fruits of the Dom Palm Hyphaene thebica and a number of poorly preserved seeds including an endocarp fragment of Balanites (?). Embedded within the charred fragments of putatively human faeces were seeds of Scirpus maritimus and a member of Compositae - tribe Anthemidae together with a broad array of finely comminuted fragments of leaf/stem epidermis and various parenchyma tissues, sometimes with vascular strands which may ultimately allow identification of the parent tissues.

Identification of the many classes of parenchyma and epidermis fragments, (particularly those in the faeces) clearly requires years of work and the use of novel criteria - both histological and chemical.

AGRICULTURE IN THE FENS: THE PLANT REMAINS FROM STONEA

M. van der Veen

In this paper I will discuss the plant remains found at Stonea, a Roman settlement ca. 50 km north of Cambridge. (The settlement also yielded small plant assemblages from the late Bronze Age and Saxon periods). The results of the analysis will be set against the few theoretical frameworks that are now available for assessing activities like consumption versus production.

In this paper I will mainly try to get a discussion going on the following points:

do we expect large quantities of grain on consumption sites or on production sites?

- on which site do we only expect the fine sievings?
- how many cereal culmnodes do we need in relation to glumebases and rachis internodes to be confident about identifying threshing remains?

do the hulled wheats (emmer and spelt) get traded in their spikelets or not?

- what is the evidence for spelt being traded in the spikelets?
- to what extent can we answer the question of consumption versus production from the internal characteristics of the plant assemblage itself?

Ulrich Willerding, Göttingen/D

Palaeo-ethnobotanical researches on houses from medieval and early modern times

This paper deals with some moreless new aspects of palaeo-ethnobotanical possibilities in order to investigate the economical and ecological structures of ancient times. There are some different types of plant remains from old houses from medieval and early modern times. They come from several parts of the Federal Republic of Germany.

1. W e l l e r h o l z (findings dated since 16. century): Straw of rye is twirled around chips of timber from the ceiling of houses. This material allows to draw conclusions on the methods of harvesting, the extent of plantgrowing and the productivity of *Secale cereale*. Within the straw occur also some weedplants, such as *Agrostemma githago*, *Centaurea cyanus* and *Fallopia convolvulus*.

2. Plant remains from F e h l b ö d e n (findings dated since 14. century). In the hollow between the ceiling of one story and the floor of the next one sometimes also plant remains are to be found. Mostley they come from threshing. Numerous are the remains from *Avena sativa*, *Secale cereale*, *Triticum aestivum* and *Linum usitatissimum*. One can find different forms of these cultivated plants, especially from flax. Here appears also a high amount of seeds of weeds. And there are remains of plants from grassland, marsh or heath, too.

3. Imprints of plants in H ü t t e n l e h m : In the loam of the walls of early houses imprints of spikes of *Secale cereale* are to be met (since 10. century). Common are imprints of straw.

4. Plant remains from G e f a c h e l e h m : In the loam of half-timbered houses often original remains of some plant species are to be found (dated since the late medieval time). Common are the remains of *Secale cereale* and the S c h e b e n of *Linum usitatissimum*. These remains of flax show, where the manufacturing of flax to get fibres was in use.

In the Gefachelehm often basketwork occurs (dated since the late medieval time). The stiks come especially from *Corylus avellana* and *Carpinus betulus*. These stiks and some ikonographical sources from fences made of basketwork show, that in the medieval time coppics were widespread.

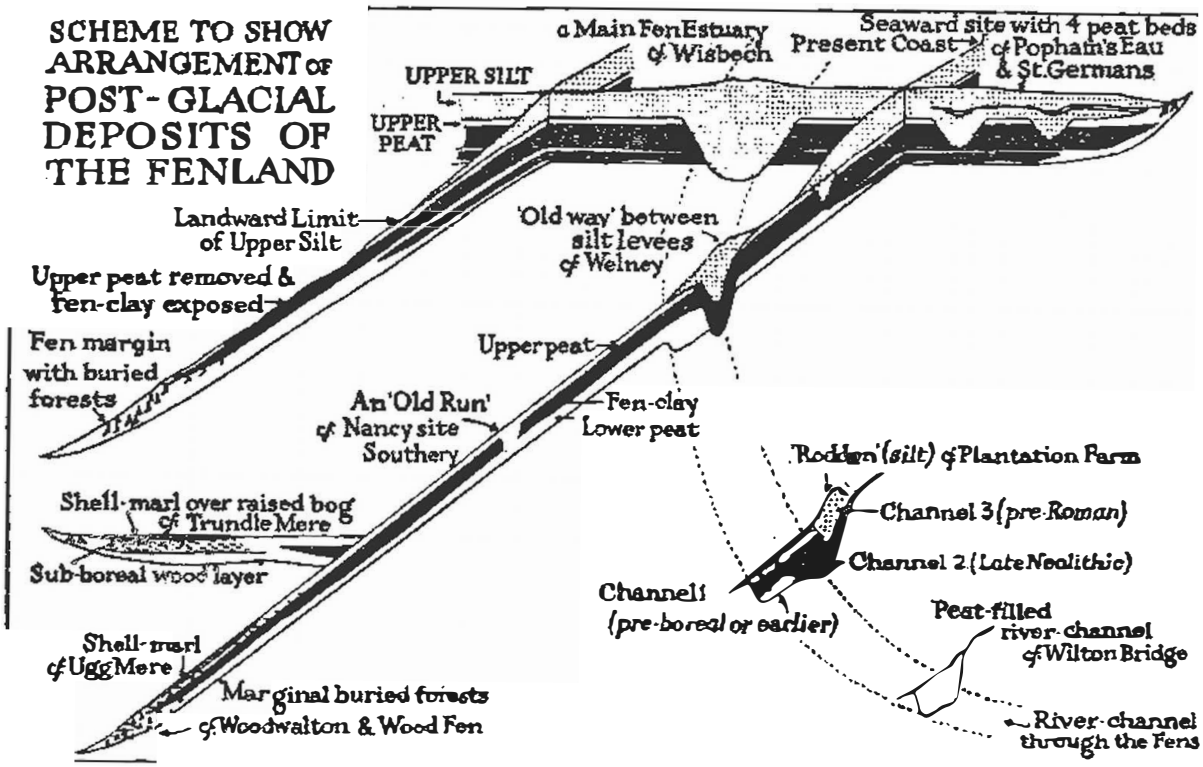
EXCURSION NOTES

The Flag Fen and Etton Sites

The site at Flag Fen was discovered in 1982 during a survey of buried landscapes revealed along the cleaned sides of Fenland drainage ditches, or dykes. The site is entirely buried beneath peaty alluvium, and nothing is visible on the surface. Boreholes suggest that it may occupy an area of about one hectare, however. Calibrated radiocarbon (I date) suggests it was built around 800 BC in the Late Bronze Age. It was situated near the centre of a narrow strait, just off the Fengate "foreshore", or Fen-edge. So far one building has been discovered: it is three aisled, ca. 6m. wide, rectangular and over 20m long. Two floor levels have been excavated. The floors were thickly dusted with coarse white sand, in which were many potsherds, a few flint flakes and animal bone. The sand has also produced cereal pollen. Away from the house the platform was constructed on a layer of carefully laid timbers, in turn capped with brushwood. The edges of the site were marked by a perimeter track or walkway structure which probably served to hold the whole structure together.

The causewayed enclosure at Etton sits on the eastern edge of the well-known Maxey complex of cropmarks, which includes a large number of Neolithic and Bronze Age sites and features. It was probably built around 3700 bc, but C14 dates are still being processed. Pottery is decorated and in the Mildenhall tradition of the Middle Neolithic (as excavated by Clark et al and published in PPS 1960). Pottery of this type has been found at other causewayed enclosures in S. Britain. The site is partly waterlogged and the interior has been protected from plough-damage by a thick deposit of alluvium. Pollen suggests that the interior of the site may have been used for the growing of cereals, and there is good evidence that the area was not covered with dense forest. The nearby sites at Etton Woodgate I and II date to the years immediately before (we think) and after the causewayed enclosure itself. Both were waterlogged and have provided important environmental deposits. Over an acre of the interior has been stripped and excavated, and will be visible in April '86.

F. Pryor



g. 9. Purely diagrammatic scheme to shew the general lines on which the Flandrian deposits of the English Fenland are arranged.

THE FENLAND

The Fens, which cover an area of some 2,500 square miles, extending from Lincoln to Suffolk and from Cambridge to Kings Lynn, form a highly distinctive region, characterized by flat, open landscapes and wide horizons. It is one of the richest agricultural areas in England, a man-made landscape with its isolated farmsteads, ditched fields, straight roads and dykes, largely the result of intensive drainage work in the 17th. and 18th. centuries.

Geologically it is a shallow basin floored with Jurassic clays, bounded to the east and south by the Chalk hills of Norfolk and Cambridgeshire and to the west by Jurassic limestone uplands. Into this basin converge numerous river systems draining the upland (the Great and Little Ouse, the Cam, the Nene, the Welland etc.). The area was not glaciated during the Devensian (last) glacial period of the Quaternary, but fossil floras preserved in the gravel terrace deposits of these rivers on the margins of the Fens, particularly at Cambridge, Earith and St. Ives, dated to between 40,000 and 18,000 years ago give evidence of a rigorous periglacial climate at that time.

During the early Post-glacial, sea level was still much lower than today and the southern North Sea occupied by freshwater fen. However, as sea level rose and drainage became less effective, peat formation in the Fenland basin, at first (c.5,000 4,000 BC) restricted to the larger valleys, became more general. It was at this time that woodland, with oak, pine, birch and yew, flourished in the Fens. As the ground conditions became wetter, these forests were swamped, and their trees were first killed and then often preserved by the accumulating peat. The trunks ("bog oaks"), very hard and often of considerable size, are a great nuisance to farmers and they can often be seen ploughed out and heaped up at the side of the fields.

By Neolithic times the North Sea had reached its present size and peat growth had spread over most of the basin, but between about 2,700 - 2,300 BC a marine transgression took place extending over much of the area and depositing a thin layer of blue-grey, buttery 'Fen Clay' over the peat. At this time we must envisage the Fens wih brackish swamps, tidal mudflats and lagoons periodically flooded by the sea. Human settlement was concentrated on the drier fen edge or on islands.

When the sea receded, peat formation resumed ('Upper Peat') with the area returning to reed and sedge swamp, willow and alder carr and with mixed-oak woodland on the driest areas. The researches of the late Sir Harry Godwin have also show that large raised bogs, with Sphagnum and heather, began to develop particularly along the western edge of the basin. At

about the same time Bronze Age peoples became established and clearly found the new conditions attractive for settlement. Numerous cemeteries of barrows, now showing up as circular patches of lighter soil in the black peat, are found, especially at major Fenland river junctions.

From towards the end of the second millenium BC cooler wetter and more unsettled conditions prevailed. When tracks became waterlogged and impassable they were superceded by wood trackways constructed across the swamps. A fortified Iron Age settlement was founded at Stonea near March. Also at this time different patterns of sediment accumulation began to develop in different parts of the Fens, which still strongly influence the area today.. Whereas thick peat deposits accumulated in the southern and central Fenland, around the margins of the Wash the tides began to deposit fertile silts. Some of this silt was carried deep inland along the tidal rivers and deposited as ribbons along their banks. Today, following three centuries of shrinkage and wastage of the surrounding fen peats, these silt lined river beds or "roddons" stand up several metres above the surrounding landscape and trace the old meandering courses of rivers now long diverted into canalized systems. When the Fens were drained many farmsteads were built on these firmer and slightly elevated features.

The Romans were the first to undertake systematic drainage of the Fenlands, canalize the rivers and construct a number of new canals, the most important of which was the Car Dyke which ran for 70 miles from Lincoln, crossing the rivers Welland, Nene and Great Ouse, to join the river Cam at Waterbeach.

Not only did the Romans, settle and cutivate the area, particularly the northern Fens, intensively but they also built up a salt-extraction industry, evaporating brackish water, and cut peat for fuel. There was a notable Roman settlement at Stonea Camp with a tall rectangular stone-built tower, perhaps commemorating the Roman victory over the Iceni and possibly the residence of a Roman procurator in charge of the Fenland Estate.

During the Iron Age and Roman period a temporary rise in sea level led to severe flooding and thick silt deposition in the northern part of the Fenland around the Wash. In the short term this produced a very fertile silt area, where many farms and villas were set up, but the drainage of the southern Fenland was badly disrupted and eventually led to such severe waterlogging again that the whole area was rendered virtually uninhabitable for the Saxon period. With the increasing waterlogging there also developed the great meres of the Fenland, such as Soham, Stretham, Ramsey and Whittlesey Meres (the latter one of the largest lakes in England) which were finally drained during the 19th. century

when the first efficient steam pumping engines were developed.

THE DRAINAGE OF THE FENS

Though the Romans had accomplished much, during the dark ages which followed their departure the Fenlands were practically uninhabited, though isolated islands such as Ely sheltered religious settlements. In Norman times the communities living on the islands of sand and gravel protruding through the peat (such as Ely, Stretham and Soham) assessed their wealth chiefly in terms of fish, fur and fowl. The fens at this time must be imagined as vast, lonely tracts of reedswamp, generally impenetrable (viz. the exploits of Hereward the Wake and his resistance to the Norman conquerors), unhealthy (the "fenland ague" was malaria) whose sparse inhabitants had little contact or respect for the ways of the outside world. During mediaeval times some drainage of the silt fens took place and that area grew richer as can be seen by the building of handsome parish churches, but the peat fens - lower-lying and danker - were left. The area was dominated economically by big monasteries on the fen islands or margins (Ely, Ramsey, Crowland) which grew rich on the natural resources of the fens particularly supplying the towns, including London with the obligatory fish for fast days and Lent. It also seems likely that, as with the Norfolk Broads, there was an important trade in peat for fuel, which effectively destroyed most of the old raised bogs of the area, which were then virtually forgotten.

The first organised drainage of the Fens, as we know them, began in the 17th. century when the Earl of Bedford and other landowners ('The Adventurers') called in the Dutch engineer Vermuyden to drain the Bedford Level by constructing long, straight 'cuts' to carry away the water more rapidly and sluices to control its level. These early schemes which continued into the 18th. century brought much new land into cultivation but could not really guard against the continual and increasing danger of flooding, since the peat surface shrank on drying and so further lowered the land level. The main watercourses, embanked between heavy clay dykes carried away the water at a level well above that of the surrounding fields, and windmills were used, as in Holland, to pump water up out of the field drains into the rivers. In the last centurythe invention of the large volume steam pump at last enabled bigger and better plans for draining the region to be carried out, and by 1860 most of the old fenland had given place to the sort of landscape we see today.

THE FENLANDS TODAY

The landscapes of the Fenland today are very much the work of man. From desolate swamp it has become one of the richest

and most intensively cultivated farming districts in the country. The farms are mostly small and medium holdings, in contrast to the large farms and estates of the neighbouring upland regions of Norfolk, Suffolk and Cambridgeshire. This is made possible by the high fertiity of the soil and intensive and very productive farming methods. The main crops are grain, roots (particularly sugar beet), market gardening and fruit (strawberries and tree fruits).

Drainage remains a major problem in the Fenland. At times of heavy rainfall or rapid thaw, great quantities of water are poured into the rivers and cuts from the surrounding uplands. Particularly in the southern part of the Fens, much of the land is at or below sea level; consequently water from the river systems (even though at a slightly higher level than the surrounding fields) can only be emptied into the Wash at low tide through great sluices, as at Denver. At times of emergency heavy flood waters are a great danger to the agricultural land and have to be released into special safety catchment areas, 'the washes', which can be flooded deliberately without harm. Similar dangers occur when the North Sea suffers very high spring tides as in 1952. Stout dykes and banks protect fields, roads and settlements from the rivers and the sea.

In the 1960s a new cut was excavated along the eastern edge of the Fens to divert flood waters coming off the East Anglian uplands, but the problems are continuous. For example, the land level of the Fens is still falling. Not only does peat contract, on drying, but it is also very prone to erosion by strong winds after ploughing. Some areas are known to have settled, shrunk or otherwise lost nearly 4 metres of peat in the last hundred years. A single storm can remove 4-6 cm of fertile peaty soils over a wide area. As the land level sinks, drainage becomes ever more expensive as well as difficult, and silting of the rivers themselves further increases the problem.

WICKEN FEN

We are going to visit Wicken Fen nature reserve, which is one of the few surviving vestiges of ancient fenland vegetation. It has survived because of four factors:

1) It is isolated from the main basin of the Fens bt the clay 'peninsula' of Wicken.

2) It was used for 'storing' excess flood waters of he River Cam.

3) The Fen was regularly cut for sedge (for thatching) by the villagers of Wicken throughout the 19th. century (and occasionally later).

4) By the 1890s, when the land was in danger of drainage, it

had attracted the attention of naturalsits, particulary entomologists, who began the purchase of different parts of the Fen (it was divided into strips), in order to preserve it as the surviving habitat of many interesting plants and animals. The property subsequently became the first nature reserve of the National Trust. On the south-east, Adventurers Fen, also owned by the Trust, was requisitioned for agriculture during the Second World War, but it was returned in 1952 greatly changed and lowered. An artificial mere has now been created here in order to attract migrant waterfowl.

Not only was Wicken Fen preserved because of its use for sedge cutting and likewise peat digging; it is also important to realise that its vegetation was strongly influenced by this particular kind of cyclic management. Today it is obvious that the Fen is much drier than it must have been even during the last century. It stands high above the surrounding country and is much less subject even to winter flooding. However, it is now realised that the invasion of shrubs, especially buckthorns and willows, which spread rapidly over the Fen in the first half of this century, is as much a response to the cessation of sedge cutting as to a drier surface. A more vigorous policy of management has already led to the return or rediscovery of certain interesting fen plants.

J.M. Renfrew
C. Turner

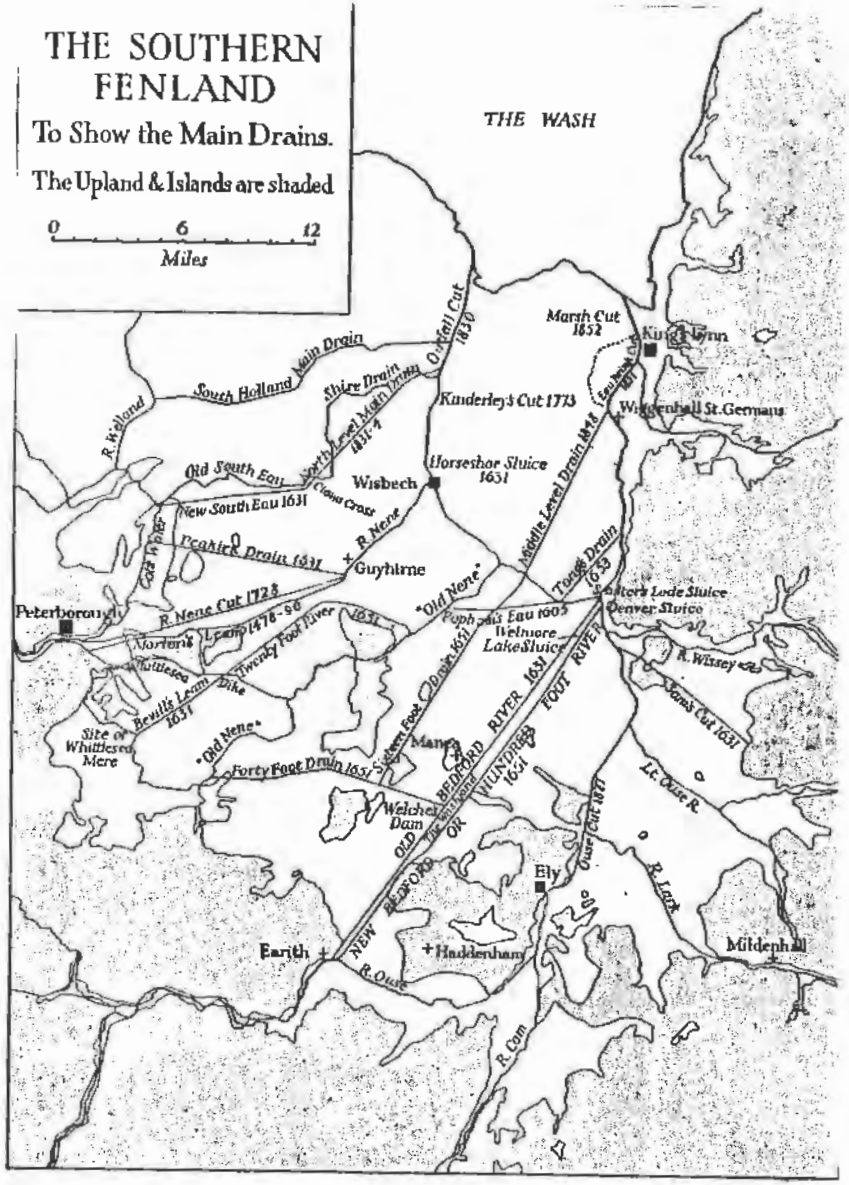


Fig. 48.

The approximate dates of the drains are given. In some cases there was an appreciable interval between the start of a project and its completion.

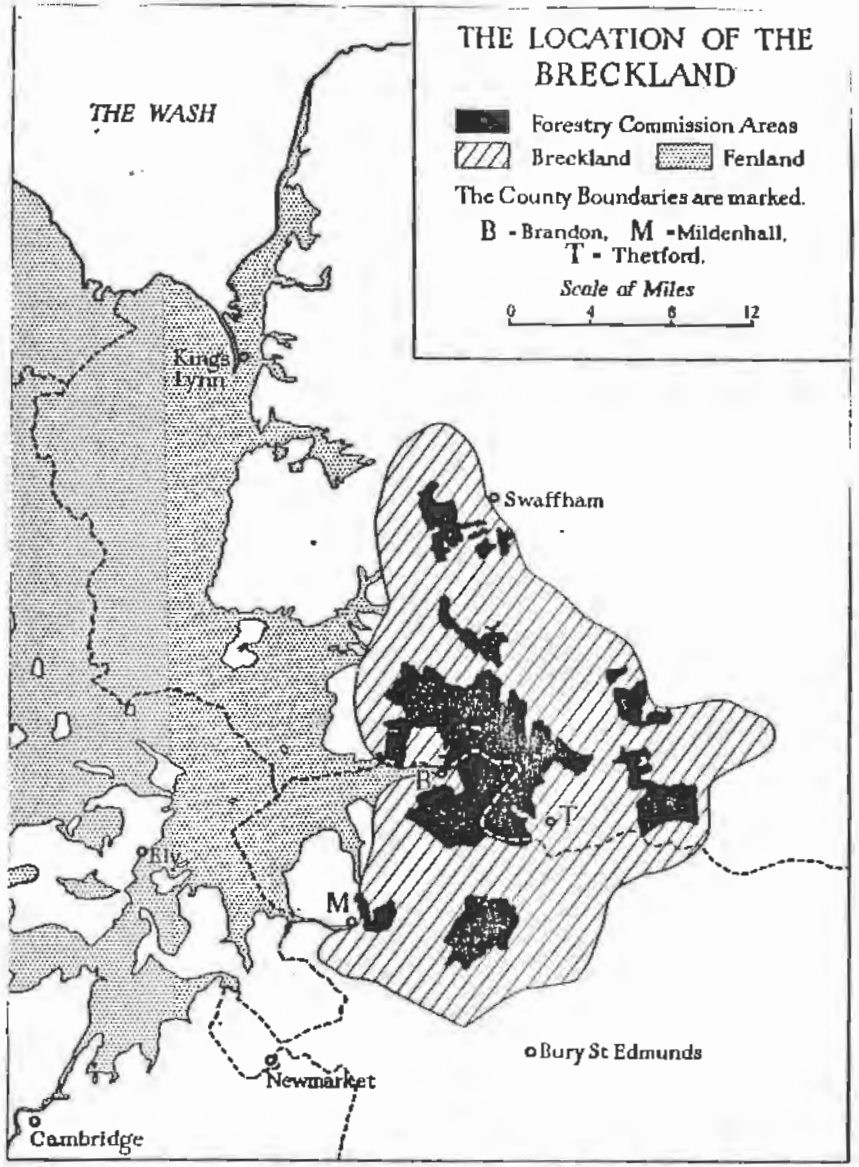


Fig. 56.

This figure shows the main location of the Breckland. Outliers with some typical Breck features occur beyond this arbitrary frontier, e.g. in Cambridgeshire, to the north of Newmarket.

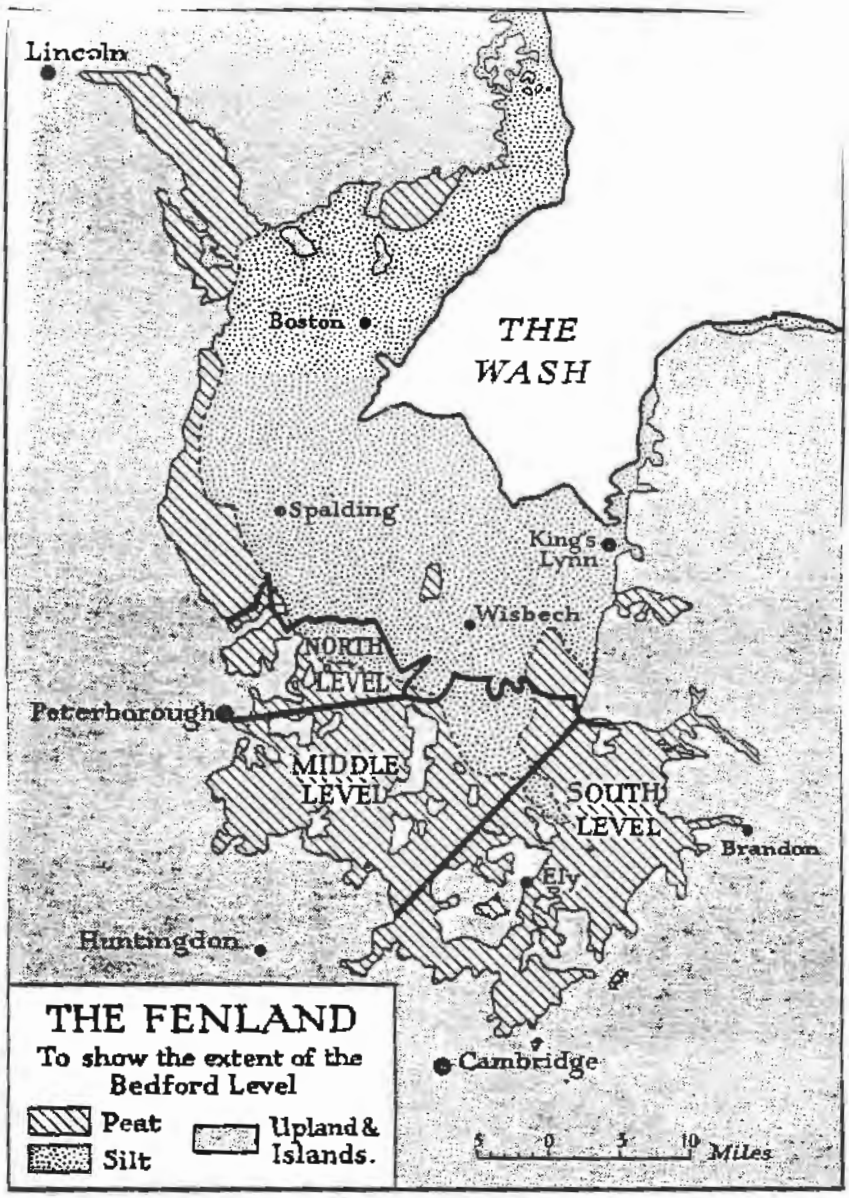


Fig. 47.

S. B. J. Skertchly, in *The Geology of the Fenland* (1877), p. 129, noted that the precise boundaries of the peat and silt were "very obscure, for the peat thins out insensibly along its borders." The limits of the Bedford Levels are taken from Samuel Wells' map of 1829 on a scale of 1½ miles = 1 inch.

West Stow Anglo-Saxon Village

West Stow Country Park is the site of a Pagan Anglo-Saxon Village dating from c.450 AD to 650 AD. with some earlier occupation. The settlement was excavated by Dr. Stanley West between 1965-1972 (West 1985). During the 1972 excavation season samples were collected for palaeobotanical analysis (Murphy, in West 1985, 100-108). Roman contexts produced assemblages composed largely of crop-cleaning waste of spelt (T. spelta) with some remains of six-row hulled barley (T. vulgare) and rye (S. cereale). In Anglo-Saxon contexts rye was well-represented, together with barley, free-threshing wheat (T. aestivum s.l) and spelt. It was estabished that spelt cultivation continued at least until c.450 AD. Impressions of cereals on Anglo-Saxon pottery were mostly of barley. This is thought to reflect the dietary habits of the population, in the sense that barley may have been the only cereal commonly used as whole grain (for brewing, or in soups and stews). Large assemblages of carbonised weed seeds suggest cultivation mainly on the light well-drained sandy soils of the vicinity with some extension of the arable area onto the edge of the river flood plain.

Since 1973 a series of wooden reconstructions of Anglo-Saxon buildings has been put up on the sites of the original buildings, using the tools and technology available to the Anglo-Saxons. The reconstructions have been built of materials of the same kind as those which were used by the Anglo-Saxons. Oak timbers from 0.15m. to 0.25m. diameter and up to 7m long have been shaped into posts and beams with axes and adzes. Larger oak trees 0.2m. to 0.9m. diameter have been split and used for cladding the walls of the buildings and for flooring. Coppice rods and poles of hazel and ash have been woven together to make the roof framework of the buildings which have been thatched with straw and sedge.

The reconstructions of the buildings on the sites of the original structures have followed several different interpretations of the ground-plan evidence. These include sunken featured buildings with the pit as the floor of the building, and both two and six post s.f.bs. with wooden floors over the pits, and side walls to the structures; there is also a small post built hall.

There are now five huts 6.25m. x 4.5m. and one hall 8.5m. x 4.5m. on the site representing a range of building techniques from rounded logs to carefully squared and lapped planks.

West, S. (1985) West Stow Anglo-Saxon Village, Vols. 1 and 2. East Anglian Archaeology Report No. 24. Suffolk County Planning Dept.

R.Darrah
P. Murphy

THE BRECKLAND

This area contrasts strongly with the Fens. It is one of the driest parts of England, with a low rainfall and quick-draining soils. Again it is a landscape of horizons with wide stretches of sandy heath, covered either by heather and bracken or by a thin mantle of poor grassland and lichens. In the background loom the dark intrusive masses of coniferous plantations.

The underlying geology is of chalk covered discontinuously with thin glacial deposits sands and gravel. Although not covered by ice since the Anglian (antepenultimate) glacial period, periglacial processes have left a lasting mark on the region and its vegetation. In particular, the segregation of sandy and chalky soils into stripes and polygons have produced distinctive patterns of heather and chalk grassland, visible both on air photographs and, in favourable sites, on the ground.

One of the curious features of the Breckland are clusters of small lakes or meres, apparently spring-fed. Some of these are permanent water, others fill up or dry out unpredictably (out of cycle with weather conditions), and clearly depend on the degree of saturation of the underlying chalk. Their geological origin is still a matter of speculation, but they appear to be solution features, floored with clay plugs.

The sediments of some of these meres have preserved a pollen record that allows us to reconstruct the Post-glacial vegetational history of the area. As over much of southern Britain, the first evidence for farming and clearence of the forests is dated to about 3,500 B.C. Clearly the early farmers valued these light and easily cleared soils, but here regeneration was poor, perhaps because sheep and cattle grazing was heavy. The pollen record suggests these clearings merging to form large tracts of open heathland. Numerous Bronze Age barrows, mainly built on the poorer marginal lands, are still visible today (often crowned by Scots pines planted in the last two centuries), and these indicate that the Breckland then supported a relatively large population.

The name Breckland is derived the term ´brecks´ which were sandy fields, cultivated intermittently amongst the heathland. Such a pattern of cultivation has probably been in existence from prehistoric times until the Second World War. Since then, some areas have been entirely let go to heathland, whilst others have been improved with fertilizers and brought into permanent cultivation.

Apart from agriculture, man has always found other ways of exploiting the Breckland. For example, there are the famous flint mines of Grimes Graves, which flourished from

Neolithic times onwards - indeed, the last flint knapper in Brandon retired (from making gunflints) only about twenty five years ago!

From mediaeval times until the nineteenth century the area was also renowned for its rabbit warrens, which provided an important source of food, fur and felt. The very large rabbit population certainly contributed to the sparsely vegetated condition of te area. A French traveller in the eighteenth century remarked how virtually every blade of grass in the area was devoured by rabbits. This may have been an important factor in the severe sandstorms that used to affect the area, and blocked the Little Ouse river one occasion. The outlines of sand dunes can be seen in several areas of the Breckland, and in two dunes are still slightly active. To control the movement of sand, landowners in the eighteenth century began to plant lines of Scots pines to act as windbreaks. These scraggy pines along road and field boundaries still give the area a distinctive air of desolation.

In the late nineteenth century, the large landowners of the area, such as the Maharajah Duleep Singh of Elveden Hall, vied with one another to develop their estates for game shooting. Enormous numbers of pheasants were bred and dispatched, royalty often being in attendance! To provide game cover quite large belts and blocks of woodland were planted, which grew quite successfully with the rabbit population under control. After the First World War, the newly founded Forestry Commission acquired large areas of Breckland ("Thetford Forest") which were planted mostly with conifers. This afforestation drastically changed the heart of Breckland, as can be seen from your map, and at present the future of these areas, which have become increasingly a public amenity is in some uncertainty.

Finally it should be noted that there is one large area, in the northern Breckland, where, as it were, time has stood still, where there are still extensive heaths, very little afforestation, no agricultural improvement and an abundance of wildlife. This is the military area, from which the public are generally excluded, but which appears to serve the aims of nature conservation rather well!

C. Turner
J.M. Renfrew