



Irish Quaternary Association (IQUA)

Spring Meeting and AGM 2011

16 April 2011

IIS Seminar Room, Trinity College Dublin

Programme and Abstracts

IQUA Spring Meeting and AGM 2011

Programme

- 10.00 am **Bettina Stefanini (NUIM)** Late prehistoric woodland patterns as reflected in the pollen record.
- 10.20 am **Ellen O'Carroll (TCD)** How much is enough! Sampling issues and methodological approaches towards the reconstruction of woodland resource usage from archaeological sites.
- 10.40 am **Keynote talk: Fraser Mitchell (TCD)** After the storm: exploring ecosystem recovery after disturbance.
- 11.00 – 11.20 am *Coffee*
- 11.20 am **Anette Overland (NUIG)** New insights into late Holocene farming in western Ireland with particular reference to the early medieval horizontal watermill at Kilbegly, Co. Roscommon.
- 11.40 am **Steve Davis (UCD)** Climate change and the adoption of agriculture in Co. Mayo.
- 12.00 pm **Emma Howard Williams (NUIM)** *Arenaria ciliata* on Ben Bulbin: a Pleistocene nunatak in northwest Ireland?
- 12.20 pm **Kieran Craven (TCD)** Testing the utility of a geochemical approach to sea-level reconstruction in western Ireland
- 12.40 – 1.40 pm *Lunch*
- 1.40 pm **Rory Patrick Flood (QUB)** Recent sedimentation processes, patterns and chronology of the west Bengal Sundarbans.
- 2.00 pm **Adelheid Fankhauser (UCD)** Speleothem versus ice core ages for the Greenland interstadials. Does the latest NGRIP chronology still exhibit time lags?
- 2.20 pm **Benjamin Thebaudeau (TCD)** Update on the ongoing research of submerged coastal features on the northern coast of Ireland.
- 3.00 pm **Annual General Meeting – all welcome**

Late prehistoric woodland patterns as reflected in the pollen record

Bettina Stefanini

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Abstract

Analysing large datasets often brings unexpected results. In the course of an environmental study for the Discovery Programme covering the period from ca. 1500 BC to AD 400, forty Irish pollen sequences are examined. Some of these were originally commissioned within an archaeological framework but most were generated in independent palaeoenvironmental investigations. Analysis of the set confirms widespread mid and late Bronze Age clearance phases. It also singles out a number of sequences from the late Bronze Age, where clearance is more wide-ranging than elsewhere. The semi-open landscapes of the early Iron Age almost universally give way to widespread woodland regeneration during a period that Frank Mitchell termed the 'Late Iron Age Lull'. In this talk, the geographies of the exceptions to the regeneration trend are examined from an environmental perspective. Such a perspective sheds light on why particular sites remain un-forested during this period but it fails to account for a cluster of cleared sites along the east coast. Here the reasons for woodland clearance are open to speculation but seem to be rooted in societal causes.

How much is enough! Sampling issues and methodological approaches towards the reconstruction of woodland resource usage from archaeological sites.

Ellen O'Carroll and Fraser Mitchell

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Abstract

The National Roads Authority (NRA) awarded funding from its Research Fellowship Programme to the authors to conduct a PhD research project entitled 'Quantifying woodland resource usage in the Irish midlands using archaeological and palaeoecological techniques'. Pollen cores from a lake and a small hollow, as well as charcoal and wood samples from 86 archaeological excavations, are being used as indicators of woodland resource usage. One of the primary aims of this research is on revising standards and improving practice in charcoal sampling and the identification of charcoal remains from archaeological sites to produce optimal information on woodland resource use. There are two main questions addressed. Are we identifying a representative sample set from archaeological sites, and are we identifying enough or over-identifying charcoal fragments from each sample in order to determine wood function, wood use and reconstruction of surrounding woodlands?

Two charcoal data sets, ranging in date from the Neolithic to the Post Medieval Periods, are currently under investigation. The first data set includes the analysis of over 500 charcoal samples where a range of charcoal fragment counts (depending on charcoal quantity present in each sample) have been identified for each sample. The second data set includes the analysis/identification of 79 charcoal samples and incorporating the results into a saturation curve programme where saturation points (the point at where all new taxa have been identified within any given sample), mean saturation points and proportion saturation points of taxa are recorded and graphed in order to evaluate woodland resource use and determine best practice and guidelines for future excavations. Initial results from the saturation point profiles for taxa diversity indicate that there is little variance in saturation points between time period, site type and short and long term charcoal deposits. Mean saturation points are also lower than expected for most site types evaluated.

Keynote talk

After the storm: exploring ecosystem recovery after disturbance

Fraser Mitchell

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Abstract

Prior to the arrival of Europeans, Massachusetts was almost entirely covered by forest. Intensive exploitation was followed by large scale land abandonment. The impact and recovery of this exploitation on the forest ecosystem will be explored through fine spatial resolution pollen analysis. This will be used to investigate how closely the post-disturbance forest resembles the pre-disturbance forest. In 1938 a massive hurricane flattened most of the forest in Massachusetts and adjacent states. The impact to, and recovery of a forest in New Hampshire to this event has been investigated through fine spatial resolution pollen analysis. The impact and recovery of natural disturbance (hurricane) to the forest ecosystem will then be compared to disturbance through human exploitation.

New insights into late Holocene farming in western Ireland with particular reference to the early medieval horizontal watermill at Kilbegly, Co. Roscommon

Anette Overland

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Abstract

An early medieval horizontal watermill, discovered during archaeological survey preparatory to motorway construction, at the edge of a small mire in Kilbegly Townland, County Roscommon, provided the opportunity for palaeoecological investigations of peat and fossil moss-polster samples. While the data – pollen and macrofossil (moss) identifications and ¹⁴C dating – relate mainly to the early medieval period, analyses of a peat core from the mire, and a moss sample that was used as caulk in the trough of a burnt mound (*fulacht fiadh*), extend the environmental record well into the Bronze Age (ca. 1850 cal. BC). Woodland and farming dynamics in the late Holocene are reconstructed on the basis of the investigations at Kilbegly and other sites in the region. An overview of human impact, and the intensity and nature of farming, since the mid Iron Age (c. 350 cal. BC) is presented, based on a review of fossil pollen evidence from key sites.

Climate change and the adoption of agriculture in Co. Mayo.

Steve Davis, Naomi Holmes and Graeme Warren

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Abstract

This paper presents some results of a recent project examining the relationship between climate change and the adoption of agriculture in North Mayo, famous archaeologically for the Céide Fields system. Our project provided new quantitative palaeoclimate data based on chironimid data from two lake cores from Co. Mayo, in addition to isotopic (C/N) and Itrax core-scanner data. These data allow some critical assessment of existing models of the causal role of climate change in the origins, nature and supposed decline of prehistoric agriculture in the region.

***Arenaria ciliata* on Ben Bulben: a Pleistocene nunatak in northwest Ireland?**

Emma Howard-Williams¹, Xiaodong Dang¹, Colin Kelleher², Pablo Vargas³, Kevin Walker⁴
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Abstract

Did any native Irish plants survive the last glacial maximum *in-situ* in Ireland? A growing body of zoological evidence suggests Ireland may have been a refugium during the Pleistocene glaciation, and a strong Iberian affinity is evident among much of the island's native flora and fauna. This project is focused on some of the earliest putative postglacial migrants to Britain and Ireland, the arctic-alpine Carnations, in an effort to characterise and date the earliest links between Ireland and Continental Europe.

The Ben Bulben mountain range in County Sligo has been suggested as an Irish refugium, which is home to the distjunctly distributed arctic-alpine *Arenaria ciliata*, where its closest sister populations occur in the Jura, 1350 km away. *A. ciliata* however is part of a taxonomically difficult group of species (*A. ciliate*, *A. moehringiodes*, *A. gothica*, *A. pseudofrigida*, and *A. norvegica*).

This project will elucidate biogeographic relationships between members of the *Arenaria ciliata* L. complex in Ireland, Iberia and central Europe in an effort to determine putative postglacial migration routes to Ireland or investigate the possibility of *in-situ* survival. Detailed biogeographic analysis of this complex is being carried out using DNA sequences from different gene regions and AFLP analysis to address the following questions:

- What is the phylogeographic affinity between *A. ciliata* and *A. norvegica* in Spain, Ireland and the Alps?
- Does the *A. ciliata* population on Ben Bulben carry a nunatak/refugial genetic signature?

Of key importance in the postglacial history of the Irish flora, these species have not as yet been studied in any phylogenetic analysis, and there exists a considerable knowledge gap in relation to systematic affinities between taxa and estimates of divergence times based on discrete DNA sequence data.

Testing the utility of a geochemical approach to sea-level reconstruction in western Ireland

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Abstract

Saltmarshes are intimately linked to tidal levels and so the identification and dating of these environments preserved within coastal sedimentary sequences is an important tool to reconstruct past changes in relative sea-level (RSL). While the western coastline of Ireland is typified by high-energy environments that are not conducive to the application of sediment-based RSL reconstruction, the Shannon Estuary contains sites of intercalated organic and clastic sediments that should record changes in RSL. However, the absence of microfossils from these sediments have hampered the establishment of accurate sea level index points (SLIPs) from the outer estuary that could be used to accurately model RSL changes over time. In recent years there has been renewed interest in the potential use of composite records developed from elemental (organic carbon, total nitrogen) and isotopic ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) data for RSL reconstruction independent of microfossils.

A novel geochemical approach to sea-level change, based on saltmarsh $\delta^{13}\text{C}$ and C/N gradients, is currently being tested within the Shannon Estuary to identify changing intertidal and terrestrial environments. Preliminary results obtained using this new methodology on sediment cores taken from three locations in the estuary show changing isotope and elemental ratios across the lithographical boundaries at the bases of peats, representing changing environments of deposition. These results could indicate a transition from intertidal to terrestrial environments that would allow new SLIPs to be established in this region, though interpretations are not definitive. This casts doubt on the new technique, though *ad hoc* solutions may exist.

Recent sedimentation processes, patterns and chronology of the west Bengal Sundarbans.

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Abstract

The primary aims of this project are to examine the sedimentation processes and sources of sediment in the Sundarbans mangrove forests of India from the late Holocene (ca. 1,000 years) to present. The Sundarbans are one of the largest mangrove forests in the world encompassing a transnational area of approximately 1 million hectares in India and Bangladesh. In tropical coastal systems, both sea-grass meadows and mangrove forests are widespread components in the stabilisation of dynamic coastlines and are highly beneficial in developing productive ecosystems. Mangrove forests are important sinks for the accumulation of marine and terrestrial derived sediment loads, due to the physical trapping effect of a complex network of aboveground root and shoot systems. The Sundarbans is known to be relatively recent development in the Holocene, and the extent of its coverage has changed considerably when the Ganges-Brahmaputra river system changed course ca. 7,000 BP. The erosional effects of waves and storm surge waters on muddy wetland environments are limited only by sediment cohesion, grass-canopy baffling, and plant-root binding. The ability of forests to persist in the face of rising sea level depends on their capacity either to migrate inland or to maintain positive surface elevation change equivalent to or exceeding the rates of sea-level rise. Fieldwork has been carried with three cores obtained from the Sundarbans, ranging in depth from 6.5 m to 4.5 m respectively. This project will employ the use of geochemical techniques (e.g. XRD, XRF, AAS etc). Stable isotope ($\delta^{13}\text{C}$) and elemental ratios analysis (organic C/N) will also be used as both provenance indicators of sedimentation in the Sundarban and potential tracers of extreme storm events. Preliminary analysis of sediment indicates stratified sequences with bands of intermittent organic and inorganic layers. Furthermore, sedimentary deposits appear to differentiate between inhabited and uninhabited islands.

Speleothem versus ice core ages for the Greenland interstadials. Does the latest NGRIP chronology still exhibit time lags?

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Abstract

Climate variability during the last glacial is exquisitely recorded by the Greenland ice cores, but in Ireland only few climate records of Midlandian age are known because of extensive glacial reworking during the Last Glacial Maximum (LGM). Cave deposits such as speleothems are relatively protected during glaciation. The air temperature of shallow caves is similar to the mean annual air temperature at the surface. Speleothem deposition requires the presence of liquid water thus cave air temperature above 0°C. While speleothem deposition was abundant in Crag cave during the Holocene, periods of ice free conditions in the last glacial can also be identified. Preliminary U-Th ages from two independent speleothems indicate episodic deposition between 44.0 and 23.5 ka BP. In particular, periods of deposition, interrupted by visible hiatuses, have been identified at 44.0 ± 0.6 , 41.95 ± 0.04 , 38.0 ± 0.1 , 34.6 ± 0.2 , 32.7 ± 0.05 , 27.9 ± 0.04 and 23.5 ± 0.06 ka BP. These periods in Marine Isotope Stages (MIS) 2 and 3 show an overall synchronicity with the Dansgaard-Oeschger (DO) events recorded in Greenland. But, whereas these interstadials are coeval in speleothem records from Crag Cave, Sofular Cave (Turkey) and Hulu Cave (China), DO events 3, 4, 5, 7, 10 and 11 appears to be offset towards younger ages in the Greenland ice core NGRIP (GICC05 chronology). Heinrich events 2, 3 and 4 are clearly marked by non-depositional episodes in the Crag speleothems. Measured $\delta^{18}\text{O}$ in the investigated speleothems are approximately 2‰ heavier than in Holocene reference material, attributed predominantly to changes in the $\delta^{18}\text{O}$ of the Atlantic surface waters. Measured $\delta^{13}\text{C}$ are as low as ca. -9‰, implying the presence of vegetation and soil microbial activity in the warm intervals of MIS 2 and 3. Some episodes of non-deposition are preceded by gradual increases in $\delta^{13}\text{C}$,

indicating slow deterioration of climatic conditions over timescales of centuries, whereas others are more likely to reflect local hydrological effects only.

Update on the ongoing research of submerged coastal features on the northern coast of Ireland.

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Abstract

The potential for recognition of submerged coastal landscapes is tested on the recent seabed mapping survey (JIBS) in the north of Ireland through a 4-year PhD project at TCD. This multi-disciplinary approach aims at recognising ancient coastlines corresponding to lowstands of the relative sea-level (RSL) in the Quaternary, and particularly in the last 20,000 years since the last glacial maximum (LGM). Indeed, the latest GRM are still displaying some discrepancies with geological data and further testing of the most robust features of the model, like the eastward gradual uplift of Ireland, is required.

This talk will present the state of the project so far. The first work undertaken was an inventory of the shore-platforms present, hard rock erosional features which are in numbers on the study area coastal seabed. After the recording the morphological parameters of all the shore-platforms identifiable on the sea bed (about 500 features for the study area) and plotting them on a database, a first analysis of the hypsometric curves will be presented, displaying unexpected results. The next step of the research, the comparison of the coastal profiles with profiles created from an erosional model, will be introduced. Finally the plan for the coming years will be mentioned, with a look at sub-bottom profiles to assess the presence of more erosional features under sediment cover as well as identify any soft sediment accretional features still present.