



IQUA NEWSLETTER

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Edited by Peter Wilson

INTRODUCTION

As is customary with the Spring Newsletter, most of the pages are devoted to accounts of recent IQUA meetings - the successful Annual Symposium in November, the joint IQUA/IGA Lecture in February, and the AGM/Discussion meeting in March.

Also within these pages are to be found notes about the next two IQUA event - a one day field meeting in June organised by Peter Glanville and the annual field meeting at the end of September. This year, the task of organising the annual meeting has been taken on by myself, so we are heading north and west to Donegal. I hope many of you will be able to attend, despite the distance you may have to travel. Its a magnificent landscape with much to offer the Quaternary scientist and although some recent research has been undertaken, it has hardly striated the surface! There is great potential within the county for more detailed work pertaining to Quaternary landscape evolution. As is usual with these events, a Field Guide will be produced.

Peter Wilson (University of Ulster).

**IQUA ANNUAL SYMPOSIUM 1994 - SEA-LEVEL CHANGE AND
THE COASTAL ENVIRONMENT**

The theme for the 1994 annual symposium was "Sea-level Change and the Coastal Environment", and as usual it was held at the Geological Survey of Ireland, Beggars Bush. The event was generously sponsored by the British Council and several other organisations, enabling two keynote speakers from Britain to address the meeting. A comprehensive set of abstracts, compiled by the symposium organiser Catherine Delaney, ensured an interesting and involved participation.

After a warm welcome from Dr Peadar McArdle, Director of GSI, the meeting was opened by Bob Devoy (Cork) who gave an overview of sea-level and coastal studies in Ireland and placed recent and current Irish research in a European context. Michael Tooley (Durham) reviewed sea-level changes during the Pleistocene and gave rates for sea-level rise and coastal retreat, based on examples from three countries. He also highlighted defects in some predictions made in IPCC publications. Andrew Brock (Galway) emphasised that simple calculations based on ice to water conversions must be accompanied by calculations based on concurrent eustatic changes due to ice-unloading.

On more local and specific processes, Michael Healy (Manchester) cited mine waste sedimentation on the Cornish coast as a key to sediment deposition rate, pointing out that levels of heavy metals are good signatures to historical events. Anne Sinnott (Cork) reported on her work in Wexford Harbour and Dungarvan Bay and gave radiocarbon dates for the fluctuations between terrestrial and inter-tidal habitats and long-term trends of rising sea level.

Attractive colour slides of Ferriters Cove, Co. Kerry, by Peter Woodman (Cork) made the transition from the late Pleistocene to the mid-Holocene and from geophysics to archaeology. Coastal habitation at 6000-5000 years BP based on marine-sourced sustenance was highlighted. Imogen Crawford (Lancaster) also used history and prehistory in her study of a "dynamic and volatile" situation at a site in North Uist. She made a case for integrating history, archaeology, ecology, pedology, chemistry and other disciplines to better understand dunal and machair environments.

After lunch, John Pethick (Hull) brought the overlap between geomorphology and civil engineering into sharper focus. He listed the limitations of current hydro-dynamic models of estuaries and showed how coastal conurbations have, and will have, to adjust to sea-level changes, especially in modified estuaries. Mark Duffy (Cork) used the hyper-tidal Severn estuary for his studies and employed models to back up a two-year monitoring programme in the inter-tidal zone.

Julian Orford (Belfast) went to Nova Scotia for his data, integrating wave climate, sediment supply and sea-level changes with terrestrial geometry of gravel-dominated barriers. Gonzalo Malvarez (Coleraine) gave credence to the "garbage-in/garbage-out" adage in dealing with data stored in admiralty charts, GIS, echo sounding and other methods of studying near-shore wave energy and warned the audience to be vigilant and selective.

The importance of pedogenic trends as read in soil profile morphology was emphasised by Peter Wilson (Coleraine) when explaining the history and chronology of dunes at Dunfanaghy, Co. Donegal. The removal of carbonates,

development of genetic horizons and the burial of profiles by sand accretion showed the interconnections between (palaeo)-pedology and geomorphology. Philippe MacClenahan's (Coleraine) contribution was based on published data for sand dune palaeoenvironments while Kieran Hickey (Maynooth) highlighted the relative youth of many of the dune systems of north-west Europe.

In summary, this was a very full and informative symposium and Catherine Delaney is to be congratulated for taking on organisation of the event.

Reference: Delaney, C. (Ed.) 1994. *Sea-level change and the Coastal Environment*. Abstracts of the IQUA Annual Symposium, IQUA, Dublin.

Jim Collins (University College, Dublin).

JOINT IQUA/IAG LECTURE

The joint IQUA/IGA Lecture entitled **The Dwyka Tillite: Permo-Carboniferous Glaciation in South Africa** was given by Michael Philcox on February 8th in the Geology Department, UCD. The Abstract of this lecture is reproduced below.

The Dwyka Tillite (now 'Group') is the oldest part of the Karoo Supergroup, the Carboniferous to Jurassic succession of marine to continental sediments that was deposited across Gondwana prior to its break-up in the late Jurassic - early Cretaceous. The Dwyka represents a major period of glaciation, lasting some 60Ma, which in Ireland is reflected by cyclic deposition in the Visean and Silesian. A wide variety of glacially related facies is present in the Dwyka in addition to the so-called 'tillite', which itself is mostly a rain-out product of marine ice sheets.

Two main facies provinces are present. The northern 'valley/highland' facies is characterized by rapid thickness changes (0-400m), complicated arrangement of lithofacies, locally derived clasts, and low content of diamictite (20%). The southern 'shelf' facies thickens steadily southwards to >700m, is relatively uniform lithologically, consisting of c. 70% diamictite, and clasts were commonly derived from remote sources, some outside Africa. Several thick and extensive diamictite units have been distinguished, representing separate ice sheets and sources. Marine interglacial units are also present.

The age of the 'tillites' is poorly constrained, but appears to range from late Westphalian to late Early Permian (Sakmarian-Artinskian, depending on location). Glaciation began in the Namurian or earlier, but the early

phases (20Ma?) are poorly represented by sediments, if at all, possibly because South Africa occupied a polar position and the expanding ice sheets were cold-based. As the continent wandered into sub-polar latitudes during the late Carboniferous, the ice became warm-based and sedimentation increased. Most of the 'tillite' was deposited during Permian deglaciation phases. Final glaciation was restricted to ice caps on the northern mountains during the Artinskian.

The 'tillite' rests on a variety of glaciated surfaces, including striated rock-pavements, rock knobs and whalebacks, boulder pavements, and grooved sediment veneers with dewatering 'dribble' structures.

ABSTRACTS OF PAPERS - IQUA ANNUAL DISCUSSION MEETING 1995

Neolithic impact in the region of Clara, and its implications for the elm decline.

Clara Bog National Nature Reserve is an ombrotrophic raised bog located in Co. Offaly. A radiocarbon dated pollen diagram has been produced for this site. The diagram covers the entire Holocene and displays several features of interest. One of these features is an uncharacteristic elm decline.

In Ireland the elm decline has been dated to between 5200 BP and 5000 BP. It is usually associated with the simultaneous impact of Neolithic agriculture on the Irish landscape. In Clara there are three elm declines which occur at 5200 BP, 5000 BP and 3800 BP. The first two declines are not as severe as the third, and are followed by complete recoveries. However, radiocarbon dating has shown the first detectable anthropogenic impact in Clara to be at 3800 BP. The elm decline at 3800 BP is quite gradual, taking about 450 ¹⁴C years for the elm pollen curve to reach its lowest value. This decline is not catastrophic, as one might expect for a disease. This later date for a coincident elm decline and the expansion of Neolithic farming, suggests that the earlier elm declines may have been disease related in the area of Clara.

Andrew Connolly, Department of Botany, Trinity College, Dublin.

Geomagnetics for evaluating potential landfill site suitability.

With growing public awareness of the environment, the traditional disposal route for municipal solid waste, landfilling, is causing increasing concern. One major problem associated with landfilling is the production

of leachate. In certain hydrogeological circumstances it can pollute the groundwater system and may ultimately reach public water supplies.

At present, a common method for assessing a landfill site's hydrogeological suitability is through pumping tests. This method however is expensive and generally yields low-resolution on a limited spatial area. As a result, major unknown faults or fractures may exist on or near a proposed site which could act as leachate conduits, accelerating the rate of attenuation to unacceptable levels. Recent work by Gibson and Lyle has shown that magnetic profiling techniques are an excellent non-destructive method for locating these geological features.

The purpose of this paper is to apply these techniques to assess the proposed landfill sites in the Greater Dublin area. In the light of the new EU Landfill Directive and strict controls on permissible percolation rates, the significance of this method is clear.

Ivan Devilly, Department of Geography, St. Patrick's College, Maynooth.

Impact of tephra on vegetation in the west of Ireland - fact or fiction?

The impact of volcanic activity on climatic change, and hence on the composition of vegetation during the Holocene, is widely debated. Potentially, there is a two-fold response, resulting either from the 'dust veil' effect which may effect solar radiation and temperature levels or alternatively the 'acid deposition' effect which occurs when erupted gases are precipitated as rain, fog or mist.

In the last number of years, tephra deposits of Icelandic origin have been recorded from sites in the north of Ireland and from northern Scotland. One particular deposit, that from the eruption of Hekla 4, c. 4000 BP, has been detected at many sites and has thus become a recognised chronozone. At many sites, this deposit appears to coincide, to one degree or another, with the decline of pine and/or expansion of blanket bog. This has led to some discussion on whether or not climatic change can be implied by the presence of tephra.

In the course of investigating the factors involved in the initiation of blanket bog at Croaghaun East, County Mayo, seven layers of tephra were detected. Two of these layers were coincident with both the decline of pine and the initiation of blanket bog (*sensu stricto*) on the site, an event which is dated to approximately 3800 BP and which appears to have a climatic rather than an anthropogenic origin. Geochemical analysis of

these layers indicate that, while there appears to be three different tephra populations present, none of the deposits represent that of Hekla 4.

The analysis of these two layers, and other analysed tephra deposits from Croaghaun East, are presented in association with pollen, fungal, rhizopod, and charcoal analysis. In addition, analysis of rates of change is employed to investigate the potential climatic effect of the double tephra layer in relation to both regional and local vegetation.

Rosaleen Dwyer, Department of Botany, Trinity College, Dublin.

Magnetic profiling techniques applied to glacial features In Co. Meath.

Magnetic profiling is a technique that has been applied widely in the Earth Sciences in order to delineate unidentified geological structures. It is an extremely versatile non-expensive, non-destructive cost-effective technique which can often provide information that cannot be obtained by other means or only provided by techniques that are much more expensive or time consuming. However, in general it has not been applied to glacial features.

In theory, variations within glacial features such as moraines or eskers should produce differential magnetic signatures which may allow internal variations to be mapped even when there is no exposure. However, because the magnetic variations for glacial features are so low, any signatures caused by them may be swamped by the much larger variations due to geological features. Glacial features near Croagh Patrick cannot be investigated magnetically due to the massive magnetic signature caused by the Clew Bay ophiolite complex. Also, the magnetic variance for the Tertiary basalts in northeast Ireland is sufficiently large to make any measurements on glacial features very difficult. However, magnetic signatures over some lithologies such as sandstones and limestones show very little variation. The small variations due to sandstones and limestone can be virtually eliminated by taking simultaneous magnetic measurements at different heights which can be used to effectively filter out deeper magnetic sources caused by geological features and enhance surface magnetic variations which are caused by variations in the characteristics of glacial features.

A number of magnetic traverses were made over the Galtrim moraine and an associated esker. The northern edge of the esker is clearly defined on one traverse by a significant anomaly across which the background magnetic signature changed. A traverse along the Galtrim moraine shows a pronounced magnetic anomaly which coincides with a pronounced break in

the moraine. Traverses across the moraine indicate that it is often associated with a small change in magnetism. A 3-dimensional plot of the magnetic variations for a 400m² area of the Galtrim moraine shows a low frequency region with relatively high magnetic values (possibly representing reasonably homogeneous glacial sediments) separated from a low frequency area with low magnetic values by a narrow north/south-trending high frequency zone.

Paul Gibson, Department of Geography, St. Patrick's College, Maynooth.

Paul Lyle, Department of the Built Environment, University of Ulster, Jordanstown.

Dorothy George, Southeast Region, The Open University.

Investigations towards the reconstruction of the Holocene history of *Pinus sylvestris* in western Ireland.

Results from palaeoecological investigations at Ballydoo Bog, a small basin bog that lies to the north of Ballydoo Lough, north-east Connemara, shed fresh light on several aspects of Holocene vegetation history, including the history of *Pinus sylvestris*. The importance of pine from early in the Holocene is evident, and its establishment on the bog surface in the mid Holocene is recorded. At the top of the profile the local expansion of bog species and the extinction of pine on the bog surface is seen. Macrofossil remains of pine (i.e. numerous stumps and some pine cones) have been recorded in the course of a detailed stratigraphical investigation of the basin. Both pollen and radiocarbon evidence indicate that the final phase of pine growing on peat dates to shortly before 3000 BP which is much later than expected.

The technique of dendrochronology has also been used to further investigate the history of pine on blanket bog. However, many of the pine stumps are either at considerable depths below the surface or, if exposed, are unsuitable for dendrochronological investigations, due to absence or poor preservation of trunk timber. At Derreighter, 14 km south of Ballydoo Bog, a large cut-over bog contains an extensive area of pine timbers. These have been sampled and ring widths measured (1-6 radii measured and means obtained for each tree). A tentative floating chronology has been constructed from these tree ring patterns. The chronology constructed from this site spans c. 500 years. Meanwhile, dendrochronological investigations of pine timbers from Garrynagran, 10 km south of the Céide Fields, is ongoing.

Eneda Jennings and Michael O'Connell, Department of Botany, University College, Galway.

The response of fluvial landforms to Holocene environmental change: evidence from the upper River Liffey catchment, Co. Wicklow.

The sedimentology and morphology of floodplains and terraces is controlled by the prevailing physical environment of the drainage basin during their aggradation. The maintenance or change of established systems of alluvial development is highly regulated by rates of surface runoff and sediment yield from the catchment, which is in turn controlled by climate, catchment vegetation and landuse types. Due to the genetic association between rivers, their associated landforms and drainage basin environmental changes, it is possible, by examining the floodplains and terraces, to infer both the nature of the environment and the environmental changes which have occurred in upland catchments in Ireland during the last 10,000 years.

This paper will consider some of the relationships between floodplain and terrace formation and Holocene environmental change. It will also describe the development of a sequence of alluvial deposits from the catchment which represent some of the major periods of river incision and alluviation during much of the Holocene, from c. 7000 BP to c. 500 BP. The floodplain and terrace development will also be placed in the context of Holocene environmental changes through the use of vegetational assemblages inferred from pollen analysis, which indicate the existence of at least three fundamentally distinct vegetation covers in the catchment during the period of alluviation.

Peter Glanville, Department of Geography, University College, Dublin.

Archaeo-geophysical imaging project: preliminary results from the Rathcroghan/Carnfree area, Tulsk, Co. Roscommon.

The archaeo-geophysical imaging project, funded by the National Heritage Council, is a multidisciplinary study of a number of important monuments in the Tulsk area. The objectives of the study are to investigate some seven of the fifty monuments recognised using geophysical techniques and to further the use of geophysics in archaeology in Ireland.

The preliminary results from Rathcroghan mound will be presented. The mound is over 90 m in diameter and rises up to 5 m above the surrounding landscape. The initial work has concentrated on determining whether the mound is a natural or man-made feature or a combination of both. A detailed topographic survey using the Electronic Distance Measurement (EDM) technique has enabled us to produce accurate surface profiles across

the mound. A combination of geophysical techniques along one of these profiles will be used to describe the inner structure of the mound. Electromagnetic (EM) surveying using a Geonics EM31 instrument has indicated zones of high apparent conductivity which have been interpreted as thick clays. A resistivity pseudosection using an imager cable configured as a Wenner array has been used to produce a vertical section through the mound to an approximate depth of 6 m. The results indicate a high resistivity structure on the western side of the mound which could be interpreted as either a remnant of a glacial feature or as a buried cairn. A zone of low resistivity correlates with the high apparent conductivity seen in the EM survey. A Ground Probing Radar (GPR) survey, using a Pulse Echo IV instrument, has allowed us to produce a high resolution depth section which shows a number of features. A strong horizontal reflector to the west correlates well with the resistivity high and could be the flat top of a cairn. The western zone of the section differs in character from the eastern zone further indicating a possible buried ditch and bank within the mound and also small reflectors which may indicate internal man-made features.

The results so far do not conclusively indicate a wholly natural or man-made feature but imply a combination of both. Further work is in progress to map the spaceform of the high resistivity anomaly and then to see if there is any evidence for structures having been built on the surface of the mound.

Kevin Barton, Applied Geophysics Unit, University College, Galway.

ANNUAL GENERAL MEETING 1995

The AGM was attended by about 35 members and a full agenda was efficiently dealt with in under two hours. The minutes of the 1994 AGM in Galway, prepared by Michael O'Connell, were circulated, approved with a minor amendment, and signed by the Chairperson, Fraser Mitchell.

The Secretary reported on the activities of the past year which included the very successful excursion to Clare Island organised by Peter Coxon and the accompanying field guide edited by Peter Coxon and Michael O'Connell. The November Symposium on the topic of Sea-Level Change and the Coastal Environment was very well attended and effectively organised by Cathy Delaney. The joint IQUA/IGA lecture was given in February at both UCD and QUB by Michael Philcox. The subject of the lecture was The Dwyka Tillite: Permo-Carboniferous Glaciation in South Africa. The IQUA Information Sheet was produced by Fraser Mitchell and distributed in October and

resulted in a number of new members. The current membership was 70, made up of 40 ordinary and 30 student members.

The Treasurer's report highlighted the increasing demands on funds for the activities of IQUA. There were difficulties with cashflow at certain times of the year due to the demands of producing field guides and for funding Symposia. The Chairperson gave a short report on behalf of the absent Newsletter Editor and asked for contributions for the next issue of the Newsletter.

The major item on the agenda was an amendment to the Constitution to allow for a new grade of Honorary Membership. There was a positive response from the members present and the proposal was passed unanimously. Following on from the Treasurer's report it was proposed that the membership subscription should be raised to cover increased costs. After some debate the proposal was passed with Ordinary Membership being raised to £7 and Student Membership to £4, with effect from 1996.

The 1995 Annual Field Meeting is being organised by Peter Wilson and will be to Donegal. Some discussion of the venue for 1996 ensued and there was general consensus that an area in the south-west should be considered. The 1995 Autumn Symposium was discussed and a topic in the area of Quaternary Geology and Hydrogeology was agreed. The Secretary was to be responsible for organisation of the event.

There being no other nominations, the Committee's nominations were accepted and the 1995/96 Committee are:

Chairperson: Dr. Fraser Mitchell
Hon. Secretary: Dr. Kevin Barton
Hon. Treasurer: Ms. Cathy Delaney
Newsletter Editor: Dr. Peter Wilson

Ordinary Members: Dr. Karen Molloy, Dr. John Sweeney, Dr. Michael Philcox, Ms. C. Glanville.

Under AOB the Chairperson raised the issue of liability insurance which is of great concern to the Committee. Some discussion ensued on this topic and it was resolved that the in-coming Committee should deal with this as soon as possible. Another topic raised was the provision of more low cost field trips and it was agreed that the in-coming Committee would investigate the possibilities.

The Chairperson thanked Barbara Miller, the outgoing Treasurer, for her efforts over the last four years and likewise Jim Collins for his contribution on the Committee.

The Meeting closed with a vote of thanks to John Sweeney for an excellently run Annual Discussion Meeting and AGM in the marvellous facilities at St. Patrick's College.

Kevin Barton (Hon. Secretary).

FORTHCOMING MEETINGS

IQUA One Day Field Trip

Fluvial Geomorphology of the Upper River Liffey Catchment

Leader: Peter Glanville

Saturday 17th June 1995

Meet at 10.30 am in the square opposite the Donshire House Hotel in Blessington, Co. Wicklow. The trip should conclude around 4.30 pm so come prepared for a full day in the field with a packed lunch. The trip will cover various aspects of the fluvial geomorphology of the upper River Liffey catchment including Late Glacial and Holocene environmental change. More details of the work are given in Peter Glanville's abstract from the AGM which is included elsewhere in this Newsletter.

There will be no further advertising for this field trip but additional information can be obtained from Peter Glanville, Geography Department, UCD. E-mail: Glanvill@ollamh.ucd.ie

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IQUA Annual Field Meeting 1995 - North-west Donegal 29th September-1st October.

Organiser: Peter Wilson, School of Environmental Studies, University of Ulster, Coleraine.

The venue for the 1995 Annual Field Meeting is to be north-west Donegal. The programme will involve a wide variety of sites of geomorphological, archaeological and palaeoecological interest, including the coastal sand dunes, containing buried soils/peats, and archaeological monuments of Horn Head, glacial sediments around Bloody Foreland, and talus-foot debris accumulations on Muckish and Errigal. Some rough and wet ground will have to be covered on foot, but walking distances at each site are short (< 1 km). Guide book contributors and field leaders include: Eamon Cody, Julie

Fossitt, Joanna Nolan, Marshall McCabe, Philippe MacClenahan, John Roberts, John Shaw and Peter Wilson.

The recommended accommodation is Arnold's Hotel, Dunfanaghy (Tel: 074 3 62 08). The price for two nights B & B will be £52 per person (sharing), with bar (evening) meals extra. Please book your own accommodation; the hotel require a deposit of £30 per person. Please mention IQUA when booking and if possible give name of person you want to share with.

For those wishing to stay elsewhere, there are numerous B & B establishments in Dunfanaghy and an Independent Hostel just to the west of the town. The convoy will depart at 9.00 am each day from outside the hotel. Those staying elsewhere might let me know, so that I'll expect to see you.

RECENT PUBLICATIONS ON QUATERNARY RESEARCH IN IRELAND

COXON, C.E. & COXON, P. 1994. Carbonate deposition in turloughs (seasonal lakes) on the western limestone lowlands of Ireland II: the sedimentary record. *Irish Geography* 27, 28-35.

COXON, P. & O'CONNELL, M. (Eds.). 1994. *Clare Island and Inishbofin*. Field Guide No. 17, Irish Association for Quaternary Studies.

CROKE, J. 1994. The buried bedrock profile and Quaternary valley fill deposits of the Glenmalure valley Co. Wicklow. *Irish Journal of Earth Sciences* 13, 1-9.

DELANEY, C. (Ed.). 1994. *Sea-level change and the Coastal Environment*. Abstracts of the IQUA Annual Symposium, IQUA, Dublin.

HALL, V.A., PILCHER, J.R. & McCORMAC, F.G. 1993. Tephra dated lowland landscape history of the north of Ireland. *New Phytologist* 125, 193-202.

O'CONNELL, M. (Ed.). 1994. *Burren, Co. Clare*. Field Guide No. 18, Irish Association for Quaternary Studies.

WILSON, P. 1994. Characteristics, age and significance of buried podzols in the Grangemore sand dunes, Co. Londonderry. *Irish Naturalists' Journal* 24, 475-480.