



Reconstructing the configuration of the British/Irish Ice Sheet off the north west coast of Ireland

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1. Introduction

Dear All,
Welcome to IQUA newsletter No. 39. This is IQUA's first newsletter in its new mid-summer slot and will hopefully summarise the events of the last few months and prepare us for our Autumn activities (including our Fieldtrip to the Aran Islands (7,8, 9 th Sept. and the Annual Symposium on 23rd Nov.).

This newsletter sees a change in editor, as I take over the mantle from Catherine Dalton. Catherine has done a terrific job producing informative and professional looking newsletters over this last number of years and she has our great thanks for doing so. The newsletter will continue under its new schedule of January and July production dates.

Stephen McCarron, July 2007

2. IQUA Autumn Fieldmeeting

The IQUA annual fieldtrip will this year visit the Aran Island of Inishmore on the 7,8 and 9th of September, 2007.

The trip will be co-ordinated by Michael Gibbons, and feature fascinating sites on the islands, led by Michael himself, Michael O'Connell (NUIG), Claire Cotter and Michael Williams (NUIG). We will assemble on Árainn (Inishmore) on Friday, spend Saturday visiting sites there before sailing to Inis Órr (Inisheer) on Sunday.

Dramatic scenery; the usual mix of all things Quaternary, including some of the most dramatic archaeology in the world; local folklore lectures plus bia, ól agus craic promises a very exciting trip.

As early September is a busy time on the Islands, accommodation, lunches and transport to and around the islands will need to be pre-booked, so I ask that all intending participants please inform me of their wish to partake as soon as possible.

To cover return ferries to and between the islands and minibus hire on the islands, lunches, a guidebook and other expenses, the trip will cost €75 per person, to be collected on the trip.

This sum excludes the cost of other meals and accommodation. Some accommodation will be reserved (B+B's and hostels), and a list of contact numbers are available from me or Michael Gibbons upon request. More details of the travel arrangements can also be obtained then. We'd like to finalise numbers by August 17th.

We intend to use Kilonan as our base and the Pier Hotel as our assembly and evening meal focus. Good walking boots are essential, along with sun-cream and a raincoat! This is sure to be a most memorable trip, and one that will prepare us well for the Annual Symposium, so I would encourage everyone to book early and come along!

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3. IQUA AGM 2007

The 2007 IQUA AGM took place in the Department of Geography, NUI Maynooth on Saturday 31st March, 2007. Several changes were made to the Committee, reflected in its current composition below:

Chair: Dr Stephen McCarron, NUIM
Secretary: Dr Robin Edwards, TCD
Treasurer: Mr Michael Andrews
Publications secretary: Dr Paul Dunlop, UU
Postgraduate Rep.: Ms Claire McLoughlin
Newsletter editor: Dr Stephen McCarron

Farrington Memorial Lecture

IQUA and the Geographical Society of Ireland co-hosted the Farrington Lecture on Saturday March 3rd 2007, also in NUIM. The 2007 lecture was delivered expertly by **Dr. Colm Ó'Cofaigh**, Durham University. The talk was attended by >20 members and NUIM staff and students and the GSI kindly provided a wine reception afterwards. Our thanks to Colm and the GSI for resurrecting the Farrington Memorial Lecture so effectively.

4. IQUA Autumn Symposium

The subject of this Autumn's Symposium has been set as 'Ireland's Islands', and aims to bring together all those working on or around Ireland's many offshore islands. As usual, possible presentation topics can range across the wide spectrum of Quaternary related items. It is hope the Autumn fieldtrip to the Aran islands will form a logical and appetite whetting prelude to the meeting.

A date of Friday November 23rd has been chosen, in the usual location of the GSI Lecture theatre, Beggar's Bush, Haddington Road, Dublin 4.

Possible contributors to the meeting are encouraged to drop an e-mail to: stephen.mccarron@nuim.ie.

5. Article
The Beltany Cup-Marked Stones

Chris Randolph (squarepeg@iolfree.ie)

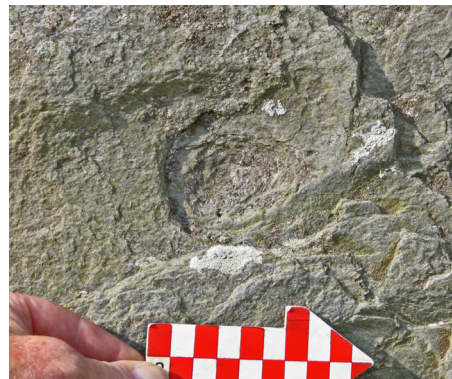
Since 2004 a geophysical and geological survey has been undertaken by Landscape and Geophysical Services on the Beltany Stone Circle near Raphoe in Co. Donegal, commissioned by the Beltany Stone Circle Research Committee, part of Raphoe Community in Action. The project has been aided by a grant from the Heritage Council, and will as part of its remit report on the physical condition of the monument.

During the summer of 2005, as part of this work by Kevin Barton and Chris Randolph of L.G.S, a visual inspection of the stones revealed five more with cup-marks carved on them, in addition to the two already known. A closer study was undertaken in July 2006 to establish the full extent of these "decorations" and a photographic record was made. The results of this are briefly presented here.



Beltany Stone Circle from the West
(photo: Airshots)

The monument probably dates from the Bronze Age, perhaps as early as 3000 BC, (A. Burl, 2006). It consists of 66 orthostats, apparently all glacial erratics, in a c.45m diameter ring. There are a number of gaps where stones have been removed, and a lone outlier to the south-east. There are certain characteristics, partly due to the lithology, which indicate that an indentation is likely to be man made and not natural. Cup-marks were carved by pecking with a hard, pointed stone, perhaps used like a chisel to achieve greater accuracy, with another cobble for a hammer - the technique of indirect percussion. Most of the carved stones at Beltany are of a schistose rock type that de-laminates as it breaks, forming a series of curving "step fractures" which are visible around the resulting cup shaped depression. The photo below shows the single cup-mark on the outer face of Stone 1, the most heavily marked orthostat which is illustrated on the visitor information board at the site. The cupmarks range in size from 3 to 7.5cm across and from 0.5 to 1.5cm deep. The cup-and-ring is 9cm over all.



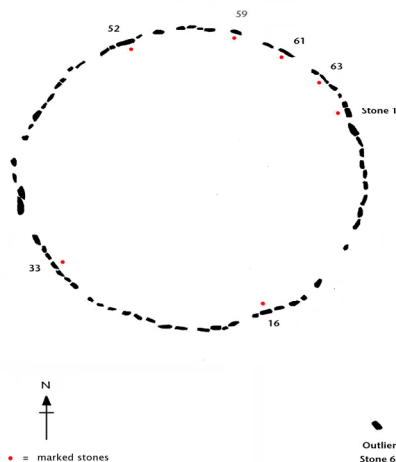


To record the marks they were ringed with chalk (subsequently brushed off) as they were counted and photographed. The numbering order was arbitrarily chosen for convenience. We went back after dark with portable flood lamps and took further photos with oblique lighting to simulate sunlight. Stone No.1 is the only decorated stone that is orientated in such a way as to effectively catch the sun across its face. This is possibly why it became the most heavily cup-marked stone. Certainly this makes it the most noticeable!

In all seven stones were found to have cup-marks, with a single cup-and-ring mark on st61, making 90 marks in total. One of the marks on st63 is covered by a layer of sod growth. It is possible that there are more marks as yet undiscovered, especially on Stone 1, as the inner faces are obscured at the base by the stoney bank lying against them.

The majority of the marked stones are in the north and north-east sector of the circle, with five stones there accounting for 79 of the visible marks. There are only 2 extant marked stones in the southern half, with 11 cup-

Plan Of Beltany Stone Circle



marks

Were any of the missing stones marked? It can be seen that there are 2 opposed pairs of marked

stones:- 16/52 and 33/63. Both stones 1 and 61 have gaps opposite them where orthostats have been lost, leading one to wonder if they too were carved and what, if any celestial alignment they indicated.

It remains unknown why such carvings were made, but a likely interpretation is that they record observations of solar, lunar or stellar events that were of some significance to the builders and users of the monument, whether for religious, agricultural or some other reason.

6. Abstracts from the IQUA Spring Meeting, NUIM, 31/03/07

Characterization of Quaternary sediments using geophysical techniques in the Tullamore region of Co. Offaly

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Several types of glacial and postglacial geomorphological features, which occur in the Irish Midlands have been analysed and characterized using Electrical Resistivity (ER) and Ground Penetrating Radar (GPR) geophysical techniques. Lithological changes in the Quaternary sediments can be inferred from ER data. Time-lapse resistivity imaging survey has been carried out on a monthly basis during 2006 along four different lines. Variations in the transfer and absorption of water through the sediments have allowed the detection of more subtle changes in the nature of the glacial sediments. In addition, the changes in resistivity on a monthly basis have been found to be considerable. Moreover, GPR has been used to classify and characterize the sedimentological and deformational structures within esker ridges, frontal moraines, glaciolacustrine sub-aqueous fans, lacustrine plains and glaciodeltaic sediments. GPR surveys carried out on exposures that occur in gravel pits, using different antenna frequencies, have facilitated the interpretation of the data gathered on areas where exposure was not available. Internal sedimentary and deformation structures within Quaternary sediments such as foresets and bottomsets within glaciodeltaic sediments, channel features and faulting within sub-aqueous fan and morainic sediments and the presence of boulders within esker ridges have been identified. Furthermore, water table and lithological

boundaries have been detected using these techniques.

Chironomid-based temperature reconstructions spanning the last glacial - interglacial transition (LGIT) from southern New Zealand

C. Woodward¹, N. J. Whitehouse¹, J. Shulmeister²
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The recovery of the Earth's climate from the grip of the last ice-age was interrupted by a series of millennial scale climatic variations. The most significant and widely studied of these variations is a return to full glacial climate conditions in the Northern Hemisphere between 12.7 and 11.6 ka. The Younger Dryas climate reversal has been reported from many terrestrial, ice, and marine records of the late glacial interglacial transition (LGIT) from the Northern Hemisphere. Ice-core records from Antarctica, in contrast, indicate that whilst a climate reversal did occur in the Southern Hemisphere during the LGIT, it began before the Younger Dryas and temperatures did not return to full glacial conditions. Recent research efforts have focused on obtaining precisely dated records of climate change from the Southern Hemisphere spanning the LGIT. A reasonable global coverage of paleoclimate records is required to be able to determine the drivers of abrupt climate change and to adequately model the response of the global climate system to such perturbations.

New Zealand, located in the southwest Pacific, is an ideal location to examine climate change during the LGIT in the Southern mid-latitudes. A recently developed chironomid (non-biting midge) temperature transfer-function allows the reconstruction of past February mean air temperatures. We present chironomid-based temperature reconstructions spanning ca. 17 – 10 ka BP from Lake Hawdon, located to the east of the Southern Alps in the South Island, New Zealand. Chironomid-based February mean air temperature reconstructions indicate an Antarctic-like signal with a maximum cooling of 3 °C occurring between 14 and 12.4 ka BP, timed before the Northern Hemisphere Younger Dryas event. Chironomid-inferred temperatures and the presence of pollen from lowland podocarps suggest warm, wet conditions just prior to the climate reversal in New Zealand.

Future work will tighten the chronology of the Lake Hawdon record and provide data from additional sites and proxies, including beetle-based temperature reconstructions.

New mapping of the Irish glacial landform record: deciphering ice flow evolution.

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An inversion of the glacial geomorphological record provides an effective means to reconstruct first-order dynamics of former ice sheets (Kleman *et al.*, 2006). The last Irish Ice Sheet has a long history of investigation, but the configuration and behaviour of the ice sheet remains a subject of debate. Many previous investigations have adopted a 'bottom-up approach' to ice sheet reconstruction, based on field observations and aerial photo mapping of glacial landforms and deposits. Whilst these approaches enable a high level of detail to be recorded, the evidence base for ice sheet reconstruction is spatially fragmented and inconsistent. Furthermore, recent recognition of a dynamic and evolving British-Irish Ice Sheet (Knutz *et al.*, 2001; Peck *et al.*, 2006) demands a re-evaluation of the existing steady-state ice sheet reconstructions.

Remotely sensed data provide an opportunity for consistent and systematic glacial landform mapping at ice sheet scale. We have used a variety of high resolution satellite images and Digital Elevation Models in a GIS framework to map subglacial, glaciofluvial and morainic landforms for the whole of Ireland. The resulting Glacial Map, comprising >35,000 features, greatly extends the previously known distribution of subglacial bedforms and identifies a wide range of landform morphologies. It is clear that a time-transgressive record of glaciation, characterised by superimposition, reworking and remoulding of landforms, has been inscribed on the Irish landscape. The Glacial Map forms the basis for building a palaeo-glaciological reconstruction of the last Irish Ice Sheet. Properties of the subglacial bedform record reveal over 100 discrete ice flow events, or 'flowsets', and their superimposition relationships enable us to constrain their relative chronology. Glacial landforms clearly hold a record of the complex and dynamic behaviour of the last Irish Ice Sheet.

Spatial complexity in the climatic response to solar forcing at 2800 cal. BP

Dr Graeme T. Swindles, Dr Gill Plunkett, Dr
Helen M. Roe

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A number of studies have proposed that a major climatic change to wetter/cooler conditions at 2800 cal. BP was triggered by a sudden decline of solar activity, inferred from an anomaly in the ^{14}C record. It has been hypothesised that this climate shift, at the time of the subboreal-subatlantic transition, was global in nature. However, proxy climate records from peatlands in Northern Ireland reveal that a major shift to wetter/cooler climatic conditions post-dated the rapid decrease in solar activity at 2800 cal. BP by ~100 years. These findings are based on multiproxy palaeoecological data (testate amoebae, plant macrofossils and peat humification) and are precisely constrained using tephrochronology and ^{14}C wiggle match dating. These replicated data may indicate marked spatial complexity in the climatic response to solar forcing, which has major implications for understanding how the Sun alters global climate.

Reconstructing the configuration of the British/Irish Ice Sheet off the north west coast of Ireland.

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Evidence from the terrestrial glacial record indicates that the limits of the last British/Irish Ice Sheet must have extended far out onto the continental shelf in the Northwest of Ireland. Data from the Irish National Seabed Survey (INSS) provides the first real opportunity to investigate this hypothesis in detail. This study utilised INSS multibeam swath bathymetry imagery along with backscatter and acoustic sub-bottom data sets to investigate the glacial record on the continental shelf off the North West coast of Ireland. The main objective was to determine whether the last British/Irish ice sheet occupied the shelf, and if so, to reconstruct its configuration and extent. The results show a complex seafloor morphology comprising of both relict and modern bedforms and we present the first evidence of former glaciation in the region. A range of submerged glacial landforms and sediments are evident that are most likely associated with a Scottish ice mass that invaded this portion of the continental shelf. The configuration of landforms close to the shelf edge suggests that ice extended as far as this and then rapidly ablated. The results provide the first evidence of at least one widespread shelf glaciation in the area and constrain ice sheet extent in this region.

The wealth of data from INSS (Irish National Seabed Survey) and INFOMAR (Integrated Mapping for the sustainable development of Ireland's marine resources): how much science can we get out of it?

Dr. Sara Benetti
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During the last six years, the Geological Survey of Ireland and the Marine Institute of Ireland worked together on the multimillion Irish National Seabed Survey project with the purpose of mapping the Irish marine territory using a suite of remote sensing equipment, from multibeam to seismic, achieving 87% coverage of the marine zone. Ireland was the first country in the world to carry out an extensive mapping project of their extended Exclusive Economic Zone. The Irish National Seabed Survey is now succeeded by the multiyear INFOMAR Programme. INFOMAR will concentrate initially on mapping twenty-six selected priority bays, three sea areas and the fisheries-protection "Biologically Sensitive Area", and then will complete 100% mapping of the remainder of the EEZ. Designed to incorporate all elements of an integrated mapping programme, the key data acquisition will include hydrography, oceanographic, geological and heritage data. INFOMAR also includes a data management, exchange and integration programme for the establishment of a National Marine Data Discovery and Exchange Service; providing improved dissemination of information to researchers, policy makers, the public and private sector. My presentation will focus on the type of data that we have acquired and are acquiring, and the possibility of collaborations and utilisation of these data, now that the Irish government has decided to make them publicly available.

Palaeolacustrine deposits in the Slaney Valley

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This research examines to identify and characterise the morphology of the Slaney valley in Co. Wicklow, specifically in the upper reaches near Stratford upon Slaney. Observation, recording and analysis of glacial landforms and sediments are the basis of the paper. Valley morphology was mapped using a Digital Elevation Model to which field data was added. Exposures provided insight into the sedimentary sources and provide data required in

the palaeohydrological reconstructions. The data presented here has led to one major discovery, Manger Lake. This lake existed during stage II of Farrington and Mitchell's (1973) deglacial history of the western Wicklow Mountains.

Former landscape – finding the context of change

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Pollen deposits in bogs are frequently used to reconstruct vegetation histories from past landscapes. It is on the basis of pollen and other proxy analyses that quite a comprehensive understanding of former Irish landscape dynamics has been built up over the years. Despite this, well-dated long pollen records are still quite rare, a fact which complicates the synthesis between landscape, climate and archaeological records. In this paper a detailed pollen record from Ballyduff Bog, north Tipperary, covering the last 5000 years will be presented. It is supported by a precise chronology based on 38 radiocarbon dates and Spheroidal Carbonaceous Particles (SCP's) as well as an extensive local surface water record based on a range of proxies. Key periods of vegetation change are examined against independent records of human and climate pressures on the landscape. A precise chronology can be used to quantify past rates of change and recovery times. An example from the late Bronze Age shows that it took less than 30 years for trees to re-establish and about a hundred years for the pollen rain from the resultant woodland to resemble its former composition. Detail and timing in a pollen record is not only an integral part of landscape reconstruction but also essential to determining rates of reforestation after agricultural clearance.

Reconstruction of hydrology, climate and human impact during the Holocene in the Burren National Park, western Ireland

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Ongoing palaeoecological studies on sediments from a series of water bodies – a permanent lake and a turlough system – at Mullach Mór, Burren National Park, aim to reconstruction of vegetation, climate and human impact during the Holocene. The Burren in north Co. Clare is internationally renowned as a classical karstic region with a

distinctive geomorphology, exceptional flora and a rich archaeological heritage. This unique, more or less treeless landscape has evolved mainly through strong interactions of farming peoples with the local environment over the last 6000 years. Pollen analytical investigations enable detailed reconstruction of human impact and resulting environmental changes. The important role of woody vegetation in the Burren for most of the Holocene is confirmed. Multi-core analyses provide new insights into the hydrology and the evolution of the lake-turlough system.

7. Research Meetings

Congress of Irish Geographers

A sparsely attended physical geography session featured talks on a wide range of topics on Irish sites or related topics. The presenters and talk titles with a Quaternary studies relation were:

LEWIS, COLIN A.

Department of Geography, Rhodes University,
Grahamstown, South Africa
Climatic changes and their effects on the lives of foragers in South Africa during the last 35 000 years

MATEJCEK, TOMAS

Department of Geography, Charles University,
Prague
The Invasive Alien Plant Species in Czech Republic Riverbank Vegetation

MCCARRON, STEPHEN

Department of Geography, NUI Maynooth
Glimpsing former subglacial environments: drumlinised cavity fill sequences at Ballyboyland, Co. Antrim

McNicholas, Elizabeth ¹ & Gallagher, Colman ²

¹ School of Architecture, UCD. ² School of Geography, Planning and Environmental Policy, UCD
Glaciofluvial Processes of the Pleistocene River Slaney

8. Notices/News

INQUA 2007

Prof. David Taylor, TCD, is representing IQUA as Ireland's national delegate at INQUA XVII, held this month (July 2007) in Cairns, Australia.

Nominations for the incoming Executive are :

Position	Nominee	Nominated By
President	Allan Chivas	Australia

President	An Zhisheng (china)	China
S-G	Pete Coxon	UK
Treasurer	Marie- Loutre	Belgium
VP	Denis Didier Rousseau	France
VP	Jan Piotrowski	Denmark
VP	Margaret Avery	South Africa
VP	Allan Ashworth (USA)	USA
VP	Koji Okumura (Japan)	Japan
VP	John Lowe	Canada

IYPE 2008

Please remember the upcoming International Year of the Planet Earth 2008, supported by INQUA.

IQUA will co-host the QRA spring field meeting in the North of Ireland as a contribution to Ireland's IYPE efforts.

Please see more on IYPE at:

<http://www.esfs.org/>

<http://www.planeteearth.ie/>

National Geoscience Programme

The Royal Irish Academy and the Geological Survey of Ireland (GSI) have jointly published the National Geoscience Strategy (www.ria.ie/committees/geosciences/new.html) on 21st February 2007. The Programme is the product of collaborative work between the RIA Geosciences Committee and the GSI and constitutes part of the National Development Plan 2007-2013. For the first time, geoscience has been recognised by the Government as a distinct sector, with an impact on economic, environmental and social development in Ireland.

9. Recent Publications

Edwards, R.J., 2007: SEA LEVEL STUDIES: Low Energy Coasts Sedimentary Indicators. *In: Elias, S.A. (ed.) Encyclopedia of Quaternary Science.* Elsevier. 2994-3006.

Hall, A.M., Hansom, J.D., Williams, D.M. and Jarvis, J. 2006 Distribution, geomorphology and lithofacies of cliff-top storm deposits: Examples from the high-energy coasts of Scotland and Ireland, *Marine Geology*, 232, 131-155.

Knight, J. 2006. Sub-ice shelf sediment deposition during the late Devensian glaciation in western Ireland. *Marine Geology*, 235 (1-4), 229-240.

McDowell, J.L., Knight, J. and Quinn, R. 2007. Mesoscale changes in present-day nearshore surface sediments and bedform dynamics off the north coast of Ireland. *In: Balson, P.S. and Collins, M.B. (eds) Coastal and Shelf Sediment Transport, Geological Society Special Publication 274*, 103-116.

Knight, J. (ed) 2006. Rapid Climate Change. *Global and Planetary Change*, 54 (3-4), 209-301

Knight, J. 2007. Impact of a lightning strike on a tor summit, County Waterford, Ireland. *Geology Today*, 23 (1), 11-12

McCabe, A.M., Clark, P.U. and Clark, J., 2007. Radiocarbon constraints on the history of the western Irish ice sheet prior to the Last Glacial Maximum. *Geological Society of America Bulletin*, 35(2): 147-150.

O'Cofaigh, C. and Evans, D.J.A. 2007 Radiocarbon constraints on the age of the maximum advance of the British-Irish Ice sheet in the Celtic Sea, *Quaternary Science Reviews*, 26, 1197-1203.

Roberts, D.H., Dackombe, R.V. and Thomas, G.S.P. 2007 Palaeo-ice streaming in the central sector of the British-Irish Ice Sheet during the Last Glacial Maximum: evidence from the northern Irish Sea Basin, *Boreas*, 36,

Swindles, G.T., Plunkett, G. and Roe, H.M. 2007. A delayed climatic response to solar forcing at 2800 cal. BP: multi-proxy evidence from three Irish peatlands. *The Holocene*, 17(2), 177-182.

Wilson, P. 2007. The Kirkby Fell rock-slope failure, Malham, Yorkshire Dales. *North West Geography* 7, 1-9.

Wilson, P. 2007. Block/Rock Streams. *In: Elias, S. (ed.), Encyclopedia of Quaternary Science.* Elsevier, Oxford.

10. Forthcoming Workshops Seminars & Conferences

**IQUA Annual Symposium,
GSI, Beggar's Bush, November, 23rd
2007**

http://www.tcd.ie/Geography/IQUA/Meet/Met_Hme.htm

XVII INQUA congress Cairns, Australia 28th July to the 3rd August 2007.

<http://www.aqua.org.au/AQUA/INQUA2007.html>

International Conference on Karst Hydrogeology and Ecosystems (Karst2007) 13 - 15 August 2007 Bowling Green, USA
<http://hoffman.wku.edu/karst2007/k2007.html>

People/environment relationships from the Mesolithic to the Middle Ages: recent geo-archaeological findings in Southern Italy 4 - 7 September 2007, Salerno, Italy.
http://www.news.unina.it/dettagli_agenda.jsp?ID=3277

11. General Membership Items

Renewal of Membership

Please let your students/ colleagues know about IQUA and encourage them to join.

Please cut out and complete the form below and send it with the relevant annual subscription to the Honorary Treasurer of IQUA:

Irish Quaternary Association

Renewal of Membership

Full members €15.00 (£10); students and unwaged €10.00 (£7)

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Address: _____

Telephone:.....

E-Mail:.....

Amount paid.....

Please also check the date on your address label (e.g. on Newsletter envelope) and contact the Treasurer if you think it is incorrect.

Honorary Treasurer:

Mr. Michael Andrews,
c/o
Mondello Park Limited
Donore
Naas
Co. Kildare
E-mail: mandrews@mondellopark.ie

Cheques should be made payable to IQUA. It is suggested that members pay two or three years subscription on a single transaction, to cut down on bank charges and maintain an active membership for a longer time period.

Note: The treasurer has confirmed that IQUA will accept Sterling cheques, although a small handling charge will be incurred.

IQUA discussion List

<https://listserv.heanet.ie/iqua-l.html>

IQUA members if you are not receiving IQUA listserv emails, please sign up.

To join the IQUA list go to listserv@listserv.heanet.ie and 'Join or leave the list (or change settings)'. A request for subscription to the IQUA-L list goes initially to the list moderator (Catherine Dalton) first for cross-referencing with the membership list.

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