



1. Introduction

Dear IQUA member,
Welcome to Newsletter no. 59.

The IQUA spring meeting was held at University College Dublin and was well attended and included a wide variety of interesting talks and posters (abstracts below – item 3). Our thanks to Steve Davis, Rosie and Mereike for organising the meeting (in particular the great array of delicious sandwiches and refreshments!). The postgraduate presentation prize was awarded to Sabrina Renken from Trinity College Dublin on her excellent talk: *Foraminifera: More than ONE proxy: An example from the eastern North Atlantic*. Congratulations to Sabrina.

The AGM included the election of a new postgraduate rep (Martha Colman) as well as two ordinary members who are stepping down (Bettina Stefanini and Gill Scott). We would like to welcome the new committee members and thank most sincerely, the continuing and outgoing members (Margaret Brown) who have contributed to the growing success of IQUA and its associated events. Other items on the agenda was the 2017 field trip and the venue. A vote on the 2017 field found the proposal to go to South Donegal to be the favourite. This idea was proposed by Ellen O'Carroll and Malcolm McClure and will be organised by them for September (see Item 4 below). The treasurer, Kieran Craven, presented the financial report where IQUA finished with a comfortable balance sheet.

The 2017 Symposium theme was voted in as 'Lakes and Rivers'. Mike Simms has agreed to partly organise. We all look forward to the symposium in the autumn and will be held on the 24th of November in GSI, Beggars Bush, Haddington Rd, Dublin 4. The postgraduate and general dating awards will also be presented at the symposium.

Thanks to all who contributed to this edition of the newsletter.

Kind regards,
Ellen OCarroll

2. IQUA Committee (2017/2018)

President: Dr Catherine Dalton, MIC, University of Limerick (continuing)

Secretary: Dr Benjamin Thebaudeau, Maynooth University (continuing)

Treasurer: Dr Kieran Craven, Geological Survey of Ireland, Beggar's Bush, Haddington Rd, Dublin 4, (continuing)

Postgraduate rep: Martha Coleman, Maynooth University (elected)

Website manager: Chris Randolph (continuing)

Publications Secretary: Sabrina Renken, Department of Geography, TCD (continuing)

Newsletter editor: Dr Ellen OCarroll (continuing)

Ordinary members: Dr Steve Davis, UCD (continuing), Dr Rory Flood, QUB (continuing), Darren Barry, MIC, University of Limerick (continuing), Dr. Sara Benetti, University of Coleraine (continuing), Dr. Frank Ludlow, TCD (continuing), Dr Dr. Gayle McGlynn, Department of Geography, TCD, (continuing).

3. IQUA Spring meeting 2017

IQUA Spring Meeting and AGM, University College, Dublin

ABSTRACTS: TALKS

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An All-Ireland Quaternary Map

Ireland has a very rich legacy of glacial deposits and landforms. More than 85% of the Irish land surface is covered by sediments of Quaternary age. Glacial landforms, associated with the direct action or melting of ice, include ice-sculpted bedrock from glacial erosion and ice-moulded glacial deposits expressed as drumlins, moraines and eskers. Postglacial sediments, covering a fifth of the land surface, were mostly deposited during the Holocene and include lacustrine and alluvial plains, peat bogs and coastal landforms. Mapping the shape and the spatial distribution of these sediments and landforms aided the reconstruction of the glacial history of Ireland. The All-Ireland Quaternary geology map at 1:500,000 scale presented here is an amalgamation of Quaternary maps from Ireland and Northern Ireland. Soil geochemistry and radiometrics data from the Tellus and Tellus Border projects were used to subdivide undifferentiated till deposits in Northern Ireland to match the till types mapped in Ireland. Merging data sets was achieved by distribution matching within the simplex. Data from the Geological Survey Ireland, the Geological Survey of Northern Ireland and the relevant literature were compiled, homogenized and simplified to produce a seamless data set comprising sixteen sediment types, four geomorphological features and the location of key sites with Quaternary and pre- Quaternary dated sediments.

Malcolm McClure, Ellen O'Carroll¹ and Helene Burningham ² (1 Independent Consultants; 2 University College London)
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How neotectonics modified the Irish Peneplain in South Donegal

This study offers new insights to neotectonic block movements on several scales. Multidisciplinary evidence from seven places in South Donegal has established the processes and timing of late Quaternary diastrophism. Detached remnants of the pre-Pleistocene Irish peneplain are disrupted by diapiric swells widely split by patterns of rectilinear faults called Alts. These penetrate deep into the crust forming a mosaic of fault blocks. Onshore displacements were accompanied by antithetic offshore movements. These isostatic movements reflect two kinds of crustal loading and unloading: the accumulation and melting of onshore icesheets causing forebulges offshore, and erosion accompanying peneplanation and uplift, with corresponding deposition offshore. Multidisciplinary evidence indicates the chronology of movement: peneplain erosion close to relative sea level continued until at least MIS4 73kaBP; drumlins formed on the peneplain after 14.5 kaBP; drumlins were faulted and tilted early in the Holocene; well graded rivers were deflected by the new faults; their final cascade to sea level shows subsequent Holocene uplift of the peneplain; *Pinus sylvestris* became common after about 8kaBP; groves of these trees below sea level dating from 5.2kaBP indicate late crustal submergence. The latter crustal movements may have prompted the migration of early Neolithic farming communities.

Sabrina J. Renken^{1*}, Torsten Bickert^{2,3}, Robin J. Edwards¹ (1 Trinity College Dublin; 2 University of Bremen; 3 Marum)
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Foraminifera: More than ONE Proxy: An example from the eastern North Atlantic

Foraminifera are the most commonly used paleoceanographic proxy, either through the properties of their fossil assemblage or as a substrate for geochemical signals. In sediments from the Porcupine Bank slope, eastern North Atlantic, assemblage data (assemblage counts, coiling ratio of *N. pachyderma* (%) and degree of fragmentation) as well as geochemical data (Mg/Ca and stable oxygen isotopes) from planktonic foraminifera have been analysed to study the oceanographic and climatic changes during Heinrich Events. Heinrich Events are usually associated with colder conditions as shown by the dominance of *N. pachyderma*. Even though *N. pachyderma* is still dominant, warm water species intrude the assemblage during Heinrich Events 2 (H2) and 4 (H4) at the Porcupine Bank, maybe due to weak warm water current interferences. Stable

oxygen isotope ratios show a similar finding for H2, while such a potential warming is not represented by the Mg/Ca data derived from the surface dweller *G. bullouides*. Intriguing are the strongly elevated Mg/Ca ratios shortly after H2 and H4. The potential salinity effect on *G. bulloides* might indicate local freshwater influxes neither reflected by either the foraminifera assemblage nor the stable oxygen isotope data.

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Survival of late-Holocene Scots Pine populations, new evidence from Tipperary

Recent research has demonstrated the long-term survival of Scots Pine (*Pinus sylvestris*) in Rockforest, Co. Clare which supports the native status of this species. A mixed stand of woodland containing Scots Pine in a similar geological setting, limestone pavement outcrop, occurs at Kyleomadaun West, Co. Tipperary. The history of this stand has been investigated through pollen and sediment analyses with dating from spheroidal carbonaceous particles and radiocarbon dating. Preliminary results reveal that after early dominance, pine maintains significant presence at the site throughout the record. The combination of both dating sources reveals the likely presence of a hiatus in sedimentation and the implications of this for the record will be discussed. The potential of limestone pavement outcrops acting as long term refugia for Scots Pine in the late Holocene will also be explored. The radiocarbon dates were supplied through a Bill Watts 14CHRONO award sponsored by the 14CHRONO Centre at Queen's University Belfast which is gratefully acknowledged.

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Recent change in lake sediments of Lough Gur

Eutrophication is the most prevalent form of fresh water pollution in the 21st century. Human activities in catchments can increase levels of nitrogen and phosphorus, two key plant nutrients. Analysis of physical, chemical and biological proxies from lake

sediments can reveal approximate timing of eutrophication. Lough Gur, Co. Limerick is a shallow lake ($\leq 4\text{m}$) that has a poor water quality and is classified as hypertrophic with large algal blooms present over the past decade. A palaeolimnological study of two parallel lake sediment records has been completed. Radiometric dates were established for each core using different laboratories in an effort to verify the sediment chronology. Dates above 1986 were similar but radiometric dates deviate prior to this date. Historic changes in organic matter were identified in both and increases are evident from the 1950s onward reaching a peak at the start of the 21st century. One core was examined for fossil diatoms and algal pigments while a geochemistry was measured on the other. Fossil diatoms were not well preserved necessitating measurement of algal pigment concentrations. Biological reconstructions suggest increasing trends in total algae, chrystophytes and some cyanobacteria since the 1950s and peak concentrations in the late 1990s. Geochemical reconstructions of total nitrogen and total phosphorus indicate elevated levels since the 1950s with maxima occurring in recent years.

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Mandibular trabecular architecture in Late Pleistocene and Early Holocene Egyptians and Nubians: biomechanical adaptation to reduced masticatory loads

Geometric morphometric and craniometric analyses consistently demonstrates that the consumption of softer foods, and the reduced mechanical loads they place on the jaw, have produced a comparatively gracile mandible, dental crowding, and increased caries in anatomically modern *Homo sapiens*, in particular in agriculturalist populations. In vivo experiments demonstrate that trabecular microarchitecture reorients in correspondence with different loads through realignment and augmentation of trabeculae. Variation in this architecture is demonstrated to reflect behavioural differences in clinical dental studies, and in the postcrania of archaeological populations. Therefore, the trabecular skeleton of the mandible should reflect variation in masticatory loading between individual diets in relation to morphological and biomechanical variability. This study addresses regions of interest in biomechanically relevant regions of the mandible in a sample of late Pleistocene, and early Holocene modern humans

from Egypt and Nubia. The aim is to contribute to the discussion regarding the biological impact on agriculture in modern humans via the biomechanically-sensitive trabecular skeleton as imaged with high-resolution micro-computed tomography. Two results are hypothesised: 1) trabecular microarchitecture will separate dietarily distinct groups consistent with current designations, and; 2) microarchitecture will be consistent with our understanding of loads incurred during masticatory behaviours.

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Morphometric and dietary changes among early and late farmers in Ancient Lower Nubia

Ecological factors play an important role to shape the patterns of morphological diversification among modern human populations. Variation in dietary practices is hypothesized to affect the masticatory structures and especially the mandible. Here we investigated cranial and mandibular shape patterns, as well as isotopic variation, among populations of Ancient Nubia during the Middle to Late Holocene reflecting a transition from early to intensive farming. Our study aimed to assess morphological changes associated with subsistence strategies and to evaluate how the skull and mandible behave differently in response to subsistence change.

We analyzed skull and mandible shape variation, as well as carbon and nitrogen isotope composition from human remains found in Lower Nubia associated to 4 chrono-cultural groups: A-group (3,300 – 2,800 BC), C-group (2,300 – 1,800 BC), Pharaonic (1,800 – 1,200 BC) and Meroitic (100 BC – 350 AD).

Both morphometric and isotopic patterns highlight differences between early and intensive farmers. The latter have narrower faces, higher and wider mandibles. However, only mandibular shape is significantly associated with diet composition. This study therefore underlines the impact of dietary practices on cranial shape and confirms that the mandible, in contrast to the skull, significantly reflects subsistence strategy rather than population history.

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The Relationship of Stable Carbon and Nitrogen Isotopes to Great Hungarian Plain Diet from the Bronze Age through the Iron Age

During the Neolithic and subsequent time periods, the Great Hungarian Plain was a junction of cultural transformation and genetic dispersion that have shaped European prehistory (Gamba et al., 2014). Changes in settlement patterns, trade networks, ceramic assemblages, and other cultural distributions all indicate the spread of plant and animal domestication as well as social dynamics (Giblin, 2009; Giblin et al., 2013). Using stable carbon and nitrogen isotopes can elucidate these changes in resource pooling. With a change in technology during the Bronze Age and again during the Iron Age, a cultural shift would also have occurred. Changes in food acquisition and preparation would coincide with these cultural alterations. Gamba et al. (2014) discovered the lactase persistence allele (lactose tolerance) in the late Bronze Age. This shift in lactose tolerance may indicate other dietary changes through time which could be reflected in the carbon and nitrogen isotopes. These dietary changes can then infer larger cultural changes through time in this area, including dietary discrepancies between age groups and the sexes.

ABSTRACTS: POSTERS

Henry Lamb¹ Cathal Jordan², James Barry², Louise Barker³, Anthony Corns⁴ Sean Cullen², Sarah Davies^{1*} Gary Devlin², Toby Driver³, Geoff Duller¹ Hywel Griffiths¹, Helen Roberts¹, Robert Shaw³

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Climate, Heritage and Environment of Reefs, ISlands and Headlands (CHERISH): understanding climate, risk and the remote heritage of the Irish Sea zone

The reefs, islands and headlands of the Irish Sea have a rich cultural heritage. These iconic landscapes on the Welsh and Irish coast form an important part of the cultural fabric of both nations yet the archaeological and historical evidence has not been fully documented and the environmental context is poorly understood. Such exposed and remote locations are at risk from coastal erosion and storm activity, the effects of which will be exacerbated with climate change and sea level rise.

CHERISH (Climate, Heritage and Environment of Reefs Islands and Headlands) is a new five-year interdisciplinary project, funded by the EU Ireland Wales Territorial Co-operation Programme (2014-2020). The project is a partnership between Royal Commission on Ancient and Historic Monuments of Wales, the Geological Survey of Ireland, the Department of Geography and Earth Sciences at Aberystwyth University and the Discovery Programme: Centre for Archaeology and Innovation Ireland. CHERISH draws together expertise in archaeology, geoscience (palaeoenvironments, geochronology, surveying) and marine geophysics to undertake detailed analysis of key sites vulnerable to the effects of extreme weather, climate change and coastal erosion. Key aims are to establish the long-term context of environmental change, to undertake baseline surveying and excavation of key sites and to develop cross-nation best practice guidance for identifying and monitoring risks to the coastal and marine historic environment. The project will involve collaboration with a wide range of stakeholder organisations and coastal communities.

Mary C. Bourke*, N. Cullen, C. Nash, R. Flood, F. Goffo, K. Migge, K. (FTCD Department of Geography, School of Natural Science Trinity) *BOURKEM4@tcd.ie

The extent of coastal rock platforms along Ireland's coastline.

Shore platforms provide important ecosystem services and are significant components of global coastal systems. Ireland's coastline is over 7,000km long. Of this, approximately one third has been classified as coastal cliffs. The degree to which these cliffs are fronted by shore platforms is not known as there are no maps which identify their distribution. In 2016, we embarked on a mapping campaign to address this. We will report on the team's progress in mapping and validating these coastal landforms.

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The Landscape of Medieval Bərdə, Azerbaijan 6th - 13th Centuries AD

The Landscape of Medieval Bərdə, Azerbaijan 6th - 13th Centuries AD' project is a pioneering research initiative aiming to investigate the history of the medieval Caucasian capital of Bərdə, Azerbaijan through the study of archaeobotanical material. These issues will be explored by drawing on recently generated data collected from a current fieldwork project, The Archaeological Exploration of Bərdə (AEB). The AEB aims to chart the development of medieval Bərdə with excavations centred around two main sites, Torpak Kala, located in the heart of the city and a rural mound located at Quaratepe. Archaeobotanical material excavated at these sites have been collected, exported and are currently under analysis. Central to this project is the identification of continuity or adjustment in agricultural practices and land management throughout the study period. The use of novella environmental techniques in medieval Azerbaijani archaeology will reveal new insights into the use of plants during the development of this urban centre, and demonstrate the impacts of political and administrative changes on urban and rural plant management and food procurement between the 6th–13th centuries AD. The project also aims to connect the history of the city with the development of the surrounding landscape, understanding the administration of this region as a 'province'.

4. IQUA Annual Fieldtrip 2017 to South West Donegal: 15th – 17nd September 2017

This year's field meeting will take place in South West Donegal, over the weekend of 15th – 17th of September.

As we are planning to hire a coach to reduce the problem of a large convoy of cars on the narrow roads of Donegal we need to know numbers. So please let us know as soon as you can if you intend to participate so that we know what size of coach will be needed.

Itinerary

On the evening of Friday 15th there will be a welcome address by Lochlann McGill (President of Donegal Archaeological and Historical Society) and a talk by Helene Burningham (Coastal Research specialist at UCL).

The main focus on Saturday will be around the Ardara - Narin – Maas area visiting and discussing archaeology, neotectonics evidence in that area and the Sheskinmore Nature Reserve. The nature reserve comprises large areas of sand dunes, lake and marsh that lies between Kiltorris and Ballinreavy Strand, north west of Ardara, Co. Donegal. The area is designated as a Special Area of Conservation (SAC), a Special Protection Area (SPA) and a Wildfowl Sanctuary. We will also visit Kildooney Centre and Megalithic tombs where we will also have lunch. Past landscapes will be examined and discussed by Bettina Stefanini who worked on pollen from an archaeological excavation at Lough Mourne.

On Sunday we will visit Glencolmcille which will be led by Brian Lacey. Dr Brian Lacey has been researching the archaeology and early medieval history of Cos Donegal and Derry for 40 years. A former university lecturer and museum director in Derry, he directed the archaeological survey of Donegal (1979-83). His particular specialism is the lore of St Colmcille.

Places to stay

We will be basing ourselves in Ardara, 28 Km from Donegal town

The Nesbitt Arms in Ardara will be the venue for Friday night and rooms have been kept for IQUA members for Friday and Saturday night for you to make your own reservations (074 9541103).

They currently have 10 single rooms available for €75 per night B&B

Also plenty of double rooms for €100 per night B&B. There will be a meal on Saturday at a cost of

There is also the Drumbaran Hostel in Ardara which is also available in September. It has 5 double rooms B&B and in a separate house with 4 double rooms to rent separately.

5. IQUA Autumn Symposium 2017

Venue: Geological Survey of Ireland Lecture Theatre, Ballsbridge, Dublin 4.

Date: Friday 24th November 2017

"IQUA's **2015 Autumn Symposium** will take place on **Friday November 24th** in the Geological Society of Ireland's Lecture Theatre, Beggar's Bush, Dublin 4. This year's symposium theme is entitled, "Lakes and Rivers". Thanks To Mike Simms for organising

6. Notices and Awards

*** Dating and analysis awards 2017 ***

The official call for the postgraduate and general awards will go out before the end of September. The deadline for applications is 31st October. The awards will have the same structure as in previous years and the final winners will be announced at the IQUA symposium in November 2017.

7. PhD awards

*** PhD awards 2017 and abstracts_***

We would like to congratulate our colleague Dr Jared Peters for the award of his PhD <http://www.ulster.ac.uk/es/resstudent/jared-peters/>. Jared's PhD project was on 'Late Quaternary glaciation of the continental shelf offshore of west Ireland'

A PALAEOECOLOGICAL ANALYSIS OF LATE QUATERNARY SAPROPELS FROM THE MEDITERRANEAN RIDGE

**Darren Barry
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Limerick**

The sedimentary sequences of the Eastern Mediterranean Sea are interspersed by black-coloured, organic rich deposits called sapropels. Ranging in thickness from a few millimeters to as much as tens of centimetres these sedimentary layers have been deposited throughout the late Cenozoic. Despite intensive research the exact environmental conditions that led to the deposition of these sapropels are not yet fully understood. Using planktonic foraminifera as a proxy, this research focuses on the deposition of several sapropels. In addition to the more commonly studied sapropels (S1 and S5) S3 and S6 have also been investigated. The principle aim of this research is to reconstruct the palaeoenvironmental conditions during these depositional events. In addition to using the traditional method of analysing faunal assemblages, particular emphasis will be placed on accessing the test size variation of individual species of planktonic foraminifera. This technique has been applied to other events in Earth's history but not in relation to sapropel deposition.

The research is based on data extracted from ODP core 969A (latitude 33.84N, longitude 24.88E, water depth 2200.3 m). With the exception of S1 (7cm), the thickness of each sapropel (S3 – 28cm; S5 – 28cm; S6 – 41cm) allows each event to be analysed at a sufficiently high resolution. One aspect of this study related to the palaeoenvironmental reconstruction of two cores from open ocean sites. Using micropalaeontological data along with multivariate statistical analysis has allowed detailed analysis of palaeoenvironmental variability since the Last Glacial Maximum (LGM). In addition, estimates of sea surface temperature (SST) shows a gradual climate amelioration from the LGM to present. A unique aspect of this research examined the mean test size data of two shallow and one deep dwelling planktonic foraminiferal species over two sapropel events. Particular attention was paid to both biotic and abiotic factors in the understanding of their effects on species growth. While no obvious increase in mean test size was noted as a direct response to sapropel deposition, variability throughout these timeframes is observed. It is concluded that the mean test size of each species responds differently depending on their SST and nutrient requirements. For the Eemian interglacial sapropel S5 and glacial sapropel S6, a palaeoecological analysis utilising palaeoenvironmental indices reconstructed the water column dynamics and trophic status during these depositional events. Sapropel S5 exhibited considerable variability in response to the position of the Cretan gyre while a two phase depositional event in S6 indicated extreme shoaling of the

pycnocline.

Late Holocene vegetation and cultural land-use history in the uplands of N Portugal

Carla Ferreira

Principal supervisor: Dr. Gill Plunkett ^a

Second Supervisor: Dr. Helen Roe ^a

External Adviser: Dr. Luís Fontes ^b

a) School of Natural and Built Environment, Queen's University Belfast, United Kingdom

b) Universidade do Minho, Braga, Portugal

Abstract

Mountain landscapes are a specific type of landscape that have evolved in a long-term relation with human communities. These regions are considered to be peripheral in socio-economic terms and that very same peripherality that contributed to the development of specific environments now threatens them, in the form of population exodus and the extinction of the traditional way of life, and the fragility of the landscapes are exposed. Because mountain landscapes are a product of ancient interaction with humans, understanding that evolution can provide insights into how anthropic pressure affects upland environments and contribute to their ultimate preservation. Landscape evolution can be approached using historical sources, but to achieve a longer perspective of landscape use and of the environmental, economic and socio-political factors that may have driven it, archaeology and palaeoecology are fundamental.

This study aims to reconstruct human activity in two mountain areas in northern Portugal (Fig. 1) using palynological analysis and integrating its finds with the available regional historical, archaeological and palaeoenvironmental resources. Six sites have been identified as suitable for palaeoenvironmental reconstruction, comprising three flush deposits close to the summit of the Cabreira Mountain, and two ponds and a flush deposit, at settlement level, at the Upper Terva Valley (UTV). Chronologies were based on ¹⁴C age-modelling. Palynology and microcharcoal were used to reconstruct the regions' vegetation and fire history.



Figure 1 Iberian Peninsula main rivers and bioclimatic zones. Both study areas a. Cabreira and b. Upper Terva Valley are located within the Euro-Siberian Bioclimatic Zone.

The timespan of the UTV deposits extends back to the Roman period while the Cabreira sites are limited to the Medieval period. The results show that mixed agriculture and livestock grazing were carried out continually in both regions, throughout the timespan of the deposits. Fluctuations in anthropogenic indicators reveal that the extent of farming varied through time, with cultivation expansion during the Medieval period and general retraction during the Germanic period.

During the Roman period, mining was an important economic activity in the UTV, but otherwise the main activity here and in the Cabreira Mountain appears to have been mixed farming, at a non-intensive scale. Socio-political factors and population change were leading factors in determining the extent of upland use. The study finds that population densities were not linear in the uplands and that human pressure expanded and contracted through time. This study did not find any evidence to suggest that fire was a widely used land-management tool nor that it was a factor in the spread of heathland. . Decreased land-use pressure enabled shrubland to expand, increasing the occurrence of fire. Climate factors do not appear to have been a determinant factor in upland economy and human activity continued in the landscape throughout periods of climatic oscillation. The establishment of warmer climate conditions during the Medieval period may have permitted the extension of cultivation into higher ground.

This study demonstrates a long story of human occupation of the two mountain areas, and that

settlement and exploitation persisted despite the various social-political and climate changes that both regions experienced. The natural environment was long lost in both areas, but the cultural landscape was maintained by non-intensive mixed farming. Landscape change was more dramatic in recent centuries, following mono-culture plantations and the decline of mountain population.

Reconstructing the Newfoundland Ice Sheet through the last glacial cycle

Maureen McHenry

**School of Geography and Environmental Sciences
Ulster University, Coleraine**

Abstract

Despite a long history of research, dating back to the 1800s, we have only a generalised overview of the flow patterns and behaviour of the former Newfoundland Ice Sheet with much of its basic properties unknown or contested. While a substantial body of quaternary research has been carried out in the region this has primarily used traditional field mapping approaches with geomorphic and sedimentary features used to produce ice sheet models. This approach which uses evidence gathered from fragmented study areas to extrapolate ice flow patterns to ice sheet scale often misses the larger scale picture of ice sheet behaviour which has been revealed in palimpsest glacial landscapes. The problems associated with this method has been alleviated by using a more contemporary “top-down” ice sheet interpretation in which a remote sensing approach is used to map individual glacial landforms from across the full ice sheet bed. These detailed landform maps allow for the unravelling of complex flow patterns and geometries recorded in superimposition and cross-cutting bedform assemblages, thereby revealing the behaviour of the ice sheet throughout its evolution and from which former ice sheets can be reconstructed.

This thesis applies this top-down geomorphological-data-driven approach to reconstruct the former Newfoundland Ice Sheet using a new database of > 160, 000 individual glacial landforms, derived from a systematic island-wide remote sensing mapping programme. These landforms provided the primary units for the glacial inversion technique which follows a formalised framework of known glaciological principles to extract the information

glacial landforms provide. A flowset approach was used to group the large number of landforms into summary units. These represent discrete flow events with the characteristics of the component landforms providing key information on the spatial, temporal and glacio-dynamics of their development. These flowsets were used in conjunction with a newly reconstructed retreat pattern derived from new mapping of ice marginal landforms and alongside numerical dating constraints from the literature and published radiocarbon databases. These provided the full evidence base from which a twelve-phase model of the last Newfoundland Ice Sheet has been produced.

This new model has significantly advanced the knowledge of the behaviour of the former Newfoundland Ice Sheet and importantly brings its response patterns into more apparent correlation with major climatic events which drove abrupt change in ice sheet behaviour during the last glacial episode. The reconstruction is therefore an important framework for further investigation of the role and response patterns of ice sheets in the wider climate system which ultimately may lead to better understanding as to how contemporary ice sheets may respond to future climate change.

Title. Holocene environmental reconstruction in Galway Bay, a shallow coastal embayment along Ireland's North-East Atlantic margin.

Joyce Novak (2011-2017):

Co-supervised with Dr. Caroline Cusack, Marine Institute. Funding Mary Immaculate College Studentship Award 2011 College Research Directorate Seed Funds and Marine Institute INFOMAR award # INF-09-19-DAL. (Examiners: Dr David Ryves (University of Loughborough), and Dr. Aaron Potito (NUIG); Viva date March 14th 2017).

Abstract

Coastal environments are highly dynamic and complicated systems that vary spatially and temporally over a range of timescales. This study explores the paleoenvironmental changes recorded in sediment cores taken from Galway Bay, located on the coast of western Ireland. Galway Bay is a large shallow bay, which is protected from ocean swells of the North Atlantic by the Aran Islands. The inner bay receives freshwater mainly from the Corrib River Catchment. Four c. 6 m sediment cores were extracted along an inner bay transect and are explored here in a multi proxy paleoecological study

to track environmental change during the Holocene period. Physical proxies obtained using a Multi Sensor Core Logger (MSCL), geochemical signatures acquired with X-ray fluorescence (XRF) scanning and microfossils (diatom and foraminifera) were examined. A Holocene timeframe was established with 23 AMS 14C dates across the four cores spanning c. 10000 cal years BP. A west-east progression is noted in the sediment stratigraphy. The western most sediment core contained no sediment post c. 8500 cal years BP while the eastern most sediment core, closest to the Corrib River outflow, contained the most complete sediment profile with sediments from the early, mid and late Holocene. A sedimentary hiatus spanning 5-7 ka is confirmed in two sediment cores. Change points in the sediment profiles are identified, reflecting known climatic events, including marine transgression, a possible 8.2 ka cooling event, freshwater phases and rising sea levels. The early Holocene encompassed the highest rate of sediment accumulation and marine transgression is captured in the proxy evidence. Coastal environmental change is postulated with water level rise and paleo tidal ranges varying from Highest Astronomical Tide to Mean High Water with high to middle marsh and mudflat development. The mid Holocene has a major break in sediment continuity with no complete mid Holocene sediment profile preserved. The innermost bay core retained sediment until c. 6000 cal years BP. The major hiatus is associated with a visible shell layer possibly reflecting a possible storm event and a sediment washout. The shell layer is overlain with late Holocene sediments (c. 500 years) in both inner bay cores reflecting either a return of conditions facilitating sediment deposition, or sediments that have not yet been washed out. The complex chronology and sedimentary profiles display a west to east progression along the inner Galway Bay transect reflecting a spatial trajectory of chronological, physical, chemical and biological change and thus environmental change as the rising sea made its way east into the Galway Bay.

Title - Using lake sediment records to examine recent productivity in Lough Gur, Co. Limerick.

Niall Walsh (2015-2017):

Co-supervisor Dr. Norman Allott (TCD). Funding Mary Immaculate College Departmental Assistantship Award. Examiners: Prof. Anson Mackay (UCL) & Dr. Aaron Potito (NUIG). Examiners report 14/7/2017.

Abstract

Lough Gur is a small, shallow lake located on limestone bedrock in County Limerick which has been classed as hypereutrophic in recent decades. The lake has no surface inflow and water level is maintained by groundwater and surface runoff. In the most recent EPA monitoring programme 2012-15 Lough Gur was classified with a 'poor' water quality rating (www.catchments.ie). Questions regarding the balance of the contribution of the inherent natural geographical conditions and the onset of anthropogenic human influences on the lake have prevailed for some time. Palaeolimnological techniques were used to infer historical water quality and identify periods of nutrient enrichment in the lake. Two short sediment cores were radiometrically dated however radionuclide concentrations were low. An approximate chronology with a basal date of 1650 at 50 cm and the cores were cross correlated using organic matter (%LOI) allowing for a multi proxy study with synchronous and asynchronous changes. A lack of intact diatoms and poor diatom preservation necessitated the identification of fossil algal pigments. Physical geochemical and biological responses suggests that the lake has been productive since the mid-1600s but a marked increase occurred in all proxies between 1950 and 2000. Concentrations of algal pigments vary throughout the sediment core and high concentrations of cyanobacteria may be indicative of enriched waters since the mid-1700s. Increases in both OM and algal pigments are consistent with geochemical measurements of TN and TP which show sustained increases from 1950-1990 followed by peaks into the 1990s and 2000s. This increase in lake productivity was likely driven by increasing amounts of nitrogen and phosphorus entering the lake from diffuse anthropogenic sources in the surrounding catchment. P loading from the intensification of agricultural activities and residential dwellings has previously been identified as contributing to the nutrient enrichment of the lake. Recent efforts to promote the heritage of the lake has additionally resulted in a large increase in visitor number which may also be contributing to further increases in nutrient loads. This intensification of nutrient loading puts pressure on the already limited natural buffering capabilities of Lough Gur. Future management measures should focus on reducing anthropogenic sources of nutrients to the lake and raise environmental awareness in the catchment

8. Seminars, conferences, events, news and updates

***IQUA MARA update ***

Dr Kieran Craven was chief scientist on board the Celtic Voyager for the multidisciplinary MALin shelf sediment ReseArch (MARA). Inclement weather and delays related to the search and rescue operation of R116 helicopter meant only four days out of the original ten were spent at sea. Much backgammon and card games were played in port in Galway before transit to the study site of the Malin Shelf! However, the four days at sea were incredibly productive, with all four objectives of the cruise achieved. These included:

1. Production and implementation of a statistically robust sampling plan of benthic sediment habitats in region of excellent backscatter coverage.
2. Collection of sediment grab samples, gravity cores and seismic data acquisition (sparker) to permit characterisation of modern sediment and shelf processes
3. Formulation of improved seabed geology maps and geodatabases through robust sampling strategy and increased sampling density.
4. Outreach and student training: the expedition was designed so students comprised >50% of participants. The aim was to convert the survey into a Training Through Research Program with particular focus on the field-working regime, including planning and offshore research experience.



Figure 1: Scientific team of CV17011 survey in Galway Harbour before departure

Huge thanks are given to the Marine Institute for providing ship time, the crew of the Celtic Voyager, and all members of the Scientific team (Dr Heather Stewart [BGS], Edward Lockhart [Bangor University], Niall Gandy [Leeds University], Oisín O’Brian [Maynooth University], John Skeeahan [Maynooth University], Niamh Connolly for all their work and good humour. Our thoughts are with the crew and family of R116 helicopter. The coast guard provide a critical service that permits our continued research at sea.

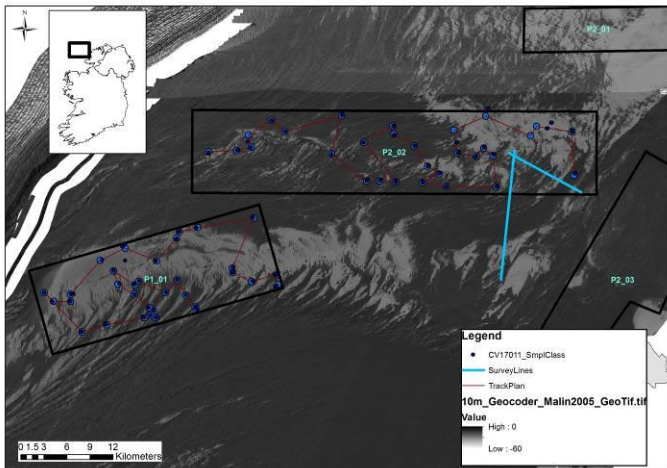


Figure 2: Backscatter image of target locations showing samples recovered, seismic survey lines and track plan.

***IPOL (Irish Pollen Database) ***

Bettina Stefanini would like to update the IPOL database if you could forward her any details on new pollen work. Ideally she would like a

copy of the report or paper as well as the site name, the altitude (if known), the county, the grid refs, the time span covered, the type of dating and number of dates, the analyst and the reference. Corrections to the existing data are also very welcome. Send items to bettina.stefanini@ipol.ie

*** Transport Infrastructure Ireland announces Heritage Week 2017 programme***

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

Saturday - August 19th

Cork - Cork Public Museum

Food and Eating in Prehistory

Time: 12:00 to 16:00

Organised by the Seeing Beyond the Site project, Department of Archaeology, University College Cork, in collaboration with Cork Public Museum, Cork Butter Museum and Arbutus Artisan Bread.

For further information

contact: katharina.becker@ucc.ie

Monday - August 21st

Sligo - Aurivo Auditorium, Sligo IT

A Prehistoric Landscape Unearthed

Recent archaeological excavations on the N4 Collooney Castlebaldwin Road Project have revealed a range of exciting new prehistoric sites and finds. Brian O’Hara, will present the preliminary findings.

Time: 19:00 to 20:00

Organised in association with Sligo County Council.

For further information contact: Orlaith.Egan@tii.ie; 071 9111955

Monday - August 21st

Carlow - Carlow County Museum

Roundabout Archaeology

Join the archaeologists who carried out excavations beside the historic graveyard at Ballinacarrig on the N80 near Carlow and find out more about their fascinating discoveries.

Time: 19:30 to 20:30

For further information
contact: museum@carlowcoco.ie; 059 9131554

Tuesday - August 22nd

Kildare - Naas Town Hall

The Kiln Fields, Sallins Bypass

This illustrated talk outlines the archaeological discoveries made in 2016 and 2017 in advance of the construction of the M7 Motorway Upgrade and R407 Sallins Bypass, Co. Kildare.

Time: 20:00 to 22:00

Organised in association with Kildare County Council and Naas Local History Group.

For further information contact: Noel.Dunne@tii.ie; 086 8296098

Thursday - August 24th

Dublin - Chartered Accountants House, 47-49
Pearse Street

Between the Lines: the archaeology of Luas Cross City

An afternoon of public talks at which archaeologists present some of the recent discoveries that they have made during the excavations for Luas Cross City (St Stephen's Green to Broombridge, Cabra).

Time: 14:00 to 18:00

Register to attend with EventBrite: <https://tii-between-the-lines.eventbrite.ie> For further information contact: Lillian.Butler@tii.ie

Saturday - August 26th

Cork - Macroom Library

The Archaeology of the N22 Road

A public talk about the archaeological discoveries made on a new section of the N22 .

Time: 11:30 to 12:30

For further information contact: Ken.Hanley@tii.ie.

Saturday - August 26th

Dublin - Merrion Square

Meet the Luas Cross City Archaeologists at the IAI Archaeofest

Time: 11:00 to 13:00 and 14:00 to 16:00

Organised in association with the Institute of Archaeologists of Ireland.

For further information
contact: Emer.Dennehy@tii.ie

Sunday - August 27th

Waterford - Waterford Greenway

Go Biking with a Viking

Go Biking with a Viking and explore the Viking history of Waterford along the Woodstown section of

Time: 12:00 to 16:00

Organised in association with Waterford City & County Council.

For further information
contact: bguest@waterfordcouncil.ie; 086 8590341

9. Recent Publications

Abd Elbasit, M.A.M., Chirima, G.J. and Knight, J. 2017. Comment on: Evaluation of kinetic energy and erosivity potential of simulated rainfall using Laser Precipitation Monitor, by Meshesha et al. (2016). *Catena*, 156, 401-404

Alexander J. Wright, Robin J. Edwards, Orson van de Plassche, Maarten Blaauw, Andrew C. Parnell, Klaas van der Borg, Arie F. M. de Jong, Helen M. Roe, Katherine Selby, Stuart Black (2017) Reconstructing the accumulation history of a saltmarsh sediment core: Which age-depth model is best? *Quaternary Geochronology* 39, 35-67. DOI: <http://dx.doi.org/10.1016/j.quageo.2017.02.004>

Biagetti, S., Merlo, S., Adam, E., Lobo, A., Conesa, F.C., Knight, J., Bekrani, H., Crema, E.R., Alcaina-Mateos, J. and Madella, M. 2017. High and Medium Resolution Satellite Imagery to Evaluate Late Holocene Human-Environment Interactions in Arid Lands: A Case Study from the Central Sahara. *Remote Sensing*, 9, 351, doi:10.3390/rs9040351.

Craven, K. F., Edwards, R. J. & Flood, R. P.: Source organic matter analysis of saltmarsh sediments using SIAR and its application in relative sea-level studies in

regions of C₄ plant invasion. *Boreas*. [10.1111/bor.12245](https://doi.org/10.1111/bor.12245). ISSN 0300-9483

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Edwards, Robin J., Gehrels, W. Roland, Brooks, Anthony, Fyfe, Ralph M., Pullen, Katie, Kuchar, Joseph, Craven, Kieran. (2017). Resolving discrepancies between field and modelled relative sea-level data: lessons from western Ireland. *Journal of Quaternary Science*. In press. DOI:10.1002/jqs.2969.

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Kemp, Andrew C., Wright, Alexander J., Barnett, Robert L., Hawkes, Andrea D., Charman, Dan J., Sameshima, Colby, King, Alexandra N., Mooney, Hailey C., Edwards, Robin J., Horton, Benjamin P., van de Plassche, Orson. (2017) Utility of salt-marsh foraminifera, testate amoebae and bulk-sediment $\delta^{13}C$ values as sea-level indicators in Newfoundland, Canada. *Marine Micropaleontology* 130: 43-59. DOI: 10.1016/j.marmicro.2016.12.003

Knight, J. and Robinson, K. 2017. What is Geography? Perceptions of first year undergraduates in South Africa. *Journal of Geography in Higher Education*, 41 (2), 230-245.

Knight, J. 2017. Deglaciation of the Northern Irish Sea Basin. In: Coxon, P., McCarron, S. and Mitchell, F. (eds) *Advances in Irish Quaternary Studies*. Atlantis Press, 151-180.

Knight, J. 2017. Issues of water quality in stormwater harvesting: Comments on Fisher-Jeffes et al. (2016). *South African Journal of Science*, 113(5/6), Art. #a0207, doi:10.17159/sajs.2017/a0207.

Matthews, J.A., Wilson, P. & Mourne, R.W. 2017. Landform transitions from pronival ramparts to moraines and rock glaciers: a case study from the Smørbotn cirque, Romsdalsalpane, southern Norway. *Geografiska Annaler* 99A, 15-37.

Organ, J, Dunlop, P., Benetti, S, Shaw, J and Bell, T (2017) *The Newfoundland Ice Sheet Shelf (NISS) Survey – Research Cruise: Bay d’Espoir to Burgeo, Newfoundland*. Newfoundland Labrador Department of Natural Resources Geological Survey. 10 pp.

O’Connell, M. and Molloy, K. 2017. Mid- and late-Holocene environmental change in western Ireland: new evidence from coastal peats and fossil timbers with particular reference to relative sea-level change. *The Holocene*, DOI: 10.1177/0959683617708447. 21 pp + eight supplementary online files.

Small, D, Benetti, S, Dayton D, Colin K. B, Fabel D, Chris D, Clark, Delia M, Gheorghiu. Newall, J Sheng Xu. 2017 Cosmogenic exposure age constraints on deglaciation and flow behaviour of a marine-based ice stream in western Scotland, 21–16 ka, *Quaternary Science Reviews*. Vol 167. <https://doi.org/10.1016/j.quascirev.2017.04.021>

Southall, D.W., Wilson, P., Dunlop, P., Schnabel, C., Rodés, Á., Gulliver, P. & Xu, S. 2017. Age evaluation and causation of rock-slope failures along the western margin of the Antrim Lava Group (ALG), Northern Ireland, based on cosmogenic isotope (^{36}Cl) surface exposure dating. *Geomorphology* 285, 235-246.

Wood, Bill L., D. Michael Williams, and John Murray. 2007 "Effects of the Younger Dryas climate event recorded in sediment near the western Irish seaboard." *Geological Journal*. <http://onlinelibrary.wiley.com/doi/10.1002/gj.2918/full>

Watson, E.J., Swindles, G.T., Savov, I., Lawson, I.T., Connor, C. and Wilson, J. 2017. Estimating the frequency of volcanic ash clouds over northern Europe. *Earth and Planetary Science Letters* 460, 41-49.

Westley, Kieran, Edwards, Robin. (2017). Irish Sea and Atlantic Margin. In: Flemming, N.C., Harff, J., Moura, D., Burgess, A., Bailey, G.N. *Submerged Landscapes of the European Continental Shelf: Quaternary Paleoenvironments*. Wiley-Blackwell. ISBN: 978-1-118-92213-2

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Wilson, P. 2017. Periglacial and paraglacial processes, landforms and sediments. In: Coxon, P., Mitchell, F. & McCarron, S. (eds), *Advances in Irish Quaternary Studies*. Atlantis Press, Paris, 217-254.

Wilson, P. 2017. Tarn Rigg, upper Teesdale. In: Evans, D.J.A., (ed.), *The Quaternary landscape history of Teesdale and the north Pennines: Field Guide*. Quaternary Research Association, London, 110-114.

10. General Membership Items

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

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We encourage all our members to update their annual subscription for 2017. The annual membership cost is: €15 waged; €10 students/unwaged.

IQUA offers a fast, safe, online payment system already familiar to many (PayPal) for joining IQUA or renewing your membership (!), and for purchasing past field guides (where available).

PayPal allows you to pay securely with your credit/debit card via the IQUA website: http://www.iqua.ie/membership.html

If you do not have access to our online PayPal system, which is our preferred method of dues collection, please cut out and complete the following form and send it with a cheque for the relevant annual subscription to the IQUA Treasurer at the address below. Cheques should be made payable to IQUA.

IQUA membership form

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Amount paid:

If you have any queries about your current IQUA membership status, or general IQUA membership queries, please contact the Treasurer.

Dr Kieran Craven, IQUA Treasurer
Geological Survey of Ireland, Beggars Bush, Haddington Rd, Dublin 4.

IQUA e-mail listserver:
https://listserv.heanet.ie/iqua-l.html

If you are not receiving IQUA listserv emails, please sign up to the list at the location above or contact Benjamin Thebaudeau (thebaudb@tcd.ie). A request for subscription to the IQUA-L list goes initially to the list moderator first for cross-referencing with the current membership list.

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