



1. Introduction

Dear IQUA member,

Welcome to IQUA newsletter No. 56.

This bumper issue includes many interesting articles on various topics related to IQUA research including a geological interpretation of the Malin Shelf and discussions on a submerged Palaeo Shoreline along Lough Corrib (see Item 7). A new research project looking at Neotectonics and the Neolithic in Donegal is also outlined in Item 6. The IQUA research awards and 14CHRONO Centre in Belfast has helped in this research.

Also included in this issue are abstracts from conferences and field trips and information on upcoming events. The 2015 symposium theme was *"Extreme Earth: Events that Shaped the Quaternary"* and the event was held in conjunction with the Irish Geomorphology Group (IGGy), who ran their 2015 IGGy Early Career Workshop and the Third IGGy Scientific Workshop on the theme of *"Extreme Events (A Geomorphological Perspective)"* on the 25th & 26th of November.

The IQUA symposium featured a range of speakers from Ireland and the UK covering various aspects of extreme events during the Quaternary. Abstracts for these exciting talks can be read in Item 5 of the newsletter. IQUA would like to thank the GSI for the use of their facilities once again. A special thanks goes to Margaret Browne and Donna Hawthorne for organising the Symposium, and to all Committee members who helped out in making it a great success. Wine and nibbles were enjoyed by all after the symposium.

IQUA's fieldtrip to the South East of Ireland lived up to its name (sunny south east) and was a very enjoyable and varied field trip which included lectures and visits to sites related to all areas of Wexford, Waterford and Cork. More detailed discussions and summaries of the fieldtrip can be

found in the accompanying IQUA Field Guide (no. G) and in Item 4 of this newsletter.

We hope you will join us for events during the year. There is currently a call for papers for the upcoming Spring Meeting and AGM (Saturday 9th of April) – see Item 3 for details. The Spring Meeting will be hosted by The University of Ulster, Coleraine and will be followed by a field trip to the North Coast on Sunday morning (10th of April). We hope you can all attend this event.

Finally, thanks to all who contributed to this edition of the newsletter.

*Kind regards,
Ellen OCarroll, February 2016*

2. IQUA Committee (2015/2016)

The IQUA Committee is as follows:

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

Secretary: Dr Bettina Stefanini, Maynooth University (continuing)

Treasurer: Dr Gayle McGlynn, TCD (continuing)

Postgraduate rep: Margaret Browne, MIC, University of Limerick (continuing)

Website manager: Dr Francis Ludlow, TCD (continuing)

Publications Secretary: Dr Kieran Craven, Maynooth/GSI (continuing)

Newsletter editor: Dr Ellen OCarroll (continuing)

Ordinary members: Dr Steve Davis, UCD (continuing), Dr Benjamin Thebaudeau, Maynooth/GSI (continuing), Dr Rory Flood, QUB (continuing), Dr Gill Scott, Maynooth University (continuing), Martha Coleman, Maynooth University (continuing)

3. IQUA Spring Meeting and AGM 2016

We are pleased to announce that the 2016 IQUA Spring Meeting will be hosted by the School of Geography and Environmental Science, Ulster University (Coleraine campus) on **Saturday 9th April**.

The meeting is open to all and will consist of short (20 mins) presentations on any area of new or ongoing Quaternary research. Postgraduate and post-doc students are especially welcome and are encouraged to take advantage of the opportunity to present in an informal and friendly setting. Both oral and poster presentations are invited and there will be a prize for best postgraduate talk. Please send abstracts of c. 200 words to: Serena Tarlati (tarlati-s@email.ulster.ac.uk), indicating if poster or talk.

DEADLINE: March 31st.

The meeting will be followed by the IQUA AGM on the Saturday afternoon and a field trip along the North Coast on Sunday morning (April 10th), see details below. Lunch on Saturday will be offered by the School so we need to get an idea of number of attendees.

Please register your attendance to the meeting and eventually the field trip here:
<http://doodle.com/poll/ds3dy8yna7vwszdt>

From this year, there will be a small fee to pay to cover some of the expenses related to the meeting and to support further IQUA activities. The fee will be €10/€5 and £8/£4 for members and students/concessions respectively. Registration will commence at 9:30am.

The field trip will be led by our colleagues Peter Wilson and Colin Breen and we will be visiting several sites along the North Coast from Portrush to Ballycastle to look at records of sea level changes (peat outcrops on the beach), medieval sites (possibly Dunluce castle) and a some glaciolacustrine/marine landscapes, where we recently got some new dates on the Scottish ice advance in Northern Ireland.

The Secretary (email: bettina.stefanini@nuim.ie) welcomes suggestions for Agenda Items up to

Friday 8th April 2016 for the IQUA AGM. The agenda will be circulated before the meeting, and will include nominations for the Committee. We are looking for a **Secretary**, a **Treasurer**, a **Webmaster** and a **Publications Officer**. We also have openings for **Ordinary Members**. Nominations can be made up to the start of the AGM, contact bettina.stefanini@nuim.ie. We would also love to hear proposals for a **location** and **organiser** for the next **Field Trip** and a **theme** for the **Symposium** for Autumn 2016.

More details on the venue location and submitting an abstract are available on the IQUA Meetings webpage.

We look forward to seeing you in Coleraine

4. IQUA/QRA 2015 Annual Fieldtrip

IQUA/QRA Fieldtrip to south of Ireland, 25th–29th September 2015.

Martha Coleman

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Introduction

It had been seven years since a field meeting collaboration between IQUA and the QRA, and thirty four years since IQUA visited the south east of Ireland. The group met at Trinity College Dublin on the Friday morning and with the weather on our side, the Sunny South East very much lived up to its name. The group travelled by coach covering multiple sites in counties Wexford, Waterford and Cork.

Day 1 Friday 25th September 2015

The trip's glacial discussions were led by David Evans (Durham University) and Colm Ó Cofaigh (Durham University). The first two stops of the field meeting were to the view the glacial deposits at the Screen Hills and Blackwater Harbour. Located south of Cahore Point in County Wexford, the hummocky topography of the Screen Hills retains a record of the temporarily stabilised Irish Sea Ice Stream as it retreated from the Celtic Sea. The

deposits demonstrate the subglacial to subaqueous processes associated with the ice stream. Walking along the impressive coastal cliff exposures at the Screen Hills (**Figure 1**), the group witnessed a sequence containing evidence of an ice deposition centre resulting from the oscillating glacier margin. The meeting then moved on to Blackwater Harbour where the group learned that the basal deposits record a southward advance of a grounded Irish Sea Ice Stream into the Celtic Sea. Here, the overlying deposits indicate shallow glacialacustrine deposition while the top of the sequence records an ice marginal environment during deglaciation.



Figure 1

Following on from these sites Pete Coxon (Trinity College Dublin) pointed out some impressive kettle holes whose size demonstrates the scale of ice coverage in the landscape. Venturing further south, the group visited the coastal cliff exposures at Ely House. This site was described as some of the best examples of glacialacustrine sediments with associated dropstone structures in southern Ireland.

Later that afternoon the field meeting travelled to the Irish National Heritage Park in Ferrycarrig, County Wexford. Michael Monk (University College Cork) gave demonstrations on a corn drying kiln and on the workings of a reconstructed horizontal mill driven by a jet of water funnelled from a mill pond. The group discovered that based on evidence from cultivation experiments on charred remains of emmer and bread wheat from the park, it is believed that these grains were among the first grains to be used by early farmers in Ireland. That evening we were treated to a talk on the history of glaciation studies in the south of Ireland by Colm Ó Cofaigh who discussed the importance of the south of Ireland in reconstructing the British Irish Ice Sheet. The group was also given an overview of the activities of the NERC funded BRITICE CHRONO

study and how it fits in with the overall reconstruction of the British Irish Ice Sheet.

Day 2 Saturday 26th September 2015

The next day started with a trip to Kilmore Quay, County Wexford to view the glacial sediment exposures related to the onshore flow of the Irish Sea Ice Stream, where it was explained that the site of St Patrick's Bridge represents a recessional moraine ridge of ice pause and retreat. St Patrick's Bridge is a long ridge of shingle stretching out from the mainland shore towards Saltee Island Little. At low water, the ends of the bridge may be seen jutting out from the townland of Nemestown on the mainland and from the north-eastern corner of Saltee Island Little. St Patrick's Rock is one of several large, named glacial erratics of Carnsore Granite scattered along the seashore on the eastern side of the bridge. These erratics are believed to have been deposited by the Irish Sea Glacier as it flowed south in the Irish Sea during the last glaciation.

Post-lunch the party headed inland where Dominic Berridge (Wexford Wildfowl Reserve, County Wexford) gave a physical and cultural history of the Corrock River and Mulmontry Gorge. The gorge formed a natural barrier between lands to the south east and the rest of the country. This possible glacial meltwater channel provided a natural divide that led to the formation of the Anglo Norman colony and Baronies of Forth and Bargo. These baronies are noted for the late survival of an old English dialect named Yola. During the fifteenth and sixteenth centuries the area was known as the second Pale.

The rest of the day was spent observing the relict pingos at Camaross (**Figure 2**). These fossil landscape features form under periglacial conditions to create dome shaped ice features. Notably, there were 200 pingos in the Camaross area that have now been largely destroyed by agricultural activity. That evening, in the Viking Hotel, the group was treated to talks on the Viking settlements in Waterford. David Pollock (Waterford Archaeology, Co. Waterford) revealed that the settlement of Woodstown was initially attempted 9km up the River Suir noting its occupation from AD 850 to 950. However, this settlement failed and during its demise another site closer to the open sea was taking shape. This site was Waterford and was the beginning of the city that stands there today. Waterford's growth was assisted by its location along the river in close proximity to the sea. The site along the River Suir also provided a natural border

that is still in existence dividing the provinces of Leinster and Munster.



Figure 2

The talks continued with Eileen Reilly (University College Dublin) discussing the environment during the Viking Age in Waterford. Pollen analysis has determined that prior to the Viking settlement a largely pastoral environment existed in the early medieval period, while woodland dominated during the seventh and eighth centuries. Research revealed some disturbance indicators at the very top of the cores which may reveal the early settlement of Vikings. However, it was also explained that limited pollen evidence has been found surrounding Waterford City due to the lack of preservation capability.

Day 3 Sunday 27th September 2015

The next morning the group made their way to the Copper Coast Geopark in County Waterford. Prior to the group splitting for different site visits the group heard about palaeoenvironmental change in the Comeragh and Monavullagh Mountains. A detailed description of methodology and results was given by Bettina Stefanini (Maynooth University Ireland) with the resulting Mesolithic dates putting previous beliefs of peatland formation into question. After the talk the group split, with some hiking up the Comeragh Mountains to Coumshingaun (**Figure 3**) while the rest of the group stayed in the Geopark centre. Following a short video on the history of the Copper Coast's mining history, the participants took a bus journey along the magnificent coastline. With geologist Mike Sweeney (Copper Coast Geopark Chairperson) as a guide, the group made stops to learn about the area's geo-tourism initiatives and discover how the Geopark status has brought the local community together endeavouring to protect their geological heritage.



Figure 3

Moving inland once again, the reunited group visited Ballynamintra Cave. Led by Richard Jennings, (University of Oxford) the Dungarvan Valley Caves Project was outlined. Through new surveys and excavations this project aims to reassess the Pleistocene faunal remains in the area. Hidden away from the road the cave contains an opening extending 10m which leads into a lower chamber with two short passages further on. A total of 50 human bones and other bone fragments have been discovered in Ballynamintra Cave, and although previously thought to have been contemporaneous with Irish Elk bones they were later dated to 3020-2580 cal BC. Previous excavations were thought to have exhausted the cave of evidence but in 2005 the above project located a Pleistocene stratigraphic sequence. With new scientific techniques such as radiocarbon and uranium series dating, together with ancient DNA and isotope analysis, the project hopes to enhance the Irish Quaternary Fauna Project and the Human Remains from Irish Caves Project.

Day 4 Monday 28th September 2015

The next morning the group moved onto County Cork as a base for the rest of the trip. After crossing the Eamon de Valera Bridge, County Cork, the first stop of the following morning was at Cobh Harbour where the group took a short trek to visit a captivating site. The bridge's construction in the 1970s led to the discovery of highly overconsolidated clay and organic sequences beneath gravels with a recognised Pleistocene provenance. The group learned that the retrieval of these interglacial deposits has met with many barriers, demonstrating the many complexities of palaeolandscape reconstruction. An investigation in 1987 did not yield the Pleistocene deposits, due to technical difficulties. Interglacial deposits were retrieved in 1994 when the use of a professional drilling company employed during the Cork Harbour Commission project made the entire quay vibrate. Following that investigation the retrieved overconsolidated clay could not be recovered from the steel tubes due to broken equipment. However,

on this occasion, the group were lucky enough to witness the red diamicton above the olive green overconsolidated interglacial base (**Figure 4**).



Figure 4

The next stop was at Howes Strand where the group visited the glacial features described by Wright & Muff (1904): a till deposit above a wave cut platform lying above a raised beach. At Howes Strand the sands are hummocky cross stratified and swaley cross stratified overlain by coarse grained massive diamict. Having formed in a shallow marine environment the hummocky cross stratified deposits overlay the raised beach thought to have formed during a storm. Today this wave cut platform is now described as erosional furrows or p-forms believed to be developed by subglacial meltwater (**Figure 5**). Participants then travelled to Courtmacsherry Bay. The raised beach noted at Howes Strand runs from Carnsore Point, South East Wexford to West Cork, but is best developed at Courtmacsherry. OSL dates from the site put the deposits at marine isotope stages 4-3. Located above the shore platform the lower horizontally bedded sands and gravels are well sorted while the upper part of the sequence is a massive, matrix supported diamict with striated faceted clasts. This sequence is said to have once been a beachface which was then covered by subglacial till deposited by the terrestrial ice originating from south west Ireland. Synge (1978) thought the sand was deposited by aeolian processes but this sand is now thought to have formed in a shallow marine environment.



Figure 5

Day 5 Tuesday 29th September 2015

Once again the group was fortunate with the weather and on the final day the group visited the last site of Ballycroneen. Heading across the valley mouth from the carpark the group viewed the deposits at Ballycroneen East. The deposits to the east of the carpark demonstrate a possible movement of the Irish Sea Ice Stream onshore. The evidence for a glacially dammed lake came in the laminated and rhythmic nature of the overlying sediments which importantly contain no marine macrofauna. While heading back towards the carpark the last discussion of the trip centred around an impressive exposure thought to have formed as a debris apron flow resembling a perfect example of remobilised sands coming down into fan.

Acknowledgements

The program ran smoothly due to the great organisation by Gayle McGlynn, Bettina Stefanini and Randal McGuckin. Thanks to all the contributors to the field guide. Thanks must also be given to the coach driver, Stephen Nolan, whose skillful driving got us down every little road.

References

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- Synge, F.M., 1978. Pleistocene events. In: Davies, G.L., Stephens, N. (Eds.), *The Geomorphology of the British Isles: Ireland*. Methuen, London, pp. 115-180.

5. IQUA 2015 Autumn Symposium

Extreme Earth: Events that Shaped the Quaternary

Friday 26th November 2015

Abstracts:

KEYNOTE TALK:

Keynote:

Catastrophic environmental events that show up in tree ring chronologies

Prof. Mike Baillie

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The long Irish oak tree ring chronology was constructed to allow calibration of the radiocarbon timescale. The bonus was a year-by-year record of what Irish oaks 'thought' of their growth conditions for every year of the last seven millennia. Interrogation of this long tree ring record uncovered a series of short-term extreme events that had affected temperate Ireland roughly once per millennium from 5000 BC to AD 1000. Some of these environmental events were global in extent and we now know that some of these were definitely caused by explosive volcanism, however, in the case of others extra-terrestrial bombardment cannot be completely ruled out.

Having been introduced, through dendrochronology, to the issue of global environmental downturns, (well witnessed by the AD 536/540 event where one third of Europe's population appears to have died) I became a catastrophist. Catastrophists have a rather different view of the past from normal folk; a view that is not always comfortable. In this talk I'll give a catastrophist's view of a few key events picked out by the Irish oaks, including the happenings around 2350 BC and AD 536/540.

However, once it is realised that some previously unrecorded catastrophes *did actually happen*, the catastrophist starts looking around for evidence of other unsuspected events. If time allows I'll address a few catastrophic issues not normally given a lot of consideration. For example; the Antrim Coast Road, built on the raised beach, testifies to the Northeast

of Ireland having risen by 8 metres since the ice retreated. The question is, did the rise take place gradually over millennia, or did it happen in sudden jumps? Or, take the peat behind the beach at Dooagh, Achill, is it evidence that a major prehistoric dune system was *totally* removed by a storm/tsunami 2000 years ago? Or, take the rotational slip of a major section of the Antrim Plateau at Knock Dhu; what exactly triggered that? Once you start looking, evidence of catastrophic events may be as widespread as the mega-clasts on the tops of Ireland's Atlantic cliffs.

Palaeofires as a disturbance and their interaction with vegetation and climate

Prof. Sandy P. Harrison

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Fire is common in most terrestrial ecosystems and has a geological history as long as that of land plants. As the major form of vegetation disturbance, wildfires are important in regulating ecosystem dynamics, diversity and carbon cycling, but at the same time vegetation type and productivity influence the fire regime. While weather and climate exert an important control on the incidence of wildfire, there are important feedbacks from fire to climate, through pyrogenic emission of trace gases and aerosol precursors that influence atmospheric chemistry and radiative balance, as well as the feedback through CO₂ emission to the global carbon cycle. Interactions between climate, vegetation and fire regimes are complicated by the influence of human activities, both through direct interventions (ignition or suppression) and as a by-product of human activities leading to landscape fragmentation and/or fuel reduction. The interactions between climate, vegetation, fire and humans are complex and vary across time and space scales. Modern observations together with sedimentary records of biomass burning now provide insights into these interactions which, together with carefully designed experiments using fire-enabled dynamic global vegetation models, are providing a comprehensive framework for understanding fire regimes – helping to explain changes in fire regimes and their consequences in the geologic past and improving our ability to predict future changes. In this talk, I will summarise the contribution of analyses of the palaeofire records, spearheaded by the Global Palaeofire Working Group, to our understanding of the controls and consequences of fire and how this knowledge is

contributing to the development (and testing) of models used to project the future.

Deciphering the composition-frequency-magnitude relations of past volcanic eruptions from medial tephra stratigraphies

Dr. Emma Tomlinson
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High-magnitude volcanic eruptions have significant global impacts, including atmospheric cooling and travel disruption, in addition to substantial local destruction. High-magnitude eruptions, those with Volcanic Explosivity Index (VEI) of more than 7, occur every few hundred years. The infrequency of high-magnitude events means that the changes in magma composition that occur prior large eruptions, and thus the processes that causing these changes, are poorly constrained. This is compounded by the burial and/or erosion of deposits from preceding, lower magnitude eruptions. Volcanic ash is preserved in sedimentary settings, such as annually layered lakes, offer huge untapped potential for improving our understanding of the frequency of past eruptions and geochemical evolution of magmatic systems.

Campi Flegrei is the source of the largest known eruption in Europe, the 39ka Campanian Ignimbrite (CI), which produced 250–300 km³ volcanic ash spread over a large sector of Central and Eastern Europe. The CI eruption has previously been implicated in the demise of the Neanderthals in Europe and their subsequent replacement by anatomically modern humans. Campi Flegrei has had at least two other high-magnitude eruptions, the Neapolitan Yellow Tuff at 14ka and the X5 at 105ka, as well as hundreds of smaller events. Tephra layers from eruptions at Campi Flegrei are preserved in the annually laminated Lago Grande di Monticchio (LGdM), which spans 3-133ka. This study investigates the geochemical compositions of these tephra layers, and reveals cycles of small eruptions that tap one of more separate magma reservoirs. These cycles are punctuated by occasional large eruptions of more variable magma, followed by a change in magma chemistry.

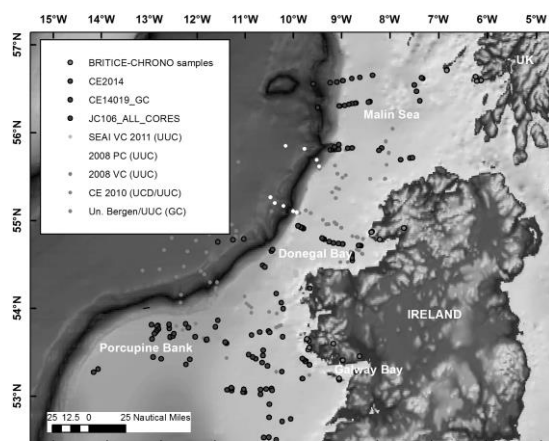
This work demonstrates how studies of tephra in high-resolution stratigraphic records can aid in deciphering the composition-frequency-magnitude relations of past volcanic eruptions. This temporal context is critical for reconstructing the eruptive history of hazardous volcanoes and to help mitigate the risk from future eruptions at these volcanoes.

The demise of the western margin of the last British-Irish Ice Sheet: new geomorphological, sedimentological and chronological evidence of offshore to onshore glacial retreat

Dr. Sara Benetti

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Bathymetric and seismic data on the Irish and UK continental margins reveal extensive evidence for past ice sheet advance and retreat across the continental shelf bordering the North Atlantic Ocean.



These marine geophysical data confirm that the British-Irish Ice Sheet (BIIS) extended for at least 100 km offshore of west Ireland and Scotland onto the continental shelf and left a signature of drumlins, moraines and iceberg scours, both buried and at the seabed. These features provide unequivocal evidence for past extension of the BIIS to the shelf edge, reconfiguration of the ice sheet into a series of lobes during deglaciation, followed by subsequent slow retreat of grounded ice from the shelf onto land. However, the timing and character of this advance and retreat remain unclear due to the limited availability of datable material both offshore and onshore.

This problem has been addressed in recent years by several marine and terrestrial sampling campaigns. Research cruises were conducted on the Irish R.V. *Celtic Explorer* in 2008, 2010, 2011 and 2014 as part of the ongoing research at Ulster University on the offshore extent of the BIIS. Additionally, further marine sampling took place on the RRS *James Cook* in 2014 and terrestrial sampling in 2013-2015 as part of the NERC-funded Consortium BRITICE-CHRONO (<http://www.britice-chrono.group.shef.ac.uk/>) coherent approach to

date the retreat of the former BIIS. During the cruises, over 200 sediment cores were collected in the region. Core sites were targeted to sample glacial features on the shelf, particularly several series of recessional moraines that record the last deglaciation from the shelf edge. The terrestrial sampling campaigns targeted either glacially deposited boulders for TCN dating or proglacial sandy sediments for OSL dating in transects that recorded the landfall and onshore retreat of the ice sheet. All of these samples, both marine and terrestrial, provide an unprecedented opportunity to characterise and date the deglaciation of the western margin of the last BIIS.

This talk will present an overview of results to date with a focus on the western Irish and UK shelf, in particular in the regions of the Malin Sea, Donegal Bay and offshore county Galway. New geomorphological and sedimentological evidence of ice sheet extent on the shelf will be shown along with chronological results from both marine and terrestrial samples

Keynote Lecture:

**Rapa Nui (Easter Island) monumentality,
environmental change and resilience (circa AD
1200-1600)**

Prof. Sue Hamilton

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Interest in Rapa Nui's iconic moai (statue) construction period is dominated by a focus on its demise. Words and phrases such as 'collapse', 'the island that self-destructed', 'ecodisaster' and 'disastrous European contact' abound. There is a tendency to analyse the moai as isolated entities, rather than as elements of a dynamic interrelationship between people, landscape, places and architecture. The neglected mystery of Rapa Nui is the relationship between a remote island's changing environment and the emergence of an island-wide cosmology of constructing with stone. The presentation will pull together the diverse research avenues by which the AHRC funded 'Rapa Nui Landscapes of Construction Project' has investigated the meaning, contexts and adaptive resilience of the moai-period construction activities. It offers a Polynesian framework of understanding place and environmental change.

"Full fathom five thy father lies..."

**The flooding of Doggerland: an early Holocene
'extreme event' from the southern North Sea**

Dr. Benjamin R. Gearey

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This paper considers the methodological and theoretical problems and potentials associated with palaeoenvironmental investigations of submerged archaeological landscapes, using a case study of the southern North Sea ('Doggerland'). It will be argued that there are particular considerations relevant to utilising palaeoenvironmental data to address archaeological questions concerning past human perception and response to events such as landscape scale flooding and environmental changes associated with changes in relative sea level. The intrinsically site-specific nature of palaeoenvironmental data and our associated ability to define any past event as 'extreme' will also be considered. Furthermore, in order to produce meaningful and integrated archaeological and palaeoenvironmental investigations, it will be proposed that we should attempt to 'scale up' from rather than 'scale down' from landscape scale models. These issues will be illustrated using multi-proxy palaeoenvironmental data from the southern North Sea

Anoxic Events in the Mediterranean Sea

Dr. Angela Cloke-Hayes and Darren Barry

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Anoxic events in the Mediterranean Sea are identified as dark, often laminated, organic-rich sediments called sapropels. The quasi periodic occurrence of sapropels within sedimentary sequences indicates their deposition coincides with precession minima. Such climatic episodes instigated a decline in bottom water ventilation and subsequent sediment deposition occurred under anoxic conditions. Using planktonic foraminiferal census counts, this research focuses on the palaeoenvironmental changes associated with the deposition of several sapropels from sediments in the Levantine Basin. In addition to the more commonly studied sapropels of S1 and S5, S3 has also been investigated. A multivariate statistical approach was employed (Q-mode Cluster Analysis and Principal Component Analysis (PCA)) providing

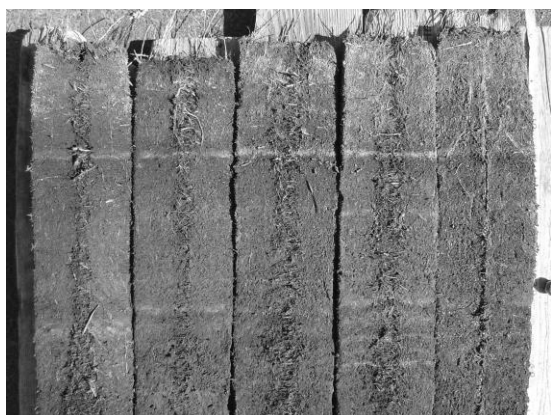
an insight into the surface water conditions that prevailed during sapropel deposition. Additional palaeoceanographic proxies (sea surface temperature (SST), productivity and stratification) are also applied to determine the hydrographic regime and trophic status of the basin at the time of these extreme climatic events.

Past evidence of sea-level extremes: Palaeo frequency or fantasy?

Dr. Robin Edwards

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The recurrence interval of high magnitude, low frequency events is difficult to establish with any reliability from instrumental records due to their limited length. This is particularly the case for extreme sea-level 'events' since tide gauge records typically span several decades to a couple of centuries at most. The geological record has the potential to significantly extend data coverage, both in space and over time, but produces data with markedly different qualities to their instrumental counterparts. In this paper, I will briefly review the role that low energy coastal deposits can play in the reconstruction of extreme sea-level changes during the Holocene. I will compare and contrast the nature of records associated with seismic events, tsunami and hurricanes/cyclones and evaluate claims that such records can provide reliable information on event frequency and recurrence intervals.



Sand layers in a Connecticut salt-marsh. These 'out of place' high-energy deposits provide evidence for extreme storm events during the Holocene: or do they?

6. Bill Watts 14CHRONO AWARDS & IQUA Research awards

We are pleased to announce the winners of the **IQUA Research Awards** and the **Bill Watts 14CHRONO Awards** 2015 as well as detail on some of the research that the awards has gone on to fund. The awards are open to all paid-up IQUA members of at least one year's standing. They consist of four AMS radiocarbon dates sponsored by the **14CHRONO** Centre of Queen's University Belfast and an additional IQUA grant designed to fund a further two radiocarbon dates, but which can alternatively cover other dating methods or laboratory fees (e.g. for DNA or isotope analyses).

The **Bill Watts 14CHRONO Awards** pay for six AMS radiocarbon dates for current postgraduate members of IQUA. Winners of the Awards are asked to present their research and the use of their awarded AMS¹⁴C dates at the Spring Meeting and to include their abstract in the [IQUA Newsletter](#).

Winners of the 2015 Bill Watts 14CHRONO Awards went to Denise McCullagh, Ulster University, Coleraine and Margaret Browne, Mary Immaculate College, Limerick, and the IQUA Research Awards were awarded to Xavier Pellicer & Kieran Craven and Bettina Stefanini

IQUA Research Awards – abstract

Neotectonics and the Neolithic: A progress report.

Malcolm McClure and Ellen OCarroll
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In the mid-19th century peat with associated tree stumps was observed 14 feet below sea level, close to the west Donegal coast at Rosbeg. This was described in an 1864 paper* by the County Engineer, Wm. Harte, who was sufficiently intrigued to offer a geological explanation. In 1891 that paper was quoted in the Geological Survey memoir and it became known in the context of other similar discoveries off the southern and western coasts of the British Isles.

The search for oil and gas led to intensive investigations of the seabed in the southern North

Sea during late 20th century. A recent investigation there** has provided geographical details about a landscape called Doggerland that became submerged in the Mesolithic. The existence of this land had long been suspected from peat clods, artifacts and extinct mammal bones caught up in fishing nets, but it only gained the attention of archaeologists after World War II. It was then explained as evidence of rising sea level, the so-called 'Litorina transgression', however an alternative is by isostatic sinking of the crust.

Abundant evidence of isostatic uplift of the Scottish Highlands during the late Pleistocene shows that that area had earlier been depressed by the mass of ice sheets. Persuasive evidence suggests that this depressed area was balanced progressively by lateral flow of deep melt that uplifted a complementary chain of forebulge component blocks. Although temporarily present elsewhere, in their extremity these uplifts extended south of Ireland, through the English Channel and into the North Sea. That forebulge chain mostly subsided and retreated in its turn after Scottish ice melted and the crust there rose again.

Forebulges have left traces of their former extent throughout the south of these islands. Superimposed drainage, submarine river channels, peneplains, raised beaches, Thames terraces etc. all point to a significant phase of uplift followed by variable subsidence in relatively recent geological time. The details of these block movements are now beginning to form a coherent picture.

The possible presence of a similar forebulge on the continental shelf west of Ireland led to our current investigation in South Donegal. The drumlins in the area were laid down on a peneplain that began to develop in the late Miocene or Pliocene; at maximum that level surface extended across much of Ireland. During the Pleistocene the peneplain was subject to local movements as the crust responded to the accumulation and melting of a series of ice sheets. In Donegal drumlins were deposited on this peneplain around 17 ka ago. Our study shows that some drumlins were later faulted with vertical displacements of up to 26 metres, establishing the importance of neotectonic movements in the area.

The Ardara,—Maas—Narin area has been extensively disrupted by a network of related neotectonic faults, suggesting that this area formed a hinge zone, with isostatic uplift to the east and related subsidence to the west. Derryness Island in Loughrosmore estuary has semi-submerged groves of pine with roots in bog, all below high tide level.

These lie within 8 kilometers of the Rosbeg submerged peat and were formed evidently by the same processes. One of these stumps has now been dated radiometrically to cal BC 3334 - 3212 (2 sigma – 95.4% BC). This date was obtained thanks to the Bill Watts/IQUA research awards and funded by 14Chrono Centre, Belfast. Submerged forests provide valuable information on sea-level change as these forests would have been inundated by rising sea levels in prehistory particularly along the Atlantic coast in Ireland and elsewhere (Bell, O'Sullivan and Quinn, 2006). Consequently they provide a woodland and cultural landscape hitherto lost with the rising tides. Indeed many archaeological finds and features have been uncovered alongside these submerged forests in the Severn Estuary in Wales (Bell, Caseldine and Neumann 2000) as well as the Shannon Estuary (O'Sullivan 2001) in Ireland and Newfoundland (Bell & Renouf 2004).

This date also establishes that individual fault blocks continued to sink until the late Neolithic when they finally established isostatic equilibrium. The court tombs and portal tombs in southwest Donegal were built by people who had witnessed these changes. The implications of this evidence for the interpretation of the adjacent continental shelf will be the subject of a follow-up study.

Bell, T. and Renouf, P. 2004 Prehistoric cultures, reconstructed coasts: maritime Archaic Indian site distribution in Newfoundland. *World Archaeology* 35, 350–70

Bell, M., Caseldine, A and Neumann, H 2000 *Prehistoric Intertidal Archaeology in the Welsh Severn Estuary*. Council for British Archaeology (Research Report 120): York.

*Harte, W. (1864). On the Physical Features of Co. Donegal. *Journal of the Royal Geological Society of Ireland* 1864 21-27

* *Gaffney, V., Thomson, K., & Fitch, S. (2007). Mapping Doggerland. *Mapping Doggerland: The Mesolithic landscapes of the southern North Sea*. Oxford: BAR Archaeopress.

O'Sullivan, A., 2001. *Foragers, farmers and fishermen in a coastal land-scape: an intertidal archaeological survey of the Shannon estuary, 1992-1997*. Royal Irish Academy, Dublin, 1-37 pp.

7. Quaternary News

Ulster University, Coleraine and Sara Benetti won one of the Geological Survey of Ireland's grants for the project GB-ENV (Past and modern environments of Galway Bay), which involves a multi-disciplinary investigation of the processes that shaped Galway Bay since the end of the last glacial maximum to today.

Paul Dunlop (PI) Sara Benetti, Ruth Plets, Maureen McHenry, Denise McCullagh (Ulster University) Trevor Bell, Thomas Brown (Memorial University, Canada) John Shaw (Geological Survey of Canada) Fabio Sacchetti, Thomas Furey (Marine Institute, Ireland) Randy Gillespie (Marine Institute, Newfoundland) were awarded 3 days on the Irish RV Celtic Explorer under the Irish National Development Plan for their project titled "The Newfoundland Ice Sheet Glaciated Shelf" to collect new geophysical data and sedimentary cores from moraine systems on the Newfoundland shelf to investigate its glacial history.

Thanks

Maureen McHenry was awarded in August (2015) the Guy Lortie Award for Best Student Presentation at Canadian Quaternary Association (Canqua) Biennial Conference St. Johns Newfoundland.

Title: Palaeo-ice sheet reconstruction of the former Newfoundland Ice Sheet, using the glacial landform record and cosmogenic exposure dating.

Ciaran Craven was elected in February to PGeo and EurGeol by the Institute of Geologists of Ireland and the European Federation of Geologists.

Dr Evelyn Keaveney, Centre for Climate, the Environment & Chronology (14CHRONO), recently received a Royal Irish Academy Award to carry out research in Loughborough in England with Dr David Ryves. The title is:

*Production rate, carbon source and burial in sediments of a hyper-eutrophic lake – Rostherne Mere. *

Mapping the Malin: A geological interpretation of the Malin Shelf

Kieran Craven

Kieran.craven@nuim.ie

In recent years (2000-present), the Irish National Seabed Survey (INSS) and Integrated Mapping for the Sustainable Development of Ireland's Marine Resources (INFOMAR) (Geological Survey of Ireland [GSI] and Marine Institute collaborations) have provided unprecedented quantities of high quality data on Ireland's offshore territories. Bathymetric, backscatter and shallow seismic data collection continues in near shore regions as science wishes to advance our knowledge of this hidden part of our world and multiple industries seek to sustainably develop the shelf regions (e.g. fisheries, marine renewable energy, hydrocarbon exploration).

In February, with funding from the Irish Research Council under their Enterprise PostDoctoral Fellowship Scheme, Kieran Craven started a project that will map approximately 25,000km² of the shallow geology of the Malin Shelf (54°-56°N and 7°-10°W, <500m water depth). He is based between the GSI and Maynooth University (MU) and continues the research collaboration between Dr Stephen McCarron (MU) and Xavier Monteys (INFOMAR, GSI), using the marine geophysical information to understand more about our current seafloor and recent glacial history.

The determination of sediment type and quantity (i.e. extent and thickness) is a crucial component of any understanding of the British-Irish Ice Sheet in this region; which will help inform on the dynamics of contemporary climatically-driven ice sheets. This study will map this physical framework and provide new knowledge in a region with significant sustainable-development potential to ensure best practice, including the highest levels of environmental protection, in any development.

A Submerged Palaeo Shoreline in Lough Corrib

Captain Trevor K Northage MNI FRIN
TREVOR.NORTHAGE@odfjell.com

I have been charting Lough Corrib as a pastime for the last seven years. For the last five years I have been using side scan sonar and various forms of underwater video to identify the numerous anomalies that have been captured in the data. A high proportion of these anomalies have been ancient wrecks some dating as far back as 2500 BC, most in a remarkable state of preservation.



Fig 1. The Clydagh Boat, slotted transom stern and steering oar (Trevor Northage)

One of the things that puzzles me about the wrecks is the fact that to date I have found none in water less than 15ft deep, and I started to look at the possibility that Corrib's shoreline had occasionally been substantially lower. This would have allowed shallower wrecks to be scavenged. I am also considering the possibility the lake was actually much lower for a considerable length of time.

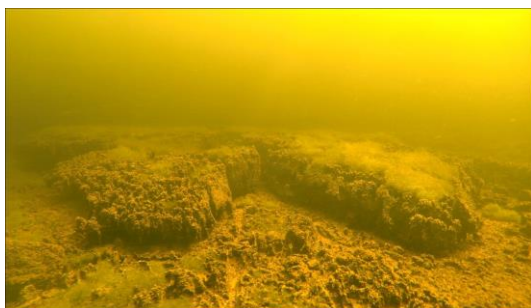


Fig 2. Limestone pavement with Rohrenkarren (T.Northage)

Several papers have postulated drying events, and indeed the *Irish Annals* record two such events, noting the Galway River running dry in 1178 AD and 1190 AD. Core samples taken from the lake bottom

15ft down and close to one of the wrecks revealed at first sight what were possibly drying events approximately 18ft below the present water surface. These core sample results are still being analysed.



Fig 3. Submerged limestone pavement captured on side scan (Trevor Northage)

The picture became somewhat more interesting when we captured footage of what appeared to be Rohrenkarren, limestone pavements, and egg-carton pitting some 15ft down. High definition movies and subaqua photography has confirmed this.

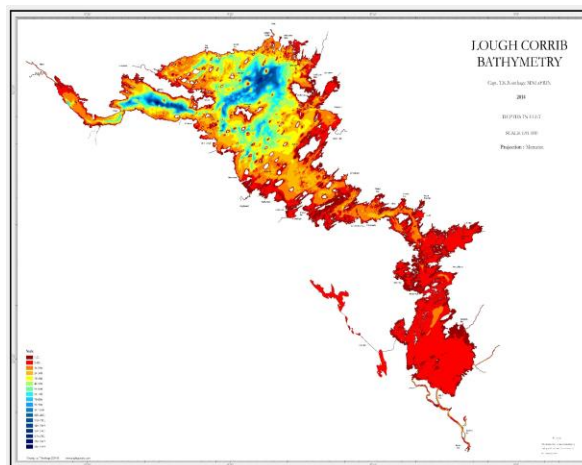


Fig 4. Lough Corrib Bathymetry

Corrib today consists of a large main lake in the northern section, a shallow (20ft) central section, and a shallower (10ft) southern section. The central and southern sections have several shallow and wide (up to 1 km) limestone bars running across them in a SW/NE orientation. The Victorians dredged and cleared a depth of 6ft on these features to allow steamers to trade on the lake.

If the lake was 15ft lower, then these features would have represented substantial limestone isthmuses separating smaller lakes in a similar fashion to the isthmus separating Corrib and Mask, each with deep holes adjacent or close to the isthmus.

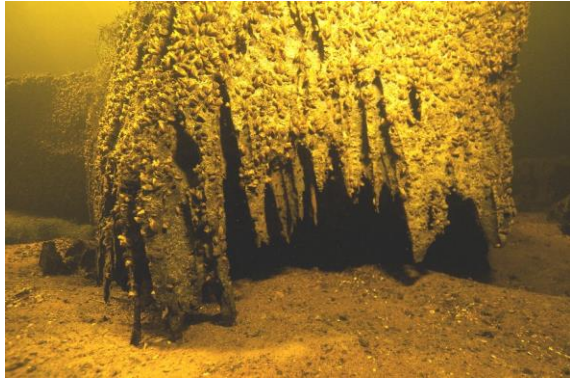


Fig 5. Section of limestone pavement, encrusted in zebra mussels. Rohrenkarren can be seen along the lower edge of the slab (photo Ciaran O'Murchu)

Our first challenge is to try and put an age to the palaeo shoreline to be able to place the boats in context. We have a huge collection of globally important marine archaeology that may well have been part of an entirely different landscape.

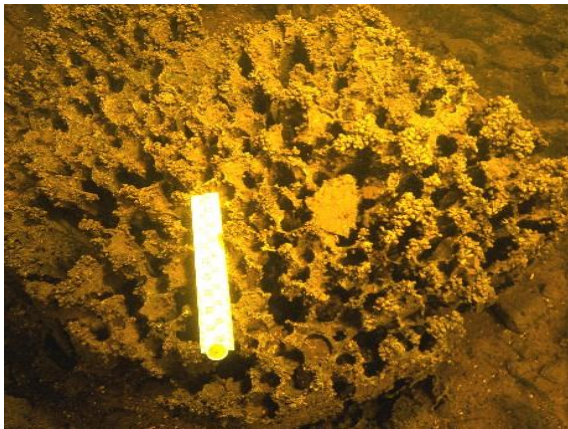


Fig 6. Egg-Carton pitting (Photo Ciaran O'Murchu)

The second challenge is to work out exactly what happened to the water when the lake was 15ft lower, and how it got to the sea. The massive Terryland sinkholes near Galway would seem prime suspects for involvement, and the sequence of deep holes (each approximately the same depth either side of the isthmuses) running down the limestone

section of the lake are to my untrained eye acting suspiciously.

Finally of course, what happened to change the lake level so drastically?

The project has so far involved just myself and my camera-girl, and we would dearly like to get some involvement from more people with expertise in this area. As my good friend Pete Coxon said, "There's a few papers in this!"

I maintain a website where you will find plenty of charts, movies and photos:

<http://www.anglingcharts.com/loughcorribhistory.html>

Neither myself nor my camera wielding accomplice are trained archaeologists, geologists, or scientists; feel free to throw some ideas into the pot.

Captain Trevor K Northage.

Footnote: The equipment we use is slightly modified but generally "off the shelf" consumer sonar equipment, consisting of; Lowrance HDS8 Sonar unit with Gen 2 transducer and structurescan unit. Positional accuracy is enhanced with an active 10Hz GPS antenna. A Seaviewer targeting dropcamera connected to a Panasonic Toughbook, with a GoPro Hero4 Black mounted piggyback on the dropcamera recording video in 4K. Sonar analysis is carried out in Reefmaster Sonarviewer.

8. Forthcoming workshops, seminars & conferences

Agricultural History Society of Ireland — Summer Conference 2016

Topic: Agriculture, Conflict and Rebellion in Early Twentieth Century Ireland

Location: National Museum of Ireland - Country Life, Turlough Park, Castlebar, Co. Mayo

Date: Saturday & Sunday, 11 & 12th June 2016

The focus of the conference is Ireland of 100 years ago with particular reference to agriculture and the rural economy, i.e. the main economy of the time. The developments of those times will be considered within a wide context, including the effects of the various reforms in land ownership in the late nineteenth century, and the impact of World War I and the 1916 rebellion on rural economies, especially in Ireland, in the early twentieth century.

Programme and details regarding registration (on Eventbrite) will be posted shortly at www.ahsi.ie.

The **Saturday programme** consists of lectures and includes the following contributors and topics:

Bernard O'Hara (former Registrar, GMIT) and **Dr Carla King** (History Department, St Patrick's College, DCU) on particular aspects of Michael Davitt's life and the land issue.

Dr Conor McNamara (History, NUIG): *Rural Ireland in War and Revolution, 1914-18: A Society in Transition*

Professor Frank Barry (Business Studies, TCD): *The Agri-food Industry in the Decades Prior to the Establishment of the Free State*

Dr Jackie Ó Cionna (History, NUIG): *'The fertiliser factory was a good thing for McDonogh and Sons; but it was a better thing for hundreds of small farmers': Martin ('Máirtín Mór') McDonogh and the fertiliser industry in the west of Ireland*

Dr Mary Forrest (School of Agriculture and Food Science, UCD): *School gardens and allotments in rural Ireland: initiatives to promote food production in the early twentieth century*

Dr Austin O'Sullivan (Founder and former Director of the Irish Agricultural Museum, Johnstown Castle, Co. Wexford): *Ireland in the early twentieth century: conflict and rebellion and the consequences for the rural population*

Dr Tony Varley (Irish Centre for Rural Transformation and Sustainability (ICERTS), NUIG): *Agrarianism and farmer politics in the west in the context of the Revolution*

Full-day excursion on Sunday, 12 June led by Bernard O'Hara

It will include: M. Davitt Museum at Straide, Foxford Woollen Mills and Hennigan's Heritage Centre, Swinford

Book launch during the conference:

Cattle in ancient and modern Ireland. Farming practices, environment and economy. O'Connell, M., Kelly, F., McAdam, J.H. (editors) Cambridge Scholars Publishing, Newcastle upon Tyne.

Expected publication date: end May 2016. The book derives from the AHSI Conference in Birr and Symposium in Dublin during 2014.

The conference is supported by Mayo County Council (1916 Commemorative Programme) and the National Museum of Ireland—Country Life.

Conference organisers (on behalf of AHSI): Dr Mícheál Ó Fathartaigh, Dr Jean Walker and Prof. Michael O'Connell

IAEG QA/QC Course - 31st March Radisson Blu Hotel, Athlone

<http://www.igi.ie/news/qaqc-course.htm> - Course Details and Flyer

Please note the date change.

The course will be presented By Dave Stewart who will introduce geologists to practical QA/QC skills. A laptop will be required for the day.

For those registering for the course there is the option to include 'real' QC data for inclusion/discussion but we would ask that this is forwarded by 23rd March at the latest so that it could be made anonymous in advance. This will be in addition to the data Dave will provide for the practical sessions.

Registration can be made at www.iaeg.org

Engineers Ireland Geotechnical Society – Half Day Seminar 2pm Tuesday April 19th 2016

Inaugural Hanrahan Lecture

Geotechnical Properties of Irish Glacial and Interglacial Soils

Dr Eric R Farrell

Abstract: The infrastructural developments and building works that have been undertaken in Ireland over the last thirty years or so since Prof. Eamon Hanrahan published his seminal work on Irish Glacial till have given considerable data on the properties and behaviour of these soils which are ubiquitous in this country.

Added to this, research has given valuable understanding of the geotechnical properties and recent geological studies have revealed new insight into the chronology and conditions during the Pleistocene Epoch when these soils were formed.

Engineers Ireland, Clyde Road, Dublin 4
Admission – Free Entry

<http://www.igi.ie/news/geotechnical-properties-of-irish-glacial-and-interglacial-soils.htm>

IGI Course - "GEOPHYSICS FOR GROUND INVESTIGATION: SURVEYING, DESIGN AND IMPLEMENTATION"

Wednesday 27th April, Keadeen Hotel, Newbridge

Link to preliminary flyer and registration form:
<http://www.igi.ie/news/geophysics-for-ground-investigation-surveying-design-and-implementation.htm>

9. Recent PhDs:

Congratulations to Donna Hawthorne who successfully defended her PhD thesis in November. She has just taken up a full time post with the AOC Archaeology Group in Edinburgh. She has also just published a paper in *Quaternary Science Reviews* that reviews the application of methods to reconstruct fire regimes from sedimentary macroscopic charcoal records and illustrates this with examples from Ireland (abstract below).

Quantifying Fire Regimes and their impact on the Irish landscape.

Donna Hawthorne

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Globally, in recent years there has been an increase in the scale, intensity and level of destruction caused by wildfires. This can be seen in Ireland where significant changes in vegetation, land use, agriculture and policy, have promoted an increase in fires in the Irish landscape. This study looks at wildfire throughout the Holocene and draws on paleolimnological records from seven study sites spread across Ireland. It addresses four main questions; what is the nature of fire in the Irish landscape in the past? Does Ireland's record of fire tie in with any regional, national or global trends in fire? What impacts did fire have on the surrounding vegetation, landscape and people? And finally what impact does fire have on biodiversity? Charcoal, Pollen, Loss on Ignition and Archaeological data are utilised from lacustrine sediment to reconstruct the

past fire regime at each of the study sites and interpret its interaction with vegetation, climate and people. This work uses new methods and techniques in fire history reconstruction; An Ensemble-Member approach to select the required smoothing method, a Gaussian mixture model to decompose the charcoal record to identify significant fire events, and various statistical methods to reconstruct fire frequency and fire return intervals. The charcoal record is validated using a Signal to Noise Index, Goodness of Fit model and Charcoal Peak Screening method. The Global Charcoal Database and Palaeofire package are used to examine any correlation between wildfire in Ireland with records from the UK, Europe, and across the Globe. Vegetation reconstructions are carried out and statistical analyses are used to examine the interactions between wildfire and the surrounding vegetation. Biodiversity is reconstructed via a number of diversity indices and the impact of fire examined at a range of magnitudes. This research is the culmination of four years' work as part of the Earth and Natural Sciences Doctoral programme, and presents the first chronological comparison of regional fire activity in Ireland, providing an important base line level of data which can be drawn on in future scenarios when fire frequency is expected to increase.

10. Recent Publications:

Cunningham, A.C., Evans, M. and Knight, J. 2015. Quantifying bleaching for zero-age fluvial sediment: a Bayesian approach. *Radiation Measurements*, 81, 55-61.

Grab, S.W. and Knight, J. (eds) 2015. *Landscapes and Landforms of South Africa*. Springer, Berlin, 187pp. ISBN 978-3-319-03559-8.

Goff, J., Knight, J., Sugawara, D. and Terry, J.P. 2016. Anthropogenic disruption to the seismic driving of beach ridge formation: the Sendai coast, Japan. *Science of the Total Environment*, 544, 18-23.

Hawthorne, D. & Mitchell, F.J.G. (2016) Identifying past fire regimes throughout the Holocene in Ireland using new and established methods of charcoal analysis. *Quaternary Science Reviews*, **137**, 45-53.

Knight, J. 2015. Ductile and brittle styles of subglacial sediment deformation: an example from western Ireland. *Sedimentary Geology*, 318, 85-96.

Knight, J. and Burningham, H. 2015. The geomorphology of Gola, north-west Ireland. *Irish Journal of Earth Science*, 33, 55-70.

Knight, J. 2016. Subglacial processes and environments from drumlins in Clew Bay, western Ireland. *Earth Surface Processes and Landforms*, 41 (2), 277-288.

McKeown, M. and A.P. Potito (2016) Assessing recent climatic and human influences on chironomid communities from two moderately impacted lakes in western Ireland. *Hydrobiologia* 765: 245-263.

McGeever, A.H. & Mitchell, F.J.G. (2015) Pine stumps in Irish peats: is their occurrence a valid proxy climate indicator? *Journal of Quaternary Science*, **30**, 489-496.

Moolla, R., Curtis, C. and Knight, J. 2015. Assessment of occupational exposure to BTEX compounds at a bus diesel-refueling bay: A case study in Johannesburg, South Africa. *Science of the Total Environment*, 537, 51-57.

Moolla, R., Curtis, C. and Knight, J. 2015. Occupational exposure of diesel station workers to BTEX compounds at a bus depot. *International Journal of Environmental Research and Public Health*, 12, 4101-4115.

O'Carroll, E. & Mitchell, F.J.G. (2015) Seeing the woods for the trees: the history of woodlands and wood use revealed from archaeological excavations in the Irish Midlands. *Irish Forestry*, **72**, 205-226.

Peters JL, Benetti S, Dunlop P and Ó Cofaigh C (2015) *Maximum extent and dynamic behaviour of the last British Irish Ice Sheet west of Ireland*. *Quaternary Science Reviews*, 128. pp. 48-68. DOI: [10.1016/j.quascirev.2015.09.015](https://doi.org/10.1016/j.quascirev.2015.09.015)

Reilly, E. & Mitchell, F.J.G. (2015) Establishing chronologies for woodland small hollow and mor humus deposits using tephrochronology and radiocarbon dating. *The Holocene*, **25**, 241-252.

Roche, J.R., Mitchell, F.J.G., Waldren, S. & Bjørndalen, J.E. (2015) Are Ireland's reintroduced *Pinus sylvestris* forests floristically analogous to their native counterparts in oceanic north-west Europe? *Biology & Environment*:

Proceedings of the Royal Irish Academy, **115B**, 97-114.

Turner JN., Holmes N., Davis S., Leng MJ, Langdon C, and Scaif R. (2015). A multiproxy (micro-XRF, pollen, chironomid and stable isotope) record for the Lateglacial to Holocene transition from Thomastown Bog, eastern Ireland, *Journal of Quaternary Science* **30**(6), 514-528. 2015.

Turner JN., Jones A., Brewer PA., Macklin MG. and Rasser SM. (2015) Micro-XRF applications in fluvial environments: perspective and prospects from research in Britain and Ireland. In, Rothwell, R. G. and Croudace, I.W.C. (Eds.), *Micro-XRF studies of sediment cores: A non-destructive tool for the environmental sciences*, Developments in Palaeoenvironmental Series, Springer Science, Dordrecht, pp. 227-265,

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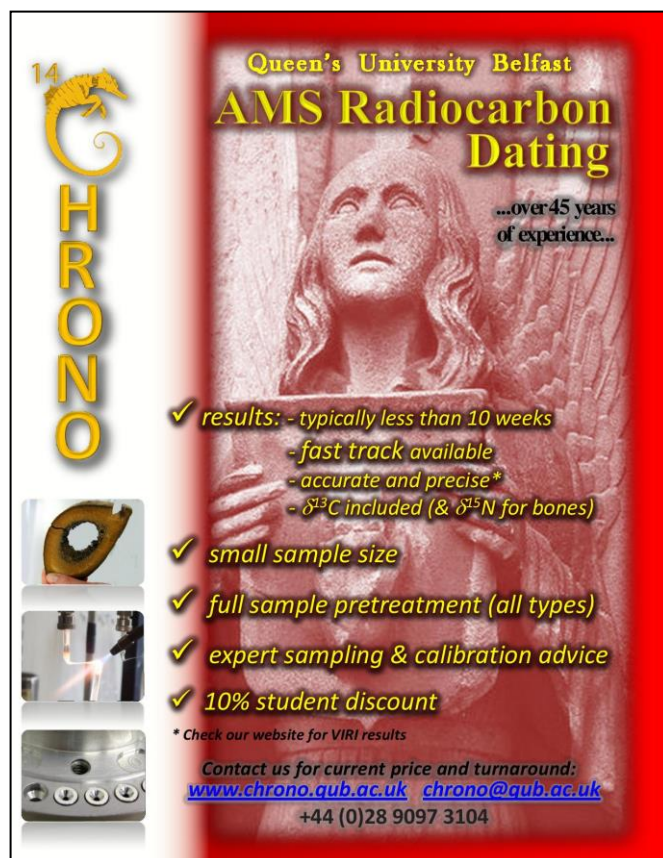
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