



EMEC 17: A HUGE SUCCESS

At the end of November, the ERI hosted the 17th European Meeting on Environmental Chemistry (EMEC17) at Eden Court Theatre in Inverness. Over 4 days the event attracted more than 120 delegates from academia, research institutes and industry to exchange information and ideas on advances in environmental chemistry and technology.

The event featured more than 40 podium presentations and an array of high quality poster presentations. Keynote lectures were given by Professor Phillip Whitfield, UHI (A Matter of Fat: The Development and Application of Lipidomic Workflow), Professor Mike Billett, University of Stirling (Advances in Environmental Chemistry - Opening the Black Box of Peatland Carbon Cycling) and Professor Jörg Feldmann, University of Aberdeen (Should We Bother About Elemental Speciation in Environmental Studies).

EMEC17 also featured a special session at the start of the conference organised with partners from the Northern Periphery and Arctic (NPA) programme 'Circular Ocean'

project. The #ChemHack sought to address some of the issues surrounding the use of antifoulant on fishing nets and ropes, and provided a platform for experts to develop and create innovative solutions to challenges associated with marine plastic waste.

EMEC meetings are delivered on behalf of the Association of Chemistry of the Environment and are held in a different European city each year: EMEC17 follows successful events held in Brno, Czech Republic and in Torino Italy. It also marked a return of the event to Inverness and to Eden Court.

Eden Court chief executive Colin Marr said: "I'm delighted to welcome back the European meeting of Environmental Chemistry. Their return is a milestone for Eden Court as a conference venue as EMEC was our very first conference when we re-opened after our extensive development in 2007. That conference took a leap of faith for them as Eden Court was a building site when they confirmed their booking, but the fact that they have returned, I think, speaks volumes".

Continued on page 2

Continued from page 1

As well as the scientific programme, delegates were introduced to the culture, food, and drink of the Highlands and Islands. A varied programme included a musical welcome from UHI's traditional music students and a brisk demonstration of traditional highland dance by the girls of Fraser School of Dancing. Delegates also had the opportunity to visit Urquhart Castle overlooking the famous dark waters of Loch Ness or, Glen Ord Distillery to sample some rather special whiskies aimed exclusively at the Asian market. The event concluded with a special conference dinner, whisky tasting and lively cèilidh in the Pavillion at Strathpeffer.

“We were honoured to again host the EMEC event and were excited to welcome some preeminent experts in environmental chemistry to Inverness.”
Professor Stuart Gibb

EMEC17 conference organisers are most grateful to commercial sponsors and to Highland Council, Highlands and Islands Enterprise and the EU's ERDF Interreg VB Northern Periphery and Arctic (NPA) programme 'Circular Ocean' project for their financial support of the event.

Speaking about the event, Professor Stuart Gibb, ERI Director said: “We were honoured to again host the EMEC event and were excited to welcome some preeminent experts in environmental chemistry to Inverness. The Association of Chemistry and the Environment believes that environmental problems are best addressed through collaboration between scientists with different specialisms. I hope that providing a forum where scientists from fields such as biology, industrial chemistry, soil science and toxicology could exchange ideas, will help us to develop solutions to some of our most important environmental challenges. We sincerely hope that EMEC17 in Inverness instigated new collaborations, as well as providing the opportunity to renew contacts with old friends from the EMEC community. We also hope that the full and varied social programme allowed delegates to enjoy the culture of the Highlands and Islands of Scotland – certainly, the feedback received has been incredibly positive!

The next European Meeting on Environmental Chemistry is to be held in Porto, Portugal.

Land to Ocean Carbon Transfer

Our climate, and hence our lifestyle and economy, is profoundly influenced by the concentration of carbon dioxide in our atmosphere. Human activities such as land clearance and burning of fossil fuels have increased atmospheric CO₂ levels by about 40% in the last 250 years causing a measurable increase in global temperature, with many of the warmest years on record occurring in the last decade.

There is now considerable interest in improving our understanding of the reservoirs of carbon which are currently locked away but which might enter the atmosphere as climate changes. One such reserve is soil carbon. Soils across the globe contain about four times as much carbon as that which has entered the atmosphere via combustion from fossil fuels. This pool is greatest at high latitudes in areas such as the 'Flow Country of Caithness and Sutherland'.

An ambitious new research programme, funded by the UK Natural Environment Research Council (and involving the ERI), aims to quantify the transport of carbon from soils via river flow, to the ocean. It also aims to understand the key transformation and removal processes controlling total organic matter (tOM) fluxes through river, estuary and sea shelf, and integrate this knowledge into models to predict how land-ocean tOM fluxes are likely to evolve under future climate scenarios.

LOCATE - Land Ocean CARbon TransfEr is being led by the National Oceanography Centre in partnership with the Centre for Ecology and Hydrology, the British Geological Survey, the Plymouth Marine Laboratory and ERI.



River Halladale

The Halladale River will be one of three LOCATE focal catchments where intensive monitoring will be combined with a series of studies and experiments to quantify the key biotic and abiotic processes that modify the tOM flux and drive carbon outgassing.

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Capturing the Flow Country

On January 21st there was dense mist in the Strath Halladale. As the sun rose the mist lifted, and the scene was set with perfect conditions for the Thurso Camera Club, which was out for a day on the Forsinard Reserve. The event was organised by Dr Pete Gilbert (ERI) and Jenny Middlehurst (Flows to the Future), with participation of Dr Roxane Andersen (ERI), Gearoid Murphy (Flows to the Future) and RSPB volunteers.

Thurso Camera Club are involved in the preparation of the 4th Flow Country Conference, which will take place in Thurso on March 21-24th. At this event, club members will present a series of images of the peatlands. The objective of the photography day was to familiarise them with the area – from the mosses on the ground to the large changes in the landscape. Members have been going out since that day to capture the many faces of the Flow Country. The final images will be unveiled on the 22nd of March to the conference participants and the wider public.



Cold misty morning, still but sunny: the perfect conditions for some spectacular mist inversion!

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INSaR as a Tool to evaluate Peatland Sensitivity to global change (INSaR ToPS)

This NERC-funded research project recently started in the Flow Country. The aim is to validate a new and transformative remote sensing method (InSAR) to address the goals of the soil security programme. The project will do this by providing an improved and predictive understanding of 1) the ability of peat to perform multiple functions in different landscape and climate settings on a wide range of scales and 2) the ability of peat to resist, recover and adapt to climate perturbations.

We will achieve this by measuring the vertical motion of the

surface of peatland - a direct indicator of mass (water, gas or organic matter) gained or lost from a peat body and powerful indication of peat soil condition. This new approach has the potential to reduce long term monitoring costs, and guide peatland management decisions by enabling 1) targeted management of degrading areas of peat 2) evaluation of restoration methods and 3) data to support effective management plans for large areas.

The project team, led by Dr David Large (U. Nottingham), also includes Dr Lauren Parry (U. Glasgow), Prof Stuart Marsh (U. Nottingham) and Dr Roxane Andersen (ERI/UHI) and will soon be recruiting a post-doctoral research assistant.

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Circular Ocean Wins Prestigious EU Award



The 'Circular Ocean' project, led by the ERI, North Highland College UHI came home victorious from the European Commission's RegioStars 2016 Awards. The inaugural Public Choice Award was presented to the project by the European Commissioner for Regional Policy, Corina Crețu in Brussels during the EU's 2016 European Week of Regions and Cities. These awards aim to recognise good practice in regional development, and to highlight original and innovative projects that could be attractive and inspiring to other regions. Winning this award has put the spotlight on Circular Ocean.

Approximately 8 million tonnes of plastic litter enter the seas and oceans annually, creating an eyesore on beaches and having a dramatic impact on marine wildlife. Funded by the EU's Northern Periphery and Arctic Programme (NPA), this project aims to help reduce marine litter by incentivising its removal and enabling communities and entrepreneurs to utilise plastic litter as a potential resource.

It was a double celebration for Circular Ocean. Project coordinator Dr Neil James, ERI said "On behalf of the Circular Ocean partners it is my pleasure to express our sheer delight at winning the RegioStars Public Choice Award 2016. It is an absolute honour to receive the first Public Choice Award, in addition to being a finalist in the category of Sustainable Growth: Circular Economy.

The award is testimony to the hard work and dedication of our partners (ERI, Macroom E, CfSD, NTNU, and ARTEK), who are deeply passionate about the issue of marine

litter, sustainable development of the NPA region, and the progression to a more circular economy. To be present among a select group of innovative and cutting-edge transnational projects is inspirational, and will further motivate us to help local economies in the NPA region, whilst facilitating the reduction of marine litter and waste.

As lead partner we are extremely proud of Circular Ocean and are honoured to lead such a wonderful and innovative project, which has only been possible through transnational collaboration and exchange of knowledge and expertise. We would like express our gratitude to the Northern Periphery and Arctic programme for providing funding to make our project a reality."

As part of the research phase, partners are currently working with harbour masters, fishermen, net manufactures, business support groups, and entrepreneurs across the NPA region to investigate the problem of discarded fishing nets and ropes, and to look at the feasibility of creating green enterprises around this waste. This will help to drive eco-innovation, generate efficient and environmentally responsible businesses and reduce levels of marine litter.

View the Circular Ocean animations:
<http://www.circularocean.eu/videos/>

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Marine Renewable Energy

Twenty S1 pupils at Farr High School, Bettyhill recently took part in a marine renewable energy activity run by Pat Kieran of DSRL and Daniel Johnston of ERI. This provided a great opportunity for pupils to learn about the marine environment and renewable developments taking place within their local area.

The class was split into teams to investigate where they might deploy a particular type of wave or tidal device in relation to a group of small islands. Information about ten possible sites was available to the teams with the aim of matching the characteristics of their chosen device to the site that presented the best opportunity for development. A number of calculations were required to determine the most lucrative site for deployment. However, teams also had to consider the potential impact of developing their device at each location. The second part of the exercise comprised an Environmental Impact Assessment that allowed the pupils to score each site



- the highest score reflecting the biggest effect on wildlife and tourism.

The activity is constructed so that the most lucrative sites do not coincide with the smallest environmental impacts. This extremely bright and focused group of pupils tackled the game very well. After completing their economic and environmental sums, each team produced a presentation that explained the technology behind their device, their results and justification of their choice of site. All the presentations were delivered convincingly. The pupils and teachers really valued the workshop which challenged the pupils across a range of subjects including Maths, Geography, English, Ecology, Engineering, Teamwork and Presentation Skills.

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New faces @ ERI



Uthman Badmus - PhD student

My BSc in Industrial chemistry at Oduduwa University, Nigeria aided my understanding of the chemical processes involved in the conversion of raw materials into useful products. I extended this knowledge through a MSc in Analytical Chemistry (University of Aberdeen), where my research was focused on the use of modern analytical techniques (NMR, HPLC, ICPMS) to elucidate novel compounds and, also, to study the molecular interaction of metals and non-metals in biological samples.

These experiences are applicable in my PhD titled 'Seaweed as a value added product for the food, drink and pharmaceutical sector'. My aim is to prove that such products can be derived from seaweed. This will be done by carrying out a series of nutrient (proteins, carbohydrates, lipids, polyphenols) and mineral (Iodine, essential elements) analyses on underutilised seaweeds from the northwest coast of Scotland. This project should also aid the understanding of the health benefits and importance of seaweed and provide new opportunity to turn waste into wealth.

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Magdalena Blanz - PhD student

Given that I started my PhD in October 2016, one may wonder as to my absence from the ERI – this is because I am based at the Archaeology Institute at Orkney College (UHI). Accordingly, my PhD will be developing trace elemental and isotopic fingerprinting methods on modern domestic animal teeth in order to identify seaweed-eating trends in archaeological samples. To achieve this, I will spend some time at the ERI, but also at SUERC (Glasgow) and TESLA (Aberdeen), where I obtained my undergraduate Master's degree in chemistry.

Switching from chemistry to archaeology may seem like a large jump but, over the years, I have studied Roman glass samples using Raman spectroscopy; analysed the decompositional states of 5000-year-old bones using laser ablation MC ICP mass spectrometry; investigated prehistoric hair samples using atomic fluorescence spectroscopy and even speciated arsenic in ancient skin samples! Combining archaeology and chemistry allows for unique insights into the past. My current work on prehistoric seaweed-foddering will hopefully aid our understanding of the modern-day potential of seaweed in our society.

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Lydia Niemi – PhD Student

I am working on my PhD, titled 'Assessment of the Degradation Pathway, Persistence and Eco-Toxicological Impacts of Human Pharmaceuticals and Degradation Products in the Aquatic Environment', which is funded through the Scottish Government's Hydro Nation Scholars Programme.

As there is limited information on pharmaceutical transformation during wastewater treatment or in effluent-receiving water, my research aims to characterise pharmaceutical degradation, persistence and fate in engineered and natural water. Focus

will also be given to developing novel chemical and bioassay methods to assess the eco-toxicological effects of these products in aquatic ecosystems. This research will provide new insight into pharmaceutical behaviour during wastewater treatment and the subsequent effects on natural water systems.

I completed my undergraduate in 2013 at the College of Wooster in my home state, Ohio (USA). In 2014, I received a MSc in Environmental Analytical Chemistry with distinction from the University of Aberdeen. Having spent the last few years in Scotland, I am very excited about my research at the ERI!

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Nina O Hanlon – Researcher

I am a seabird ecologist who has just spent the last four years exploring the west coast of Scotland and Northern Ireland whilst studying Herring gulls for my PhD at the University of Glasgow. I joined the ERI in October, continuing my work on seabirds

through researching the literature to determine what we currently know about plastic ingestion, and nest incorporation of plastic in seabirds in northern Europe and the Arctic region. This study will contribute to Circular Ocean project. I love being outdoors, especially if it involves being by the sea and birds, therefore I am very excited to be up in the Highlands and having the opportunity to explore a new part of Scotland.

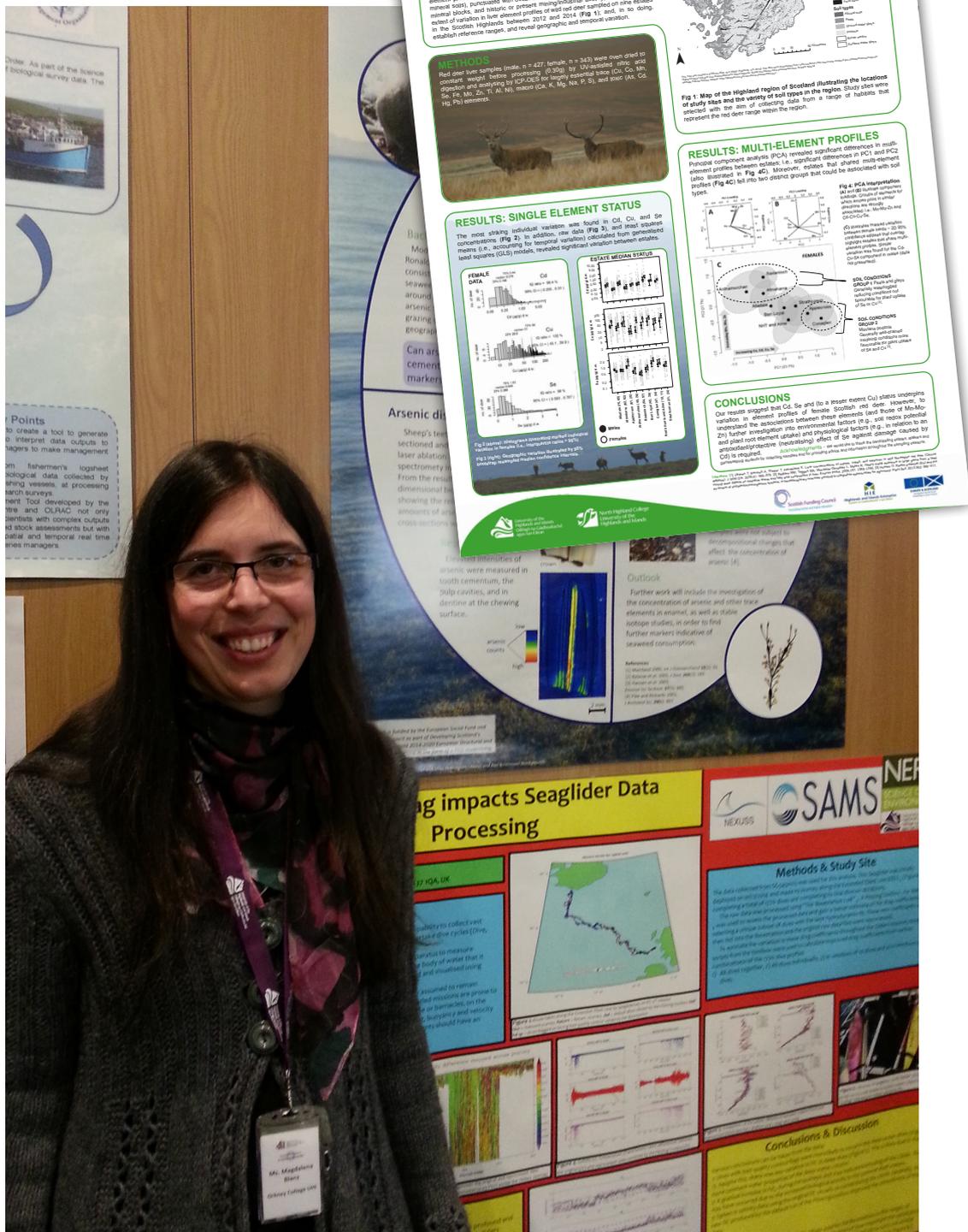
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Presentation successes

The ERI's Yuan Li was recently awarded best student presentation at the Ninth Scottish Symposium on Environmental Analytical Chemistry (sponsored by Royal Society of Chemistry) for her talk on 'Optimising the Removal of Steroid Hormones and Pharmaceutical and Personal Care Products (PPCPs) from aqueous media by using Low Cost Biosorbents'. Yuan was also awarded the conference prize from the Royal Society of Chemistry at their Water Framework Directive and Priority Substances conference in Edinburgh for the same study.

Meanwhile, at the UHI Research conference in Inverness, David Braidwood received the 'Best presentation' award - postgraduate researcher session- for his work on 'Remediation trials at Dounreay nuclear site, northern Scotland'. Whilst Magdalena Blanz's poster entitled 'Concentration and distribution of arsenic in seaweed-eating sheep's teeth' was awarded the prize for the best postgraduate student poster. (pictured)

Dr Andrew French (poster pictured) took the honours at the 17th European Meeting on Environmental Chemistry in Inverness, winning the 'best poster by an early-career researcher' prize for his work on 'Geographic variation in liver element profiles of wild red deer (Cervus elaphus)'.



Publications

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environmental research from a new perspective

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