WELCOME

You will notice that this newsletter has changed its name from “Alumni Newsletter” to “Newsletter”. The change is based on the fact that the news is about the entire Department; its Staff, its research, its current students and, of course, alumni news when it is offered.

The previous edition (Number 7, August 2014) was the last edition produced by our former secretary, Catherine Brown, who did a sterling job on the editing and production of the Newsletter. Sadly, Cathy has moved to pastures new and the task of taking on the Newsletter has passed to me.

Once again we urge alumni to send us news which we will be pleased to incorporate in future editions of the Newsletter.

Richard A Batchelor

STAFF NEWS

The Department is pleased to announce the recruitment of new staff to augment the existing staff.

We welcome Frankie Kerr-Dineen on board as the new DEES secretary. Sami Mikhail (Lecturer) brings expertise in planetary atmospheres, isotope geochemistry and experimental petrology, and is complemented by Claire Cousins (RSE Fellow) who works on planetary sciences. Paul Savage complements the isotope geochemistry field and he will be involved in designing a new MSc course in geochemistry. Teaching Fellow Will McCarthy has already immersed himself in teaching, with his specialities being structural and metamorphic geology. Jonathan Cloutier arrives soon as Teaching & Research Fellow in ore geology and industrial minerals. James Rae was the recipient of the “Outstanding Young Scientist” award from the European Geosciences Union (see later). Ruth Robinson and Stuart Allison received Teaching Excellence Awards from the University (see later).

From the Director of Teaching, Ruth Robinson:

Spring started the season of League Tables! We have done very well recently in the Complete University Guide for 2016, ranking 3rd behind Cambridge and Imperial. We have the highest graduate prospects in the UK and are very proud of this top position. Great stuff!

With an almost constant stream of new staff arriving over the last few years, the teaching programme has been redesigned and emphases have shifted to match the staff research interests. Significant changes have occurred to the BSc in Environmental Earth Science (formerly called Environmental Geoscience), and this now has a substantial component of low temperature and environmental geochemistry, as well as biogeochemistry. Key staff teaching on this programme are Nicky Allison, Andrea Burke, Mark Claire, Tim Hill, Harry Oduro, James Rae, Vincent Rinterknecht, Michael Singer, Rob Wilson and Aubrey Zerkle. This BSc degree now has a dedicated 2nd year excursion to the Rio Tinto acid mine drainage in southern Spain and new residential excursions for 3rd and 4th year are to be rolled out in the next couple of years.

The BSc in Geology has benefited recently from the appointment of Will McCarthy as a Teaching Fellow; his dedication and enthusiastic teaching style have been immediately and immensely well-received by students (and staff). Additional new blood who will shortly be joining the old guard (Stuart Allison, Richard Bates, Peter Cawood, Colin Donaldson, Adrian Finch, Tony Prave and myself) and Tim Raub in supporting the BSc Geology degree are Sami Mikhail (appointed May 1st), Paul Savage and Jonathan Cloutier. All these new young academics bring research interests related to solid Earth processes, mantle dynamics, igneous petrogenesis, ore geology,
metamorphism and planetary geology. Our teaching programmes are truly broadening and deepening in scope.

With this injection of staff, we are pleased to announce that the Department will start a new taught MSc in Geochemistry in 2016, a one year programme that will be co-taught with the School of Chemistry. We are also currently looking at the potential to develop an MSc in Earth Resources (with a mining focus). We are also part of the new Scottish Funding Council Innovation funded MSc in Oil and Gas Innovation, as part of the Oil and Gas Innovation Centre (OGK) based in Aberdeen. Needless to say, we are looking for ideas and input from industry and alumni into how to design these programmes and produce postgraduates that have the right combination of knowledge and skills.

These really are exciting times for our teaching and training programme and we hope you will be pleased with all the evolution that is occurring.

Teaching Awards

Ruth Robinson (middle row, 2nd from left) won the University’s 2015 Teaching Excellence Award for her "inspirational dedication to assuring maintaining and delivery of educational standards that are second to none" and her “exemplar outreach activity bringing research-inspired teaching to schools” through GeoBus. Stuart Allison (middle row, 4th from left) won the 2015 Award for Commitment to Teaching by Support Staff for “in a Department known for staff to go above and beyond the call of duty, he stands head and shoulders above the rest.”

Dr Adrian Finch is a consortium leader on a SoS RARE 4-year NERC/EPSRC consortium worth £4.5M (of which approx. £0.5M comes to St Andrews) addressing the challenges posed by the exploration and extraction of high value Rare Earth metals using his experience of consulting for exploration companies in the Arctic looking for rare elements within alkaline igneous rocks. The project will use isotope studies to understand more fully how lanthanides are sourced in the mantle and which processes in the crust augment (or reduce) the final grade. It will also explore how the luminescence of ore minerals can be used as a tool in 'smart' sorting during processing.

Richard Batchelor. The Geological Society of London declared 2015 The Year of Mud which prompted a response from him. It was published in Geoscientist, April 2015 issue.

Alternative Mud: There is mud (assorted clays and clastics) containing lovely animal and plant fossils, then there is mud (clay) produced by the alteration of volcanic glass. Yes, I am talking about bentonites (mostly smectite/illite) that I have worked on for 30 years. These muds also contain fossils, but these are fossil crystals formed in-situ in the original melt. Apatite, zircon and sometimes biotite occur as beautifully preserved crystals which also tell a story, albeit a geochemical one. Combined with bulk chemical analysis, the fossil crystals help to date the rock, to identify the magmatic environments and to correlate strata across countries, and sometimes across continents. Let’s hear it for bentonites!
Richard has been awarded £300 from the Clough Fund of the Edinburgh Geological Society to study apatites found in the Loch Maree Banded Iron Formation.

New Research GEMS!
On 30th April 2015 we had the first ever Maths-Geosciences collaboration event, the Geo-Environmental Modelling Symposium (GEMS). The aim was to encourage collaboration between the Vortex Dynamics, Statistics and Geoscience Research Groups at the University of St Andrews. PhD students Cristina Evans (Vortex Dynamics and DEES), Batzi Fischer (DEES) and Charlotte Jones-Todd (Statistics) organised the interdisciplinary event which brought together staff and postgraduate students across the research groups. The event involved short talks given by members of each group where speakers described their own research interests along with opportunities for collaboration with the other department. Having secured the CAPOD GRADskills Innovation Grant to run the event, a lunch, coffee breaks and a wine reception helped to encourage discussions and got the creative juices flowing!

GEMS was attended by 30 people from across the two groups, including representatives from the University’s Research Business Development group who provided insight into funding opportunities for the proposed projects. There has been a lot of positive feedback following the event, with many attendees expressing their excitement about the potential for joint research and asking for a repeat of the event in future years. Cross-disciplinary seminar invitations have been an immediate result and a few collaboration projects are already being discussed.

RESEARCH NEWS

The first common market
Long before we had mountains of grain and vast lakes of wine accumulating to excess across the continent our ancestors had worked out that the best entrepreneurial way to stay ahead was through trade with as wide a market as possible. A study published in Science (“Sedimentary DNA from a submerged site reveals wheat in the British Isles 8,000 years ago” DOI: 10.1126/science.1261278) describes the first evidence for grain traded across Europe 8000 years ago, 2000 years before the accepted beginning of farming in Britain. The team, including Dr Richard Bates studied two submerged sites at the extreme ends of Britain, off the shores of the Isle of Wight and Orkney, to discover sediment sequences that contained wheat grains. In the southern site, einkorn DNA (an early form of farmed wheat) was collected from material that had previously formed a land surface which was later sealed by sediment and submerged by rising sea levels. When the grain was dropped, the Mesolithic people were leading a hunter-gatherer existence as farming had only spread as far as Southern Europe. As the einkorn was not native to Britain, in order for it to have reached this site, there must have been contact between the people of Briton and the Neolithic farmers. This contact could even have been across narrow land bridges over
what is now the English Channel and southern North Sea.

The work continues in the Orkney Isles around the iconic Neolithic landscapes where we will use these techniques to continue investigating the land of the ancestors who constructed the monuments at these sites.

**Sulphate on the early Earth – how low was low?**

Findings published in *Science* (“Sulphate was a trace constituent of Archaean seawater”, DOI: 10.1126/science.1258966) suggest that sulphate – a key biological nutrient – could have been incredibly scarce in the Earth’s ancient oceans. Sulphur is a crucial component of biomass and an important source of energy for microbial metabolism. It also plays a central role in regulating atmospheric chemistry and global climate over geologic timescales.

Researchers including Dr Aubrey Zerkle collected samples from Lake Matano, Indonesia—a sulphate-poor modern analogue for the Earth’s Archean oceans – to examine the isotope effects associated with sulphur metabolisms under early Earth conditions. The team used state-of-the-art mass spectrometric approaches to demonstrate that microorganisms in this lake fractionate sulphur isotopes at concentrations orders of magnitude lower than previously recognized.

“These results suggest that sulphate levels in the Archaean could have been thousands of times lower than today, which would have had important consequences for the cycling of sulphur in the oceans and atmosphere, and for the evolution of early microbial ecosystems”, says Dr Aubrey Zerkle.

**The Southern CO₂ that helped end the ice age**

Leading theories about the processes that caused CO₂ to rise and help end the last ice age have involved increased CO₂ release from the deep ocean around Antarctica, but direct evidence to prove this has been lacking. A study by Dr James Rae and colleagues used the geochemistry of tiny planktonic fossil shells to reconstruct the amount of CO₂ in waters around Antarctica during the end of the last ice age. They were able to show, for the first time, that CO₂ was indeed released from the Southern Ocean to the atmosphere, helping warm the planet and melt back the ice sheets that would have covered Scotland and much of the rest of Northern Europe and North America.

Dr James Rae said “intervals of CO₂ and climate change in the past offer an opportunity for us to better understand the path of future climate. As the ocean currently takes up about a third of the CO₂ emitted by humans, it’s important to understand the controls on CO₂ exchange between the ocean and the atmosphere so we can predict how ocean CO₂ uptake may change in the future. It’s also striking to think that CO₂ change has contributed to climate
changes in the past as dramatic as melting back a mile of ice on top of Scotland, and you’ve got to wonder what adding the same amount of CO₂ to the atmosphere, but 100 times faster, will do to climate in the years to come.” [see Nature 518, 219–222 (12 February 2015) DOI: 10.1038/nature14155, "Boron isotope evidence for oceanic carbon dioxide leakage during the last deglaciation."]

Tree-rings reconstruct the South Asian summer monsoon index over the last millennium
The South Asian summer monsoon (SASM) is a major atmospheric synoptic climate system affecting nearly a quarter of the human population. Dr Rob Wilson with co-authors from China have published a 1000-year-long reconstruction of SASM in the Nature Group journal Scientific Reports (Shi, F., Li, J., and Wilson, R. 2014. “A tree-ring reconstruction of the South Asian summer monsoon index over the past millennium”. Scientific Reports, 4 (6739). DOI:10.1038/srep06739). They utilised 15 tree-ring chronologies to reconstruct the SASM index over the last millennium. The reconstructed SASM index captures 18 of 26 (69%) recorded historical famine events in India. Moreover, the reconstructed SASMI is positively correlated with variations in total solar irradiance (TSI) on multi-decadal timescales implying that variations in solar activity may influence the SASM. Epoch analysis additionally indicates that volcanic events may also drive some of the SASM variability about 2 years after major eruptions.

The Building Blocks of Life
Searching for the essence of life on Earth, understanding climate change and investigating the spread of diseases - these are a few examples of the fundamental research that academics in the Department will be tackling with new equipment won under a competitive £0.5M NERC grant. This cutting edge analytical set-up combines a multi-collector inductively coupled plasma mass spectrometer (MC-ICP-MS) with a gas chromatograph (GC), and will be the first of its kind in the EU (and only the third in the world!). The NERC capital equipment fund bid was led by Drs Andrea Burke, Harry Oduro, James Rae, and Heidi Burdett.
Dr James Rae has been awarded the European Geosciences Union (EGU) "Outstanding Young Scientist" in the Biogeosciences (BG) Division as part of their announcement of 35 recipients of this year’s Union Medals and Awards, Division Medals, and Division Outstanding Young Scientists Awards.

The individuals, from both European and non-European countries, are honoured for their important contributions to the Earth, planetary and space sciences. James' research focuses on reconstructing past climate change and its causes, with particular interests in the cause of recent glacial-interglacial cycles, and climate changes over the Cenozoic. James uses geochemical measurements on fossils, sediments, water and ice, with a special focus on the boron isotope proxy for pH. Recent research highlights include new estimates of tropical ocean temperatures over the last 5 million years (DOI: 10.1038/ngeo2194), and a new mechanism for the end of the last ice age (DOI: 10.1002/2013PA002570).

Working alongside colleagues at NASA, University of Washington and UNAM, Mexico, Dr Mark Claire has discovered that signs previously thought to confirm the presence of life on alien planets, might not be as definitive as thought. Whilst searching for life on other planets, astronomers rely on finding gases – such as oxygen, ozone or methane – in the planet’s atmosphere, as these are thought to be significant signs of the existence of life. However, research published in The Astrophysical Journal [“Abiotic ozone and oxygen in atmospheres similar to prebiotic Earth” :doi:10.1088/0004-637X/792/2/90] proves that the existence of one of these alone is not enough to predict the presence of organic life. The research strengthens the belief that the existence of detectable levels of oxygen, ozone and methane together would be a convincing sign of life on another planet.

Evidence of ‘super henge’ surrounding Stonehenge

Dr Richard Bates has been part of a team working at the iconic site of Stonehenge where they have unveiled a remarkable new picture of the henge and its surrounding areas, including the remains of an even bigger ‘super henge’ nearby. For the project, Richard Bates used remote sensing techniques and geophysical surveys to discover hundreds of new features which now form part of the most detailed archaeological digital map of the Stonehenge landscape ever produced.
Electromagnetic survey results showing the outer bank at Durrington Walls marking the circumference of the new super henge.

The startling results of the survey include 17 previously unknown ritual monuments dating to the period when Stonehenge achieved its well known shape. The project has also revealed completely unexpected information on previously known monuments. Arguably the most significant relates to the Durrington Walls ‘super henge’, situated a short distance from Stonehenge. This immense ritual monument, probably the largest of its type in the world, has a circumference of more than 1.5 kilometres (0.93 miles). The team now hopes to apply this geophysics approach to other World-renowned sites in Orkney.

The project was the subject of a BBC documentary Operation Stonehenge: What Lies Beneath, broadcast on BBC Two in September 2014 and is the subject of an exhibit at the 2015 Royal Society Summer Exhibition.

POSTGRADUATE NEWS

St Leonards Research Lecture Prize
St Leonards is the postgraduate college of the University of St Andrews. Once a year, it awards a competitive prize to postgraduates who apply to give one or more lectures on their subject. DEES 1st year PhD student Ben Taylor won this prize this year. He gave two lectures on The Science of Climate Change. In the first part How do we collect data on climate change past and present? he gave an overview on how data on climate change is generated and how trustworthy it is. The second part Looking into the future: What are the impacts of a changing climate and does science have a solution? he showed how climate change affects the world and humanity and what kind of options we have to avert or mitigate the consequences, including hot topics such as renewable energy and carbon capture and storage.

Ben Taylor during his first talk of the Science of Climate Change lecture series.

Conferences
Graham Hambley (3rd year) and Viktoria Oliver presented talks at the EGU conference in Vienna in April. Viktoria talked on organic carbon in soils from different land uses in the Andes of Peru, whereas Graham’s talk outlined restoration of peatlands and their contribution to the storage of carbon.

As part of the annual review in May, postgraduates have to give a presentation on their research to members of the department. This year’s PG conference took place on May 5th and encompassed talks ranging from deep Earth geology over ancient and recent oceanography to environmental studies of carbon and water fluxes at the Earth’s surface. Each talk was followed by questions, which stimulated fruitful discussions that were continued at the cheese and wine reception that ended the event.

G&G Football Club
Some of the DEES postgraduates have teamed up with postgraduates from DGSD to form a School football team, competing in the University’s six-a-side league. Although going into the season with high expectations, the team has cleverly left plenty of room for improvement in the next season, finishing fifth in the “poor” league (out of six teams,
one of which withdrew from the league). Training will continue over the summer – so prepare for better news from G&G FC in the next season.

**Recent graduates**

**Viktoria Oliver** successfully defended her PhD thesis on “The effect of land-use on soil organic carbon dynamics in the Peruvian Andes” in December last year. She continues to work on biogeochemical cycling as a research fellow at the University of Aberdeen, where she will live in Italy for a while working as part of the “GreenRice” project, which aims to explore the genetics, microbiology and biogeochemistry of alternative wetting and drying (AWD), as a water saving technology for rice production in Europe.

Because of a job offer, **Emma Hunt** had to finish her PhD rather quickly. She submitted at the end of February, passed her *viva* in mid-March and was Dr Hunt before the end of March. She has now left the hemisphere to commence a two-year postdoc at the University of Witswatersrand in South Africa, working on magma chamber processes in the Bushveld complex.

**Robert Campbell Postgraduate Prize**

Congratulations to **Cristina Evans**, this year’s winner of the Robert Campbell Postgraduate Prize. The citation states that “the award was given in recognition of outstanding progress in research and for significant contributions to the research community”. Robert Campbell was a research student in DEES who sadly died in August 2013. This award for research postgraduates in the Department was established in his memory. The first winner was Sebastian Fischer in 2014.

Cristina is a second year postgraduate student who is researching the dynamics of water availability to riparian trees. Her work involves mathematically simulating the processes of water distribution in floodplains under different climatic regimes. At her own initiative, Cristina also organised the **GEMS** event in which both mathematicians and environmental scientists participated, which led to new collaborative research interests.

In the photograph Cristina is being presented with the award by Professor Peter Cawood in front of a flourishing oak tree at Andrew Melville Hall, planted there in memory of Rob by the students he cared for while serving as an assistant warden.
UNDERGRADUATE NEWS

First Year “Highland Fling” field excursion

“We were freezing cold, soaking wet and shivering like penguins for an entire week hiking in blizzards and being made to stand in the rain…”

Well... no. All that nice, snazzy kit was absolutely useless. Nothing could have prepared us freshers for our first real taste of geological field-tripping. To begin with, against all expectations we had glorious weather. Not a single drop of rain; we thought we might have some on day 3 at Portgower, and we got our waterproofs on only to have to take them off due to it being too warm. On day 5, hiking up to admire a U-shaped valley near Glen Nevis it felt more like a summer picnic.

The most fun part of the entire week was on day five at Alvi Quarry. People set to searching as if they were looking for diamonds although most of the stuff we found was inevitably ‘economically exploitable’ as our lecturers would put it. There would be cries of excitement, followed swiftly by the sudden clumping of people, as rocks containing shiny molybdenite were found. This quarry provided a first taste of what some of us might do later in life, and it certainly made me wonder whether I would be interested in mining as a career. Another thing that the trip really hammered home for us was the scale of Geology. On day two we drove slowly west from Scotstown, stopping every few kilometres looking at the way new indicator minerals had formed as we got closer to our final destination, Portsoy Harbour. Here a large intrusion of gabbro had been pushed up from the mantle and had metamorphosed the surrounding sedimentary rocks.

The final highlight was neither the rocks nor the numerous nights out, but rather the fine gentlemen who gave up a week of their time to teach us. These figures, who we’d usually see for two hours a day, a week at a time, were barely known to us before the trip. Once out in the field however they came alive, sharing their passion for the landscapes around us with such energy that one could not avoid getting involved. Nor were their interests just limited to Geology: the “Highland Fling” was a real eye-opener to the world of whisky, with a surprise stop at Cynelish distillery for a dram really setting the tone for student-staff-alcohol interactions. Whether it be sharing a bottle of whisky while playing pool or just chilling and watching a film by the fire in the lodges, by the end of the trip the seed of friendship had been firmly planted.

Second Year Spain mapping trip

March 14th, 2015: And we were off again for the week-long ES2002 Geological Mapping excursion to central Spain! There was much excitement and enthusiasm from the students – they were raring to get going on their mapping. This was the first field excursion for Dr Will McCarthy since joining the department in January and he was keen to get in the field too! Will taught mineralogy and metamorphism to the ES2002 class and he has been a complete “hit” with the students. We had 8 groups and 39 students this year – one of the larger groups we have had on the Spain mapping trip, but all went according to plan and Ruth, Peter and Will also enjoyed the trip tremendously!

Even though it is our 11th year of running this trip, it is still refreshingly rewarding to see the
students tackling such a complex set of rocks and structures, and seeing the fantastic mineralogy, including rotated quartz-feldspathic porphyroblasts in the high grade Hercynian metamorphic rocks and the thrust faulting of the Alpine sedimentary rocks. Big smiles abound when students find their first Barrovian minerals, and great examples of staurolite, kyanite and sillimanite were found this year.

Fieldwork in the snow!

The weather was rather mixed. On the upside, everyone kept smiling through the snowstorm and the rain, and morale was high. We had very good weather for about half the time, but 2 - 3 cm diameter snow-flakes were a big surprise for everyone on the day we decided to study the Barrovian sequence as a group! As always, Hector and Carmen at the Calumet Hostel in Berzosa contributed so much to the success of the trip. The trip continues to be an amazing learning experience for the students and they felt they had learned so much during the week. Roll on 2016!

Ruth Robinson

Second Year Rio Tinto Field Trip

Gurgling cherry red waters swarmed over and around outcrops of phyllite - a blossoming, criss-crossing array of streams that flowed out from abandoned tailings piles. This was one of the many fascinating sights that the Rio Tinto field area contained, just one example of the curious marriage between human activity and natural processes known as Acid Mine Drainage. Here, just next to the town of Nerva in Southern Spain, acidic waters that are mostly inhospitable to familiar forms of life eat away at the landscape, dissolving rock deep underground and carrying the yielded materials up to the surface. Life does survive, however, as evidenced by foamy microbial communities and gently billowing green streamers. This is as large as life is likely to get in these waters as the conditions are harsh; in fact, scientists have used the Rio Tinto environment to try to conceptualize how episodic surface waters on Mars might have developed during its intriguing geological history. These questions and more were all considered during the trip, which was approached with enthusiasm by students and staff – an excitement that no amount of unseasonal rainstorms could dampen!

Evidence of mining activity was commonplace in an area that has been exploited for its rich pyrite deposits during previous millennia. Some sites have been in use in one form or another since Roman times; others were developed by the British in the 19th century during the Industrial Revolution, while some of the largest scale developments occurred in the last fifty years as the Rio Tinto Mining Corporation established itself as a global mining force.

Acidic waters of the Rio Tinto

THANKS TO THE ALUMNI FOR SUPPORTING OUR MAPPING TRIP TO SPAIN!
Aside from the science, good local food and comfy beds (heaven compared to the field trip to Central Spain!) kept the students and staff perky upon returning to the hotel each day. A few nights into hosting the trip, the hotel unveiled its trump card: karaoke sessions that soon involved staff belting out ABBA to raucous approval!

On the final day of the expedition a remediation site was visited. It was with a certain disappointment that the students looked upon the system as it cleaned up those mysterious red and orange acidic waters, converting them to something far less extreme – approaching drinkable! Even if the perfection of such systems would mean the return of greenery to the waters edge, of insects to the surface and of fish to the depths, it would also mean the loss of a geological phenomenon that illustrates with the harsh art of acid wearing away rock that humanity can impact our world – in ways both destructive and beautiful.

Craig Walton

Third Year “Mullapool” field trip
With the entire third year class armed with shiny new 'Write in the Rain' clipboards, we were ready to face the bleak weather and harsh wind that we were warned that the microclimate of Ullapool could throw at us. We were expecting similar conditions as the Highland Fling which we went on two years previously, but on the final night in the Inchnadamph youth hostel, we sat reddened from the sun and thankful that the Scottish weather has been so sparing. The sun had been with us the whole week so our teams of three bounced across the hillside above the town of Ullapool; the sun brought out our eagerness. The day of independent mapping at Stoer was a very alternative yet rewarding experience to anything we had done in previous years. We were given a map of an area in Assynt at the beginning of the day, told by Will, Tony and Batzi that we would be mapping the area independently, driven to and dropped off at a camp site by the coast and told to get on with it. I think I speak for the class in saying that it was a challenge that greatly improved our self-confidence in mapping and to prove our capabilities. We even had the good fortune to be shown one of the world's few outcrops of suevite at the end of the day. To sum up, we snaked through the moon-like Moine Thrust Belt in the vans stopping at some incredible outcrops, one of the most notable ones being the old nepheline syenite quarry not far from our hostel.

Having spent the first week in Ullapool in sunshine, we sat on the ferry to Mull on Saturday with great anticipation. For the first few days, the only thing many of us saw was granite and horizontal rain. The groups mapping on Iona were constrained by the ferry timings. Our maps were half mush by Wednesday, however the weather improved and in a final attempt to get as much area covered as possible, pressure pushed each of us to complete our designated map areas. We finished the maps on the Thursday morning, with intricate inset-drawings of some of the unique features we saw along the Sound of Iona Fault and in the Moine Schist, proud of our efforts despite the hindrances. The final day of the two week trip was spent on a paradise beach, which unsurprisingly inspired Robert Louis Stevenson’s Treasure Island. We drew the links between the structures and lithologies from the first week in Ullapool and saw how they merged with the features we had seen on the west coast as we compiled an Iona and Mull ‘story’. We drove back to St Andrews in brilliant sunshine.
As with every field trip, the class's friendship tightened and connections between students and staff grew stronger, even to the point that one of the class members performed a pretty accurate impression of Tony – in front of Tony.

**Johanna Norris**

**ES1901 Evening Degree Field Trip**

![Students of the Evening Degree course in Geology, on the shore at St. Monans.](image)

**The Study Abroad Experience ‘Canada Eh?’**

Last year I applied to study at The University of Western Ontario in London, Canada for the year and I’ve never looked back. The idea of studying abroad was at first a little scary, after all, who wouldn’t be when moving to the other side of the world. My study abroad experience started with a few days in Iceland sightseeing the beautiful landscape such as Gullfoss Waterfall, Blue Lagoon and the Geysers. However, while I had been worried, once I arrived in Canada I found everyone to be so friendly.

My first few months in Canada were crazy. We experienced fresher’s week, new classes, new friends and really hot weather!! However, the warmth didn’t last that long and soon -30°C became quite common. While waiting for the bus in a hat, scarf, coat, boots and every layer possible, you realise how much you must love your subject. Maple Syrup and Poutine (chips with gravy and cheese curds is a Canadian favourite!) soon became my favourite foods and Ice Hockey soon became my favourite sport. Wednesday nights were ‘Ricks’ nights at the Spoke and I made friends from all over the world. Snow tubing, ice-skating, cross country skiing, sledding, and winter camping (yes it was cold!) were some of the winter activities I managed to participate in.

The education system at Western was very different, as I soon discovered. I took a wide range of classes that allowed me to take modules that wouldn’t have been available in St Andrews. Night class was a challenge and lots of hours a week in the classroom were quite demanding.

While studying hard, I found the opportunity to do more sightseeing by travelling to Niagara Falls, Toronto, Montreal, Ottawa, Quebec City and Minnesota to name a few. Even though for the first six months of the year the snow is covering the rocks I still managed to go on a few fieldtrips, one to Bancroft and the other to Sudbury. The Sudbury advanced mapping course was an adventure and I had a real Canadian experience. I got very close to a bear and was scared off by its roar. It was one of the most terrifying experiences I’ve had.

So, in conclusion, studying abroad, as a geology student has been one of the best decisions I’ve ever made and to anyone considering it I would totally recommend it. It is not always easy, there are challenges but you will certainly love it. For anyone that has seen me out in the field, I finally found an awesome Rose Quartz in Canada, which matches my pink hard hat!

**Collette Pilsworth**

![Collette in the wilds of Ontario](image)
ALUMNI NEWS

Martin Perry (BSc 1993)
After completing a Ph.D. in Highway Engineering, he spent 5 years in Project Management roles in the Building Materials Industry. In 2000 he moved into the Software Industry, undertaking Finance, Strategy and Senior Leadership roles with IBM and Microsoft. In 2011 he suffered a major head trauma when cycling home from work. Two and a half years of recovery followed. After completing a PMP certification in late 2013, he returned to Microsoft on a part time basis, taking an operations program management role in the Reporting and Analytics team.

Dave Cook (BSc 1972, PhD 1976)
Having retired from ExxonMobil in 2007, Dave is now heavily involved in volunteering for the American Association of Petroleum Geologists (AAPG). He was President of the Europe Region of AAPG between 2009 and 2011 and is now co-chairing the committee that runs the AAPG/AAPG Foundation Imperial Barrel Award programme. This programme provides MSc students with both the opportunity to experience exploration geoscience through the interpretation of a seismic and well dataset and also to present the results and recommendations to a panel of industry experts. It is a good introduction to the hydrocarbon exploration industry and is an invaluable networking opportunity. Dave currently splits his time between Maldon, Essex and Houston, Texas, when he is not attending conferences in various parts of the world.

Bertie Welch (BSc 2013)
I am in my second year of my PhD research at the Open University into trace greenhouse gas emissions from forests. After spending 5 months last year as a pre-doctoral research fellow at the Smithsonian Tropical Research Institute in Panama, I am currently working on a temperate study here in the UK at Wytham Woods, Oxfordshire.

Peter Leggo (BSc 1959)
Based in Cambridge, Peter is researching the properties and benefits of using an organo-zeolitic fertilizer (bio-fertilizer) for the production of food crops and vegetation on contaminated and marginal land. The intensive use of chemical fertilizers over the last seventy or more years has had a deleterious effect on soil health. In contrast the bio-fertilizer, composed of organic waste and crushed zeolitic rock containing Clinoptilolite and commonly Mordenite, functions biologically in sponsoring nitrification. Ammonium ions, provided from the degradation of the organic component, are adsorbed to the zeolite mineral surface thus avoiding loss to the atmosphere by volatilization. On addition of the bio-fertilizer to soil, oxidation of the ammonium ions by soil nitrifying micro-organisms, provides major and trace element nutrients to plants.

Helen Pearson (BSc 1999)
Helen has just been appointed on to the Council of BOHS (British Occupational Hygiene Society), which is a voluntary role for the society looking after worker health. BOHS is one of the biggest occupational hygiene societies in Europe, and the only professional society representing qualified occupational hygienists in the UK. She is now Chair of the Edinburgh branch of the IOSH.

Andrew Mackenzie (BSc 1977)
In March, Andrew (CEO of BHP Billiton) returned to St Andrews to see the development work that has been taking place in the Department’s labs, and to give a talk to our undergraduate students. Andrew, accompanied by his wife Liz, visited the new geochemistry labs in the Purdie building, and discussed the wonders of trace elements and their isotopes, shale gas exploration, and climate change, with Andrea Burke, James Rae, and Harry Oduro. He then gave a talk to undergraduates from Geosciences and Chemistry, addressing the importance of geology, and the sciences more generally, for decision-making in industry and in government policy. Andrew was optimistic
about the sustainability of most major natural resources (oil being an interesting exception), provided we have the science to find and suitably extract them, and stressed the importance of making environmentally-informed choices about which deposits we develop. He predicted that in the coming decades carbon capture and storage industry will - and must - become as big as the hydrocarbon industry is today to reduce our impact on Earth’s climate.

Andrew McMillan (BSc 1974) has now retired as Treasurer of the ICOMOS International Scientific Committee for Stone. He was also involved in the design of their new web site, for which he called on the expertise of Alan Fyfe (BSc 1972; MSc 1986). The result of their handiwork can be seen at http://iscs.icomos.org.

John Cunningham (BSc 1970) took part in an expedition to Tonga and the Cook Islands in autumn 2014. The objectives were, as a pioneer of cave exploration in Tonga, to first assist a New Zealand academic to enter two difficult caves in Tonga to sample stalagmites for age/climate analysis. He then proceeded to the Cook Islands to assist a group of academics from Australia and UK to set up a drip-water and environmental sensing kit in caves that were known to exist, but had not been entered.

He quotes: "We were exhausted when we came out of the cave - getting in was a 9m abseil followed by a tricky squeeze through boulders for another 9m, a long crawl, dragging the electric drill and 20 kilos of water to keep it cool, all the ropes and other equipment and then on the way out, a 15kg stalagmite. It was nearly dark when we came out and we then had to haul all the equipment up a steep 'path' - really just a stagger upwards through the rainforest, full of wildlife, including some very vocal parrots. Only one other group has ever been in this cave - hard to get to and in to; once inside, it was like the London Underground and 1km long."

"Once in Palangi Chamber, the full wonder - and horror - of the place became apparent. It was a massive void, populated by swifts and bats, with 1ft of red mud on the floor covered by 2-3 ft of guano. Just moving through it, knee-deep in the stuff, was difficult and the air quality left us hot and sweaty”.

Peter J. Wyllie (BSc 1955, PhD 1958, Hon. DSc 1974) was awarded Honorary Fellowship (Membership) of the International Union of Geodesy and Geophysics. The IUGG established a set of Union Awards in 2013, with first presentations in 2015. The Union Fellowships honour individuals who have "contributed exceptionally to international cooperation in geosciences, and attained eminence in the field of Earth and space sciences". Wyllie was President of IUGG 1995-1999.

OUTREACH geoHeritage Fife. The group, whose Chairman is Richard Batchelor, published a new geological trail leaflet for the Wormit shore in North Fife. 

Wormit Shore Geological Trail

See evidence of volcanic activity 400 million years ago which powered out vast quantities of lava. In between eruptions, rivers deposited conglomerates, and temporary lakes filled with sand and mud. After the lava eruptions ceased, now rotten rock pushed its way through and formed an intrusion of a reddish-coloured magama.

During the last Ice Age, glaciers scoured the landscape and rocks from the Highlands were carried down the Tay valley to Fife.

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News - May 2015

Numbers update: GeoBus has been clocking up the miles and visits since the last newsletter and has now worked with close to 35,000 pupils across Scotland since the beginning of the project. The number of different schools regularly visited by the team is now 171, and those schools are located in every educational authority across Scotland. GeoBus has extended its reach over the past academic year and has more than doubled the number of schools and pupils participating in workshops in Dumfries and Galloway and the Scottish Borders.

New Staff: In January of this year, we were delighted to welcome Carina Gaertner to the GeoBus team. Carina completed her BSc in Geosciences at the University of Mainz in Germany before coming to Scotland to complete an MSc with Distinction in Urban Water and Environmental Management at the University of Abertay. She was awarded the Balmoral Prize in Environmental Management for best overall student. Carina has been getting up to speed with all the workshops and Challenge events since she started. As part of her Assistant Education Officer role, Carina has taken on the huge responsibility of organising all of the GeoBus resources and keeping the store room immaculate!

Teaching highlights: One of the workshops that is growing in popularity is the Magic of Minerals. This workshop is taught in chemistry classes, as well as geography and geology. We were very fortunate to get funding from the Aberdeen Formation Evaluation Society (AFES) last year and this has really enabled us to teach microscope skills more effectively. Needless to say, thanks to AFES for the financial support.

Other existing workshops have been revised and improved over the last six months, including Scotland Rocks and Drilling for Oil. Over the next months, we will be developing Carbon Capture and Storage workshops (subject to funding approval from the Crown Estate) and these will very nicely complement the existing hydrocarbon-focused workshops.

Field work continues to be very popular with teachers and pupils; trips are run from May to June. A new endeavour this year is the development of GeoBus Field Camp which ran in late-June. About 20 pupils from...
England and Scotland participated in this 3-day event and pupils were taught by University of St Andrews staff and the GeoBus team.

**Conferences:** GeoBus participated in several conferences over the past six months, including the American Geophysical Union (AGU), the Association of Science Educators (ASE), Scotland Rocks, and the European Geosciences Union (EGU). In December, Charlotte Pike gave a very successful talk at AGU in San Francisco and also attended the GIFT (Geoscience Information For Teachers) workshops. In early January, we went south to Reading for the ASE conference. This was GeoBus’ first attendance at ASE in England and we ran two workshops that are appropriate for the broader science curriculum. In April, the team set off to EGU in Vienna where Kathryn Roper and Charlotte Pike presented an invited talk and poster, respectively. There were extremely positive responses for both presentations and this resulted in a lot of Twitter activity about the project.

All the conferences provide opportunities to promote GeoBus and gain insights and ideas from other outreach projects. The different audiences mean that we are reaching more science teachers in England and Scotland, and more academics and industry people at research conferences. We made new links with physics and chemistry teachers at ASE, and several bookings in science departments in new schools, and schools that GeoBus already visits, occurred directly after the ASE conferences. EGU is Europe’s largest geoscience conference with about 14,000 delegates and AGU is the largest conference with about 23,000 delegates so there was a lot of interest and feedback from people at these research conferences. Needless to say, GeoBus continues to be a unique project and there is nothing similar in the US or wider Europe.

We would like to say a huge thank you to our Principal Sponsors for their continued support. For more information (www.geobus.org.uk), please contact Dr Ruth Robinson (rajr@st-andrews.ac.uk).
Graduating B.Sc. class of 2015

Back Row, left to right: Hamish McGregor, Michael Turkington, Mark Marshall, Peter Stanger, Alex Rolland, Fiona McLean, Maia Krall Fry

Front Row, left to right: Gwenno Talfryn, Chris Allman, Matthew Kerr, Peter Clark, Jake Cain, Pip Tildesley, Elena Field, Katy Relph.
(Some students are missing)

M.Geol. class of 2015 and Emma Hunt (Ph.D.)

Left to Right: Tom Baker, Neel Patel, Emma Hunt, Alex Russell, Tanya Patel
USEFUL LINKS
http://earthsci.st-andrews.ac.uk
https://www.facebook.com/standrewsgeologyalumni
http://soi.st-andrews.ac.uk
http://www.cersa.org.uk
http://www.geobus.org.uk
http://www.st-andrews.ac.uk/alumni/relations
http://www.st-andrews.ac.uk/alumni/relations/stayconnected/email

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We are always interested to receive news from our alumni which, with your permission, we would like to publish in the Newsletter and the DEES website. Contact the editor: Richard Batchelor (rab@st-andrews.ac.uk)