

# A Tiger in Aber

Sonali Ghosh

Having grown up reading Asterix and Obelix; the first thought that crossed my mind on landing at Aberystwyth was Wow! This is how the modern day Gauls would have lived. .... Happily by the sea with even a 'hint of sun' being an excuse to celebrate and rejoice. RA (the sun god) has been kind so far, and though I claim to have lived all my life at the foothills of Himalayas, cold is cumbersome. Back in India, I was managing forests that harbored tigers and rhinos. Yes! We are proud of them and fortunately Assam (the northeastern state that I come from) has some of the finest Protected Areas such as Kaziranga National Park that hold viable populations of these endangered species. With a total count of 2048 rhinos in Kaziranga this year; India now has the world's highest number of great Indian One Horned rhinos (*Rhinoceros unicornis*) in the world! And given such a high prey base (rhino and Asiatic elephant calves, wild buffaloes, Swamp Deer, Hog Deer, Barking Deer, Wild boar to name a few) it is natural that tigers also attain their highest density in Kaziranga .

Having said that; even these magnificent creatures dread the cold. A rhino would remain in its wallow for days together while a tiger will hold his 'royal durbar' on the forest road. Not to mention the rock pythons and monitor lizards that would all be up and sunning themselves! The bashful elephants of course would take every opportunity to 'raid' forest camps in the lookout for salt, potatoes and country liquor! giving a scare of their lives to the humble forest guards that keep round the clock



Forest guards keeping vigil while a wild elephant crosses the road



Dense tropical forests of Assam

vigil against poachers. But in the end it makes them feel good, being part of this Eden family.

So I will face the cold bravely here at the foothills of Pumlumon and do my bit to save the wild denizens of Eden. What do tigers want? Is a question that I plan to answer with my PhD research at IGES. Through this study I will try to map the forests in which tigers live, the prey base and the human induced factors that have and will influence the past, present and future distribution of tigers. As someone said, it would have been a lot easier to simply interview the tiger! But until I get an audience with his majesty, I take a cue from my childhood buddies and pledge to work hard and play with the changing seasons at Aberystwyth.

*Sonali Ghosh has been working as a forest officer in Assam, India. She is currently on a Commonwealth Scholarship to pursue her PhD at IGES under Prof Richard Lucas and Dr Pete Bunting.*



Rare Clouded Leopard (*Neofelis nebulosa*) cubs rescued and currently under rehabilitation in Assam

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# Securing Cameroon's Future:

teaching environmental issues to children of Central Africa

**Nathan Brettell**

*IGES Environmental Earth Science graduate Nathan Brettell spent 6 months with the NGO United Action for Children teaching environmental issues in Cameroon.*

During my placement at the Jamadianle Primary School, Bwitingi, I taught over 120 primary school children Environmental Sciences 4 times a week. As part of this subject, the topics that I covered were; migration, plant biology, waste management, animals and soils. Following completion of their exams, there were no failures in the Environmental Sciences category which was very good news.

I also took part in the School on Wheels project. With this, I travelled every day to the surrounding villages of Buea to teach the underprivileged children in the mountain and forest villages basic English and Maths. Each day was different and had a set of new challenges to overcome. Many of the children could not read at all.

The Cameroonian culture has no concern about the effects they are having on their environment. I aimed to help make the first step in changing their outlook. To this end, I instigated and secured funding for the 'Eden Project' which offered practical recycling and waste management tips and offered the children their first opportunity to grow plants and food from seeds. An integral part of this project was to encourage the children to transform their school ground from a brown, dusty and barren site into a green, safe and friendly environment for the children to play in.

The pupils are heavily involved in the implementation and maintenance of the project. They help to plant the trees and shrubs where they will learn practically about plant biology. Pupils are to be encouraged to bring in their fruit and vegetable waste from their homes which will be used to make compost. This is designed to introduce the concepts of waste management and recycling to the Jamadianle children whilst, at the same time, making the project sustainable. A vegetable garden was established at the rear of the school, where each class will grow their own vegetables which they must nurture and harvest. There is still much to be done at Jamadianle but the hardest stage is now over. Future work includes playground construction, a second seating area, upper level grassed, nature garden construction and sensory garden construction. I will attempt to fundraise in the UK to provide the UAC with more money to continue the Eden Project.



Transforming Jamadianle School: the first stages of the Eden Project





Teaching Environmental Science



The Schools on Wheels project



# Wine, Whisky, Beer and ..... Geology?

Alex Maltman

When you drink a glass of wine, do you imagine the vineyard it came from? Can you taste the rocks and soils where the vines put down their roots? Many wine writers would have us believe you should be able to do just that. Similarly, Scotch whisky advertisements tell us of granite hills and their soft, crystal waters said to be so crucial for what you taste in your glass. For some years, Alex Maltman, Professor of Earth Sciences in the Institute, has been studying such claims about the importance of geology. And while he concludes that such assertions about wine and whisky tend to be overblown, he argues - perhaps surprisingly - that it is in beer that an unsung but direct link with geology does exist. The key difference is in the use of water. "The beer in your glass is around 95% water", Alex points out, "and still for many breweries it is the local groundwater, drawn from the brewery's own wells. The water chemistry therefore depends on the aquifers below the brewery. Any taste the water had at the outset is probably still there in your beer glass and its chemistry will have had a crucial influence on the brewing process itself and the kind of beer produced." Over the years, his work has sparked interest around the world. Alex's work has been quoted in numerous international newspapers, magazines, web-pages and books, he has given interviews on TV and radio, and has given invited talks around the U.K. and in France and America.

Most recently, Alex has been focusing on geology and wine. Vineyard geology influences how well vines perform and ripen their grapes, and hence affects the resulting wine. Factors like vineyard slope, aspect, soil colour and drainage - all depending on geology - play important roles. "But", Alex says, "I have to dispute the popular claim that we can actually taste the vineyard rocks and soils. I read descriptions like a wine from near Vesuvius tasting of volcanic ash, the slate bedrock of the Moselle giving its wines a slaty taste, and of a graphite taste in wines from Priorat (Spain), where - as I suspect the taster knew full well - the vineyards are sited on a rock called graphite schist. Yet every geologist knows that rocks themselves simply have no taste. And there is no conceivable way in which such flavours - even if they did exist - can somehow be transmitted to the finished wine for the drinker to detect, especially amongst all the complex organic molecules that do determine wine taste. Similarly, these days many wines are described as having a "mineral taste", commonly assumed to result from the vineyard minerals somehow being transferred through the vine and surviving into the wine glass. At a recent meeting of the Geological Society of America in Portland, Oregon, Alex argued that romantic though all this might sound, scientifically it just cannot be. It created a stir on the Internet wine pages and the current issues of several wine magazines and vineyard newsletters are reproducing Alex's arguments.

"I suppose people are too busy enjoying their wine and beer to drinking to think carefully about the marketing hype, and to bother about what really lies behind the stuff in their glass. I find this a pity. All I can do is point some of the facts out, and who better to do it than a home wine and beer making geologist with a name like mine".



*Gazing at magnificent sceneries, amazing at the size and expanse of the Grand Canyon, marvelling at the underlying geology of Yellowstone National Park. These are just some of the experiences I had whilst attending the University of Montana, in the USA.*

# Montana Sky

Sioned Haf Leyshon



University of Montana campus

At first I was very anxious about what lay ahead for me in this unheard of state in America. But when I arrived during the boiling months of August, it certainly took my breath away. It shocked me as to how friendly and helpful the locals were, and would always stop you to find out where you came from, and how I was enjoying my stay. Although, on some occasions there was a slight confusion as to where I inherited my accent from, I must have been asked quite a few times 'where are you from? Australia or New Zealand?', the shock on their faces when I said 'Wales' spoke a thousand words!

During my stay in the States, I was very lucky to travel around as part of my course to some of the US's most spectacular sights. These included a 10 day geology field trip to the Grand Canyon, a weekend travelling around Yellowstone National Park during the cold winter months, and numerous trips to Glacier National Park.

As Montana was situated in the middle of the Rocky Mountains it made it very easy to travel to all of these areas, and also made it exceptionally simple to walk a short distance and be right in the wilderness. Coupled with its wide range of sports such as skiing/snowboarding, climbing, kayaking and mountaineering I was able to easily escape the 'pressures' of university work.

Although it was very different from that of Aberystwyth University, the education system gave students a chance to broaden their horizons. While I attended the university I was able to do a range of subjects to gain experience in a lot of fields. Through this, I didn't have to specialise in one subject, I could enjoy a range of classes from whatever subject I wanted!

I would like to take this opportunity to thank all the people who made my experience in Montana a memorable occasion. All the sites I have seen, and the experience I have gained from this year abroad has helped me to develop as a person, and it will stay with me for the rest of my life. I would also like to thank the IGES department and the International Student Programme for allowing me this amazing chance of spending a year in the United States of America.



Bore Da printed on the pavement on campus



Mammoth Hot Springs, Yellowstone National Park

Glacier National Park



Grand Canyon





# The North Face

Ben Robson, Eleanor Raper,  
Scott Midgley & Steven Jennings

One of our first activities on arrival in Svalbard was our safety training - a compulsory part of our course. Due to the extreme conditions that can be experienced in the Arctic every student has to undertake intense two day survival training. As part of this course we all had to learn how to correctly wear a survival suit and exit a boat. For this we all had to jump out into the fjord from different heights. We were taught the correct way to jump in, in order that our bodies would be protected from the impact of a jump from a height. Whilst in the water we all had to swim together and establish ourselves into a chain in order that individuals did not drift away and we could be found more easily at sea if a rescue operation had to occur. Despite the seriousness of this part of the training we all had a lot of fun. The next part of the course included learning how to set up a tent camp in a way that would offer the most protection from a polar bear. This included establishing trip wires around the camp and knowing where to place the different purpose tents. Further to this we were taught how to use essential emergency communication equipment such as satellite phones and VH radios. Finally we were all taught how to use a rifle, flare gun and pocket flare. This would be essential for potential polar bear sightings. Polar bears are legally protected in Svalbard and therefore it was essential for us to learn when a rifle could be used as a means of protection. The rifle training was of mixed success, with some of us lacking a sense of aim!

As part of the Quaternary history of Svalbard module, we undertook a 2 day tent camp followed by a four day cruise. The camp was located in Billefjord and was a truly amazing location, surrounded by stunning peaks, with seals in the fjords and the thunderous sound of glacier carving echoing around the mountains. Somewhat unnervingly, the camp was surrounded by tripwires and guarded by Nuna, a polar bear watch dog to help us with our night time guard duties. From this base, we travelled on zodiac boats to other locations, which were always eventful trips! As well as other students falling into the water while disembarking the zodiacs, engine failures and moored boats drifting into the sea, on one occasion the seas were so stormy that water inundated the zodiacs

and dragged students into the sea! Needless to say, we were glad to reach dry land! A highlight of the trip was a glacier hike on Nordenskioldbreen, a massive carving glacier close to the camp. After getting geared up with ropes, crampons, ice axes and helmets we negotiated huge crevasses and learnt about processes in the ablation zone!

After finishing the activities from the base camp, a cruise boat picked us up from the fjord and took us to the West Coast of Spitsbergen, where we visited a further three picturesque coastal study sites to continue learning about the Quaternary landscapes and history of Svalbard. Despite early mornings for briefings and preparing equipment and late night lectures, staying on a boat was a great experience, especially with unlimited food for dinner!

Part of the pleasure of studying in Svalbard is the amount of activities available to do in your free time. Right behind the barracks you stay in are two glaciers – Longyearbreen and Larsbreen. We've been up both of these on several hikes, each time noticing something has changed. There are a vast amount of hikes you can do from Longyearbyen within a day, and once you know the route, have checked the university maps for any danger such as crevasses, and hired a rifle and flare gun from the logistics department, you can set off on one! One such hike is Trollenstein, a peak that requires you to walk up along a snow ridge; the wind was so cold when we did it that people's hair was frozen at the top!

One day we went by boat to Barentsburg, the last Russian settlement on Svalbard and to Pyramiden, a recently abandoned Russian town. The strange thing about Pyramiden was that everyone seemed to have left in a hurry! As we came out of one of the buildings we saw an Arctic Fox investigating someone's backpack left below a bust of Lenin. We stopped off at two very impressive glaciers on the way where we saw seals swimming around the ice bergs as we got served a lunch of barbecued Whale, rice and salad. Whale was surprisingly nice but attempts back in Longyearbyen for students to cook whale bought in the supermarket have not ended well!

Several of us have been trying to learn how to ski each evening outside the barrack; progress is slow but still enjoyable. On days where the temperature is nearing 0°C the roads become as slippery as an ice rink to walk on, one way around this is to use the university sledges to get to lectures. The hours of daylight are now down to three or four dusky hours a day, an on going project we have started in the evenings is the construction of an igloo outside our Barrack. It's a work in progress but we hope to have it finished before we go.



# The Croation Horse Wrangler

Dorothy McCarthy

This summer I spent two months in Velika Plana, a remote village of 40 inhabitants hidden up in the mountains of the Croatian national park. By day I would fill out my duties as wrangler, training the horses, teaching others to ride and getting in a little gardening and general farm labouring if there was time. By night I would curl up next to the wood burning stove in my tepee after an evening round the fire often involving American Indian rituals practised by the locals.

Whenever out riding I would have to ensure Medor (the over sized Croatian mountain dog who was roughly the size of a small horse) came along too. Bozidar, my Boss told me this was essential to protect me from the native wolves that lived all around in the forests that blanket the mountains. If out on the trail for more then a day a rifle was also needed due to the Lynx which would stalk you in the tree canopy above, shadowing your movements as the horse below wove through the trees for hours at a time before making a meal of you.

Zahir, a bright eyed stallion of only two years caught my eye as soon as I arrived. By the end of my time at the ranch I had backed him at walk, trot and canter and taken him out of the ranch onto a neighbouring field with a few other

riders where he behaved as though he had been riding for years. However upon returning to the ranch he decided he had had quite enough and I experienced a less then graceful dismount into a newly erected fence! I survived to tell the tale, the fence, however, was not so lucky!

The summer has flown by, each day bringing about new challenges and experiences. I could tell tales of hidden caves leading to clear blue pools hidden in the folds of the mountains, protected as the local legend goes, from the outside world by guardian fairies. Gathering hay by hand, riding on the hay field cart back to the ranch, watching the bright white clouds float across the clear blue sky edged by the rugged mountain peaks. All the households of the village rushing to the aid of one snake-bitten sheep, unheard of in the western world where we can replace anything so easily. Racing Deer through the forest on horseback at full gallop, learning to lasso from the saddle, relying on animals for protection and to find water while out on the trail.

The naming ceremony given to me by the Croatian family I became a part of, learning to live off the land with nothing but a fire for an oven. I could go on, but to really give the tale justice requires a warm glowing fire, a good bottle of Croatian whisky and the clear night skies of Velika Plana, the milky way shimmering overhead.

*To really give the tale justice requires a warm glowing fire, a good bottle of Croatian whisky and the clear night skies of Velika Plana, the milky way shimmering overhead.*





*Elatsite Cu mine, Bulgaria. A key source of contaminant-metals in the lower Danube drainage basin.*

## Bucharest or bust: drilling holes in the lower Danube floodplain Graham Bird



*Sunshine at last, coring near Giurgiu, S Romania.*

During July 2009 IGES' Dr Graham Bird and Dr Paul Brewer, ably assisted by MSc student Josie Ashe, spent a fortnight in southern and western Romania working with collaborators from the Romanian Institute of Geography, as part of an AU-funded project examining the dispersal of contaminant-metals through the lower Danube drainage basin.

Tributary catchments of the River Danube in Hungary, Serbia, Romania and Bulgaria contain some of Europe's most valuable base and precious metal ore deposits. This latest research project, which builds upon 9 years of previous research in the region, is focused on using Pb isotopes as geochemical tracers in order to: 1) quantify the inputs of contaminated sediments from mining-affected tributaries of the River Danube, and 2) to reconstruct patterns of historical metal contamination in the lower Danube using sediment cores collected from the River Danube floodplain.

Following a 2,000 mile drive from Aberystwyth to Bucharest, through 6 countries, fieldwork focused on collecting 5m-long sediment cores from 4 sites along the River Danube, along with river channel sediments from the Danube and Romanian tributaries. With the weather changing from thundery showers to 40°C heat as the fortnight went on, the miles were racked up on some of Europe's most pot-holed roads! After filling the van with samples all that was left was the drive home...



*Percussion-coring in inclement weather, near Faeceni, SE Romania.*



Can a new partnership between hydrology and epidemiology provide the missing toolbox for malaria interventions?

## The Last Mile towards Malaria Elimination: can hydrology explain the variability of malaria transmission?

**Mark Macklin & Mark Smith**

Can a new partnership between hydrology and epidemiology provide the missing toolbox for malaria interventions?

Malaria kills one to three million people world-wide every year, mainly children under five, and mainly in sub-Saharan Africa. This is a disease that can be both prevented and cured. Control efforts such as bednets have drastically reduced malaria transmission rates; however, these interventions currently lack an understanding of physical processes underlying the variability of malaria transmission. A new collaboration between IGES and IBERS seeks to address this deficiency.

The basic idea is very simple: the malaria parasite is transmitted by mosquitoes and mosquitoes need standing water to breed. Thus, coupling models of catchment hydrology with those of disease transmission offers the potential to understand the physical processes behind malaria transmission all the way from rainfall to infection.

Working in the Kilombero Valley of Tanzania, home to the highest rates of malaria transmission in the world, the project team aims to implement a monitoring strategy to record and understand variations in surface water bodies and density of mosquito larvae.

The monitoring data will inform a suite of models which, in turn, will be capable of generating a dynamic malaria hazard map at the landscape scale. This presents the opportunity to



*Anopheles gambiae taking a blood meal*



*The Kilombero Valley, Tanzania*

redirect important resources, including bed-nets, to those areas who will benefit most. Moreover, when combined with rainfall from Global Climate Models, the modelling approach offers an ability to predict how projected climate change will affect the transmission of malaria both in Sub-Saharan Africa and beyond.



**“ Thank you IGES! ”**

*Hannah Bailey, 3rd Year BSc Geography*

Sarah Lane worked at an orphanage in Sri Lanka, Tom Williams went to into deepest, remotest, Costa Rica and Michael Pawlkowicz experienced the US-Mexican border. Thomas Evans explored the role of football in Argentina, Alan Smith discovered volcanic hazards in the Bay of Naples, and Ben Scott worked with a church in Durban. Hannah Bailey trekked the Tour du Mont Blanc, Jonathan Harris taught in Malawi and Jonathan Waller visited Jordan.

Each year we offer up to 13 travel awards, worth up to £400, to students looking to explore the world. Here are just some of the stories from those who made it back!

# IGES TRAVEL AWARDS 2010

## THOMAS EVANS IN ARGENTINA 2ND YEAR BSC GEOGRAPHY

My travels to Argentina although thoroughly enjoyable was not solely about travelling and having my picture taken in cool places. I lived the life of ‘Los Porteños’ (the citizens of Buenos Aires) experiencing the culture and the daily regimes and flows of the city. Further more, throughout my time there I was researching and collecting data for my dissertation – ‘The influence and role of football on Argentinean society’ – going to football matches and taking in all of the emotions and feelings, an incredible experience.

I spent 3 months in Argentina, the vast majority of that time in Buenos Aires (La Capital Federal). Argentina is a very diverse country with a variety of climates and geographies. I went to the south of Argentina in the Patagonia where I visited Ushuaia, El Calafate and Iguazu. Ushuaia claims fame to being the most southern city in the world. During my time there I went on an excursion into ‘El parque nacional del Tierra del Fuego’ as well as a catamaran trip around a nearby archipelago to observe the local flora and fauna. El Calafate is an extremely popular tourist destination situated in the south-west of Argentina, famous for the ‘Perito Moreno’ glacier. I visited El Calafate in late August and went on a walking excursion, including a two hour guided trek of the glacier. Iguazu National Park stretches across the borders of Argentina, Brazil and Paraguay. I visited the park



## BEN SCOTT IN DURBAN, SOUTH AFRICA. 2ND YEAR BA FILM & TELEVISION STUDIES AND HUMAN GEOGRAPHY

I travelled with 352 other young Christians to Durban to serve with 40 local churches, seeing change and bringing change. Specifically I worked with a church who were trying to feed and provide basic health care for 900+ street orphans in the nearby slums. Many of the children would be caring for younger brothers and sisters.

Despite managing to feed around 900 children, often there would be around 200 who we could not give food. The church had also taken on an abandoned health clinic however their resources were limited.

One day we were forced to link arms and form a human barrier to stop younger children being crushed in the surge for food. To calm the crowd we would sing songs and do dramas. We also built a kitchen for a future orphanage.

## TOM WILLIAMS IN COSTA RICA 3RD YEAR BSC GEOGRAPHY

I spent three weeks in the summer of 2009 travelling around Costa Rica. For a country that has a land area less than half that of England, Costa Rica is extraordinarily rich in natural wonders of all kinds. I spent some time at the Arenal Volcano, one of the world's most active volcanoes. The last major eruption here was in 1968, and killed more than 80. The subsequent tourist boom and development in the area has significantly increased the vulnerability of those who live here, and the thousands of tourists who come here to watch the fireworks of Arenal every year.

My IGES Travel Award also helped me to travel to remote areas of the country such as Tortuguero, where I was lucky enough to witness the huge Green Turtles nesting, and Manuel Antonio, where monkeys play in trees which line white sand beaches.



*At 3842m, the Aiguille du Midi was the highest point of the trip & brought us within touching distance of the Mont Blanc summit. The weather was perfect providing magnificent views across the Alps, including the distant Matterhorn.*

## TREKKING THE TOUR DU MONT BLANC HANNAH BAILEY 3RD YEAR BSC GEOGRAPHY

The Gareth Thomas Travel Scholarship was established by former lecturers to enable students to explore and travel to "the farthest ends of the world." For this reason I wanted to do something adventurous - complete the Tour du Mont Blanc! This is a 200km hike circumnavigating the highest mountain in Western Europe, Mont Blanc at 4808m. On this ambitious adventure, travelling with my boyfriend, we successfully navigated through the French, Italian and Swiss Alps, encountering three very diverse cultures with different languages and cuisine unique to each region.

Being both physically and mentally demanding with an overall height gain (and therefore loss) of 35,000 ft, this trek developed my skills of hiking and climbing safely in a high altitude environment, as well as considerably improving my own endurance abilities. I would highly recommend this expedition to anyone interested in physical geography with a love of mountaineering and an unnatural desire to haul a heavy backpack 200 km! The satisfaction from completing the trip is indescribable, but a personal highlight has to be trekking along the Grand Balcon Sud (Grand Southern Balcony) on the Aiguilles Rouges, with a perfect view across the entire Mont Blanc Massif and the famous Mer de Glace.

## WADI FAYNAN – JORDAN JONATHAN WALLER – 2ND YEAR BSC ENVIRONMENTAL EARTH SCIENCE



Most of the day was spent transecting areas of the desert logging burial sites, collecting pottery and bones for later input into a GIS map. 6.00 am to 2.00 pm was spent working as a team collecting data, with the occasional interruption of passing camels, or 'ships of the desert' as they are known.

During my weeks away I experienced many new things, I made lasting friendships, matured as a person and have ignited a passion for travel.

Academically I was blessed with the opportunity of studying in a remote location for my dissertation, while being surrounded by world leaders in research and their invaluable knowledge and experience.

## MALAWI – JONTHAN HARRIS 1ST YEAR BSC GEOGRAPHY

I stayed in Malawi for a month and became involved in two different 'missions'.

The first two weeks I worked with a team called STORM (Short Term Out-Reach Mission). This is a Christian mission team which was based near the city of Blantyre – a seven hour drive from the airport! On STORM I was involved with village ministry, youth work, school teaching and some manual labour.



The final two weeks I worked alongside a Christian missionary couple and helped them in their work of telling people about Jesus. This involved teaching at the nearby Saw mill (a big source of employment in the area), teaching in the church and a lot of children's work.

## SRI LANKA SARAH LANE – 2ND YEAR HUMAN GEOGRAPHY

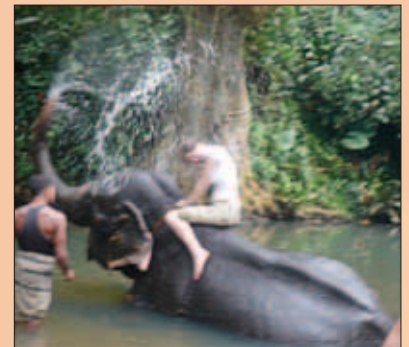
The island of Sri Lanka was devastated by the 2004 tsunami, and the Kosgoda Community Development Project looked to rebuild the lives of the villagers of Kosgoda.

Community Development mornings were spent with the ladies of the village weaving baskets in order to provide extra money for their families, utilised for their children's education as most of the village industry had been destroyed in the tsunami. Both sides were deeply enriched as the women learnt English from the volunteers and we in turn learnt from them invaluable lessons about Sri Lanka and the country's customs and ways of life.

Vajira was the largest children's orphanage in Sri Lanka, housing two hundred and fifty children, ranging from new born babies all the way to eighteen years of age. I spent two weeks living with the children getting to know them, teaching them basic English, computer skills and playing sports. The ability to speak English is vital to finding a job so many children were incredibly keen to learn, therefore classes were always full and very eventful!

Academically, I enjoyed seeing another culture trying to deal with educating its people on ideas of sustainable development and the environment after the tsunami.

Personally, I feel that this trip changed my life. I am a more confident person now and I feel ready to take on any challenge thrown at me. I learnt that true happiness comes from within and that material goods cannot make you happy - the orphans I worked with owned just one outfit each and that's all they had in the world, yet were still content.



Washing and riding an elephant on my day off



## ROME AND THE BAY OF NAPLES ALAN SMITH – 2ND YEAR BSc GEOGRAPHY

The aim of this trip was to collect data for my undergraduate dissertation travelling around Rome and the Bay of Naples. Arriving in Rome we spent several days visiting amongst other things; the Vatican, Colosseum, Trevi Fountains and the Pantheon. Taking the train south to Naples, where we based ourselves, we visited the ruins of Pompeii and Herculaneum, and in the west of the bay, Campi Flegri. Exploring Naples we visited the Archaeological museum, Castle Nuovo and Sant'Elmo, and climbed to the summit of Mt Vesuvius. Finally we took the ferry to the island of Capri in the bay. During this time we used a GPS to collect coordinates for use in a volcanic hazard map. Academically we were able to visit study sites documented in journals, with the overall experience giving a much more in-depth knowledge about the area and the volcanic hazard.



The Colosseum in Rome, built in 70 AD, most of the present damage today resulted from a severe earthquake in 1349 AD.



Vatican City: features many artworks by Raphael and Michelangelo, such as 'The Creation of Adam' in the Sistine Chapel.

## USA – MEXICO BORDER. MICHAL PAWELKOWICZ – 3RD YEAR BA HUMAN GEOGRAPHY WITH BUSINESS AND MANAGEMENT

The aim of my trip was to experience one of the deadliest and busiest borders in the world. During three weeks of the road trip, my girlfriend and I travelled 6500 miles. We crossed the border 10 times (twice outside the official point of entry). We started in Houston, Texas heading for the Mexican Gulf, then down and along the border to the West Coast – San Diego. Our final destination was San Francisco.



We enjoyed that time, thanks to the people we met the places we visited and the many adventures we came across. We saw places of outstanding, intact, natural beauty and some of the most congested cities of North America.



Thanks to this trip I was able to see places of geographical importance to contemporary politics and policies. I saw immense wealth on the north and unlimited 'hunger' for it in the south of the border. I experienced free movement to Mexico and complex controls when crossing back to the US. But thanks to these controls I felt safe in the US and less at ease in Mexico. Now I am able to understand the problems and differences between these two nations in greater depth.

# GRADUATE BIOGRAPHIES

You've worked hard and played hard for three years, and that degree is securely in your pocket, but what do you do next? Here are some of our recent graduates to show you just what you can do with a degree in Geography!

## JENNIFER BARLOW GEOGRAPHY TEACHER



Having graduated from Aberystwyth University I worked for 8 months to save up enough money to travel around Australia and New Zealand for four months. Whilst travelling I discovered a great deal about the culture and wildlife of both countries. I also met people from all over the world and unexpectedly bumped into two fellow students from Aberystwyth! I visited a range of environments from the rainforest in North Australia to the Fox and Franz Joseph of Southern New Zealand where I did a sky dive over both glaciers.

On my return I was ready to begin a SCITT PGCE to be a Geography teacher in Herefordshire. The knowledge and enthusiasm I gained from Aberystwyth coupled with my experiences abroad stood me in good stead to tackle the many and varied challenges ahead. I am now teaching in a rural comprehensive in Herefordshire and putting everything I have learnt throughout my education to good use! Having undertaken a number of fieldwork studies at Aberystwyth as well as

studying a range of topics, I have the confidence to take on teaching right from year 7 to the year 13 and even introduce new ideas such as GIS and glacial fieldwork into the Geography department.

## DANIEL LEWIS

NOW WORKS FOR: PETER BAXTER & ASSOCIATES, *SITE ENGINEER*



After leaving Aberystwyth University in 2006, I started work with a civil engineering firm in Gillingham, Kent. Peter Baxter Associates Ltd. brought me in on a contract job, working on the construction of a new large scale landfill cell in Romsey, Hampshire, near Southampton.

My job title was Site Engineer. This very autonomous position involved the sampling of clay core samples and their analysis in an

onsite laboratory for shear stress, bulk density, dry density, moisture content and percentage air voids, in order to satisfy Environment Agency legislation. I was also solely responsible for the sampling and packaging of other clay and geotextile samples which were sent away for external analysis.

I was given my own off road vehicle to allow me to collect my samples and take them back to my laboratory.

The hours of work were long because I had to sample all of the clay that was placed that day. My usual working day would start at 7.30am until at least 5.30pm, sometimes

working as late as 7.30pm. However, clay placement would not take place when it was raining, which gave me a lot of free time off.

I believe my time spent reading BSc Geography in Aberystwyth gave me the skills needed in order for me to carry out my job. I found the module Environmental Management (EA20110) especially useful, giving a broad introduction to issues confronting environmental management, such as landfills. Laboratory work undertaken in the module Physical Analysis of Materials (GG21510) gave me essential sampling, interpretational and analytical skills required as a site engineer.

The module Geographical Data, Fieldwork, Analysis and Presentation (GG10720) as well as Tutorial work throughout all 3 years of my degree has given me the confidence to write reports and converse with professionals.

My next Job will be starting in Canterbury. I will be acting as the CQA engineer on a small civil engineering project. This will include the removal of a soil bund between two landfill cells and the instillation of underground drainage. The role will involve the supervision of the contractors works, primarily to check the quality of work against the plans. A diary of events must also be taken for billing purposes.

I hope to continue with civil engineering/geotechnical contract work for the next year or so, building up experience in this sector, with the aim to go back to university and do a masters degree.

## AARON COUSINS

NOW WORKS FOR: RPS GROUP, ENVIRONMENTAL CONSULTANT



I visited Aberystwyth University (AU) on an Open Day, and was impressed with the Institute of Geography and Earth Sciences, I was particularly attracted to the fact that there weren't too many students per lecturer accepted onto their courses, allowing a much more 1:1 approach to lectures. I had no desire to go to a city university where often numbers in each class are high, and loved the rural location of Aberystwyth.

Six months on from completing my degree in Environmental Earth Science, I am working as an Environmental Consultant for the RPS Group.

My role involves site investigation, environmental risk assessment and the remediation of contaminated land. I work within a small team and spend about a third of my time out on site and the rest in the office writing up reports on my findings. Part of the role involves doing ground and stream water sampling, which involves gathering samples on site and sending these off for analysis in the laboratories. Being out on site is definitely the aspect of the role that I most enjoy.

I realised the need to get some practical work experience early on during my studies at Aberystwyth, to give me the edge over other graduates from similar disciplines upon leaving university. I used my own initiative to find a company that would provide me with a valuable experience, and the company BME Systems agreed to employ me for a year during my second and third year at university; which, following discussions with my tutors, I was granted a Year in Industry break to allow me to accept the position and broaden my horizons. I have no doubt that this experience was a significant deciding factor in the RPS Group's decision to employ me.

I would advise students to do a Year in Industry and/or take up smaller daily/weekly/monthly placements, which incidentally can be organised through the Careers Advisory Service, as this gives you valuable experience in the field that you might wish to work in, and can help rule out various options and help you focus on where you want to go. I certainly wouldn't have got the job with the RPS Group as an Environmental Consultant without all of the experience I gained in the industry during my year out.

## JULIE CARR

NOW WORKS FOR: SCOTTISH GOVERNMENT  
SOCIAL RESEARCHER

My degree in geography from Aberystwyth provided me with a good understanding of current social science issues and sound analytical/research skills and experience, so after graduating from IGES at Aberystwyth, I wanted to continue to develop these skills and decided to study for a PhD in Leeds. My PhD was on the Geographies of Young People, Crime and Social Exclusion and through my studies I became involved in a range of contract research projects on crime, community safety and substance misuse for the police and local authorities in Leeds and Bradford.

After completing my PhD I started work as a social researcher at the Scottish Government. Social researchers in government are part of Government Social Research and provide research-based evidence and advice for officials and Ministers to inform policy development, implementation and evaluation. Key roles of social researchers at the Scottish Government include generating new ideas; understanding and challenging assumptions, beliefs and attitudes; evaluating policy ideas; and developing a deeper understanding of social issues as they affect the people of Scotland. My work has also enabled me to become actively involved with the wider social research community through the Social Research Association, where I am a member of the UK Board and chair of the Scotland branch.

The work that I undertake requires the application of all the important skills I learnt at Aberystwyth, as well as an appreciation of research in a policy context.



# The Italian Job

Matt Westoby

This summer myself, fellow MSc Glaciology student Alex Neen, and third-year Environmental Science student John Balfour travelled to the Italian Alps to spend a month collecting data for our Masters dissertations, and a complementary project for John. The original plan was arguably a tad ambitious; obtain funding and spend 6 weeks trekking and undertaking glaciological fieldwork in the Nepalese Himalaya. However, we managed to secure an offer of £2000 from the Royal Geographical Society before common sense eventually prevailed (read as: far too many impending deadlines and exams to reschedule!). With regret we politely turned down this initial offer, though we were kindly allowed to re-submit our grant application. We subsequently set our sights on a location closer to home, and were successful once again!

Armed with £1000 from the RGS Geographical Fieldwork Grant scheme (monies kindly donated by the Jeremy Willson Charitable Trust) and a generous £750 from the Aberystwyth University Postgraduate Discretionary Fund we set off in early June for the tiny alpine ski-resort of Macugnaga. Following a two-day drive in my (almost undoubtedly overloaded) car we reached our destination without incident, and spent the next few days reconnoitring our chosen glacier: 'Ghiacciaio del Belvedere' (Belvedere Glacier), a heavily debris-covered temperate glacier possessing a spectacular ice fall and fed by ice and rock avalanches from the rather intimidating east face of Monte Rosa (rising approximately 2600 m from the glacier to its peak, this face is the largest in the Alps). Daily access to the glacier was by chairlift, though the initial relaxation this afforded was quickly replaced by exhaustion as we hiked kilometres each day across the hazardous debris cover at altitude in 25-degree heat (all in the name



of science!). Interestingly, a handful of public footpaths have been established across the glacier tongue, meaning that on one occasion we encountered locals and their horses engaged in a spot of crevasse-dodging!

It was necessary to modify our individual research projects as they had been based on rather basic satellite imagery (in my case meaning there wasn't, as hoped, an abundance of supraglacial ponds...), though this paid off as three weeks worth of high quality meteorological data which I had originally planned to use was lost after our weather station lost its fight with an electrical storm! Despite a few obligatory setbacks, by the time of our departure in July our trio had amassed a respectable amount of data pertaining to the geomorphological, sedimentological and energy-balance characteristics of the glacier with which to construct our dissertations. The expedition was thoroughly enjoyable and productive, and well worth the relatively short time spent planning and putting together funding applications. I would strongly encourage any students to pursue funding for your dissertation fieldwork as plenty of grants are available each year, both from institutions and various societies. Who knows, you could find yourself doing something a bit more exciting than measuring striations in Snowdonia in the pouring rain next Spring!

The Institute of Geography & Earth Sciences held an undergraduate photographic competition for students who submitted photographs from this year's residential fieldtrips held in New Zealand, New York, Crete, Ireland, Cornwall, Spain and North Wales.

Students submitted photographs for the following categories:

- \* Best Photo of individual or group activities
- \* Best Photo that captures the spirit of a place
- \* Best Photo that captures your fieldtrip experience
- \* Best Photo that captures Geography and Earth Sciences as you see it

Prizes were awarded for:

- \* First Prize for Best Overall Picture - £50 book token
- \* First Prize for each listed category - £30 book token
- \* 4 Highly Commended Prizes - £20 book token

# IGES PHOTO



**Overall Winner – Thomas Glithero – BSc Geography (New Zealand)**



**Elzbieta Kruger – BA Human Geography (New York)**

## Joint Winners – Individual or Group Activities



**Damon Hammond – BSc Environmental Earth Science (North Wales)**



**Winner - Spirit of a Place  
Chris Frisby – BSc Geography (Ireland)**

## Highly Commended

**Michael Pawelowicz – BA Human Geography (New York)**



**Alan Smith – BSc Geography (Crete)**





# COMPETITION



Geography (New Zealand, North Island)

Elizabeth Boswell – BSc Environmental Earth Science (Cornwall)



## Joint Winners – Geography and Earth Sciences As you See it



## Spot of the Place

Physical Geography (New Zealand)



Hannah Shepherd - BSc Geography (New Zealand, North Island)

## Highly Commended



Chris Frisby – BSc Physical Geography (Ireland)



Elzbieta Kruger – BA Human Geography (New York)

# THE W. J. EDWARDS AWARD



*Bill Edwards (1944-2007) was passionately interested in Wales –particularly in community, politics and participation. He was also fascinated by the links between Geography and other disciplines such as Art, History and Literature, as well as the social and physical sciences. As Director of Teaching in IGES and as Dean of Arts, he made a great contribution to improving the experience of students in Aberystwyth.*

*Honouring Bill's love of Wales and his commitment to supporting the academic and personal development of our students, this award is designed to support dissertation or Joint Honours project work which contributes to our understanding of any aspect of the physical and / or human environment of Wales. In May 2009, we were pleased to present awards to four second year IGES students. Their dissertation projects reflect the diversity of geographical and environmental research in IGES, tackling topical issues in sometimes challenging environments. Here they report back on their experiences over the summer.*

## Matt Greenwood (Bsc Physical Geography)

The Aran mountain range in mid Wales has had remarkably little academic study. This is surprising as I thought the highest mountains got bagged first! It did though draw my attention to the unanswered question of whether the summit of the highest peak, Aran Fawddwy (907m), was a nunatak during the Last Glacial Maximum. To discover this was my primary aim.

The Aran Mountains were definitely a different environment compared to the lecture theatre, tiring for different reasons. Being in such beautiful surroundings really does inspire the imagination, cleansing the spirit as well as the obvious health benefits of climbing

mountains everyday. I was in the lucky situation of staying in a mountain hut at the base of the mountain which had hot showers, gas cookers, a coal fire, fine views and a small library of climbing literature. This really did enhance the whole experience and I'm sure my work rate would have dropped considerably without these comforts. The bursary of the WJ Edwards award helped me greatly, supporting the costs of staying in the mountain hut for two weeks – and keeping me well-fed, as I discovered that being on the hills dot-to-dotting boulders uses up a lot of energy!

The Aran Mountains really are in a stunning location and any chance to go back there would be excellent - either for research or rock climbing!

## Stephen Jennings (BSc Physical Geography)

In the summer of 2009 I braved the wilds of Wales in the name of scientific research. My objective was to discover the glacial past of the Llyn Teifi area of mid-Wales at the Last Glacial Maximum; 18 000 years ago.

Despite it being known for many years that mid-Wales was once covered by the Welsh Ice Cap at the Last Glacial Maximum, very few if any scientific studies have been conducted wholly within this area. The textbook glacial landscapes of Snowdonia have received the majority of the attention while the more subtle glacial landforms of mid-Wales have been ignored. Due to this, very little is known about the dynamics and basal regime of the mid-Wales sector of the Welsh Ice Cap. By mapping the preserved glacial landforms in the Llyn Teifi area, and determining their glacial flow orientation, I hope to be able to fill in some of the gaps in our scientific knowledge concerning Britain's glacial history.

To gather the data required for my study I spent a week in the field identifying and measuring glacial landforms. Despite the Welsh weather throwing everything from thunderstorms to scorching summer days at me and having to spend an inordinate amount of time knee deep in mud and water, the experience of seeing the Welsh countryside in all its rugged beauty was inspiring.



The funding that I received from the W. J. Edwards award has enabled me to undertake research I am passionate about in a truly spectacular location. The experience has been invaluable and has inspired me to conduct more research in the future.

### Emma Parry (BSc Geography)

For my dissertation I wanted to concentrate on farming, as being a farmer's daughter I have always had an interest in the politics and policies that affect farming day to day life. I decided to focus on Ceredigion as a geographical area by undertaking questionnaire based interviews with farmers, their families and relatives who no longer farm, to investigate their views on how policies have affected their approach to farming and how they cope with increasing regulation placed upon them.

My findings reveal many farmers were uncertain of new rules and felt that they were not well informed; rumours heard in farmers markets and between neighbours did not help any ambiguity. Some farmers highlighted that unwillingly they have had to reduce sheep stock numbers due to increasing pressures of EID (electronic identification) regulation and fears of not being able to cope. Farmers felt disillusioned by changing government policies and regulations. Generally farmers and their families believe that there should be increased justification and clarification as well as policies based on practical on-farm research, which seeks farmers' opinions and experiences. Many spoke of the burden of agricultural administration and the desire to keep paper work to a minimum. This came through as the main reason for not participating in voluntary schemes such as Tir Gofal (countryside stewardship) and organic farming. It emerged that the farmers interviewed genuinely care for the environment, the biodiversity and the health and well being of their stock.

The W. J. Edwards enabled me to travel to different rurally located farms and homes, as well as supporting the costs involved. This research has inspired me to pursue my interests in agriculture and seek employment with the National Farmers Union or Farmers Union of Wales as I would like to help support the agricultural industry in Ceredigion.



*Farmer and his son sorting sheep while sheep are being sheared by contracted shearers*

### Sam Pettipher (BSc Geography)

Onshore wind farms are very controversial and evoke strong reactions. With the UK government legally committing to carbon reduction targets of 20% of 1990 base levels by 2010, and up to 80% by 2050, there is no doubt that the deployment of renewable energy needs to increase. Onshore wind farms represent the most economic and technologically advanced of all renewable energy types. Studies have repeatedly shown that there is a high level of support for wind farms (70%>). However, in 2009 around only 25% of onshore wind farm applications were approved compared to around 63% in 2007. In Wales the TAN8 policy designed to support the development of 800MW of onshore wind power has been unsuccessful to the point of being 82% behind schedule as of July 2009 as only 102.5MW has been installed. Why is there this apparent gap between support for wind power and the number of approvals?

My dissertation topic is to examine how landscape affects the acceptability of wind farm development and whether local people feel they should be 'compensated'. To do this I travelled to five sites across the UK, including Aberystwyth and took a sequence of photos.

Using professional software, turbines were superimposed to produce a realistic visual representation of what turbines would look like on the skyline. Sixty-six people were interviewed about their perceptions of wind power and whether they thought these developments were acceptable. Additionally, 100 children aged 12-14 were surveyed on whether they thought a three turbine wind farm on their school field was acceptable.

More than 96% of those surveyed said they supported wind power, but over 80% of the school children found the development on their school field unacceptable. In Aberystwyth, the Constitution Hill development was acceptable to 60% of Aberystwyth participants. When asked if local communities should be compensated 45% of those in Aberystwyth said they should, whilst 41% said they shouldn't and 14% were unsure.

I am grateful for the support provided by the W. J. Edwards Award. Undertaking this study has been very interesting as it has helped me understand how local communities perceive wind turbines and I hope that it helps me with my intended career as a wind farm developer.



*How the skyline of Aberystwyth would be affected by a three turbine wind farm*

# EES THE AGE OF STUPID –

## Environmental Earth Science Society

What were a group of students doing in the depths of A6 after 6pm on a cold, damp Friday afternoon when everyone else was heading home for the weekend? Some of them may well have been thinking the same thing, but little did they know they were about to hear a talk that could change their life and possibly the world.....

Do you care about your planet? Do you want people to stand up and be counted? Do you want to know more about what you can do to save Earth? Then "The Age of Stupid" is the film for you.

On Friday the 6th March, we were privileged to have not only a people's premier screening of the film, described as "captivating and continually surprising" by George Monbiot, but we were also treated to a talk by Lizzie Gillett.

This new environmental film aimed at the general public, deals with the problems surrounding climate change as viewed from 2055 and stars Pete Postlethwaite asking why we didn't do more

to tackle climate change. The film looks at the massive impacts of our consumer nations, using real-life examples and firsthand accounts of the impacts that have already occurred, noting the necessity for major social reformation if we want to avert disaster.

Lizzie, the producer of this cutting-edge, thought-provoking film offered a rare insight into the making of the film and the reality of climate change. Following the film viewing there was a vibrant question and answer session fronted by Lizzie and Paul Allen (Director, CAT - Centre For Alternative Technology).

"I defy anyone to come out of this film and not feel like they have to make a difference.." Caroline Lucas Leader of The Green Party

The whole evening was simply un-missable for anyone who cares about the future of the planet and both informative and inspiring to students and the local community, particularly those studying the environment here in Aberystwyth.

With many thanks to Siobhan McGovern (Arts Marketing), David Gwilliams (Wales One World Film Festival) and Geogsoc for all their help organising the talk.

Danielle EES President  
Visit [www.ageofstupid.com](http://www.ageofstupid.com)



# Environmental Earth Science Society

# Aberystwyth Expedition Society



The Aberystwyth Expeditions Society is one of the most active outdoor clubs here in Aberystwyth, organising regular hiking and scrambling trips. After a group of us visited Norway for a week long hiking expedition in the Joutenheim National Park last Summer, we had our minds set on a bigger and better challenge! This year we planned a seven day expedition across Arctic Sweden, which would include an attempt at climbing Sweden's highest mountain – Mt Kebnekaise.

After an extremely wet practise expedition in the Scottish Highlands at Easter, in June a group of seven enthusiastic members headed out to Sweden ready to complete one of our most challenging and exciting expeditions yet. After a seventeen hour train Journey from Stockholm, we arrived at our starting point, a small village called Abisko which is located in northern Sweden, over 200 kilometres north of the Arctic Circle. From there, our planned route would take us south along the Kungsleden – which in English translates as King's Trail – heading towards Kebnekaise – before heading west towards our finishing point of Nikkaluokata.

It all started well with us making excellent progress over the first two days hiking, enjoying the beautiful scenery and wilderness that northern Sweden has to offer. Having made good progress so far, our third day was meant to be a nice and easy day, with just a relatively short distance to travel to where we intended to camp. The reality was very different. We decided to take a detour from the main path into a valley in order to get up close to some glaciers. However, the snow in the valley we were heading up was much deeper than expected, and we soon found ourselves hiking through knee deep snow whilst traversing a steep slope. Incredibly tiring and frustrating work!

All this snow meant we couldn't stop and camp where we wanted, and had to keep walking through the night until 3.00am where we eventually found some suitable ground to camp on.

After another day hiking through deep snow we rejoined the main trail at Salka. From there a long days walk took us to the base of Kebnekaise. Looking up towards the peak from where we stood in the valley below, the route to the top looked ridiculously challenging, with steep slopes covered in snow and ice. The

next morning, two of the group, Fergal and Richard, set off on their attempt to reach the summit, with the rest of the group opting to have a relaxing day at camp. Twelve hours later, they returned, feeling rather pleased to have successfully reached the summit of Sweden's highest mountain.

From there, a final day of hiking took us to the village of Nikkaloukata, the finishing point of the expedition. After an awesome seven days in the mountains, we caught the bus back to Kiruna before boarding the train for the long journey back to Stockholm.

You can find out more about the Expeditions Society at [www.aber-expeds.co.uk](http://www.aber-expeds.co.uk).



*Standing on the summit of Mount Kebnekaise – Sweden's highest mountain*



*Trekking in the snow – The King's Trail, Lapland*



*Descending towards Salka – The King's Trail, Lapland*

# FIELD COURSES

## Drop Dead Gorges:

### Crete Fieldtrip

IGES recently launched a brand new fieldtrip to Crete - taking in some of the most spectacular gorges in Europe. The landforms of southern Crete offer a perfect environment to reconstruct flood events taking place over the last century, examine alluvial responses to climate and base-level change, test the stability of some rather precipitous cliffs (a hard-hat is essential), and investigate possible tsunami deposits dating back to AD365. It's also a pretty nice place to enjoy the local food, drink and relaxed lifestyle.



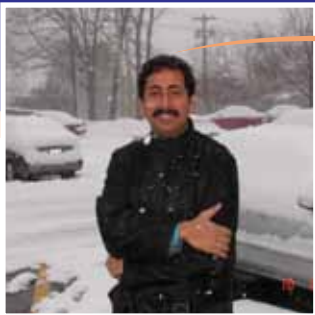
### New Zealand Fieldtrip



### New York Fieldtrip



### Spain Fieldtrip



# Indian Spice in Bay of Bengal

## Chandra Bhushan

Living in Aberystwyth reminds me of my days in Nicobar islands. The Nicobar islands are a group of 22 islands (12 inhabited and 10 uninhabited), located in between the 6th and 10th parallel of North Latitude and in between 92 and 94 degree of East Longitude. They are strategically located on international sea route for going to Indonesia/ Singapore.

This small group of islands has been a bone of contention amongst various European companies from the 17th century onwards to control the famous spice trade route. Since 1947, the islands are part of Indian territory.

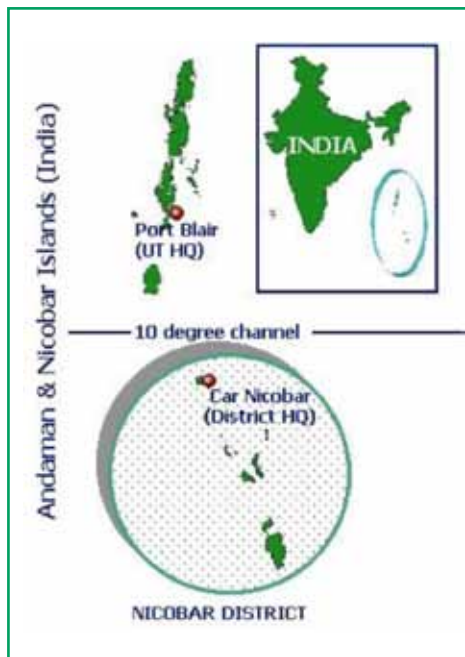
The islands are inhabited by two indigenous tribes – Nicobarese and Shompens. It is remarkable to see the difference in growth in both the tribes. Surprisingly, Nicobarese are well educated and part of planning and decision-making, whereas Shompens are still in semi-nomadic stage. Introduction of Nicobarese into modern life has happened gradually due to their contact with traders. Despite modern education, the Nicobarese have a distinct structure of governance in the form of tribal council, island council and village council. Contact with Shompens is still very limited.

I stayed on the islands for 18 months during 1998-2000 as executive head (Deputy Commissioner) and have wonderful memories of the place. The simplicity in personal and community life of the Nicobarese, their concern for the island ecology and its conservation have been learning experiences for me. Commercial exploitation of the resources has never been their forte. But, they are not unhappy. This tiny place has been national school football champions for four times. They are content and happy, the way they want to live!

After five years, I had to make another trip to Nicobars, unfortunately, it was after the devastating Tsunami of 26 December 2004. It was a visit to be part of rehabilitation process. The resilience of the community despite of the heavy loss of lives and properties has been remarkable. The eagerness to come back to normal life without cursing the nature has helped them to start afresh.

(If you want to visit these islands, you will have to reach Port Blair by ship/air via Kolkata/Chennai. From Port Blair, ships as well as helicopter services are available. You need an Inner Line Permit, which is easily available at any of the tourism offices (Delhi/Kolkata/Chennai/Port Blair) of Andaman & Nicobar Islands <http://tourism.andaman.nic.in/>. Details of Nicobar Islands are available at <http://nicobar.nic.in/Default.htm> )

*Chandra Bhushan Kumar is an Indian Administrative Service officer with fifteen years of diverse experiences at senior level posts in different parts of the country. He is a mathematics graduate with Masters in Public Administration and Bachelor in Law. He is on study leave to do PhD in human geography looking into the issue of 'challenges of institution building for environmental management in megacity'.*



Children in classroom



Pristine sea coast



A boat race



Traditional Nicobarese house



Local tribal dance

# “Old Dog Learns New Tricks!”

Keith Haylock

November 14th 2007 the day my life was shaken to the roots by a sudden, but short illness. This was the moment I realised that my life needed to change and refocused on something more than the business I had been running for the previous 25 years. That might sound strange to someone aspiring to run their own business, but the time had come. But what could I do?!!

The thought of education had always appealed to me, but I never considered myself university calibre. With no O or A levels to gain conventional entrance to higher education, I started to look at the options. University web sites, access courses and GCSE's and A level courses. It soon became apparent that there was a possibility that I could rejoin the world of education at the age of 51.

The first tenuous enquires I made were driven by a good friend and my wife, this, after I mentioned the somewhat delusional thoughts of education that were in my head. I subsequently arrange an interview at Aberystwyth some 5-6 months after I had recovered from the illness. Confidence was low, and I almost phoned to cancel the appointment. However, I was pleasantly surprised at the welcome I got. It wasn't a case of you need this or that as a prerequisite to enrol, but, what we can do to help you get in to University.

I applied and was required to attend a further interview to consider my application. Job done. I was offered an unconditional place starting September 2008. This ranks as one of the best days of my life. I remember attending the open day with my eldest son (who had just completed his Degree course in Aberystwyth). And meeting the staff, who would be guiding my education over the coming 3 years? They were Impressive!

First day of semester 1. I was so nervous, the thought of being found out as academically inadequate haunted me for the first 3 months of university life and I considered leaving on numerous occasions. But with help from other mature students and my wife, I hung on. And applied myself to the task of learning in the only way I could, all or nothing!

The interaction with the younger students was fantastic, what they could help me with was the new skills that are so important in education. I'd like to think I've given something back by way of my slightly more mature approach to things?

Professor John Gratton (another big influence on me being here) mentioned a field trip to Jordan, it got my interest and, I asked if I could go. Yes, was the answer and another part of this new chapter in education was about to start. With other member of staff, undergraduates from Aberystwyth, post grades from Oxford, and a contingent from the USA and Canada we travelled out to The Middle East for 4 weeks of survey work during the summer recess. This is something that 12 months prior I would have never consider a possibility. To tell you about this trip would require numerous chapters, but what I can say is, the memories will stay with me forever.

How can I describe my first year of university? Well, it has been a roller coaster of emotions, but also a realisation that I do have some ability to learn, even with periods laced with frustration and self doubt. To any mature person considering a return to education, whether with some or no educational background, do not be put off by a lack of confidence, you will find it. And remember education is a privilege not a right.

Thanks to Aberystwyth University and the IGES department who have given me the opportunity to full fill a dream and hopefully send me out in to the world with a completely new set of skills that I can use in a positive way.







*Me going in for a tackle in the finals of the European's*

# “Octopush?!! What on earth?”

**Alexandra Kilcoyne**

Okay, my name's Alex Kilcoyne and I'm first year studying Geography. I've got a sports bursary for Aberystwyth Uni, but not for your average sport... Octopush! Yes, that's right, like octopus... with an 'h' stuck on the end! Many call it underwater hockey, but that just tends to conjure up visions of people with full sized hockey sticks underwater, which, of course would be silly!

Instead, it's played on the bottom of a pool with 'pushers' and a lead puck. There are 6 players in the water and a further 4 for rolling substitution. The aim is to push the puck along the bottom of the pool and into one of the goals, or 'tins' while holding your breath. This makes it one the the ultimate anaerobic sport and great for fitness. It's played in 2 meter or 3 meter pools so breath holding skills are a must. I've been playing for about 6 years and I can now hold my breath for 3mins... some may say it's unnatural!

Players wear fins, mask and snorkel. Although it's a non contact sport, all those fins tend to make it a bit dangerous... and did I mention you could flick this 1.5kg puck off the bottom? Watch out if you give it a go! Hopefully the photos will give you some of an idea.

I play Octopush for Sheffield, Yorkshire, the Great Britain U19's Squad and now our very own Aber Uni squad. Having played in Rennes (France) at the start of the summer with the GB squad in the Europeans, I'm hoping to make the team to play in the Worlds next year. Of course I also do other sports, including a fair bit of mountain biking, rather a lot of running, orienteering, and have just started climbing.

I got the bursary by filling in an application form explaining the sport and what I wanted to achieve, then I sent it back to Aber - easy! If you want to try Octopush out here, come along on Fridays at 8pm in the sports centre. More info about it can be found on the web.



*Celebrating 2nd place in the Europeans*



*Warm up before matches*



*Team photo!*

# Treading on the toes of North Greenland's Sleeping Giants

Alun Hubbard

Petermann Glacier, the largest in the northern hemisphere, lies well above the Arctic Circle on the 81st parallel. It's an outlet glacier draining over 10% of the Greenland ice sheet which like an immense conveyor belt, flows NW from this inland ice reservoir gradually gathering pace to deliver ~12 billion tonnes of ice to the sea each year. There, hemmed in by towering 1,000m high limestone cliffs, this giant ice conveyor continues its journey afloat (as an ice shelf) for 50 miles down a 12 mile wide fiord where it terminates in the Kennedy Channel and the Arctic Ocean. It is a vast and surreal landscape – the air so crystal clear that mountains 100 miles away look close enough to touch and the maelstrom of blues from the sky, ocean and ice leave the senses reeling (there's no vegetation – no greenery). Add to this, the sleep deprivation that comes from continuous and intense sunshine, an 8 hrs on/4 off work-schedule and just the occasional polar bear for outside company, then one gets an inclining of the mind-bending experience that is polar fieldwork. Whether you love it or hate it, one becomes a tad 'removed from reality' and the experience leaves a stark, indelible imprint on the conscience.

Last May, with colleagues Richard Bates (St Andrews) and Jason Box (Ohio State) I was invited aboard the Greenpeace ship, Arctic Sunrise, as an independent scientist to provide an objective assessment of the changes taking place across this remote region of the Arctic. Despite an already full summer, I jumped at the chance as the region was a blank-slate in

terms of baseline data and only a handful of people had even set foot there. Furthermore, I was intrigued by the idea of a Greenpeace expedition – they certainly put themselves about and the prospect of a helicopter and a bunch of motivated militant activists at my disposal in the name of science (without having to fill in the paperwork) was appealing. I was also interested in the Greenpeace media machine - if they would try to vet findings and place pressure on my reporting to tow the 'party line'; I relish a heated argument and I wondered how many hippy fruit-loops I could offend before getting keel-hauled? My suspicion being that these huge northern outlet glaciers (sleeping giants) of the Greenland ice sheet were well beyond the effects of recent climate change – the mean temperature of -30°C being just too frigid for the degree or so of 'anthropogenic warming' to make a hoot of difference.

Ignorance is bliss and so it was with mild surprise and slight frustration that I found myself aboard the Arctic Sunrise the end of last June sailing into a Kennedy Channel that was completely devoid of ice. To put it in perspective, only half a dozen ships have ever navigated this channel; it is usually so choked up with multi-year sea-ice, brash and bergs that only the largest and most powerful of the Canadian icebreakers ever attempt it. Both in 2006 and 2007, the CCG icebreaker Henry Larsen was thwarted and failed to navigate it. The advice from that captain was 'just don't go there – you'll do well to come out scrambled egg' and hence, for us aboard the puny Arctic Sunrise to find the Kennedy Channel clear of all ice was not only a letdown (or relief, depending on your disposition) but also highly perplexing. I've not often had my preconceptions completely shattered (ever visited Japan?) but this was the start of a 6 week field-campaign that upended my ideas of Greenland, Greenpeace and the vulnerability of the Arctic.



Once Arctic Sunrise was moored off the front of Petermann Glacier, it was quite evident that we were looking over a vast icescape that was far from frigid, but stagnating in situ; the edge of the ice shelf was not calving, it was too thin and down-wasted to form bergs. But this didn't make sense – the brief summer is not warm enough to melt the 700m thickness of the glacier conveyor that enters the fjord. Hence, the next 5 weeks became a mission to establish what was going on here; an ambitious task and after 100s of oceanographic profiles, the deployment of a network of dozens of high-precision GPS systems, weather stations and time-lapse cameras it was clear that the demise of Petermann's ice shelf was also the key to the total lack of sea-ice in the Kennedy Channel.

Early one morning towards the end of my 6 hr watch taking CTD (Conductivity, Temperature & Depth) profiles from the ship, Paul, the first-mate called down from the bridge that the sea was warm enough to 'go take a skinny-dip'. I laughed and shouted back 'rather you than me', but he was quite serious; the ship's hull transducer was recording sea-surface temperatures of +15°C (warmer than Aber given our usual summer!). I chucked a bucket off the stern to confirmed the ocean was warm... this wasn't just outflow from the engine. On examining the transect of CTD profiles, we'd recorded a 30mile wide slug of 12°C water to 20m deep which was moving in under the front

of Petermann. Water is 10 times more effective at melting ice than air at the same temperature... this abnormal southerly current was the reason

why Kennedy Channel was ice free and Petermann shelf was wasting away... its underbelly was being eroded by warm ocean circulation.

It is easy to measure the surface of glacier – getting at its base is more challenging. To confirm this theory I put an outlandish idea and an eager crew of activists to work. Our plan to ski or walk the ice shelf was impossible as the shelf was too crevassed and intersected by melt-channels. However, within the inventory of campaign equipment aboard the Arctic Sunrise was four kayaks (for stealth raids on offending installations) that proved useful. So under a sky as blue as the tributary into which my paddle blades dipped, I kayaked into the flow of one of Petermann's major meltwater channels which meandered 30miles down-glacier to the ice front... we had devised a plan to measure the rates of basal melt using the Aberystwyth 'deep-look' ice radar strung between the kayaks. It was a bold undertaking, not least as this channel ended in a moulin-whirlpool plunging to the base of the glacier. It was also the perfect combination of adventure, science, stupidity and photo-opportunity to mobilize the militant (& by now slightly bored) crew of the Arctic Sunrise. It was also a lot of fun and a strangely surreal experience. The surroundings otherworldly: the icescape morphing with each bend – babbling creeks, idyllic eddies, ice canyons, distant cliffs – and the hours swept by as fast as the crystal water below. The smooth riverbed was a kaleidoscope of patterns and shades, remnant snapshots of the glacier's history. Occasionally, we'd drift over giant ice chasms that left me gaping in awe. By afternoon, the melt had reached its peak flow of ~10 km/hr and we surged into a canyon land of tight chicanes before attaining our exit point. Fortunately, the safety crew was on-station and the pull out went smoothly; I got my radar snapshot to corroborate the rapid melt-rates under the ice shelf and came away with some of the most vivid memories of a lifetime,

just 8 hours long, etched firmly into my mind for posterity. I also came away with new found respect for the inspired and fearless curiosity, improvised 'can-do' approach and commitment of the crew the Greenpeace ship Arctic Sunrise and a strong sense that the Arctic environment is not quite as robust as I had previously thought.



Photographer: Nick Cobbing. Copyright: Nick Cobbing and Greenpeace.

# IGES goes Walkabout

Amanda Keen-Zerbert

Post Doctoral Researcher  
Amanda Keen-Zerbert travels through central Australia, 130 million years of history, and an awful lot of mud.

I didn't expect to see rain in central Australia but I did expect to see the field sites of many classic studies of fluvial geomorphology. After presenting at the International Association of Geomorphology conference in Melbourne, I participated in a field trip led by prominent fluvial geomorphologist, Gerald Nanson of the University of Wollongong in Australia. He is known not only for his excellent work in geomorphology, but also for his destruction of rental vehicles and ability to explain geomorphology through witty analogies. Luckily, I had packed my rain jacket, a field book full of blank pages, and a sense of adventure.

The trip started with a look at the stratigraphic history Lake Mungo, a paleolake that has an adjacent lunette, or crescent shaped dune, that formed as wind-blown sediments were eroded from the desiccating lake bed and deposited on the eastern shore. Here, researchers have discovered evidence of early Aboriginal occupation dating back 45,000 years. Mungo Man, the oldest human remains unearthed in Australia to date, was found in the eroding sediments of the lunette.

After spending the night in a wool shed, we travelled through the Flinders Ranges, South Australia's largest mountain range. At one of several stops, we looked for stromatalites in the Trezona Formation that dates to ~630 Ma. Despite lashing rain reminiscent of winter in Wales, our persistence paid off with a look at the rare late Precambrian fossils in situ. As we continued west, we crossed the Cambrian-Precambrian boundary, a point in geologic time when there is a marked increase in diversity and complexity of life forms in the fossil record. By the end of the 20 km drive, we had travelled through 130 million years of earth history and coated the tour buses in 2 cm of mud.

Our next stop, Cooper Creek, is famous in Australian folklore because of its significance in the tale of Burke and Wills ill-fated expedition. It is also the site of several classic studies of anabranching river channels, which divide and rejoin along their courses. A low level flight from Innaminka revealed spectacular views of the complex channel system, dunes, and waterholes. By the end of the trip, we had covered over 2000 km, destroyed a trailer, stopped for countless bus repairs, and learned a lot about the dynamic geomorphology of central Australia.



# DEPARTMENTAL NEWS

## NEW STAFF



### Chris Bear

Dr Christopher Bear arrived in Aberystwyth in January 2009, having previously worked at the Universities of Aberdeen, Durham and Hull. A cultural geographer, his research focuses on environmental issues, particularly those involving human-animal relationships. In previous and ongoing work, he has concentrated particularly on fish, looking at the politics of knowledge in Scottish salmon management, and at the certification of commercial fisheries

as 'sustainable' by the Marine Stewardship Council and at the knowledge practices of recreational anglers in Yorkshire. This work examines the ways humans attempt to make sense of, and regulate, animal behaviour. He will take these interests in a new direction in 2010, through a new ESRC-funded project on the role of technologies in the dairy sector. Working with colleagues at the University of Hull, the research looks at the development of new robotic milking technologies and at how these might change the relationships between humans, cows and technologies in the dairy industry. He has brought these research interests together in a new third year option module on *Geographies of Food*. Away from geography, he enjoys theatre, music, gardening, walking in the Welsh countryside and supporting Aberdeen and Hull Football Clubs.



### Sharron Fitzgerald

Dr Sharron A. Fitzgerald is a critical feminist and legal geographer with a strong international and interdisciplinary research background. She is a Fulbright Scholar who studied in Ireland, the USA and Canada. She sits on the Academic Council for the United Nations System. Her research focuses on the state regulation and representation

of human trafficking, transborder sex work, irregular migration and the proliferation of securitisation globally. She has co-ordinated and drafted several Consultation Responses to Home Office and the Border and Immigration Agency's policy documents on these issues. Sharron has published articles in top tier international geography and law journals on human trafficking and sex work. She is the author and editor of a new collection entitled: *Regulating the International Movement of Women: From Protection to Control* (2010: Routledge- Cavendish). She has been a visiting speaker at various UK and International institutions, including the School of Architecture for All, Athens, Greece, NALSAR University of Law Hyderabad, India and Birkbeck Law School, London.



### Hywel Griffiths

Dr Hywel Griffiths joined the IGES staff this October as a Lecturer in Physical Geography through the medium of Welsh. Hywel has been at IGES for eight years, having studied for his undergraduate degree (jointly with Mathematics), his MSc in River Basin Dynamics and Management and his PhD in the department. His research focuses on the rates, processes and

controls of fluvial processes, in particular incision and aggradation processes on Welsh rivers over the historical timescale. He is also interested in theoretical geomorphology, including non-linearity and self-organised criticality in river systems. Hywel contributes teaching to the ever-expanding range of modules offered through the medium of Welsh in IGES, focusing specifically on fluvial geomorphology and global hydrology and water resources. He is also involved with recruitment of Welsh medium students, and has ventured into Web 2.0 to create a blog of IGES news and features (<http://daearaber.wordpress.com/>). In his spare time, Hywel enjoys playing football as an increasingly slow midfielder and reading and writing literature, specifically the Welsh medium strict verse poetry called cynghanedd, of which he has published two volumes.



### Andy Mitchell

Dr Andrew Mitchell has come from Montana State University where his was an Assistant Research Professor in the Faculty of Chemical and Biological Engineering, and a EU Marie Curie Fellow at the University of Copenhagen. Andy's interests are in the importance of microbes in regulating many common chemical reactions at the Earth's surface and in the deep subsurface, specifically

through the interaction with mineral surfaces. He is particularly interested in how such processes allow microorganisms to survive in cold and icy environments and potentially on other planets. Andy also undertakes applied research into manipulating these biogeochemical processes for environmental engineering purposes, including metal and radionuclide pacification and geologic carbon capture and storage. Prior to this, Andy was a Postdoc at the University of Toronto. Andy has travelled and worked all over the world, and is particularly drawn to mountainous areas and mountain sports.



### Lynda Yorke

Dr Lynda Yorke joined IGES as a Lecturer in Physical Geography in April from the University of Liverpool where she worked as a PDRA for a year. Lynda is a geomorphologist with interests in UK fluvial systems and the response of those systems to the last glacial-interglacial cycle. Lynda also has a keen

interest in Lateglacial sediments, particularly relating to deglaciation of the last British Ice Sheet. Lynda's work is currently focusing on historic river responses to increased flooding in Wales and building on her PhD research in the north of England with regards to the large glacial lakes that built up during deglaciation. Outside of work, Lynda is a huge sports fan (ice hockey & football) and enjoys playing badminton, horse riding, dancing, and baking cakes whenever she gets the chance.

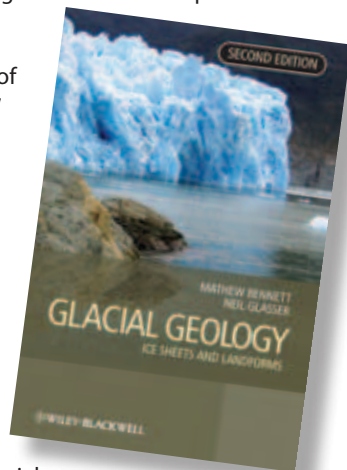
# DEPARTMENTAL NEWS

'It is the year 1307 in medieval London. Rumours are abound that one denizen of the fledgling metropolis has been subjected to a gruesome penalty for perpetrating the most novel of crimes. This unnamed individual, it was claimed, had broken the recent Royal Proclamation banning the burning of sea-coal in the city. The punishment meted out to this early atmospheric felon, or so the tale goes, was torture, hanging and ultimate decapitation! While it seems unlikely that such a punishment was ever actually carried out, it was perhaps the nature of the crime, as much as the extreme form of the purported penalty, which would have concerned the fourteenth-century urban dweller. Before the Royal Proclamation of 1306 the idea that polluting the air could be deemed a criminal offence was simply inconceivable. The age of British atmospheric government had begun.'



*State, Science and the Skies*, by Dr Mark Whitehead provides an account of the making of a modern climatological state in the UK. The book follows the expert and the state in their creation of atmospheric government and its aerial responsibilities. Blending an historical narrative with analyses of the atmospheric lives of boiler attendants, employers, government inspectors and housewives, this volume provides an important framework for thinking about the current concerns surrounding climate change and air pollution.

SEPTEMBER 2009: Wiley have just published the new Second Edition of *Glacial Geology* written by Matthew Bennett and Centre for Glaciology staff member Neil Glasser.



The new Second Edition of *Glacial Geology* provides a modern, comprehensive summary of glacial geology and geomorphology. It is has been thoroughly revised and updated from the original First Edition. This book will appeal to all students interested in the landforms and sediments that make up glacial landscapes.

The aim of the book is to outline glacial landforms and sediments and to provide the reader with the tools required to interpret glacial landscapes. It describes how glaciers work and how the processes of glacial erosion and deposition which operate within them are recorded in the glacial landscape.

The Second Edition is presented in the same clear and concise format as the First Edition, providing detailed explanations that are not cluttered with unnecessary detail. Additions include a new chapter on Glaciations around the Globe, demonstrating the range of glacial environments present on Earth today and a new chapter on Palaeoglaciology, explaining how glacial landforms and sediments are used in ice-sheet reconstructions. Like the original book, text boxes are used throughout to explain key concepts and to introduce students to case study material from the glacial literature. Newly updated sections on Further Reading are also included at the end of each chapter to point the reader towards key references. The book is illustrated throughout with colour photographs and illustrations.

Publisher's website: <http://eu.wiley.com/WileyCDA/WileyTitle/productCd-0470516909.html>

*Contested Territory*, by Dr Heidi Scott explores the ways in which Peru's early colonial landscapes were experienced and portrayed, especially by the Spanish conquerors but also by the Amerindian populations. It focuses on the role played by indigenous groups in shaping the Spanish experiences of landscapes, the diverse geographical images of Peru and ways in which these were constructed and contested, and what this can tell us about the nature of colonial relations in post-conquest Peru. The study draws on archival records and cartographical materials and seeks to offer a nuanced view of the complexity of colonial relations.



## Peter Merriman



Peter Merriman has been undertaking a number of media engagements in connection with the 50<sup>th</sup> anniversary of the opening of the first sections of England's M1 motorway. In addition to appearing on the Radio 4 documentary "M1 Magic", he has written an article entitled "The first day on the M1" for the November issue of *BBC History Magazine*.

## New Climate Change Initiative



The universities of Aberystwyth, Bangor, Cardiff and Swansea have launched the Climate Change Consortium of Wales (C3W), a £4 million initiative to be financed by the Welsh Assembly Government (WAG) through the Higher Education Funding Council for Wales (HEFCW).

Together with additional support from the Countryside Council for Wales and substantial investment from the four universities C3W is set to considerably enhance the climate science profile of Wales.

The Consortium has been developed by a group of internationally respected academics in collaboration with staff in a wide range of disciplines across the four universities. These disciplines cover the impact of climate change on land, sea, atmosphere and cryosphere, as well as its social consequences.

The aims of C3W are to (i) improve our fundamental understanding of the causes, nature, timing and consequences of climate change on Planet Earth's environment and on humanity, and (ii) to reconfigure climate research in Wales as a recognisable centre of excellence on the world stage.

Professor Michael Hambrey was interviewed on BBC Good Morning Wales to mark the launch.

# Red Nose Day

Hello one and all!

I would like to extend a huge thankyou to everyone who participated on Friday for Comic Relief, the turnout was fantastic and we have raised so much more than I dreamed we could. So, from myself, on behalf of the EES committee and most importantly for all the projects money from RND goes towards, thankyou for all your support.

Give yourselves a pat on the back, we raised £350.12 and 2 euros!

Thankyou very much to everyone who helped to organise the day, to all the staff and lecturers for their support, to all the bakers for their amazing cakes and biscuits and all the creators of the pet rocks, to the brave volunteers who are now silky smooth and of course to everyone who donated, helped us to consume the goods, gave good homes to pet rocks and gave us that all important cash. I hope you had fun and all enjoyed the day as much as I did as well.

Danielle and the EES committee  
President of EES society

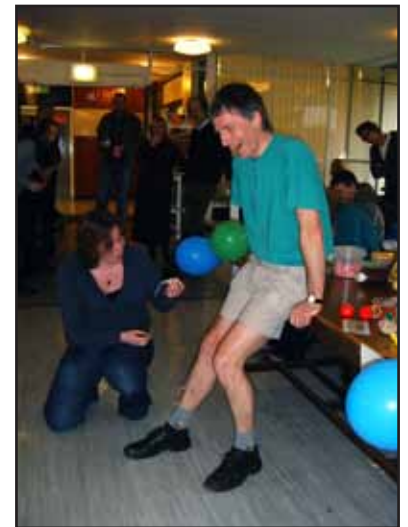
To put your contribution into perspective, this money is enough to:

- buy 60 mosquito nets in Uganda that could save the lives of many children whose bedtimes can leave them vulnerable to deadly malaria.
- hire of 6 minibuses with wheelchair access for half a day, to allow a group of isolated older people to enjoy the companionship of an outing together.
- 6 young people who have been homeless to complete a computer training qualification so they have the skills and confidence to find a job.
- pay the salary of an ambulance driver for a year in Somaliland. Every week hundreds of women die unnecessarily during childbirth, an ambulance could provide life saving treatment to these women, something we take for granted in the UK.
- training for over 300 women in Uganda in business skills, enabling them to create an income and provide for their family.

# Chris Bear Award



Dr Christopher Bear has been awarded around £180,000 by the Economic and Social Research Council for a research project on *Robotic and information technologies in livestock agriculture: new relationships between people, cows and machines*. A collaboration with colleagues at the University of Hull, the project will: examine the relationships between humans, cows and technology in robotic milking systems; investigate how knowledge about robotic milking is produced and communicated; examine the ethical issues raised by robotic milking; and develop methodologies for examining human-animal relationships in farming.





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Aberystwyth University, Llandinam Building, Penglais Campus,  
Aberystwyth, Ceredigion, SY23 3DB, Wales, UK.

Telephone: (0)1970 622596  
Fax: (0)1970 622659  
E-mail: [iges-admissions@aber.ac.uk](mailto:iges-admissions@aber.ac.uk)