University of BRISTOL

re:search

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re: search editorial

Field work

Even in today's world where information about every topic imaginable is on the web, there are some disciplines where there is just no substitute for going out there to measure, watch and even hear your subject – be it a volcano, a penguin or an ancient burial site. Field work is therefore an important and popular part of science training, particularly in the Earth and Biological Sciences, and many students will attend one or more formal field courses during their studies. Field work allows integration of the skills learnt from lectures and laboratory classes, as well as developing students' skills of observation and interpretation, and techniques for investigating specific subjects. Many become so bitten by the bug they continue to do research in the field throughout their academic lives.

With increasing technological advances, such as GPS, satellite phones and tiny cameras, it is possible to penetrate into more and more remote places, and to observe increasingly elusive subjects. Not that field work always has to be done in inaccessible places or into rare species – there is still much to understand about this country. This issue of *re:*search focuses on some of the field work being done by researchers at the University and takes us to Brazil, Ethopia and South Africa, as well as to Stonehenge, right here in England, where, you might imagine, everything possible has already been unearthed. Even a kind of medical field work is being carried out in Chile and India where some academics are making a real difference to the lives of thousands of depressed people.

Field work in foreign countries always requires collaboration with those living there and frequently includes training as part of the agreement, which obviously benefits all concerned. But another form of international collaboration can be found in the Research Mobility Programme of the Worldwide Universities Network, through which universities are coming together to offer postgraduate students the chance to study abroad, particularly those who need access to specific expertise or rare facilities. The increasing interconnectedness of the world, alongside issues such as globalisation and climate change that affect the entire planet, calls for a new generation of international collaborative researchers – be they up a volcano in Ethiopia or in the archives of a library in China.

Cherry Lewis
Editor

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Cover image: 'Kazim' by Lorraine Field

pre: view

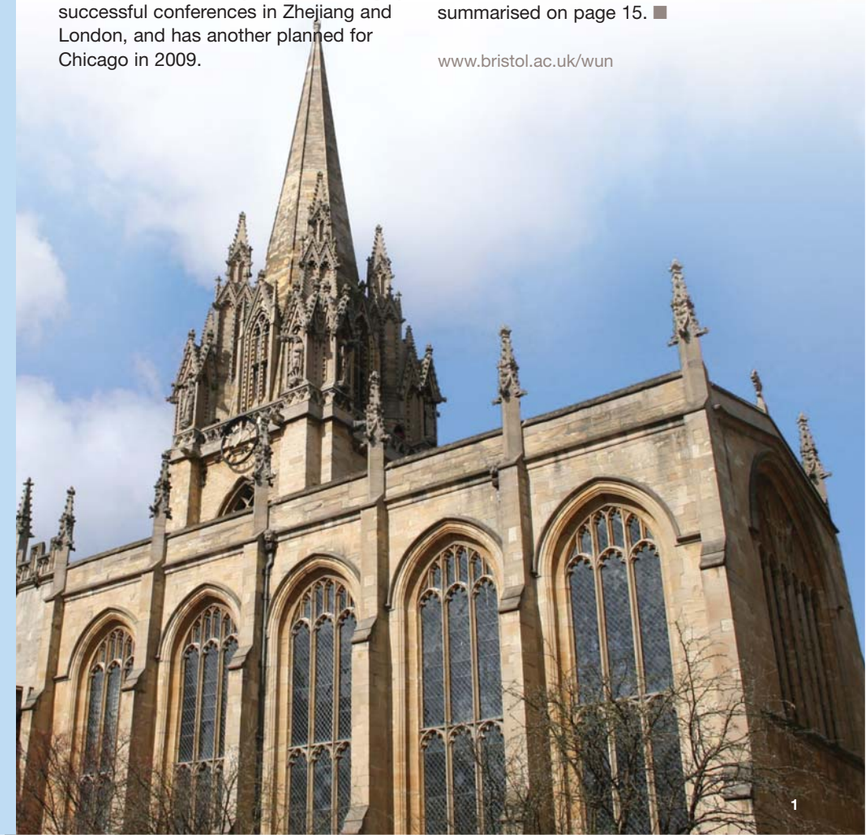
The Worldwide Universities Network

The Worldwide Universities Network (WUN) is a partnership of 16 research-led universities across Europe, North America, South-East Asia and Australia. It provides a global platform for innovation in research and education, collaboratively tackling the big issues currently facing societies, governments, corporations and education that no one member could address alone.

Projects cover the full spectrum of disciplines, from the weathering of soils to multilingualism in the middle ages, and different institutions take the lead, depending on their particular expertise. The 'Ideas and Universities' project, co-ordinated by Rosemary Deem and Ian Wei at the University of Bristol, began in 2005 as an interdisciplinary research workshop and became a WUN project when it launched its international video seminar programme in January 2007. It involves institutions from eight different countries, providing the opportunity to compare the intellectual cultures of universities around the globe. Alongside a series of virtual seminars, the project has already staged two highly successful conferences in Zhejiang and London, and has another planned for Chicago in 2009.

The project explores the way in which ideas have found institutional expression in universities from the emergence of the earliest European universities in the late twelfth and early thirteenth centuries until today. Its objectives include examining the purpose of universities, their ideals and realities, internationalisation, and the causes and mechanisms of change. The results of some of the research so far are summarised on page 15. ■

www.bristol.ac.uk/wun



The cry of the jungle

Bruna Bezerra is a Brazilian student studying for her PhD in the Department of Biological Sciences. Her interest in the behaviour, social communication and ecology of primates means she has just returned from the Brazilian rain forest where she was conducting research on the vocal communication of the rare monkey, the golden-backed uacari.

BRUNA BEZERRA

Bezerra has been undertaking expeditions to the Amazon since 2006. Her base is the Jaú National Park, in Amazonia, Brazil, the second largest national park in Latin America. Just getting to her field area is a challenge. From the nearest city, Manaus, she travels by boat along the Rio Negro for about 24 hours, taking everything with her that she is likely to need for the next few weeks. She usually travels alone, although her supervisor and colleagues visit for a few days during some trips.

About ten per cent of the Jaú National Park is swampland and it is here that these rare, shy, arboreal monkeys can be found

When in the field, Bezerra stays with a local family who live in a small wooden hut (left) without electricity, sleeping in a hammock and taking cold showers in the river. A communal hole-in-the-ground acts as a toilet. She relates some amusing tales about her ablutions: "One day I was showering in the river when I saw the head of a cayman (alligator) coming towards me. It looked soooo scary! Once safely out of the water I discovered it was literally just its head; the locals had eaten the rest of it and then thrown the head back into the river. It was coming towards me because there were some piranhas nibbling on it, pushing the head forwards." Another time she found a wild piglet that had fallen into the toilet hole which had to be rescued at four in the morning before she could use the facilites.

About ten per cent of the Jaú National Park is Igapó forest – blackwater swampland that is one of the most difficult and challenging of South America's habitats – and it is here that these rare, shy, arboreal monkeys can be found. When flooded, there is far more fruit available in the Igapó forest, which is probably why the uacari, having a preference for hard, unripe seeds, visit during the wet season. Thus Bezerra's studies have to be conducted entirely from a small wooden canoe which she and a local guide use to gingerly move around the flooded jungle, avoiding the caymans, piranhas, snakes, scorpions, spiders and other creepy crawlies, while enjoying the antics of creatures like giant otters, and swimming with tame dolphins, now living wild in the Negro River.

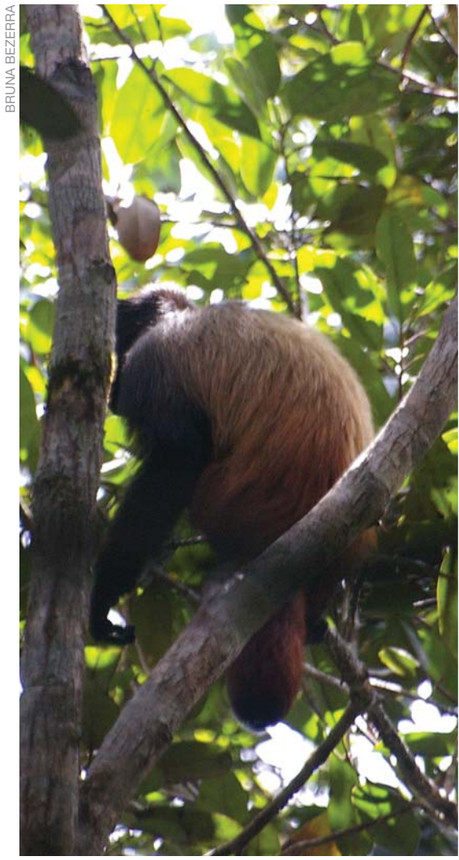
The golden-backed uacari, *Cacajao ouakary*, has an unusually short tail, characteristic of primates of the *Cacajao* genus, a reddish-brown body and thighs, with black head, arms, chest and legs, but a bright golden mid-back. It lives in social groups of up to 200 individuals and mating seems to occur throughout the wet season. Adult females nurse and care for their babies until they are around a year old. Only a few preliminary investigations of diet and habitat choice have so far been conducted on them and so Bezerra's project will provide completely new data about the behavioural and social ecology of this rare primate, as well as helping to understand the social status of individuals and groups, which will then be used for future conservation and welfare plans.

The type of call heard gives an idea of the uacari's emotional state and the behaviour it might be exhibiting, even if you cannot see it

Vocalisations are an essential communication tool for primates that live in trees, because of the visual restrictions imposed by their habitat. Despite this, studies of vocal repertoires have only been conducted on 42 of the approximately 625 primate species described so far, of which nearly 25 per cent are at risk of extinction. The golden-backed uacari used to be classified as 'vulnerable', although that has recently been changed to 'low risk'. However, knowing the locals hunt the golden-backed uacari for food, Bezerra believes the numbers have been overestimated.

Capturing the uacari's vocalisations and their contexts can become an important instrument with which to survey the species, which is one of the first steps in a conservation plan. For example, if you hear an animal vocalising in the wild, you know that it is actually there. Furthermore, the type of call heard gives an idea of the uacari's emotional state and the behaviour it might be exhibiting, even if you cannot see it. Knowledge of vocal behaviours and repertoires is also valuable for solving taxonomic issues, as different species have different vocal signals. So understanding vocal behaviour and repertoire can became an extra tool to help taxonomists to differentiate between species. Finally, data on the behaviour and the sociality of a species in the wild can help zoos and laboratories make improvements in their enclosures, so that captive animals behave more like they would in the wild.

BRUNA BEZERRA



A rare photo of the shy and elusive golden-backed uacari.

ADRIAN BARNETT

Bezerra piloting a wooden canoe.

Bezerra has just returned from the Amazon after spending the past six months studying the monkeys in their natural habitat, so she still has a lot of data to compile and analyse before a fuller picture of how to conserve these elusive animals starts to emerge. "At times I feel like a cross between a Victorian explorer and David Attenborough," she says, but apart from the risk of getting malaria or rabies, being drowned when the canoe suddenly fills with water in a torrential downpour, or being tipped out of the boat by caymans gliding beneath it, it's a pretty interesting life. ■

www.bio.bris.ac.uk

JOSHUA POLLARD

Unraveling our heritage

Over the past decade, Dr Joshua Pollard from the Department of Archaeology and Anthropology has co-directed two projects at the Neolithic monument complexes of Avebury and Stonehenge. The Longstones Project sought to understand the sequence and context of monument construction in the later Neolithic of the Avebury region, while the Stonehenge Riverside Project examined the local and regional context of Stonehenge as part of a more extensive ceremonial complex focused on the River Avon.

Archaeological research is often labour intensive, sometimes involving substantial teams of people ranging from professional archaeologists and students to enthusiastic local volunteers. Thus, both the Longstones and Stonehenge projects have involved teams from several universities, a collaborative approach that has brought the varied specialist knowledge of different archaeologists together to address the key questions of why such great prehistoric monuments were constructed, and in the form that they were.

The henge monument of Avebury is one of the most significant Neolithic sites in the world. Constructed in several stages during the course of the third millennium BC – the later Neolithic and early Bronze Age – the massive earthwork enclosure and stone settings have had a complex history, both in their construction and destruction. As at Stonehenge, the Avebury henge was created in a landscape that had witnessed earlier settlement and monument construction, such as the Windmill Hill enclosure and West Kennet Long Barrow. As recent research has shown, these earlier Neolithic sites may have been especially important to later Neolithic communities, which shaped the way monuments like Avebury and Stonehenge were created.

Despite nearly four centuries of archaeological research, it is surprising what remains to be discovered in landscapes such as that around Avebury. The Longstones Project discovered a sizeable, but long disappeared, Neolithic enclosure and confirmed the existence of the Beckhampton Avenue, a curving 1.5-kilometre setting of large paired standing stones which runs broadly south-west from Avebury towards the Longstones at Beckhampton. Although all but two of the stones are now gone, a 120-metre section of the avenue was excavated, indicating that it had consisted of a double row of stones placed at 25-metre intervals. These discoveries alone served to effectively double the area known to be covered by the monument complex.

Most of the Avebury megaliths seem to have survived intact up until about the 14th century and then, partly because of the expansion of the village of Avebury, some of the stones were buried in order to get them out of the way of the plough, or to create new areas of pasture. After that, in the late 17th and early 18th centuries, there was a very active phase of deliberately breaking up the stones in order to create building material for houses and walls.

JOSHUA POLLARD

ADAM STANDFORD © AERIAL-CAM

Perhaps one of the most important outcomes of this research has been a better understanding of the chronology of Neolithic monument building. We tend to imagine that someone sat down one day and decided to build a monument like Stonehenge in all its complexity, rather like a modern shopping centre. In fact, what is becoming evident is that places like Stonehenge and Avebury were continually revisited, altered and reworked over a period of a thousand years or so. What's more, it has been possible to pick out certain periods in time when there has been a great intensity of monument building. That is particularly evident in the centuries either side of 2,500 BC when the scale of construction around both Stonehenge and Avebury seems to dramatically increase. Comparable monuments were built in both places at similar times, but were different in detail, almost as if the two places were in competition with each other, yet retaining their regional identity. The critical period around 2,500 BC, which saw the creation of the main megalithic settings at Stonehenge and Avebury, and the construction of colossal earthworks such as Durrington Walls and Silbury Hill, also coincides with an explosion of contact with continental Europe and the appearance of early metalwork.

But one of the most fascinating features of the Avebury work was the realisation that the megalithic constructions seemed to mark the end of the active engagement of people with these places. Timber and earthwork constructions of the period are often found to be associated with feasting debris – flint, pottery and animal bone – and evidence of people gathering periodically and living in these places.

But once some of these sites were converted to stone, there is little evidence of people visiting. Instead, all that is found is the occasional human burial close to the stones. From fieldwork it has been possible to establish that the avenues of stones at Avebury could never have functioned as proper processional routes, which suggests the idea that they may have been constructed as paths for the ancestral dead, rather than for the living, as we tend to assume.

In fact, new radiocarbon dates of human cremation burials at Stonehenge indicate that the monument there was used as a cemetery from its inception just after 3,000 BC, until well after the large sarsen stones went up around 2,500 BC. Many archaeologists previously believed that people had been buried at Stonehenge only between 2,700 and 2,600 BC, before the large stones were raised. The new dates provide strong clues about the original purpose of the monument and show that its use as a cemetery extended for more than 500 years.

These dates were only part of the many discoveries made by the Stonehenge Riverside Project, now into its fifth season of excavation. Much focus has concentrated on Durrington Walls, a Neolithic henge enclosure, located three kilometres north-east of Stonehenge. The results of the work show that before the henge enclosure was constructed, there existed a seasonal settlement of up to 300 houses at Durrington Walls, ringing a large multiple-timber circle; in fact, a timber equivalent to the megalithic settings at Stonehenge. Middens around the houses were packed full of animal bone, evidence of midwinter feasts, perhaps left by those constructing Stonehenge.

Another discovery, made along the cliff top south of the timber monument known as Woodhenge, was of monumental timber structures, each with four large posts at the centre. While it is clear these were not domestic buildings, their true purpose is still uncertain. One suggestion is that they supported raised platforms where bodies of the dead were left to decay.

Stonehenge and Avebury have been part of the British landscape and psyche for so long, it is easy to think we know all there is

Stonehenge and Avebury have been part of the British landscape and psyche for so long, it is easy to think we know all there is. But another field season is about to start and students from many universities will gather in the hope of revealing yet more of the fascinating story of this enigmatic place and its people, who created such intrigue for their descendants. ■

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Landscape of the Megaliths by Mark Gillings, Joshua Pollard, David Wheatley and Rick Peterson, describes the results of the Longstones Project and has just been published by Oxbow Books.

Providing pain relief with computers

Pain relief is big business – very big business – which is why Dr Adrian Mulholland in the Department of Chemistry has just won an EPSRC Leadership Fellowship grant of nearly £1million, part of which will be used to further his research into designing drugs for pain relief. However, he never goes near a lab, doing it all from his computer.

Providing relief from pain is what every doctor wants for their patients and people have sought ways of doing this ever since they first encountered the stinging nettle – we have all tried rubbing a dock leaf on the sting in an attempt to alleviate the pain. Today pain relief comes from drugs, but the problem with many drugs is their side effects. Drugs may promise great things, but when tested on humans they are sometimes found to cause adverse reactions that outweigh the benefits. One such compound that has been hotly debated over the past ten years is THC, the active ingredient in marijuana. Unfortunately, although THC is quite effective as a pain suppressant, it also creates a whole range of side effects.

More recently, an enzyme called FAAH, found in the brain, has been identified as a target for new pain relief drugs. When you feel pain, the body releases certain chemicals which provide a degree of natural pain relief, but the effectiveness and duration of their activity is determined by how fast they are broken down. In particular, when the body senses pain the brain releases 'anandamide' (the name comes from the Sanskrit for bliss), which nullifies the pain by blocking the pain signal. However, the effect is weak and short-lived, as FAAH quickly breaks down the anandamide. It does this because, of course, it is important for us to know when we have hurt ourselves. Conversely, if we could harness that natural mechanism by blocking FAAH and preventing it from breaking down anandamide, we might be able to develop a mild but more targeted version of pain relief. This is where Mulholland's work starts. It is known what the FAAH enzyme looks like and that there is a hollow tube within it, in which the drug molecule sits. The drug works by forming a new bond to the enzyme, but for a long time the question was which way up should the drug molecule be in order to form the most effective bond? Working with biochemists in Italy and California, Mullholland resolved this question by testing various scenarios on his computer. The results of this computer model explain experimental data and should help in designing newer and more effective versions of the drug, which is now ready to enter clinical trials.

Increasingly, drugs are being designed on computers because it is just too difficult to manually handle the vast numbers of possible drugs and the many ways they could bind to proteins in our bodies. Software packages aim to predict how drugs fit into proteins, but current methods are very approximate and often unreliable. Mulholland will work on developing better methods to predict how changing the structure of a potential drug molecule may make it bind more tightly to its target, making it more effective. He will also work on methods to model how different drugs react in the body, and whether this makes them more efficient or even whether or not they are toxic. The calculations require vast amounts of computer power, recently facilitated by the installation of High Performance Computers in the University. But even with these state-of-the-art machines, the fastest calculations take a few hours and the slowest may take a week or even longer. The new funding will last for five years, helping Mulholland's research team develop new methods and new drugs designed to help us live longer and feel better as we do so. ■

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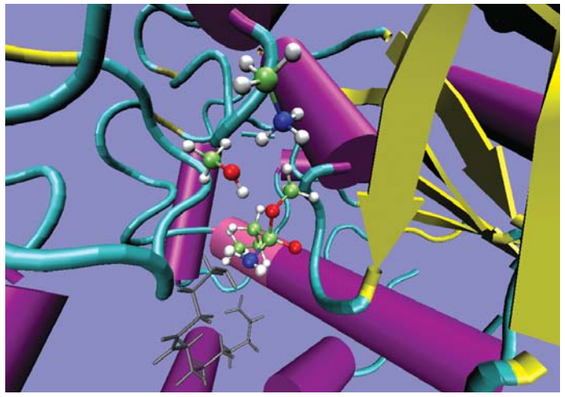
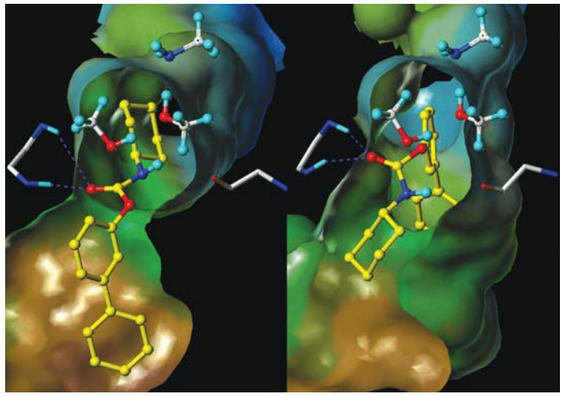




Computer modelling shows how drugs bind to FAAH, and how reactions happen in the enzyme.

BIRTH OF A NEW OCEAN

In a remote part of northern Ethiopia, the Earth's crust is being stretched to breaking point, providing geologists with a unique opportunity to watch the birth of what may eventually become a new ocean. Lorraine Field, a PhD student, and Dr James Hammond, both from the Department of Earth Sciences, are two of the many scientists involved in documenting this remarkable event.

LORRAINE FIELD

The African continent is slowly splitting apart along the East African Rift, a 3,000 kilometre-long series of deep basins and flanking mountain ranges. An enormous plume of hot, partially molten rock is rising diagonally from the core-mantle boundary, some 2,900 kilometres beneath Southern Africa, and erupting at the Earth's surface, or cooling just beneath it, in the Afar region of Ethiopia. It is the rise of this plume that is stretching the Earth's crust to breaking point.

scientific history – greatly excited geologists, who rushed to this very remote part of the world to start measuring what was going on. It began with a big earthquake and continued with a swarm of moderate tremors. About a week into the sequence, eruption of the Dabbahu Volcano threw ash and rocks into the air, causing the evacuation of 6,300 people from the region, while cracks appeared in the ground, some of them more than a metre wide. The only fatality was a camel that fell into a fissure.

In September 2005, a series of fissures suddenly opened up along a 60km section as the plate catastrophically responded to the forces pulling it apart

In September 2005, a series of fissures suddenly opened up along a 60-kilometre section as the plate catastrophically responded to the forces pulling it apart. The rapidity and immense length of the rupture – an event unprecedented in

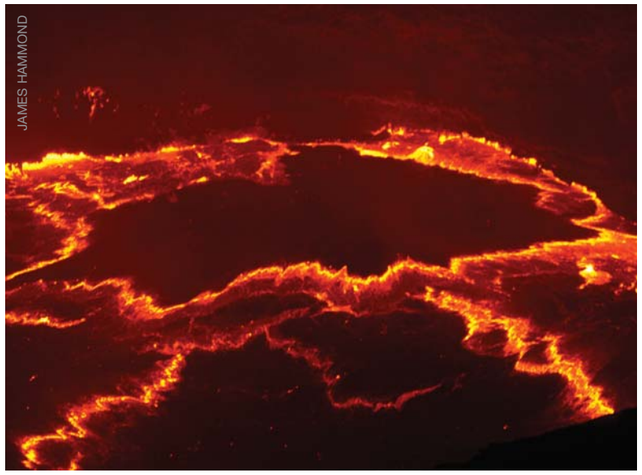
LORRAINE FIELD

While these movements are only the beginnings of what would be needed to create a new ocean – the complete process taking millions of years – the Afar event has given geologists a unique opportunity to study the rupture process which normally occurs on the floor of deep oceans. In order to do this research, a consortium of universities was formed and divided into five interdisciplinary working groups. Each group has its own aims and experimental programme whilst linking with, and providing results to, the other groups.

Lorraine Field is studying the Dabbahu volcano, located close to where the rifting event occurred, which had never been known to erupt before it woke up in September 2005. Following a very strong earthquake, locals reported a dark column of 'smoke' that rose high into the atmosphere and spread out to form an umbrella-shaped cloud. Emissions darkened the area for three days and three nights. Many of the lava flows on the mountain are made of obsidian, a black volcanic glass, and the fissure which opened in 2005 emits fumes and steam with a very strong smell of bad eggs. Water being extremely scarce, the local Afaris have devised an ingenious method of capturing it. They build a pit next to a fumarole that is emitting steam and gases.

LORRAINE FIELD

JAMES HAMMOND



The unusual Erta Ale volcano.

A low circular retaining wall is then built around the fumarole and topped with branches and grasses. These provide a condensing surface for the vapour which collects in the pit or 'boina'. Of some concern, however, is the level of contamination in the water from the various chemicals and minerals found in volcanic areas. Occasionally goats have died from drinking this water, so in order to test its quality the locals hold a shiny piece of obsidian over the fumarole. If a milky deposit forms, this indicates a 'bad' boina, so they move on to the next. Members of the consortium have brought back some water to analyse in the hope of developing a device, similar to the Aquatest kit reported in the last issue of re:*search*, but which tests for toxic metals rather than bacteria.

James Hammond is using a variety of seismological techniques to image the crust and mantle beneath Afar. For example, seismic waves are generated during earthquakes, so a network of 40 seismometers has been set up across the plate boundary zone to record seismic activity. One of the seismic stations was placed in the chief's house, close to the summit of Erta Ale. This extraordinary volcano is essentially an open conduit right down into the mantle. By comparing the arrival times of seismic waves at the seismometers, Hammond and his team will be able to generate a three-dimensional image of the crust, crust-mantle boundary, mantle structure and base of the lithosphere across the study area. This will allow some constraints to be placed on the location of melt in this region, enabling the team to obtain information on the mechanisms of break-up involved in the rifting process. In a nutshell, the consortium has the best array of imaging equipment deployed anywhere in the world to help it 'see' into an actively rifting continent.

But all this work will not just benefit the scientific community; it will also have an immediate impact on understanding and mitigating natural hazards in Afar. Consequently, the teams work closely with Ethiopian scientists and policy makers in the region. In addition, the project will provide training for Ethiopian doctoral students and postdoctoral researchers, and Ethiopian scientists will be trained in the techniques used by the consortium. Over the next five years, scientists from the UK, Ethiopia and many other countries will all come together to further our understanding of the processes involved in shaping the surface of the Earth. ■

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The Afar Rift Consortium involves scientists from the universities of Bristol, Leeds, Cambridge, Edinburgh and Oxford and has links with others in the US, Ethiopia, France and New Zealand.

The rocks collected will be analysed to determine the relationship between rifting and volcanism

Field's base was in a small village called Digdigga, which comprises a long main street with a mix of square houses built of wood and traditional round Afar houses, made of a lattice framework of sticks covered in thatch, skins and sacking. Digdigga has a concrete school building, the grounds of which became Field's base camp for nearly three weeks in January this year. The village is situated on an immense, flat, windy plain surrounded by volcanic mountains and cinder cones. Due to the lack of any vegetation, everything quickly becomes covered in a layer of dust, but the bare rocks mean that satellite images can be used to measure the way the Earth's surface changes as faults move and as molten rock moves up and along the fissures within the rift valley.

Conditions are still too extreme for normal field mapping and so representative rock samples from key locations have been collected. In order to access Dabbahu mountain, the team hired eight camels to carry supplies, taking enough food and water for six days (and an emergency day), and keeping in touch with the base camp by satellite phone. The rocks Field collected will be analysed to determine how the chemistry of the magmas varies at different locations and how it changes over time. This in turn gives information about the depth of the magma chambers within the crust and the relationship between rifting and volcanism in this area.

Left: Boinas on Dabbahu volcano.

LORRAINE FIELD

Early day motions

Politicians tend to ‘toe the party line’ on most votes, but when it comes to MPs expressing their private opinions, Dan Bailey and Guy Nason, statisticians from the Department of Mathematics, have looked at just how cohesive political parties really are.

The early day motion (EDM) is a device used to publicise the views of individual Members of Parliament in the House of Commons. It allows MPs to express their opinion on a subject and to canvass support for it by inviting other members across all parties to add their signatures. Historically it was a motion put down by an MP calling for a debate on a particular subject. In recent years, however, the amount of government business and the increasing number of EDMs – now in excess of 2,000 a year – has meant that time is very rarely found for them to actually be debated. Nevertheless, public interest in EDMs is high and many attract press coverage, locally if not nationally, which is sometimes their main purpose.

The topics addressed are hugely varied; anything from backbenchers seeking to accelerate or otherwise change Government policy, to those offering congratulations to a particular football club. Other EDMs relate to purely local issues, for instance, criticising the decision to close a post office or hospital. Only about six or seven EDMs each session attract over 200 signatures and the vast majority have considerably less than that, but whatever the subject, the key point about EDMs is that they are ‘unwhipped’.

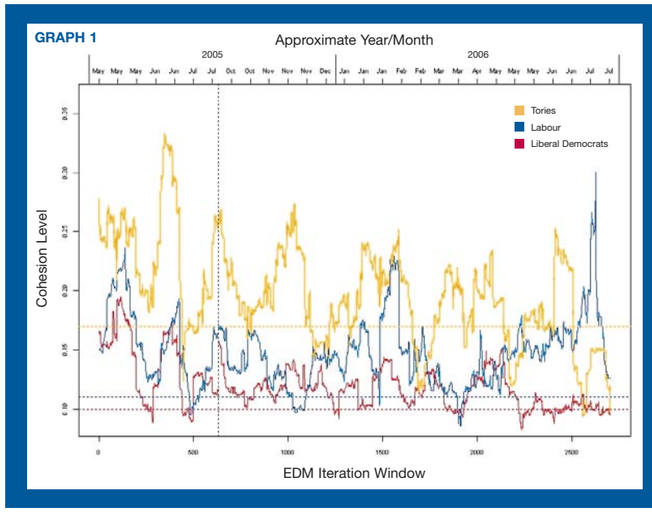
On most issues, MPs are forced by party whips to vote according to the party line

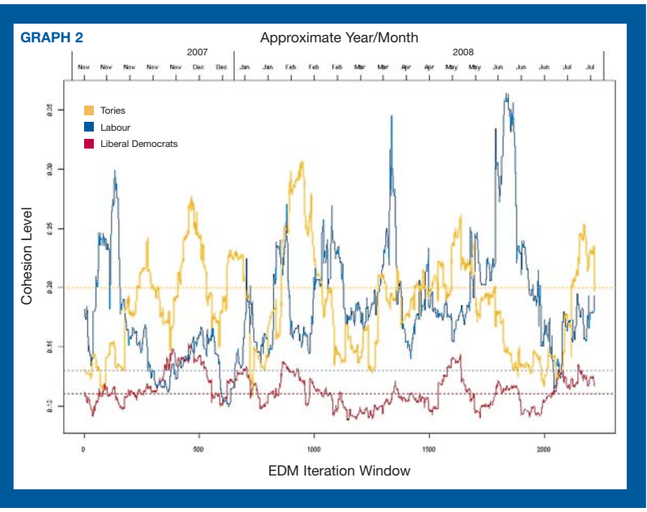
On most issues, MPs are forced by party whips to vote according to the party line. With EDMs, however, there is no party pressure put on individual MPs to sign (or not sign) one. It is therefore thought that an EDM gives a fair indication of what an individual MP really believes. As a consequence, Bailey and Nason considered that the signing of these motions would allow them to gauge whether political parties showed cohesiveness among their members.

In other words, do MPs fundamentally agree with each other or, when expressing personal opinions, do they agree with members of opposing parties? They were also able to use the cohesion of EDM signatories to identify issues which cause political parties to unite or divide in opinion. The idea is that if things were going well for a party, MPs are cohesive – they all agree with each other and stick together – but if things are going badly for a party, they start disagreeing and have different opinions, so factions appear.

Using a variety of statistical techniques, Bailey and Nason were able to plot the cohesiveness of the three main parties during the period following the General Election in May 2005 when Labour won for a third term, but with a greatly reduced majority. The number of Labour seats was down from 413 to 356; furthermore, Labour’s share of the vote declined to 35 per cent, the lowest level in history to form a government with a majority. But the Tories, expected to make large gains, fared little better, causing Michael Howard, then leader of the Conservatives, to announce that he would retire from front-line politics. The results were interpreted by the UK media as an indicator of a breakdown in trust in the Government, and in the Prime Minister, Tony Blair, in particular.

Unsurprisingly, the period following the election is marked by all three parties showing a considerable level of fluctuation in their cohesiveness, as if in some disarray (Graph 1). But after the summer break (dashed vertical line in June), things settle down and become more cohesive in each party, although overall, the cohesion of the Liberal Democrats is more variable than the others, due to there being far fewer MPs in the party, making the cohesion level more sensitive to differences in opinion.





A cohesion level of ‘0’ on the graph indicates no cohesion at all, while ‘1’ indicates everyone agrees with each other and the party is very cohesive. The dashed horizontal line for each party represents the level one would expect if MPs were signing EDMs randomly. It is important to note, however, that the cultural ways in which different parties sign the EDMs may prevent comparison between parties.

Although Michael Howard resigned as Tory party leader after the election, he did not step down immediately. The leadership campaign lasted all of November and continued into December, with David Cameron finally emerging as leader on 6 December 2005. This is reflected in the trend in cohesion of the Conservative party which slumps in November and then rises, continuing an overall upward trend right through to the end of January. But then a further low can be seen during late March. The new leader was starting to show the direction in which the party was heading and a controversial education bill was narrowly passed, but only with Conservative support.

Following a disappointing General Election result, the leadership came under a lot of pressure

During the session, the Liberal Democrats’ cohesion level dramatically rises and falls. Following what many considered to be a disappointing General Election result, despite gaining seats, the leadership came under a lot of pressure. Activists felt the party had not taken advantage of a weakening government and opposition and criticised the leader, Charles Kennedy, for his policies and election campaign. It was also known within the party that he was battling with alcoholism. After a period of intense pressure by high-profile party members, Charles Kennedy admitted having a problem and resigned as party leader on 9 January 2006. However, following the leadership election, Sir Menzies Cambell’s Liberal Democrats did not achieve the cohesion levels seen during 2005.

The Labour party generally exhibits lower cohesion than the other main parties and even after the summer break, there appears to be no significant change. Cohesion levels are at a level which suggests that MPs regularly disagree with other members of the party. One period of interest is that of March 2006. As with the Conservatives at this time, the cohesion of the party dropped. The education bill which was passed during this time split the Labour party, with mass rebellion from the Labour backbenches.

There is a lot of other information that can be gained from looking at this kind of data: does your MP really agree with party principles, or are they secretly more in tune one of the other parties? What are the issues that are causing your party trouble and strife? What is the overall mood of the party at any one point in time – just before an important vote, for example – and could the cohesion of the major parties be predicted? These are fascinating questions that other politicians, journalists and the general public might well be interested in having answers to.

And what about more recently (Graph 2)? What has been going on within the parties since Gordon Brown became Prime Minister on 27 June 2007? Are they a happy bunch, do you think? ■

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Left to right: Peter Barham (Physics), Tilo Burghardt (Computer Science) and Innes Cuthill (Biological Sciences) at Bristol Zoo Gardens.

Spot the penguin

Every year the Royal Society holds its Summer Science Exhibition, the premier showcase for scientific excellence in the UK. Universities and other institutions are invited to submit proposals and a lucky few are accepted. The University of Bristol has been chosen for the past four years. This year it was the turn of the Penguin Recognition Project, a collaborative venture between the departments of Computer Science, Physics and Biological Sciences.

One of the problems facing animal conservationists is that in order to find out what is happening to an individual or a group of endangered animals over time, it is often necessary to identify them in some way as individuals. Currently, tagging is the method of choice. This may cause some distress to the animal, both while it is being tagged and afterwards, and they are not always reliable, since batteries run out and tags may be lost or misread. A far better solution would be to devise an intelligent, visual surveillance system that can be integrated into wildlife habitats as a non-intrusive means of capturing detailed and reliable data on the population. The aim of the Penguin Recognition Project is to do just that. By developing a system capable of the automatic monitoring of species, the team may have found the solution to a multitude of problems facing ecologists around the world who are hoping to conserve anything from butterflies to buffalo. Specifically, they are developing software and hardware to permit remote monitoring and identification of large populations, using techniques that originated in computer vision and human biometrics.

We tend to think of penguins as creatures of the ice, so it comes as something of a surprise to discover that Robben Island, a kilometre-wide piece of rock off the arid coast of South Africa where Nelson Mandela was incarcerated for 25 years, is home to a colony of African (or Jackass) penguins. The island's original penguin colony was exterminated in the 1800s when the hunting of whales and seals was at its peak ('robbe' meaning 'seal' in Dutch), but in 1983 the penguins started to come back, since when the colony has grown to about 20,000, despite near-disaster following a major oil spill in 2000.

The aim of the Penguin Recognition Project is to develop a system capable of the automatic monitoring of animal species

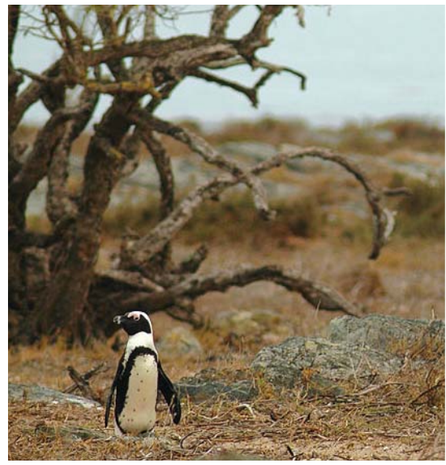
Adult African penguins engage in mutual preening on the beach.

But worldwide their numbers have declined from well over a million penguins in the 1930s to less than 35,000 breeding pairs today, with the loss accelerating in recent years. Today the African penguin is listed as 'vulnerable to extinction'.

To understand the impact of any conservation measures taken to improve the lot of the African (or other) penguins, it is important to follow the life-cycle of individual birds, thus it becomes necessary to identify individuals and to record where and when they are seen. By collecting large data sets it is then possible to estimate survival times and breeding success rates. However, the methods currently used to identify penguins (transponders placed under the skin or steel bands clipped to their flippers) induce stress in both the bird and the handler. The trauma can lead to nest abandonment and possibly reduced breeding rates, and there have been reports of tags getting snared in undergrowth.

'recognising' the patterns made by the spots on their chests. When finalised, the new technology will enable biologists to identify and monitor large numbers of diverse species cheaply, quickly and automatically. This in turn will revolutionise the precision, quantity and quality of population data available to ecologists and conservationists in a wide range of scenarios.

In order to record the movements of African penguins, camera systems, hidden on the penguins' path between the sea and the nesting area, capture images and send a time-stamped version of them in a live stream to locally connected computers. The relevant areas of interest in each image – in this case the penguin's chest patterns – are then transferred to local hotspots using a wireless network. From there, directional Yagi antennae submit the data to the central server network. The server extracts the biometrical patterns from the observed penguin snapshots and compares these to the population database. If the pattern is recognised, the penguin can be identified. If it is not recognised, the biologist decides whether a new penguin has been identified and, if so, adds it to the database for future comparison. As a result, the presence of particular penguins can be regularly confirmed at a certain time and location. An essential part of the research is focused on developing the 'intelligent' software that allows the system to make sense of complex camera images and interpret animals and their patterns as individual entities.



Back to the nest after a successful fishing trip.

African penguins are quite small and carry a pattern of black spots on their chests that does not change from season to season during their adult life

African penguins are quite small – about 40 centimetres in height – and carry a pattern of black spots on their chests that does not change from season to season during their adult life. To African penguins, these patterns are as unique as our fingerprints or the stripes on a zebra. In collaboration with Professor Les Underhill, Head of the Animal Demography Unit at the University of Cape Town, a real-time system has been developed by the Bristol team that can locate individual penguins by

Provided that a good image of a penguin can be extracted, the system can correctly identify the individual to within 98 per cent reliability. The main limitations at the moment are that passing penguins may be hidden behind others, or the lighting is poor. The team is currently working to overcome these problems both by combining images from intelligent pan-tilt-zoom cameras, and by using infrared imaging to acquire data both day and night. The basic image-recognition system has already been trialled with zebras and, in principle, could be extended to any species with complex surface patterns that remain constant over life.

This project will bring two remarkable changes to the study of animal demography and behaviours. The first is that it will be possible to obtain data remotely without ever having to handle the animals being studied; the second is that the sheer volume of data obtained will allow the testing of complex hypotheses where only small differences might be expected, thereby providing greater insight into the world inhabited by these endearing creatures and enabling more complete conservation strategies to be put in place. ■

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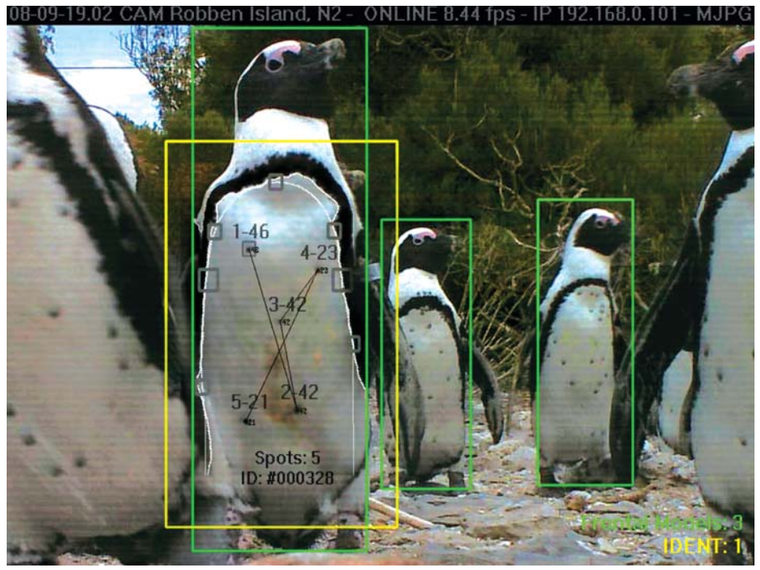

The computer captures penguins on their way to the sea.

Hans Arnold Heilbronn 1908-1975

Celebrating Hans Heilbronn

This October marks 100 years since the birth of Hans Heilbronn (1908-75), after whom the University's Heilbronn Institute is named. Established in October 2005, the Heilbronn Institute brings together high-calibre mathematicians from various disciplines to conduct research into key areas of mathematics. A three-day conference at the Institute in September will celebrate Heilbronn's life and work.

Heilbronn was a mathematician who worked on number theory and it was while he was at Bristol in 1934 that he achieved the work for which he is most famous – solving the Gauss Class Number Conjecture that had foxed mathematicians for more than 100 years.

While he was at Bristol in 1934 he achieved the work for which he is most famous

Heilbronn was born into a middle-class, Jewish-German family and in 1926 entered the University of Berlin, reading first medicine then mathematics and natural science. It was during his time at university that Heilbronn acquired his duelling (or bragging) scar. At the turn of the 20th century, the duelling scar was popularised by upper-class Austrians and Germans, who saw it as a mark of class and honour, signifying their inclusion in an elite social rank. It is interesting, however, that no scar is evident on any of the photographs of him – they have presumably been re-touched.

Mathematics soon became Heilbronn's main interest and in 1930 he became assistant to Edmund Landau at Göttingen University. In 1931, he gained his PhD for a thesis using analytic methods to improve prime number estimates. He began to make a name for himself with his first few papers on prime numbers and analysis, but Hitler's rise to power in 1933 effectively barred academic careers for Jews in Germany, so Heilbronn moved to Britain where he obtained a one-year position at Bristol University. His work at that time represented important steps in number theory, an area of research that has remained active both here at Bristol and in other major centres of mathematics around the world.

In 1935, Heilbronn was awarded a Bevan fellowship at Trinity College, Cambridge, where he remained until 1940, when, like many other refugees, he was interned. Following service with the British forces in the Signal Corps, he returned to Bristol University in 1946 and was Professor and Head of the Mathematics Department from 1949 to 1964. Dr Bill Banks, a student at the time, remembers coming for an interview to study in the department: "At the end of the interview, they seemed to say I could come, pending my A-level resluts. I then asked if they needed a character reference. Heilbronn responded by saying that they assumed I would behave like a perfect gentleman." This was typical of Heilbronn, whose rather formal manner, strong German accent and duelling scars could be rather overwhelming at first. Nevertheless, his friendly attitude won him many friends, although his intellectual honesty did not allow him to pass over anything he considered below standard.

Heilbronn was elected a Fellow of the Royal Society in 1951 and was President of the London Mathematical Society from 1959 to 1961. But in the early 1960s, feeling concerned that government plans for university expansion would lead to a drop in standards, Heilbronn tried to convince policy makers of the dangers that lay ahead. When this had no effect, he resigned his chair at Bristol with characteristic directness. He moved to a chair in the Mathematics Department at the University of Toronto in the later 1960s, where he built up an active research school. He died in 1975 during an operation to implant a pacemaker, aged only 66. ■

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What does it mean to be 'world class'?

In recent years, the notion of a world-class university has become a concept much invoked by governments and by universities themselves. A collaborative project between members of the Worldwide Universities Network's 'Ideas and Universities' project, Rosemary Deem from the University's Graduate School of Education, and Ka Ho Mok from the Faculty of Social Sciences at the University of Hong Kong, explored the concept of 'world-class' status.

One major consequence of the quest for world-class status is the intensified competition among universities to 'prove' their performance through global university league tables or ranking exercises, which are becoming increasingly influential in shaping how contemporary universities are governed and what core activities they undertake.

This drive for world-class status can only be achieved by a very small number of institutions

But with increasing competition for students and the ceaseless search for research funding, what does the concept of 'world class' actually mean? Should we all be thinking more carefully about the dangers involved in competing to outrank each other in such league tables? If we all tacitly accept the same criteria by which performance is to be judged, is there is a risk that universities will start to become the same the world over, losing what is distinctive about their educational cultures and traditions? Furthermore, since the consequence of this drive for world-class status is something that can only be achieved by a very small number of institutions within each country, there are inevitably going to be many losers.

For example, using Research Assessment Exercise (RAE) grades, citation indexes, publication rates and rates of staffing, a 2003 report for UK Universities on 'Funding Research Diversity' examined how the concentration of research resources affects levels of research achievement in different regions. The report found overwhelmingly that the three regions in the south-east of England had the highest density of departments rated of 'international excellence'. If institutions in these areas gain yet more funding as a result of the current RAE, places such as Wales and the East Midlands will lose out. This may result, the report argues, in 'reduced regional research capacity [that] will have knock-on effects for regional economic performance and the capacity for technology innovation'. The negative consequences of further concentration of research resources cannot be over-stated in this regard and the situation is likely to be the case in other countries as well.

While the quest for world-class status in higher education is clearly not going to disappear, the social and political costs should not be underestimated. The task of the 'Ideas and Universities' project, therefore, is to find a shared language for discussion and offer a forum in which to bring together people from a wide range of backgrounds to consider the purpose and value of universities in the face of different models of internationalisation and globalisation. Through this, the project team aims to create awareness of a greater range of possibilities and offer a more informed critique of current planning and policy-making. To help this process, they are using video conferencing technology to broadcast seminars and hold lively discussion sessions with staff and students around the globe, in a bid to inform the debate about the future of universities and understand exactly what it means to be 'world class' in a competitive twenty-first century. ■

www.wun.ac.uk/ideasanduniversities

Small money, big difference

Professor Ricardo Araya studied medicine in Chile where he was a classmate and good friend of the current President, Michelle Bachelet, the first woman to hold that position in Chile. Today he is Professor of Psychiatry at the University's Academic Unit of Psychiatry.

After getting his medical degree in Chile, Araya came to the UK and trained as a psychiatrist and epidemiologist in the Institute of Psychiatry at the Maudsley Hospital in London, where he remained for eight years. But with the return of democracy to Chile in the early nineties, it was time to go home. There he took up a post as adviser to the Ministry of Health and Women's Ministry, but after several years of working as a high-ranking public servant, Araya wanted to return to the academic world. He joined the University of Chile, where he set up a mental health research unit aiming to support the process of improving services for people with mental health problems. He remembers those early days: "I managed to get a large grant from the European Union in collaboration with Professor Glyn Lewis at the University of Bristol to carry out a large survey in Santiago, but at that time there was no real research infrastructure in the University of Chile – it was a project that had to be built up from scratch." During the next six years of hard work, researchers were trained and equipment acquired to set up a unit that eventually accommodated more than ten staff members.

Throughout this period, Araya maintained a collaboration link with the UK and in 2002 he became a member of staff at the University – "Glyn Lewis and I have been friends and collaborators for almost 20 years now," he says. They have carried out several studies, including the largest household and primary care mental health survey ever undertaken in Chile, but "eventually people got fed up with surveys and what they considered an exercise in counting the ill and dead. The real question was what could be done to improve the situation?" However, financial support was difficult to find. The Ministry of Health considered that the depression found among Chilean people on low incomes was caused by their poverty and social deprivation, so priority was given to social programmes aimed at alleviating those problems.

They did not anticipate that they would dramatically alter the delivery of treatment for depression in Chile

As luck would have it, while Araya was in Chile, a well-established mental health services researcher from the US, Dr Greg Simon, decided to take a sabbatical in Chile and between them Araya and Simon persuaded the US National Institute of Mental Health to give them some funding to try an improved treatment programme for depression among low-income people. What they did not anticipate at the time was that, along with other Chilean colleagues, they were going to dramatically alter the delivery of treatment for depression in Chile.

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Nurses and social workers were trained to teach simple problem-solving techniques to depressed women visiting the clinic

The team decided to test a depression-treatment programme in government-funded primary care clinics, since such clinics are the major source of healthcare for the poor in Chile. The idea was to improve on what was already available by increasing the involvement of non-medical personnel, since doctors' time is expensive. Several nurses and social workers were trained to teach simple problem-solving techniques to depressed women visiting the clinic, as well as to monitor treatment progress and act as care managers. If a patient was severely or persistently depressed, her care manager would consult with a clinic doctor about treatment. If the doctor decided to prescribe an antidepressant for her, it would be a generic one, not a named brand, which is considerably cheaper.

The women were randomly divided so they either received the improved depression-treatment programme or the usual care. After six months, subjects in the intervention group showed large improvements relative to those in usual care, and although the 'improved' programme turned out to be slightly more expensive, the extra cost per person per year to keep them depression-free was only in the order of £13. This compares very favourably with the costs of innovative depression-treatment programmes in the UK and US, which usually cost hundreds of pounds extra per person per year. "But in the developing world," Araya explains, "you are usually starting from a place where people aren't getting any care at all, so there is a lot more room for improvement. Thus with a relatively modest investment, you can get more out of it."

Then came the biggest challenge of all – getting the Chilean government to implement the programme in its public healthcare system. There were both scientific and political issues. "You have to have the evidence that it is effective, but you also have to establish connections with people who have the decision-making power. So we pursued both those issues – doing the study to generate the scientific evidence, but also working with people in the Ministry of Health to make it happen." And it did. The programme has now been scaled up at a national level and more than 400,000 depressed people have been treated in the past three years.

These studies have led to significant changes in government policy towards the treatment of depression in Chile, and the model is increasingly viewed as one likely to be adopted in other countries around the world. At present, a similar but much larger programme is being tried out in India with funding from the Wellcome Trust, and Araya, in collaboration with others from the University, is working on projects in Lebanon and Brazil. A recent large grant from the Wellcome Trust will allow Araya and his team to test an intervention to prevent depression in schools from low-income areas in Santiago, Chile. This is a natural and welcome extension of the work to reach the community, especially children and young people, outside health clinics. In the meantime, Araya has become a member of the prestigious Lancet Global Mental Health Initiative, a group of 40 international experts that launched a movement to improve services for common mental problems in resource-poor settings. "So much is needed in poor countries around the world and there are so many opportunities to make a huge impact with small investments," he enthuses. "The University has a great opportunity to take a leading role in this field and I am so happy to be part of this much-needed and timely initiative." ■

www.bris.ac.uk/Depts/Psychiatry

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