Subtext 4

Autumn 2007

Manikin man
Meeting a maker of many parts

Beyond belief
Tackling totem and taboo on telly

Far out
Why astrophysicists spend ages clearing out the rubbish

Bodies of knowledge
A matter of life and death

University of BRISTOL

Welcome

The views expressed in this publication do not necessarily reflect those of the University of Bristol, its Vice-Chancellor, senior administrators, staff or students.

Well, obviously.

If a university isn't a place where opinions, theories and arguments can be exercised, we should all pack up and go home. Individuality is a crucial ingredient in the lifeblood of an institution such as the University of Bristol, even if the administrative machinery that makes any large organisation work can seem rather impersonal.

We try to get as much character and variety into *Subtext* as possible, while tackling big issues – such as the birth of the universe (p10) and superstition (p6) – and illuminating small corners, one of which is occupied by a lungfish called Leonard (p14), and another by an artificial dog skeleton called Fang (p9). Even Bob Dylan and Alfred Hitchcock (look carefully) make an appearance (p14 and p8, respectively).

Speaking of opinions, if you have any about *Subtext*, send us an email.

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Contents

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***Subtext* Autumn 2007**

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SIBEL ERDURAN

Dr Sibel Erduran, Senior Lecturer in Education (Science) in the Graduate School of Education, grew up in Cyprus and studied and worked in the US and London. She talks to Hilary Brown about how a range of experiences fostered a multitude of interests that converged in Bristol.

I was born in Cyprus to Turkish Cypriot parents. When I was two, there was a lot of civil unrest on the island, and my brother was sent to London to live with my aunt. A lot of families sent their sons away so they wouldn't have to do military service. He grew up in London and I grew up in Cyprus.

I am bilingual. My grandparents and parents were trilingual, and spoke English, Turkish and Greek. I went to a school with a British system of education. Classes were in English or Turkish, and we spoke Turkish at home. But the most important language I learned from my parents was that of compassion. My mother excelled in the arts and encouraged me to take up music, which is so vital in developing empathy for, and an understanding of, human nature.

I lived through the 1974 conflict when the island was divided. In some ways it was frightening. It was a real war, and we had to stay in shelters. In other ways it wasn't as traumatic as you might think. My friends and I played in the streets with debris from the fighting. I even made necklaces out of bullets. When I see images from other conflicts around the world now, I'm struck by how resourceful people, especially children, are in making something of these situations.

Growing up against a background of ethnic conflict taught me the importance of considering other people's points of view. To the Turkish community, the arrival of Turkish troops to establish an independent state in north Cyprus was a peace operation, as they felt relieved of being a minority. But the Greek Cypriots felt disempowered by this foreign force. Everyone was a Cypriot, but they experienced the event in different ways. One of my research interests now centres round argumentation and the multiplicity of perspectives, not in the context of war, but in a scientific sense.

One of my most treasured possessions is my grandfather's atlas. My grandfather was a teacher in a one-room village school, teaching both Turkish and Greek Cypriots. He was interested in geography and languages. He lived at the time when the Turkish alphabet was still using Arabic letters. The atlas is covered in scribbles in Arabic – I can't understand them, but they still fascinate me.

Teaching is in my blood. My father has been a teacher, headteacher, inspector of schools and director of in-service training. He is a true educator who inspired me to take up education as a career. I loved the two years I spent as a teacher of chemistry and science. There is a perception that science is an elitist subject, and that only the very bright can do it. I think that if science is taught properly, in a way that really involves learners, anyone can do it and be good at it.

I got two Fulbright Fellowships to study chemistry in the US. The first was directly after my A-levels. I had hardly ever been out of Cyprus until then – it's difficult for Turkish Cypriots to travel abroad since no country other than Turkey recognises their travel documents. My movements were restricted until I became a British citizen two years ago, which really changed the way I experience and relate to the world.

I found the US very cold! My first scholarship was at Northwestern University, near Chicago. The campus was by Lake Michigan. It was beautiful, but the winters were freezing. There was lots of snow, which I wasn't used to, coming from a hot country. I still get excited when it snows.

Living in America made me challenge my assumptions. As a teenager, I thought the Americans didn't really take things seriously – that life was fun and easy for them. But when I lived there I realised that things can be difficult for people the world over. Some of my American friends couldn't afford health insurance, for example, and the reality there is that if you don't have insurance, you don't get proper medical treatment.

I lived in the lab while working on my Masters at Cornell. I was studying the effect of additives on meat and had to take samples every four hours. I had a futon in the lab and stayed there for two weeks at a time. I would come out, rest for a bit and go back in. It was a very regimented lifestyle. It made me realise that I loved science but I didn't want to live the life of a scientist. After my Masters, I turned to education and completed my doctorate at Vanderbilt.

My professional interests – chemistry, education and philosophy – traditionally don't mix, especially chemistry and philosophy. When I was studying chemistry I would ask myself such questions as 'Does the water in this beaker really exist ?'. This wasn't welcome in the scientific community because scientists don't operate in this way. But I've managed to unite these fields of enquiry in my research into the nature of chemical knowledge from philosophical and cognitive points of view. The education side comes into it in examining how children perceive the material world and how they can be supported in their learning of this world.

I love the way the department here promotes interdisciplinarity. In most schools of education people are organised around traditionally discrete disciplines. At Bristol they're organised around centres. I'm in the Centre for Learning, Knowing and Interactive Technologies, where I work with people from areas such as technology, science and maths education. The structure puts you in a position to collaborate.

My professional life has taught me that things are never clear-cut. This applies to my identity, too. To give an example from chemistry, from an early age we are taught that there are three states of matter – solids, liquids and gases. But you come across something like foam, and what is that? It's a bit like a liquid *and* it's a bit like a gas – it's something else. People often ask me whether I consider myself to be Turkish Cypriot, American or British, and I can't say, because I am all of these things.

I love living in Bristol. I came here after working at King's College London for five years. London has a lot to offer, but I hated the commuting. Bristol is more manageable, and it's beautiful. Every time I go through the Avon Gorge I feel amazed. I'm happy about the way my life has moved on. I hope to stay here.

JASON INGRAM

When the media spotlight fell on Bruce Hood, Professor of Developmental Psychology in the Department of Experimental Psychology, he never expected to find himself discussing the nature of belief with argumentative astrophysicists, Irish entrepreneurs and 20 million Russians. He talks to Hannah Johnson.

BEYOND BELIEF

It all began with a science festival, a press release and a serial killer's cardigan. Invited to give a lecture at the BA Festival of Science about his work on the psychology of objects, Professor Bruce Hood didn't quite anticipate the huge media response one simple experiment would unleash.

'I asked members of the audience if they were prepared to try on an old-fashioned blue cardigan in return for a £10 reward,' he explains. 'Plenty of people volunteered until I told them the cardigan used to belong to Fred West (even though, in reality, it didn't). On hearing this, most people refused to touch it. They believed it had some invisible property – an "essence" – as if evil had become physically manifest inside the clothing.'

The reasons why we think like this lie at the heart of Hood's research – but he never imagined having to explain them to the world's media. A press release issued to coincide with the lecture rapidly generated enormous interest in Hood's theories about belief, religion and the supernatural.

'With a topic like this, I knew there was going to be some interest but I hadn't bargained for quite how much,' says Hood. 'It was a bit of a blur during the week following the festival. I lost count of the number of radio interviews I did. It went worldwide: Radio Hong Kong and stations in Australia, America and Ireland. The biggest was Radio Russia, which I'm told has 22 million listeners. My interview had to be translated into Russian, so I have no idea what I ended up saying.'

This initial wave of media interest singled Hood out as an expert on supernatural beliefs and he's since been asked to comment on a whole range of related subjects – a distinction that can prove dubious. 'While I'm happy to do the occasional local radio interview about, say, Friday the 13th, I have to feel comfortable that it's a subject where I can say something sensible. I don't want to be a complete populist. There's a fine line and you have to make sure you're coming over as a serious academic, not someone who's happy to trivialise things.'

Engaging with the media has led to all kinds of interesting encounters, though, including finding himself on Radio 4's *Material World* alongside two astrophysicists. 'I felt really out of my intellectual depth because they were arguing about whether there were 11 or 12 dimensions to the universe. I have enough trouble with four! It was a really fascinating experience listening to other scientists.'

Then there was the TV chat show in Dublin that featured a pair of unusual entrepreneurs. 'They were selling Irish dirt to the Americans, shipping it over in packets. For the life of me, I couldn't understand what this was all about until I discovered people were buying it for burials to throw on the coffin. This was very supernatural thinking: that somehow a bit of Ireland was in the dirt. The irony, of course, is that because of stringent laws in America this had to be the most sterile earth in the world, carefully processed before being sent out. I came on straight after them and it made a very nice segue into my work.'

While most interviews have been positive experiences, some journalists can get personal. 'Everyone has an opinion on the supernatural. It's something people have quite strong feelings about and, of course, it impinges on religious beliefs so inevitably interviewers will ask me about my own belief systems. I tend to be quite coy, simply because I don't want to appear to have any agenda. However, a lot of people then assume my reluctance to state anything is an indication of some hidden agenda.'

Despite the occasional tricky question, Hood is convinced that appearing in the media has had a positive effect on his work, helping to impress funding bodies and recruit trial volunteers. And it's also increased his respect for a profession that doesn't always have the best of reputations: 'I think there's a misconception that journalists are out to dumb down. Most of the journalists I've dealt with have really earnestly tried to get a true story. Things do get distorted, but then any story that's passed through several minds will get distorted. Journalists have an amazing capacity to straddle huge areas of science and make them accessible to the general public. That's not an easy thing to do.'

JASON INGRAM

EVERYTHING IS ILLUMINATED

In the age of digital downloads, HDTV and YouTube culture, the odd ritual of sitting in a large, dark room and watching shadows move around still exerts a huge attraction. Professor Sarah Street talks to Nick Riddle about the enduring appeal of cinema.

JASON INGRAM

Film, so long thought of as an ephemeral medium, is now a well-populated field of academic study – not least because it overlaps with so many other areas. Sarah Street, Professor of Film in the Department of Drama: Theatre, Film, Television, is a good example. She began her career as a historian. 'My DPhil started out being about the social history of leisure in the 1920s and 30s,' she says, 'and cinema became one of my key topics. My thesis was on Britain's response to Hollywood in that period.'

Street has continued to study this topic, and was recently awarded a three-year grant (with a colleague from Kingston University) from the Arts and Humanities Research Council (AHRC) to investigate the use of colour in film, especially in Britain. A key element in the story of British colour film is Technicolor, the process that dominated the motion picture industry from the 1930s to the mid-1950s. Street recently visited the Technicolor archives in Los Angeles (with British Academy funding) to examine the papers of Natalie Kalmus, the famously formidable ex-wife of Technicolor co-founder Herbert T Kalmus.

'Natalie Kalmus was called "colour consultant" on every Technicolor film ever made,' says Street. 'Whether she was present on every set is debatable, but she had a clear idea of what she wanted. She had a theory about particular colours and their use in cinema genres.' Filming in Technicolor required special and very cumbersome cameras and processing equipment, which were only available on lease from the company itself. When Technicolor came to the UK in the mid-1930s, Natalie Kalmus visited the UK in her 'colour consultant' role. One of the questions that Street hopes to answer is how restrictive this was for the UK industry, 'or could they be creative enough to produce a recognisably "British school" of Technicolor? And why did Technicolor end up being the most successful process commercially and aesthetically for some 20 years?'. The AHRC grant means that Street has been able to recruit a postdoctoral researcher and a fully funded PhD student to the project, which will culminate in a conference on colour in cinema to be held in Bristol in 2009 as well as a book and special journal editions that will deliver the first in-depth analysis of colour in British cinema. The team will also conduct an oral history exercise, interviewing cinematographers and art directors who worked with colour film.

'People love the big, enveloping experience of cinema.'

Students now, says Street, are very sophisticated and cine-literate, but often lack the academic framework and the language to articulate it. And that framework is crucial, now that popular culture is so ubiquitous and splintered into markets, genres and formats. But this ubiquity makes fertile soil for interdisciplinary work. In the picture house of film studies, a lot of different disciplines meet up in the foyer: academics working in modern languages, historical studies, sociology, history of art, music and drama often use film as a major part of their research. And this is the reasoning behind another project Street has initiated: a cross-departmental group called *Screen Research @ Bristol*. The group holds fortnightly sessions and day conferences on themes such as Italian cinema, audiences and reception, film sound and music. 'It's intriguing to find out how people from other subjects approach these themes,' says Street, 'because you do get locked into your own discipline. When I did some work on colonialism, it was interesting to see how other people think about a similar problem.'

The problem facing cinema itself – namely its survival as an art form – never quite goes away, but Street agrees that it has proved surprisingly tenacious after its first century. 'People love the big, enveloping experience of cinema,' she says. 'We can do much more in our own homes now, what with high-definition formats, but the cinema experience is just as much about going out. And there's a sort of relay of film culture now: you see the film, then you get the DVD with the extras. It's a different experience, but one that still depends on enduring images, stars, lights, action and sound.'

MANIKIN MAN

There's a shed in Stoke Bishop filled with body parts. But don't worry – they're all artificial, except for the ones attached to Andrew Levy, Professor of Endocrinology. Nick Riddle pays a visit.

A dog dangles from a hook in Andrew Levy's shed. 'That's Fang,' he says. 'I made him for the Royal Veterinary College years ago.' Fang doesn't resemble a real dog, but he's not supposed to. He's a manikin, created for vets to practise their skills. And he's the only animal presence in an otherwise anthropomorphic body shop.

Levy's interest in making manikins was inspired by his love of teaching. It started, not very auspiciously, when he sat on an exam committee. He was asked to run the final exams for the medical students – 'and I've been doing it ever since'.

He decided that changes were needed. 'The final exams should prepare someone for being a doctor,' he says. 'They need to have a portfolio of skills: analysing a drug card, putting in an intravenous infusion, interpreting a chest x-ray and so on.' Then there are things like breast exams, rectal exams and taking blood, which new doctors often used to learn on the job. A few years ago, the General Medical Council made it compulsory for medical students to demonstrate these skills before being awarded their qualification. So Levy had to figure out how to test them.

'You're never going to get someone to sit there with their arm out and have a dozen students take blood from it,' he says. 'You need manikins. The commercial ones are dreadful – they look like an arm but they don't feel like one. There's a special skill to getting blood out of them, but it has nothing to do with getting blood out of a person.' So Levy started thinking of ways to make better manikins.

'At school I was dead set on being a silversmith, until I decided medicine was more sensible,' he recalls. 'But I'd always mucked about with bits of stuff in the shed. So I tried things out.'

His first major project was an opthalmoscopy manikin. 'The commercial one looks like a face, but it's not much practical use,' says Levy. 'Mine doesn't look like a face, but if you look into the eye you have to use all the skills that you need to use an opthalmoscope on a human eye.'

But how to simulate the anatomy of the eye? 'Originally, I planned to make a few eyeballs out of Perspex, then use some old contact lenses that the Eye Hospital very kindly gave me.' After weeks of grappling with these materials, he had an epiphany: 'I realised that disposable cameras have lenses. A local chemist lets me have their old ones, and I stitch the lenses on to ping-pong balls.'

The opthalmoscopy manikin slowly developed and improved, and the manikins are now sold to medical schools in Europe and Australasia. The modest income from them goes towards research, equipment and 'more goop to make new manikins'.

Levy expanded his repertoire: a set of lips for putting in stitches; an arm for taking blood; a bottom (complete with buttocks) for rectal exams. In the process, he discovered a new way to train students. 'If you get someone to make a plasticene model of, say, a structure in the brain, they'll never forget that structure,' he says. 'We now have study modules that involve making manikins or models.'

He hunts for materials that can mimic the qualities of human tissue. The arm manikin, for instance, is made out of wood, pipe insulation, stretch denim, vinegar, bleach, foam and liquid latex (the last of which is used a lot in the sex industry: 'You paint it on your partner and peel it off with your teeth,' Levy explains). Recently, he started using foam latex – the main ingredient in the *Spitting Image* puppets – which he mixes up in a blender.

But it's not all unfettered shed-tinkering; Levy has to observe the economies of scale. 'There's no point producing something wonderful if it's too expensive or easily damaged. Anything that you stick needles into will be destroyed pretty quickly, so you have to make them cheap and disposable.' He is still refining a breast examination model with this in mind: 'It has 15 pieces that must be cast separately and put together carefully. I need to get it down to fewer components that I can assemble quickly.'

The challenges keep on coming; Levy is still grappling with a penis manikin. 'I was so pleased with the prototype, but when I showed it to a group of surgeons they asked, "Where's the foreskin?"'. One of the crucial skills of inserting a catheter is putting the foreskin (if there is one) back correctly after retracting it. Otherwise it can swell and cause a nasty condition called paraphimosis. 'A foreskin is very difficult to make,' says Levy. 'It needs to be very thin, but strong enough to withstand being pulled around a lot. It's a tough one. But I *will* get there.'

If Levy's inventive energy ever flags, he always has teaching to draw on. 'Our medical students are the bees' knees,' says Levy. 'I love doing basic science research, and the clinical work too. But it's teaching that has turned out to be incredibly compelling and satisfying beyond all measure. Sometimes students write to say thanks – this year I had half a dozen cards and letters. When they're 50 and I'm dead, and they say, "Somebody I used to know taught me this", that's quite something.'

JASON INGRAM

FAR OUT

There's stargazing. Then there's astronomy. Then there's astrophysics. Nick Riddle meets Professor Mark Birkinshaw and Dr Katy Lancaster from the Astrophysics Group to discuss galaxy clusters, tell-tale shadows and how the universe – and their careers – got started.

First principles

KL: I blame my parents. My entire family has Physics and Maths A-levels, so I don't think there was any escape. We lived near Jodrell Bank in Cheshire. Their Lovell Telescope is 250 feet across – it's very impressive. We used to go to the visitor centre, and I was fascinated by the whole thing. When I left primary school, they had us dress up as what we wanted to be when we grew up. I chose a white coat and a glitter wig and said I wanted to be a mad scientist. A scientist I am, the madness I'm working on.

MB: I always enjoyed fiddling around with ideas and lumps of stuff – bashing the rocks together. Or mixing up foul chemicals to see what would come out. My father was a radio engineer, so I grew up with bits and pieces of engineering. But I was the first in my family ever to go to university. I wasn't sure whether I was a physicist, a mathematician, a chemist … but I discovered that the interesting bit, because it was hard and seemed to have more insights, was the physics side.

DAVE PRATT

Left: Professor Mark Birkinshaw and Dr Katy Lancaster with an inflatable model of the universe (yes, all of it)

In a nutshell: the Sunyaev-Zel'dovich effect

KL: You can think of the Big Bang as a hot explosion, and the universe is still warm from it. We can detect this warmth in the form of cosmic microwave background radiation. When the radiation was produced, structures in the universe had already started to form. So we can 'see' the imprint of those formations on the background radiation. In the pictures, it looks kind of blobby.

MB: The mind-boggling bit is that, sometime in the first 10-26 seconds of the Big Bang, quantum mechanics was involved in a phase of very rapid expansion that created galaxies and clusters of galaxies and other huge structures that we see today.

KL: If you use a radio telescope to look at a bit of sky that seems dark to the naked eye, you find that it's *not* dark. The whole of the sky is bright at radio frequencies because of the cosmic microwave background radiation. Some groups are looking for the structures from the very early universe; what we do is look for more recent structures. Galaxies form because stars are held near one another by gravity, so it makes sense that galaxies are held close to each other through gravity as well. What you get are actually huge clusters of galaxies – potentially thousands. Galaxy clusters contain a lot of gas at their centre. If we look out at the background radiation and there's a galaxy cluster between us and that radiation, its light is scattered as it travels towards us by the gas in the cluster, and we see a shadow. That's called the Sunyaev-Zel'dovich effect, and that's what we look at.

MB: We do it by measuring changes in brightness and temperature. The background radiation has a temperature of about 3 Kelvin; the shadows change that temperature by less than 0.1%. So we're trying to take the temperature of gas halfway to the edge of the universe using a radio telescope here, to an accuracy comparable with that of the best thermometers on Earth.

KL: It requires a lot of pain and suffering to actually see anything. On my part, anyway.

The hard stuff

KL: I think it's a myth that physicists find physics easy. I find it challenging every day. I think people are put off physics because it's hard. But that doesn't mean you can't do it, or can't work through it. And the good thing about it is it makes people think you're really clever. (Laughter.)

MB: Or mad.

KL: Or both.

MB: I think the mathematical aspect of physics is the easy bit. What's hard is translating physics situations into analysable chunks. Physicists are like interpreters between the language of mathematics and the phenomena of the real world. Then we interpret back again, using the mathematics to predict things. If the predictions don't work, it means there's an element of misunderstanding that we can sort out by doing more observation. For example, we used to think the expansion of the universe was slowing down. But in fact it seems to be accelerating. That points to a phenomenon that had been hypothesised in the past but never proven. The Sunyaev-Zel'dovich effect can provide a very good indicator of that acceleration, and it might be another way of finding out about the so-called 'dark energy' that's forcing the universe apart.

KL: I think it's much more interesting when we prove ourselves wrong. We just keep proving ourselves right over and over again with the whole cosmic microwave background stuff. We're waiting for something to come along that tells us, 'Don't get too complacent – you don't understand this properly'.

Throwing out the rubbish

MB: We're looking out from Earth at a tiny signal, and our atmosphere emits thermal radiation that changes with the weather. So you have to make sure that what you're seeing really is a shadow of something near the edge of the universe, not the shadow of something about 30 feet in front of the telescope.

KL: Telling those things apart is tricky. A lot of our work involves trying to cancel out the data from the first few hundred feet of the signal path. The atmosphere changes rapidly, so you have to measure it quickly, and

repeatedly, to subtract it accurately. When you get your data you have to chuck out a large portion of it because it's contaminated. But if you subtract a bit too much, you'll see something that's not actually there.

MB: Until recently, we had to use telescopes that were designed to do something else. Now we're getting into the era of purpose-built instruments, so hopefully things will accelerate. There are a dozen groups in the world trying to do this using different techniques and different telescopes.

KL: It's a very hot topic at the moment. One of the exciting things is that in theory you can see any cluster at any distance using this technique because the strength of the Sunyaev-Zel'dovich effect doesn't depend on how far away the cluster is. That means we should be able to look right back to when these clusters first started forming. That's what people want to do now. If you believe what you hear at conferences, it's all going to work wonderfully and not be very difficult. I don't believe that for a minute. It's going to be really hard.

Competition and collaboration

KL: We have strong links with Cambridge University, where there's another group building another survey instrument. We hope to collaborate by combining datasets, because theirs will be different. Different is often good because you get more information.

MB: You can also point fingers at one another and say, 'Your data is contaminated'; 'No, it's yours' – and that sort of friendly competition can help you to find the problems. If you compare two datasets taken in slightly different ways, it's a more powerful way of finding the effect itself and getting rid of some other, smaller-scale contaminants.

KL: When you're looking at something that's so hard to measure, it's reassuring when someone else can confirm that what you're seeing is correct. I feel better when my results are backed up by somebody else. Of course, there's an element of competition – lots of people are trying to do similar things – but on the other hand, you all need each other. I feel like it's more of a community thing: if someone else discovers something, I'll be happy that they've discovered it rather than annoyed that I didn't discover it. Maybe I'm just not competitive enough.

MB: No, it's a characteristic of the field. A couple of years ago we had a review of the telescope in Hawaii [see below]; on the panel were two of the principal investigators in competing experiments. The organisation that runs the telescope was shocked that competitors were being allowed to see the experiment. But that's how astrophysicists work – we tend to lift the veil, to let people inside to see what's going on, because we appreciate the help. You don't want to have to reinvent a diddly piece of equipment every time – it would take you forever.

Getting it across

KL: I know from the outreach I've done that getting kids interested in physics is not easy. Children tend to develop an anti-physics attitude at some point, perhaps because their teachers tell them it's terribly hard. It's very difficult to get them out of that, so I think anything that gets them inspired is a good thing.

MB: On the other hand, if children think physics can be done by just putting words and concepts together, they have a big shock when they get to university and discover that to fit concepts together accurately you have to go through an accurate mathematical process. That's disillusioning for some people, even at A-level.

KL: There's a bit of a furore in academia at the moment about the way physics is being taught in schools, because they just keep watering it down by trying to take the mathematical side out of it.

MB: General relativity is incredibly simple – you can explain the concepts to schoolchildren in five minutes. The hard part is converting those concepts into workable techniques and showing how they lead to valid, testable predictions. You can always explain a piece of the jigsaw to someone by using a set of analogies, but all analogies are to some extent false – you can't push them too far.

KL: You need the mathematical approach for the nitty-gritty.

MB: Absolutely. You can have a perfectly rational discussion with somebody about the physics of nuclear reactors without using the mathematics. But if you try to design a nuclear reactor and you don't have the mathematics, I would stand well clear.

Physics and life

KL: There are two reactions when I tell people what I do. The first one is utter horror and they then leave, and the second is that they're so interested that they want to ask me all of their burning questions.

MB: Being a physicist certainly affects the way you look at things. The clouds in the sky, ripples on the ocean, whatever – you can see the physics in them. It's a bit like somebody from the Department of Music listening to a symphony. The beauty of the music is still there, but they can also analyse the structure and see how the music fits together. In the same way, a physicist looking at a beach sees a number of phenomena as well as the beach. It's a question of how much you screw your mind up to look at the explanations or broaden it out to look at the overall structure.

KL: I have a logical approach to a lot of things and I attribute that to being a scientist, because I've watched my non-scientist friends and their approach is so different – to organising something, for example. I like to have everything written down in logical steps, but they would be less logical.

MB: Though you can push logic too far when you're trying to sort out some of these experiments. You need to explore and see if there's another way into a problem. Lateral thinking works in physics as it does in any other field, except maybe we're using a different set of tools to produce the lateral thought.

KL: There's sometimes a danger in overthinking something. I think there has to be a balance. I say that I have a logical approach, which makes me sound like my life is very organised, which is so far from the truth. (Laughs.)

'Being a physicist certainly affects the way you look at things. The clouds in the sky, ripples on the ocean, whatever – you can see the physics in them.'

THE HARDWARE

KL: Below is the main telescope we're using at the moment – AMiBA (Array for Microwave Background Anistropy) in Hawaii. It's an interferometer, which is a collection of smaller telescopes that you can use to synthesise the resolution of a much larger one. Interferometers are also great at getting rid of contaminant signals, which is why they're often used in cosmic microwave background astronomy. AMiBA is relatively small for an interferometer; it has seven dishes arranged in a hexagon on a platform with six hydraulic legs, called a hexapod.

MB: You can point it around the sky by changing the length of each of the legs. You also rotate it while it's tracking. It's the strangest animal imaginable to watch moving – it sort of corkscrews its way across the sky. Nearby are the telescopes of the Mauna Kea observatory, which is the Manhattan of astronomy. We're over in the Bronx, on the next mountain over.

KL: With a very long and bumpy access road and facilities in storage containers rather than actual buildings. It's not at all luxurious.

PICTURE COURTESY OF THE AMIBA COLLABORATION

KNOT JUST A GREAT TEACHER

Professor Dick Clements is a mathematician, an engineer and a born teacher. He talks to Barry Taylor about his long and multi-faceted career. And about knots.

You probably use a Granny Bow, but you'd be better off with a Double-Slipped Reverse Surgeon's Knot. Shoelaces tied with the former come undone; ones tied with the latter don't.

Professor Dick Clements demonstrates the difference with dextrous ease. Knots are something of a passion for him, especially so-called 'symmetrical bends' that are easy to untie but that don't work loose of their own accord. He thinks he may even have been partly responsible for inventing one such bend, known in the arcane world of the knot-fancier as the Symmetrical Simple Simon.

His fascination with knots dates back two decades. That's when his association with the Royal Naval Reserve began. He was responsible for training novice seamen in a broad range of skills – except that there was very little by way of an organised syllabus. 'The academic in me rebelled at this,' says Clements, 'so I started to devise a properly structured training programme even though I myself was learning my seamanship skills as I went along.'

Some years later, when the Royal Navy was developing its national training scheme, it drew heavily on the work done by Clements during his time as First Lieutenant of the Bristol University Royal Naval Unit. His reward came eight years ago in the form of an MBE (Military).

His expertise in tying knots and his understanding of their theoretical basis has deepened over the years, and is sustained in part by his membership of the International Guild of Knot Tyers – a body with its own journal (called, with a certain inevitability, *Knotting Matters*), to which Clements has contributed many erudite pieces, complete with diagrams and photographs.

Obscure though the world of knots may seem to most of us, Clements can point to some very practical, non-nautical applications of his knowledge. 'For example, I've been used as an expert witness in a high-profile court case,' he says. 'The knot in question was not tied in a piece of string but in a pair of tights around the victim's neck. Unconventional sexual practices seem to have been at the root of the matter.'

His interest in forensic knotting is still growing. Next year he is planning to undertake some experimental work on knots and handedness, as well as on the strength of knots. 'It would be worth quantifying – purely from an academic point of view, I assure you – exactly how hard you have to pull in order to strangle someone.'

Clements has been on the staff of the University's Engineering Mathematics Department since 1973. He arrived with a first degree in Mathematics and a PhD in Aeronautical Engineering from Cambridge University. At Bristol he has focused on producing mathematicians with an understanding of engineering science and the will and skill to apply mathematics in the engineering industry.

Clements' research work is probably not as widely recognised as some others'. And he clearly feels that devoting so much energy to teaching at a research-intensive university has not always made for a comfortable life. But in 2005, the University made him a Professorial Teaching Fellow. The title is awarded in recognition of great academic distinction in teaching. For Clements, it was something of a breakthrough – confirmation at last that the University values talents in teaching as highly as talents in research.

He goes way beyond the call of duty in his teaching role. He is one of the many academics at Bristol who somehow manage to fit outreach activity into their schedules, working with visually impaired people, stimulating secondary school pupils' interest in Maths, giving talks on knots and symmetry. It's clear that for him, being a good and committed teacher is a mark of the true scholar.

As if this weren't enough, Clements also volunteers as a bedell – a ceremonial officer – at the University's degree ceremonies, helping to make sure everything runs with the military precision he clearly enjoys. 'Not everyone sees the point of graduation ceremonies, but I reckon they're a great way of rounding off our students' time here. We all need a bit of ritual.'

Clements is coming up for retirement, but he is one of those people with boundless energy who is sure to keep up a bewildering range of commitments – one that would tie most of us up in knots.

'I've been used as an expert witness in a high-profile court case ... unconventional sexual practices seem to have been at the root of the matter.'

DAVE PRATT

Bristol in pieces

NICK RIDDLE

TWENTY QUESTIONS

Given half a chance, Kate Tapper, Staff Development Manager in Personnel Services, would ban plastic bags and be off to Cape Town.

What is your favourite meal? Choosing one food over another seems almost unethical, but right now it has to be Thai green curry.

Cat or dog? Or neither? Cat. I like dogs for their enthusiasm, but they smell and their hair gets everywhere. Cats are sleek and know their own mind.

Which historical figure would you invite to dinner? Oscar Wilde.

What do you sing in the shower? I must take up singing in the shower. I tend to write mental to-do lists in there, which is less fun. I'll start with something jolly.

Favourite smell? Freshly washed, line-dried bed-clothes.

Your greatest character flaw? I don't suffer fools gladly.

What keeps you awake at night? Worrying. I'm a dreadful worrier; as soon as I've finished one worry, another one sets in.

Native Americans believe we all have a Spirit Animal. What would be yours? A horse. I feel an affinity with their dual characteristics – watchful and anxious on the one hand, playful and free on the other.

Favourite spot in the world? A tiny mooring off the Aegean coast of Turkey where the sea and sky are blue and the restaurant owner comes and picks you up in a rowing boat when it's time for dinner.

Least favourite spot? Winterstoke Road traffic lights.

One book, one piece of music, one film. *Jane Eyre* (Charlotte Bronte), *Half the Perfect World* (Madeleine Peyroux), *Gladiator* (Ridley Scott).

Who would you like to banish to a desert island? Natasha Kaplinsky.

You can make one new law. What would it be? To make it illegal to own, use or peddle plastic carrier bags.

Your biggest life-changing experience (so far)? Supply teaching in Bristol schools. Nothing teaches tolerance and gratitude in the same way.

Something you wish you'd known about life when you were 18? That life is best enjoyed when you are fully absorbed in the moment, and not dreaming about the next thing.

'My philosophy is this …' All is well and all things will be well.

When and where were you happiest? Between 12 and 15 when I'd spend the entire summer holiday working at the local riding school, running wild with a pack of horse-mad East London girls.

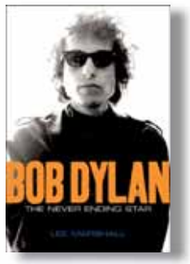
Where will you be ten years from now? Living in the country enjoying marvellous work–life balance.

How would you sum yourself up in one line? A happy, creative soul who gets excited about life.

Is there a question you'd like to be asked? 'Would you like these free airline tickets to Cape Town?'

THE PLUG

Bob Dylan: The Never Ending Star
by Lee Marshall (Polity)



It's not easy to come up with something original to say about the singer-songwriter who has been a major figure in popular music for five decades and the subject of countless texts, but Dr Lee Marshall of the Department of Sociology has done just that. *Bob Dylan: The Never Ending Star* provides new insight into the musician's career by focusing on him as a star. Dr Marshall discusses Dylan's emergence as a star in the folk revival and the formative role he played in the development of rock, as well as shedding new light on how Dylan's later career has been shaped by his earlier star image, leading Dylan to try repeatedly to throw off the limitations and responsibilities of his stardom. This study of the nature of fame has been hailed as 'a major contribution to studies of stardom and a provocative intervention into debates about the art and identity of Bob Dylan'.

THINGS YOU NEVER NOTICED
4. DR LEONARD P ANNECTENS

Visit the office of Dr Leonard P Annectens in Earth Sciences and you realise why he is listed as 'Departmental Lungfish'. It's because Dr Annectens is … well, a lungfish. Leonard arrived in 2004 after Dr David Hone (who has since left Bristol) bought him from a local pet shop. He is now looked after by PhD student Graeme Lloyd, who can attest that Leonard has a healthy set of gnashers: 'He managed to bite me once. But he can't move his teeth from side to side, so he has to spit his food out and suck it back in to move it around.'

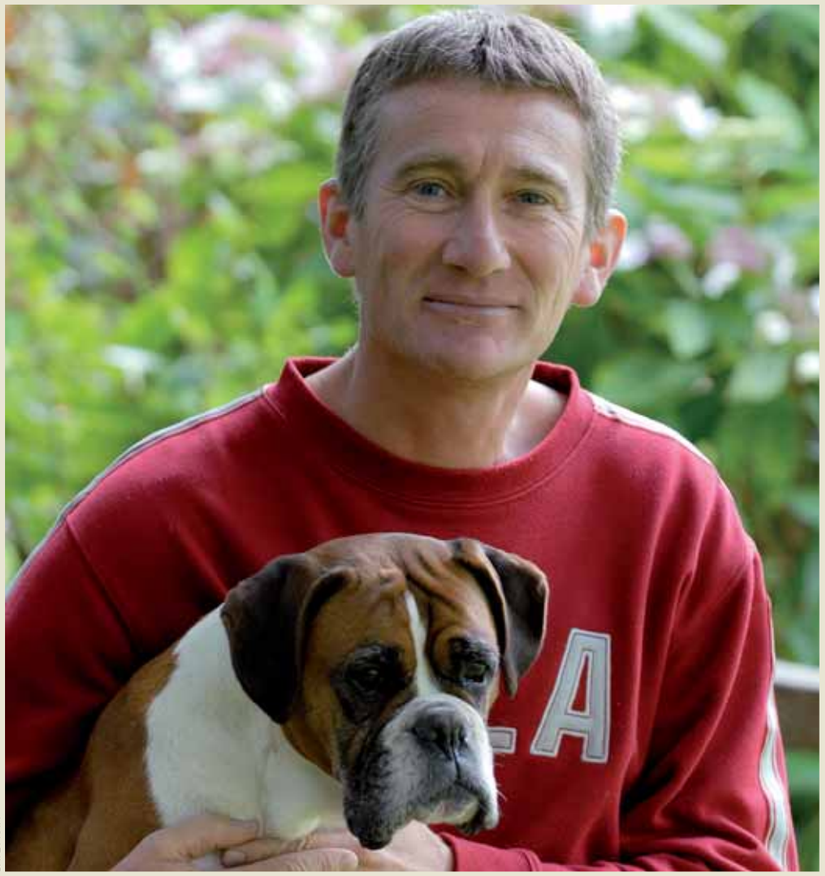
The African lungfish (*Protopterus annectens*) can live to at least 100 years old and is sometimes called a 'living fossil' because of its rather prehistoric appearance.

And yes, Leonard is just a pet. 'We're not doing experiments on him or anything,' says Lloyd, throwing a prawn or two into the tank – and keeping well clear of those teeth.

LIZ LOEFFLER

BEST IN BOXERS

Working in the Arts and Social Sciences Library is a cleaner who could tell you a thing or two about dogs. Dara O'Hare meets John Cormack, breeder and judge of boxers.



DAVE PRATT

According to John Cormack, to be a champion one needs to be 'agile, athletic, friendly and a little vain'. One could be excused for thinking that Cormack is describing a sports star, but he is in fact referring to Hot Champion Sugarwood Slave to Love Horace – or just plain Horace, his prize-winning and beloved boxer dog.

Cormack breeds and judges boxer dogs in his spare time. What started as a hobby at the age of 13 has developed into a full-scale passion that occupies most of Cormack's weekends and has taken him all over the world. He breeds championship boxers and judges and attends dog-shows up and down the country practically every weekend of the year. Many shows run over four days and Cormack finds the University's decent holiday allowance a big plus when planning his busy dog-show schedule.

'To win, a dog needs agility, good muscle tone, a friendly disposition, and maybe just a little arrogance.'

Asked what attracts him to boxers over other dogs, Cormack says 'they're loyal and friendly, and a great family dog'. He describes with obvious affection how his nieces and nephews learned to walk, holding on to a dog's collar. In the showground, he says, boxers are known as clowns for their comical expression, their ability to get into scrapes, their delight at running round in circles and their predilection for toys (the squeakier the better). So what about their tough exterior? Is it all a front? Not at all, says Cormack. Despite their silly side, they are extremely pugnacious and make excellent guard dogs, which is why the German police use them as police dogs.

Although Cormack breeds boxers mainly to show them, he occasionally sells any surplus pups in a litter and these have found new homes as far afield as the Caribbean and Scandinavia. One dog he sold to a buyer in Barbados is now the top stud and a show champion there, Cormack relates with evident pride.

He describes meeting other breeders at the weekly shows as comparable to family gatherings. Dog-breeders the world over are a close-knit and friendly bunch who stay in regular contact between shows. The showground is a great leveller, he says, where cleaners, minor royalty and captains of industry all share a common interest – a love of dogs and a desire to win.

To win, Cormack says, a dog needs agility, good muscle tone, a friendly disposition, and maybe just a little arrogance. And he should know, having won three championships over the past 21 years. This is quite an achievement, given that his dogs compete with about 250 other boxers at each show.

The ultimate goal for all dog-breeders is to win at Crufts, where Cormack has won second prize many times, as well as taking first prize a few years ago in the junior dog class with Hot Champion Sugarwood Slave to Love Horace. As for the origin of the name, Cormack explains that dog breeders can buy an affix, or kennel name, from the Kennel Club. In Cormack's case, this is 'Sugarwood' – 'more exciting than "John's dogs",' he explains. And Slave to Love? Well, it turns out John is a big Bryan Ferry fan …

Apart from shows in the UK, Cormack has travelled to Australia, Europe and the US, mainly to judge competitions. Becoming a judge is a rigorous process that takes 16 years to complete. Once a judge makes the grade, they can judge all over the world, thanks to mutual agreements between the UK and other countries. Cormack particularly enjoys shows in the US where dog handlers have the status of jockeys and can earn $80,000 a year. On the subject of Americans and their dogs, has Cormack seen the film *Best in Show*? He laughs; according to him, it's a pretty accurate portrayal of the dog-show world, with lots of recognisable archetypes.

Would he ever give up the day job and take up breeding full time? 'Not a chance,' says Cormack. He enjoys his job too much and likes having a hobby that fits in so neatly with his work schedule. In the meantime, he'll keep doing what he does so well and wait for that phone call from Crufts.

BODIES OF KNOWLEDGE

Bill Wrigley is Dissection Room Manager in the Department of Anatomy and the University's Body Bequest Officer. It's a job that has as much to do with life as with death, he tells Hilary Brown.

Many would balk at doing what Bill Wrigley does for a living. After 16 years of working in dissection rooms, he's used to the raised eyebrows and the references to *Crime Scene Investigation* (it's nothing like that, of course). He is perfectly at ease, though, in his role – at once down to earth, compassionate and humorous.

Wrigley came to Bristol as a graduate in applied biology and got a job as a histology technician in veterinary anatomy, preparing microscope slides of animal tissue for research. He began working in the veterinary dissection room as one of the few who was prepared to remove the tissue from the dead animals. Was it a shock, then, when he moved to the human dissection room in the Medical School and saw his first dead body? 'Not really,' he says. 'They did whip the sheet back in those days to test your reaction, but when you're used to doing post-mortems on horses it takes more than that to put you off.'

He would be lying, though, if he didn't admit to having some qualms about carrying out his first embalmment. 'We embalm through the femoral artery in the thigh, and to start with I had to keep the body covered up and just work on the leg. Once a corpse has been embalmed, it's much less life-like, but even so, the smallest thing, like an eyelash or a nasal hair, can unnerve you, because it reminds you that it's a real body.'

Wrigley has seen hundreds of corpses since then: as Bequest Officer, he is responsible for the 70-odd bodies accepted by the University each year for research or teaching purposes. But, while it is necessary to preserve some degree of detachment, he is far from blasé. 'I like to use the analogy of a hotel, where guests come and stay with us, we care for them for a while, then send them on their way – one stage on their journey to their final resting place.' Under the 2004 Human Tissue Act – this is a highly regulated area – bodies can be kept indefinitely, but at Bristol they stay for around three years. After this, Wrigley arranges for their cremation, in consultation with the families.

There is certainly no room for complacency when you're on call 12 hours a day, seven days a week, and enquirers run the gamut from bereaved relatives to prospective donors. 'It takes some getting used to when you get someone with a terminal condition who wants to discuss donating their body. I had one chap on the phone who was almost certainly going to die of syringomyelia, a rare condition where a cyst forms in the spinal cord. He did die of it, his body came to us as requested, and we now have the cyst displayed as a teaching specimen.'

Odd requests come in from time to time, such as the caller who wanted to be embalmed in honey: '"If it was good enough for the ancient Egyptians, it was good enough for me," he said! It took a while to persuade him that we don't do it like that any more. Then I get the occasional call from the bloke in the pub quiz who wants to know what the largest organ in the body is – I've no idea how they get my number.'

One hard lesson Wrigley has learned is that you are not necessarily dealing with people who have died of old age or disease. 'The worst time was when a colleague who was only 35 died in an accident. His body came to us, and it was incredibly difficult, as I'd only recently seen him round the precinct.' One of the things that helps in all cases, however, is knowing you're fulfilling the person's wishes.

In Wrigley's experience, people have all sorts of motives for donating their bodies. Some do so out of public spirit; some because they have suffered from a certain condition and want to further scientists' understanding of the disease (often cancer victims); and some because 'they think it's a waste to be buried', especially in these more secular times.

What makes Bristol different from other medical schools is that it is the only place in the country that accepts bodies for research as well as teaching purposes. This means that although Wrigley is responsible for donations in the South West, he sometimes takes bodies from further afield, when it is the person's wish that their body be used specifically for medical research.

It is the research element that is particularly rewarding for Wrigley. He has developed a 'soft embalming' technique especially for research purposes. The teaching bodies are embalmed in the conventional way, using formaldehyde, which makes them rigid, like manikins. Wrigley's 'soft' technique uses methanol, with the result that the bodies remain flexible, allowing surgeons to manipulate them as they would in real life. His anatomical knowledge is constantly being put to the test. 'I once worked out a way of displaying the nerve plexus, which you can't see in the standard cadaver. This had an impact on the way surgeons perform hysterectomies.'

Over the years, Wrigley, with the help of his colleagues, has built up the department's extensive pathology collection. During their training, students match up the sections of organs he has mounted in Perspex boxes to corresponding x-rays or digital images of soft tissue. The collection includes some ancient and unusual specimens, such as TB and glioblastomas (brain tumours), and Wrigley and his colleagues are intending to build up a full library of all body parts. He is part of the team that takes specimens out to schools in the department's mobile anatomy unit for widening participation events. The team will eventually take bodies out to other medical schools and that don't have the facilities Bristol has.

Would Wrigley donate his own body? 'Yes, but not to Bristol, because I would worry about what effect it would have on my colleagues. I'm not scared of death, as I have become so familiar with it, but this job has made me more aware of the impact of death on those around you. But if in death you can benefit the living, and add to the sum of medical knowledge, I believe it's a worthwhile thing to do.'

DAVE PRATT

... ARCHITECT OF THE INNOCENCE PROJECT

What Dr Michael Naughton does now seems a world away from what he did in his teens and twenties. But perhaps it's not so very different, as he explains to Barry Taylor.

I was born and brought up in Lancashire in a large, working-class Irish Catholic family. Our house was always full of extended family, with some staying for weeks, months or even years.

I should have gone to grammar school but the 11 Plus was scrapped and I went to a local secondary school instead, missing most of the first year due to rheumatic fever. I was put into lower sets, even though I'd had lessons during the three months I'd spent in hospital and hadn't missed any of my education at all.

When I was growing up, education didn't seem to have much value. My dad had left school when he was nine and got a job, my mum when she was 13, and they were doing all right. One day, after I asked for help with some homework, dad went to the school and told them it was their job to educate me – I never got homework again!

I was more than happy to leave school at 16 without a single O-level and start work, taking up an apprenticeship as a mechanical engineer. During the slump of the early '80s, I took the opportunities that came with redundancy to do some of the things I thought I'd missed out on. I did a season at Butlins and was a cocktail barman on a ship on the Thames and in Covent Garden. I did a lot of disco dancing all through this period and won many competitions. I was a bit like Billy Elliott and could probably have made a career of it, although you wouldn't think so to look at me now!

I also went to Israel to work on a kibbutz – something else I'd always wanted to do. It was there that I met my future wife. On our return to the UK, we set up home back in Lancashire where I got a job as a machine-shop foreman.

It dawned on me that if I was to progress in my career, I had to get better qualified. I exhausted all the opportunities that were available in Engineering at the local colleges and took A-levels in Maths and Sociology as well.

At a chance meeting in a hospital consultant's waiting room following an industrial injury to my back, my old A-level Sociology teacher sowed the seed in my mind that I could go to university. I was 32 when I started here at Bristol. I got a First in Sociology and went straight on to a PhD about miscarriages of justice, then to an ESRC postdoctoral fellowship.

I was 42 when I got my lectureship. I teach in both the Department of Sociology and the School of Law. My first book, *Rethinking Miscarriages of Justice*, comes out in September and I have a couple more in the pipeline. I'm regularly invited to speak to a range of audiences here and abroad about aspects of the criminal justice system.

I set up the University of Bristol Innocence Project to educate people about wrongful convictions and to be of practical help. It's the first such venture in the UK, involving about 25 Law students working on real cases where people who've been found guilty of crimes may actually be innocent. I founded the Innocence Network UK*, an umbrella organisation to support the establishment of similar innocence projects in other universities. There are seven active member projects working on cases; ten more are in the process of being set up.

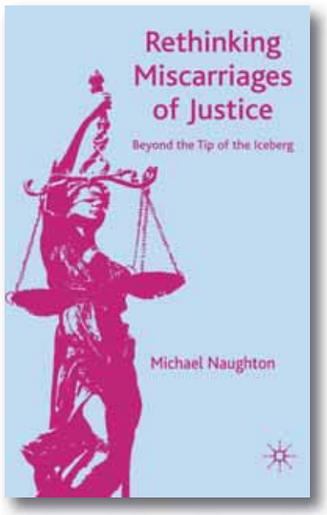
My work feels natural to me, connecting with my personal values and my history. When I started meeting victims of injustice and their families for my PhD research, I could identify with them. They, too, were predominantly working-class, poorly educated men. I couldn't treat them as just research subjects and walk away.

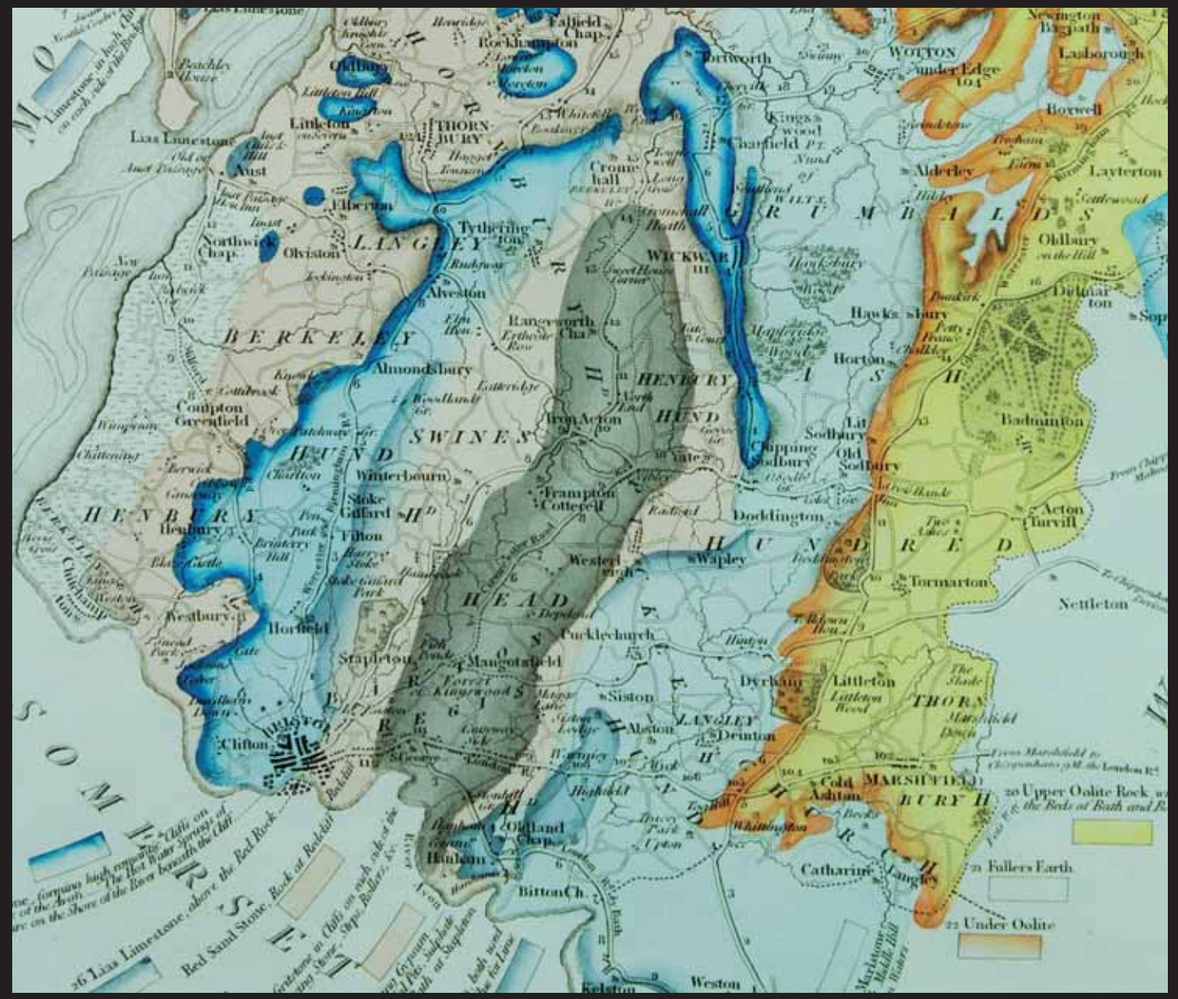
I believe sociologists who go out and investigate society's problems have an obligation to try to do something about them. Some people think I'm an activist and a troublemaker. I've even been called an enemy of the state. I see myself as a trouble shooter – I want to build confidence in the criminal justice system and help find solutions to some of the ills in society through rigorous academic research.

I was a maintenance engineer at one time. Now I see myself as a maintenance engineer for the criminal justice system, with the innocence projects as machinery for unearthing problems that need fixing.

* *You can read about the network at www.innocencenetwork.org.uk*

DAVE PRATT





ROCK OF AGES

The Eyles Collection is considered to be one of the finest accumulations of early geological publishing in the world. It formed part of the library of Dr Victor and Mrs Joan Eyles and was bequeathed to the University in 1986. One of its greatest treasures is a copy of the first-ever geological map to be published – William Smith's 1815 'Geological Map of England and Wales and Part of Scotland'. From particular assemblages of fossils, Smith (1769-1839) was able to demonstrate that the strata of England were deposited in a definite order and could be followed for hundreds of miles across the country.

Because of its size (six feet across by nine feet high), the map was printed as 15 separate copperplate engravings. The image above shows a section from the Gloucestershire map. The colour was added by hand. Note how the colour deepens and darkens towards the bottom of each formation, providing a three-dimensional feel. Roughly 400 copies of the map were printed and signed by Smith, but only 100 are known to still exist.

Endnotes

1 Running the Safaricom Marathon through Lewa Wildlife Conservancy in Kenya. A team of 12 people from Bristol – including Karen Harvey of the Centre for Sport, Exercise and Health and students Richard Williams, Oli Mott and Nick Young – took part in this year's event to raise funds for a community sport project at a school in Lewa. It is the only marathon run within a wildlife game reserve and located at an altitude of 5,500 feet above sea level. Team Bristol exceeded its fundraising target of £10,000.

2 On the set of the 2007 production of *The Room*. The first play by Nobel Prize-winning playwright Harold Pinter had its first production in the University's Drama Department in May 1957. To mark its 50th anniversary, Simon Reade, the then Artistic Director of Bristol Old Vic, re-staged the play last term in the Wills Memorial Building with a group of third-year drama students. The performances were supported by the Alumni Foundation.

3 'Fleeing Pompeian', by Beatrix Parnaby-Price, one of the runners-up in the 14 and over category of the Casts Project run by the Department of Classics and Ancient History. The project, which aimed to explore what the Roman disaster caused by the eruption of Vesuvius in 79CE means to us today, invited schoolchildren from across the country to enter a competition to create artworks inspired by the famous Pompeii casts. The winning entry in the 14 and over category was a poem by Emily Wright from Newcastle High School.

4 Recreation time at Badock Hall for pupils on the NAGTY (National Academy for Gifted and Talented Youth) Summer School. The summer school is aimed at pupils aged 11-19 who are in the top five per cent of the country's academic ability range. Many risk underachievement through low aspiration, lack of opportunity or financial circumstances and the academy aims to further their educational potential and development.

5 Bristol's very own buckyball – a large-scale representation of a carbon molecule – being installed on the roof of the University's new Centre for Nanoscience and Quantum Information. The molecule is so named as it resembles a geodesic sphere, a structure made popular in the 1940s by American designer Richard Buckminster 'Bucky' Fuller. The installation of the buckyball was part of the ongoing construction of the £11 million nanoscience building, which is due to be completed by spring 2008.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GRAHAM BURKE


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DAVE PRATT


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DAVE PRATT

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