

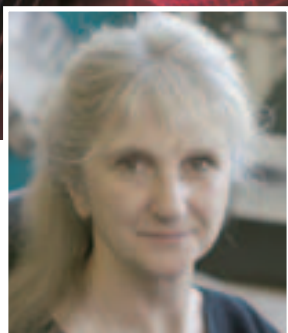


University of
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re:search

University of Bristol • Research Review • Issue 11 • March 2006

- **The Union Jack**
- **The pensions crisis**
- **The state we are in**



re:search

Learning from the past

The range of research topics covered by the University never ceases to amaze me. I discover new fields of investigation every time I visit a department looking for material to write about in this magazine. Consequently, for every issue I have to make hard judgements about what to include and what, unfortunately, must be left out. Resources are finite.

Due to the different nature of their research, the Science, Engineering and two Medical faculties produce by far the largest percentage of peer-reviewed research papers originating from the University, since research in the Arts Faculty tends to result in a book which, inevitably, has a longer time-scale before reaching publication. The Social Sciences and Law Faculty sits somewhere in the middle, producing both books and papers.

These proportions are roughly reflected in the pages of this magazine, which means that there are generally more articles about medicine, science and engineering than arts, social science and law. But on occasion, the balance has been felt to be a bit unfair with the Arts Faculty, in particular, getting rather limited exposure. This edition attempts to redress the balance, with half the articles coming from the Arts Faculty and another being on an arts subject (history).

The consequent mix of articles has proved very interesting, not only for their content but because we find, for example, an historian writing about the pensions crisis – a topic considered to be of great concern to *modern* society – and a geologist writing about the history of birth control. These two articles alone are excellent examples of what James Ladyman means when he says in 'The fads and fashions of academic life' that academic research always has been interdisciplinary. As history teaches us – nothing is new.

In 1796 the great French anatomist Georges Cuvier said: "It is only with the help of anatomy that geology can establish in a sure manner several of the facts that serve as its foundations." In the same vein Thomas Huxley, Darwin's great champion, said in 1869 that "Biology takes her time from geology". These different disciplines needed each other in order to progress – and the same is true today. It is therefore encouraging to see interdisciplinarity coming back into fashion, whether it is represented by the lone polymath or by a team of individual specialists.

Dr Cherry Lewis
Editor



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pre: view



The Union Jack

This year marks the 400th anniversary of the first raising of the Union flag.

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The scientific evidence is compelling that regular physical activity reduces the risk of premature death.

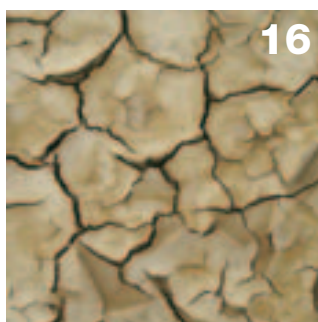
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The University's annual 'New Enterprise Competition' is one way of finding innovative new business ideas.

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The state we are in – understanding the life-cycle of soils

Are we robbing the future to pay the present?

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The Union Jack



This year is the 400th anniversary of the first raising of the Union flag. To celebrate this event,

The Union Jack: A History of the British Flag by Dr Nick Groom, Director of the Centre for Romantic Studies in the Department of English, will be published in 2006. It is a book about Britain and Britishness, as much as a book about the flag.

You can write the story of the Union Jack on the back of an envelope. The cross of St George, which stands for England and its principality, Wales, was in 1606 interlaced with the Scottish saltire (a saltire is a cross with diagonal bars of equal length) of St Andrew to act as a common flag for the two kingdoms united under the crown of James VI of Scotland, who later became James I of England. When Ireland joined the Union in 1801, the red saltire of St Patrick was added, offset or 'counter-changed'. Hence, in the upper corner nearest the flagpole (the canton), the broad white diagonal should always lie above the red diagonal, unless the flag is being flown upside-down to indicate distress.

Saint George's early reputation was as a 'megalomartyr'

Nick Groom's book begins in Roman times with tattoos, which were the insignia worn by the Ancient Britons. Attention then focuses on the dragon standard as an early emblem of union in the popular imagination – most famously as the golden dragon of Wessex. The dragon standard fell at the Battle of Hastings in 1066, but was carried into battle by English armies until the 15th century. It was flown alongside increasingly elaborate heraldic devices, which form what is essentially the 'prehistory' of the Union Jack. Heraldry

developed as a visual sign system to identify one's family and lineage.

The three crouching lions were established by Richard the Lionheart as the royal arms of England. They were then 'quartered' with the *fleurs-de-lys* of France to indicate the English claim to the French throne – a claim that was part of the British royal title until as late as 1801. The harp of Ireland became part of the royal coat of arms when Henry VIII declared himself 'King of Ireland', and the red lion of Scotland was, of course, added by James. All of these national emblems remain in extensive use today: for example, as the three lions on England's football jerseys and cricket sweaters.

Alongside the fantastical world of heraldry, the crosses of the three patron saints each have their own story. The bloody cross of St George was associated with the saint because of his early status as a 'megalomartyr'. Long before the episode with the dragon entered his legend, he was depicted as a martyr among martyrs, tortured and executed only to be resurrected and come back for more, eventually being crucified. The St Andrew's cross, a silver saltire on blue allegedly represented the diagonal cross on which St Andrew died, but it was also the omen seen in the sky by the Pictish king Angus before he defeated a Danish invasion. The case of St Patrick is somewhat different: his red saltire derived from a badge of the Geraldines, ancient kings of Ireland, that by the 16th century was being used by the Earls of Kildare to rally the Irish in rebellion against the English. Come the 1801 Act of Union and the need for the second Union flag – the one familiar today – it was apparent that the cross of St Patrick could be readily assimilated into the interlaced design of St George and St Andrew. →



→ In the 19th century, the Union Jack became a globally recognised symbol for trade, colonialism, and the values of the British Empire. Unusually for a national flag, there were never any official stipulations regarding the dimensions, or even colours of the flag, and it is only at sea that there is any sustained respect given to its fabric. Neither are there restrictions on the use of the flag by private citizens. Since the 1840s, there have been Union Jack handkerchiefs and Harrods has been using Union Jack wrapping paper. It was both a sacred symbol – flying defiantly, for example, for three months over besieged Lucknow during the Indian Mutiny in 1857 – and a household knick-knack. Dozens of music hall songs were sung (Groom's favourite being 'My Girl's a Union Jack Girl', which compares the attractions of a young lady to the colours of the flag), there were Union Jack marches and polkas, and it was used to advertise anything that could reasonably be described as British.

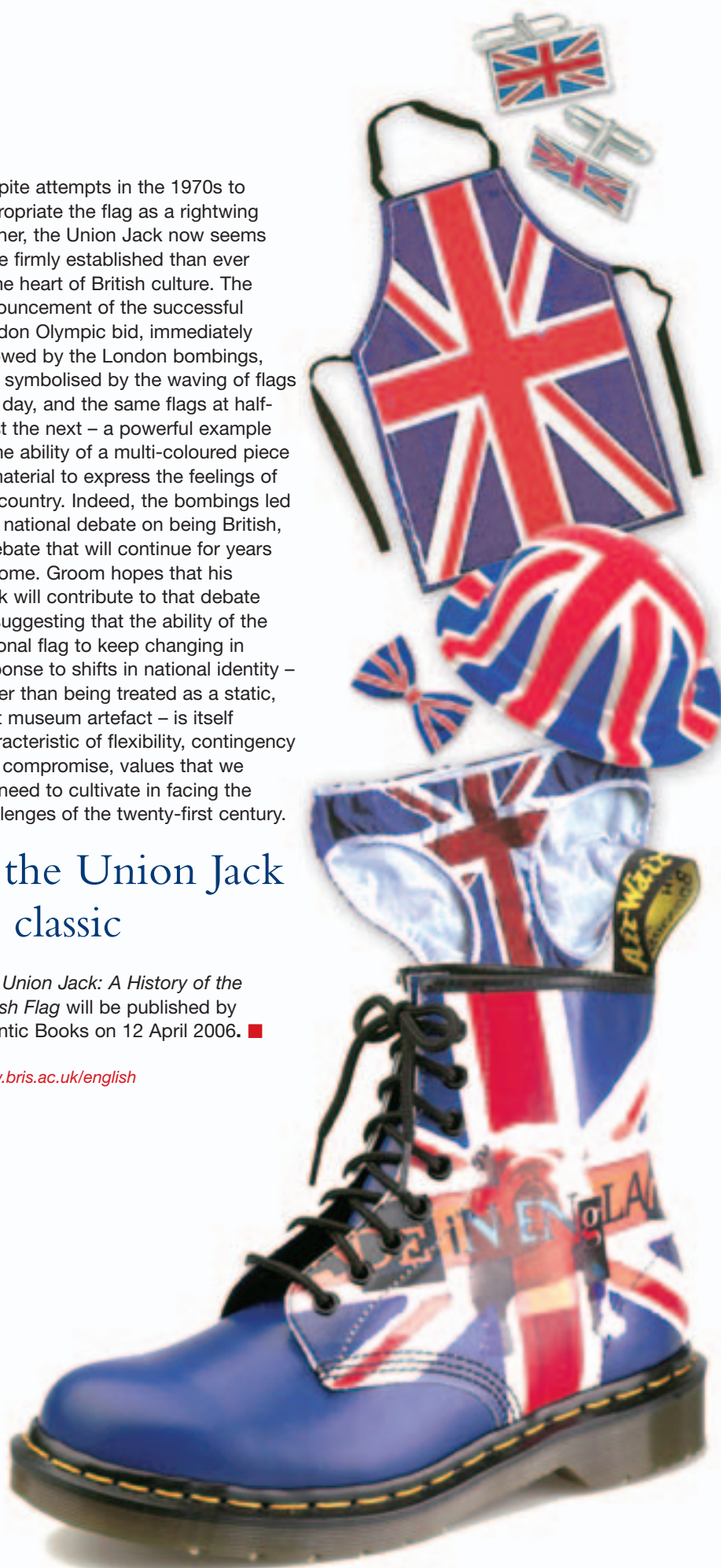
Despite attempts in the 1970s to appropriate the flag as a rightwing banner, the Union Jack now seems more firmly established than ever at the heart of British culture. The announcement of the successful London Olympic bid, immediately followed by the London bombings, was symbolised by the waving of flags one day, and the same flags at half-mast the next – a powerful example of the ability of a multi-coloured piece of material to express the feelings of the country. Indeed, the bombings led to a national debate on being British, a debate that will continue for years to come. Groom hopes that his book will contribute to that debate by suggesting that the ability of the national flag to keep changing in response to shifts in national identity – rather than being treated as a static, inert museum artefact – is itself characteristic of flexibility, contingency and compromise, values that we will need to cultivate in facing the challenges of the twenty-first century.

By the 20th century, the Union Jack had become a design classic

By the 20th century, the flag had become a design classic. Although its totemic significance continued throughout two world wars, it was also a domestic commodity. In the 1950s, questions were asked in the House about the suitability of 'Coronation ladies underwear, ornamented with the Union jack at the rear'. Commentators pointed out that the American Stars and Stripes was protected by laws regarding the desecration of flags, but not so the Union Jack. It became a Carnaby Street favourite: Mods wore jackets made out of Union Jacks, and a decade later punks were cutting up the flag and rearranging it. Since then, the flag has been flown by Freddie Mercury, the Spice Girls, and Iron Maiden. And it continues to be reinvented as a fashion icon: a trip down any High Street will reveal dozens of instances of Union Jack design.

The Union Jack: A History of the British Flag will be published by Atlantic Books on 12 April 2006. ■

www.bris.ac.uk/english





Far left: Professor Nigel Franks
Left: Dr Pru Foster

Science that

Ants teach each other a lesson

Research by Professor *Nigel Franks* and *Tom Richardson*, reported in *Nature* 12 January 2006, provides evidence that ants can teach.



Certain species of ant use a technique known as 'tandem running' to lead another ant from the nest to a food source. Signals between the two ants control both the speed and course of the run. It is believed to be the first time a demonstration of formal teaching has been recognised in any non-human animal.

According to the accepted definition of teaching in animal behaviour, an individual is a teacher if it modifies its behaviour in the presence of a naïve observer, at some initial cost to itself, in order to set an example so that the other individual can learn more quickly. But Franks believes that true teaching must also involve feedback in both directions between the teacher and the pupil. In other words, the teacher provides information or guidance for the pupil at a rate suited to the pupil's abilities, and the pupil signals to the teacher when parts of the 'lesson' have been assimilated and that the lesson may continue.

Tandem running in *Temnothorax* ants meets all these criteria and thus qualifies as teaching. At the start of a tandem run, the leader finds an individual who is willing to follow her. But tandem runs are rather slow because the follower frequently

pauses to look round for landmarks so that it can learn the route. Only when the follower has done this does it tap on the hind legs and abdomen of the leader to let it know that the tandem run can proceed.

Tandem leaders pay a cost because they would normally have reached the food around four times faster if not hampered by a follower. But the benefit is that the follower learns where the food is much more quickly than it would have done independently. Tandem followers learn their lessons so well that they often become tandem leaders and in this way time-saving information flows through the ant colony.

The occurrence of teaching in ants indicates that teaching can evolve in animals with tiny brains. This behaviour indicates that it could be the value of information, rather than the constraint of brain size, that has influenced the evolution of teaching. ■

www.bio.bris.ac.uk

Extinguishing frogs

Dr *Pru Foster*, from the Department of Earth Sciences, was one of a team of academics who reported in *Nature* 12 January 2006 on a direct link between climate change and the extinction of dozens of frog species in the pristine habitats of tropical America.

Seventeen years ago, in the mountains of Costa Rica, the Monteverde Harlequin Frog vanished along with the Panamanian Golden Toad. An estimated 67% of the 110 or so species of *Atelopus*, which are endemic to the American tropics, have met the same fate. The study in *Nature* reports compelling evidence that global climate change creates favourable conditions for a pathogenic fungus in Central and South America which affects the frogs' skin. The infection has been implicated in widespread extinction.

The team has shown that the timing of the extinctions in the *Atelopus* correlates with observed temperature trends. These trends favour the growth of the infectious disease *Batrachochytrium*, which in turn kills the frogs.

Analysing the timing of extinctions in relation to changes in sea surface and air temperatures, the authors conclude with 'very high confidence' that large-scale warming is a key factor in the disappearances. They propose that temperatures

Panamanian Golden Toad



at many highland localities are shifting towards the growth optimum of *Batrachochytrium*, thus encouraging outbreaks. With climate change promoting infectious disease and eroding biodiversity, the urgency of reducing greenhouse-gas concentrations is now undeniable. ■

www.gly.bris.ac.uk



hit the headlines

The marula myth

Dr Steve Morris, from the School of Biological Sciences, and his colleagues say it is just a myth that elephants get drunk by eating the fermented fruit of the marula tree.



Although there are travellers' tales from about 1839 reporting Zulu accounts that 'elephants gently warm their brains with fermented fruits', there is nothing in the biology of either the African elephant or the marula fruit to support the stories.

The marula tree, a member of the same family as the mango, grows widely in Africa. Its sweet, yellow fruit is used for making jam, wine, beer and a liqueur called Amarula. But the first flaw in the drunken-elephant theory is that it is unlikely that an elephant would eat the fruit if it were rotten. Elephants eat the fruit right off the tree, and will sometimes push them over to get at the fruit, even when rotten fruit is on the ground.

If fermented fruit on the ground is out of the question, so too is the notion that the fruit could ferment in the stomach of elephants, the study authors say. Believers of the drunken-elephant lore have often

supported this theory of internal fermentation, but food takes between 12 and 46 hours to pass through an elephant's digestive system, which is not enough time for the fruit to ferment in the stomach since in elephants this process occurs in the 'hind-gut'. Moreover, in the hind-gut sugars within the diet are turned into fat before they can ferment into alcohol.

It is conceivable, the authors concede, that some small amount of ethanol could be produced in an elephant's digestive system, if its diet were rich enough in both yeast, which is necessary for fermentation, and fruit. Even in the unlikely event that these things happened, it's still highly improbable that the food would produce enough alcohol to make an elephant drunk. Through calculations of body weight, elephant digestion rates, and other factors, the authors conclude that it would take about 1.9 litres of ethanol to make an elephant tipsy.

Assuming that fermenting marula fruit has an alcohol content of 7%, it would require 27 litres of marula juice to come up with that 1.9 litres of alcohol. Producing a litre of marula wine requires 200 fruits. So an elephant would have to ingest more than 1,400 well-fermented fruits to even start to get drunk. Even then the elephant would have to ingest the alcohol all at once, otherwise its effects would wear off as quickly as the alcohol was metabolised.

It may make for a good story and a durable myth, but the science suggests that you are unlikely to see a drunken elephant sitting under a marula tree. Morris contends that it is because elephants display many behavioural characteristics viewed as positive traits in humans that we often identify with them in anthropomorphic ways. Or it could simply be that people just want to believe in drunken elephants. ■

www.bio.bris.ac.uk



Professor Martin White

Performing knowledge exchange

Knowledge transfer, especially between academic research and the needs of industry, is currently high on the agenda of bodies that fund research in universities. However, *Martin White*, Professor of Theatre in the Department of Drama and Provost of the Institute for Advanced Studies, prefers the term *knowledge exchange*, as he thinks it better captures the sense of mutual benefit.

The Great Western Research (GWR) project is a five-year, £14 million initiative which aims to catalyse and drive research collaboration between south west higher education Institutions and industry partners in five designated areas – one of which is Creative Arts. Martin White – chair of the GWR Creative Arts theme panel – is currently involved in a number of

research projects that link to creative industry partners.

White's research focuses on the drama and theatre produced by the commercial playhouses and acting companies that operated in London in the late 16th and early 17th centuries, and the presentation of the plays in their time and our own. One recent project involved the creation of a full-

scale, candle-lit reconstruction of an indoor playhouse, based on 17th century drawings, held in the Library of Worcester College, Oxford, of an unidentified theatre. White's collaborators included designer Jennie Norman, professional actors, a film production company (that filmed on high definition cameras from four points in the auditorium) and the Globe in London (which dressed the actors

A recent project involved the creation of a full-scale, candle-lit reconstruction of an indoor playhouse

in costumes made using original techniques). The resulting interactive high definition DVD, which also contains interviews with scholars, new essays and web links, will provide new insights into performances lit by candles, torches and lanterns that White anticipates will alter theatre historians' understanding of these aspects of early modern theatre, as well as creating a unique research and teaching resource.

This project relates directly to his work at the International Shakespeare Globe Centre in London. The reconstruction of →

The reconstructed indoor Jacobean playhouse in the Wickham Theatre.



→ an Elizabethan open-air playhouse, which opened in the mid-1990s, was an immense interdisciplinary research project. It involved scholars, architects, archaeologists, builders and theatre artists, and resulted in the largest polygonal timber-framed building to be erected in England since the 17th century. The Globe – which receives no subsidy but is, like its illustrious namesake, a commercial theatre – continues to put research high on its list of priorities. White chairs the international research group, with a remit to advise the Globe's trustees on the priorities for developing the theatre and to provide the information on which those developments are to be based.

For example, in the light of new research, the group is considering questions related to possible alterations to the structure of the Globe itself and trying to decide on the decorative scheme for the interior of the theatre. In addition, it has to take key decisions on the completion of the indoor playhouse that will stand alongside the Globe, and which is to be based on the Worcester College drawings. The shell is already built, but complex questions remain regarding the interpretation of the drawings, which the work done in Bristol will help to answer. In addressing the issues, the group has to sift the evidence and, from its members' different points of expertise, conclude a plan. But while a theatre history book can always be revised or replaced by another book, a theatre, once built, is very expensive, perhaps impossible, to alter. However, the historical evidence for early theatres is limited, and ideas that find physical realisation in any reconstruction can imply a greater certainty than the necessarily speculative scholarship can justify. Nevertheless, the groups needs to try to provide the firm answers that builders and craftspeople rightly demand.

The second area of White's work relates to how the plays of Shakespeare's time are presented on the modern stage. In 1827, the essayist and poet Charles Lamb observed that about two-thirds of extant plays from the time of Shakespeare were still generally unknown, and though the number

in print has increased, the number of plays performed on the professional stage is still comparatively small. For many years, in the Wickham Theatre in the Department of Drama in Bristol, White has directed a series of less well-known Elizabethan and Jacobean plays, partly to try to expand the narrow range of plays from that period that still form the repertoire as well as the syllabuses of schools and many universities.

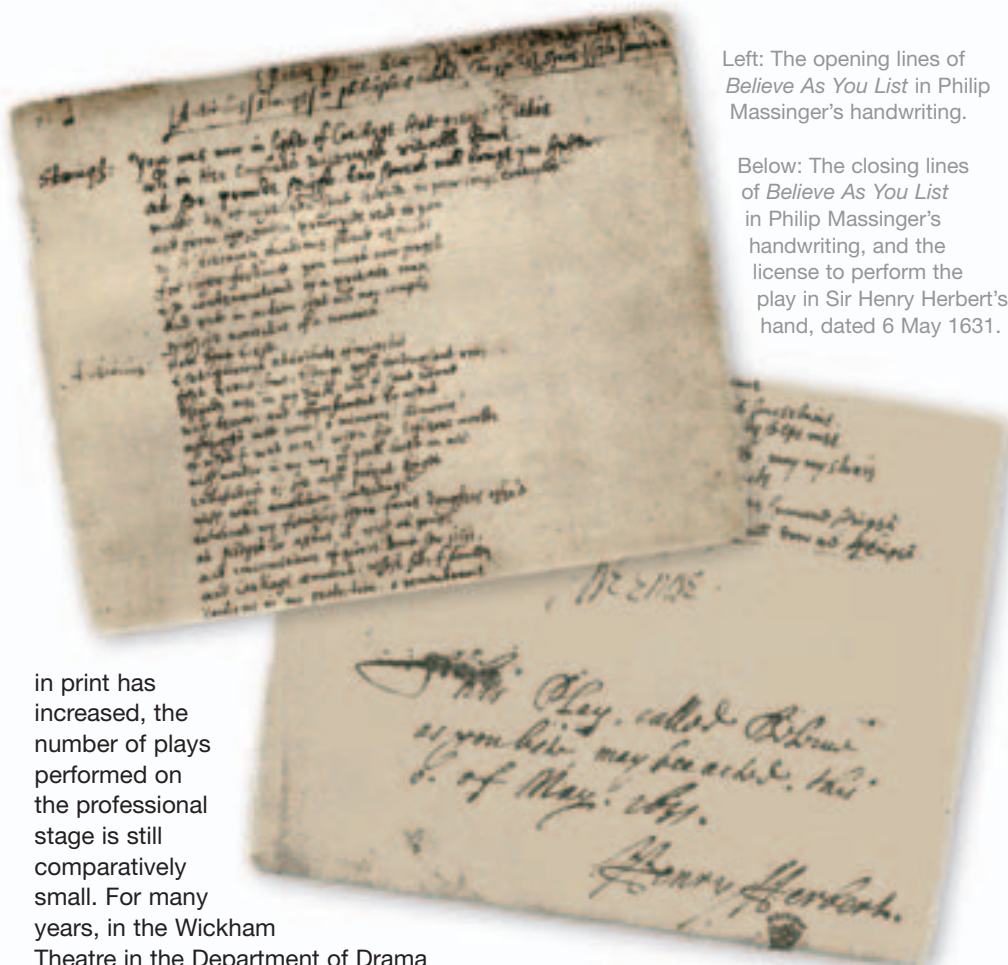
In 2002, Greg Doran, Associate Director of the Royal Shakespeare Company (and a former student of White's) invited him to help devise a season at the Swan Theatre in Stratford, drawing on the knowledge White had gained from years of directing and writing about early modern plays and assessing their theatrical potential. Among his suggestions White included a 1626 play by Philip Massinger, *The Roman Actor*, which he had earlier staged in Bristol and was about to edit. It proved one of the hits of the season. In exchange, access to the rehearsal process enabled White to test his own understanding of the play as a play against the company's engagement with it, with obvious benefits to the published edition.

Last year, Doran invited White to act as consultant to the whole 2005-06 Swan season, working to establish the

texts for performance, provide contextual information for the different directors and casts, and write or oversee the extensive programme material. His suggestions included another Massinger play, *Believe As You List*, that White had also directed in Bristol, in 2001, the first known production since the 1630s. Never printed in its own time, it survives in a manuscript in Massinger's own hand, although some key parts of the play have been destroyed over time. Working with a poet, Ian McHugh, who created new text to replace what was lost, White prepared a new, modernised performance text for the RSC. This text (retitled *Believe What You Will*), with White's introduction, was published by Nick Hern Books to coincide with the production.

In these ways, White's research contributes to and influences the decisions and activities of two major, international theatre companies, while his own work is palpably enhanced by his engagement with those professional practitioners – an exchange of knowledge that is to everyone's benefit. ■

www.bristol.ac.uk/ias/martin-profile.html
www.bristol.ac.uk/drama



Left: The opening lines of *Believe As You List* in Philip Massinger's handwriting.

Below: The closing lines of *Believe As You List* in Philip Massinger's handwriting, and the license to perform the play in Sir Henry Herbert's hand, dated 6 May 1631.



Dr Hugh Pemberton

Back to the future: history and the pensions crisis

Last summer, Dr *Hugh Pemberton*, from the Department of Historical Studies, co-organised a conference at the British Academy. It brought together leading experts to debate the makings of Britain's pensions crisis and the way forward, along with policy-makers, representatives from the financial services sector, think-tanks, pressure groups and trade unions. Here he reports on some of their findings.

The problem of security in old age is amongst the most urgent political issues in Britain today. It seems to be generally accepted that we face a major crisis over the next few decades which is largely the product of our ageing population, but

But if we are to craft and implement such a settlement, we would be well advised to understand better how the present crisis has arisen. And to do that, we need better to understand the history of British pensions over at least the past half-century.

became increasingly complex and increasingly inefficient. This has implications for those seeking to defuse the pensions crisis. Firstly, much of the complexity is 'locked-in' by contracts that are expensive to break. This constrains options for

| We face a major crisis over the next few decades

also of the complexity and inefficiency of the current arrangements. The Pensions Commission (set up by the Government to examine the problem) recently concluded that 'major reform of the UK pension system is needed to create a new settlement for the twenty-first century'.

The importance of history

In crafting its proposals for change, it is notable that the Pensions Commission found itself highly constrained by history. So it's perhaps surprising that the Commission's recent report devoted only two of its 460 pages to any consideration of how the present systems developed. In fact, a notable feature of the current pensions debate is a persistent failure to consider the roots of the pensions crisis as well as possible solutions to it. An important reason why history matters is that pensions embody very long-term contracts (sometimes implicit but often explicit). This has not fitted well with the short-term nature of British politics.

Within the constraints of past decisions, changes proved relatively easy for governments to make, since the costs would not come home to roost for a long time. The result was a major 'reform' of the system at least once a decade after the end of the Second World War. But each change left a very long-term legacy. Consequently, over time the system

change. Secondly, an important lesson from the past is surely that we need to avoid short-term fixes and build a solution flexible enough to avoid the need for further reform for some time to come.

Let us consider three examples of how historical legacies are shaping the present crisis, and shaping solutions.

History and the state basic pension

We tend to think of our national insurance contributions building up a fund out of which our basic state pension will be paid – as Beveridge proposed in his famous 1942 report *Social Insurance and Allied Services*, the foundation stone of Britain's postwar welfare state. In reality, this is not the case. When the National Insurance Pension was implemented in 1946, the then Labour government judged it politically impossible to pay anything but a full pension to new retirees who had suffered the privations of the 'hungry thirties' and the Second World War. It therefore decided to drop Beveridge's proposal that there be a 20-year transition to →



→ full pension rights and effectively shifted to paying pensions out of taxation. But this move was concealed from contributors, who continued to believe that their contributions would build up a fund out of which a future pension would be paid.

This had far-reaching consequences. For one thing, since it would be funded out of current taxation, governments now had an incentive to keep the state pension as low as possible. At the same time, in the minds of British workers the idea was created that a firm financial contract existed between them and the state in respect of 'their' pension – an illusion which persists today. This explains why a basic pension that is insufficient to keep people out of poverty endured, and so explains an important element of the present crisis. Furthermore, despite the inadequacy of that pension, the implicit contract embodied within it has limited the Pensions Commission's room for manoeuvre. The public expenditure implications of shifting everyone to a better deal led the Commission to back away from advocating a single unified state pension, bringing together the existing state basic pension and the earnings-related top-up.



The political costs of transferring a substantial amount of money from men to women are very high

Women and pensions

One might also cite the role of history in creating a pensions system that profoundly disadvantages women. This is also the product of the past – of a world in which the 'family breadwinner' was assumed to be male and the earnings of women were 'pin money'. Of course, that world has (largely) gone, but those old assumptions shaped the present position. And because the *financial costs* of addressing such discrimination, and the *political costs* of transferring a substantial amount of money from men to women are very high, history again imposes limits on the options available to today's policy-makers.

Back to the future

Finally, and remarkably, neither the Commission, nor any of the

enormous volume of comment that has followed its second report, seems to have recognised the historical resonances of its proposals for a new National Pensions Saving Scheme with funds invested in the stock market. There is much to be said for the proposal, but the historical auguries are not good. The idea is reminiscent of Labour's 'National Superannuation' proposals in the late 1950s – a scheme rejected by the electorate in 1959 after a successful campaign by the financial sector to label it as 'nationalisation by the back door'. There are signs of a similar response developing amongst pensions companies today but, if the scheme is to be implemented, the Pensions Commission needs to recognise the lessons of the past and devise a system that removes direct control of the funds from government.

So, history matters. And our lack of understanding of that history matters. If we are to craft an effective and enduring solution to the pensions crisis, we have to understand how history has shaped that crisis; we have to learn the lessons of history (not least the very long-term consequences of decisions taken for short-term political advantage); and we have to recognise the ways in which history has closed off some of our policy options.

The proceedings of the conference, *Britain's Pensions Crisis: History and Policy*, will be published by the British Academy in September 2006. ■

www.bris.ac.uk/Depts/History



Dr Howard Falcon-Lang

Passionate about palaeobotany

What does the female orgasm have to do with fossil plants? The answer is, of course, Marie Stopes (1880-1958) – controversial author of *Married Love*, the first sex manual for women, birth-control pioneer, and err... geologist! So who was the scientist behind this sexual revolutionary? Dr *Howard Falcon-Lang* from the Department of Earth Sciences visited her most famous fossil site in eastern Canada to find out.

Marie Stopes was one of the most flamboyant and influential figures of the 20th century (*Guardian* readers voted her Woman of the Millennium in 1999). Her landmark sex manual, *Married Love*, was nearly never published. On receiving the manuscript, one prospective publisher responded

that if women demanded too much in the bedroom, they wouldn't find a husband at all (it was, after all, the First World War and men were in short supply). She later courted huge controversy over her birth-control clinics (the Catholic Church, in particular, argued that they would surely undermine the fabric of decent

society). Indeed, in 1940, an Australian MP made the extraordinary claim that the British Empire had three enemies – Hitler, Goebbels and Stopes – and the greatest of these was Stopes!

Despite her international renown, few people realise that Stopes's initial training was in geology, and specifically in palaeobotany (the study of fossil plants). With a distinguished scientist for a father and a well-known feminist for a mother, there must have seemed an ironic inevitability to the way her bipolar career unfolded.

In 1901, she accidentally gained first class honours degrees in both geology and botany after only two years of study at the University of London (she had entered for the exams a year early as a practice run for her finals). A period of doctoral research in palaeobotany then followed at Munich University. By 1910, the year when her popular textbook *Ancient Plants* hit the bookshelves, she was already widely acclaimed as the rising star of British geology, aged only 30. ➔



REPRODUCED BY KIND PERMISSION OF HER SON, HARRY STOPES-ROE.



The Fern Ledges of Saint John, New Brunswick.

shrinking violet, Stopes took a clear and outspoken stance against this widespread but dubious practice, declaring it simple fakery. Even more significantly, she was careful to separate observation from interpretation, which is the essence of good scientific method.

Unlike many female scientists of her era who lived in the shadow of men, often failing to get the recognition they deserved, Stopes dominated her field from the outset. She left geology at the height of her powers, and by her own choice; even before the ink was properly dry on her Fern Ledges monograph, she was moving into radically different spheres. Hot on the heels of her sex manual in 1918, her first birth control clinics opened in London in the early 1920s – the most enduring of her many legacies. Some have snidely argued that she used her doctorate in palaeobotany to tacitly provide medical credibility for these advice centres; more likely, I suspect, she just let others make their own assumptions.

In the same year that Stopes worked at Fern Ledges, another young palaeobotanist, Walter Bell, was cutting his scientific teeth at Joggins, a fossil site a little further around the Bay of Fundy in eastern Canada. Bell rose to be one of the leading palaeobotanists of his day, but none of his many monographs matched Stopes's work for quality. One cannot seriously talk about missed opportunities when discussing an iconoclastic figure like Marie Stopes, but it is only natural to wonder what she might have achieved had she devoted her whole life to geology. Equally, of course, I wonder what kind of society we might live in today, if she had. ■

www.gly.bris.ac.uk
www.geolsoc.org.uk/hogg



→ In 1911, Stopes became embroiled in a geological controversy concerning a fossil site in eastern Canada known as Fern Ledges. Hewn by the world's highest tides on the Bay of Fundy,

was paid for by a Matthew Fellowship, the legacy of George Frederic Matthew, a Canadian geologist who had consistently opposed Stopes's conclusions.

Few people realise that Stopes's initial training was in geology

these beds of primeval rock had yielded some of the oldest known remains of land animals and plants. But just how old were they? Did they date from the Carboniferous – the time when the coals were laid down – or were they part of a much older rock succession? This would have hardly mattered had it not been for the fact that opposing factions within the Geological Survey of Canada were openly confronting one another in print. This simply would not do, and so the powers that be brought in Stopes as a 'hired gun' to sort things out.

Stopes's Fern Ledges monograph was quickly recognised as a classic of its genre – as clear, incisive and influential today as when it was first published in 1914. It effortlessly sliced through decades of sloppy thinking, proving once and for all that these famous rocks were no older than the Carboniferous Coal Age. I have long been fascinated by Stopes, and in August 2005, was afforded the spine-tingling pleasure of undertaking palaeobotanical research at Fern Ledges myself. Ironically, the trip

Much remains to be discovered at the Fern Ledges, not just in the rocks themselves, but also in the writing of Marie Stopes. A recent conference on Women in Geology (28 November, 2005) sponsored by the History Group of the Geological Society of London (HOGG) gave me the opportunity to delve deeper into her work. Stopes must have been a hugely versatile thinker; in fact, she was finishing her Fern Ledges monograph at the same time as penning the first draft of *Married Love* – an interesting piece of multitasking if ever there was one. Nevertheless, there was clear continuity between the two works. As a piece of science, the Fern Ledges monograph was, in its own way, revolutionary – boldly challenging geological conventions.

One aspect that has particularly impressed me is the way that Stopes always 'told it as it is'. Science is meant to be impartial, but many of Stopes's palaeobotanical colleagues tried to improve their fossils by tweaking photographs or drawing extra details on specimens. Never a



The fads and fashions of academic life



Dr James Ladyman, a Reader in the Department of Philosophy, takes a critical and highly personal look at the latest trends in academia. Ladyman has just been awarded a prestigious Philip Leverhulme Prize 'for outstanding scholars whose work has already been recognised at an international level'.

One doesn't hear much praise these days for specialisation, individual expertise and lifelong obsession with the minutiae of some recondite area of knowledge. On the contrary, the fashion is 'interdisciplinarity', that is, academic research which crosses the boundaries of different disciplines. Given the hype that interdisciplinarity attracts, one might suppose that it refers to a startling new idea for researchers in different fields to talk to one another, or for a researcher in, say, history to inform their work by reading literature. But hasn't academic research always been about this?

Consider a specialist in, say, 18th century French painting employed in a department of History of Art. They will no doubt be familiar with earlier periods of French painting and with painting throughout Europe, but also with the history, politics, geography, philosophy, literature and even the science of the period. In other words, there is an infinite amount of information that is relevant to most

As we fill in grant forms, apply for jobs and promotion, and participate in quality assessment procedures – that sometimes seem as pointless as they are endless – we are given countless opportunities to emphasise our interdisciplinary credentials, and one cannot escape the feeling that someone who professes an interest in highly focused specialised research in a traditional academic discipline runs the risk of being regarded as some kind of dinosaur, ill-suited to the postmodern academy.

Along with treating interdisciplinarity as an end in itself, 'themes' are now being adopted by most universities in one form or another in an attempt to create a distinctive brand for each institution. After all, if you claim to carry out research in, say, history, literature and classics, you do not as such do anything to distinguish your identity in the marketplace from that of every other higher education establishment. However, we must not lose sight of the fact that research and teaching must be ongoing in all areas

There is something unsettling about the current obsession with 'interdisciplinarity'

academic research and it does not come neatly packaged into one discipline or another. Furthermore, there is something unsettling about the current obsession with 'interdisciplinarity' that may be to the detriment of some of those who are engaged in academic research of the highest quality, namely, that it is insufficiently acknowledged that interdisciplinarity cannot flourish on its own and that it must be anchored in specialist knowledge of something in particular.

of study whether or not they are currently hyped or fashionable, and themes that are currently in vogue, like nanotechnology, will be actively researched in very many places and no one university can lay claim to them. I am not suggesting that it is inappropriate to draw attention to what we do well; however, I am concerned that too much emphasis is placed on themes when they are such short-term features of a university's life. After all, if a few key members of staff go elsewhere, a theme can →

It is now routine for university documents to be laden with management-speak

→ collapse overnight, and if someone good is appointed in a new area, a new theme is *de facto* created. It would be folly indeed to allow themes to determine appointments and library provision, as opposed to always appointing the very best scholar, and maintaining library provision for all subjects, even those that are currently out of the limelight.

What concerns me most is the widespread abuse of language and thought now so prevalent in university life, and the willingness of so many academics to go along with it. It is now routine for university documents to be laden with management-speak. I once filled in a form so that a job could be advertised. Under the heading that referred to the main task of the employee I wrote 'to teach philosophy of science'. Someone from personnel phoned the Head of Department to say this lacked content to the point of sounding sarcastic. When the Head revised it to say 'to contribute to the delivery of our programmes in philosophy of science', that was considered fine. So what we have is empty words being mistaken for content. Academics are supposed to be the guardians of clear thought and expression – not to collude in obfuscation.

We are also required to produce endless lists of marking criteria, supposedly in the name of accountability and rigour in assessment procedures. The thought must be something

like this: 'We can't have university teachers just giving marks for essays because that appears to be a totally subjective process. If there are some implicit reasons for the marks given we ought to be able to make them explicit and hence ensure the transparency of the marking process'. This seems reasonable for about half a second until one realises that of course those criteria must be applied, and if the original demand for criteria was legitimate, one might wonder what the criteria for their application is, and so on. Ultimately, we use our judgement and as an examiner at whatever level, I only need to know the following to do this: what is the pass mark, and what mark does really distinguished work get? I am much more confident of my ability to mark work on this basis than I am of my ability to apply the supposed marking criteria. In practice, reference to marking criteria is always a post hoc rationalisation that wastes time and belies the real nature of assessment. The ineliminable need

for academic judgement should be emphasised not disguised.

Like schoolteachers, academics find themselves in Trotskyesque nightmare of permanent revolution. We are often asked what we have done that is 'innovative', for example, in respect of teaching methods. The idea that the basic model of teaching via lectures, seminars and tutorial feedback on written work is incapable of improvement seems never to have been considered. It may be useful to use virtual learning environments and the like as a supplement to traditional methods, but it ought to be acknowledged that one can be an academic of the highest quality without ever doing anything particularly innovative in respect of teaching methods. Research in so far as it genuinely advances the state of the field is *ipso facto* innovative, and so, therefore, is teaching based on it. ■

www.bristol.ac.uk/philosophy





Professor Ken Fox

Health regeneration

The scientific evidence is compelling that regular physical activity, even at moderate levels, reduces the risk of premature mortality and of developing various chronic diseases. Professor **Ken Fox** and his team from the departments of Exercise and Health Sciences, Social Medicine and Education, and Middlesex University, looked at whether our health can be improved by improving our environment.



The cycle track before, during and after regeneration.

The current UK National Strategy for Neighbourhood Renewal includes improving health as one of its key outcomes. The study therefore examined the attitudes of residents and users of an area undergoing regeneration to the possible health benefits of a planned renewal. The area in question lies in one of the most deprived wards in the UK. The proposed regeneration included the creation of a home zone – a street system designed primarily to meet the needs of pedestrians and cyclists that opens up the outside space for social use – and an extension of the National Cycle Network (NCN) into the neighbourhood.

Four groups were canvassed – adult residents, school children, adult students and tutors from a college in the area, and local authority planners. Whilst similar themes emerged in each of the groups, the team also found important differences in their attitudes. A clear mismatch in the perspectives of the planners and residents existed, particularly relating to the benefits of the NCN.

Primary school children perceived their current neighbourhood as dirty and unsafe, and antisocial as a place for outdoor play. Since it is known that active children are more likely to remain active as they grow up, addressing their safety concerns by introducing traffic calming and play areas would be likely to help them maintain levels of activity in the future. Adult residents, however, were mainly concerned about their own personal

car parking space and were worried that the NCN might bring in outsiders and increase vandalism and crime in the area. Participants from the local college shared the residents concerns, but did see some potential for increased physical activity from the new development. Planners expressed some frustration with the residents' 'obsession' with car parking in front of their house and felt that overall the new development would make the neighbourhood safer and provide a healthier environment.

However, the planners' assumption that an improved environment would convince users that their lives would be enhanced was not found to be the case, since those interviewed felt that it failed to address (and possibly exacerbated) their most pressing concerns relating to fear of crime and antisocial behaviour. Furthermore, the potential impact of the development on physical activity opportunities was not considered central to any of the four groups. Although consultation was carried out with this community, a mismatch in perceptions still remained, suggesting planners need to be more receptive to the concerns and opinions of the community.

Professor Fox has recently been awarded a grant by the National Prevention Research Initiative (NPRI) to study *Profiles of physical activity in older adults*. The NPRI funding targets conditions that affect or kill thousands of people every year in the UK, and millions worldwide. ■

www.bris.ac.uk/ehs

Entrepreneurship news

New Enterprise Competition

The University's annual 'New Enterprise Competition' is one way of finding innovative new business ideas. Open to staff, students and recent graduates, it aims to inspire new high-growth business and to stimulate entrepreneurial talent. The winners are announced at the University's annual dinner to celebrate innovation and enterprise, which is attended by representatives from business, industry, government and academia.

Run by the Research and Enterprise Development (RED) department of the University, the entries are judged by a panel of experts from the sponsoring organisations and the winners are awarded cash prizes as well as support to help bring their ideas to the marketplace. In 2005 the competition was supported by RED's corporate sponsor group – Business West, Deloitte, Fortis Bank, Osborne Clarke, ST Microelectronics and SULIS Innovation Ltd – which, between them, donated the prize fund of £30,000.

The winners included ...

1st: Revolymer

Professor Terry Cosgrove developed a new polymer which will make chewing gum much easier to clean off the streets, thereby saving the taxpayer millions of pounds in cleaning costs. Similar techniques in controlling adhesiveness will be applied to other materials in coating surfaces in hospitals, medical devices, and for anti-graffiti paints and industrial coatings.

2nd: Null Hypothesis

The journal of unlikely science. A new monthly publication that offers a unique, fresh and humorous view of science. Despite only being in the shops for a few months, it has already won widespread acclaim and was called the 'Private Eye of science' by the *Daily Telegraph*.



From left:

Professor Eric Thomas, Vice-Chancellor of Bristol University;

MP Dawn Primarolo, Paymaster General;

Dr Neil Bradshaw, Director of Enterprise.

3rd: BbPod

A sound system for the nursery that is controlled by the baby and, based on the pattern of usage, is able to adapt to the baby's preferences.

The Undergraduate Prize went to Ashley Berlin for his Cargo Measurement System, an idea he has already built a prototype for after developing the idea during a work experience placement.

The 2006 competition was officially launched at the end of last year when Dawn Primarolo, the Paymaster General and MP for Bristol South, visited the University. Addressing staff and students from the university who attended the launch, Dawn Primarolo

commented: "Competitions such as these provide a valuable platform to help transfer some of the excellent research coming out of universities by putting it back into society. Introducing innovation and enterprise is the foundation of a growing and successful economy and I encourage those with bright ideas to come forward and take part in the competition." ■

www.bristol.ac.uk/research

To enter the 2006 competition, entry forms must be submitted by 27 February 2006. Forms can be found at www.bristol.ac.uk/research/newco/competition



The state we are in – understanding the life-cycle

In his book *A Short History of Progress*, Ronald Wright attempted to answer the question posed by the French painter Gauguin, “where are we going?”. There Wright demonstrates that empires which collapse show similar behaviours: sticking to entrenched beliefs and practices; robbing the future to pay the present; and spending the last reserves of natural capital on a reckless binge of excessive wealth and glory. “Does this sound familiar?”, asks Professor *Vala Ragnarsdottir*, from the Department of Earth Sciences.

In 2001 the European Commission indicated that soil loss and declining soil fertility were a main threat to sustainable development, because they diminish the viability of agricultural land. Some soil protection is undertaken through various policy areas but a comprehensive European Community soil protection policy does not exist. It has now become evident that soil problems have global consequences for food security, poverty reduction, water protection and biodiversity. Concerted approaches are therefore needed for providing solutions.

This is not the first time in geological history that soil loss is a world wide problem. Two hundred and fifty million years ago, the Permian-Triassic mass extinction occurred – the biggest extinction of all time. At that time, greenhouse gases were injected into the atmosphere by gigantic volcanic eruptions in Siberia, causing the runaway greenhouse effect that

triggered the mass extinction. The rising temperatures, together with increased concentrations of greenhouse gases, caused acid rain that killed the vegetation on land and the soils were washed into the sea.

Soil degradation has been the most frequent cause of total civilisation collapse

More recently, the world’s first civilisation – the Sumer from Southern Mesopotamia, which is now Iraq – collapsed around 2000 BC as a result of soil degradation. Subsequently, soil degradation has been the most frequent cause of cultural decline and total civilisation collapse. But in the past, civilisation collapses were localised to certain geographical areas. Today, with six billion inhabitants on Earth who are intertwined in global trade, the looming collapse is likely to be global.

While we have an overview of what is causing soil degradation world wide, our understanding of soil formation processes and rates are still poor. Soil – while strictly speaking a renewable resource – has formation rates that

are very slow, while degradation rates are much higher. How much higher is not well known.

Soil degradation

A special issue of *Science* on 11 June 2004 claimed soil to be the most complicated biomaterial on the planet. It is a composite of minerals (rock weathering products) and organic matter (decomposing plant →



of soils

→ material), and the fertility of the soil is dependent on the level of its mineral and organic content. Threats to soil degradation include erosion, decline in organic matter and soil contamination. It has been estimated that 52 million hectares of land in the EU are affected by degradation process, 16% of the total land area in the EU. Soil degradation in dry areas is known as desertification, which is a major problem in many of the Mediterranean regions. World wide, desertification can cause the destabilisation of societies and migration of human populations, and has thus extremely serious socio-economic consequences.

Natural processes such as wind and water induce soil erosion by removing soil and transporting it elsewhere. However, human activities can dramatically increase erosion rates. Man-made erosion has been estimated to be an order of magnitude higher (100 gigatonnes/year) than natural erosion, roughly 50% of which is due to inappropriate agricultural practices. Man has thus become a geological force! Erosion is enhanced by steep slopes, climate, inappropriate land use, land-cover patterns and ecological disasters. The results of soil erosion are the loss of soil functions and ultimately the loss of soil itself. In parts of the Mediterranean the erosion is as high as 200 mm/100 years and in Africa a staggering rate of 2,000 mm/100 years is reported.

Organic matter plays a central role in maintaining key soil functions and is an essential determinant of erosion resistance and soil fertility. The European Soil Bureau has estimated that 75% of the total area analysed in south Europe has a low (3.4%) or very low level of (1.7%) soil organic matter – agronomists consider soils with less than 1.7% organic matter to be in pre-desertification stage. The percentage of soils in Europe with

less than 2.6% organic matter rose from 35% to 42% in the period 1980-1995. Organic carbon loss in England and Wales over the past quarter of a century is as high as 16%, or 4.4 million tonnes of carbon per year. Globally, more than twice as much carbon is held in soils as in vegetation and the atmosphere combined and soil protection is thus a major issue for the buffering of climate change.

The world has grown too small to forgive us any big mistakes

Soil formation

Soil is the product of complex interactions between climate, geology, vegetation, biological activity, time and land use. Average world soil formation rates, based on the conversion of parent rock into soil, are estimated to be between 0.05 and 10 mm/100 years. These numbers have large error bars. Within this uncertainty range, soils of agricultural land most often result in a net loss.

Scientists in the US and their European counterparts now wish to establish research networks that are collaborative and focus on understanding the biological, chemical and physical processes in the Critical Zone (from treetop to bedrock) that control the atmosphere, biota, landforms and water supplies. This can be done most effectively by establishing 'Soil Observatories', where common measurements are undertaken in regions that differ with

respect to geology, climate, landscape and anthropogenic influence.

To this end, the National Science Foundation in the US has provided funding for instrumentation at five field sites; the effect of biota on weathering will be studied in the next five years by

Ragnarsdottir and her colleagues in Bristol, Sheffield and Leeds, funded by a Natural Environment Research Council consortium grant; and the Worldwide Universities Network (WUN) will assist the European community to establish a link with their activities so that weathering and soil formation can be understood at the global scale and these results used to underpin soil protection policy.

In the words of Ronald Wright, *"the future of everything we have accomplished since our intelligence evolved will depend on the wisdom of our actions over the next few years. Humans on Earth have a presence so colossal that error is a luxury we can no longer afford. The world has grown too small to forgive us any big mistakes."* ■

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