

BUSH TELEGRAPH

The House Magazine of the Edinburgh Centre for Rural Research

Web Watch ...

ECRR

View the new ECRR web site at www.ecrr.org.uk

UK biodiversity

Find out about action plans, reports, as well as exploring factors affecting the decline of species or habitats
www.ukbap.org.uk

Encouraging new scientists

SETNET Scotland provides a diary of science communication events for schools and the general public.
www.setpointscotland.org.uk

Biotech news

Latest news and information from the Scottish biotech community.
www.biotech-scotland.org

Funding the science

The programme of research, education and advisory work funded by SEERAD.
www.scotland.gov.uk/abrg

Mapping the country

Attractive maps showing in fine detail the geology, soils, land use of Scotland.
www.macaulay.ac.uk/explorescotland/index.html

Landscape Forum



Attracts 100 delegates despite the weather **Page 11**

National Museums of Scotland

The Chinese Connection: Dinosaurs are still with us and coming to Edinburgh from 27th June - 7th September. **Page 12**

School of Life Sciences, Napier University



Restoring Kenya's mangroves and designing of new anticancer and anti-inflammatory drugs **Page 14**

The Royal Zoological Society of Scotland

A strategy for conservation. What is it that we are trying to conserve? **Page 17**

SAC, Animal Biology Division

New SAC Dairying Centre open at Dumfries. **Page 18**

Visit to Millport



ECRR Directors saw some of the wide range of activities being undertaken by the University Marine Biological Station. **Page 21**

Tribute to Rob Kempton



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EDITORIAL

I am sorry if the Bush Telegraph is a little thin this time but unfortunately a number of member organisations have not produced the goods this month! This is a great pity because it means they miss the opportunity to disseminate information regarding their activities as well as the free advertising space.

Publicity can add to the positive image of an organisation and its staff and may ultimately influence in a small way the community support they get for their work. Lack of information could be (mis)interpreted as *nothing is happening* which is obviously not true. The truth, I suspect, is that communications is unfortunately a lower priority for an organisation than it ought to be. Many scientists are under so much pressure that they devote most of their time to their research (and to seeking funding!). This means they neglect the important role of dissemination of what they are doing and finding. Given the image science has with the public we need to take every opportunity available to improve its positive profile.

Please remember there is an electronic version of Bush Telegraph available on the ECRR website at www.ecrr.org.uk

Mike Steele
Editor

Correspondents please note.

**Deadline for copy for next issue is
August 29th 2003.**

**All contributions, comments and
suggestions can now be e-mailed to
M.Steele@ed.sac.ac.uk with copies to
m.talbot@bioass.ac.uk please.**

A TRIBUTE TO ROB KEMPTON (1946 – 2003)



Rob Kempton, Director of Biomathematics & Statistics Scotland (BioSS) sadly died on 11th May 2003 at the age of 56, while on a cycling holiday in Yorkshire.

Rob was greatly respected by the international scientific community and was Vice-President and President-elect of the International Biometric Society. In 1999 he was elected Fellow of the Royal Society of Edinburgh and had been Director of BioSS since its inception in 1987. His wife, Annelise, and their three grown-up children, Emily, William and Benjamin survive him. The funeral, in Edinburgh on May 20th, was attended by family, friends and colleagues from a wide range of scientific organisations.

Rob was born in Isleworth, Middlesex on 2nd July 1946. After attending Chislehurst and Sidcup Grammar School, he read mathematics at Oxford University, graduating from Wadham College in 1968. This was followed by a B. Phil. in Applied Statistics.

After university Rob worked for six years as a statistician at Rothamsted Experimental Station. Here he laid the foundations of his lifelong enthusiasm for biometry and the opportunity it provided for his involvement in a wide range of applications in the life sciences, spanning agriculture, the environment, food, medicine and health. Much of his consultancy work at Rothamsted was in ecology - nature in all its forms was an abiding interest for Rob - and from his experience as a consultant evolved the book with PGN Digby on "Multivariate analysis of ecological communities".

In 1976 Rob was appointed head of the Statistics Department at the Plant Breeding Institute, Cambridge, where he worked for 10 years. His subsequent contributions to research in the design and analysis of experiments with carryover of treatment effects between experimental units was stimulated by his observations of competition between adjacent varieties in plant breeding trials at Cambridge. The book that he edited with PN Fox, "Statistical methods for plant variety evaluation", encapsulated, in Rob's typically clear and concise style, many of the statistical good-practices in plant breeding.

Rob's move to Edinburgh, as first Director of the Scottish Agricultural Statistics Service [SASS] (now Biomathematics and Statistics Scotland [BioSS]), confronted him with the twin tasks of inspiring a team of statisticians whose future had seemed uncertain and of forging relationships between his new organisation and the various other Scottish agricultural research organisations. Rob led

by a quiet example of rigorous professional excellence, and a generous and open spirit. He combined a ready sense of humour and a diplomatic style that built bridges where there had been none. Rob's management of BioSS was exemplary. His vision took BioSS from being a purely statistical organisation to encompass the disciplines of mathematical modelling and bioinformatics, with a broadening of application areas from agriculture to the environment, food, health and risk. The resulting organisation is internationally regarded as a model way to harness the potential of statistics and mathematics to improve the quality and effectiveness of scientific research.

He had, what many would call, an exemplary work-life balance. He was a keen hill walker on occasion including his colleagues on hikes in the Scottish countryside. In 1986 when he arrived in Edinburgh with his wife and three children they became involved in founding the Edinburgh branch of the Woodcraft Folk, an educational movement for children and young people, designed to develop self confidence and activity in society, with the aim of building a world based on equality, friendship, peace and co-operation. His success around the world sprang from these ideals.

A strong supporter of the International Biometric Society (IBS), Rob gave many years of service to its work, initially as British region secretary and then as regional president. In the late 1980s, Rob initiated a scheme to support East Africans with membership of the IBS. He worked tirelessly to get IBS groups going in Africa and this led to the formation of the Sub-Saharan African Network of biometricians (SUSAN). He played a key role in arranging for the IBS to meet in Africa for the first time in 1998. The many tributes that have come from Africa

write of his selfless mentoring role in encouraging individuals to develop research ideas and to share results with others.

In the academic sphere Rob was external examiner for biometry courses at the Universities of Oxford, Reading and York. Over the last decade he has been the main supervisor for seven PhD students. Recent research interests concerned the estimation of risk. He was leading a group studying methods for assessing potential health risks from food, including pesticides, microbial organisms and GMOs.

Rob's intellectual contribution received recognition from the wider scientific community when, in 1999, he was elected a Fellow of the Royal Society of Edinburgh. This was followed by his appointment to the Executive Committee of the International Centre for Mathematical Sciences. He also served on numerous other committees and review groups, most recently for the Food Standards Agency and for Forest Research.

In the spirit of encouraging individuals to work together, Rob was a strong supporter of ECRR activities. He was an active member of its Executive Committee from 1996 to 1999, and had hosted a Directors' Lunch at BioSS just a few weeks before his death.

Rob was a modest, generous and kind man, who focussed on people's strengths rather than their weaknesses, and brought out the best in them. He died at the height of his powers, still full of ideas and plans for the future. His untimely death is a great loss, not only to his family, but also to BioSS, and to the wider scientific communities. He will be sadly missed.

Tributes to Rob can be found at <http://www.bioss.ac.uk/tributes.html>.

ROTA OF SOLICITED CONTRIBUTIONS TO BUSH TELEGRAPH

MARCH

British Geological Survey
Biomathematics & Statistics Scotland
University of Edinburgh, Institute of Ecology and Resource Management
Royal Society for the Protection of Birds
SAC Research Division
University of Edinburgh, School of Engineering
University of Edinburgh, Institute of Cell & Molecular Biology

JUNE

University of Edinburgh, Institute of Cell, Animal & Population Biology
Centre for Ecology & Hydrology
MRC Human Reproductive Sciences Unit
University of Edinburgh Royal (Dick) School of Veterinary Studies
Royal Zoological Society of Scotland
SAC Animal Biology Division
University of Edinburgh, Department of Geography
Napier University, School of Life Sciences

SEPTEMBER

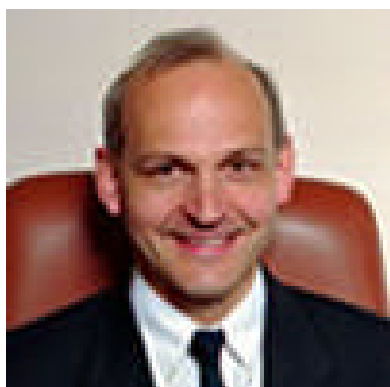
Edinburgh Centre for Tropical Forests
Lasswade Veterinary Laboratory
National Museums of Scotland
Roslin Institute
Royal Botanic Garden Edinburgh
Scottish Natural Heritage
University Marine Biological Station, Millport
University of Edinburgh, Centre for the Study of Environmental Change
& Sustainability

DECEMBER

University of Stirling, Institute of Aquaculture
Moredun Research Institute
Forest Research Northern Research Station
University of Edinburgh, Centre for Tropical Veterinary Medicine
Scottish Agricultural Science Agency
Scottish Centre for Animal Welfare Sciences
Scottish Crop Research Institute
Scottish Vertebrate Wildlife Centre

PEOPLE & EVENTS

NEW CHALLENGES



Professor Quintin McKellar, Director of the Moredun Research Institute, has been appointed Principal at the Royal Veterinary College. He will take up his new appointment on 1 August 2004.

The RVC is the UK's largest veterinary school and is a college of the University of London. The RVC was rated 5 in the latest Research Assessment Exercise and received the maximum score in an assessment of teaching standards by the Quality Assurance Agency.

CHANGES AT BioSS



Following the untimely death of Rob Kempton, David Elston has been appointed Acting Director of Biomathematics & Statistics Scotland (BioSS) until the appointment of a new Director. David was formerly Deputy Director. He will continue to be based at the Macaulay Institute where he is head of the BioSS Environmental Modelling Unit with responsibility for providing statistical and mathematical support to the Macaulay Institute and the NERC's Centre for Ecology and Hydrology Banchory.

ECRR DIARY

Jun 20	Directors' lunch	University Marine Biological Station, Millport, Isle of Cumbrae Host: Dr Rupert Ormond	12.30 hours
Nov 3	Main Board Meeting & AGM	Moredun Research Institute Pentlandfield Host: Prof Quintin McKellar	14.30 hours
	Reception	Moredun Research Institute Pentlandfield	15.00 hours
Mar 1 2004	Directors' lunch	National Museums of Scotland Chambers Street, Edinburgh	12.30 hours

SCIENTIFIC DIRECTOR'S NOTES

Professor Ian Aitken

A NEW (ADDITIONAL) ROLE

Following several years of active involvement with ECRR as a member of the Board and of the Executive Committee Professor Mary Bownes, Professor of Developmental Biology in the University of Edinburgh and Convener of the Senatus Postgraduate Committee, became Chairman of the ECRR Board in November of last year, an appointment made by the University Court. That same body has just confirmed that, with effect from next October, Professor Bownes will be University Vice Principal with particular responsibilities for widening access, recruitment and community affairs. This new distinction is warmly welcomed by her colleagues in ECRR and it is particularly pleasing that the remit of her new post accords well with ECRR's aims and objectives of promoting greater public engagement on scientific matters. In her dual roles of ECRR Chairman and University Vice Principal synergistic opportunities beckon.

LANDSCAPE FORUM

As luck would have it Thursday 8th May provided an example of the influence that weather (as opposed to climate) can have on planned events. High winds the night before and well into the morning of the 8th caused closure of the Forth Road Bridge to vehicles other than cars and diversion of all high sided vehicles to alternative routes. Those travelling from the south to the Forum venue at Battleby faced considerable traffic delay and disruption but most of the 100 delegates had assembled by 10.30 allowing the Forum to begin only 30 minutes behind schedule. Excellent time-

keeping by speakers (with only the occasional prompt from Chairmen) and a slightly abbreviated lunch break ensured that, overall, the programme kept to time.

As expected, delegates came from diverse backgrounds although 'academics' were in the majority. That in no way narrowed the focus of discussion as the topics presented covered a range of issues and stimulated both challenge and debate. The essence of speakers' presentations are provided in the summaries in ECRR's web pages while the wider interest generated by the Forum was reflected in the considerable press coverage of the event, including a leader commentary in the following day's *Scotsman*.

The proceedings of the Forum, including discussions, having been recorded and work is in hand to transcribe key points and formulate a report but, as anyone who has attempted such a task will acknowledge, it is not the easiest route to publication. The Forum made clear, however, that much remains to be done in achieving a coherence of policy in respect of Scotland's landscape and in reconciling divergent views on what is optimal for present and future management of the landscape elements of Scotland's natural heritage.

BIODIVERSITY AND SUSTAINABILITY

The above issues were at the heart of the ECRR Annual Lecture given in February by Professor John Lawton. His address stimulated considerable interest, not least concerning the accelerated loss of biodiversity being triggered not by natural environmental change but by relentless human exploitation of earth's resources. Readers wishing to delve more deeply into the arguments on which he

built his case can consult the multi-authored text, *Extinction Rates*, (1995) edited by J H Lawton and R M May and published by Oxford University Press.

Notwithstanding the sobering elements of Professor Lawton's lecture it is evident, as he also pointed out, that much of Earth's existing biodiversity remains unexplored. A striking example of the hitherto unknown is the recent report of "a lost world of ancient spiders" discovered in the semi-arid wheat belt of southwestern Australia in the course of a government-commissioned survey of habitats within an area not considered to be rich in biodiversity. At least 500 of the 655 arachnid species found in the survey are new to science and, given Australia's physical isolation, the novel population is likely to include representatives of species that are many millions of years old. Arachnologists world-wide have been awestruck by the discovery and its implications for their specialist area of science. Many are likely to beat a path to the museum in Perth (WA) where work on describing and classifying the spiders will be carried out. Arachnophobes will not wish to apply.

DEFRA'S SCIENCE & INNOVATION STRATEGY (2003-2006)

The formation of DEFRA in 2001 drew together the former MAFF and other government departmental interests, notably those concerned with the environment in its widest sense and rural viability. To underpin its current and future policies under the common theme of 'sustainable development' DEFRA has formulated a science and innovation strategy drawing upon earlier consultative inputs from the science community, public and government stakeholders and its own Science Advisory Group set up in 2002. The new document, the successor to the earlier draft version, was published at the end of May. From its science budget of £325million for 2003-04 some

£155million will be devoted to R&D over six Science Themes:

- Sustainable farming and food
- Conservation and use of natural resources
- Marine and coastal environments
- Thriving rural economies and communities
- Public and animal health
- Climate change and other environmental risks

There is a commitment, already being implemented, of working with other government and private sector funders in supporting quality research initiatives, including those of longer term strategic significance, that can inform or contribute to its core policies. Entitled *Delivering the Evidence: DEFRA's Science and Innovation Strategy (2003-06)*, the text should be essential reading for all looking for research funds.

Contact DEFRA Publications, Admail 6000, London SW1A 2XX (Tel 08459 556000) or see DEFRA's website

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PARTICIPANTS AT THE LANDSCAPE FORUM ON 8 MAY 2003



Speakers at the landscape forum: Dick Birnie, David Graham, Michael Usher, Colin Legg and Charles Warren.



Dick Birnie explaining his phrase 'Landscape Macdonaldisation' to Andy McLeod and Melvin Cannell

THE CHINESE CONNECTION: DINOSAURS, BIRDS AND EDINBURGH

Jason Hilton.

Curator of Palaeobotany.

Department of Geology and Zoology,

National Museums of Scotland,

Chambers Street, Edinburgh, EH1 1JF.

E-mail: j.hilton@nms.ac.uk

FOSSILS AND EVOLUTION

Those readers who get the opportunity to look through popular science magazines, will undoubtedly have noticed that feathered fossils from China get regular and high profile coverage. These spectacular fossils come from China's north-eastern province of Liaoning and form part of the now world famous Jehol biota. They are from the Lower Cretaceous and are approximately 124 million years old, although the entire biota ranges from approximately 125-110 million years old. The reasons why these Jehol fossils have attracted so much attention are numerous; they are exquisitely preserved, often complete, biologically diverse, and in many cases numerous examples of individual species have been discovered. They are also visually stunning. Although the same can be said of a great number of fossils from other places and other ages, these particular fossils are especially important because of their evolutionary significance. Fossils from the Jehol biota tell us things about evolution that no other fossils can, and this information concerns some of the most popular and media-friendly groups of animals ever known; dinosaurs and birds.

BIRDS AND DINOSAURS

Since the discovery in Germany of the fossil bird *Archaeopteryx* in 1861, scientists have puzzled over the origin of birds. In

Archaeopteryx scientists could clearly see feathers, but the rest of its body- it was eventually revealed - was that of a dinosaur and not a bird. Clearly, there was something unusual going on, but to many it suggested an evolutionary link between ground-dwelling dinosaurs and the earliest birds. The issue of bird origins had been hotly debated, drawing in some of the finest evolutionary thinkers of the time including Charles Darwin and Thomas Huxley. However, the gap between birds and dinosaurs remained until only recently when the fossils from Liaoning were discovered, with these providing the much needed evidence bridging the gap between the two.

THE LINK?

We all know what dinosaurs are, and we all know what birds are, but many won't know about the fuzzy bit in the middle of the two groups. This is where the most exciting discoveries have been made in recent years. The Jehol biota includes a number of small, land-dwelling dinosaurs, and also a number of primitive birds. It also includes a number of species that are morphologically and anatomically between the two, informally known as dino-birds. Dino-birds show steps in the transition between dinosaurs and birds, with a range of intermediates showing beyond doubt that birds had dinosaur ancestors.

Dinosaurs didn't all become extinct: one group, the birds, have survived until the present day.

THE 'FUZZY-RAPTOR'

The most compelling evidence for this evolutionary link is the range of dinosaurs with feathers, and primitive birds with dinosaurian features in the Liaoning fossils. The birds show a range of body forms that include species with long, bony tails, sharp teeth, and ferocious claws. The dinosaurs include species with feathers, of which perhaps the most stunning is affectionately called 'Fuzzy raptor'. As the name implies, 'Fuzzy' has a covering of soft, downy feathers, but has a body that is unmistakably that of a theropod dinosaur. 'Fuzzy' is one of the missing links that scientists have been waiting for, and has feathers very different from *Archaeopteryx*'s.

In the Jehol biota, it is not just the range of animals that is astounding, but the range of features preserved in them. For instance, several different kinds of feathers have been identified, showing that even this far back in evolution feathers served a number of different purposes, possibly for temperature regulation or for display and attracting mates, as well as flight. These discoveries are helping change the way we now think about dinosaurs and birds, and are providing a unique viewpoint on how and why feathers evolved. This also allows scientists to consider how flight originated in birds, whether it was from the trees-down through gliding, or from the ground-up through running and flapping at the same time, or through other techniques.

THE EDINBURGH CONNECTION

So what has this got to do with Edinburgh? Dino-Birds are coming to the capital this summer. From June 27th until 7th September, ***Dino-Birds: feathered fossils from China*** will be on display at the National Museums of Scotland in the Royal Museum. The exhibition has been created and developed by the Natural History Museum, London in collaboration with the Geological

Museum of China. This exhibition represents cutting-edge science on public display in Edinburgh. It will provide visitors with the opportunity to see the range and diversity of these astounding fossils from Liaoning Province, and to discover how feathers, flight and birds all evolved. In addition to the exhibition, a study day on the issues raised in the exhibition is being planned, details of which will be available in the near future (www.nms.ac.uk).

A further connection between Edinburgh and these remarkable fossils is that staff at the National Museums of Scotland has been involved in collaborative research on the Jehol biota, researching its evolutionary and ecological significance. From the picture now built up from these fossils, it is clear they provide an unparalleled window into the past, showing a complete Early Cretaceous terrestrial ecosystem. It's not just dinosaurs, dino-birds and birds that are preserved, but representatives of the entire ecosystem of that time, also including a diversity of plants, invertebrates, and other vertebrate fossils. This work has taken more than 18 months to complete, and represents the first comprehensive synthesis of these exceptional fossils and their evolutionary importance. Results have recently been published as a review article (Zhou *et al.* 2003, *Nature* 421: 408-414). Collaborative research is ongoing between NMS staff and Chinese investigators on these and other fossils from China, and we hope to continue this active and successful collaboration in the future.

NAPIER UNIVERSITY SCHOOL OF LIFE SCIENCES

Dr. Kathy Velandar, Senior Lecturer
10 Colinton Road, Edinburgh EH10 5DT
Tel: 0131 455 2221 Fax: 0131 455 2290
k.velander@napier.ac.uk

INTRODUCTION

As you can see from the following research reports we have a wide range of research activities within the school. If you would like more information on either project, please do contact Dr. Huxham or Dr. Mincher, directly.

RESTORING KENYA'S MANGROVES

Dr. Mark Huxham
Senior Lecturer
m.huxham@napier.ac.uk

Mangrove forests are unique ecosystems that provide a range of important goods and services. For example, many local communities utilise mangroves for fuel wood and timber – figure 1 shows a school being built at our field site using a traditional design of mangrove poles and clay.



Figure 1 Building with mangrove poles

In addition, much research on mangroves has demonstrated their importance as nursery sites for fish, and has suggested that they could help stabilise coastlines and prevent erosion.

Unfortunately, mangrove ecosystems are suffering high rates of destruction around the world; it is estimated that between 1-2% of all mangroves are lost annually to extraction and removal for shrimp farming and beach developments. Their future prospects could be bleak; they will be one of the first ecosystems affected by predicted sea level rise, and it is not known whether most mangrove forests will be able to adapt to greater salt-water inundation. This new project, run in collaboration between Napier School of Life Sciences and the Kenya Marine and Fisheries Research Institute and funded by Earthwatch, aims to establish re-planted experimental plots of mangroves in cleared areas at Gazi Bay, Kenya. We will be planting mixtures of three different species of mangrove, and monitoring over the next five years how the normal features of mangrove ecosystems become re-established. We want to know if different species-mixes result in different productivities, disease-resistance, utilisation by crabs and fish and sediment properties. Volunteers from Earthwatch will assist in planting mangroves, and in measuring a wide range of biological and physical variables.

In addition to this multi-species experiment, single species stands will be planted in high wave impact areas to record the effects of trees on sediment dynamics. There is much anecdotal evidence that removal of

mangroves can lead to beach erosion – figure 2 shows a beach site at Gazi where mangroves have been removed, and erosion is felling palms.



Figure 2 Erosion of palms caused by mangrove removal

We aim to establish a properly controlled experiment that will allow us to measure the effects of replanted mangrove stands on erosion. This could have important implications for efforts around the tropics to control the effects of sea level rise.

THE DESIGN OF TISSUE_SPECIFIC ANTI-CANCER AND ANTI- INFLAMMATORY DRUGS

Dr. David Mincher
Reader in Experimental Chemotherapy
d.mincher@napier.ac.uk

If you have ever wondered whether it is possible to find a source of funding that permits fundamental research and its commercial exploitation to co-exist without conflict, then perhaps you should take a closer look at Scottish Enterprise's Proof of Concept (PoC) award programme, designed to promote this objective.

As a recipient of a PoC award, a research team in Napier University is working on the

chemical synthesis of new anti-cancer drugs, prepared in latent form, that exploit a key difference between cancer tissue and normal tissue. This could lead to treatments that target cancer cells more specifically, reducing the side effects associated with most current chemotherapy. Currently, very few of the clinically used anti-cancer drugs can discriminate between cancer tissue and normal tissue. Consequently, these drugs have an effect on both cancer cells and normal cells, which reduces their efficacy and causes severe side effects. The research team's novel approach seeks to exploit one of the few identifiable differences between tumour and normal tissue: an over-expression of certain key proteases in tumour tissue, especially in solid tumours. The approach demands the *de novo* chemical synthesis of new cytotoxic agents, prepared in a latent form, which are preferentially metabolised in tumour cells rather than normal cells. Active agents are released into the tumour environment by processes mediated by the key enzymes. The structure and levels of the drug-releasing enzymes vary from tumour to tumour, but the new technology allows modulation of enzyme selectivity and sensitivity by appropriate manipulation of the chemical composition of the latent form of the drug.

The technology has a number of advantages, including:

- more anti-cancer drug is delivered to the tumour
- greater selectivity for tumour versus normal cells
- considerably reduced general toxicity for patients
- fewer side effects.

The technology offers the opportunity to target specific cancer cell types by tailoring latent drugs to the individual expression pattern of individual drug-releasing enzyme and can also be used to promote patient-centred medicine, if used in conjunction with complimentary screens of enzyme levels in the tumour. Applying the new technology to

modify the chemical structure of the parent drug could improve the therapeutic index of existing clinically useful treatments.

The PoC funding has created a critical mass of research workers and will accelerate the task of proof of principle by enabling chemists and biologists to work together on this necessarily multidisciplinary project within a commercially relevant time frame.

The award further provides funding for Intellectual Property protection, market research and business development. The project aims to make a significant improvement in therapeutic index and should this objective be achieved it is likely that the technology could be adapted to treat other chronic disease states including multiple sclerosis and Alzheimer's disease.

THE ROYAL ZOOLOGICAL SOCIETY OF SCOTLAND



Rob Thomas,
tel: +(0)131 314 0318/fax: +(0)131 314 0376
www.edinburghzoo.org.uk

A STRATEGY FOR CONSERVATION 2003-2006

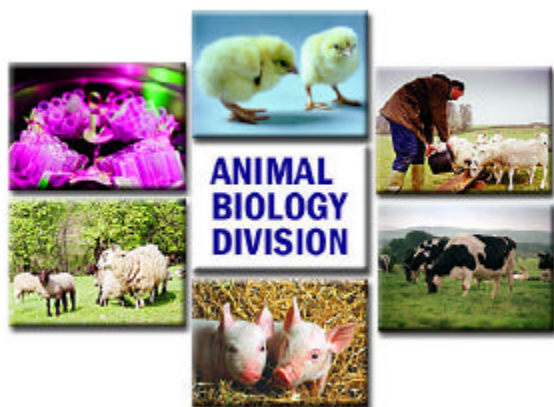
Conservation is a word that is often used and abused in today's popular parlance, but are we really sure what it means? What is it that we are trying to conserve? When and why did we stop using words like preservation? The Royal Zoological Society of Scotland has throughout its 94 year history had, at its core, the remit to study and protect fauna and has achieved much within the realms of captive breeding of endangered species and education programs. In 2003 the Society has now formalised its conservation aspirations via the new Conservation Strategy.

Conservation is a human activity. It is something that individuals, groups and society as a whole does, in order to prevent the loss of something that we in our 'world view' believe it would be intrinsically wrong to lose. Ultimately, at the conceptual level the 'thing' we are trying to conserve is biodiversity. The RZSS Conservation Strategy is essentially a four-pronged approach to ensuring that The Society makes a genuine and measurable contribution to ameliorating the effects of rapid environmental change on biodiversity. Two of the four are familiar to us all and are activities that both Edinburgh Zoo and the Highland Wildlife Park have excelled at for many years namely *ex situ* conservation and education. By maintaining a high proportion

of endangered species that are managed within programs The RZSS meets its obligations to the World Zoo Conservation Strategy. A strong program of education initiatives ensures that the conservation message is communicated in an appropriate manner to all our visitors and others. It cannot be overstated how much has already been achieved in these two fields but more can be done. The third 'prong' is our engagement of *in situ* conservation. There have been one or two incidental initiatives in the past (mostly driven by the conviction of individuals) that have given us a presence outside our own walls but there has been no long term development of these footholds or the conservation skills acquired as a result. The world zoo community has witnessed significant change in recent years (much of it internally driven) and the need to demonstrate a commitment *in situ* is now firmly embedded in zoo philosophy and legislation.

The *in situ* work that the Society chooses to carry out must be relevant to the efforts within its animal collections and the subsequent link between *in* and *ex situ* can be made through education interpretation. We shall be looking at where and how as a Zoological Society we can contribute to Conservation Research and Conservation Action in Scotland as well as worldwide locations that have relevance to the species in our captive breeding programs and ensure our resources are best utilised. The final prong extends from the fundamental principles that apply to any conservation centred organisation, the ability to tread lightly. The day-to-day activities of the RZSS, through its two sites and the 600,000+ visitors that pass through them each year, necessarily have both an immediate and longer-term effect on the environment. We must demonstrate environmental sustainability in our approach to business and ensure that best 'green' practice is upheld at every opportunity. Additionally visitors to RZSS collections should come to the end of a rewarding day, fully aware of what we do for biodiversity and enable them to act likewise.

SAC ANIMAL BIOLOGY



NEW DAIRY RESEARCH CENTRE

June 2003 saw the official opening of the SAC Dairy Research Centre at Crichton Royal Dumfries where SEERAD-supported developments have enabled SAC to integrate all its dairy cattle research at one site.

AIMS AND FACILITIES

The overall aim of the new SAC Dairy Research Centre is to develop and then test sustainable breeding and management systems for dairy cattle, with particular emphasis on improving the health and welfare of the animals. Research at the new centre will provide a much more solid scientific basis for the development of future breeding and management schemes that have measurable benefits for cow health and welfare and for the environment. The research programme at the Dairy Research Centre involves collaboration with many organisations including the University of Edinburgh and the Hannah Research Institute at Ayr.

The Centre aims to answer research questions that have a direct bearing on dairy farming, and to convey the knowledge gained from answering these questions in practical and relevant ways. There are 400 dairy cows and 200 youngstock, in two herds, at the Centre. The main steading is the location for the long-

term, SEERAD funded, systems study, using the Langhill herd. Acrehead Unit has facilities for commercially-funded dairy cow experiments. Indoor studies can be carried out with groups of animals, or can use individual Griffith-Elder feeding stations for more detailed intake measurements. Typically, this is to evaluate the effect of different feed ingredients, feed supplements, additives or pharmaceutical products on dairy cow or calf performance. Outdoor grazing studies are another area of the Dairy Centre's work, including investigations into greenhouse gas emissions from cows, and performance on grass swards of contrasting height, density and structure. Maize varieties are evaluated in trials at Crichton, as it has marginal UK maize-growing conditions. As well as testing variety performance, trials compare the efficacy of different types of plastic cover on plant emergence, growth and yield, and measure the effect of commercial spray treatments on growth, yield of dry matter and starch.

GENETICS

A major aspect of the work at Crichton is to develop and then test sustainable breeding and management systems for dairy cattle, with particular emphasis on improving health and welfare of the animals. Within this, the main emphasis of the genetics programme will be on developing and testing broader selection indices, including identifying reliable indicators of health and welfare-related traits, and on understanding how genotype and production system interact to affect cow health and welfare. The first development at the Centre was the move of the Langhill Herd, co-owned with the University of Edinburgh, from Edinburgh to Dumfries. The select group within this herd have been bred for high butterfat and protein yield over the last 30 years, whilst the control group have been kept at the average level of commercial cattle in the UK.

Researchers will investigate the importance of genotype x system interactions in dairy cattle, especially for:

- production
- feed intake
- fertility
- health
- condition score
- energy balance.
-

Genetic relationships between health, fertility and production in concentrate-based and home-grown-feed-based production systems will be examined.

Recent work has shown that cows differ in the way they gain and lose body condition over their lifetimes. The new systems will shed more light on this and assess the impact of body condition loss and gain on survival, health and fertility and, indirectly, on the environmental impact of dairying. The aim is

to investigate indicators of 'robustness' in dairy cows, which could be used in future breeding programmes.

SYSTEMS

Two dairy systems will be implemented at the Dairy Research Centre. Cows from the select and control genetic groups will be on each system. A High Forage system will rely on homegrown feeds, including maize and other wholecrop cereals, and grazed grass. One of the difficulties with this system is to grow high quality protein crops. Thus, for the first phase of the project, the cows will be fed purchased protein feeds. The Low Forage system will be housed all year, with access to an exercise area during the summer months. The table below shows some of the system differences.

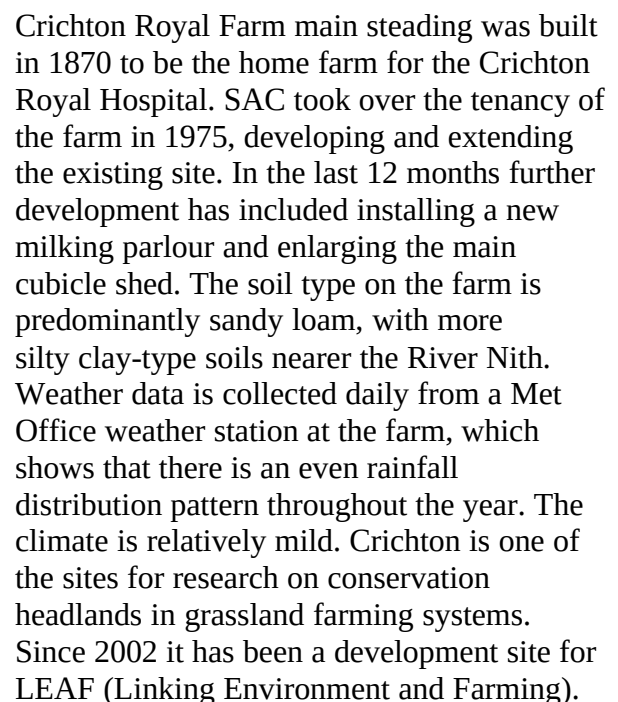
	Low Forage System	High Forage System
Select cows target yield	13000 litres	7 500 litres
Housing	All year	Winter only (+summer & buffer Feeding)
Milking frequency	3 x day	3 x day
Ration target ME	12.0 - 12.5 MJ/kg DM	11.5 MJ/kg DM
Ration target Crude Protein	180-190 g/kg DM	180g/kgDM

Previous systems work has improved Nitrogen efficiency from 17% to 34%, which is of particular importance in Nitrogen Vulnerable Zones. The new systems look at input efficiency of nutrients (Nitrogen, Phosphorus, Potassium) and also that of land, labour and other costs.

The data will be used to develop, validate and evaluate mathematical models in co-operation

with dairy farmers. The wide range of grassland dairy farming systems will be simulated on the basis of the input provided by the participating farmers. The variety of virtual farm models created in this way can then be used as decision support tools for farmers to evaluate different farming options. They will also help when planning future research at the Dairy Centre.

There are two major programmes of research in health and welfare that will take place at the Dairy Centre. The first programme will look at the relationship between selection for yield and hoof health and whether this interacts with the way animals are managed. In addition other health aspects such as mastitis will be examined. Knowledge gained from these studies will be used to select cows for improved health and welfare. The second programme will compare the welfare of the cows in the two systems, primarily by observing animal behaviour. The behaviour of the cow will reflect how she is coping with the management system. Competition between cows for access to feed, favoured lying areas and water will be assessed by measuring levels of aggression. The time spent lying and standing, and use of loafing areas, will be monitored at regular intervals. The results of the lameness study will be incorporated into the SAC/Liverpool University website, presently featuring a systematic review of the dairy cow lameness literature, developed thanks to earlier funding (from MDC, SEERAD and DEFRA) and currently being funded by MDC. This will contain a section on cattle footcare for the herdsman. Output from the behaviour study will also be made available on the website and via technical notes. It is envisaged that the website will be expanded in the future to form a hybrid information system aimed at education and decision support for farmers and field advisers.



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ECRR VISIT TO UNIVERSITY MARINE BIOLOGICAL STATION, MILLPORT

*Mike Talbot
ECRR Secretary*

The University Marine Biological Station Millport (UMBSM) is one of ECRR's most westerly member organisations, based as it is on the Isle of Cumbrae in the Firth of Clyde. On Friday 20 June 2003 a party from ECRR visited the Station at the kind invitation of the director, Dr Rupert Ormond and his colleagues.

UMBSM is formally an institution of the Universities of London and Glasgow and provides marine biological teaching support for both of these 'parent' universities. However, the Station also has a national role in providing facilities for field teaching by all UK universities. During our visit staff were preparing for the arrival of students from the Universities of Newcastle and Swansea. In the past year more than 1,200 students have studied at the Station. Increasingly, European students are being drawn to the Station, located as it is in one of the best areas in the UK for marine biological fieldwork.



*ECRR visitors viewing the specimens' tank
with UMBSM Director Rupert Ormond*

The Station's small core of academic staff maintains an active research programme,

much of it involving international collaboration. The principal topics include:

- Sustainable fisheries exploitation
- Impact of human activities on key marine habitats
- Behaviour and ecology of benthic organisms
- Marine biodiversity
- Benthic and water column microbiology.

The UMBSM is also a major UK centre for the training of divers. Just a few weeks prior to our visit Princess Anne had opened the new Hyperbaric Unit, which includes a chamber for the treatment of divers who suffer decompression illness.



The new recompression chamber for divers

The ECRR visitors were given a guided tour of the teaching laboratories, the aquarium and the Hyperbaric Unit. Dr Ormond spoke about plans for development of the Station and the on-going research programme, as well as the support being given to the UK fishing industry. Later this year a major meeting is planned which brings together scientists and fishing industry representatives to explore issues of importance to the industry.

We left Millport with a vision of an organisation with strong sense of purpose and esprit-de-corps. Many thanks are due to the staff of UMBSM for the warmth of the hospitality that we experienced.