

Knowledge exchange

Research grant proposals now include a knowledge exchange plan



Earthquake monitoring in Ethiopia

Violent earthquakes and volcanic activity are ripping apart the Afar Depression in Ethiopia, once described as the cruellest place on Earth. The area is unique: the exposed bare landscape is allowing scientists to witness tectonic processes that normally occur deep beneath the ocean.

In 2007, NERC awarded £2.8 million to a consortium of researchers led by Tim Wright from the University of Leeds to investigate plate tectonics in the region. In collaboration with researchers from Ethiopia, New Zealand, France and the US, the team are carrying out interdisciplinary geological, geochemical and geophysical research to measure rifting, volcanism and tectonics.

Tim said, 'Through our Ethiopian collaborators, we are communicating the latest information about the ongoing hazards to the regional authority in Afar.'

■ www.see.leeds.ac.uk/afar

Extending the UK's territorial waters

Geologists and geophysicists at the National Oceanography Centre, Southampton (NOCS) have delivered independent scientific evidence to the United Nations that could have a major impact on the UK's territorial sovereignty.

The UK's sovereignty extends beyond dry land to include a sizeable area of the seabed that forms the continental margin. According to the UN Convention on the Law of the Sea, a state has sovereign rights to a 200 nautical-mile Exclusive Economic Zone and beyond that, up to a further 150 nautical miles of continental shelf.

NOCS staff led the UK technical team in preparing and presenting submissions to the UN which could secure UK sovereignty over continental shelf areas beyond 200 nautical miles.

NOCS is a world leader in providing this type of technical advice.



Protecting marine life

Regulators use marine reserves to prevent over-fishing and conserve biodiversity, but uncertainties remain about their ideal design.

A European team including Paul Somerfield from the Plymouth Marine Laboratory has shown that increasing the size of the zone in which all fishing is banned (the no-take zone) increases the density of commercial fish stocks within the reserve. But increasing the area of limited fishing around the no-

take zone (the buffer zone) has the opposite effect: fewer fish in the reserve.

The researchers used 58 datasets from 19 European marine reserves to arrive at this conclusion. They also showed the positive effects of marine reserves on commercial fish stocks and how species richness has increased since reserves have been set up. The research has strong implications for managing coastal areas.

■ Marine reserves: size and age do matter. *Ecology Letters*, 2008.

The Coastal Simulator

Protecting Norfolk's cliffs from erosion is increasing the flood risk of neighbouring low-lying lands, according to the Tyndall Coastal Simulator, which identifies how the future coastline will evolve as the climate changes.

The simulator, developed by the Tyndall Centre for Climate Change Research and the Environment Agency, has also been used by scientists at Proudman Oceanographic Laboratory to show how two realistic scenarios of future greenhouse gas emissions would affect the UK coastline. Both emissions scenarios showed that in a warmer world more stronger, larger waves will reach the UK coast.

The Meeting Place – a new way to stimulate debate

For the second time, the UK Energy Research Centre's Meeting Place organised a workshop attended by a high-profile international group of energy experts. The results of this meeting are feeding into the G8 decision-making process in Japan in 2008.

The Meeting Place brings together UK researchers, stakeholders and overseas experts to develop solutions and further the energy debate. It promotes interdisciplinary working and provides a forum for collaborative projects addressing key issues.

In its first four years of operation, the venue has attracted more than 3000 people from 35 countries.

Spin-out sells for \$275 million

In June 2007, Norwegian oil giant Petroleum Geo-Services (PGS) bought Scotland's largest academic spin-out company for \$275 million. The spin-out, formed just three years before, uses a new method to prospect for oil and gas deep beneath the ground. NERC-funded PhD student David Wright and his supervisors Anton Ziolkowski and Bruce Hobbs invented the new system at the University of Edinburgh. Traditionally, geophysicists use seismic exploration to find new oil and gas fields. But MTEM Limited (Multichannel Transient ElectroMagnetics) uses an electromagnetic system to detect variations in electrical resistance deep beneath the surface. This reduces the need to drill expensive and unproductive wells.

David, who completed his PhD in 2003, said, 'When my PhD started to yield some exciting results it was clear that there was much commercial potential.'

Protecting satellites

British Antarctic Survey (BAS) researchers have discovered that low-frequency radio waves accelerate electrons within Jupiter's magnetic field. This finding, which improves understanding of how electrons are accelerated, will help scientists protect satellites at risk from high-energy charged particles.

According to lead author Richard Horne from BAS, 'We've shown before that very low frequency radio waves can accelerate electrons in the Earth's magnetic field. But this new work shows that the same theory works on Jupiter, where the magnetic field is 20,000 times stronger.'

The research, published in *Nature Physics*, overturns a theory that has held sway for more than a century.

High-energy particles encircling the Earth in the Van Allen radiation belts can damage satellites. The number of particles in the radiation belts can change dramatically within minutes, which is why more accurate forecasting is needed.

■ Gyro-resonant electron acceleration at Jupiter. *Nature Physics*, 2008.

Cliff erosion at Happisburgh, Norfolk.



David Moore / Alamy

Ozone is damaging crops in 16 European countries

For the first time, scientists have provided conclusive evidence that ozone damage to crops and natural vegetation is widespread across Europe. The research produced by the Centre for Ecology & Hydrology has also shown that risk maps based on ozone uptake by plants are better predictors of damage than those based on ozone concentration.

Ozone pollution forms when sunlight acts on pollutants from vehicle exhausts and industry. It is widespread across Europe during spring and summer, causing characteristic yellow or brown blotches on leaves, and reducing growth, seed production and the ability to over-winter.

The report, produced for a major international programme that is coordinated by CEH and reports to the United Nations, collated 16 years' evidence of ozone damage from 1990 to 2006.

■ Evidence of Widespread Ozone Damage to Vegetation in Europe (1990–2006).

Cochrane Collaboration approach for environmental science

With large volumes of environmental research out there, how can anyone find the most accurate, up-to-date information to make decisions?

The environmental research community is learning from the medical profession and has set up the Collaboration for Environmental Evidence (CEE), based on the Cochrane Collaboration established in 1993 by the British epidemiologist Archie Cochrane. The new approach will systematically review specific areas of environmental research for the global scientific community.

The Cochrane Collaboration is dedicated to making up-to-date, accurate information about the effects of healthcare readily available worldwide. It is the gold standard for determining effective healthcare interventions.

Andrew Pullin from the University of Bangor has developed this new collaboration with the help of a knowledge transfer grant from NERC.

■ www.environmentalevidence.org



Ozone injury on *Centaurea nigra*, North Wales Nature Reserve

Removing toxic waste

Bacteria that can break down toxic chemicals used in the aerospace and car manufacturing industries will help a new spin-out company from the Centre for Ecology & Hydrology (CEH) compete in Europe's \$1 billion metalworking-fluids treatment market.

The bioremediation company Microbial Solutions Ltd is based on research developed by Christopher van der Gast and Ian Thompson at CEH and has successfully raised £1.2 million to develop industrial applications.

The technology allows engineering industries to safely treat toxic metalworking fluids in an environmentally friendly way.

NERC's Commercialisation Team has collaborated with the Oxford-based firm H2O Venture Partners to develop the project.

Royalties and licence income by research centres (£k)

Centre	2006-07	2007-08
BAS	13	31
BGS	1,692	2,279
CEH	197	405
POL	75	48
Swindon Office	10	5
Total	1,987	2,768

Patents filed

2004-05	6	These patents were filed by NERC research centres and grant holders.
2005-06	7	
2006-07	6	
2007-08	10	



Trends in publications with industry

Funding type	2004			2005			2006			2007		
	No. ISI® listed papers	No. with private sector co-author	%	No. ISI® listed papers	No. with private sector co-author	%	No. ISI® listed papers	No. with private sector co-author	%	No. ISI® listed papers	No. with private sector co-author	%
Responsive (Blue skies)	833	26	3	1,392	39	3	1,455	37	3	1,574	44	3
Core strategic	1,462	61	4	1,671	75	4	1,713	71	4	1,711	92	5
Directed	280	13	5	397	25	6	446	22	5	444	18	4
Infrastructure	187	9	5	236	3	1	293	11	4	306	4	1
Unclassified				88			3					
Total	2,762	109	4	3,784	142	4	3,910	141	4	4,035	158	4

Direct income to NERC data centres from the sale of data and software licences (£k)

Data centre income	2004-05	2005-06	2006-07	2007-08
British Oceanographic Data Centre	18	23	26	27
Environmental Information Centre / National Water Archive	343	340	500	651
National Geosciences Data Centre / National Geosciences Information Service	1,341	2,092	1,278	1,250
NERC Earth Observation Data Centre	-	-	236	-
Total	1,702	2,455	2,040	1,928

Note: Two of the NERC data centres do not raise income through the licensing of data or software. These are the Antarctic Environmental Data Centre and the British Atmospheric Data Centre.

Storm database for insurance industry

A new storm database that stores the properties of thousands of tropical cyclones is exciting insurance companies in Japan and the UK.

Scientists from the National Centre for Atmospheric Science (NCAS) produce the database by running global climate models under a variety of different conditions, from pre-industrial emissions levels to future climate scenarios. Insurance analysts can integrate this data into the catastrophe models used by the insurance industry to assess risk from weather-related disasters.

Leading scientist Pier Luigi Vidale said, 'Up until now, most catastrophe models have relied on limited observations from storms and statistical modelling techniques. Having access to this dynamical database, which we can adjust over time to incorporate the effects of climate change, will enable climate scientists and the insurance industry to predict more accurately the location, occurrence, frequency and strength of future



cyclones across the globe.'

The work is part of NCAS's contribution to the Willis Research Network – a unique academic-industrial partnership with one of the worlds largest reinsurance brokers, Willis Re.

The database has also generated substantial interest in Japan, where NCAS has strong scientific links.

■ Contact: Dr Pier Luigi Vidale, Dr Jane Strachan, email: p.l.vidale@reading.ac.uk

Endocrine disruption to fish in England and Wales

A system developed by scientists from the Centre for Ecology & Hydrology (CEH) has become the Environment Agency's main tool for managing endocrine disruption in fish.

Scientists believe the active ingredients of the contraceptive pill, steroid oestrogens, can enter UK rivers

causing endocrine disruption – the chemicals interfere with a fish's hormone function.

The system is the world's first national river catchment-based risk assessment for steroid oestrogens. The team say some 39 per cent of the rivers modelled in England and Wales are at risk from endocrine disruption.



Online repository for NERC research

In 2007, NERC launched a new service to collect for the first time all published academic papers from NERC's research centres. The NERC Open Research Archive, or NORA, is an online repository for storing the research outputs from the British Antarctic Survey, the British Geological Survey, the Centre for Ecology & Hydrology and the Proudman Oceanographic Laboratory.

The repository now has over 2000 entries, mainly from 2007 and 2008, but it holds information on research papers published as far back as 1972. The service is managed by library staff from all four NERC centres.

■ <http://nora.nerc.ac.uk/>

Trends in research council income from the UK private sector (£m)

	2003-04	2004-05	2005-06*	2006-07*	2007-08*
UK Private sector	5.5	8.1	13.3	9.3	5.4
Total at 2007-08 prices	6.1	8.7	14.0	9.5	5.4

* Figure for 2005-06 onwards include Integrated Ocean Drilling Program income to BGS of 2005-06: £4.5m; 2006-07: £1.8m and 2007-08: £1.1m. This is a change of classification on 2004-05.

Value of earned income (contract research) by research centres (£k)

Centre	2006-07	2007-08
BAS	1,475	1,464
BGS	19,468	16,127
CEH	9,463	10,237
NOC	1,065	2,062
POL	1,346	1,604
Swindon Office	1,088	1,941
Total	33,905	33,435