



UNIVERSITY
OF ABERDEEN

Scientia

KNOWLEDGE FOR A BETTER WORLD

ISSUE 1 | 2012

Feeding the future

Health for life

Powering ahead

Looking North

CONTENTS

- 3** Research themes for our time
- 4/5/6/7** Food for our future
- 8/9** Calculation fields
- 10/11** Eating into the environment
- 12/13** Less water, less arsenic, more rice
- 14/15** Technology to transform rural life
- 16/17** Speaking our language
- 18/19** Health from cradle to grave
- 20/21** Fertility insights are pioneer's legacy
- 22** Making the numbers add up for health
- 23** Improving our treatment of health
- 24/25** Tackling the hidden killers
- 26/27** Quest to 'untangle' Alzheimer's disease
- 28** The three challenges of energy research
- 29** Capturing the past to secure the future
- 30/31/32** Turning the tide on renewables
- 33** Looking North
- 34** Moving on from 007



It's been a summer of sport - and of confirmation of the power of bold thinking and determined effort. The discovery of the Higgs boson particle - now a household name - is an exciting reminder of the role of universities in daring to think big, in advancing the frontiers of knowledge, and in pursuing opportunities to use that knowledge in a very practical way to address the challenges facing us as global communities, economies and families.

Welcome to Scientia, a new publication designed to introduce a flavour of the fantastic range of research underway at the University of Aberdeen, and highlight some of our research themes for the next few years.

Research and the expansion of knowledge is fundamental to the history and character of our University, and is central to our ambitions for the future. We look forward to engaging you in our exciting pursuit of knowledge.



SCIENTIA IS PUBLISHED BY
University of Aberdeen
King's College
Aberdeen
AB24 3FX
T: +44 (0) 1224 272014
communications@abdn.ac.uk

DESIGNED & PRODUCED BY
HAMPTON ASSOCIATES
Aberdeen, Tel: 01224 620562
www.hamptonassociates.com

PRINTED BY
NB GROUP
Paper sourced from sustainable forests

PRINCIPAL & VICE-CHANCELLOR
PROFESSOR IAN DIAMOND FBA
FRSE AcSS

VICE-PRINCIPALS FOR RESEARCH AND KNOWLEDGE EXCHANGE
PROFESSORS PHIL HANNAFORD
AND CLAIRE WALLACE

EDITOR
KELLY POTTS

EDITORIAL
SHAUNAGH KIRBY
JENNIFER PHILLIPS
JOANNE MILNE

PHOTOGRAPHY
ADAM MORRICE
KATE SUTHERLAND

COVER IMAGE
VITAMIN C CRYSTALS TAKEN BY
POLARIZED LIGHT MICROSCOPY.
TAKEN BY KEVIN MACKENZIE,
MICROSCOPY AND HISTOLOGY
FACILITY MANAGER, IMS,
UNIVERSITY OF ABERDEEN.

© 2012 UNIVERSITY OF
ABERDEEN

www.abdn.ac.uk



Research themes for our time

World-class universities are about creating and using knowledge to make a difference. They achieve this by bringing together excellent students, staff and external partners to identify and address key issues of the day. They have to be flexible, fleet-of-foot organisations, so that they can respond imaginatively to challenges which often emerge at a fast pace.

The University of Aberdeen conducts world-class research. Although established in 1495 to meet a local need for teachers, doctors and clergy, it very soon developed, and has maintained, a national and international perspective. Over the centuries, our researchers have pioneered many developments in medicine, science and the social sciences, and five Nobel Laureates have been associated with the University.

In this issue of *Scientia* we highlight a key component of the University's strategy to ensure that it continues to be at the forefront of research. Four institutional, interdisciplinary research themes:

- **Environment and food security**
- **Pathways to healthy living**
- **Energy**
- **The North**

bring together experts from a range of disciplines across the University, to provide innovative solutions to some of the key questions of our time. Questions such as: how does the world's burgeoning population meet its energy needs, and how do we ensure that everyone is well-fed and has optimal health, in a sustainable way that does not destroy the planet?

The cross-university themes build on areas of current research excellence, where researchers and their collaborators are already making a difference on the local, national or international stage. By bringing together researchers from a range of disciplines and professions critical mass is obtained, new perspectives developed, new insights learnt and funding opportunities optimised. The thematic approach also helps the University clarify why, and where, it wants to build strategic external alliances to advance its ambitions.

Knowledge exchange (in both directions) is a fundamental part of theme activity, since the impact of our endeavours will be less if our work does not address the needs of the public, industry, practitioners, policy-makers, governments or others, or if these key stakeholders remain unaware of our findings. We are delighted, therefore, that the University has recently become the only recipient in Scotland of a Research Councils UK Catalyst grant to train and support its researchers in their public engagement and other knowledge exchange activities.

We are immensely proud of the University's strong track record of conducting excellent, relevant research, which has helped shape global developments over the past five centuries. Our institutional research themes should ensure that the University continues to be a key player in an increasingly complex, fast-moving world. ■

Phil Hannaford, Claire Wallace
Vice-Principals for Research and
Knowledge Exchange



Professor Peter Smith

Food for our future

As our population rises, so does pressure on the world's land space for food production. Scientists at the University of Aberdeen are at the heart of tackling the challenge of how we can work together to secure food for our future. ➡

↗ Fast Facts



By 2050 there will be 9 billion mouths to feed on the planet



To feed everyone, food production needs to increase by 70-100% by 2050 – on the same amount of land



Food security is not just about food production – it is about people having access to safe, nutritious and affordable food



We already grow enough food globally to feed everyone – but still many millions of people go to bed hungry every night



There will be more demand for livestock products from developing countries in the future – this will greatly increase the need for food, as livestock production is far less efficient than crop production for direct human consumption



Changing diet can help to manage food demand – if we ate less meat, we could feed people more efficiently



In developed countries a decrease in meat consumption would also have health benefits



Globally, around 30% of all food is wasted – reducing waste will help us on the way to delivering global food security



Rice feeds half the world, with citizens in the rice bowl of SE Asia dependent on 70% of their calorific intake from this crop

In 1945, Sir John Boyd Orr, the founding Director of the University of Aberdeen's Rowett Institute of Nutrition and Health, speaking as the Director-General of the Food and Agriculture Organization of the United Nations, evoked the idea of a “great world food scheme, which will bring freedom of want of food to all men”.

Fast forward over six decades and scientists from the same institution are still at the heart of tackling the very same challenge - how to feed our increasing global population sustainably in the future.

"The issue of ensuring we have enough food to feed the world's population may not be a new one, but it is an escalating one – in fact the dimensions of the current crisis are quite disturbing," explains Professor Peter Smith, from the University's School of Biological Sciences, the scientist charged with overseeing research taking place at the institution into the challenge presented by food security.

"By 2050 our population is set to peak at 9 billion – meaning there will be 2 billion more mouths to feed, yet the amount of land we have for food production will remain unchanged.

"Food security needs to be high on the global list of priorities and this is why the University of Aberdeen is using its research expertise to contribute to tackling what is an international concern."

Scientists from environmental science, ecology, agricultural science, international development, water science, health and nutrition, politics and business are coming together to take an interdisciplinary approach to deal with what Professor Smith explains is a complex issue with no single, simple solution.

"The problem of food security is multi-faceted and there is not one obvious quick fire solution which can resolve the issues associated with providing safe and nutritious food for all, competition for land, and minimising the environmental impacts of food production.

"At this University we have scientists working together, sharing their knowledge on how we approach this challenge from the many different disciplines required to develop solutions.

"Relatively few eco-systems across the globe are not impacted on by humans and much of our conversion of natural land is driven by agricultural expansion. This can lead to the loss of many species, and significant greenhouse gas emissions which further exacerbate climate change. "This is not a legacy we can afford to leave to our children, so we need to feed the 9 billion people in 2050 without expanding agriculture onto remaining natural areas."

"One of the key problems at the heart of food security is not only that the population is growing, but also the new demand for meat and other livestock products as poorer countries emerge from poverty.

"Countries such as India, China and Brazil are in a transition period where their economies are growing, and as they become less poor, their populations demand more meat.

"This demand for livestock products, like meat and milk, means that we need more land to feed the livestock, as livestock is a far less efficient use of land than crop production for direct human consumption. Consuming the crops directly is far more efficient."

"If humans only ate vegetable matter, we could easily feed 9 billion people, so one of the main issues which we could address is the food choices people make.

"It is not realistic to expect the entire population to become vegetarian, but small shifts in consumption, such as reducing meat consumption or having meat free days, could make a big difference. So we don't just need to look at food production, but also food consumption. We need to rethink our diets and reduce the amount of meat we consume."

"It is actually quite clear from the rise in obesity in the UK and USA that these are not places developing countries should aspire to when it comes to diet. Encouraging developing countries to aspire to healthier diets than our own could make a big difference."

Changing our habits on what we eat is only one step towards a resolution. How we best use the land we have available, how we treat that land, and which areas of land we select for food production all play a role in moving towards a more secure future.

"Research – such as the development of a computer-based tool which guides famers regarding their greenhouse gas emissions, and provides tips on how they might lessen their environmental impacts – is ongoing at the University. Such tools are already helping farmers to reduce their greenhouse gas emissions."

"We're also investigating how best to deal with competition between the use of land for biofuels and food production."



Food security needs to be high on the global list of priorities and this is why the University of Aberdeen is using its research expertise to contribute to tackling what is an international concern."

"It's not just what we eat, but how we approach the land on which our food is grown, that feeds into the issue of food security," Professor Smith continues.

"If we want to feed more people without using more land, we need to increase the amount of food we get from each unit of land. In the past, this has been achieved by applying more agrichemicals such as fertilisers, pesticides and herbicides, but these are environmentally damaging. Nitrogen fertilisers, for example, produce greenhouse gases that are nearly 300 times more potent than carbon dioxide in causing climate change. So we need to find ways of increasing food production whilst avoiding such potentially devastating environmental impacts."

"European legislation is such that we have a commitment to increasing the amount of biofuels used for transportation purposes, meaning there is a growing demand for land on which plants used for biofuels can be grown."

"In simple terms, without some fundamental changes in what we eat and how we generate the fuels we need, there is not enough land to go round – so a balance needs to be struck between these competing demands."

"It is crucial we work together across our academic community to examine how we can optimise our land use to feed the world, whilst minimising environmental impacts. Surely there are few more important challenges facing humanity." □



For more information please contact pete.smith@abdn.ac.uk

Calculation fields

Could the challenge of reducing global greenhouse gas emissions begin in front of a computer screen? An innovative technological tool is helping food production giants tap into a greener future.

The saying goes that mighty oaks from little acorns grow. Imagine it was feasible that the minor action of tapping a few keys on a computer could lead to major benefits for the environment.

This is exactly the positive outcome, with globally significant consequences, which has sprung from a project bringing together scientific minds with giants in the food production industry.

The Cool Farm Tool (CFT) is a unique piece of computing technology, developed by scientists from the University of Aberdeen's Environmental Modelling Group in partnership with Unilever and the Sustainable Food Lab.

Its aim is to provide those working in the farming and food industries with a way to calculate, and ultimately take action to mitigate, the carbon footprint of their production process.

Dr Jon Hillier, one of the experts behind the project, explains its impetus: "When it comes to analysing agricultural emissions – which account for a large percentage of the greenhouse gas emissions generated in the food production process – there had never been a simple and straightforward method.

"These emissions are extremely tricky to quantify, due to geographic variability in terms of climate and soil conditions and differences in practice between land users.

"Unilever approached us, having identified this need for a formulaic way to measure the environmental impact of their agricultural process which would help them meet the ambitious environmental targets they set as a company.

"This collaborative work led to the development of the CFT – a farmer-friendly greenhouse gas calculator which allows estimation of a greenhouse gas footprint within minutes, and then provides the opportunity to test and compare other more sustainable options."

Having downloaded the CFT software for free, the farmer or grower then enters their own data on how they are managing their crops or livestock, such as the kind and quantities of fertiliser they are using, livestock feed, and energy used in field machinery operation, animal housing, and on-site storage or processing.

The tool then provides a tailored emissions profile and suggests likely beneficial mitigation options, such as the use of more efficient fertilisers, using different technologies, better soil carbon management, or looking again at the energy they are using for storage.

A number of major food industry companies have been quick to adopt CFT including Marks and Spencer, Costco, McCain Foods and PepsiCo, who specifically are using it to help implement their target to reduce the company's greenhouse gas emissions by 50% over 5 years.

Dr Hillier continues: "One of the positive spin-offs of the tool we are gleaming from industry feedback is the economic benefits it is providing.

"Productivity in business terms is all about minimal input for maximum output, and the fertilisation of land can carry a hefty price tag, so employing guidance on how they can use less agricultural chemicals in their process can only ever be a good thing."

In the context of the potential conflict of land space being used for food or fuel crop production, the CFT also has an important role to play.

The technology is now being used in the Social, Economic and Environmental Research (SEER) project, led by academics at the University of East Anglia, which is aiming to add further insight into the challenge of how we best use the land we have available.

The study – funded by the Economic and Social Research Council – will build data on the variations in greenhouse gas emissions which occur from agricultural processes across the UK, that depend on the climate and soil conditions of a particular geographical area.



"The land we have available across the globe for the production of food and fuel is limited, so using each individual area of space to its optimal benefit could not be more crucial," Dr Hillier adds.

"CFT allows you to analyse how efficiently you can produce food or fuel on the land in question so that the best decision on what that land is employed for, can be made."

"As part of the SEER study the CFT is also being used to understand the relationship between emission levels and land. The emissions which come, for example, from the use of a nitrogen fertiliser will be more or less depending on the climate and soil of the space that fertiliser is being applied to.

"Through this study we will assess how the production of given agricultural products varies with geographic location in the UK. This understanding will be incorporated into a larger social and economic analysis to develop optimal UK land use and deployment scenarios." □



For more information visit www.coolfarmtool.org or contact Dr Jon Hillier at j.hillier@abdn.ac.uk

You are what you eat – but the individual food choices we make are having significant consequences which reach far across the globe.

Eating into the environment

Understanding how we develop diets which feed into both our health and future sustainability is being tackled by experts in nutrition at Aberdeen.

"Part of the challenge in achieving food security is to ensure the global population has the access to the right type of foods for health," says Dr Jennie Macdiarmid, Senior Research Fellow in Public Health Nutrition at the University of Aberdeen's Rowett Institute of Nutrition and Health.

As climate change has moved up the agenda, the effect what we choose to eat on a day-to-day basis has on our environment is being felt with greater urgency.

Taking into account the whole lifecycle of the food we eat – from when it is planted to when it is disposed of – it is estimated our current diet in the UK accounts for 20-30% of the UK's greenhouse gas emissions.

But Dr Macdiarmid – one of a team of scientists at the University leading research into the climatic impact of our dietary choices – warns it is crucial we ensure that nutritional values are not compromised in striving to select sustainable foods.

"We know people are eating too much fat and sugar, foods which are too high in salt, and not enough fibre. This is contributing to health problems such as obesity, which is a growing problem with latest statistics showing that 60% of adult population in the UK is overweight or obese.

"It's clear that despite the messaging to the public on healthy eating this is not changing what people are choosing to eat.

"When we add the need to eat a diet which is sustainable and reduces the impact on the environment to the equation, we are at risk of confusing people by providing conflicting messages about what they should and should not eat for different reasons.

"Producing food more efficiently will only go some way towards helping solve the issue of food security and climate change. Our biggest challenge is tackling how we can encourage the public to alter their diet to one which is healthier and more environmentally sustainable.

"The work we are doing here at the University is aiming to work out where there are synergies in the message sent out to the public, to ensure consistent advice is given on how to eat both healthily and sustainably.

A project called Livewell has formed the basis for much of this work.

Funded by WWF, the aim of the study, undertaken by scientists from the University of Aberdeen Rowett Institute of Nutrition and Health and Biomathematics and Statistics Scotland Research Institution, was to test whether it was possible to have a diet that would meet dietary requirements for health and at the same time had lower greenhouse gas emissions than the current diet, and as part of this to develop a methodology to analyse the balance between eating sustainably and nutritionally.

Dr Macdiarmid explains: "Working collaboratively we developed a mathematical modelling technique that can be used to generate a diet plan for a person, which meets their nutritional requirements whilst reducing greenhouse gas emissions.

"What this research did was show that it is possible to eat both sustainably and healthily – the challenge now is inputting this message into society in a simple way and getting people to change their diet."

Outcomes of the Livewell project were presented as part of the evidence in the House of Commons Environmental Audit Committee on Sustainable Food report which was published in May 2012.

Whilst pushing forward policy was one outcome of the research, other spin-outs have been developed off the back of the study, which it is hoped will also have societal impact.

Dr Macdiarmid explains: "We are in the very early stages of working on a project funded by the Biotechnology and Biological Sciences Research Council (BBSRC) to develop this research into a computer/mobile phone application.

"The long-term vision is that this 'app' could be used by members of the public as an educational tool to better understand how they can make changes to their diet to meet their health needs, whilst reducing impact on the environment.

"As another aspect of our research we are also looking to better understand how people might be willing to change their eating habits through a study which is funded by the Scottish Government's ClimateXChange programme.

"This work will commence with a survey investigating the trade-offs people are willing to make in their diet, examining which foods they feel they could forgo, exchange, reduce or increase.

"We hope our findings will inform future studies to understand how we can encourage people to make healthier and more sustainable food choices." □

For more information contact
Dr Jennie Macdiarmid at
j.macdiarmid@abdn.ac.uk

“

Our biggest challenge is tackling how we can encourage the public to alter their diet to one which is healthier and more environmentally sustainable.”



Dr Jennie Macdiarmid

Less water, less arsenic, more rice

It's one of the world's most important grains, eaten as a staple part of the diet by the majority of the world's population.

Yet the amount of water required to produce rice makes it an unsustainable food choice for the future.

Scientists at the University of Aberdeen are working towards a breakthrough in crop genetics, they believe could transform the way the crop is grown and potentially improve the lives of millions of people across the globe.

Rice grain is relied upon as a sustenance food by half of the world's population.

Yet counteractively, the growing process involved in developing this crop is accountable for a massive drain on the world's water resources.

A mammoth 2500 litres of water is required to produce just 1kg of rice.

In Bangladesh, where rice accounts for 70% of the population's calorific intake, University of Aberdeen scientists are leading a consortium addressing the challenge of reducing the level of water used in rice production.

It's hoped the outcomes of their research will lead to the development of a new type of rice, which has greater nutritional benefits and contains significantly lower levels of arsenic – which is taken up by the crop from ground water during the growth process.

Scientists behind the project say it is the cutting-

edge techniques and interdisciplinary approach they are employing which will help them achieve their intended outcome of discovering a way to produce greater volumes of higher quality rice under more sustainable conditions.

Explaining the background to the four year study, which is funded by a grant of £1,200,000 from the Biotechnology and Biological Sciences Research Council (BBSRC), Dr Adam Price from the University of Aberdeen's School of Biological Sciences says:

"The traditional process by which rice is grown involves keeping the roots of the crop flooded in water.

"Our research will test a new technique for rice production developed by the International Rice Institute, called alternative wetting and drying.

"Instead of permanently flooding the rice, the crop is flooded and then dried out for 10 to 15 days.

"Our focus will be to analyse the major benefits we believe to be aligned with this technique, to assess whether alternative wetting and drying is the sustainable option for the future, which we understand it could be.

"The first of those benefits is the potentially large reduction

“ using less water means that there is less opportunity for arsenic to enter the rice grain from the ground water, leading to lower levels of arsenic contamination.”

in water usage and analysis of this will be a main focus for the study. As a positive offshoot, using less water means that there is less opportunity for arsenic to enter the rice grain

from the ground water, leading to lower levels of arsenic contamination.

"Initial studies have also shown that the technique enhances yield and increases the levels of nutrients contained in the grains – specifically zinc and iron.

"This is of particular significance given that increasing these nutrients in our diets is one of the United Nation's top ten actions that humans can do to reduce suffering."

Those behind the research say it is the cutting-edge, advanced genetics that will be applied in the project which will allow the real breakthrough to be made.

Professor Andrew Meharg, a biogeochemist at the University, and an expert in arsenic explains:

"What is unique in our study is that we will be employing one of the most pioneering developments in plant science – genome sequencing of plants.



Measuring soil hardness in a farmer's rice field in Bangladesh

For more information contact Professor Andrew Meharg at a.meharg@abdn.ac.uk or Dr Adam Price at a.price@abdn.ac.uk

"In fact we will be using the very same equipment and chemistry that is used to sequence genes in the human body, to analyse genes within rice.

"We plan to sequence the genes of 300 varieties of rice from Bangladesh and the surrounding Indian states. What we will be looking for are markers in each of those individual rice types which can be associated with a positive trait we wish to measure – for example greater yield, lower arsenic or higher zinc levels.

"If we can identify the genes responsible in rice for traits then we can improve crops more rapidly and accurately and ultimately develop a new type of rice which has far greater benefits for the world's population."

Describing the potential global impact of their research Professor Meharg adds: "Our team consists of scientists from the fields of maths, biogeochemistry, plant physiology, plant genomics and systems biology and spans the globe with collaborators coming from Lancaster, Bangladesh and the Philippines.

"It would be fair to say that this is one of the first occasions that scientists from such a broad range of areas have come together to address the challenge of sustainable rice production in this way.

"If we achieve the outcomes we believe are possible from this project, the result could essentially be the improvement of the lives of millions worldwide, putting better quality rice in the mouths of more people." □

“
We will be using the very same equipment and chemistry that is used to sequence genes in the human body, to analyse genes within rice.”

Professor Andrew Meharg (left) and Dr Adam Price (right)

"...Ruby (Carrbridge) had an interesting flight down to Loch Duntelchaig via Dochfour on 6 March before flying back to Drumsittal, spending the 10 March in the Loch Ussie area (possibly attracted by the feeding potential there!) and then back to Drumsittal for the 13th..."

Technology to transform rural life



Professor Peter Edwards

“The premise of the £11.8m *dot.rural* research drive is that rural areas of the UK should, through the user-led application of digital technology, become more economically, socially and environmentally sustainable.”

Ruby is a busy lady. She's also a red kite - a species reintroduced to the UK and whose success across regions varies in ways we don't yet understand. Professor Peter Edwards of the University of Aberdeen's Digital Economy research hub *dot.rural* explains how Ruby is helping a unique research drive to bring new opportunities to rural and remote regions of the UK and beyond:

Can narratives that bring to life the behaviour of specific members of a species have a positive effect on the involvement of the team working on their conservation? Perhaps.

Our *dot.rural* Digital Conservation project, working with the Royal Society for the Protection of Birds, is building a system using natural language generation technologies to produce a commentary on the daily activities of red kites tagged with satellite tracking devices. Bringing these birds to life in this way may well impact positively on the humans involved in their conservation, and that will be important not only to the species but also to the communities who share their rural homes.

Other projects under the *dot.rural* banner include enlisting the public's help in improving the mapping of the UK's 24-species bumblebee population, exploring how open data and crowd-sourcing using mobile phones can improve transport information for rural passengers, developing new online business networking tools to help rural enterprises grow and flourish, and providing support and aiding handover for Community First Responder, arriving first on the scene of medical incidents. In these projects *dot.rural* is working in partnership with the Bumble Bee Conservation Trust, First Group, Scottish Enterprise, and the Scottish Ambulance Service among others.

The common mission for the unique critical mass provided by the interdisciplinary, 78-strong research team is to explore and test the potential for digital innovation to transform the lives and prospects of vulnerable rural communities.

Rural sustainability is a national, European – and global – priority. The challenges are considerable: rural areas have specific characteristics that include small, often dispersed populations, narrow and uneven channels of information flow, and rapid



“
Research being pioneered
in Scotland has the
potential to be applied in
some of the world's most
vulnerable regions.”

change in population structures and the bases of economic activity. The premise of the £11.8m *dot.rural* research drive is that rural areas of the UK should, through the user-led application of digital technology, become more economically, socially and environmentally sustainable.

Launched in 2009 as one of only three Digital Economy research hubs funded by the UK research councils (RCUK), Digital Economy research works to rapidly realise the transformational impact of digital technologies on aspects of community life, cultural experiences, future society, and the economy.

Hub activities are organised around four rural challenges: healthcare, accessibility and mobilities (transport), conservation of natural resources, and enterprise and culture. The technology being investigated to tackle these challenges is focused around natural language generation and affective communication, mechanisms to support reasoning, coordination and collaboration, intelligent information infrastructures, and satellite and wireless communications.

dot.rural brings together internationally leading expertise in computing science, communications engineering, geography, sociology, environmental science, medicine and transport, simultaneously capitalising on the opportunity to provide a unique training environment for young researchers at earlier stages of their careers.

A critical component is the engagement of industry partners, and with communities themselves. Digital Economy research is all about working with end-users, and to date there are nearly 100 different organisations involved with *dot.rural*, ranging from large technology companies including IBM and BT to local authorities, community groups and individual rural dwellers – some of whom have been trained to become community researchers.

Research being pioneered in Scotland has the potential to be applied in some of the world's most vulnerable regions. *Dot.rural* researchers are now involved in an additional £7 million package of projects called Bridging the Urban and Rural Divide (BURD), funded in the UK by the Research Councils UK (RCUK).

TRUMP (Trusted Mobile Platform for the Self-Management of Chronic Illness in Rural Areas) is a £1.7 million three-year project to explore the potential of trusted mobile technologies to improve the management of chronic diseases in rural areas of the UK and India – now leading causes of death in both developing and developed countries.

The TRUMP team of UK universities led by Aberdeen and working with a consortium of top Indian institutes of management, IT, health and medical sciences to develop a 'platform' combining hardware and software that allows patients and health workers to trust the system, that it will

not harm them and that their medical information is managed securely and reliably. Policy makers also want to be satisfied that systems take account of drivers for future health services and enterprises.

While the UK and India have very different practices and structures for healthcare delivery, the effective management of chronic illness is a priority for both countries – and so is addressing the particular challenges posed by patients in rural communities. This is particularly relevant to India, where 71% of the population in rural areas. In the UK, while overall fewer than one in five people are rural dwellers, in Scotland the figure is 29%. Two common chronic conditions, diabetes and depression, have been chosen as exemplars for the development of the platform and its evaluation.

Drumsmittal to Delhi may be a little far for Ruby the red kite, but *dot.rural* research aims to reach the furthest corners of the continents where rural sustainability has never been higher on our shared national and global agenda. □

For more information visit:
www.dotrural.ac.uk or contact
Professor Peter Edwards at
p.edwards@abdn.ac.uk

Speaking our language

A pupil from Capability Scotland's Corseford School using the How was school today? technology

It's said some people have a way with words – but what about a computer?

Pioneering technology developed by Aberdeen scientists is combining language with cutting-edge software to improve the experience of people in some of life's most challenging situations.

"Pie charts, graphs and complex data may be part and parcel of the many layers of our day to day lives but they are usually not the best way to tell a story," says Professor Ehud Reiter from the University of Aberdeen's School of Natural and Computing Sciences.

"Our work is focused on the development of software that uses technology – called *Natural Language Generation* – which enables large and diverse sets of data to be automatically translated into simple paragraphs of text that can be understood quickly and easily by anyone.

The team of University of Aberdeen scientists working within this area – who account for the largest concentration of NLG researchers in the world – are deploying their knowledge and expertise to enhance the way we live our lives in numerous ways – but perhaps

most notably within medical scenarios.

"A project called *Babytalk* is probably one of the most significant examples of the way that NLG can be used to have an important impact on people's lives.

"The work – which is being conducted in collaboration with the Royal Infirmary of Edinburgh and is funded by the Engineering and Physical Sciences Research Council (EPSRC) and Research Councils UK Digital Economy programme – is investigating ways NLG can support staff working with and parents of children receiving treatment in, the hospital's Neonatal Intensive Care Unit."

A particular strand of this project – *Babytalk Family* – is developing software which provides parents with simple, daily, personalised reports on their child's condition over the last 24 hours.

Saad Mahamood from the University of Aberdeen's Department of Computing Sciences, one of the researchers involved in the project said: "The experience of having a premature baby

undergoing medical treatment is intensely stressful and parents can find it hard to absorb the clinical information they need to take in, whilst dealing emotionally with the situation they are facing.

"*Babytalk Family* takes information from their baby's electronic record – facts such as heart rate, temperature and any medication administered, but also commentary from staff on the baby's overall behaviour, eating and sleeping – and transforms it into a simple text summary.

"The unique quality of *Babytalk Family* is that the use of NLG allows the data record to be interrogated for even small facts that may not be as clinically pertinent but will be highly important to the parent.

"For example, if the baby has slept well or has increased in weight, *Babytalk Family* will pull out this information in the summary and use positive language to highlight this fact to the parents in a way which is both informative and responsible.

The system does not replace existing communication from staff – the information given in the reports produced by *Babytalk Family* is exactly the same as that which is communicated by staff.

Professor Reiter continues: "Its aim is not to replace staff but provide an additional reference point – parents can go back and re-read the information and access it by themselves when they wish.

"The intent is that the system actually helps increase parents' understanding of the care that is being given to their child by allowing them to digest the information in their own time, then encouraging them to come back and ask staff more questions on their child's condition.

"Also some parents might not be able to visit the neonatal unit as often as they would like, because of commitments to other children in the family or work, so the tool is extremely useful in passing on information accurately and simply between family members."



For more information visit:

<http://inf.abdn.ac.uk/research/babytalk/>

<http://howwasschooltoday.computing.dundee.ac.uk/>

<https://www.facebook.com/HowWasSchoolToday>

or contact Professor Ehud Reiter at e.reiter@abdn.ac.uk

How was school today? is another project which highlights the potentially life-changing impact of NLG technology.

In this instance the software – the result of a collaborative project with scientists from the University of Dundee, and Capability Scotland, funded by EPSRC – was designed to give a voice to children with communication difficulties.

Professor Reiter explains: “For a child with severe motor disabilities and limited or no speech, holding a conversation is often very difficult and limited to short one to two word answers.

“To tell a longer story a communication device is often needed to form sentences but this can be very time consuming, putting a lot of strain on holding and controlling the conversation.

“The *How was school today?* software was developed to enable children with disabilities such as cerebral palsy and learning difficulties to have conversations in a faster, more interactive way.

“The system uses a combination of sensors, swipe cards, and a recording device to gather information on what the child using the system has experienced at school that day. This can then be turned into a story by the computer – using NLG – which the pupils can then share when they get home.

“Its intent is to support a more interactive narration, allowing children to easily talk about their school day and to quickly answer questions.”

Speaking of the potential future opportunities for NLG technology, Professor Reiter says: “Our group is currently exploring a wide range of practical uses of NLG but our interest goes further than just its most straightforward application of translating large amounts of complex data into simple text.

“We’re also looking at the theoretical side of its use, investigating the kind of effects that language can have on the reader and how we can employ this within our software to potentially make a real difference to someone’s day or even ultimately life.” □

Empowering technology

Aberdeen scientists behind software that translates sign language into text are continuing to develop their technology, which could empower the 70 million deaf people worldwide who use sign language as their first language or mother tongue.

Computing scientists at *Technabling*, a spin-out company of the University of Aberdeen, have created the *Portable Sign Language Translator (PSLT)* to bridge the gap between sign language and more standard forms of communication.

The person using *PSLT* signs into a standard camera integrated into a laptop, netbook, Smartphone or other portable device such as a tablet. Their signs are immediately translated into text which can be read by the person they are conversing with.

It’s anticipated the technology – which is the first of its kind in the world which can be used on portable devices and allows users to customise sign language to their own specific needs – could be available as a product next year.

Scientists leading the project engaged with members of the deaf community throughout the design process and are continuing to trial the technology with deaf volunteers to optimise the potential impact of the device.

Dr Ernesto Compatangelo, a lecturer in Computing Science at the University of Aberdeen, and founder and Director of *Technabling* explains: “The primary aim of the device is to empower sign language users by enabling them to overcome the communication challenges they can experience, through portable technology.

“Our current research is focused on optimising the design of the technology and also investigating the multitude of ways the software could be integrated into our day to day lives.

“For example, is it possible that the software could be used within the retail sector to enhance how sign language users communicate when they go to pay for something at a till, or within the business sector within the reception area of buildings? We believe this could be entirely feasible and are building links across industry sectors to investigate this potential.”

Work is also underway looking at how the software could enhance the lives of people with limited mobility.

“One of the most innovative aspects of the technology is that it allows sign language users to actually develop their own signs for concepts and terms they need to have in their vocabulary – essentially any gesture can be assigned to any given word.

“Using the same theory, there is great potential for the technology to benefit those with limited mobility – someone who has for example suffered a stroke.

“In this instance the software would be linked through Bluetooth technology to devices in that person’s home and gestures could be used to instruct appliances – a wave of the hand could action the curtains to open or a ‘thumbs up’ could make the kettle to boil.

“We know this software has the potential to change the lives of people in a variety of scenarios, on a global scale – and investigating every prospective avenue for this is our focus.” □



For more information visit:
<http://www.pslt.org/>
or contact Dr Compatangelo
at pslt@technabling.co.uk



Health from cradle to grave

Many factors shape our lifelong health – some of them before we are even born. Now Aberdeen researchers are piecing together a detailed picture of the issues that influence our wellbeing across the life cycle, in studies tackling many of the big questions.

What a mother eats when she is pregnant can have a lasting impact on the lifelong health of her baby.

And how that child is raised – his or her diet, lifestyle and upbringing – are among the factors that might have an impact on their health in the years to come.

Understanding the whole life cycle – to try to achieve not only improved life expectancy, but also life expectancy free of disease – is the driver behind the University of Aberdeen's Pathway to Health research theme.

"It's well documented that there is a demographic shift in Scotland due to increasing life expectancy, leading to a greater proportion of older people in the population," says Dr Baukje de Roos, theme leader and part of the internationally-recognised

University of Aberdeen Rowett Institute of Nutrition and Health.

"But there are marked differences in life expectancy, especially healthy life expectancy, in different parts of the country.

"Deprivation plays a large part in this, but other factors such as genetics, nutrition, environment and lifestyle choices, as well as education, peer and media influences, all have an important role.

"Understanding more about these influences is vital for the development of the best interventions to improve the health and wellbeing of the population.

"Aberdeen is combining the specialist research of the Rowett Institute with expertise from across the University to create a world centre for studies in this field."

Scientists across the disciplines are using their specialties to tackle the big problems in health.

"Take obesity, for example, we have our medical people, nutritionists, health economists, social scientists, as well as researchers in other fields, examining the problem," says Dr de Roos.

"While the medical experts focus on the diseases associated with obesity, such as diabetes, the nutritionists are looking at lipids in the blood and other nutritional responses in people who are obese. Meanwhile scientists on the socio-economic side might be looking at how and why social-economic background influences the chance of people becoming obese.

"This is the type of collaborative approach we are taking to all sorts of medical problems to try to find answers to a wide range of important health questions."

The ageing process occurs throughout our lives and that is why researchers are studying the human journey from pre-conception to old age.

"A lot of chronic problems can start very early in life although you won't get the clinical problems until later on in life," says Dr de Roos.

"Heart disease can begin during teenage years but the symptoms won't manifest themselves until many years later, and we will see this more often as children are becoming obese or getting type II diabetes at a younger age.

"Many factors, such as poor diet, poor access to health care or poverty, can have long term health consequences and we need to find early interventions to slow or prevent the development of debilitating medical problems.

"At the same time, we also need to look at ways to educate people on how to lead a healthy life, and how to sustain the change in people's behaviour."

The scientists' research spans a wide range of topics, including the implementation of sustained lifestyle changes – how do we maintain favourable changes in healthy behaviour for a long period of time?

"We are working on developing new interventions that might help change behaviour and lifestyle. Some of these methods might not be delivered via the NHS, but through workplaces and schools. New technologies such as smartphones and social media may also have a role."

In addition, several research disciplines will work together to better understand the biological mechanisms underlying healthy ageing, and determine how health inequalities affect outcomes of well-being and socio-economic performance.

Iron



Professor Harry McArdle

The importance of iron to our health is one of the *Pathways to Health* projects as **Professor Harry McArdle from the University of Aberdeen's Rowett Institute of Nutrition and Health explains...**

We all know that problems at birth are likely to lead to difficulties in the long term. But we are now discovering that factors pre-birth can have long-term consequences for the baby.

Insights into how nutrition during pregnancy can alter health in later life began with research which showed size at birth was related to the risk of heart problems in adulthood.

This work also revealed that smaller babies had an increased risk of cardiovascular disease - even after other factors such as smoking, were taken into account.

Subsequent studies have shown that the risk appears to extend to other health concerns, such as stroke and diabetes. It seems that the rate of growth after birth may also be an important factor.

THESE OBSERVATIONS ARE CRUCIAL.

Firstly, if we can alter the growth trajectory of the baby in the womb, then we may be able to reduce the risk of ill health and the burden on the NHS.

Further, if we can identify those at risk when they are born, we can plan remedial strategies. In order to do this, we need to understand why and how the problems occur.

At the Rowett we have been studying the importance of iron during pregnancy and the impact of deficiency on birth outcome.

Iron deficiency is a disturbingly common occurrence, even in the developed world. We have shown it has consequences in the short term in people.

Others have found that poor levels of iron at birth lead to an increased risk of cognitive problems, even schizophrenia, in adults.

Iron is a very important nutrient, central to the development of most body systems, including the brain. And brain development takes place over a defined time scale in the unborn baby.

Because iron is so important, the foetus has developed systems to try and protect itself against deficiency, even if it means the mother becomes more deficient.

However there appears to be a limit to which the mother can increase iron absorption, so giving her more iron may not always help.

If we could overcome this barrier, or trick the foetus into helping her to do so, this may help us develop strategies to reduce the risk of ill health.

OUR WORK IS ADDRESSING AGEING AND RESILIENCE AT SEVERAL LEVELS.

Firstly, we are examining metabolism during pregnancy, arguably a critical part of the life stage. We are determining the influence of pregnancy on long-term health and also testing approaches to improve resilience in response to the common challenge of iron deficiency during pregnancy.

Finally, we, and others at the Rowett, are testing how nutrition during pregnancy has these effects, and why the body cannot reverse the change after the "critical window" of brain development has closed. □

“As we are now living longer than our forebears we need to find answers to the many big medical and socio-economic questions if we are to age in the best of health.”

Dr Baukje de Roos

Both topics will explore the associated concept of 'resilience'.

"Being resilient involves coping with the emotional, cognitive and physical demands of everyday life. Few people can avoid stress and illness but some cope better than others. But what causes some to succumb but allows others to carry on?" says Dr de Roos.

"We've all heard of reports of people who have had the healthiest lifestyle possible but have then suffered a chronic disease. We've also heard of cases where people have apparently smoked, drank and been unhealthy throughout their lives but have had no obvious health problems.

"Some people cope better, and show a higher resilience to impaired health, sometimes despite deprivation.

"As we are now living longer than our forebears we need to find answers to the many big medical and socio-economic questions if we are to age in the best of health." □

For more information contact Dr Baukje De Roos at b.deroots@abdn.ac.uk

For more information contact Professor Harry McArdle at h.mcardle@abdn.ac.uk

Fertility insights are pioneer's legacy

Who knows whether Professor Sir Dugald Baird could have predicted the invaluable findings that would be delivered from a pregnancy database he created.

The late reproductive health expert – a pioneer of his time – set up the **Aberdeen Maternal Neonatal Databank as a resource for the study of the physiology, pathology and sociology of pregnancy more than 60 years ago.**

Today it is yielding insights on a wide range of maternal health issues, providing guidance on healthcare for women having or trying for a baby. It is also helping provide clues on other medical problems experienced by women.

“The Databank is a truly unique resource that has been logging details of every single pregnancy in Aberdeen city and district since 1950,” says Professor Siladitya Bhattacharya, Professor of Reproductive Health, at the University of Aberdeen.

“Given that the north east of Scotland has a stable population with relatively little outward migration, it means we have built a lifetime of reproductive events, which includes inter-generational data for 30,000 mothers and daughters, and 5,000 grandmothers, mothers and daughters.



Professor Siladitya Bhattacharya

“This means we have genuine population-based information on all kinds of reproductive health such as ‘normal’ deliveries, miscarriages, ectopic pregnancies, pre-eclampsia, pre-term birth, stillbirth and fertility issues.

“We are also able to link up information from the Databank with other datasets such as the Reading Survey, which contains information on children born in the 1950s who sat intelligence tests, the Aberdeen Psychiatric Case Register and the Scottish Morbidity Records.

“Cross-referencing the Aberdeen Maternal Neonatal Databank with these kinds of datasets is enabling us to make a number of research findings on a range of other medical conditions affecting women such as mental health problems, cardiovascular disease and cancer.”

“Our databank is one of a kind in the world and is recognised internationally for the high quality of research that it is helping us deliver,” adds Professor Bhattacharya.

“Prof. Dugald Baird created the Databank because he was aware, even though others did not share his views at that time, of the importance of socio-economic factors on maternal health. His thinking was very much ahead of his time.

“The University of Aberdeen is following in his footsteps and producing important maternal health research that is extremely pertinent locally and globally.” □



The Databank is a truly unique resource that has been logging details of every single pregnancy in Aberdeen city and district since 1950.”



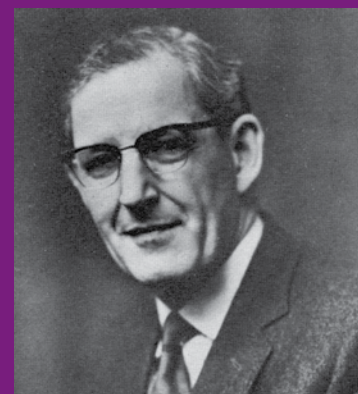
For more information contact Professor Siladitya Bhattacharya at s.bhattacharya@abdn.ac.uk

Peterhead Maternity Ward
in the 1960s (image courtesy
NHS Grampian)



Some examples of findings to emerge from analysing the Databank, and, in some cases cross-linking datasets, include the discoveries that:

- Women born prematurely, or who have brothers and sisters who were born too early, are more at risk of having a pre-term baby
- Women with pregnancy induced high blood pressure are at a higher risk of suffering and dying from ischaemic heart disease, but have a lower risk of cancer
- Obesity in pregnancy doubles the risk of infection following delivery by forceps or ventouse
- Women with a history of anorexia nervosa have a slightly increased risk of bleeding during pregnancy, and of delivering a smaller baby
- One in 10 women who have given birth at least once will require surgery for a pelvic floor problem



Professor Sir Dugald Baird

Professor Sir Dugald Baird (1899-1986) was a key figure in the University of Aberdeen's distinguished reproductive health history, which stretches back to 1795 and Dr Alexander Gordon's breakthrough findings on puerperal infection.

Sir Dugald graduated in medicine from the University of Glasgow in 1922. His early experiences attending births in the Glasgow slums, and in the city's Royal Maternity Hospital, shaped his interest in the social and economic influences on the health of women, their babies, and across generations.

Sir Dugald came to Aberdeen in 1937 as Regius Professor of Midwifery – a post he held until his retirement in 1965.

During those three decades, he made outstanding contributions in the fields of clinical practice, service provision and health policy in reproductive health, perinatal and maternal mortality, social obstetrics, sterilisation, induced abortion and cervical screening.

Together with his wife Lady Baird, Sir Dugald also established the first free family planning clinic in Aberdeen.

Sir Dugald and Lady Baird had the Freedom of the City of Aberdeen conferred on them for their contribution to medical science and health in the City and beyond. □

The University of Aberdeen's highly influential Health Economics Research Unit (HERU) has been at the cutting edge of economic research into health for over 30 years. HERU's research aims to make a difference both to the effectiveness and delivery of health services and to the health of populations in Scotland and beyond.

HERU's research findings helped support the Scottish Government's introduction of smoke-free public places. Professor Anne Ludbrook found that the health and economic benefits of reducing exposure to tobacco smoke would be far greater than any potential loss of business in pubs and restaurants.

Professor Ludbrook also provided economic input to the Scottish Government's decision to introduce minimum pricing for alcohol.

Other HERU research to make an impact includes work led by Unit Director Professor Bob Elliot which has prompted changes in funding for primary care trusts and hospitals in England and Wales and to the formula that distributes funding for hospital and community services to health boards in Scotland.

HERU – which receives core funding from the Chief Scientist Office of the Scottish Government Health Directorates – develops and encourages the application of economic methods to improve health and health care in Scotland.

Ranked as one of the best economic research centres of its kind in Britain and Europe, HERU focuses on two research programmes.

One aim is to improve the delivery of healthcare and guide decision-makers on how best to deploy scarce health care resources.

Research includes looking at patient preferences for how healthcare is delivered and exploring whether the introduction of new technologies – these could include new surgical techniques, devices or tests for medical conditions – offer good value for money.

"A manufacturer might produce a new product but is it a wise use of NHS resources to offer it to the population if there is likely to be very little health improvement?," says Dr Paul McNamee, who leads this programme.



Making the numbers add up for health

"Our research examines the costs and benefits of new techniques against current ways the condition is managed to see which performs better. As well as new methods, we also evaluate how good existing methods of treating patients or delivering healthcare actually are. For example, we are currently involved in two studies in dentistry, one of which is looking at the benefits of scale and polish, and the other is considering whether 6 month check-ups are better than less frequent or risk-based approaches."



The second research programme applies economic approaches to better understand the behaviour of the health workforce and organisations and health behaviours in the population.

This could involve looking at ways for recruiting and retaining GPs or the incentives that might help make other healthcare professionals work more effectively.

One study from this research programme in the area of health behaviours evaluated a smoking cessation scheme run by NHS Tayside which combines behavioural support, medication and financial incentives to help eligible smokers in Tayside kick the habit.

"One of the incentives is a voucher that can be used towards a grocery shop," says Dr Marjon van der Pol, who heads up this research programme and was one of the researchers involved in evaluating the quit4U cessation scheme.

"We found that the scheme was highly effective. Whilst some people may question the use of NHS resources to reward quitting on ethical grounds, the research showed that the scheme provides good value for money. The reduction in smoking will lead to substantial savings in NHS costs of treating smoking related diseases."

Another area Dr van der Pol is investigating is what's known as people's 'time preference' with regards to health.

"I'm looking at whether people are 'present' or 'future' orientated," she explains. "If they are present orientated they are interested in the 'here and now' and are less likely to take steps such as quit smoking."

"Whereas 'future' people who look ahead are more likely to invest in their health. I'm taking this approach to what's known as the 'Glasgow' effect, which, even when you take into account areas of deprivation, is a city with lower levels of health than other big cities such as Liverpool and Manchester."

"There is a greater need than ever to make the best use of our healthcare resources," adds Dr McNamee.

"You traditionally hear of the cost pressures of rising patient expectations, of population ageing, and of the introduction of new technologies? However there is a fourth pressure which is today's climate of financial austerity and that's why it is even more important than ever to examine economic issues in health." ■

For more information visit
<http://www.abdn.ac.uk/heru/>

Improving our treatment of health



Professor Marion Campbell

Discovering a link between calcium supplements and an increased risk of heart attack is the finding of just one of a number of high profile studies to emerge from a University of Aberdeen unit internationally recognised for its research into health care.

Professor Alison Avenell and Mr Graeme MacLennan from the Health Services Research Unit (HSRU) took part in the analysis of calcium supplement trials conducted across the world - the largest led by the University of Aberdeen and involving more than 5,000 people throughout the UK.

Other work by HSRU to make an impact includes a study which found that advising women to breastfeed exclusively for six months might be 'unhelpful' and far too idealistic.

NHS Health Scotland commissioned Dr Pat Hoddinott's research which has since been cited by UNICEF in its review of breast-feeding standards

which are recommended by NICE - the National Institute for Clinical Excellence which provides healthcare guidance.

HSRU was set up in 1988 to examine the best ways of providing health care and to train those working in health services in how to carry out research. Most of its work sets out to establish whether developments within the health service really are effective, efficient and appropriate - particularly pertinent in today's economic climate.

"We have a national remit to study and evaluate clinical activities in order to ensure that treatments performed in the health service are the most beneficial, safe and cost-effective," says Professor Marion Campbell, Director of HSRU, which is core-funded by the Chief Scientist Office of the Scottish Government's Health Directorates.

"There is a lack of evidence as to the effectiveness of many treatments in practice today, and how they should best be delivered, and the work of the unit aims to address these gaps."

Research at HSRU is focused on both assessing health care interventions and scrutinising the delivery of care - the latter includes issues such as how the behaviour of health professionals and organisational culture and governance can impact on the delivery of

care and its quality. The unit has particular expertise in evaluating non-drug treatments such as surgical interventions and diagnostic tests.

HSRU researchers are involved in a wide range of projects, from examining different ways of undertaking knee replacement surgery to exploring the health care experiences that matter to patients.

They are also studying the effectiveness of treatments for common medical conditions such as incontinence after childbirth and prostate surgery; severe acid reflux; kidney stones; varicose veins, and one of the main causes of shoulder pain - tears of the rotator cuff. The screening and treatment of glaucoma - which if left untreated can lead to blindness - is also being evaluated by HSRU researchers. Most projects involve many centres in the UK and often a number of countries around the world.

HSRU also incorporates CHaRT (the Centre for Healthcare Randomised Trials) - one of a select number of units in the UK which is accredited to design and coordinate important national and international clinical trials and which has helped build Aberdeen's reputation as a centre of excellence for these kind of large, multi-centre, UK-wide studies.

"HSRU is academically excellent in the evaluation of non-drug treatments such as surgery, the use of new medical technologies, such as robotic surgery, and new methods being used to diagnose a range of medical conditions," adds Professor Campbell.

"One of our key strengths is our ability to pool expertise from a wide range of areas such as health services research, economics, statistics, organisational management, health psychology and clinical services, applying this combined approach to give a thorough look at how we are dealing with very real and pressing healthcare problems".

"According to the last Research Assessment Exercise, HSRU was ranked joint top unit of its kind in the UK. The unit also undergoes strict academic scrutiny from independent experts every five years and the conclusion from the last independent review was that HSRU's performance had been outstanding."

HSRU's research has had significant impact on a number of practices in the health service. For example work conducted at the unit led directly to the amendment of national guidance on the role of laparoscopic (keyhole) surgery for inguinal groin hernia repair, and also on the role of laparoscopic surgery for colorectal cancer resection. Their work has also resulted in a change in the dental contract for NHS dentists within the UK on the management of fissure sealants in children.

Professor Campbell added "HSRU aims to provide quality evidence to inform decision makers in health services. Our work is all about making a direct impact on the quality of health care, and ultimately on the care patients receive". □



For more information visit <http://www.abdn.ac.uk/hsru/>

Tackling the hidden killers

They cost billions to treat and claim tens of thousands of deaths around the world each year, yet many fungal infections are not even household names. However the University of Aberdeen Fungal Group – the biggest research group of its kind in Britain and one of the largest in the world – is fighting back. Professor Neil Gow, Chair in Microbiology at the University, and one of the Group leaders, explains.

Most people are far more aware of infectious disease caused by viruses (such as the common cold, influenza, HIV, rabies) bacteria (MRSA, *C. diff*, *E. coli*, legionnaires disease) and parasites (malaria, sleeping sickness and Leishmania) than they are of diseases caused by fungi.

However this is not a fair reflection of the importance of fungi as agents of human disease.

Usually fungi are relatively harmless in healthy people and around a quarter of us are infected with dermatophytes - fungi that infect the skin, scalp, feet and other parts of the body. But these are never life-threatening.

However modern medical practices, the use of invasive surgical interventions, and the AIDS pandemic particularly in Third World countries, have led to significant numbers of people with immune deficiencies. Their susceptibility to and risk of potentially lethal fungal disease is much greater.

- Yeasts such as *Candida* species are now ranked fourth on the list of the most frequent blood infections in the developed world.
- There are about 700,000 cases of life-threatening infections due to the mould *Aspergillus* each year.
- Over one million cases of diseases caused by a fungus called *Cryptococcus* occur per year occur in sub-Saharan Africa - this is causing greater mortality than AIDS-associated tuberculosis.

None of these fungi are household names, yet the disease burdens are high and the mortality rates due to invasive fungal infections are often worse than those due to bacteria or other infectious agents.

There are more deaths each year in the UK caused by fungal infection than by MRSA, *E. coli* and many other publicly recognised bacterial diseases and "superbugs". Around half of those who suffer from invasive fungal diseases die from these infections despite the efforts of doctors.

Other fungal species cause major endemic problems in developing countries where access to expensive drugs and modern diagnostics used to treat fungal infections is often very limited.

Fungal allergies are also significant problems in respiratory medicine and dermatology and many millions of women suffer from mucosal infections that severely impact on their quality of life.

It costs around \$1000 a day to protect the most vulnerable patients in cancer and intensive care wards from fungal infection and the worldwide costs of treating these various fungal problems is now in the region of \$12 billion.

Despite the suffering, importance and financial burden of fungal diseases, the study of medical mycology has lagged behind those of other pathogens, and remains poorly represented.

This is the case both in developing countries and in wealthy nations, where lethal fungal diseases often undo the good work carried out by doctors in the treatment of patients with cancer, in intensive care and those who are severely sick and are recovering from malignancies, trauma due to accidents and other medical problems.

The Wellcome Trust has awarded a £5 million grant to a University of Aberdeen-led group of investigators to stimulate research, training and build capacity in this important but neglected aspect of medicine.

The UK has an excellent but dispersed community of scientists working in this field. This new award will enable this community to come together to deliver innovative, interdisciplinary research which will:

- better understand the biology of fungal diseases
- generate better diagnostics, novel therapeutic approaches and new antifungals
- deliver a new generation of highly skilled medical mycologists

The University of Aberdeen has heavily invested in medical mycology, and has a vibrant community of internationally renowned scientists with a significant breadth of expertise.

The Aberdeen Fungal Group has more than 50 research scientists and students and is the single largest academic group in this field in the UK and in Europe. It is co-ordinating the UK-wide activities of the Wellcome Award to create a network of centres of expertise which will promote new scientific and clinical research and generate an unrivalled training platform for medical mycology and fungal immunology.

These developments aim to dramatically enhance our capabilities to understand, treat and diagnose fungal diseases in the future.

The Wellcome Award will also train a new cohort of highly talented PhD students from developing countries, and aid their return to their own nations, to provide much needed expertise in areas of high disease burden.

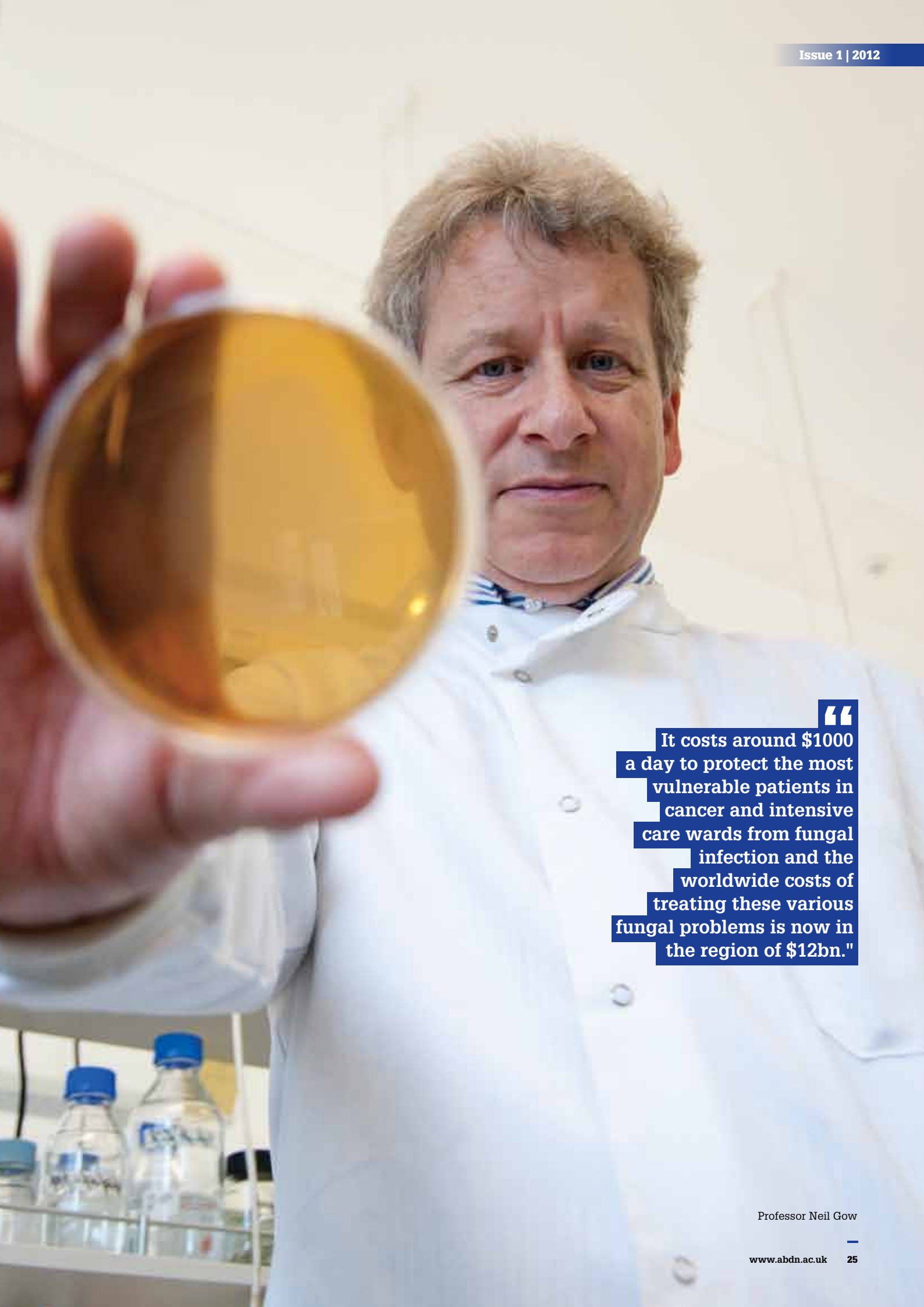
It will also support the training of a new generation of UK-based clinical doctors with specialist training in this field.

The Wellcome Award involves collaborators in Newcastle, Manchester, Birmingham, London, Canterbury and Exeter, but has the potential to link any of the major UK research centres in the field.

This latest award adds to the £8 million-plus of other grants at the University of Aberdeen funding research into medical mycology.

We hope the latest initiative provides the boost that this vitally important branch of microbiology needs to address the huge medical demands caused by fungal pathogens. □

➔ For more information contact Professor Neil Gow at n.gow@abdn.ac.uk



“
It costs around \$1000
a day to protect the most
vulnerable patients in
cancer and intensive
care wards from fungal
infection and the
worldwide costs of
treating these various
fungal problems is now in
the region of \$12bn.”

Professor Neil Gow

Pioneering chemistry team part of quest to 'untangle' Alzheimer's disease

One summer evening in 2008 this story made headline news across the UK's news network channels. It was a story that not only excited the national and international media, but also gave hope to millions of families affected by Alzheimer's disease worldwide. It was breaking news about the rember™ study, involving a new investigational drug that could potentially go beyond treating the symptoms of Alzheimer's to actually slow or stop its progression.

Letters, emails and phone calls flooded in from desperate families. They were encouraged by the promising results from a clinical trial presented by researchers from Aberdeen's King's College and the University's spinout company, TauRx Therapeutics which is incorporated in Singapore.

For Professor Claude Wischik, Chairman of TauRx, and the team of analytical and synthetic chemists led by Professor John Storey at King's College, this 'proof of concept' was the culmination of nearly three decades of research led by Professor Wischik. For the team, this announcement marked the beginning of a subsequent four-year quest to refine the drug and enhance its effectiveness.

Alzheimer's disease is associated with the formation of neurofibrillary 'tangles' - originally discovered by Alois Alzheimer in 1906 - which ultimately choke and kill neurons. During his tenure at Cambridge University in the 1980s, Wischik and his team discovered that these tangles were made of tau protein. The drug developed by TauRx and evaluated in the clinical trial, rember™, is a 'Tau Aggregation Inhibitor' or TAI, and is the first chemical entity to target and 'dissolve' these tangles. Importantly, extensive research data indicates that targeting these abnormal tau tangles will help slow, halt or even prevent the progression of debilitating symptoms such as memory loss, and mental impairment due to Alzheimer's.

Current treatments for Alzheimer's do little to stop the progression of the disease, and at best only temporarily alleviate its symptoms. Other therapeutic approaches also in development include drugs that target the beta-amyloid (A β) protein fragment which forms insoluble 'plaques' outside the neurons. However, despite the heightened publicity around beta-amyloid over the past few years, the effectiveness of this approach is being re-evaluated in light of repeated clinical trial failures.

In the Phase II rember™ trials, the Aberdeen researchers found that patients taking the TAI had a 90% reduction in the rate of progression of their symptoms over two years, compared to those who did not take the investigational drug. Functional neuroimaging results from these patients showed absence of decline in the areas of the brain affected by the abnormal tangles of tau protein.

With such promising results, the team was keen to advance and improve the delivery and stability of the active agent, while minimising its side effects. "The drug must be converted to the active form and absorbed quickly in the acid medium of the stomach, so that the bioactive agent is released," explains Professor Storey. He and his team have played a critical role in developing a novel form of the drug which permits direct absorption of the active ingredient, giving rise to LMTX, a second-generation TAI to rember™. "We took the mode of action of rember™ as the starting point, and we're delighted that the drug we have come up with will be better absorbed and tolerated by the patient," he says.

The new second-generation drug, LMTX, does everything its predecessor, rember™ did, but with improved absorption at higher doses, according to Professor Storey. This second-generation drug is planned to enter the final phase of clinical research - the highly anticipated Phase III rember2™ clinical trials - late 2012.



Professor John Storey

"We have fantastic advantages here at Aberdeen," says Professor Storey, who leads the team of 14 research fellows focused on this ambitious project.

"The close partnership between the University and its spinout company, TauRx Therapeutics, brings together the expertise of chemists and biologists, with the investment made possible by what is now an international biopharma company. This gives us the ideal platform for major medical advances," he says.

"We are in the unique position of being the only university chemistry team in the UK to have a laboratory accredited by the MHRA for Good Laboratory Practice (GLP) and Good Clinical Practice (GCP)," he says. "These are the demanding standards and traceability of data required by the regulator in order to conduct clinical trials."

"We're very cost conscious," says Professor Storey. "Developing new drugs can be expensive - but the starting ingredients don't have to be. We wouldn't want cost to become a barrier for this product. So our starting point is chemicals which are affordable."

In addition to their work on LMTX, the team has also been working on a diagnostic tool aimed at identifying patients at an early stage of Alzheimer's. "We have synthesised a range of diagnostic



“
for the first time – doctors
will have a tool capable of
detecting the condition in
its earlier stages, when it
should be easier to slow its
progress

ligands, completely new chemicals which will mean that – for the first time – doctors will have a tool capable of detecting the tau tangles early, when it should be easier to slow its progress,” says Professor Storey.

The new diagnostic ligand for PET (Positron – Emission Tomography) will be used to show the degree of Tau accumulation in the patient’s brain. The ligand is being developed in collaboration with Bayer and Piramal Imaging and is expected to be available in 3-4 years. “We’re excited about the potential of our new diagnostic, which would make it possible to identify individuals with very early forms of the disease. Our data from our first trial indicate that these early stage individuals were the ones benefitting most from the drug,” he explains.

“This is demanding, painstaking science, as we move from treatment to early diagnosis, and hopefully one day to the ultimate goal of prevention. But thinking about all the many people who are affected by this disease – wives, husbands, sons, daughters and grandchildren – makes it all a hugely worthwhile commitment for our talented and dedicated team.” □

For more information visit
<http://www.taurx.com/>
or contact Professor John
Storey at j.storey@abdn.ac.uk

The story of tau and TauRx

The 2008 news of the first encouraging evidence of the clinical efficacy of a tau-based treatment was in stark contrast to disappointing clinical results from some 17 trials in pursuit of the rival -amyloid theory, which has dominated scientific thinking for over 20 years.

In 1984, Professor Claude Wischik, while working in Cambridge with Sir Martin Roth and Nobel laureate Sir Aaron Klug, began research at the MRC Laboratory of Molecular Biology (LMB) to discover the structure of the paired helical filament of which the Alzheimer tangle is composed, using techniques Klug had won the Nobel Prize for. The LMB is one of the birthplaces of modern molecular biology.

In 1988, Wischik discovered that the tangle fibre is composed of a short segment of the microtubule-associated protein tau, and in 1996 that it was possible to dissolve PHFs isolated from the Alzheimer’s brain with pharmaceutically viable compounds which act as Tau Aggregation Inhibitors (TAIs).

Tau protein normally functions to stabilise nerve axons by binding to microtubules which form their backbones. The team showed that from very early stages of the disease there is tau-based destruction of nerve cells in the brain’s hippocampus, and that tau aggregation first appears in the cortex 20 years before the clinical impact on the person becomes apparent.

Strong correlation between tangles and dementia, and genetic evidence for the role of tau aggregation in a wide

range of neurodegenerative disorders suggested that a drug which blocks tau aggregation could be useful in the treatment of Alzheimer’s. Recent discoveries have shown that once tau aggregation has started in one brain region, the process is able to spread from neurone to neurone throughout the brain, destroying neurones in its path. That is why a TAI is so important in terms of potential treatment.

In 2003, the team developed their first generation molecule, rember™, as the first pharmaceutically viable drug with activity against the tangle filaments, which yielded disease modifying effects in the Phase II trial.

Wischik moved with his team to take up a Chair in Mental Health at the University of Aberdeen in 1997, where work continued in the chemistry and medical science laboratories. TauRx Therapeutics was formed in 2002 as a Singapore incorporated spin-out company from the University to take this promising work forward.

TauRx plans to initiate the global Phase III rember2™ program with LMTX, an improved form of the original drug, late 2012. This will consist of two trials in mild-to-moderate Alzheimer’s disease (AD) as well as one trial in frontotemporal dementia (FTD).

As the importance of tau in Alzheimer’s continues to emerge, TauRx has the potential to revolutionise the treatment of this disease, moving from treatment to early diagnosis, and potentially the ultimate goal of prevention.



Professor
Jim Anderson

The three challenges of energy research

The debate around energy is wide and varied, at times deeply controversial, but also fundamental to development of society throughout modern history and into the future. Professor Jim Anderson, theme leader for Energy at the University of Aberdeen explains.

Energy outputs are required to provide heat and light our homes and buildings, to power factories and offices and to fuel our cars and other transport systems. The challenges in achieving this in the 21st century are enormous, with global demand for energy, particularly for transportation, predicted to continue to grow significantly for many decades to come. This growth in demand is at odds with the drive for cleaner energy, cheaper prices, and demand reduction.

All this means ever more dramatic challenges in the form of energy security, energy efficiency, and the potential relationship between energy and climate change. These three challenges in particular are among the key drivers to research within the broad theme of Energy.

The development of modern societies has been driven by exploitation of fossil fuel resources. Coal and oil especially have fuelled vehicles and power stations, but are now increasingly being replaced by alternative energy resources, gas and biofuels among them, and by renewable power generated from marine, wind and solar energy. The place of nuclear energy also remains prominent. Of course the choices between these energy sources are not straightforward, and a blend of mixed energy resources will be required to support a growing world population, modern lifestyles and the need for development especially in many of the world's poorer countries.

Energy research encompasses all these areas from the perspective of production and utilisation. However it is important also to consider the exploitation of energy resources within the context of broader issues. There are a number of consequential challenges, not least within the political and economic spheres, but also complex questions related to how communities are affected in social and cultural terms. The Energy debate plays out in spheres well beyond questions of green and clean energy, into challenges of energy poverty, migration, healthcare and conflict. In broad terms of main challenge facing the Energy sector is therefore one of sustainability.

At the University of Aberdeen research into energy covers each of these areas. The University is uniquely placed in the UK to respond to the fundamental research questions, being located in the Energy Capital of Europe. Aberdeen has a long and proud history as an important centre for fishing and farming, and the related maritime industries and food and drink. However it is known to most as an oil town, and it has been the hub of the oil & gas industry in the UK for the past 50 years. Research over recent decades has focussed towards this industry, with an excellent track record of research in Petroleum Economics and in Exploration Geology in particular. In recent years this has grown to include all stages of the oil & gas production lifecycle from the technical challenges of exploration and production to addressing the legal and fiscal environments, and has become increasingly diversified beyond hydrocarbons to respond to the clean energy agenda.

The development of the University's Energy theme is intended to achieve a number of objectives, fundamentally:

- To build on the current research base and to develop opportunities resulting from closer co-ordination amongst researchers working on energy problems;
- To connect researchers in a more systematic manner with end beneficiaries of research, including the oil & gas industry in Aberdeen, but also the growing renewables sector in Scotland, the wider international context, and other stakeholders in the energy debate;
- To engage coherently with research questions of energy efficiency and alternative energy sources (such as solar photo-voltaics and bioenergy), and the connections between energy exploitation, energy efficiency and carbon reduction;
- To consider all facets of a complex problem, including energy demand management (considering choices and behaviours), the contribution of energy to the development agenda, and the real and potential impacts of energy for the natural environment and wider society.

We are structuring this to respond to the challenges through interdisciplinary research which draws on the expertise of a range of specialists from engineers and geologists, lawyers and economists, biologists and chemists to mathematicians, geographers, anthropologists, sociologists, historians and medical scientists.

A research approach which takes us from specific technical problems through to analysis of whole energy systems will, we believe, help develop a secure and sustainable energy future for generations to come. □

CHALLENGES	THREATS	DEMAND	LIFECYCLE	SOURCES
Energy Security	Population	Heat	Energy Production	Fossil Fuel
Energy Efficiency	Health	Power	Energy Utilisation	Renewable Energy
Climate Change	Conflict	Fuel	Energy Reduction	Alternative Energy

For more information contact Professor Jim Anderson at j.anderson@abdn.ac.uk or visit www.abdn.ac.uk/energy

Capturing the past to secure the future

Could geological insights from 400 million years ago inform future methods for preventing global warming?

Carbon capture – trapping harmful carbon emissions and storing them away from the atmosphere to prevent global warming – is one of the great white hopes in the fight against climate change.

A multitude of techniques are currently being investigated by industry and academia to understand the best methods by which the process can be conducted.

Now work by a team of geologists from the University of Aberdeen has looked 400 million years into the past to improve understanding of how this technique could prevail in future.

Professor John Parnell from the University's School of Geosciences who is behind the research explains: "Since the Industrial Revolution the concentration of carbon dioxide (CO₂) globally has markedly increased in particularly in the northern hemisphere where more fossil fuel burning occurs.

"The process of carbon capturing is being heralded as a strong option for reducing the impact of CO₂ in the future and our work has focused on one of the potential techniques for this – the trapping of the carbon emissions in basalt rock.

"We know when CO₂ is absorbed into basalt it is 'used up' in a chemical process by which it precipitates and forms new minerals.

"Our aim was to provide some guidance on how much CO₂ basalt can actually absorb."

Professor Parnell's team looked back into geological records to identify a time when basalt was predominant on the Earth's surface, as a starting point for their work.

"400 million years ago, in the Devonian period, the northern British Isles were undergoing a period of high volcanic activity because of where the tectonic plates were lying on the surface of the Earth.

"Most volcanic lava is one of two sorts – basalt or andesite.

"At this time the British Isles were in a tropical latitude, and when temperatures are hot essentially things happen faster.

"So when the basalt lava did cool and cover the land, it quickly became weathered by the atmosphere. Part of this weathering process involved the absorption of CO₂ from the atmosphere into the basalt rock which had formed.

"By literally digging down into our past and taking samples of rock from this era from areas including Stonehaven, Dundee and the Scottish Borders we are working towards examining the levels of CO₂ taken in by rock through this natural process at this time millions of years ago.

"Understanding this will give us a data point to assess the capacity of basalt to take in CO₂. As such our research could give a new insight into how industry and academia could work together to pursue basalt as an option within carbon capturing processes in the future." □


➤ For more information contact Professor John Parnell at j.parnell@abdn.ac.uk

Turning the tide on renewables

Unlike a Scottish summer, tidal energy is predictable. But could harnessing the force of tides pose a threat to diving seabirds and their prey? This is one of the big questions a major research collaboration involving the University of Aberdeen will investigate.



Dr Beth Scott



Around 25% of the tidal energy in Europe is estimated to be around Scottish waters. Scotland is leading the world in developing and testing new marine technologies, such as tidal turbines, that could be used to extract power from the ocean.

"There is a push towards tidal because it provides certainty," says Dr Beth Scott, a marine habitat expert at the University of Aberdeen, and one of the researchers on the £1.2 M FLOWBEC project, which is assessing the potential effects of future marine renewable energy devices on the environment.

"Wind and wave power is weather dependant. When it's windy there are lots of waves, so you're either going to get lots of wind and wave power, or not very much. With solar you can predict that energy should be available during daylight, but it's not possible to predict if it will be cloudy more than a few days into the future.

"Ideally you want a mix of renewables, which includes one that is predictable, and with tides you have exactly that. You can predict what the tides are going to be like 200 years into the future or even 1000 years ahead."

However a potential pitfall of marine harvesting technology like turbines – which sit on the ocean floor – is that their environmental and ecological impacts are not yet understood.

"Some are complete unknowns," says Dr Scott. "There is a lack of knowledge regarding the effects of these devices in terms of how they may change the movement of water directly around

them and how these changes may affect the behaviour of marine animals. Also little is understood about possible 'downstream' physical and biological impacts of the cumulative effect that many tidal devices may have..

"The aim of our project is to understand in great detail what is going on in areas that could host tidal technology."

The research involves six universities, two marine labs, Marine Scotland Science, Openhydro Ltd, one of the leading tidal turbine developers, and Orkney-based EMEC – the European Marine Energy Centre Ltd, the world's first centre to offer developers the ability to test full scale grid connected energy harvesting devices in extreme wave and tidal conditions.

Funded by the Natural Environment Research Council, the project will examine links between different marine animals in the food chain. It will also model the effects of tides and waves and investigate the impact tidal turbines have on seabirds and fish as well as organisms that live on the ocean floor.

Aberdeen, in close collaboration with Marine Scotland Science, is leading the seabird and fish part of the project which will explore whether tidal turbines could be a serious risk or maybe even a habitat enhancement for species such as shags, common and black guillemots, razorbill and puffins as well as the fish they prey on.

"A lot of people are worried about the possibility of collision risk – that birds will collide with turbines while they dive down hunting fish and we want to find out if this is the case," says Dr Scott. ➡

Fast Facts

FLOWBEC is a National Oceanography Centre (NOC)-led project, which is funded by the Natural Environment Research Council and Defra (the Department for Environment, Food and Rural Affairs).

It brings together scientists from the Universities of Aberdeen, Bath, Edinburgh, Exeter, Plymouth, Queens University Belfast, Plymouth Marine Laboratory, Marine Scotland Science, European Marine Energy Centre (EMEC), and one of the world's leading tidal turbine developers, OpenHydro Ltd.



OpenHydro turbine at the Eday site in the Orkney Islands

Researchers are trying to answer that by analysing data captured via a pioneering monitoring unit – the first of its kind – deployed earlier this year in 30 metres of water in the main tidal flow of the EMEC test site, south-west of Eday, in the Orkney Islands, where tides are some of the strongest in the world.

The sea-bed mooring, designed by Marine Scotland Science, featured a multi-frequency fisheries sonar and a multi-beam echosounder which have provided the first continuous measurements of how fish and their predators behave around a tidal energy structure. A marine radar also monitored surface activity, tracking the behaviour of seabirds, mammals and surface currents and, along with all the high tech instrumentation, a skilled birder, University of Aberdeen NERC CASE PhD student, James Waggitt, made observations from the island of Eday, which identified the times and types of seabirds diving for food within the site.

“What we are now doing with the data collected is looking to see whether birds and fish behave any differently in the water column above a turbine structure than they do in the same environment a little bit away from the turbine where there is no effect from the device. If we get enough information about what the birds and fish are doing underwater we can work out the probability of collision.



Ideally you want a mix of renewables, which includes one that is predictable, and with tides you have exactly that. You can predict what the tides are going to be like 200 years into the future or even 1000 years ahead.”

“This will help inform Marine Scotland Science which is responsible for providing the licensing on where these devices could be placed. At the moment they must follow very precautionary measures when judging the need to protect marine wildlife and also deciding which areas are allowed to be licensed to developers.”

Some seabirds can dive up to 150 metres for fish. But some of the researchers' preliminary data from boat surveys in these highly energetic tidal areas suggests that some species, such as the puffin, are instead making frequent but very shallow dives.

“If the birds are truly only feeding in the top 10 or so metres then they are not coming close to the turbine blades and may not be in any danger, although we will know more when we go through all the data.

“Personally I think the biggest affects will be well downstream of turbines.

“If we extract enough energy out of tides we could see changes to the level of mixing

of water that takes place in our oceans. This could cause changes up the entire food chain as the level of mixing directly affects the amount of plankton, which is what makes up the bottom of the marine food chain.

“As for the turbines themselves, many studies have shown that any structure in the marine environment will attract life. Tidal turbines, especially their bases, may become fish-attracting devices.

“This in turn may attract more birds to feed in these areas. This could see them dive to depths they previously would have avoided and this change in behaviour may increase their chances of finding prey but also increase their risk of colliding with a turbine blade.

“There are a lot of unknowns which we hope our research will address because we need to move forward quickly, and with more certainty, as the effects of climate change, like the tides, will not wait for anyone.” □



For more information visit: <http://www.noc.ac.uk/project/flowbec> or contact Dr Beth Scott at b.e.scott@abdn.ac.uk

Looking North

Situated on Scotland's north-east coast, Aberdeen is the gateway to a northern region that extends eastwards to the Nordic and Baltic countries and to northern Russia and Siberia, and westwards to Iceland, Greenland, Canada and Alaska.

This northern region shares many similarities in climatic, environmental, historical, geopolitical and cultural conditions.

Now researchers at the University of Aberdeen want to find out how these connections not only shaped the development of the region and its people, but how they might shape the future.

The North is one of the key research themes for the University and four projects bringing together academics from a broad range of subject areas will investigate this sensitive region of the world from new perspectives.

Dr Isobel Cameron, from the University's Psychiatry Group, will work as part of a team examining how temperament in the north differs from that in other regions.

"People in the north are often stereotyped as 'dour, stoical and reserved'" she says.

"While this may just be a stereotype, cultural differences do exist in the way people express emotions and this can have an impact when it comes to healthcare.

"We are interested in the extent to which emotional expression in the north can be misrepresented. If northern inhabitants differ in their emotional expression from a standardised international norm, this has important implications for the recognition and treatment of affective disorders such as depression."

Dr Cameron will work with a post-doctoral research fellow and several PhD candidates in a team which also includes experts in anthropology, applied medicine, clinical

psychiatry, computing science, history of art, psychology, and culture and traditions.

"When people have looked previously at cultural differences in mood, they have done so using methods distinct to their own field, so you have anthropologists and psychologists, for example, working in isolation.

"By bringing together people from different disciplines, we hope that something more is to be gained and that we can examine this area using new methods.

"Parallel to this scientific investigation we will study cultural and aesthetic dimensions of the ways people perceive and value northern environments, and look at how these affect well-being."

Other projects on The North will look at climate changes in this fragile region and how its inhabitants can adapt to them, the rise of early medieval kingdoms, and processes and impacts of colonialism.

Professor Tim Ingold from the Department of Anthropology is leading The North research theme.

"Today the circumpolar North has become an observatory for the exploration of changing relations between human societies and their environments", he says.

"Aberdeen is the principal centre for northern research in the UK and these four exciting new projects on The North will further cement the University's status as a centre of excellence for research in this important area."

Professor Ian Diamond, Principal and Vice-Chancellor of the University of Aberdeen, adds: "In a number of fields, such as in geosciences, environmental biology, archaeology, anthropology, history and Scandinavian studies, the University has already established a leading international research reputation.

"No other University in the UK currently comes close to being so heavily invested in northern research, and in none are the prospects for the future development of research in the region so promising. This is an area in which the University can achieve world-class distinction." ■

Moving on from 007

As the world becomes ever more integrated, it is time to stop thinking about security in the 'James bond' style concerned only with bombs and spies," says Dr Andrea Teti, one of the founding members of the University of Aberdeen's Centre for Global Security and Governance.

"Instead security should be seen as one of three intrinsic strands, which together with development and democracy, is essential for a stable world."

Dr Teti, a lecturer in politics and a leading authority on the Middle East, teamed up with historian Dr Tom Weber to create the Centre, which aims to bring together expertise from across the University to address the big challenges of the 21st century.

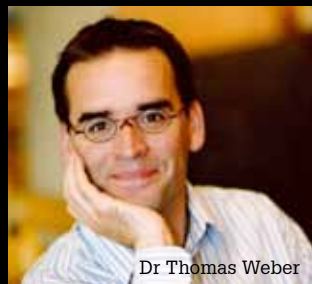
"We look at the issues covered by the theme of global uncertainty to consider security in the context of other challenges of our time," he adds.

"Security is no longer about trying to make one country safe and what I refer to as 'James Bond thinking'.

The world has changed dramatically in the last two decades and while the 1980s and early 1990s were very much focused on inter-state security, the globalisation of the world makes national boundaries arbitrary when it comes to the threats facing society.

"As a result the Centre has identified eight core areas of security which we hope to address by bringing together the sciences, humanities and social sciences to give a broad perspective.

"These are International Security, Radicalisation and Conflict Resolution, Organised Crime and Terrorism, Energy and Oil, Food Security, Climate Change and Environmental Threats, Economic and Financial Development and Sustainability, Cyber Security and Threats to Infrastructure."



Dr Thomas Weber



Dr Andrea Teti

Dr Weber, Director of the Centre, says the financial crisis of 2008 demonstrated the need to consider the implications not only of physical threats to our infrastructure but of breakdowns in financial and other 'cyber' systems.

"The 2008 crisis was significant not just in terms of what actually happened with the collapse of several banking giants, and its repercussions across the world, but the potential implications for society had the financial system broken down totally.

"This could apply to a number of other fields such diverse as the rule of law, trade, or food and supply chains. What happens if the existing infrastructure fails to operate or does so in an ever more volatile fashion? These are questions it is important we all address and the Centre provides an academic framework in which to consider these issues."

Many of the Centre's experts are already engaged in work tackling just such issues. Dr Julian Williams, from the University of Aberdeen

Business School, is working on a number of projects connected to threats to transport and critical infrastructure and has collaborated with Hewlett Packard to look at 'cloud' security in computing systems.

Expertise at the centre ranges from business and economics to the law, politics and international relations, sociology and marine biology.

Dr Weber adds: "We are told that the more integrated we are, as if something goes wrong the shock is absorbed by a system, not a state or country.

"But, as we have seen with recent developments in the European Union, problems can also be amplified through a worldwide system.

"By establishing the Centre for Global Security and Governance, we aim to ensure the University of Aberdeen is at the forefront of an important research area and that we can contribute an academic perspective to thinking on these important issues." □



For more information visit: <http://www.abdn.ac.uk/global-security/> or contact: Dr Andrea Teti at a.teti@abdn.ac.uk, Dr Thomas Weber at t.weber@abdn.ac.uk



ENERGEIA



AT WORK FOR THE ENERGY SECTOR

As an internationally-renowned research and teaching institution at the heart of Europe's Oil Capital and with academic links all over the world, the University of Aberdeen is ideally placed to work with the energy industry on the challenges it faces. From major research on the environment of the deepest oceans to the latest teaching on global economics, we thrive on developing solutions which will boost the sustainability and competitiveness of the energy sector.

Energeia – the University of Aberdeen's magazine for the Energy Industry.

For more information visit: www.abdn.ac.uk/energy



UNIVERSITY
OF ABERDEEN



**COME HERE.
GO ANYWHERE.**

THAT'S THE DIFFERENCE

POSTGRADUATE PROGRAMMES AT THE UNIVERSITY OF ABERDEEN

The University of Aberdeen is internationally renowned for the quality of its teaching and research, attracting students from all over the world. Founded in 1495, the University can boast over 500 years of history and achievements. Students are taught by academics at the forefront of their fields of expertise and actively engaged in research. The latest UK Research Assessment Exercise (RAE) confirms that we are among the UK's top research universities. Nearly 90% of our research activity was rated as being of international quality and eleven research areas were ranked among the top 5% in the UK.

The University offers excellent facilities for students, including a beautiful central campus where ancient buildings sit side by side with modern, first-class laboratories, up-to-date computing facilities, including a wireless campus, and our newly opened £57 million Library.

The University has also been ranked within the top 150 in the Times Higher Education World Rankings. We offer over 150 different one year masters programmes, along with a wide range of postgraduate research degrees. Opportunities for part-time and distance learning study are also available.

A selection of the wide range of courses on offer include:

- Over 70 Arts & Social Science programmes
- 15 LLM Law programmes with distance learning opportunities
- Oil & Gas programmes in Geology & Engineering
- Business and Management programmes including world-class MBAs
- Environmental and Rural Development programmes
- Advanced Computing Science and IT conversion programmes
- MEd and CPD Education programmes
- Biological, Medical & Molecular Science programmes
- International & Public Health programmes
- Sport Science programmes
- Divinity and Religious Studies programmes
- Politics and International Studies programmes
- History and Cultural Studies programmes

A range of funding opportunities are available for both taught and research programmes. For further information visit www.abdn.ac.uk/funding

**Postgraduate Open Day
Wednesday 7th November 2012
www.abdn.ac.uk/pgopenday**

WWW.ABDN.AC.UK/POSTGRADUATE



**UNIVERSITY
OF ABERDEEN**