



*Magnify your
potential.*
Postgraduate
research
opportunities

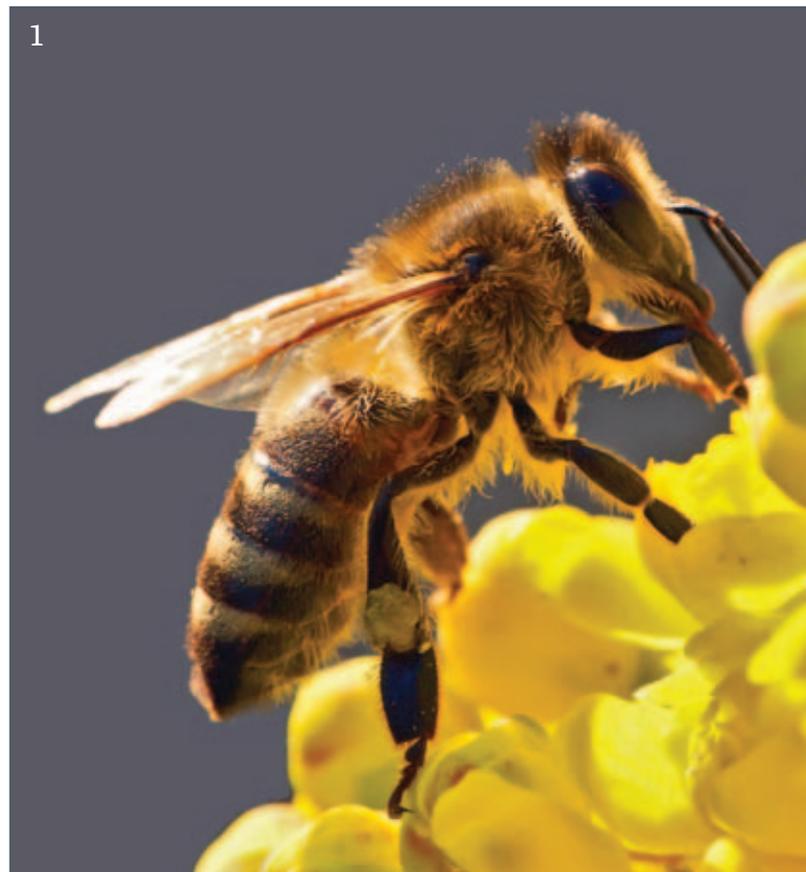
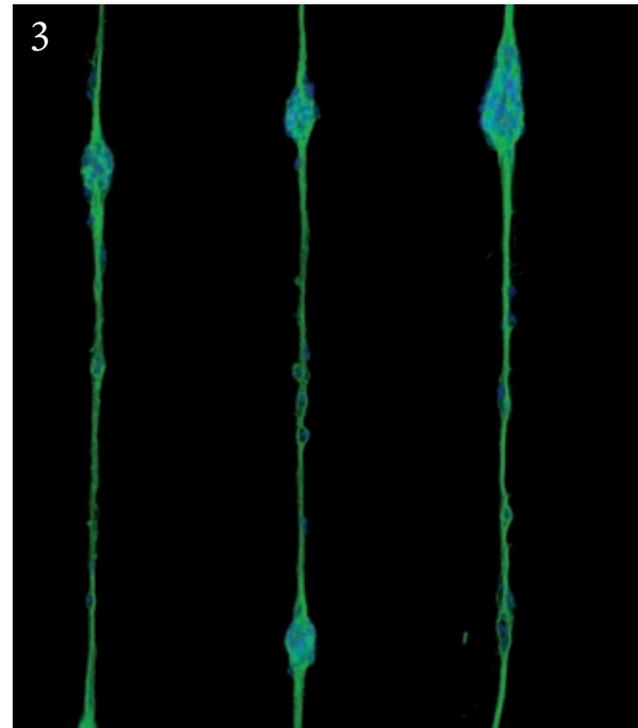
Welcome to the Centre for Biological Sciences

The University of Southampton is one of the UK's leading research universities, with a reputation for pushing the boundaries of knowledge to break new ground and make cutting-edge discoveries.

As an international and world-leading centre for bioscience research, Southampton offers a rewarding and inspiring postgraduate study experience. In the last Research Assessment Exercise (RAE) we were confirmed as a centre for internationally excellent research, putting us amongst the UK's leading biological research departments.

Starting postgraduate research is both exciting and challenging. You have the freedom to study independently, with the opportunity to set your own timetable and agenda. We can provide you with plenty of advice and support on your way to a successful postgraduate research degree. You will work with a personal supervisor, who will help you to draw up a personal development plan to make sure you are well equipped for the challenges ahead. To help you make the most of your time in the Centre for Biological Sciences' Graduate School, we provide a series of introductory seminars and courses to give you a good grounding in the tools you will need. This support continues throughout your PhD, with subject-specific and key skill training you will require in your future career. Modern research is based upon international collaboration both formal and informal, and we aim to offer you the opportunity to travel during your PhD. Meeting scientists from all over the world, whether through presenting your own work at national and international conferences or by working in partner laboratories, gives you the chance to become part of our scientific research community. With all that knowledge to gain, life at the Graduate School will always be interesting.

We look forward to welcoming you.



1. Are honey bee declines caused by diesel pollution?

Investigating links between pollution found in diesel fumes and the global collapse of honey bee colonies.

Page 4

2. Miracle metal

Copper takes on the superbugs as researchers discover its natural antimicrobial properties.

Page 6

3. Infections drive disease

Research into neurodegenerative diseases is helping to improve quality of life for ageing populations.

Page 8

4. Research areas

Addressing the fundamental challenges of human health and environmental change.

Page 13

In this prospectus

The Graduate School	10
Career prospects	12
Molecular and Cellular	14
Environmental	16
Biomedical Sciences	18
How to apply	22

Are honey bee declines caused by diesel pollution?

Scientists are investigating a possible link between tiny particles of pollution found in diesel fumes and the global collapse of honey bee colonies.

Professor Guy Poppy, an ecologist, Dr Tracey Newman, a neuroscientist, and their team from the University of Southampton, believe that minuscule particles, or ‘nanoparticles’, emitted from diesel engines could be affecting bees’ brains and damaging their inbuilt navigational ability. They believe this may stop worker bees finding their way back to the hive. The team is also investigating the possibility that nanoparticles are one of a number of stress factors that could lead to a tipping point in bee health, which contributes to bee colony collapse.

“Diesel road-traffic is increasing in the UK and research from the US has shown that nanoparticles found in its fumes can be detrimental to the brains of animals when they are exposed to large doses. We want to find out if bees are affected in the same way – and answer the question of why bees aren’t finding their way back to the hive when they leave to find food,” explains Professor Poppy.

Bees are estimated to contribute billions to the world’s economy - £430 million a year to the UK economy alone - by pollinating crops, producing honey and subsequently supporting the agricultural industry. Yet winter losses have led to the loss of tens of thousands of beehives year on year since 2007. The US has seen a 35 per cent unexplained drop in the number of hives in 2007, 2008 and 2009. Extensive research, including a recent United Nations Report, has so far not identified the cause of bee declines.

The team from the University of Southampton, including biologists, nanotechnology researchers and ecologists will test the behavioural and neurological changes in honey bees, after exposure to diesel nanoparticles.

Chemical ecologist Dr Robbie Girling, adds: “The diesel fumes may have a dual affect in that they may be mopping up flower smells in the air, making it harder for the bees to find their food sources.”

Recent research which has revealed more about the effects of nanoparticles has enabled scientists to investigate this possible link to bee colony collapse.

The three year study has been made possible by a Leverhulme Trust Research Project Grant.

“We want to find out why bees aren’t finding their way back to the hive when they leave to find food, which could be linked to bee colony collapse.”

Professor Guy Poppy,
Director of Multidisciplinary Research and Professor of Ecology



Honey bees are a major contributor to the world’s economy

“Studies have now repeatedly shown that the use of copper as a surface material in key public places such as hospitals and food preparation areas substantially restricts and reduces the spread of harmful infection.”

Professor Bill Keevil,
Head of the Microbiology Group and Director of the Environmental Healthcare Unit

Miracle metal. Copper takes on the superbugs

Every year, approximately seven million people worldwide acquire a healthcare-associated infection (HAI). Of the four million in Europe, around 37,000 die. In addition to the immeasurable personal impact, HAIs cost over \$80 billion globally, every year.

Microbes that thrive on objects we touch every day cause these infections. Despite aggressive hand washing campaigns and routine cleaning, infection rates remain unacceptably high. Antibiotic-resistant organisms like MRSA have spread from the healthcare environment to schools, homes and public transportation.

In addition, antimicrobial resistance – the theme of 2011’s World Health Day – and its global spread, threatens the continued effectiveness of many medicines used today to treat infectious diseases.

Painstaking research over several years by Professor Bill Keevil, Head of the Microbiology Group and Director of the Environmental Healthcare Unit at the University of Southampton, has established that the natural antimicrobial properties of copper and copper alloys dramatically reduce the presence of MRSA bacteria (staphylococci) compared with stainless steel, the most commonly used surface metal in health institutions. These findings were presented at the World Health Organisation International Conference on Prevention and Infection Control in Geneva.

Once settled on stainless steel, MRSA bacteria remain fully active for days. On brass (an alloy of copper and zinc) they die in less than five hours and on pure copper the superbugs are eliminated in 30 minutes.

The E. coli outbreak in Germany, May 2011

The crisis in Germany was caused by a strain of E. coli never before seen in an outbreak (O104:H4). New research conducted at the University indicates that copper could help prevent the spread of similar infections in the future.

Professor Keevil explains: “A study looking at copper’s efficacy against new strains of E. coli has just been completed. Although it did not specifically look at O104, all the strains investigated have died rapidly on copper.”

On a dry copper surface, the study shows 10 million E. coli bacteria are eliminated within 10 minutes. On a wet copper surface, one could expect a total kill within around 45 minutes. This antimicrobial property is inherent to the metal, and shared with alloys such as brass and bronze.

In the wake of the outbreak, hand washing and careful food preparation have been highlighted as key concerns, as has cross-contamination. Any raw food placed on a work surface can contaminate other food, or have bacteria transferred onto it from previous items resting there.

Deployed as a touch surface in food preparation areas, copper will continuously kill any pathogens that settle on it, reducing the risk of cross-contamination, and helping to prevent the spread of infection.

Infections drive disease.

Quality of life for ageing populations

A multidisciplinary team at the University of Southampton is carrying out research to identify and understand the biological mechanisms that cause injury to neurons in neurodegenerative diseases, such as Multiple Sclerosis, Parkinson's and Alzheimer's with the long-term intention of aiding the development of novel therapeutics.

The Southampton team, which includes Professor Hugh Perry (Biological Sciences), Dr Jessica Teeling (Biological Sciences), Professor Clive Holmes (Medicine), Dr Tracey Newman (Medicine), is investigating the impact of common infections, such as colds, on the progression of neurodegenerative diseases of the brain. This is an issue for the ageing population in both the Western world and the developing world where infections are more common.

There are two key areas to the research:

The translation of experimental research to the clinic

Investigations by the team using experimental models and human studies, have found that systemic inflammation, caused by diverse infections, can speed up the rate at which diseases in the brain progress. If the team can uncover how this happens it may be able to find ways to manipulate the process in order to slow or halt the progression of disease. Halting the speed at which diseases develop will help individuals to maintain a better quality of life with less reliance on health services. The team works with clinicians and health educators to ensure that knowledge around lifestyle choices, such as the winter flu vaccinations, is widely disseminated and acted upon.

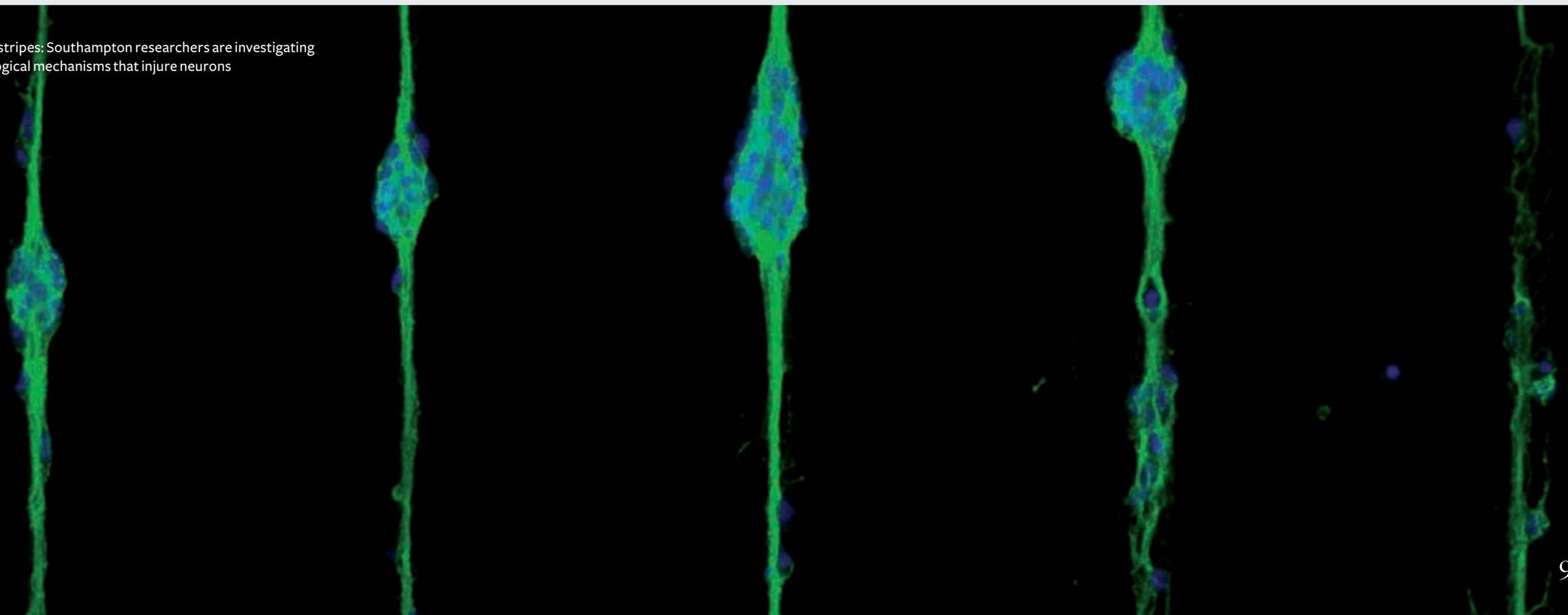
Application of technology to neuroscience

The researchers have collaborated with colleagues in Electronics and Computer Science to devise smart devices to advance the study of neurons. The nervous system is highly organised; the smart device mimics this organisation and will enable researchers to take a new approach to the study of neurons. The team is also exploiting nanotechnology, through the use of nanoparticles, to improve the treatment of brain disease. Drug delivery to the brain is difficult because of the selective shield, or blood-brain barrier, that controls the entry of substances into the brain. The team are developing drug-loaded nanoparticles that are tagged with molecular address labels, which will be recognised by cells at different sites within the nervous system. Work is now going on to find ways of enabling the

nanoparticles to bypass the blood-brain barrier and to deliver their cargo of drugs within the nervous system. This is an exciting and challenging development.

This multidisciplinary approach provides a feedback loop, where clinical applications provide information to understand the disease model better.

Neuron stripes: Southampton researchers are investigating the biological mechanisms that injure neurons



The Graduate School

Our aim is to support postgraduate students in a stimulating research environment, encouraging them to develop their individual skills in pursuit of a successful scientific career.

Biological Sciences PhD students are based in the new Life Sciences Building, a scientific focal point for researchers from across the University and other external organisations, or at Southampton General Hospital, one of the country's leading teaching hospitals.

Research activities in the area of biological sciences are rapidly expanding. The search for answers to the fundamental problems of human health and environmental change is especially important to us. The Centre is recognised for its proteomics facilities and we work closely with Chemistry, Medicine, and Engineering and Computer Sciences.

We pride ourselves on our strong track record of postgraduate research students, with an excellent record for thesis submission.

What does the Graduate School offer?

- A supportive environment for postgraduate study and personal development
- A stimulating project in one of our major research themes
- A programme that provides an integrated series of training modules, supervised by our world-class scientists, with the opportunity to develop your scientific expertise, professional and personal skills
- Networking opportunities at UK and overseas conferences and seminars, as well as a lively postgraduate social club within the Faculty
- A good grounding in vital subjects such as bioethics, lecture presentation, securing scientific funding and report writing.

PhD opportunities

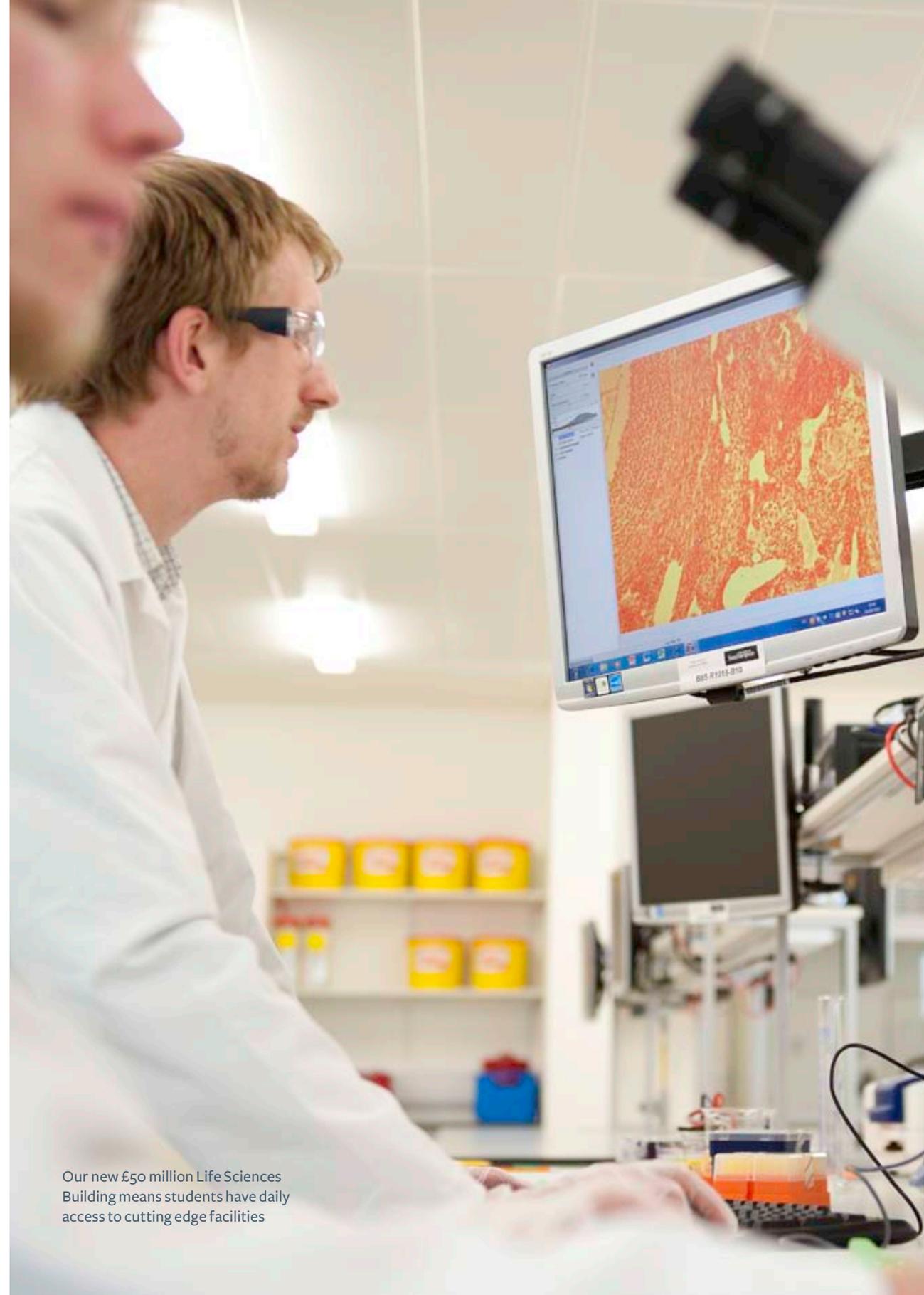
Our programmes provide an integrated series of training modules to help you develop your professional and personal skills as well as your scientific expertise.

Your research work will be closely supervised and supported, particularly in the early months. At intervals during your project, you will be expected to demonstrate to our academic staff that your work is progressing well and likely to achieve a successful outcome. If you have a sponsor, such as a UK Research Council or an overseas government, this is also an assurance that they will expect.

Opportunities exist for postgraduate research in line with the Centre's three thematic research groups; Molecular and Cellular, Environmental and Biomedical Sciences.

Find out more

For further information about postgraduate opportunities at the Centre for Biological Sciences, please visit www.southampton.ac.uk/biosci/postgraduate



Our new £50 million Life Sciences Building means students have daily access to cutting edge facilities



Training for a rewarding career

Career prospects

We have links with major companies and our postgraduates have gone on to work in varied roles, as wildlife researchers, ecological consultants, industrial scientists and university academics.

Choosing the Centre for Biological Sciences for your postgraduate studies will set you well on your way to a successful career. Our students aspire to be world-class scientists, and our successful postgraduates follow a variety of occupations. These include positions in:

- academia
- research institutes
- management
- biosciences research
- food industry
- pharmaceutical industry
- biotechnology and allied industries
- agriculture
- civil service
- scientific journalism.

“I took full advantage of all the courses on offer to postgraduate students to help them prepare for the world of work – I’m convinced that played a major part in landing my present job.”

Leigh Felton

Biological Sciences alumnus, currently working as a Molecular Immunologist in Experimental Medicine at GlaxoSmithKline.

Find out more

Find out more at
www.southampton.ac.uk/biosci/pgcareers

Research areas

Our three major research themes address the fundamental challenges of human health and environmental change.

Molecular and Cellular

- Biomembranes
- Control of gene expression
- Microbiology
- Molecular evolution and bioinformatics
- Molecular structure and function
- Plant cell and molecular science
- Signalling

Environmental

- Behaviour and ecophysiology
- Biodiversity
- Chemical ecology
- Evolutionary biology
- Pathogens, parasites, evolution of immunity
- Plant responses to stress
- Responses to environmental change
- Population growth and persistence
- Sustainable environmental management

Biomedical Sciences

- Developmental neurobiology
- Integrative analysis of neural/synaptic function
- Neurodegeneration
- Neuroinflammation
- Synaptic function and plasticity
- Developmental biology

Research facilities

Within our state of the art Life Sciences Building and at Southampton General Hospital, we have a range of cutting edge facilities and services, supported by dedicated technical expertise, for use by researchers in Biological Sciences and the wider University, as well as local and corporate communities.

Our postgraduate students have access to:

- Invertebrate facilities
- Plant growth facilities
- Transgenic facilities
- Biophysical equipment
- The Centre for Proteomic Research
- Imaging and Microscopy Centre
- Interdisciplinary Centre for NMR

Find out more

For further details about our research and facilities, please visit:

www.southampton.ac.uk/biosci/researchfacilities

Molecular and Cellular

We have a diverse and successful group of research staff working on different systems seeking to understand the cellular and molecular mechanisms that underlie basic biological processes. These include those concerned with disease, development, nutrition and environmental problems.

Molecular structure and function

The increasing sophistication of cell biological studies constantly generates new opportunities and challenges for the understanding of protein and nucleic acid structure and function in a biological context. Physical and engineering scientists are looking at biomolecules as substrates and to develop novel materials. We are well equipped for structural (X-ray and NMR) and biophysical studies of proteins and nucleic acids. This supports a number of research programmes in membrane protein and lipid biophysics; enzyme structure and catalytic mechanisms; recognition of fibrillar proteins; and proteins that modulate cell-cell interactions as well as cell signalling.

Plant biology

Plant biology is a thriving area of research at Southampton with emphasis on genetic and molecular techniques. These answer fundamental and applied questions relating to plant function and development, and the responses of plants in changing environments. We use functional genomics supported by biochemical, molecular, physiological and ecophysiological analysis of plant tissues. Key areas of research are: membrane transport proteins involved in the acquisition and distribution of nutrients; trees as sources of renewable, carbon neutral energy; defences against disease causing organisms and vectors; light regulation of development; and plant function in relation to the environment, particularly to changes in nutrients, light, CO₂, heavy metals, ozone and pathogens.

“Working in a diverse laboratory has allowed me not only to improve my general understanding, but also to learn new techniques more easily due to supporting academic’s expertise in a variety of research fields.”

Scott Kimber

Molecular and Cellular PhD student



High resolution microscopy is an essential tool for today’s cell biologists

Environmental

Our research scientists are investigating fundamental ecological processes within the general theme of adaptation in a changing environment.

We apply our expertise to developing general ecological principles and solving environmental issues that are relevant to society today. Our base in ecology and environmental biology allows us to investigate key applied issues, such as the impact and mitigation of climate change; Genetically Modified Organisms (GMOs) in the wider environment; crop science; and the sustainable use of natural resources including farmland management. The theme also includes the Environmental Healthcare Unit which focuses on microbial growth on surfaces, particularly in high species diversity biofilms. Our work in cellular and molecular biology is examining the functioning of plants in relation to the environment. This includes plant responses to abiotic and biotic stresses including heavy metals, drought, elevated CO₂ and pathogens. We are particularly interested in the use of plants for renewable energy and in the potential for improving nutrition.

Current research areas

- Individual behaviour and ecophysiology
- Population growth and persistence
- Effects of metapopulation structure on genetic diversity and population persistence
- Ecology and evolution of immunity to parasitism and disease
- Species co-existence and local diversity
- Global patterns of species diversity
- Phylogenetic patterns of species diversification
- Plant pathogen, plant-insect and tritrophic interactions
- Plant responses to climate change, the light environment and nutrient status



We have a strong grouping in plant biology that addresses the functioning of plants in relation to the environment

“After doing a BSc in Biomedical Sciences, I continued with a PhD in Neuroscience. Whilst challenging, I am very much enjoying my project, and hope that something novel will come out of it.”

Nash Matinyarare
Biomedical Sciences PhD student

Visualising the cytoskeleton
of a glial cell from the brain

Biomedical Sciences

Multidisciplinary research in this rapidly expanding, vital and exciting area is co-ordinated through the Southampton Neuroscience Group (SoNG) which includes both basic and clinical scientists.

Neuroscience

There is growing evidence of similarities in the molecular and cellular mechanisms of nervous system function across a range of different organisms. We are developing this knowledge by investigating the properties of excitable tissues from nematodes, insects and mammals. Research on each of these organisms is directed towards understanding nervous system function in health and disease, and utilises information from the genome mapping of key species such as nematodes, fruit flies and mice. Through this research, we have achieved new insights into diseases associated with protein misfolding and aggregation, such as Alzheimer's, Huntington's and prion disease, and disease states such as epilepsy and multiple sclerosis.

Developmental biology

We host a strong developmental biology group which employs key developmental models including mouse, Drosophila and C. elegans, and tissue and cell lines. The main areas of research are: cellular signalling; epithelial differentiation; neurogenesis; transcription factor activity; foetal programming; and epigenetics. Much of our work links basic mechanisms with applications in clinical medicine and the causes and consequences of human diseases. We have strong research collaborations with Medicine studying the mechanisms that underlie foetal programming.

Current research areas

- Neuronal signalling, energetics and survival
- Cellular and molecular determinants of neuronal signalling
- Molecular mechanism of neurodegenerative diseases
- Chemoreception in insects, modulation of sensory input to neuronal networks
- Molecular mechanisms of synaptic function and dysfunction
- Functional and evolutionary causes of extraordinary life spans
- Experimental neuropathology, inflammation in the central nervous system
- Modelling neurodegenerative diseases in Drosophila
- Neuroimmunology
- Mechanisms of protein misfolding, neuronal dysfunction and death
- Early mammalian developmental mechanisms and blastocyst morphogenesis
- Effects of periconceptional maternal diet on the offspring's developmental potential and lifelong health
- Developmental epigenetics and its contribution to adult health and disease
- Impact of assisted reproductive technologies on long term health of the offspring
- Regulation of cell proliferation through signal transduction mechanisms
- Stem cells of the early embryo as a model of developmental potential
- Mechanisms underlying the interaction between endothelial and osteogenic cells in development
- Biology of the islet of Langerhans
- Maternal sickness around conception and its effects on the development of innate immunity in the offspring

Living in Southampton

Southampton is a thriving, modern city, steeped in history and culture, and is one of southern England's top leisure and cultural destinations.

With its bustling marinas and relaxing parks, international shopping outlets and modern restaurants and bars, Southampton is a great place to live and work. The city offers a vibrant mix of recreation, culture and entertainment – from restaurants, cafés, bars and nightclubs, to cinemas, sports facilities, internationally acclaimed arts venues and one of the UK's top shopping centres.

The countryside is never far away – Southampton Common, designated a Site of Special Scientific Interest, is next to our Highfield campus and the New Forest, the Jurassic Coast and the Isle of Wight are all within easy reach. Uni-*link* buses connect the airport, coach and train stations. There are excellent links to Europe via cross-channel ferries from Portsmouth and Poole, and Southampton and Bournemouth International Airports have frequent flights to European cities and holiday destinations. All that and we have one of the best climates in the UK, with more sun and less rain.

English language qualification

In accordance with University regulations, international students whose first language is not English must provide evidence of the ability to communicate in English by offering one of the recognised tests in English (minimum requirements are an IELTS score of 6.5, TOEFL 580, CBT 237 or iB-TOEFL 92). This is applicable to all overseas students except those from countries named by the University as being exempt from testing. English Language lessons are provided if required.

International students

The University of Southampton is a truly international institution with a global reputation for excellence in cutting-edge research. Students from more than 100 different nations study here and our network of university partnerships spans the globe.

As an international recruiter, we aim to make our entry and admissions procedures straightforward. We offer a number of scholarships for international postgraduates and can provide advice and guidance on all aspects of living and studying in the UK.

Staff from our International Office are also on hand to help you adjust to your new life in Southampton. We have three specialist academic advisors, whose role is to support you with your studies. The Students' Union Advice Centre also provides cultural and personal support. Contact the International Office for more information:

www.southampton.ac.uk/international

Southampton offers you a great social experience
- our campus is a dynamic and lively place to study



The new Life Sciences Building, home to the Centre for Biological Sciences.

How to apply

Entry requirements

Upper second-class honours degree or equivalent in an appropriate subject

Duration

3–4 years (full-time); up to 6 years (part-time)

Assessment:

MPhil/PhD thesis, viva voce, transferable/research skills portfolio

Start date:

October (but possible throughout the year)

Intake:

30

Applying:

University application form with transcripts

Closing date:

None, but studentship deadlines may vary

Funding:

BBSRC; EPSRC; MRC; NERC; Wellcome Trust; research council-funded studentships are available from February onwards

Fees:

Please visit www.southampton.ac.uk/pgfeesandfunding for the most recent information relating to tuition fees.

To apply

Call, email or contact us through the website, quoting Postgraduate Administration:

Tel: +44 (0) 23 8059 4121

Email: pgafnes@southampton.ac.uk

Web: www.southampton.ac.uk/pgapply

Fees

Tuition fees vary according to the type of programme you choose. Fees charged to full-time international students from outside the EU include the full cost of tuition, examinations, Students' Union membership and research support expenses (where applicable).

Funding opportunities

Many studentship opportunities become available during the year. The majority of these studentships are backed by Research Councils and charitable trusts. Collaborative studentships are also obtained by individual members of academic staff through their relationships with industry. Details of these studentships will be announced on the Graduate School website as they become available:

www.southampton.ac.uk/biosci/pgstudentships

Enquiries

All enquiries relating to admission to the MPhil/PhD Research Programme at the Centre for Biological Sciences should be directed to our Admissions Team:

pgafnes@southampton.ac.uk

+44 (0) 23 8059 4121

Find out more

For more information about the University of Southampton's Centre for Biological Sciences, and for frequently asked questions about university life – from accommodation to careers after graduation – visit www.southampton.ac.uk/biosci

You can also keep up-to-date with what is going on at the University by browsing our social media channels at www.southampton.ac.uk/social

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Relevant web links are shown throughout the Postgraduate Opportunities brochure. Please also consult www.southampton.ac.uk/biosci online for further details and/or any changes which have appeared since first publication of the Postgraduate Opportunities brochure or phone +44 (0) 23 8059 4121 for more information.

Disclaimer

The University of Southampton will use all reasonable efforts to deliver advertised programmes and other services and facilities in accordance with the descriptions set out in its prospectuses, student handbooks, welcome guides and website. It will provide students with the tuition, learning support, services and facilities so described with reasonable care and skill.

The University, therefore, reserves the right if it considers it to be necessary to alter the timetable, location, content or method of delivery of events provided such alterations are reasonable.

Financial or other losses

The University will not be held liable for any direct or indirect financial or other losses or damage arising from changes made to the event timetable, location, content or method of delivery of various services and facilities set out herein.

Force majeure

The University will not be held liable for any loss, damage or expense resulting from any delay, variation or failure in the provision of services and facilities set out herein, arising from circumstances beyond the University's reasonable control, including (but not limited to) war or threat of war, riot, civil strife, terrorist activity, industrial dispute, natural or nuclear disaster, adverse weather conditions, interruption in power supplies or other services for any reason, fire, boycott and telecommunications failure.

In the event that such circumstances beyond the reasonable control of the University arise, it will use all reasonable endeavours to minimise disruption as far as it is practical to do so.

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This information can be made available, on request, in alternative formats such as electronic, large print, Braille or audio tape, and in some cases, other languages. Please call +44 (0)23 8059 7726 to request an alternative format.

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