Neuroscience

Essentials

Taught programme
MSc degree
Cellular and Molecular Neuroscience

Research programmes
MPhil, PhD Neuroscience

Related programmes
MSc in Cognitive Neuroscience (p141)
MSc in Imaging in Biomedical Research (p47)

Admissions requirements
For information on overseas qualifications that meet the admissions requirements, refer to pages 156-157
MSc
A first- or upper second-class undergraduate honours degree in a suitable subject (from the biological or biomedical sciences or candidates with relevant professional experience, all with a good interest in neuroscience
MPhil and PhD
A first- or upper second-class undergraduate honours degree in a subject relevant to your chosen area of research

English language requirements
IELTS 6.5, with not less than 6.5 in Writing and 6.0 in the other sections. Internet TOEFL with 92 overall, with 21 in Listening, 22 in Reading, 24 in Speaking and 25 in Writing. For more information and alternative English language requirements, refer to page 156

Fees
Refer to pages 158-159 for information on fees

Further information
Taught programme
Neuroscience, PG Admissions,
School of Life Sciences,
John Maynard Smith Building,
University of Sussex, Falmer,
Brighton BN1 9QG, UK
T +44 (0)1273 678057
E lifesci@sussex.ac.uk
Research programmes
Deeptima Massey,
School of Life Sciences,
John Maynard Smith Building 3b4,
University of Sussex, Falmer,
Brighton BN1 9QG, UK
T +44 (0)1273 678057
E d.massey@sussex.ac.uk

- Rated 8th in the UK for 'Pre-clinical and Human Biological Sciences' research in the 2008 Research Assessment Exercise (RAE). 85 per cent of our research was rated as internationally recognised or higher.
- Research in the neuroscience subject group is aimed at determining how the nervous system acquires, processes, stores and uses information required in the generation and execution of adaptive behaviour.
- We provide an exciting and excellent study environment for you in an area that demands multidisciplinary training.
- Areas of particular strength include hearing, vision, learning and memory formation, neural circuit analysis, animal navigation and CNS evolution.
- Links with the Centre for Computational Neuroscience and Robotics (CCNR) provide opportunities for neuroscientists and computer scientists to collaborate, and links with the Sackler Centre for Consciousness Science (SCCS) also provide exciting opportunities. Visit **www.informatics.sussex.ac.uk/ccnr** and **www.sussex.ac.uk/sackler**
- A very wide range of state-of-the-art molecular, cellular, electrophysiological and brain imaging (PET and MRI) technologies is available.
- In addition, the Sussex Centre for Advanced Microscopy provides confocal, 2-photon and CCD microscopy, and cryo- and transmission-electron microscopy.

The electrical activity in neural networks can be analysed using microelectrodes placed inside the individually identified neurons that comprise the network. This work provides insight into how the brain generates the complex patterns of activity that underlie adaptive behaviour

Taught programme

MSc in Cellular and Molecular Neuroscience
1 year full time
This MSc comprises four core courses, teaching both practical techniques and experimental approaches, as well as the theoretical background to active areas of progress in cellular and molecular neuroscience. A large part of the degree is devoted to a research project, undertaken in one of the active research groups in neuroscience (or through an industrial placement).

Career opportunities
Many of our graduates continue their studies at doctoral and post-doctoral level, often at Sussex, although the multidisciplinary nature of the training allows graduates to progress into many areas of industry such as biotechnology or neuropharmacology.

Programme structure
Autumn term: Advanced Techniques in Cellular and Molecular Neuroscience (largely lab based) • Transmission and Transduction.

Spring term and vacation: Plasticity – Development and Learning (which includes a very interactive journal club) • Sensory Systems and Receptors. You will also start your research project.

Summer term and vacation: you continue your research project.

Assessment
You are assessed by essays, presentations, laboratory reports, examinations and a project dissertation.

Research programmes

Projects falling within the range of faculty research interests (refer to far right) can be considered.

Recent thesis titles

An in vitro eletrophysiological analysis of associative long-term memory

A role for prestin in amplification, otoacoustic emissions, and shaping mechanical tuning in the cochlea

Comparison of tonotopic gradients of basolateral potassium currents in inner hair cells of gerbils, guinea pigs and mice

Computational modelling of the feeding central pattern generator in the pond snail Lymnaea stagnalis

Defensive coloration and behaviour in juvenile common cuttlefish Sepia officinalis L

Development of the giant fibre system of Drosophila melanogaster

Evolving dymanical system models of path integration

Functional maturation of mouse cochlea inner hair cells

Involvement of PKA and CREB in memory consolidation/reconsolidation after single-trial reward classical conditioning in Lynmaea stagnalis

The molecular basis of long-term memory formation

Use of inner ear-specific promoters to ectopically express Math 1 in vivo in the developing mouse cochlea

Using neural networks for the adaptive control of movements: an investigation into the problem of interference in distributed feedforward networks

Visual perception and camouflage of the common cuttlefish Sepia officinalis

Career opportunities

Our graduates have gone on to careers in Higher Education and research, and hold roles such as lecturer, research associate and research fellow.

Related research centres

Centre for Computational Neuroscience and Robotics (CCNR)

The cross-discipline synergy between computer science and neuroscience holds the key to future developments in robotics and artificial intelligence. It will lead to a better understanding of how the brain works and promises biomedical advances of enormous benefit. The CCNR links physical and biological sciences and places Sussex in a powerful position at the forefront of an emerging and increasingly important interdisciplinary field. For more information, visit **www.informatics.sussex.ac.uk/ccnr**

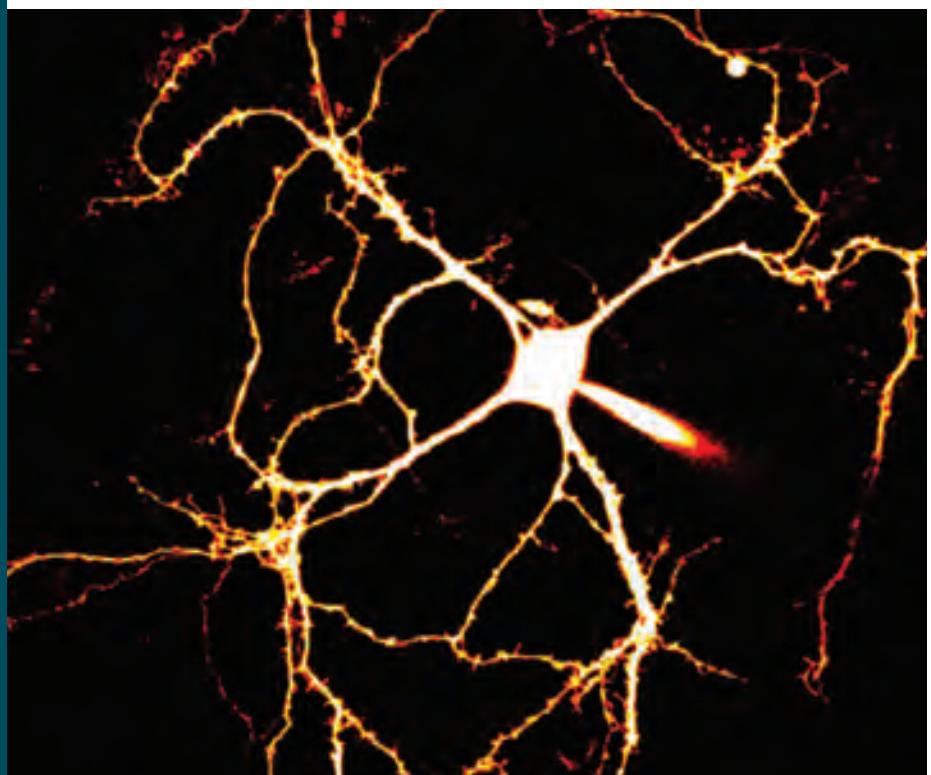
Sackler Centre for Consciousness Science (SCCS)

Founded in 2010 with a generous donation from the Mortimer and Theresa Sackler Foundation, SCCS represents a new and multidisciplinary approach to clinical intervention and diagnosis, based on the science of the complex brain networks that give rise to consciousness. For more information, visit **www.sussex.ac.uk/sackler**

Sussex Centre for Advanced Microscopy

This Centre provides state-of-the-art facilities for confocal, 2-photon and time-lapse video microscopy, and cryo- and scanning electron microscopy. For more information, visit **www.lifesci.sussex.ac.uk/scam**

Hippocampal neuron filled with fluorescent Ca^{2+} indicator dye



Faculty research interests

Individuals' research interests are briefly described below. For more information, visit **www.sussex.ac.uk/lifesci/people**

Jonathan Bacon *Foraging behaviour of Pharaoh's ants.* How Pharaoh's ants explore new space. Using real populations and modelled in virtual ant populations in silico.

Paul Graham *Insect and robot navigation.* Interest in navigation and visual learning in insects. Use of behavioural studies, simulations and robots to investigate models of visually guided navigation.

Majid Hafezparast Refer to the Biochemistry subject entry on page 48.

George Kemenes *Long-term memory formation*. Evolutionarily conserved cellular and molecular mechanisms of long-term memory formation; invertebrate (snail) model of learning and memory.

Sergei Korneev *Regulation of gene expression in the brain.* Investigate NATs that are expressed in the CNS and involved in the regulation of the production of important signalling molecules.

Corné Kros *Physiology of inner ear sensory hair cells.* Patch-clamp electrophysiology and calcium imaging to understand how hair cells turn sound into electrical signals that the brain can interpret.

Andrei Lukashkin *Physiology and biophysics of the mammalian cochlea*. Mechanisms responsible for acute sensitivity, enormous dynamic range and sharp frequency selectivity of the cochlea.

Mark Maconochie *Inner ear development*. Molecular basis of how the mammalian inner ear is generated from a small patch of ectoderm during development.

Daniel Osorio *Visual ecology, colour, camouflage and biological signalling*. Cerebral lateralisation of visual behaviour in zebrafish and birds. Colour measurement in biological signals and visual camouflage.

Guy Richardson *Cellular and molecular basis of hearing and deafness*. Mechanisms of mechano-transduction in sensory hair cells, how the extracellular matrices of the inner ear influence frequency tuning in the cochlea.

Ian Russell *Biological basis of hearing and deafness.* Examine normal and genetically modified cochleae investigating the cellular and molecular basis of hearing and deafness in mammals.

Kevin Staras *Neurotransmission at central synapses.* Examining the activity-dependent remodelling of vesicle pools as a basis for synaptic regulation and plasticity.