



Neuroscience Matters: research for future health



British
Neuroscience
Association

Fundamental neuroscience is key to future health

World-leading neuroscience research in Scotland can help us meet the societal challenges we face in the future.

The science of the nervous system is essential for understanding what makes us human, preventing and treating neurological and psychiatric disorders, and keeping the UK at the forefront of cutting-edge research internationally. That's why investment in neuroscience research is key, and why we should celebrate the world-leading research happening in Scotland.

The British Neuroscience Association (BNA) is the largest UK organisation connecting, representing and promoting neuroscience and neuroscientists across the globe. We're committed to creating a supportive and inclusive neuroscience community, making connections between academia, industry, medicine and wider society,

and moving world-class neuroscience research up the agenda.

We have over 300 members across Scotland and over 2,750 members overall, whose interests cover the whole range of neuroscience: from molecules to whole animal behaviour to real-life applications in the clinic and beyond.

In recent years, two Scottish neuroscientists have won the Brain Prize (the highest neuroscience prize) and the current presidents of the BNA, the Association of British Neurologists, and the president-elect of the British Paediatric Neurology Association are all based in Scotland.

With support from the Scottish Parliament, Scotland has the potential to become even stronger in neuroscience research.



Professor Tara Spires-Jones

Deputy director of the Centre for Discovery Brain Sciences at the University of Edinburgh and BNA President



1m people with a neurological condition

Including within Scotland an estimated:
90,000 with dementia, 58,000 with epilepsy, 15,750
with MS, 12,400 with Parkinson's, 400 with MND.¹

1 in 3 people in Scotland
are estimated to be affected by
mental illness in any one year²



£2.9 billion

Estimated cost of
dementia every year
in Scotland³

Get involved

If you're an MSP:



Sign the motion
'Neuroscience Matters' from
Daniel Johnson MSP



Visit a neuroscience project
in your constituency or
region

If you're a neuroscientist:



Join the BNA and/or your
local group in Scotland



Share your work with your
local MSP

About neuroscience



Neuroscience is the study of the brain and nervous system in both humans and non-human animals, and in both health and disease.

It is a relatively new field of science, only emerging as a distinct subject in its own right during the 20th century. However, it has grown rapidly and now covers multiple areas including novel technologies, and research into many brain functions and disorders, as well as applications as diverse as education, AI and the law.

The brain is responsible for our thoughts, mood, emotions and intelligence, as well as our physical movement, breathing, heart rate and sleep. In short, it makes us who we are and facilitates almost every aspect of what it means to be alive.

Neuroscientists have the daunting task of trying to understand how all these billions of neurons in the brain and nervous system work.

Although there has been incredible progress, there is still much left to discover.

Weighing about 1.3 kg, the human brain consists of millions of individual nerve cells or neurons plus millions of additional cells known as glia.

These are all connected via microscopic points of contact into a vast network of interlinking circuits and sub-circuits.

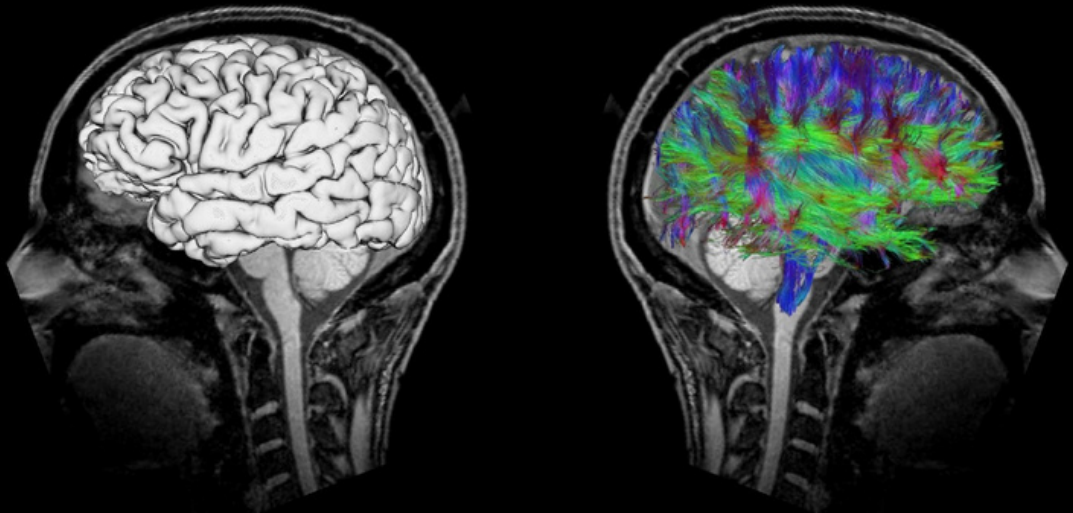
The need for research

Neurological disorders are one of the leading causes of disability globally and brain disorders are estimated to cost over £100bn per year in the UK alone.

The complexity of the nervous system makes neuroscience inherently highly challenging. Despite an explosion of knowledge over the last century, we are just scraping the surface when it comes to understanding many of its fundamental functions. To rise to this challenge, we need to drive advances in basic, preclinical, fundamental neuroscience research.

One of neuroscience's biggest challenges is that the field is chronically under-funded compared to other biomedical fields. Within dementia research, for example, for every £10 in health and social care costs for dementia, dementia researchers received £0.08 funding; whereas cancer research received £1.08 funding per £10 costs i.e. a funding rate thirteen times higher for cancer than dementia.⁴

We need research funders to help to close the funding gap.



Case study: Rett Syndrome trial

Neuroscience research pioneered by teams at the University of Glasgow and University of Edinburgh has laid the path to a potential new treatment in **Rett Syndrome**.

Rett Syndrome is a progressive neurodevelopmental disorder estimated to affect 1 in 10,000 girls (it is only rarely seen in boys), making it one of the most common genetic causes of developmental and intellectual impairment.

There are no approved therapies for Rett Syndrome targeting the underlying cause of the disorder, with treatment focusing on symptom management and supportive care.

Dr Stuart Cobb's lab was the first to

report the effect of gene therapy in mice modelling of Rett Syndrome, in work supported by the Rett Syndrome Research Trust. Many Rett symptoms are caused by mutations in a single gene, *MECP2*, and gene replacement therapy delivers healthy genes to compensate for mutated genes.⁵

The lab is now working with Neurogene to take their gene therapy platform into a **clinical trial**, with enrollment set to start in 2023.



Prof Stuart Cobb
University of
Edinburgh



Case studies: ALS research

Jenna Gregory is a Consultant Pathologist and Principal Investigator at the University of Aberdeen, whose research focuses on the molecular mechanisms underlying neurodegenerative diseases with a particular focus on **Amyotrophic Lateral Sclerosis (ALS)**.

The work in her lab involves studying patient samples (tissue and biofluids) for molecular differences that could explain why people with ALS have such diverse symptoms. Her work is funded by the NIH, Target ALS and MND Scotland and

her lab recently discovered that markers of ALS can be detected in the gut years before motor symptoms begin.

The aim of her lab's work is to identify targets that could be used for diagnosis or to monitor disease progression, or ultimately, for therapies to improve the outlook for people with ALS.



Dr Jenna Gregory
University of Aberdeen

A native of the Scottish north coast, **Chris Henstridge** completed his PhD in Dundee before returning as a Principal Investigator to establish his lab there.

His lab has received joint funding from MND Scotland and Alzheimer's Research UK to study **ALS**.⁶



Dr Chris Henstridge
University of Dundee

Chris has also recently been awarded an Alzheimer's Society Dementia Research Leaders Fellowship and an Academy of Medical Sciences Springboard Award to develop his work on ALS.⁷

Chris's lab aims to discover when, where and why synapses are lost in ALS, with the hope to design ways to stop it happening.

Chris believes this work could one day discover ways to slow or even stop diseases like MND in their earliest stages.

Case study: Strengthening Credibility in Neuroscience

The BNA is committed to driving neuroscience research to be as robust, reliable, replicable, and reproducible as possible, to create an exciting and sustainable future for 21st century neuroscience.

Our **Credibility in Neuroscience** programme, supported by the Gatsby Foundation, is helping to change the research culture, provide neuroscientists with new skills and knowledge, and change the broader environment researchers work in.⁸

In 2021, we launched a set of annual Credibility Prizes to champion leading examples of credible practice in neuroscience research, with the inaugural team prize winner the **CAMARADES research group** at the University of Edinburgh.

CAMARADES was founded in 2004 by Malcolm Macleod and David Howells, and has used

systematic review and meta-analysis to address translational failures in preclinical research in disease models such as neuropathic pain and Alzheimer's disease.⁹ The team pioneered the use of the systematic review as a method to interrogate the reproducibility of preclinical research studies.

As part of their goal to improve the validity and value of the preclinical models of human diseases, CAMARADES have also campaigned and advocated for changes in the reporting of preclinical research, working with Nature Publishing Group and PLOS One to revise editorial policy.



Professor Emily Sena
Convenor of CAMARADES and member of the BNA Credibility Advisory Board

Case study: Lothian Birth Cohort Studies



Scotland is home to the longest study of human cognition in the world.¹⁰

The **Lothian Birth Cohorts** are two groups of people, born in 1921 and 1936, who attended school in June of 1932 or 1947 respectively and took at that time an intelligence test called the Scottish Mental Survey.

Surviving members of these cohorts were traced and have been tracked in new studies by researchers at the University of Edinburgh to investigate how the brain changes with age, and which lifestyle, health and genetic factors influence these changes.

Dr Simon Cox
Director of
The Lothian Birth
Cohort Studies



Discoveries from the Lothian Birth Cohort Studies have included showing that:

- differences in people's genes might account for about 25% of the variation in how thinking skills change from childhood to old age. Some genes become increasingly important for accelerated cognitive and brain ageing within older age.
- cognitive and brain health are harmed by smoking, loneliness, pollution and social isolation, and is aided by maintaining vascular health, physical and intellectual activity into older age.¹¹

The studies' findings have **influenced policy** in Scotland and internationally.

Building a positive research culture in neuroscience

BNA Scholars Programme

Our Scholars Programme launched in October 2020 and supports students and early career researchers from underrepresented ethnic groups to thrive in neuroscience, and to build a supportive community through networking opportunities, bursaries and mentorship.

Through the support of 16 forward thinking organisations representing the full breadth of the neuroscience sector we have so far **provided support to 21 scholars**, each carefully matched with a mentor.

Arish Mudra Rakshasa-Loots, University of Edinburgh

Arish is a neuroscientist, liberal arts scholar, and EDI consultant.

Born and raised in Ghaziabad, India, Arish joined our **2023 cohort**.

Arish is completing a PhD in Translational Neuroscience, researching the neurobiological mechanisms underlying the high prevalence of depression amongst people living with HIV. This work is driven by Arish's passion for HIV healthcare and interest in neuropsychiatric disorders.

Leveraging HIV participant cohorts in the UK, the Netherlands, and South Africa, Arish is working to determine whether neuroinflammation can explain why people living with HIV face a significantly higher risk of depression.

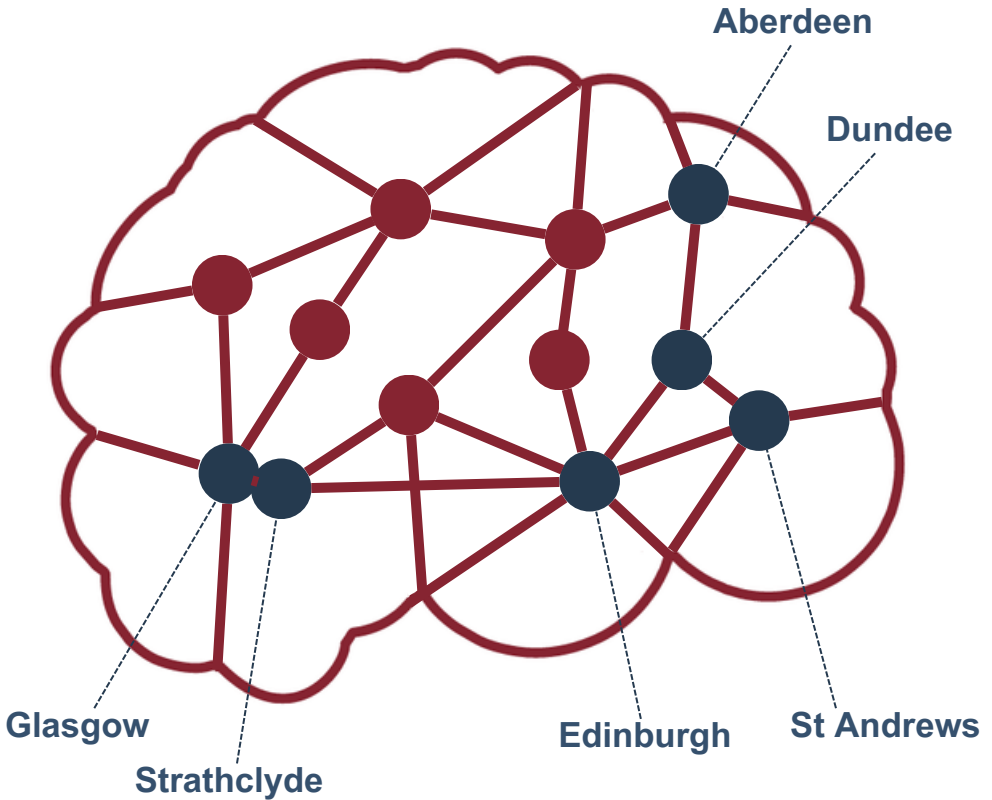
Arish has also worked in partnership with collaborators, mental health professionals, and people with lived experience of depression to develop a transcultural translation in isiXhosa of a widely-used depression screening tool.



If you're interested in sponsoring our Scholars programme, visit bna.org.uk/about/our-scholars/

Our neuroscience community

6 BNA local groups at institutions across Scotland



300+ members across Scotland – spanning a range of disciplines and career stages

bna.org.uk/members/local-groups/

Discover more at:



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1. Sources respectively: scottishneurological.org.uk; alzscot.org; epilepsyscotland.org.uk; mssociety.org.uk; parkinsons.org.uk; mndscotland.org.uk.
 2. gov.scot/policies/mental-health
 3. BNA estimate derived from: European prevalence rates for dementia (2017) and average annual cost per person (alzheimers.org.uk)
 4. Luengo-Fernandez R, Leal J & Gray A. UK research spend in 2008 and 2012: comparing stroke, cancer, coronary heart disease and dementia. *BMJ Open* 5, e006648 (2015).
 5. reverserett.org/research/cures/gene-replacement
 6. mndscotland.org.uk/news/powering-mnd-research/
 7. acmedsci.ac.uk/grants-and-schemes/grant-schemes/springboard/springboard-awardees
 8. bnacredibility.org.uk
 9. ed.ac.uk/clinical-brain-sciences/research/camarades
 10. The Lothian Birth Cohort, nms.ac.uk
 11. ed.ac.uk/lothian-birth-cohorts

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