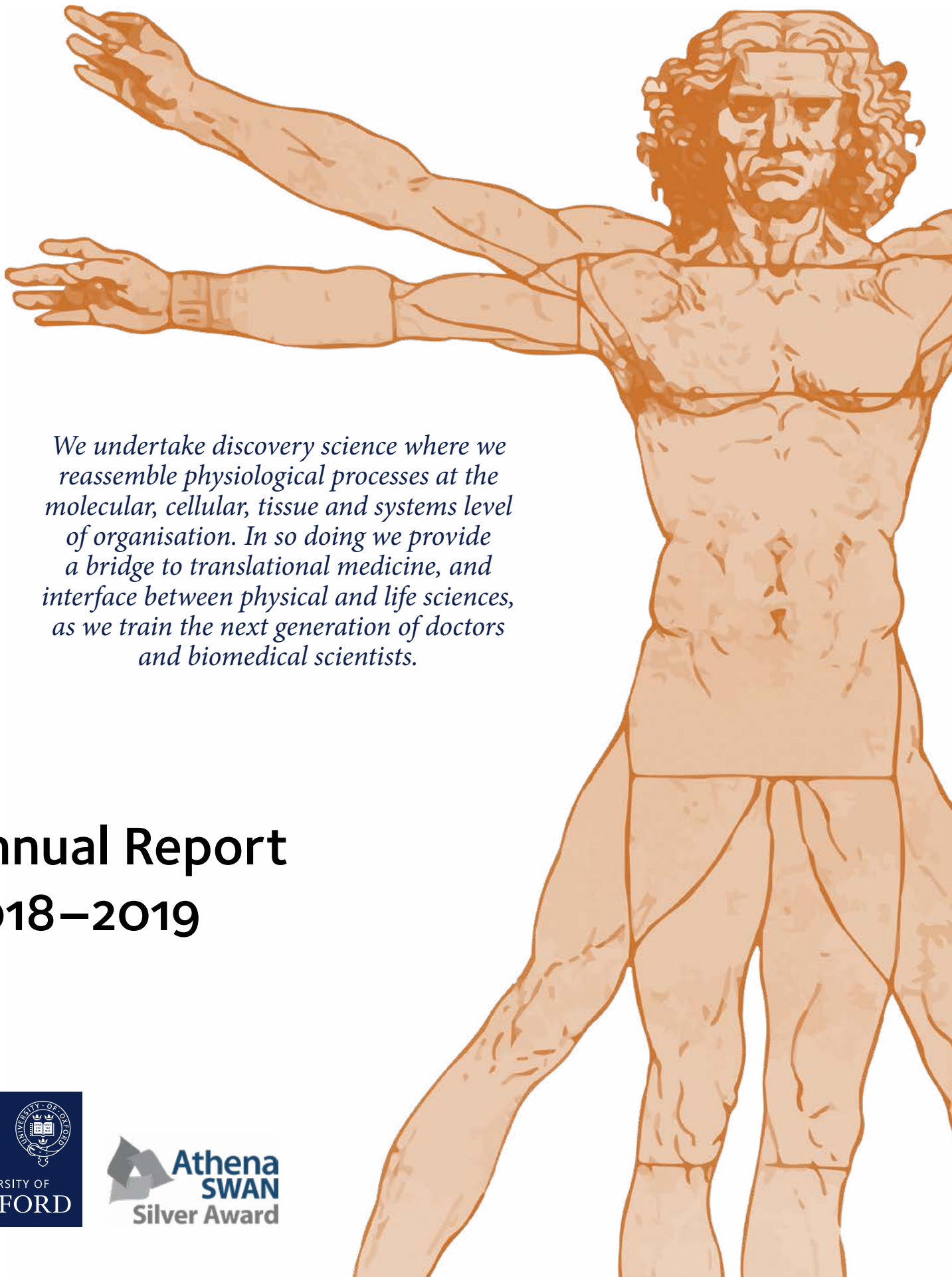


DEPARTMENT OF
**PHYSIOLOGY, ANATOMY
AND GENETICS**



We undertake discovery science where we reassemble physiological processes at the molecular, cellular, tissue and systems level of organisation. In so doing we provide a bridge to translational medicine, and interface between physical and life sciences, as we train the next generation of doctors and biomedical scientists.

Annual Report 2018–2019



From the Head of Department



The Department of Physiology, Anatomy and Genetics has enjoyed another successful year, from our cutting edge research papers revealing key insights into heart regeneration, iron deficiency and Parkinson's to name a few, to hosting three major international scholars for our named lecture series.

Particular highlights for me have been hosting Jeffrey M. Friedman ForMemRS for the inaugural Hans Krebs Lecture, Carla J. Shatz ForMemRS for the Charles Sherrington Lecture, Jennifer Doudna ForMemRS for a special Sherrington Prize Lecture on CRISPR-cas9 Gene Editing, and Anant Parekh joining these world-leading scientists on his own election as Fellow of the Royal Society. Another highlight is Professor Dame Kay Davies FRS receiving the premier award lecture in biological sciences, the Croonian Medal and Lecture.

I am also pleased to note that the Department is once again in a world leading position this year, coming a close second to the University of Cambridge. Cambridge achieved an overall score of 96.1 and we achieved 96 in the 2019 QS World University Rankings for Anatomy and Physiology.

We have advanced our workplace environment this year as part of our continued commitment to the Athena SWAN charter and promoting equality. Mental health and wellbeing is one of our particular priorities, and we have appointed five mental health first aiders within our staff.



The Department continues to evolve, having recently refurbished several major laboratory spaces in the Sherrington building. The majority of our public facing areas are completed and our four scientific research centres of excellence are now open.

I would like to thank all of our staff for their commitment to the Department and unfailing hard work over the past year.

David Paterson

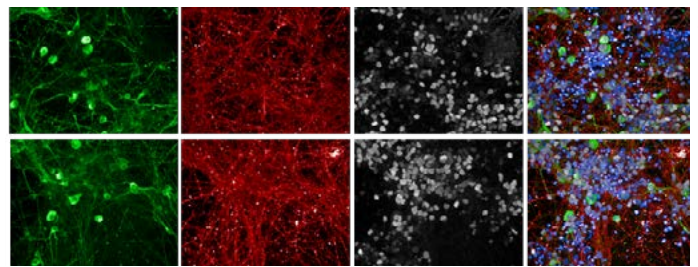


© Colin Beesley

Fish genes hold key to repairing damaged hearts

Key research into the Mexican cavefish led by Associate Professor Mathilda Mommersteeg and Research Assistant William Stockdale has led to an important paper suggesting a gene called *lrrc10* may hold the key to this fish's remarkable ability to repair its own heart after damage. Their findings could inspire change in the way human heart failure is treated.

www.dpag.ox.ac.uk/news/fish-genes-hold-key-to-repairing-damaged-hearts



© Natalie Connor-Robson, Oxford Parkinson's Disease Centre

New method developed to target the leading genetic contributor to Parkinson's

The Wade-Martins Group has identified how the dysfunction of a key protein called *LRRK2* causes the neurons affected in Parkinson's to lose their ability to clear out cell components that have been damaged. This discovery has enabled the team to find a new way to target and correct this issue, paving the way for a potential new clinical treatment.

www.dpag.ox.ac.uk/news/new-way-to-target-and-treat-leading-genetic-contributor-to-parkinsons



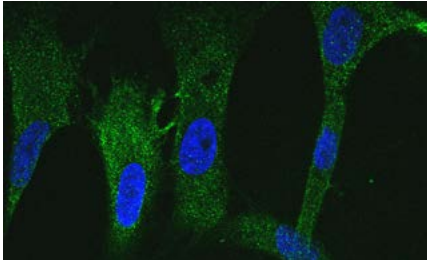
© Centre for Neural Circuits and Behaviour

Sleep and ageing: two sides of one coin?

A team led by Professor Gero Miesenböck has published a report in the journal *Nature* demonstrating how oxidative stress, believed to be a reason why we age and a cause of degenerative diseases, is also a root cause of sleep. The discovery brings us closer to understanding the still-mysterious function of sleep and offers new hope for the treatment of sleep disorders.

www.dpag.ox.ac.uk/news/sleep-and-ageing-two-sides-of-one-coin

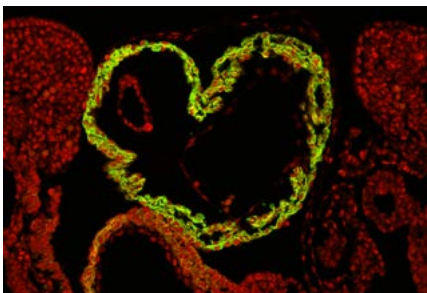
Progress



Iron deficiency linked with a serious cardiovascular disease

Research led by Associate Professor Samira Lakhali-Littleton demonstrates that iron deficiency within the smooth muscle cells of the pulmonary arteries is sufficient to cause pulmonary arterial hypertension, even in the absence of anaemia, which is commonly thought to be the cause. This discovery could hold the key to improving treatment by correcting tissue iron deficiency without targeting anaemia.

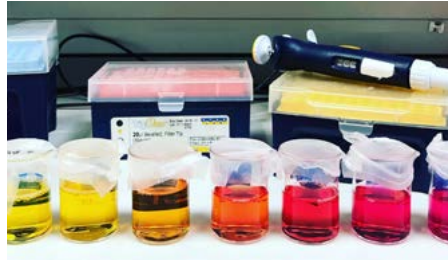
www.dpag.ox.ac.uk/news/lakhali-littleton-study-reveals-critical-link-between-iron-deficiency-and-serious-cardiovascular-condition



Striking evidence into cause of most common birth defect in babies

Dr Duncan Sparrow has collaborated with the Victor Chang Cardiac Research Institute to demonstrate evidence that some cases of Congenital Heart Disease may be caused by the combination of genetic and environmental factors. Strikingly, each factor by itself appears not to cause a birth defect, only when combined.

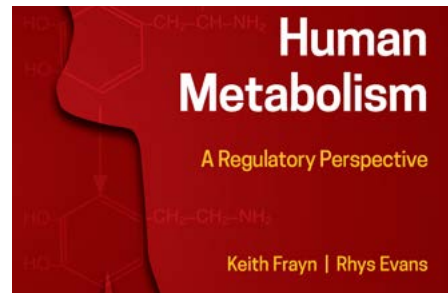
www.dpag.ox.ac.uk/news/duncan-sparrow-demonstrates-striking-evidence-into-cause-of-most-common-birth-defect-in-babies



New guidelines for controlling pH in cell culture systems

Due to its powerful effects on biology, pH is the most fundamental chemical variable that researchers consider when preparing culture media. The Swietach Group led by Dr Johanna Michl have proposed guidelines for improving pH control and reproducibility in culture systems, setting the standard for countless laboratories using cell culture and pH as a variable that requires control for numerous experiments.

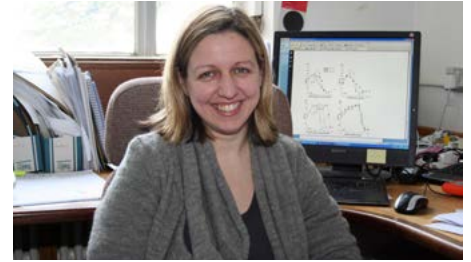
www.dpag.ox.ac.uk/news/new-guidelines-for-controlling-ph-in-cell-culture-systems-could-improve-reproducibility-in-numerous-experiments



Bestselling guide to human metabolism and metabolic regulation

Dr Rhys Evans, Reader in Metabolic Biochemistry, has co-authored the fourth edition of "Human Metabolism: A Regulatory Perspective" with Emeritus Professor Keith Frayn. This new edition offers a current and integrated review of metabolism, explaining difficult concepts in clear and concise terms to provide an accessible and essential guide to the topic.

www.dpag.ox.ac.uk/news/bestselling-guide-to-human-metabolism-and-metabolic-regulation



Insights into social influence bias in children

A paper led by Associate Professor Kristine Krug sheds light on the development of social influence bias that affects even simple perceptual decisions. It demonstrates that neurotypical children start systematically integrating social information into their decision-making from early adolescence, whereas Autistic children do not. Prof Krug has a legacy of outstanding research in our Department and this year takes up a Professorship at the Institute of Biology, Otto-von-Guericke-Universität and Leibniz-Institute for Neurobiology, Magdeburg, Germany.

www.dpag.ox.ac.uk/news/krug-group-research-widens-understanding-of-social-influence-bias-in-children



New approach to reducing damage after a heart attack

During the emergency procedure used to reopen the blocked artery causing a heart attack, "micro" blood vessels can remain constricted leading to significant damage. A new study led by Associate Professor Neil Herring published in *European Heart Journal* finds that neurotransmitter Neuropeptide-Y released during the stress of a heart attack binds to a specific receptor in the vessels causing them to constrict, and blocking this receptor can minimise the size of a heart attack.

www.dpag.ox.ac.uk/news/new-approach-to-reducing-damage-after-a-heart-attack

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An astronaut's exciting journey

NASA astronaut and physiologist, Dr James (Jim) Pawelczyk from Penn State University, gave an inspiring talk on his mission as part of the STS-90 crew on the US Space Shuttle *Columbia* in 1998, and the significant challenges facing humans in any future attempt to travel to Mars. An engaged audience ranged from local Year 7 schoolchildren to professors, the President of *The Physiological Society*, as well as our own students, departmental staff and their families.



www.dpag.ox.ac.uk/news/an-astronaut2019s-exciting-journey

Inaugural Sir Hans Krebs Lecture



The Department introduced the Sir Hans Krebs Lecture series, hosting Dr Jeffrey Friedman ForMemRS for its inaugural year. Krebs became Oxford's Whitley Professor of Biochemistry after receiving the Nobel Prize for Physiology or Medicine for his discovery of the citric acid cycle. Dr Friedman identified leptin, an adipocyte hormone that regulates food intake and body weight.

www.dpag.ox.ac.uk/news/jeffrey-friedman-delivers-inaugural-sir-hans-krebs-lecture

Honours, Fellowships and Prizes

The Department is proud to host a number of academic staff who have been honoured with fellowships and prestigious awards. The following list offers some highlights from the past year: **Professor Anant Parekh FRS**, Fellow of The Royal Society and Batsheva de Rothschild Prize; **Professor Dame Kay Davies FRS**, Royal Society Croonian Lecture and Biochemical Society Centenary Award; **Professor David Paterson**, Fellow of the American Physiological Society; **Professor Gero Miesenböck FRS**, Francis Crick Lecture, Rumford Prize and ERC Advanced Grant, **Professor Zoltán Molnár**, Fellow of the Anatomical Society; **Associate Professor Tim Vogels**, Wellcome Trust Senior Research Fellowship; **Professor Scott Waddell**, Bindra Lectures; **Professor Damian Tyler**, conferral of title of Professor of Physiological Metabolism and BHF Senior Fellowship renewal; **Associate Professor Nicola Smart**, BHF Senior Fellowship renewal; **Associate Professor Samira Lakhal-Littleton**, International BioIron Society Board of Directors, **Associate Professor Neil Herring**, Fellow of the Royal College of Physicians; **Dr Joaquim Vieira**, BHF Intermediate Fellowship; **Dr Armin Lak**, Wellcome Trust Henry Dale Fellowship.



Next generation of scientists meet CRISPR pioneer



The Department hosted a public understanding of science event, the Sherrington Prize Lecture, delivered by Dr Jennifer Doudna ForMemRS on *CRISPR Biology and Biotechnology: The Future of Genome Editing*. Dr Doudna outlined research into the innovating family of proteins behind CRISPR-Cas9 gene editing to a captivated audience including the University Vice Chancellor, graduate students and local sixth form Biology students, demonstrating how these transformative technologies are revolutionising the fields of biomedicine and agriculture.

www.dpag.ox.ac.uk/news/next-generation-of-scientists-meet-crispr-pioneer

Dr Carla Shatz ForMemRS delivers the 2019 Charles Sherrington Lecture

The Department hosted an exciting talk by Dr Carla Shatz ForMemRS on *Synapses lost and found: Developmental critical periods and Alzheimer's disease*. Sherrington coined the phrase "synapse," which is the focus of her life's research. Dr Shatz won the 2016 Kavli Prize in Neuroscience for the discovery of mechanisms that allow experience and neural activity to remodel brain circuits.



www.dpag.ox.ac.uk/news/dr-carla-shatz-gives-the-2019-charles-sherrington-lecture



Raising Awareness of Mental Health

This year the Department hosted a series of wellbeing events to highlight the mental health support materials available to staff and students. In October, Associate Professor Vladyslav Vyazovskiy delivered a talk entitled “Sleep Matters: the impact of sleep on mental health”. In November, departmental members attended a workshop entitled “Looking behind the label: Mental Ill-Health in the Workplace”. In February, the Athena SWAN team held “Time to Talk Day” in aid of Oxfordshire Mind. In May, the Department marked Mental Health Awareness Week with lunchtime yoga and a presentation introducing our five new Mental Health First Aiders, who are trained to offer a confidential, supportive and non-judgmental space to talk.

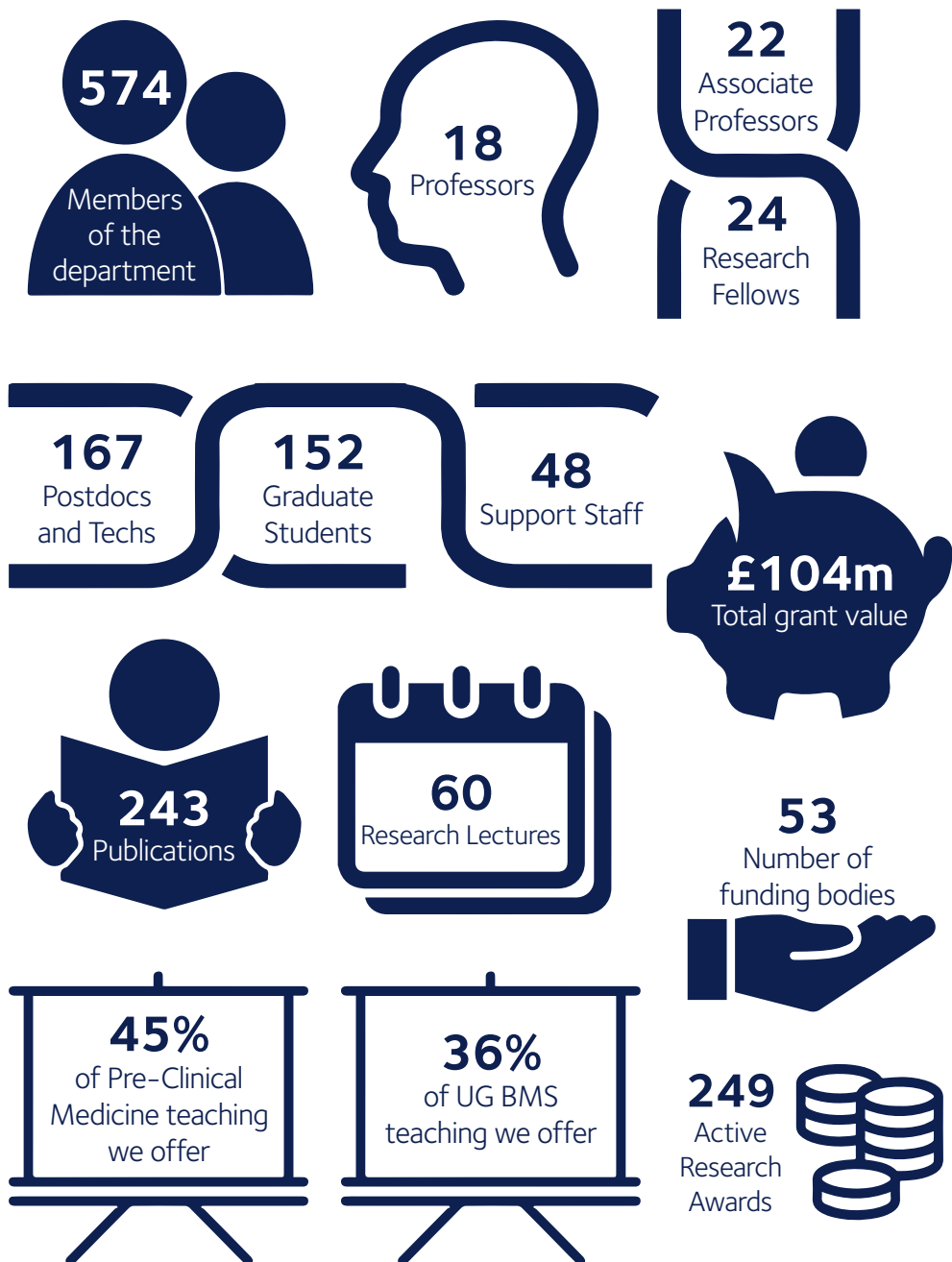


Sherrington Talks 2019

Final year DPhil students presented their research to senior members of the Department at the annual Sherrington talks before embarking on the next step of their careers. This year's prize winner is Bradley Roberts for his talk entitled *Striatal GABA transporter activity governs dopamine transmission and shows maladaptive downregulation in a mouse model of parkinsonism*.

www.dpag.ox.ac.uk/news/sherrington-talks-2019-prize-winners

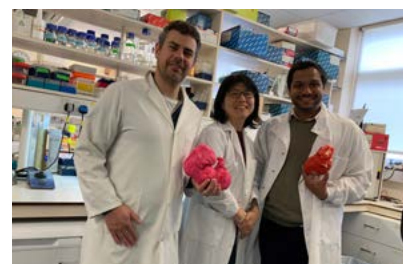
Statistics for 2018–2019*



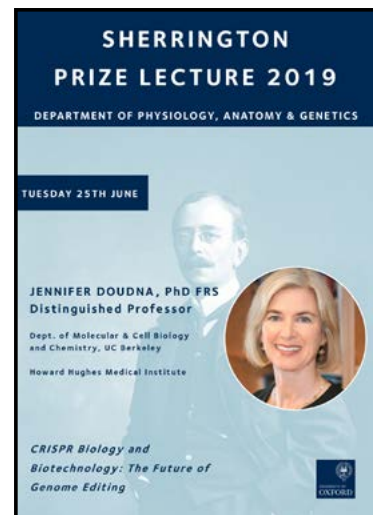
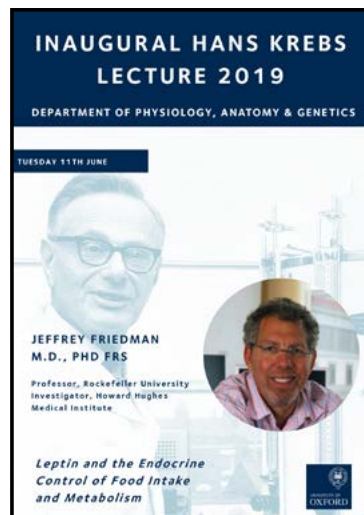
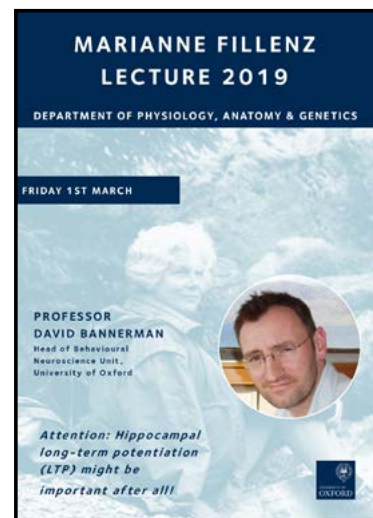
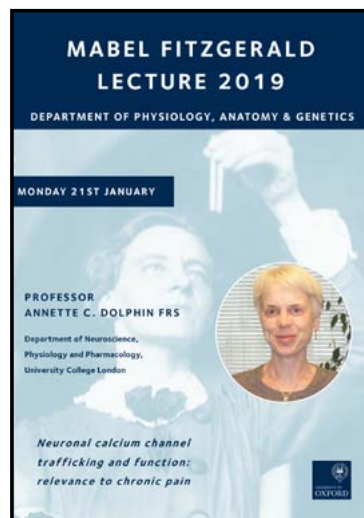
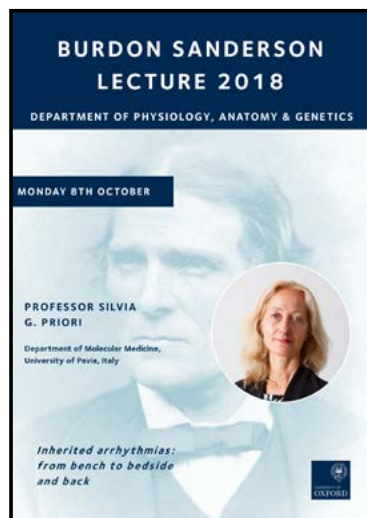
*Statistics taken for the academic year up to end of May 2019.

Enhancing public understanding of embryo development with virtual reality

Postdoctoral Research Scientists Dr Tomoko Watanabe, Dr Matthew Stower and Dr Shifaan Thowfeequ from the Srinivas Group attended the Cheney School's annual Iris Festival of Natural History, Classics, Art and More, engaging with around 50 visitors, including school students and their parents, to introduce concepts of embryo development. They brought a stall of virtual reality, including images of early mouse embryos taken with confocal and light sheet microscopes, and 3D printed models of developing hearts.



www.dpag.ox.ac.uk/news/srinivas-group-members-enhance-public-understanding-of-embryo-development-with-virtual-reality-at-local-school-festival



This year we hosted six named lectures in honour of prominent scientists who have been associated with the Department: the Burdon Sanderson Lecture by Professor Silvia G. Priori (top left); the Mabel FitzGerald Lecture by Professor Annette C. Dolphin FRS (top middle); the Marianne Fillenz Lecture by Professor David Bannerman (top right); the Sir Charles Sherrington Lecture by Dr Carla J. Shatz ForMemRS (bottom left); the inaugural Sir Hans Krebs Lecture by Dr Jeffrey Friedman ForMemRS (bottom middle); the Sherrington Prize Lecture by Dr Jennifer Doudna ForMemRS (bottom right).



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Defining Excellence

Oxford Anatomy and Physiology ranked #1 in the QS World University Rankings by subject 2017, 2018

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