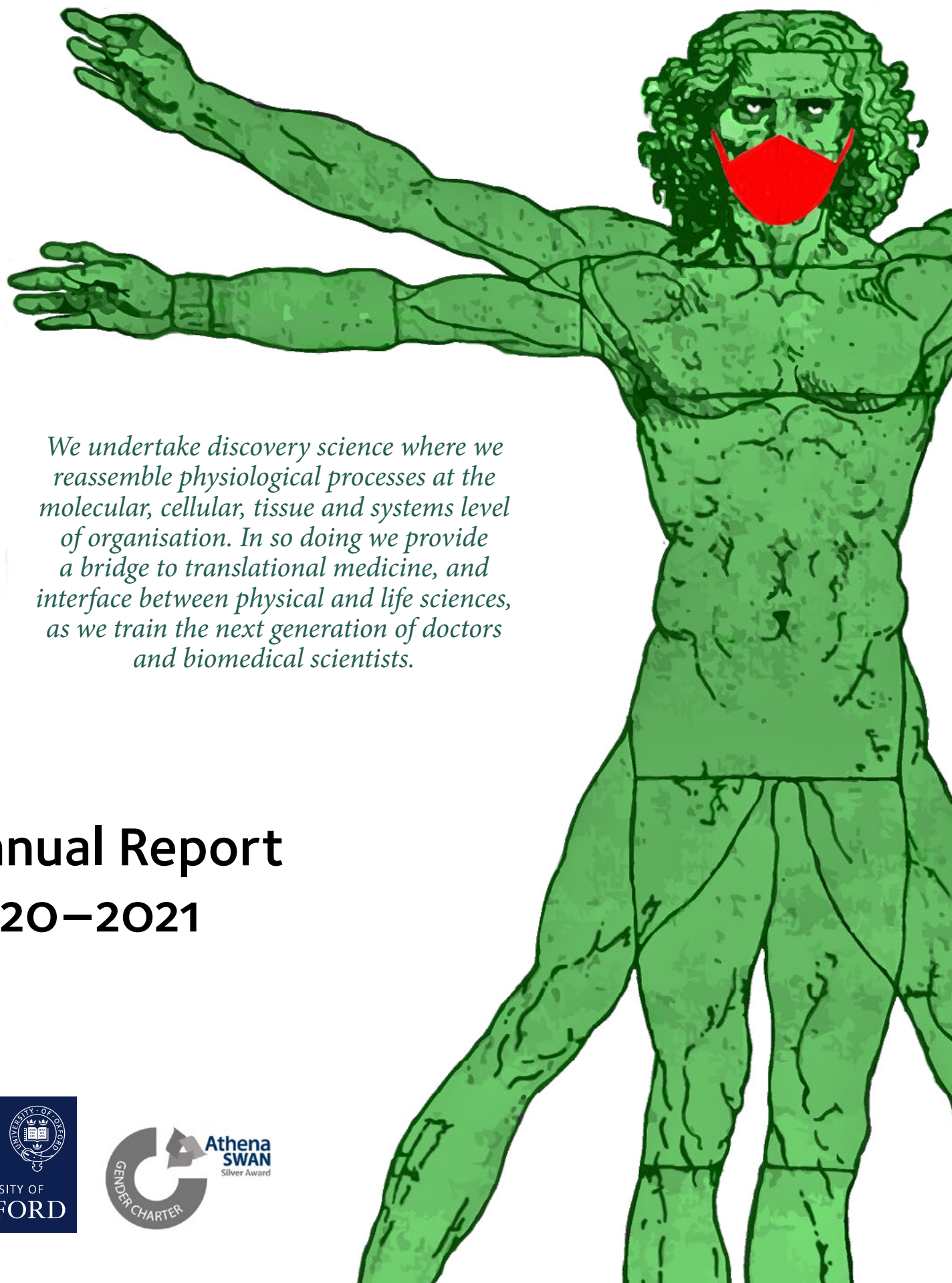


DEPARTMENT OF  
**PHYSIOLOGY, ANATOMY  
AND GENETICS**



*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

## 2020–2021



## Defining Excellence

Oxford Anatomy and Physiology ranked #1 in the QS World University Rankings by subject 2017, 2018, 2020, 2021

### From the Head of Department



Despite the ongoing challenges presented to us by the COVID-19 pandemic, the Department of Physiology, Anatomy and Genetics has enjoyed an enormously successful year. In December, we welcomed the exciting news that the new Kavli Institute for Nanoscience Discovery led by Professor Dame Carol Robinson FRS will soon open in Oxford, where DPAG will have a significant footprint. In March, I was pleased to see our world leading position reinforced in achieving the top ranking for Anatomy and Physiology once more. In May, we saw Professor Gero

Miesenböck FRS formally awarded the prestigious Shaw Prize in Life Science and Medicine after the award ceremony was long delayed by the pandemic, and I would like to congratulate Professor Scott Waddell FMedSci on his election to the Academy of Medical Sciences that same month.

This has also been an important year for equality and diversity. Last October, DPAG was proud to be awarded renewal of our Athena Swan Silver award in recognition of our continued commitment to the advancement of gender equality within the Department. In this centenary year of women being formally admitted into Oxford, we undertook a project to celebrate many of the women who have contributed to the success of DPAG through launching a website and diversifying the Sherrington building walls by displaying several of their photographs in June. This follows the mounting of two plaques by The Physiological Society in honour of Sir Charles Sherrington and Florence Buchanan. Sherrington was instrumental in helping to secure Buchanan's Physiological Society membership, so commemorating both pioneers together is testament to the advocacy and mentoring that was evident over a century ago as equality was championed.

Furthermore, this year an Anti-Racism Working Group was formed, leading to some key initiatives. These include running a departmental Anti-Racism survey, introducing mandatory race equality training, and updating our recruitment documentation to demonstrate our commitment to inclusivity. We are also proud to introduce an official departmental Statement of Inclusion as an external demonstration of our commitment to inclusivity: *We, as a Department and Community, will be considerate and welcoming of all people, regardless of race, ethnicity, religion, disability, sexual orientation and gender identity. We acknowledge societal inequalities and how these impact us, and those around us, personally and professionally.*

One of our champions of equality, Professor Dame Kay Davies CBE FMedSci FRS has now retired as our Dr Lee's Professor of Anatomy. I would like to heartily thank her for her many years of service and ground-breaking research in the Department and wish her a very happy 70th birthday. She will remain Professor Emeritus at DPAG.

I conclude by thanking all of our staff for their continued commitment to the Department, and in particular, the excellent work of the professional services staff, such as the Facilities team, who have been coming in every day to keep us going throughout the pandemic.

**David Paterson**

# A Year of



### DPAG once again tops World Rankings by Subject 2021

DPAG has once again been ranked world number one for Anatomy and Physiology in the 2021 QS World University Rankings by Subject. The rankings are based on academic reputation, employer reputation, research citations per paper and H-index. It is one of the highest rated departments globally in Oxford University, joining five other subject areas at the top position - just one of two departments within the Medical Sciences Division to have been ranked number one in the world.

[www.dpag.ox.ac.uk/news/dpag-once-again-tops-world-rankings-by-subject-2021](http://www.dpag.ox.ac.uk/news/dpag-once-again-tops-world-rankings-by-subject-2021)



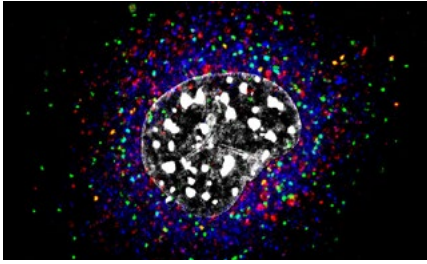
### New Nanoscience Institute to advance physiology research in Oxford

A new Kavli Institute for NanoScience Discovery is opening in Oxford thanks to a \$10 million gift from The Kavli Foundation. Kavli INSD will uniquely combine structural biology with world-leading biochemistry, pathology, chemistry, physics, physiology and engineering. The Institute will be based in a new building at the centre of Oxford's Science Area site in close proximity to DPAG's Sherrington building to facilitate close collaboration. It will house 40 faculty and 400 students, postdocs and research staff, including several DPAG research groups spanning across the Department's six key themes of research, and a new Krebs Chair in Physiological Metabolism.

[www.dpag.ox.ac.uk/news/new-nanoscience-institute-to-advance-physiology-research-in-oxford](http://www.dpag.ox.ac.uk/news/new-nanoscience-institute-to-advance-physiology-research-in-oxford)



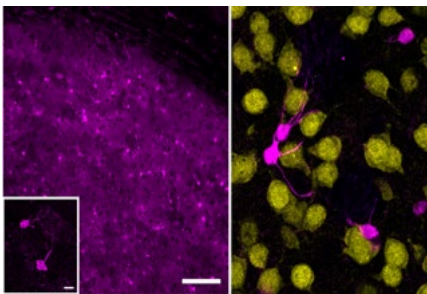
# Progress



## New target identified to develop treatment for Abdominal Aortic Aneurysm

Prevalence of abdominal aortic aneurysm (AAA) is nearly 13% depending on age group. If it ruptures, the mortality rate is around 80%. A new study led by Sonali Munshaw and Associate Professor Nicola Smart has shed light on the initiation and progression of AAA by revealing the protective role of a little-known small protein called Thymosin  $\beta$ 4 (T $\beta$ 4), thus identifying a promising new drug target to potentially treat the disease.

[www.dpag.ox.ac.uk/news/new-target-identified-to-develop-treatment-for-abdominal-aortic-aneurysm](http://www.dpag.ox.ac.uk/news/new-target-identified-to-develop-treatment-for-abdominal-aortic-aneurysm)



## Sites of early dysfunction in Parkinson's identified

A new study led by Dr Bradley Roberts and Professor Stephanie Cragg has revealed that GABA transporters on astrocytes, the brain's lesser known yet critically important cells, support dopamine release in the striatum and are sites of early dysfunction in parkinsonism. Identifying areas of the brain where the problems in Parkinson's start earlier is a big step towards developing effective treatment.

[www.dpag.ox.ac.uk/news/sites-of-early-dysfunction-in-parkinsons-identified](http://www.dpag.ox.ac.uk/news/sites-of-early-dysfunction-in-parkinsons-identified)

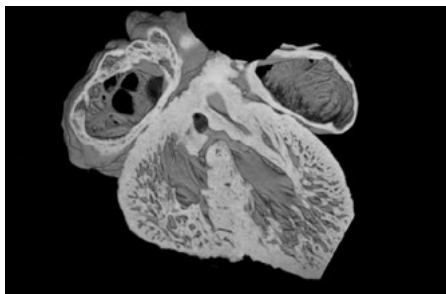


© Gil Costa (www.gilcosta.com)

## 'Junk' DNA could be rewiring our brains

More than half of our genome is made up of 'junk' DNA, a large part of which is comprised of potentially mobile pieces called transposons, or "jumping genes", which are believed to have evolved from ancient viruses. Research led by Dr Christoph Treiber and Professor Scott Waddell has used state-of-the-art single-cell sequencing on the brains of fruit flies to uncover evidence that transposons might play an important altruistic role in the body that could ultimately diversify our behaviour, cognition and emotions.

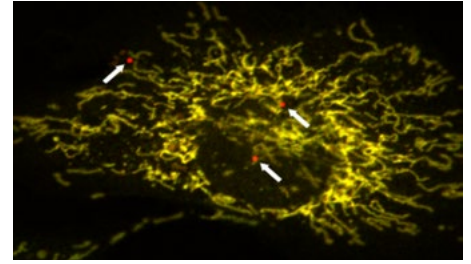
[www.dpag.ox.ac.uk/news/junk-dna-could-be-rewiring-our-brains](http://www.dpag.ox.ac.uk/news/junk-dna-could-be-rewiring-our-brains)



## Iron deficiency anaemia in early pregnancy suggested to increase risk of heart defects

Congenital heart disease is the most common human birth defect, affecting 12 babies born each day in the UK, yet the cause in two-thirds of cases is often unknown. Research led by Dr Jacinta Kalisch-Smith and Associate Professor Duncan Sparrow has identified a new risk factor. Using animal models, they have shown that maternal iron deficiency in the first trimester can cause severe cardiovascular defects in her offspring.

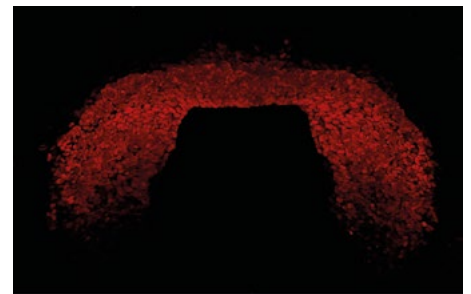
[www.dpag.ox.ac.uk/news/iron-deficiency-anaemia-in-early-pregnancy-increases-risk-of-heart-defects](http://www.dpag.ox.ac.uk/news/iron-deficiency-anaemia-in-early-pregnancy-increases-risk-of-heart-defects)



## Insights into mitochondria quality control hold key to treating metabolic disorders

Research led by Miguel J Lobo and Professor Manuela Zaccolo has identified a new mechanism that regulates mitophagy, a process that is crucial to maintaining healthy cells and preventing disease. The process involves the cAMP-degrading enzyme phosphodiesterase 2A2 (PDE2A2), an exciting discovery as this enzyme can be targeted pharmacologically, thus offering a potential novel therapeutic approach to control metabolic disorders.

[www.dpag.ox.ac.uk/news/new-insights-into-mitochondria-quality-control-could-hold-the-key-to-treating-metabolic-disorders](http://www.dpag.ox.ac.uk/news/new-insights-into-mitochondria-quality-control-could-hold-the-key-to-treating-metabolic-disorders)



## Earliest origins of the forming heart identified

The forming heart is less than half a millimetre in width, and so far the precise molecular identity of the various cell types that make up the heart during these early stages have been poorly defined. New research published in *Science* led by Dr Richard Tyser and Professor Shankar Srinivas has characterised the earliest known progenitor of the outermost layer of the heart for the first time and linked it to the development of other critical cell types in the developing heart.

[www.dpag.ox.ac.uk/news/earliest-origins-of-the-forming-heart-identified](http://www.dpag.ox.ac.uk/news/earliest-origins-of-the-forming-heart-identified)



## Sir Charles Sherrington Prize Lecture 2021

The Department held its first named lecture since the outbreak in connection with The Physiological Society on 23 June 2021. DPAG's Waynflete Professor of Physiology and pioneer of optogenetics Professor Gero Miesenböck FRS delivered "Lighting Up the Brain" in honour of the Department's 1913 Waynflete Professor and Nobel Laureate Sir Charles Sherrington. Following the lecture, the new Sir Charles Sherrington plaque was unveiled by Emeritus Professor Sir Colin Blakemore FRS, the first President of The Physiological Society.

[www.dpag.ox.ac.uk/news/gero-miesenbock-gives-2021-sherrington-prize-lecture](http://www.dpag.ox.ac.uk/news/gero-miesenbock-gives-2021-sherrington-prize-lecture)



## Quatercentenary of Thomas Willis's birth

On 27 January 2021, the Department celebrated the 400th anniversary of the great neuroanatomist Thomas Willis, who is renowned for describing the 'Circle of Willis' and credited with coining the word 'neurologia'. Professor Zoltán Molnár recorded interviews with eight experts to help us understand the enduring influence of the life and work of the Father of Neurology.

[www.dpag.ox.ac.uk/about-us/our-history/thomas-willis](http://www.dpag.ox.ac.uk/about-us/our-history/thomas-willis)

## Honours, Fellowships and Prizes

The Department is proud to host a number of academics who have been honoured with fellowships and prestigious awards. The following list offers some highlights of such honours from the past year, though it is not exhaustive: **Professor Gero Miesenböck FRS**, The Physiological Society's Annual Review Prize Lecture 2022; **Professor Dame Frances Ashcroft FRS**, the Dale Medal, and with **Professor Denis Noble CBE FRS**, Fellow of the IUPS Academy of Physiology; **Professor Scott Waddell FMedSci**, Fellow of the Academy of Medical Sciences; **Professor David Paterson**, Elected Member of Academia Europaea; **Associate Professor Samira Lakhal-Littleton**, Associate Professor in Cell Physiology and Tutorial Fellow at Brasenose College, MRC Senior Non-Clinical Fellowship; **Professor Pawel Swietach**, conferral of title of Professor of Physiology; **Associate Professor Neil Herring**, BHF Senior Clinical Research Fellowship; **Professor Zoltán Molnár**, Einstein Visiting Fellowship to Charité – Universitätsmedizin Berlin; **Professor Paul Riley**, Director of the Institute of Developmental and Regenerative Medicine; **Associate Professor Nicola Smart**, John French Memorial Lecture 2021; **Dr Dan Li**, University Research Lecturer; **Dr Dayne Beccano-Kelly**, UKRI Future Leaders Fellowship; **Dr Lukas Krone**, Global Young Scientists Summit, Christian Guilleminault Young Investigator Award; **Nchimunya Nelisa Tebeka**, Diabetes UK Early Career Investigator Award; **Dr Richard Tyser**, Charles Darwin Award Lecture 2020; **Sonali Munshaw**, International Vascular Biology E-Poster Prize.



## Two DPAG pioneers honoured on Sherrington Building Plaques

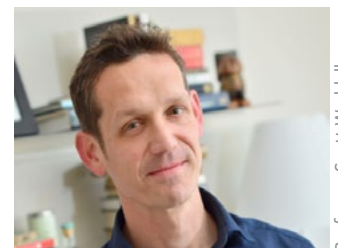
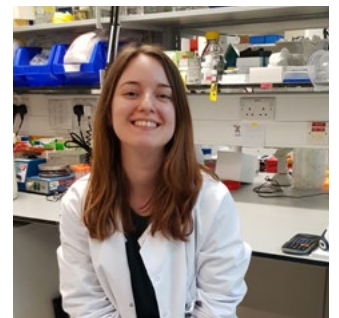
In Hilary Term, The Physiological Society mounted two blue plaque on the front entrance of the Sherrington Building in honour of Sir Charles Sherrington FRS (1857-1952) and Florence Buchanan (1867 - 1931). It was Sherrington's patronage in 1912 with J.S. Haldane from the University Laboratory of Physiology, which resulted in Buchanan becoming the first woman member of The Physiological Society in 1915.

[www.dpag.ox.ac.uk/news/two-dpag-pioneers-honoured-on-sherrington-building-plaques](http://www.dpag.ox.ac.uk/news/two-dpag-pioneers-honoured-on-sherrington-building-plaques)

## Sherrington Talks 2021

Third year DPhil students presented their research at the Department's premier annual event for graduate students, this year held on Microsoft Teams. This year's prize winner is Lucija Fleisinger for her talk entitled "Endothelial *KLF2* is developmentally regulated by two distal enhancers."

<https://www.dpag.ox.ac.uk/news/sherrington-talks-2021-prize-winners>

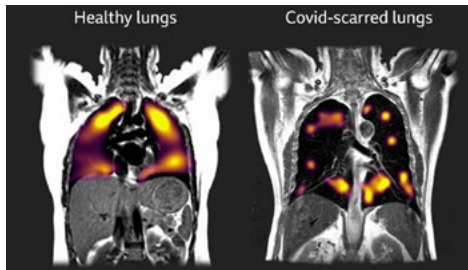


Professor Scott Waddell



Samira Lakhal-Littleton

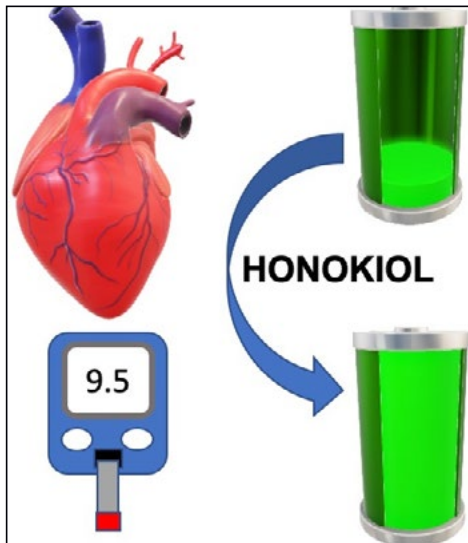




## COVID-19 lung damage identified

In a major collaborative study into the longer-term damage amongst patients recovering from COVID-19, DPAG Research Fellow Dr James Grist of the Tyler Lab has been running a novel scanning technique that shows a dramatic decrease in the ability of the lungs to diffuse gas into the blood stream after COVID infection. This work may shed light on the problem of breathlessness after COVID infection and help guide us in understanding therapeutic selection and efficacy.

[www.dpag.ox.ac.uk/news/covid-19-lung-damage-identified-in-study](http://www.dpag.ox.ac.uk/news/covid-19-lung-damage-identified-in-study)

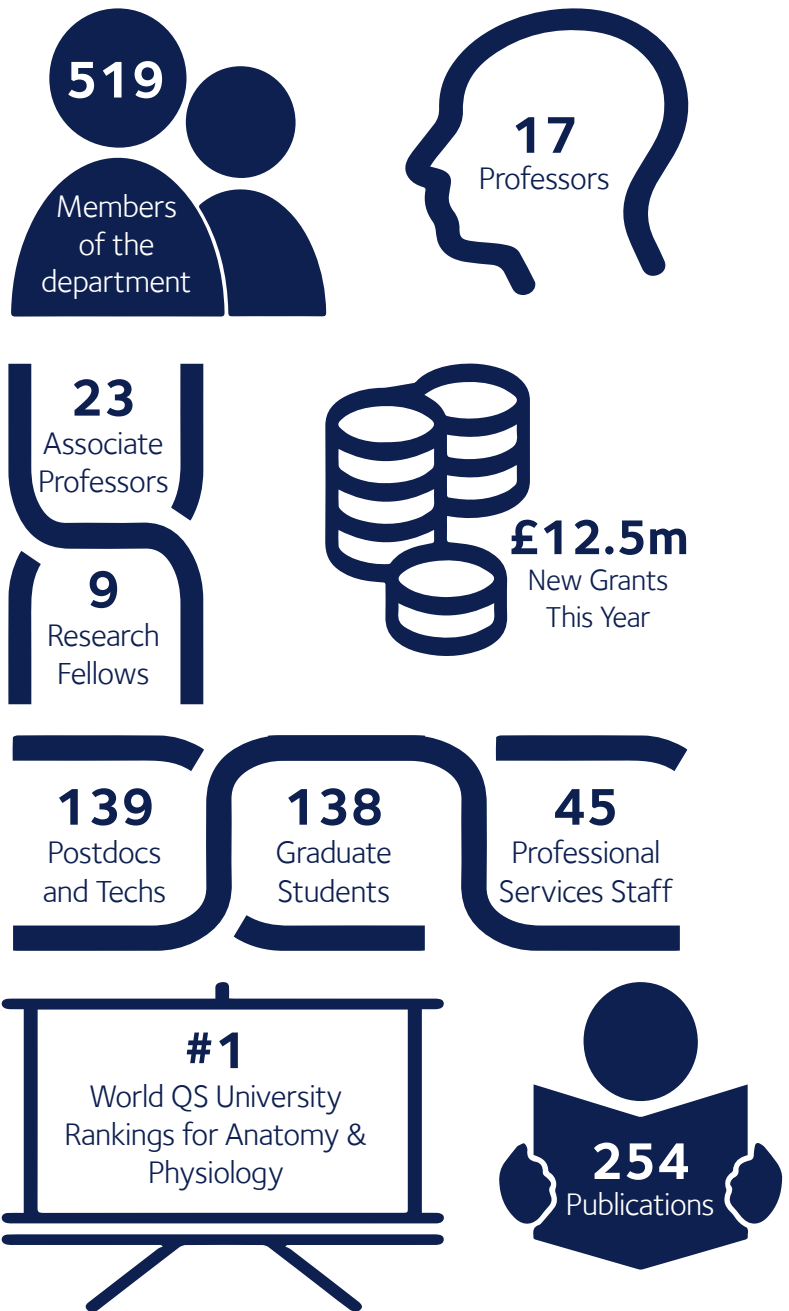


## Recharging the battery of the diabetic heart

Patients with type 2 diabetes have less energy within their hearts, resulting in less energy to power the pumping of the heart, but the mechanisms responsible have so far been unknown. Research led by Associate Professor Lisa Heather has shown that early in development of diabetes, the cardiac mitochondria work more slowly, causing mitochondrial proteins to become hyperacetylated. The team were then able to demonstrate that an activator of SIRT3 called honokiol can be used to reverse the hyperacetylation, speed up mitochondrial function and increase the amount of energy within the heart.

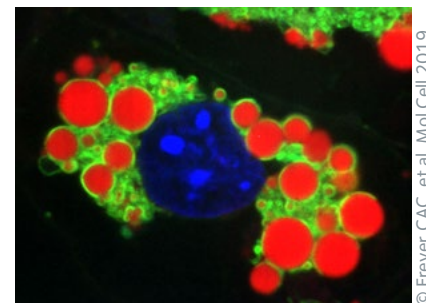
[www.dpag.ox.ac.uk/news/recharging-the-battery-of-the-diabetic-heart](http://www.dpag.ox.ac.uk/news/recharging-the-battery-of-the-diabetic-heart)

## Statistics for 2020–2021



## Charting the expanding frontiers of lipid biology

Associate Professor Robin Klemm has edited a special issue for *Seminars in Cell and Developmental Biology*, providing an overview of the most recent developments in the field of lipid droplets (LDs), which are important storage organelles at the centre of lipid and energy homeostasis. Given the sheer pervasiveness of LDs in the human body, this special issue highlights the vital need to better understand LD biology and its metabolic functions, particularly in light of the fact that metabolic disorders such as obesity and type 2 diabetes are among the most prevalent diseases in the world.



© Freyer CAC, et al. Mol Cell 2019

[www.dpag.ox.ac.uk/news/robin-klemm-charts-the-expanding-frontiers-of-lipid-biology](http://www.dpag.ox.ac.uk/news/robin-klemm-charts-the-expanding-frontiers-of-lipid-biology)



In Trinity Term 2021, we displayed photographs of 16 women from DPAG's rich history on the Sherrington building walls to mark the centenary of women being awarded degrees at Oxford University. Top Row L-R: Professor Sulayma Albarwani, Dr Dame Alice Josephine Barnes, Dr Daphne Bascom, Dr Alice Carleton. Second Row L-R: Dr Marianne Fillenz, Mabel FitzGerald, Dr Pamela MacKinnon, Professor Margaret Matthews. Third Row L-R: Professor Gillian Morriss-Kay, Dr Mary Phillips, Dr Ann Taylor. Bottom Row L-R: Dr Dame Janet Vaughan, Dr Susan Noble, Dr Hilary Brown, Jean Banister and Professor Junko Kimura.

View their profiles, and many more women who have contributed to the Department's success over the last century, at [www.dpag.ox.ac.uk/women-in-physiology-anatomy-genetics](http://www.dpag.ox.ac.uk/women-in-physiology-anatomy-genetics)



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