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
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
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 β4 (Tβ4), 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

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

‘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

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

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.


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
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."

www.dpag.ox.ac.uk/news/sherrington-talks-2021-prize-winners

Two DPAG pioneers honoured on Sherrington Building Plaques

In Hilary Term, The Physiological Society mounted two blue plaques 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

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 Paweł Swietach, conferment of title of Professor of Physiology; Associate Professor Neil Herring, BHF Senior Clinical Research Fellowship; Professor Zoltán Molnár, Einstein Visiting Fellowship to Charité – Universitätmedizin 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 Guillemaund 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.
**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 bloodstream 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

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**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

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**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.

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

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