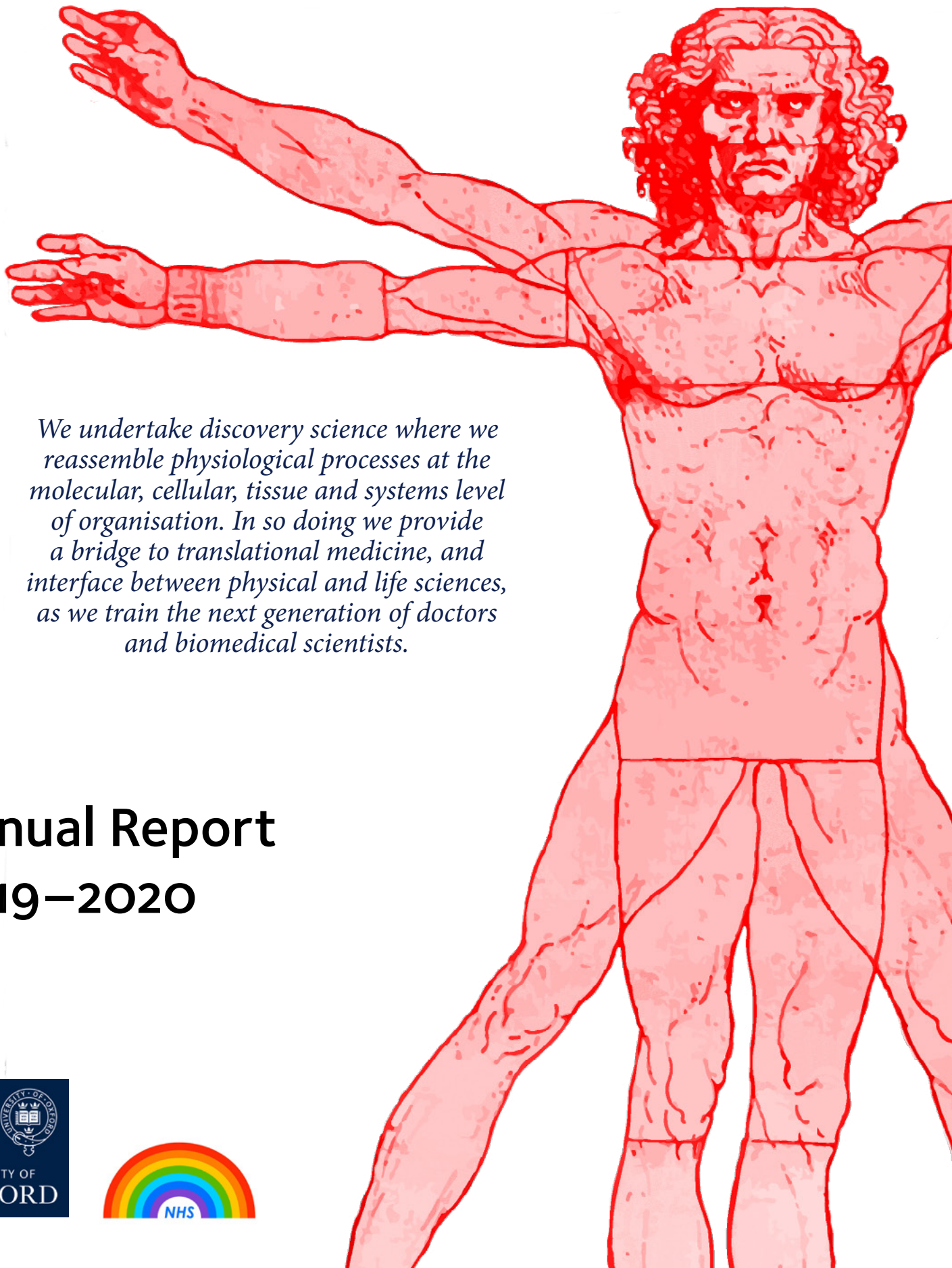


DEPARTMENT OF  
**PHYSIOLOGY, ANATOMY  
AND GENETICS**



*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 2019–2020



## Defining Excellence

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

# A Year of

## From the Head of Department



The Department of Physiology, Anatomy and Genetics has faced both a challenging and successful year. In March, we recaptured our world number one ranking for Anatomy and Physiology; both academic and professional services staff are to be congratulated. We soon came to understand that our world leading position came with a responsibility to rise to the challenge of COVID-19,

which has redefined the year and shaped our future. In response, we donated equipment for testing, seconded personnel to the clinical frontline and investigated repurposed and existing drugs to treat the virus.

Particular highlights for me have been hosting the 2019 Nobel Laureate Sir Peter Ratcliffe FRS for the inaugural Haldane Lecture, Christine Mummery for the Burdon Sanderson Lecture, Eve Marder for the Mabel FitzGerald Lecture and Nils Brose for Marianne Fillenz Memorial Lecture. In particular, I would like to congratulate Professor Gero Miesenböck FRS on being awarded The Shaw Prize in Life Science and Medicine, this is an outstanding achievement.

I am delighted to welcome Associate Professor of Physiological Metabolism Robin Klemm, Associate Professor in Cardiovascular Physiology Neil Herring and Associate Professor in Cellular and Molecular Neurobiology David Dupret. The Department has also awarded the title of Departmental Lecturer to Dr Megan Cameron Neville, Dr Johannes Dahmen, Dr Anna Hoerder-Suabedissen, Dr Dan Li, Dr Michael Puljung, Dr Fernando Rodriguez Nodal and Dr Ben Willmore in recognition of their high achievement in both research and teaching. We also welcomed Sally Vine as our new Head of Administration and Finance, while bidding farewell and thank you to Tania Boyt and Lynn Brown, who we congratulate on their promotions to Bursar of Parks College and Deputy Administrator of WIMM respectively.

Having submitted our Athena SWAN Silver Award Renewal Application, we continue to improve our workplace through introducing mandatory anti-bullying and harassment training for all staff, which 100% of our principal investigators have now completed, and demonstrating support for our LGBT+ members by introducing rainbow lanyards and an LGBT+ network.

I conclude by thanking all our staff for their commitment to the Department and unfailing hard work over the past year as we all adapt to the new normal and a world of Zoom and Teams. Although we are physically distancing, we are still socially and academically connected.

**David Paterson**

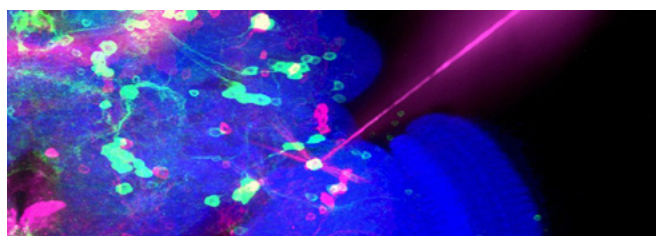


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## DPAG tops World Rankings by Subject 2020

DPAG has once again been ranked world number one for Anatomy and Physiology in the 2020 QS World University Rankings by Subject based on academic reputation, employer reputation and research impact. It is one of the highest rated departments globally in Oxford University, joining seven other subjects in mostly humanities disciplines at the top position.

[www.dpag.ox.ac.uk/news/dpag-tops-world-rankings-by-subject-2020](http://www.dpag.ox.ac.uk/news/dpag-tops-world-rankings-by-subject-2020)



© Centre for Neural Circuits and Behaviour

## Gero Miesenböck receives Shaw Prize 2020

Professor Gero Miesenböck FRS, Waynflete Professor of Physiology and Director of the Centre for Neural Circuits and Behaviour, was awarded The Shaw Prize in Life Science and Medicine "for the development of optogenetics, a technology that has revolutionised neuroscience." The \$1.2 million prize, shared with two other scientists, represents international excellence in research and discovery.

[www.dpag.ox.ac.uk/news/gero-miesenbock-receives-Shaw-Prize-2020](http://www.dpag.ox.ac.uk/news/gero-miesenbock-receives-Shaw-Prize-2020)



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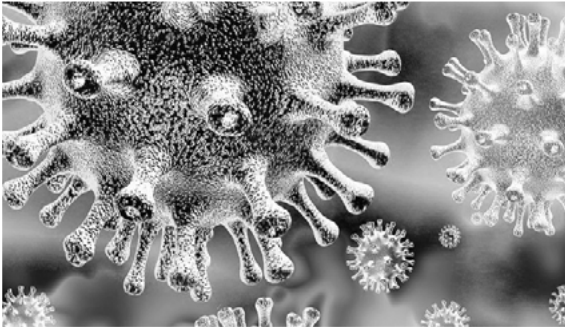
## Nobel Laureate Sir Peter Ratcliffe FRS delivers inaugural John Scott Haldane Lecture

The Department hosted the inaugural John Scott Haldane Lecture, given by Sir Peter Ratcliffe FRS: "A hundred years on: 21st Century Insights into Human Oxygen Homeostasis." In 1911, Haldane made discoveries at a landmark expedition to Pike's Peak, Colorado, that revolutionised current ideas about respiration. In 2019, Sir Peter shared the Nobel Prize in Physiology or Medicine for discovering how cells respond to varying oxygen levels in the body. After the lecture, Sir Peter took time to meet departmental students.

[www.dpag.ox.ac.uk/news/nobel-laureate-sir-peter-ratcliffe-frs-delivers-inaugural-john-scott-haldane-lecture](http://www.dpag.ox.ac.uk/news/nobel-laureate-sir-peter-ratcliffe-frs-delivers-inaugural-john-scott-haldane-lecture)



# Progress



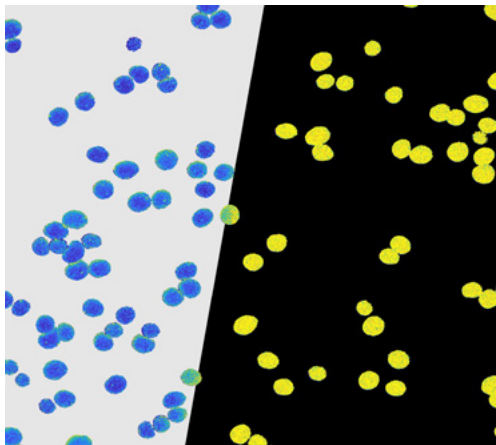
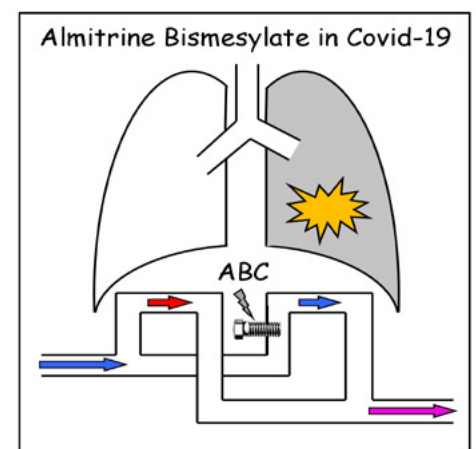
## Supporting the community during the COVID-19 outbreak

During the COVID-19 pandemic, the Department has been contributing to the national effort by providing both key pieces of equipment for testing the virus and personnel. The Department has supplied qPCR machines to the UK Biocentre, which has been transformed to test swab samples for COVID-19 on an industrial scale. The Department has also seconded clinically trained faculty members, who have been re-deployed to local hospitals. Furthermore, Professor David Paterson and Associate Professor Keith Dorrington have contributed expert advice to frontline clinicians dealing with patients as part of The Physiological Society's COVID-19 Advisory Panel.

## COVID-19 drug trial could lead to enhanced respiratory care for patients

Oxford University Researchers led by Professor Peter Robbins are working with clinical collaborators from NHS hospitals to carry out a new clinical drug trial funded by LifeArc. It will test a drug called almitrine bismesylate that could raise oxygen levels in the blood in COVID-19 patients in order to improve their chances of recovery. Raising oxygen levels is important in COVID-19, because many patients with the disease die when oxygen levels in their arterial blood fall to levels that are too low to support life. The team aim to use almitrine to preferentially constrict the blood vessels going through the diseased parts of the lung in COVID-19 patients, redirecting the blood towards the healthy parts where it can pick up oxygen.

[www.dpag.ox.ac.uk/news/covid-19-drug-trial-could-lead-to-enhanced-respiratory-care-for-patients](http://www.dpag.ox.ac.uk/news/covid-19-drug-trial-could-lead-to-enhanced-respiratory-care-for-patients)



## Shedding light on how blood transports oxygen in disorders such as COVID-19

A team led by Associate Professor Pawel Swietach developed a single-cell oxygen saturation imaging technique to study oxygen handling by red blood cells (RBCs). The importance of oximetry measurements has been highlighted by the COVID-19 crisis, as patients present a profound drop in blood oxygen. Previously, however, the speed with which RBCs take up and release oxygen had not been measured, which is vital for evaluating the physiological fitness of RBCs. This new method quantifies gas exchange in individual RBCs, and in doing so both identifies the adaptations needed to allow healthy RBCs to exchange gases quickly and explains how disease-related changes may impair oxygen transport.

[www.dpag.ox.ac.uk/news/new-technique-could-shed-light-on-how-blood-transport-oxygen-in-disorders-such-as-covid-19](http://www.dpag.ox.ac.uk/news/new-technique-could-shed-light-on-how-blood-transport-oxygen-in-disorders-such-as-covid-19)

## HCQ with antibiotics to treat COVID-19 dangerous for the heart

A new international study, on which the groups of Professor David Paterson, with Dr Dan Li, Associate Professor Neil Herring and Dr Ming Lei in Pharmacology have collaborated, has provided mechanistic insight into how the anti-malaria drug, Hydroxychloroquine (HCQ), combined with an antibiotic called azithromycin (AZM), can cause adverse cardiac side-effects in COVID-19 patients. The paper, senior authored by former DPAG Postdoctoral Research Scientist Dr Guoliang Hao, reveals the electrophysiological process during HCQ/AZM treatment that makes the heart more susceptible to afterdepolarisation and sudden death, particularly in patients with sepsis or COVID-19 where hypotension is present. Their findings give weight to US Federal advice against using this combined treatment.

[www.dpag.ox.ac.uk/news/hcq-with-antibiotics-to-treat-covid-19-could-be-dangerous-for-the-heart](http://www.dpag.ox.ac.uk/news/hcq-with-antibiotics-to-treat-covid-19-could-be-dangerous-for-the-heart)



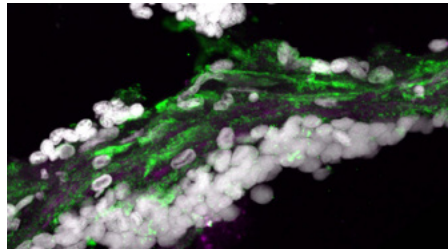


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## Malnutrition linked with increased risk of Zika birth defects

Professor Zoltán Molnár's group collaborated with researchers from the Federal University of Rio de Janeiro to show that the severity of deformations in babies associated with Zika virus is affected by environmental factors such as maternal nutrition. More than 75% of Congenital Zika Syndrome cases in Brazil have been found in the socio-economically disadvantaged Northeast region. The team found that this rise in cases is linked to poor diet among the infants' mothers.

[www.dpag.ox.ac.uk/news/malnutrition-linked-with-increased-risk-of-zika-birth-defects](http://www.dpag.ox.ac.uk/news/malnutrition-linked-with-increased-risk-of-zika-birth-defects)



## New target identified for repairing the heart after heart attack

A Riley Group study led by BHF CRE Intermediate Transition Research Fellow Dr Filipa Simões revealed for the first time that immune cells called macrophages are involved in creating the scar that repairs the heart after damage. By showing macrophages produce collagen, this challenges the current dogma that myofibroblasts are the sole cells contributing to the cardiac scar and paves the way for potential new therapeutic targets for heart regeneration.

[www.dpag.ox.ac.uk/news/new-target-identified-for-repairing-the-heart-after-heart-attack](http://www.dpag.ox.ac.uk/news/new-target-identified-for-repairing-the-heart-after-heart-attack)

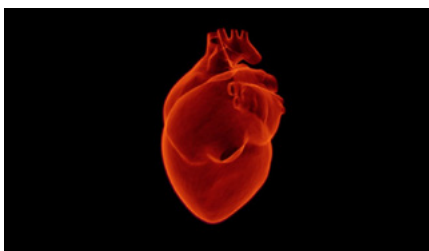


© @CireniaSketches

## New weight-loss drug brings hope for safer obesity treatment

Amphetamine (AMPH) class drugs are some of the most popular prescribed anti-obesity drugs, but are also addictive and can cause cardiac side effects such as hypertension. A collaborative research team from the Universities of Oxford and Cambridge co-led by Associate Professor Ana Domingos discovered that these adverse effects originate in the brain. In response, they designed a new weight-loss amphetamine called PEGyAMPH that does not pass the blood-brain barrier, and therefore avoids harmful side effects.

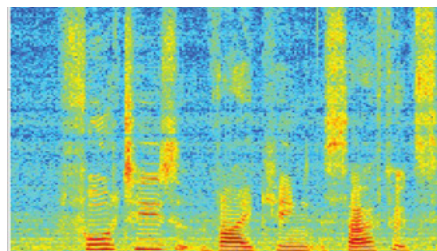
[www.dpag.ox.ac.uk/news/new-weight-loss-drug-brings-hope-for-safer-obesity-treatment](http://www.dpag.ox.ac.uk/news/new-weight-loss-drug-brings-hope-for-safer-obesity-treatment)



## Biomarker for increased risk of early mortality in patients with heart failure

Herring and Paterson Group researchers collaborated with UCLA scientists to reveal a new way to predict which patients with "stable" heart failure have a higher risk of dying within one to three years. They found that patients who have higher levels of neuropeptide Y, a molecule released by the nervous system, are ten times more likely to die within one to three years than those with lower levels of neuropeptides.

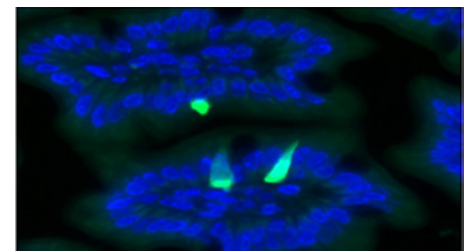
[www.dpag.ox.ac.uk/news/biomarker-predicts-which-patients-with-heart-failure-have-a-higher-risk-of-dying](http://www.dpag.ox.ac.uk/news/biomarker-predicts-which-patients-with-heart-failure-have-a-higher-risk-of-dying)



## How the brain makes sense of our constantly changing soundscapes

A team led by Professor Andrew King FRS had previously shown that auditory neurons in the brain constantly adapt their responses to match the statistics of the myriad of sounds we hear through a process known as contrast gain control. A new paper from the team has shown that these adaptive properties arise at an earlier stage in the auditory processing pathway than previously thought and sufficiently account for contrast-dependent effects on human perception.

[www.dpag.ox.ac.uk/news/new-insights-into-how-the-brain-makes-sense-of-our-constantly-changing-soundscape](http://www.dpag.ox.ac.uk/news/new-insights-into-how-the-brain-makes-sense-of-our-constantly-changing-soundscape)



## Understanding role of little-known gene in regulating our metabolism

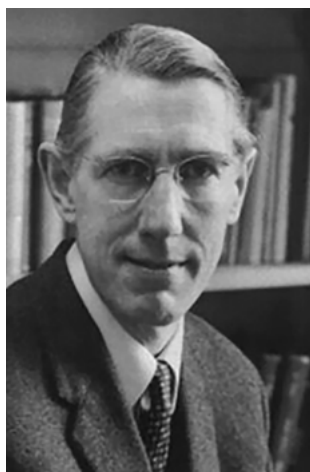
Thousands of genes are involved in the regulation of our day-to-day metabolism and relatively little is understood about their function. One key protein, an ABC Transporter called ABCC5, is predicted to be a susceptibility gene for Type 2 diabetes. Research led by Associate Professor Heidi de Wet has confirmed ABCC5's role in energy metabolism and identified the mechanism behind its metabolic impact for the first time.

[www.dpag.ox.ac.uk/news/understanding-role-of-little-known-gene-in-regulating-our-metabolism](http://www.dpag.ox.ac.uk/news/understanding-role-of-little-known-gene-in-regulating-our-metabolism)



## Peter B C Matthews FRS 1928—2020

### In piam Memoriam



© Experimental Physiology

Members of the Department were sad to hear of the death of Peter Matthews, Emeritus Professor of Sensorimotor Physiology, in the University Laboratory of Physiology and Emeritus Student of Christ Church at the age of 91. His outstanding scientific achievement was unravelling the working of the muscle spindle and writing an influential monograph on the subject. Many also remember him for his invaluable academic support and advice, and his dedicated and enthusiastic approach to teaching.

[www.dpag.ox.ac.uk/news/peter-b-c-matthews-frs-obituary](http://www.dpag.ox.ac.uk/news/peter-b-c-matthews-frs-obituary)



### Awards for Excellence in Teaching

Three academics from the Department received Teaching Excellence Awards from the Medical Sciences Division: Dr Michael Gilder for transforming the teaching of anatomy to Graduate-Entry Medical students; Associate Professor Lisa Heather for her enthusiastic development of the metabolism teaching and refining the Year 1 Biomedical Sciences molecules thread; and Associate Professor Robert Wilkins received a Project Award for targeting outreach activities to potential applicants for Biomedical Sciences from black and ethnic minority backgrounds.

[www.dpag.ox.ac.uk/news/three-dpag-academics-teaching-excellence-awards-2019](http://www.dpag.ox.ac.uk/news/three-dpag-academics-teaching-excellence-awards-2019)

### 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 of such honours from the past year, though this is not an exhaustive list: **Professor Gero Miesenböck FRS**, Warren Alpert Foundation Award and The Shaw Prize in Life Science and Medicine; **Professor Dame Frances Ashcroft FRS**, Jacob Henle Medal; **Professor Kieran Clarke**, William C. Stanley Award Lecture; **Dr Adam Packer**, European Research Council Starting Grant; **Professor Damian Tyler**, Honorary Skou Professor, University of Aarhus; **Professor Manuela Zaccolo**, Fellow of the Royal Society of Biology; **Professor Zoltán Molnár**, Elected Member of Academia Europaea; **Associate Professor Neil Herring**, Associate Professor in Cardiovascular Physiology and Tutorial Fellow at Exeter College; **Associate Professor Robin Klemm**, Associate Professor of Physiological Metabolism and Tutorial Fellow at Somerville College; **Associate Professor David Dupret**, Associate Professor in Cellular and Molecular Neurobiology and Tutorial Fellow at St Edmund Hall; **Dr Duncan Sparrow**, Associate Professor; **Dr Dan Li**, University Research Lecturer; **Dr Kerry Walker**, Associate Professor; **Dr Samuel Malone**, Marie Skłodowska Curie Individual Fellowship; **Dr Oliver Stone**, Wellcome Trust Henry Dale Fellowship; **Associate Professor Samira Lakhal-Littleton**, 2021 Bayliss-Starling Prize Lecture; **Professor Anant Parekh FRS**, Honorary Guest Speaker at the 108th Indian Science Congress.



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### Professor Christine Mummery delivers the 2019 Burdon-Sanderson Lecture

The Department hosted the annual John Burdon-Sanderson Lecture in honour of the University's first Waynflete Professor of Physiology, delivered this year by renowned stem cell scientist Professor Christine Mummery with a talk entitled "Cardiovascular diseases and drugs: hiPSC models moving forward". Mummery is the incoming president of the International Society of Stem Cell research (ISSCR) and was recently awarded the Hugo van de Poelgeest Prize for Animal Alternatives in research.

[www.dpag.ox.ac.uk/news/christine-mummery-gives-2019-john-burdon-sanderson-lecture](http://www.dpag.ox.ac.uk/news/christine-mummery-gives-2019-john-burdon-sanderson-lecture)



### DPAG Sponsored International Women's Day Wikipedia Edit-a-Thon

An international event organised by Postdoctoral Research Scientist Cristiana Vagnoni and DPhil Student Tai-Ying Lee aimed to increase visibility of women in academia by enhancing their online presence in the form of Wikipedia profiles. Several distinguished female scientists were featured in 16 new articles and 96 existing articles, and within a few days this effort yielded 160,000 article views, rising to over 30 million within two months.

[www.dpag.ox.ac.uk/news/first-dpag-sponsored-international-womens-day-wikipedia-edit-a-thon](http://www.dpag.ox.ac.uk/news/first-dpag-sponsored-international-womens-day-wikipedia-edit-a-thon)

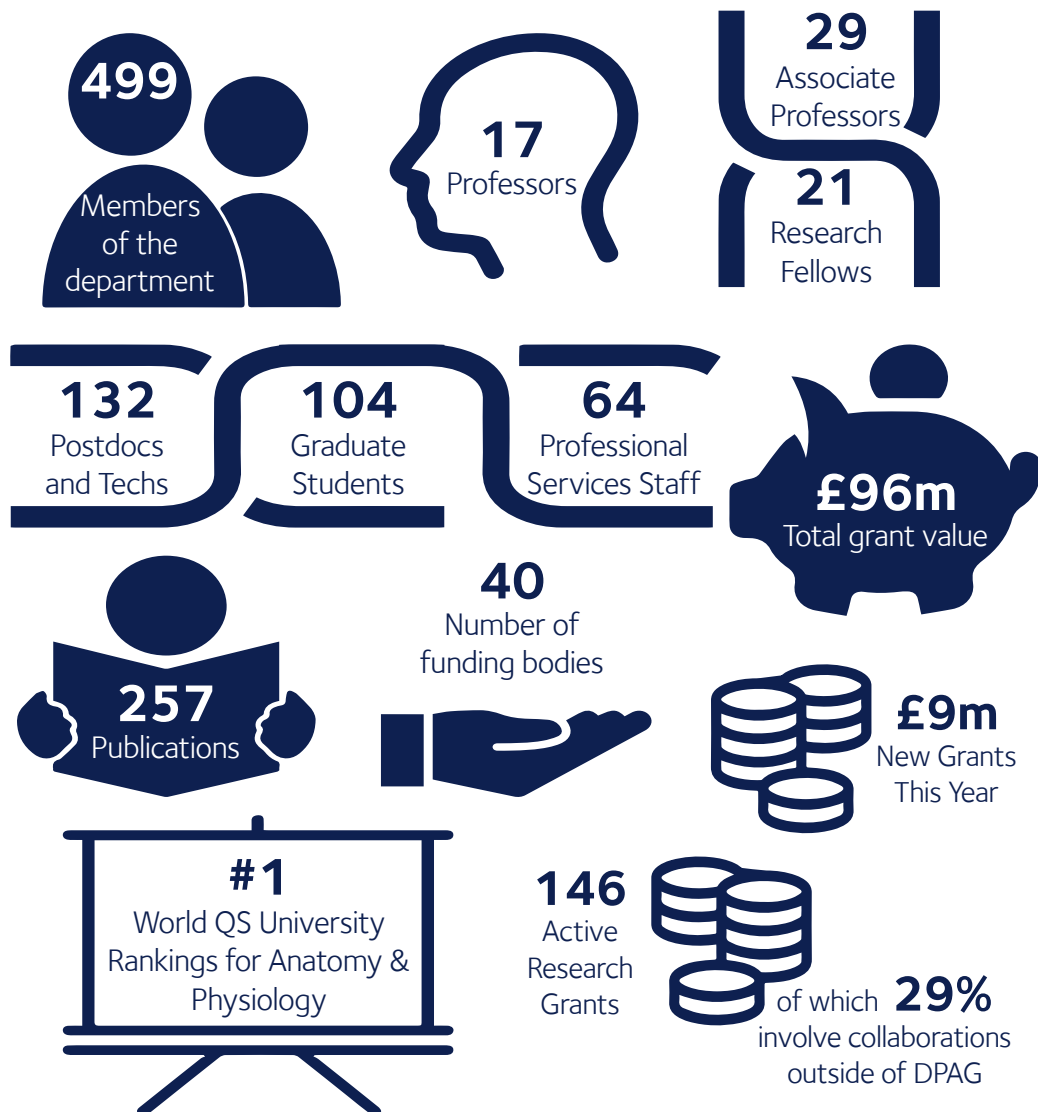


Dr Adam Packer



Professor Manuela Zaccolo

## Statistics for 2019–2020



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01865 272548 [communications@dpag.ox.ac.uk](mailto:communications@dpag.ox.ac.uk)  
Sherrington Building, Parks Road, Oxford, OX1 3PT