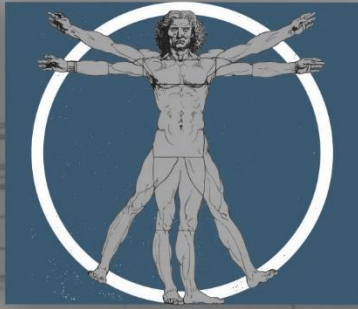
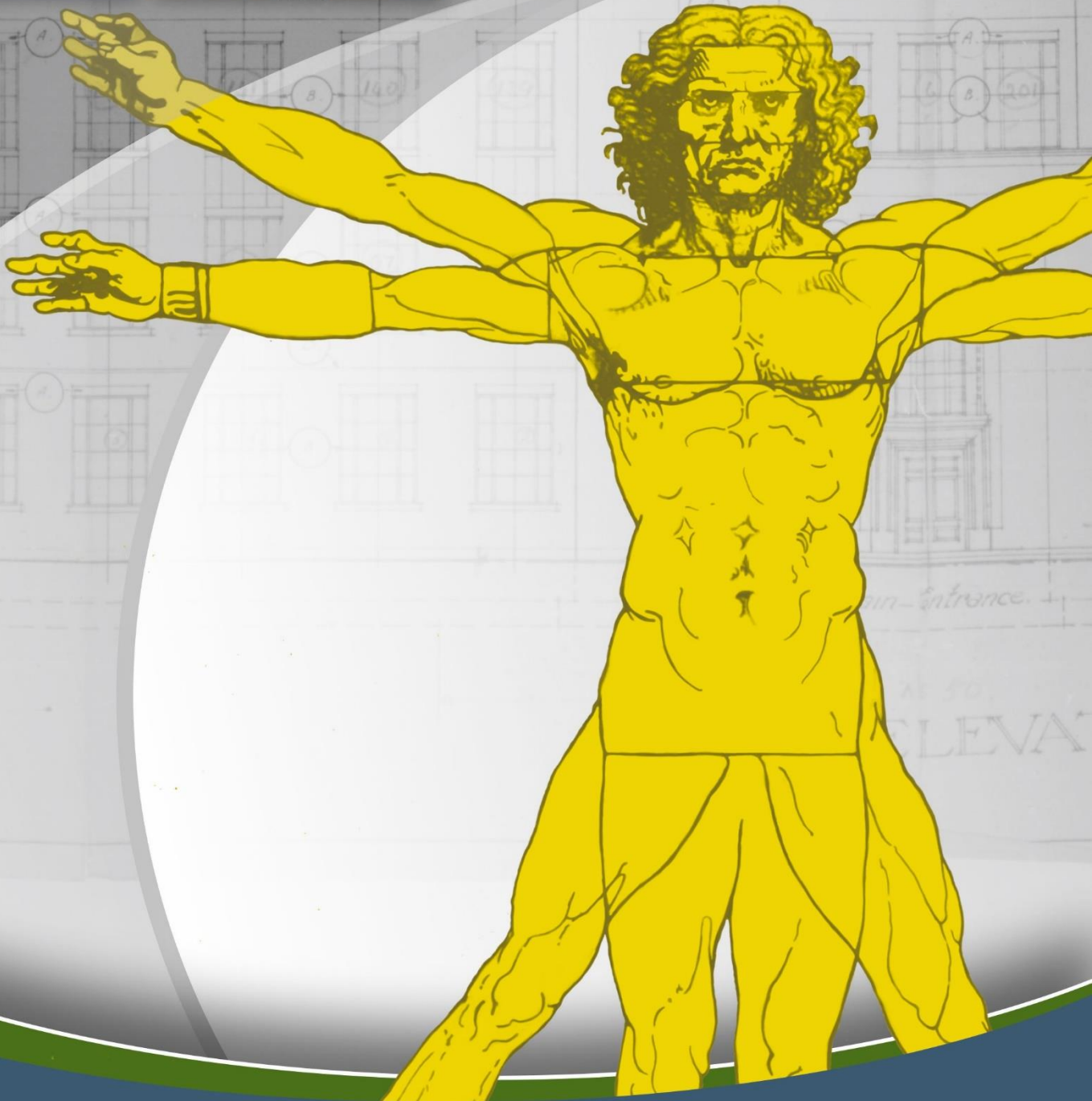


DEPARTMENT OF  
PHYSIOLOGY,  
ANATOMY &  
GENETICS



# Annual Report 2023–2024



*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.*



# A year of progress

## From the Head of Department - David Paterson

The Department of Physiology, Anatomy and Genetics has enjoyed another enormously successful year. We continue to lead the way with our ground-breaking research and top-quality advanced degrees, as recognised once again in the QS world rankings, having retained our spot as world number one for Anatomy and Physiology. In November we said a fond farewell to the Le Gros Clark Building, which we had inhabited since 1893! We now look forward to our new-improved Sherrington Building with anticipation. The whole department greatly enjoyed the wonderful Street Party, held in July last year – we look forward to the 2024 Street Party on 5 July.

This year has also seen an extraordinary number of awards and prizes for our department (see below for an overview), both from our esteemed long serving members and distinguished new recruits. In particular we extend a warm welcome to Professor Dame Molly Stevens and her large, interdisciplinary research group whose members have now joined us here in Oxford. Professor Stevens was made a Dame in the New Year Honours. His Majesty The King has appointed Professor Dame Sue Black to the Most Ancient and Most Noble Order of the Thistle, the highest honour in Scotland. I am absolutely delighted to see my long-term colleague Sir Peter Hunter KNZM FRS FRSNZ recognised in the King's Birthday Honours list, he has been promoted to Knight Companion of the New Zealand Order of Merit, for services to medical science.

Additional highlights for me this year have been hosting a number of eminent scientists who have contributed to a varied and exciting series of talks across the year: These have included Sir Nigel Shadbolt talking about 'Science in the age of AI', Professor David Ron talking about 'Regulation of protein synthesis and proteostasis by the Integrated Stress Response', Nobel Laureate Professor Richard Axel, whose lecture was titled 'Scents and Sensibility: Representations of Identity, Illusion and Value in Olfactory Cortex', and Professor Stefanie Dimmeler who spoke to us about 'Cardiovascular Ageing: Unravelling the Interplay of Vessels, Nerves, and Inflammation'.

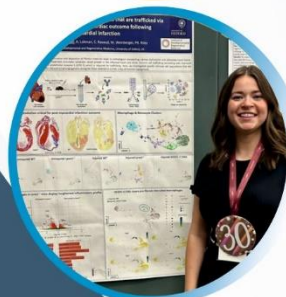
I conclude by congratulating all our academic, research and professional services staff for their unflinching hard work in helping us maintain our world-leading position and for making DPAG an ever more vibrant and productive community each year.

*Oxford Anatomy and Physiology ranked #1 in the QS World University Rankings by subject 2017, 2018, 2020, 2021, 2022, 2023, 2024*

## 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 it is not exhaustive:

**Molly Stevens** was made a Dame Commander in the New Year's Honours list and won the Novo Nordisk Prize, she also joined Exeter College as a Supernumerary Fellow. **Manuela Zaccolo** received the Ketty Schwartz Award 2023, **Yitao Zhu** was awarded the Goodger and Schorstein scholarship, **Duncan Sparrow** was elected Supernumerary Fellow of Exeter College, **Jaideep Pandit** was awarded the Sir Ivan Magill Gold Medal of the Association of Anaesthetists, **Neil Herring** was awarded the title of Professor of Cardiovascular Medicine, **Shankar Srinivas** was awarded a Wellcome Discovery Award, **Robin Klemm** won a grant from the Chan Zuckerberg Initiative, at the Medical Sciences Teaching Awards **Sharmila Rajendran** and **Rumi Smilevska** received Project Awards and **Lisa Heather** and **Kerry Walker** received Excellent Teacher awards, **Mootaz Salman** won a BBSRC Pioneer Award and the ARUK David Hague Early Career Award, **Rui Ponte Costa** received a EPSRC New Investigator Award, **David Paterson** was made an Honorary Fellow of The Physiological Society, and Fellow of the International Union of Physiological Sciences, he also received an Honorary degree from the University of Western Australia, the **Anatomy Teaching Team** won the Inclusive Teaching and Assessment Award at the Vice-Chancellor's Awards, **Pawel Swietach** and **David Dupret** were elected to membership of Academia Europaea.



## Molly Stevens

Professor Molly Stevens FRS FREng, John Black Professor of Bionanoscience at the Department of Physiology, Anatomy and Genetics and the Institute for Biomedical Engineering, has been appointed Dame Commander of the Most Excellent Order of the British Empire (DBE) for services to Medicine. She is also the Deputy Director of the Kavli Institute for Nanoscience Discovery.

Professor Stevens is a Fellow of eight Professional Bodies, including The Royal Society (FRS) and Royal Academy of Engineering (FREng), and is also a Foreign Member of the National Academy of Engineering and an International Honorary Member of the American Academy of Arts and Sciences.

Professor Stevens said: 'I would like to thank my incredible team of researchers and staff who inspire me every day towards the mission of transforming healthcare through biomaterials technologies. All the advances that we have made into the design of new biosensing, therapeutics and regenerative medicine technologies are the result of strong teamwork both inside the lab and through to our external collaborators and key industrial partners. A key focus has been, and will continue to be, designing effective yet accessible technologies that can help in democratising access to healthcare.'



### Flies neglect food and endure shocks to seek a dopamine reward : Waddell Group paper published in Nature

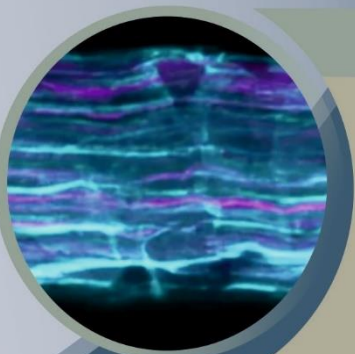
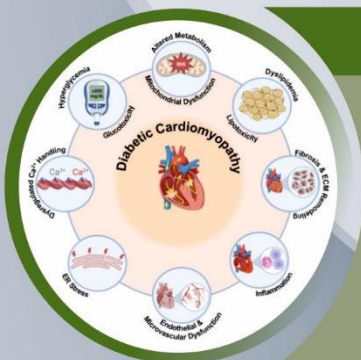
Research led by Dr Kristijan Jovanoski, DPhil student and second author Lucille Duquenoy and Professor Scott Waddell reveals dopamine systems can cause flies to seek reward despite negative consequences. The team used optogenetics to activate a subset of reward-encoding dopamine neurons together with an odour. Flies took risks to endure shock while seeking reward because the dopamine neurons that ordinarily signal electric shock punishment were functionally impaired by prior activation of the reward-encoding dopamine neurons. This revealed antagonism between reward-encoding and punishment-encoding dopamine neurons in the brain.

### Heather Group publish a paper about how type 2 diabetes progression changes occur within the myocardium

Changes in cardiac metabolism underpin the development of Diabetic Cardiomyopathy (DbCM), and understanding how these dysregulated metabolic intermediates drive changes in the myocardium underpins the Heather Group's research. What has been lacking is a consistently applied and universally accepted definition of DbCM. In the article 'Redefining Diabetic Cardiomyopathy: Perturbations in Substrate Metabolism at the Heart of its Pathology' the team redefine DbCM, based on new advances in the literature

### New paper by Professor Ana Domingos and DPhil student Emma Haberman published in the journal Immunity

The paper, 'Immunomodulatory Leptin Receptor+ Sympathetic Perineurial Barrier Cells Protect Against Obesity by Facilitating Brown Adipose Tissue Thermogenesis' covers research that reveals a cellular target unifying the neuroendocrine and immunometabolic regulation of adipose tissue homeostasis, which could be targeted therapeutically to mitigate obesity. It demonstrates that the production of anti-inflammatory IL-33 by LepR+ perineurial cells acts as a 'brake' on the adipose tissue neuroinflammation that is usually associated with obesity. This research demonstrates a link between neuroendocrinology and immunometabolism.



## New artwork unveiled



On Thursday 19 October our latest piece of art was unveiled, a piece which now hangs in the Sherrington Building foyer. The artist Patrick Hughes was present to unveil his new work, 'Shoulders to stand on'. Like other works by Hughes is a dynamic piece that changes as you look at it from different directions. Hughes is the creator of 'reverspective', an optical illusion on a 3D painted surface where the parts of the picture that seem farthest away are actually physically the nearest.

Head of Department David Paterson commented, 'The Department is grateful to be the custodian of Patrick's latest artwork 'Shoulders to Stand On', which reflects the science legacy of this department and its future. We hope it will inspire the next generation as we continue to build knowledge'.

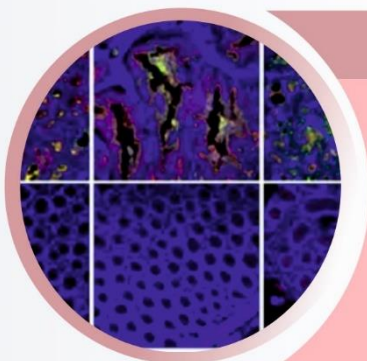
## Street Party 2023



On Friday 7 July 2023, DPAG, Biochemistry and Kavli INsD came together for the second Sherrington Road Street Party to enjoy paella, ice cream, street food snacks, Pimms, and garden games in University Parks.



## Research identifies ways of targeting therapies to the acidic microenvironment of colorectal tumours



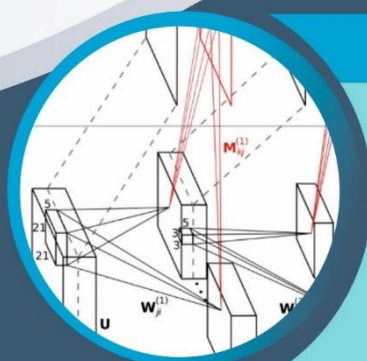
A paper in the Proceedings of the National Academy of Sciences (PNAS) by Dr Johanna Michl and Professor Pawel Swietach at DPAG has identified CEACAM6 as a marker for acid-resistance in colorectal cancer cell lines. The study shows that colorectal cancer cell lines which are resistant to high levels of acidity express higher levels of the cell adhesion protein CEACAM6, and its related isoform CEACAM5. This discovery could allow improved drug targeting to the tumour microenvironment, which is typically acidic.

## New Paper on Layer 6b published in Neuron



Professor Zoltan Molnar has collaborated with colleagues at Charité, Berlin on the paper, 'Layer 6b controls brain state via apical dendrites and the higher-order thalamocortical system' which was published in the journal Neuron. The paper concludes that orexin/hypocretin-activated cortical neurons form a multifaceted, fine-tuned circuit for the sustained control of the higher-order thalamocortical system. The results support the notion that L6b neurons support both attention and understanding. Zoltán Molnár has been conducting collaborative research as an Einstein Visiting Fellow at the Charité – Universitätsmedizin since 2020.

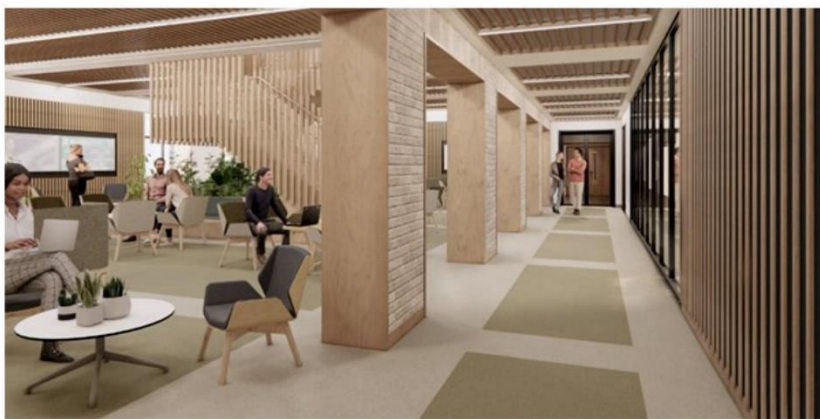
## Paper 'Hierarchical temporal prediction captures motion processing along the visual pathway' in the journal eLife



Professor Andrew King and members of his research group published a paper 'Hierarchical temporal prediction captures motion processing along the visual pathway' in the journal eLife. The paper suggests that the brain may represent the sensory world in a way that best predicts future input. This work builds on an earlier computational study showing that an artificial network of neurons trained to predict the next few video frames from their immediate past resulted in stimulus preferences that resembled those of real neurons recorded in the primary visual cortex.

# The Sherrington Project

The Sherrington Building, the main building of the Department of Physiology, Anatomy, and Genetics, has been in need of refurbishment for some time, and this summer we will see the building work commence, with the purpose not only of fixing, but greatly improving our building.



The Sherrington project will return disused parts of our building to a usable, flexible state that is suitable for modern science; to provide an enhanced student experience; and to allow DPAG to recruit to senior faculty posts and attract externally-funded fellows to sustain the department's world-leading academic position in teaching and research.

The building works will refurbish and improve the existing building but also create an entirely new fourth floor. Works will allow the creation for the first time of a flexible academic interaction, seminar, event and social space available to all within the department. This 'Academic Hub' will exist on the third and fourth floor level, where researchers will also have access to private external space on a small roof terrace. Our improved building will also deliver better environmental sustainability and benefits to the welfare and wellbeing of our staff and students.

Building works are inevitably inconvenient and noisy, but we are excited about the new opportunities our improved Sherrington Building will provide for our community.

# Public Engagement with Research



## A Busy and Successful Year for our PER team

This year has seen our dedicated Public Engagement with Research team (and many additional volunteers) run a number of very popular events, bringing our science into the Oxford Community and engaging with a wide variety of different people. More than 100 children, with parents and caregivers, enjoyed a variety of activities on the theme of 'Exploring Our Senses' at the Oxford Brookes Science Bazaar held in February. In November DPAG researchers participated in the Oxford Digital Festival to showcase a virtual reality experience created by the interdisciplinary Shaping Destiny public engagement project.

In October DPAG hosted an inspiring 'World Anatomy Day' event at the Natural History Museum. This event, themed 'The Art of Anatomy: Explore, Create, Connect,' brought together a diverse group of participants, from sixth form students aspiring to join medical school to seasoned researchers and medical students. DPAG's Outreach and Public Engagement Working Group played a pivotal role in making this event a resounding success, supported by dedicated volunteers, including research scientists, clinical anatomy teaching staff, and undergraduate medical science students. The Science in the Park event held in July 2023 was a huge success and is due to be repeated this year.

2023/24  
In Numbers



DEPARTMENT OF  
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Sherrington Building, Parks Road, Oxford, OX1 3PT  
T: 01865 272548  
E: [communications@dpag.ox.ac.uk](mailto:communications@dpag.ox.ac.uk)  
W: [www.dpag.ox.ac.uk](http://www.dpag.ox.ac.uk)