



## Pushing against boundaries



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In 1944 Erwin Schrödinger published a now-famous book called ‘What is Life?’ Bored of his cat taking the credit for being two things at the same time, the Nobel prize-winning physicist was keen to try and become a biologist as well as a physicist. This book sparked the imagination of many aspiring young scientists, including Crick and Watson. Crick of course was not a biologist, but a physicist. It was his expertise, however, combined with zoologist Watson’s zeal and the meticulous work of spectroscopists Franklin and Wilkins, that led to the discovery of the structure of the most famous of all biological molecules, DNA.

Science is always very fertile at its boundaries. In the case of DNA, it was the expertise of physicists and biologists working together in the hinterland between their disciplines that was crucial for the discovery. This continues to this day. Go into any hospital and you will see arrays of instruments and machines in the wards and in the labs. These were conceived not only by doctors but by teams of people including engineers, physicists, chemists, all working together at the edges of their comfort zones for a common goal. It is these ‘interdisciplinary’ teams that continue to push forward the boundaries of science.

We pride ourselves on interdisciplinary research at the University of Southampton, particularly in medical research. If you cast your eyes over some of our recent successes, you will see many examples, including pharmacists and engineers, working together to develop treatments for inflammatory lung disease, crystallographers and cancer biologists finding the next generation of anti-cancer drugs, and engineers, surgeons and biologists working together to replace our damaged bones and joints. We also host the Institute for Life Sciences at the University, which is dedicated to bringing together physical scientists and biologists to better fulfil the future medical needs of people in the UK and beyond.

It continues to be important that our talented researchers are supported in their interdisciplinary research. It has been pleasing to see Wessex Medical Research taking an active role in this. Recent projects awarded WMR funding through their Innovation Grants have included the development of polymers to help understand how pancreatic cancer progresses (Dr George Williams *Engineering*) and the development of new three-dimensional hydrogels for growing liver-like tissue in the lab. (Dr Nicole Prior *Biological Sciences*). With this in mind, we are pleased that WMR has recently agreed to partner with the Faculty of Engineering and Physical Sciences at the university to co-fund an iPhD studentship each year that brings together engineers and biomedical scientist to push these boundaries further.

We hope by fostering this research it will be no longer necessary that an aspiring researcher has to be in two places at once. Instead, they will have the interdisciplinary team right there on hand to get the job done. The team behind DNA won the Nobel prize. Who knows what our WMR-funded researchers may achieve next?

## The benefit of translational research

*Increasing emphasis is being placed on the translational value of medical research. That is, when a particular area of research benefits not only the original, often narrow area originally identified but is now able to be applied to other fields of medicine with great benefit. The Centre for Cancer Immunology at Southampton, an institution currently unique in medical research in the United Kingdom, was set up some five years ago. Here, one of their scientists explains the benefit of the joint funding with WMR of a number of PhD studentships.*

**W**essex Medical Research (WMR) is a charity focusing on providing initial funding for the medical researchers at the start of their career. They provide the necessary tuition fees, stipend and consumables to enable the student to start their chosen scientific project. This funding is critical in advancing medical research by offering the necessary resources, expertise and infrastructure to make progress in understanding a disease, developing new treatments and ultimately improving the lives of patients.

Over the last 5 years WMR and the Centre for Cancer Immunology (CCI) have come together to develop an innovative new partnership to fund a series of highly successful 4 year integrated PhD (iPhD) studentships. The programme allows the student to take 3 rotation projects during their first year, presenting their findings in the form of a project report. This provides them with a unique opportunity to expand their research experience, acquire various types of expertise and develop critical analysis and writing skills before commencing their main project. Moreover, they learn which aspects they enjoy and want to pursue, and thus they become active participants and enthusiastic drivers of the research programme concerned. During this initial year the students also receive a large amount of additional training in transferrable skills, equipping them for a future career in academia and biotech by teaching not only the scientific skills but also leadership and active decision making.

Over the last 5 years this arrangement has benefitted 7 PhD students. The highly-successful programme is continuing with calls for applications for studentships to commence in 2024 announced at the beginning of the current academic year: prospective projects are now under consideration.

As an example, in 2022 WMR jointly provided funding alongside the CCI for a cutting-edge iPhD research project to investigate “*The role of GABAergic signalling in tumour vascularization*”. Gamma-aminobutyric acid (GABA) is known to be an inhibitory neurotransmitter of the central nervous system. However, recent advances have shown it also to be present and active outside the central nervous system, including in various cancers such as breast, colon and pancreatic. Moreover, GABA has been shown to be associated with the inhibition of the immune system’s anti-cancer function and so it is likely to play an important part in the cross-talk between cancer and immune cells. This study specifically aims to delve deeper into the mechanism behind this process and its possible interaction with a tumour’s vascular system.

WMR/CCI funding has provided a unique opportunity to develop this highly innovative project. It will potentially lead to the shift of our understanding of “neurotransmitters” from the central nervous system specific compounds to key signalling molecules in the rest of the body. The translational value of the projects lies in the development of a new generation of medicines targeting GABAergic signalling outside the central nervous system. but which do not cross the blood-brain barrier.

This work is being undertaken by iPhD student, Kaja Stoklosa, at the CCI, jointly supervised by Dr Yury Bogdanov and Professor Claire Clarkin. Simultaneously, new compounds targeting GABAergic signalling pathways are being developed by our collaborators at the University of Copenhagen under the leadership of Professor Bente Frolund.



Dr Yury Bogdanov

## Innovation Grants

**W**e have once again been able to make five Innovation Grants, each of up to £20,000, to early career researchers. Details of the recipients and their particular areas of research are set out below.

### Dr Ysobel Baker

*Faculty of Engineering and Physical Sciences*

**“A new class of RNA degrading therapeutic oligonucleotides.”**

*This project requires the purchase of two items of equipment, together with consumables. The purpose is to create a new class of RNA targeting treatments that redirect one of the body's natural defence mechanisms against viruses.*



### Dr Colleen Deane

*Faculty of Medicine*

**“Using metabolomics to uncover novel biological markers of, and targeted nutritional interventions to offset, age-related musculoskeletal decline.”**

*As people age, their muscles get smaller and weaker, increasing their risk of falls. This project will examine samples of blood and urine for natural chemicals in a large number of people aged over 75 who have normal or low muscle mass for their age. The aim is to identify ways of reducing muscle loss in later life.*

### Dr Jodie Ackland

*Faculty of Medicine*

**“Using triple RNASeq to investigate macrophage-bacterial-viral interactions during co-infection.”**

*This project builds on previous research showing that co-infection with a virus and bacterium causes greater inflammation than either alone and the possible need for treatment in hospital. Using triple RNA sequencing, it is hoped to identify specific markers to tell whether individuals have bacterial, viral or combined infections so that they can receive the most effective treatment.*



### Dr Ella Baker

*Faculty of Medicine*

**“Understanding the anti-inflammatory actions of pinolenic acid, a sustainable alternative to EPA and DHA.”**

*Regular eating of Omega-3 fats has long term benefits by reducing inflammation and the risk of heart disease, diabetes and cancer. Oily fish are a rich source but stocks are decreasing. Pinolenic acid, found in pine nuts, has similar anti-inflammatory effects and these will be studied in greater detail as a potential alternative to oily fish.*

### Dr George Williams

*Faculty of Engineering and Physical Sciences*

**“Polymer conjugates for advanced imaging and drug delivery to study and treat pancreatic ductal adenocarcinoma.”**

*Many patients with the most common form of pancreatic cancer are not suitable for immediate surgery. Instead, they require chemotherapy to shrink their tumour and this can cause severe side effects. The project seeks to develop a novel drug which is activated in the tumour tissue. This will be tested on human pancreatic cancer cells and organoids, simplified versions of organs which are grown in the laboratory.*





For some time now, we have been promoting the idea of recycling used printer cartridges for the benefit of WMR. This is an ongoing appeal so please search around and see what you can find. You can send them direct to recycle4charity (go to their website at [www.recycle4charity.co.uk](http://www.recycle4charity.co.uk) for freepost instructions) but remember to tell them it's for the benefit of Wessex Medical Research and give our reference number (C16805).



We are proud to be a member of the Association of Medical Research Charities and our last regular Peer Review Audit took place in 2020.



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## PhD Studentships

We are pleased to report that in the Spring of 2023 we were once again able to award three PhD studentships. The students have now been recruited and began their studies on October 2023. Details of the projects are as follows:



*"Can endometrial gland structure and function help us understand why some women are more at risk of miscarriage than others?"*

*For a successful pregnancy, the embryo must implant in the lining of the womb. Some 10-15% of pregnancies end in miscarriage and 1-2% of women suffer two or more miscarriages in a row. The project will use 3D imaging to study how womb cell structures are arranged and function in samples taken from women who have suffered repeated miscarriages.*

Principal supervisor

**Dr Jane Cleal**

Associate Professor in Reproductive Cell Biology

Jointly funded with Rosetrees Trust

*"Calculating neonatal biochemical age at the bedside to transform paediatric nutrition."*

*Good growth is essential for healthy development but poor weight gain is a problem, particularly in babies born before the 37th week of pregnancy. This project will assess their biological demands across the first six months of life by analysing chemicals in their urine using nuclear magnetic spectroscopy.*



Principal supervisor

**Professor Jonathan Swann**

Professor of Biomolecular Medicine



*"Investigating the genomic structure, regulation and function of the low affinity FCGR cluster to improve cancer immunotherapy."*

*Despite huge progress, some regions of the human body structure remain poorly understood. Among these is the Fc gamma receptor gene cluster which regulates normal immune processes and the response to immunotherapy in patients with cancer. The project will use a new technique to analyse these genes in both normal patients and those suffering from cancer.*

Principal supervisor

**Dr Jane Gibson**

Lecturer in Cancer Bioinformatics and Genomics

Jointly funded with the Centre for Cancer Immunology

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