THE FRANCIS CRICK INSTITUTE

BUILDING CONNECTIONS

The Francis Crick Institute Annual Review
2018/19

ABOUT THE CRICK

The Crick is a place for collaboration, innovation and exploration. We are a biomedical research institute breaking down barriers between disciplines; a space where some of the most talented and ambitious scientists in the world can pursue big and bold ideas.

We support our scientists in a dynamic environment, fostering excellence with state-of-the-art infrastructure and a creative and curious culture.

We are prepared to take risks on unusual, pioneering research that answers fundamental questions about human health and disease. And with the help of our partners, we aim to bridge the gap between research and application to ensure our discoveries change lives for the better.

We have five strategic priorities:

- **Pursue discovery without boundaries**
- **Create future science leaders**
- **Collaborate creatively to advance UK science and innovation**
- **Accelerate translation for health and wealth**
- **Engage and inspire the public**

FOUNDING PARTNERS

MRC Medical Research Council · UCL · Imperial College London · King's College London · Wellcome · Cancer Research UK

> **Working in partnership – across London, the UK, Europe and globally – is crucial to tackle major scientific questions.**
>
> *Sir Paul Nurse*
> *Director of the Francis Crick Institute*

INTRODUCTION FROM PAUL NURSE

Welcome to our annual review for 2018/19, where we're focusing on the connections the Crick has been building as we establish ourselves as an integral part of the global biomedical research community.

Working in partnership – across London, the UK, Europe and globally – is crucial to tackle major scientific questions. We highlight examples here; interdisciplinary relationships within the Crick, as well as Crick researchers working with partners in universities, hospitals and industry. You can also read about how we work with the local community to share our science and support health and wellbeing projects. Making connections with others helps the Crick achieve its ambitions.

Sir Paul Nurse
Director of the
Francis Crick Institute

SCIENTIFIC HIGHLIGHTS

> I've learnt that it is much more stimulating to join forces rather than compete. I believe that scientific discoveries can be accelerated if we work together, rather than against, each other.

Max Gutierrez

Max Gutierrez

MAKING THE LINK

Max Gutierrez is a tuberculosis researcher who was originally studying the role of a protein in the immune system that is primarily linked to Parkinson's disease.

He has now uncovered a connection between the two diseases and a potential cause of Parkinson's disease – something that has evaded Parkinson's researchers for decades.

When Max began to enter the world of Parkinson's research, he found that a group at Newcastle University were working in parallel on the same topic and after comparing their results at a conference, they decided to join forces and publish their results together.

By collaborating on the final experiments rather than racing to publish first, Max and his colleagues were able to make a key contribution to the understanding of Parkinson's disease.

Andrey Abramov and Sonia Gandhi

UNRAVELLING PARKINSON'S DISEASE

For years, scientists have known that Parkinson's disease is associated with a build-up of alpha-synuclein protein inside brain cells, but haven't known how these protein clumps cause neurons to die.

A team of international collaborators led by Sonia Gandhi, group leader at the Crick and UCL, and Andrey Abramov, Professor of Biophysics at UCL, found that in nerve cells generated from patients with Parkinson's disease, the abnormal protein clumps damage mitochondria and cause them to swell up and burst, leaking out chemicals that tell the cell to die.

CLASSIFYING CANCERS

The TRACERx Renal team published an analysis of over 1000 tumour samples donated by 100 kidney cancer patients, showing that there are three distinct types of kidney cancer.

The team, made up of scientists at the Crick, UCL, The Royal Marsden NHS Foundation Trust and Guy's and St Thomas' NHS Foundation Trust, identified three types of tumours that evolve at different speeds and with varying aggression. By classifying patients' tumours, clinicians could be able to choose the best treatments for patients and potentially diagnose cancers much earlier.

This study brought together scientists from physical chemistry, single molecule biophysics and biology across the Crick, UCL and Cambridge. By working at the interface of disciplines, we were able to discover a fundamental mechanism in a complex human disease.

Sonia Gandhi

CHALLENGING THE NORM

Biology textbooks have taught for decades that nerve cells initially form the brain, and a subset of these cells then specialise to become the spinal cord.

A collaboration between James Briscoe and Nick Luscombe's groups at the Crick suggests this is not the case and that cells decide to become brain cells or spinal cord cells much earlier than previously thought. The finding helps to explain how embryonic stem cells could be used to generate new spinal cord neurons, opening up opportunities for regenerative approaches to treating spinal cord injury and disease.

Aneesh Sharma, PhD student in Dominque Bonnet's group at Crick.

Sex-reversed male XY mouse (left) and female XX mouse (right).

DECODING SEX

An international group of scientists led by Crick group leader Robin Lovell-Badge and postdoc Nitzan Gonen showed that chromosomally male mice grow ovaries instead of testes if they are missing a small piece of regulatory DNA that doesn't contain any genes. The work may explain some sex development disorders in humans, over half of which have unknown genetic causes.

EATING YOUR GREENS

While the health benefits of vegetables are well-established, many of the mechanisms behind the benefits remain unknown.

Research from Gitta Stockinger's team working with our animal research facility showed that mice fed on a diet rich in indole-3-carbinol – which is produced when we digest vegetables from the Brassica genus like kale, cabbage and broccoli – were protected from gut inflammation and colon cancer.

A malaria-infected red blood cell on the verge of rupture.

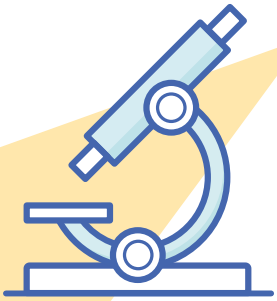
STOPPING MALARIA IN ITS TRACKS

Malaria-infected red blood cells spread the infection through the body by rupturing and releasing waves of parasites. Research from Mike Blackman's group at the Crick has revealed how the malaria parasite shreds a red blood cell's outer layer and causes the cell to rupture.

The team identified a series of enzymes that activate each other in a chain reaction, eventually destroying the cell's outer membrane. If any enzyme in the chain was intercepted, the chain reaction would stop in its tracks and prevent the infected cells from rupturing. This could form the basis of a new type of antimalarial drug that limits how far the disease can spread through the body after infection.

> The study was like a massive jigsaw puzzle that we had to solve. Thanks to years of effort from the many scientists who each contributed bits as they passed through the lab, we were finally able to see the whole picture.

Michele Tan, PhD student, Blackman lab



9

new group leaders joined the Crick to establish their first research groups.

MAKING CONNECTIONS

The first cohort of Crick African Network Fellows: (L-R) Dr Yaw Bediako, Dr Mandy Mason, Dr Brigitte Glanzmann, Dr Peter Quashie and Dr Benoît Assogba.

FUTURE AFRICAN RESEARCH LEADERS

The Crick African Network is a joint project with five African partner institutions, funded by the UKRI Global Challenges Research Fund.

The network awarded its first round of Career Accelerator Awards to five outstanding African postdoctoral researchers in October 2018. The fellows will spend two years working and training at both the Crick and an African partner institution and leave the scheme prepared to lead their own research groups in Africa. The fellowships support researchers studying infectious diseases which disproportionately burden Africa, including malaria, tuberculosis and HIV/AIDS.

LAB MEETS CLINIC

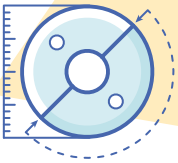
'Medicine at the Crick', our new series of events to connect lab-based scientists with clinicians from across the UK, launched in June 2018 with a meeting on genome editing. Each event focuses on a current topic in biomedical research and creates a forum to discuss the latest advances in biomedicine and their impact on patient care.

VISUALISING LEUKAEMIA

Scientists from our Haematopoietic Stem Cell lab and in vivo imaging team have used existing MRI machines to develop a preclinical bone marrow imaging technique that efficiently measures novel indicators of leukaemia and could give patients a more accurate prognosis of their disease.

A grant from the Crick's i2i (idea to innovation) scheme, funded through the Medical Research Council's Confidence in Concept programme, allowed the Crick team to work with an MRI specialist and partner with a consultancy.

Through the team's work with the consultancy, they have established links with haematologists and imaging consultants at Barts NHS Trust and will shortly be launching clinical trials.



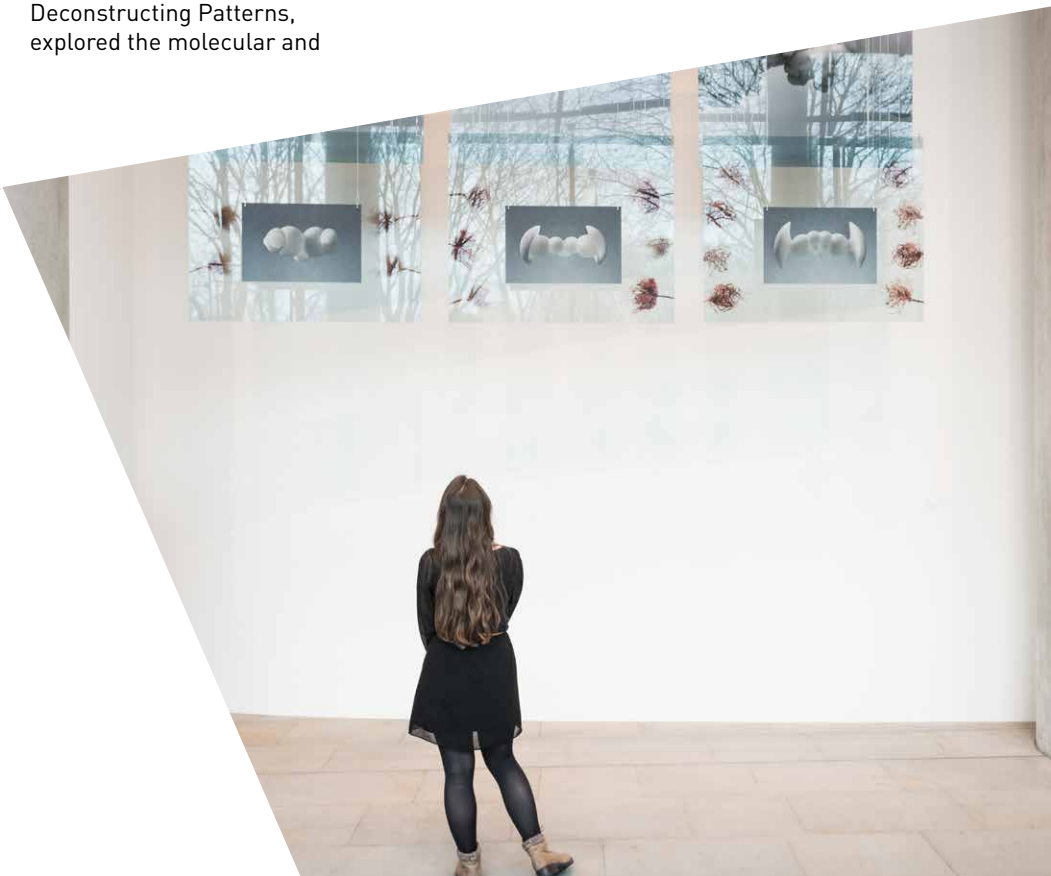
3,093

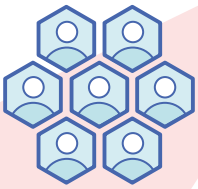
visitors to Craft & Graft in its opening month.

ART AND SCIENCE

Our latest public exhibition, Craft & Graft, showcases the surprising roles of the people who work around the clock to make our life-changing research possible.

By highlighting our technicians, engineers and specialists, the exhibition gives visitors a chance to go behind the scenes at the Crick and meet the teams supporting our science. Our previous exhibition, Deconstructing Patterns, explored the molecular and cellular patterns studied at the Crick through unique collaborations with local and international artists, including the Knowledge Quarter's Poet in the City.





25,713

visitors to Deconstructing Patterns from April to November 2018.

MAKING CONNECTIONS

We joined UCL, King's College London and Queen Mary University of London to establish Cancer Research UK's City of London Major Centre. The new world-class research hub will bring together scientists from across a range of disciplines to become a global centre of excellence for biotherapeutics, a pioneering field of cancer research.

16,000

local school students have been engaged through our education outreach programme.

91

work experience students have spent time in teams at the Crick.

In March 2019, the Crick was awarded the status of 'Employer Champion' by the Science Council, recognising the work that we do to support the career development of our scientific and technical staff through professional registration.

Undergraduate students from across the UK spend the summer or a full year in a team at the Crick, working alongside our scientists as part of their degree.

This year, students from 13 different universities have spent time at the Crick.

The Crick's undergraduate students.

Work experience students at the Crick.

In October 2018, the Crick launched KQ Labs, a start-up accelerator for companies working at the interface of biomedical and data science. The ten successful start-ups received capital from an Innovate UK grant and took part in a 16-week programme, providing access to mentoring, venture capital and other resources.

1,730

people have participated in local health and wellbeing projects funded by the Crick's Community Chest scheme, our programme which awards grants to community projects taking place within a mile of the Crick.

In April 2019, we signed a collaborative memorandum of understanding with the European Molecular Biology Laboratory to strengthen pan-European scientific cooperation and advance life science for the benefit of European society. The partnership will allow us to both support our existing European collaborations and encourage new ones.

We campaigned for a positive outcome for science after Brexit and spelled out the risks of no-deal. This follows a survey of Crick staff that showed that 97% of our scientists believe a hard Brexit would be bad for UK science and 70% of staff are unsure about the future of their collaborations with EU colleagues.

Scientists in our Neurophysiology of Behaviour Laboratory have developed an AI-powered map of research literature to help scientists navigate the ever-increasing number of scientific papers. With the help of a grant from the Crick's translation team and KQ Labs, the Crick's start-up accelerator, they were able to work with a specialist data scientist to create a unique machine learning system that 'reads' papers and extracts the experimental methods and results. The program can then compare similar studies, as well as show gaps in previous research where more work could be done.

11,370

people have used the St Pancras and Somers Town Living Centre, a local health and wellbeing centre supported by the Crick and run by a group of Camden-based community organisations.

90%

of people who participated in the Living Centre's volunteer and mentoring programme have gone on to secure employment as a result.

Former Prime Minister Theresa May and Indian Prime Minister Narendra Modi chose the Crick as the site to launch the UK India Tech Alliance, a project to identify and pair businesses, universities and others to provide routes to markets for British and Indian entrepreneurs.

Fifteen Crick PhD students organised and hosted the International PhD Student Cancer Conference, an entirely student-led meeting. It brought together more than 100 PhD students from leading cancer research institutes across Germany, Italy, the Netherlands and the UK to share their scientific work and build vital international connections at the very beginning of their research careers.

SUPPORT US

The Crick is a registered charity that partners with Cancer Research UK to fundraise effectively. We rely on grants and donations from our generous funders and donors to maintain and sustain our work.

To learn more about how you can support our vision to translate discoveries into new ways to prevent, diagnose and treat diseases please visit **www.crick.ac.uk/support-us**

Want to work with us?

To find out more about the Francis Crick Institute and how we work in partnership, visit our website at **www.crick.ac.uk** or contact us:

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