Lincoln University Global Science Medal

Professor Julian Charles Rayner BSc (Hons) *Lincoln*, PhD *Cambridge*

The worldwide impact of Professor Julian Rayner's career focus - malaria - is huge, conspicuous and visible, an irony given the disease's cause by minuscule, submicroscopic parasites less than a thousandth of a millimetre long that invade our red blood cells and reach us delivered by mosquitoes.

Professor Rayner's application of the latest molecular tools to explore how these parasites recognise and colonise human red blood cells has significantly deepened biological understanding of the disease process and led to the identification of new vaccine and drug targets.

His discoveries, plus the reputational credit he has brought to Lincoln University as an alumnus and science graduate of distinction, qualify him undeniably for the Global Science Medal.

Dr Julian Rayner is Professor of Cell Biology at the University of Cambridge, Director of the Cambridge Institute for Medical Research, a Fellow of the UK Academy of Medical Sciences and a Member of the European Molecular Biology Organisation.

His career, which has led him from New Zealand to the United Kingdom and United States, with partner collaborations in multiple malaria-endemic countries, well illustrates the influential bio-medical pathway that a Lincoln University science degree can initiate.

The bio-medical tradition at Lincoln University, for which there are many examples of important work, includes pioneering advances in animal transgenics by Professor David Bullock, who was Head of the Department of Biochemistry and Microbiology and supervised Julian's BSc Honours project. The inspiration and mentorship provided by Professor Bullock and the environment at Lincoln had an impact on his career direction that he readily and gratefully acknowledges.

Julian graduated from Lincoln University in 1993 with a Bachelor of Science degree with First Class Honours in Biochemistry and Biotechnology, and was Senior Scholar in his year.

After a PhD at the Medical Research Council (MRC) Laboratory of Molecular Biology in Cambridge, Julian became interested in malaria parasites and moved to the Centres for Disease Control and Prevention (CDC) in Atlanta, USA, on a postdoctoral fellowship.

He was led to malaria by its enormous worldwide impact (over 250 million cases each year and 600,000 deaths, primarily children under five in Africa), and the complex biology that takes place between humans, parasites and mosquitoes.

At CDC Julian identified a new protein family that the deadliest malaria parasite, Plasmodium falciparum, uses to recognise and invade human red blood cells. While these parasites have complex life cycles, all the symptoms and pathology of malaria are caused while the parasites colonise the red blood cells. Blocking the parasite's ability to invade these cells could therefore have a huge impact on disease reduction and mortality.

Following his postdoctoral fellowship, Julian started his own research group as an Assistant Professor at the University of Alabama at Birmingham, before returning to the UK to work as a Group Leader at the Wellcome Sanger Institute in 2008.

While at the Sanger Institute, Julian made multiple novel discoveries.

In one line of research, Professor Rayner and his team worked with others to establish that a particular protein used by the parasite to recognise red blood cells seemed to be essential for this process to occur. This protein is now a high priority for vaccine development, with the first large-scale human trials last year showing encouraging results.

In another line of research, the team led by Professor Rayner took on the huge challenge of understanding the genetic makeup of the Plasmodium parasite to identify any potential vulnerabilities which could be exploited in treatment regimes.

Plasmodium parasites are only distantly related to other organisms, so prior to this work most of their more than 5000 genes had no known function. Working closely with colleagues at Sanger and in the USA, Julian's team co-led the first ever genome-scale genetic screens in Plasmodium parasites, delivering large-scale data that is now used routinely by researchers around the world to understand parasite biology and identify new drug and vaccine targets.

In 2019, Julian moved to the University of Cambridge and directorship of the Cambridge Institute for Medical Research. He continues his pioneering research, recently establishing the molecular explanation for why some naturally occurring genetic variants protect individuals against malaria. This study involved close collaboration with scientists in Kenya.

Malaria is an infection with enormous economic, social and cultural impact. Ultimately eliminating or ameliorating its presence will benefit societies and communities across the board, and Professor Rayner's research has informed global efforts towards this end in multiple ways.

Professor Rayner also has a strong interest in learning and public engagement and regularly gives talks to schools, community groups and other audiences about both malaria and science broadly, and its impact on research, health and society.

Professor Rayner's connections with New Zealand are well-known in the international circles in which he works. As a Lincoln University alumnus, his scientific accomplishments and on-going work reflect very favourably on Lincoln University's reputation.

Professor Julian Rayner is a distinguished Lincoln alumnus and the university is delighted to award him its Global Science Medal for 2025.

Professor Grant Edwards
Vice-Chancellor

Bruce Gemmell
Chancellor

Lincoln University Global Science Medal

Emeritus Professor of Molecular Pathology David Norris Palmer

Bio-medical research at Lincoln University has long been an internationally respected extension of the land-based institution's traditional work in animal science.

In no field is Lincoln University's current bio-medical research better illustrated or more acclaimed than in the Batten disease work and leadership of the 2025 Global Science Medal laureate, Professor David Palmer.

Two features of Professor Palmer's 30-year academic career at Lincoln University qualify him eminently for the award of the Global Science Medal.

First, the world-class nature of his research in the field of bio-medical pathology, and second, the wide international network of esteemed scientific institutions and organisations with which he has collaborated, sharing with them the work being done by his team in New Zealand, and thereby enhancing Lincoln University's global reputation for excellence.

The focus of Professor Palmer's research career has been the rare but devastating and fatal hereditary neurological disorder Batten disease, which affects infants and adolescents. The brains of such children degenerate, there is no cure, and typically sufferers live at best only until their early teens.

Forms of Batten disease also occur in animals and Lincoln University has provided an ideal environment in which to develop and study sheep in which Batten disease follows from naturally occurring genetic mutations. After Professor Palmer arrived at Lincoln from Massey University in the 1980s with some sheep affected with one form, he and his team found sheep with another form. They founded flocks of each and used both of them to understand mechanisms involved in these disorders.

Today, after decades of painstaking and meticulous scientific investigation by Batten disease researchers worldwide, prominent among them Lincoln University's Professor David Palmer, explanatory pieces of the disorder's pathology have been put together and there is hope now that through gene therapy the inexorable progress of the disease may be slowed or halted.

Contributing in a uniquely Lincoln way to the global effort has been the sheep work by the university's Professor Palmer and his team members, prominent among them Dr Nadia Mitchell and Dr Samantha Murray.

This Lincoln work has led to several 'breakthroughs'. Importantly, Professor Palmer and his colleagues have demonstrated that brain and eye-directed, virally mediated, gene therapy has halted neurodegeneration and vision loss in sheep with a particular strain of Batten disease, CLN5 neuronal ceroid lipofuscinosis. Their gene therapy product was approved by the US Federal Drug Agency (FDA) for clinical trials which began in 2022.

The FDA approval was described by Professor Palmer's colleague Dr Mitchell as a 'huge milestone in providing hope for children and families impacted by CLN5 Batten disease'.

This US support is not the first for Professor Palmer's Batten disease research. Early in his career his team won major US Institutes of Health funding for their work, a significant coup for Lincoln as 'foreign' NIH grants are very rare and the money was substantial.

Notable aspects of Professor Palmer's career at Lincoln in relation to his Batten disease work include his support for the formation of the Batten Animal Research Network, bringing together scientists from Lincoln, Otago, Sydney and Cambridge universities and King's College, London.

In 2007, Professor Palmer's association with Nobel Chemistry Prize winner Sir John Walker, Director of the British Medical Research Council's Dunn Human Nutrition Unit, Cambridge, led to a visit by Sir John to Lincoln University and a public lecture on the campus. This was the first, and to date only, visit to Lincoln University by a Nobel Prize winner.

The connection with Sir John Walker is important. In the course of his Batten disease research, Professor Palmer discovered the abnormal storage capacity of a subunit, subunit c, in adenosine triphosphate (ATP) synthase, a nano-sized molecular machine involved in maintaining life in organisms. Professor Palmer's discovery was quickly recognised as important by Professor Walker when others were dubious. Working together with colleagues, Professor Palmer and Sir John extended the discovery to the major human and animal forms of Batten disease, and fully characterised this difficult-to-work-with protein.

At Lincoln University, Sir John praised Professor Palmer's 'asymmetrical thinking at a time when others favoured simpler ideas'.

An important part of the Batten disease work by Professor Palmer and his team has been the establishment and maintenance of a close liaison network among researchers, parents, patients and caregivers. This has led to combined conferences of all four communities, with three of the gatherings having been held at Lincoln University.

While this citation and the award of the Global Science Medal are focussed on Professor Palmer's Batten disease work, it must not be overlooked that the recipient has been a long-serving working academic in the university's Faculty of Agriculture and Life Sciences, with all that means in terms of teaching loads, postgraduate supervision, leadership expectations, professorial-level administration and other duties. His career has included the following memberships and roles within professional and learned bodies associated with his discipline area.

Membership of the New Zealand Society of Biochemistry and Molecular Biology and NZSBMB delegate to Federation of Asian Oceanic Biochemistry and Molecular Biology Societies (FAOBMB); membership of the Batten Disease Support and Research Association (BDSRA); Trustee and Life Member Lysosomal Diseases New Zealand; Editorial Advisor to the Biochemical Journal and Member, Biochemical Society, UK; Sir William Dunn Medical Research Council (MRC) Scholar, Mitochondrial Biology Unit, Cambridge; Member, New Zealand Neurological Foundation and founding Member, New Zealand Organisation for Rare Diseases; Life Member, Health Research Society of Canterbury.

Professor Palmer's teaching has included areas of mitochondrial and lysosomal function, assembly, enzymology and bioenergetics. He has supervised honours and postgraduate students in aspects of Batten disease and is the author or co-author of over 100 refereed publications.

In pursuit of his Batten disease studies Professor Palmer has spent significant sabbatical time as a visiting scholar, research fellow and scientist at the New York State Institute For Basic Research, Staten Island, NY; McGill University, Montreal; the University of California at San Francisco and Los Angeles; the Institute of Child Health, London; the MRC Laboratory of Molecular Biology and the Mitochondrial Biology Unit, Cambridge; Tufts University, Boston; the University of Helsinki and the Institute of Psychiatry, Kings College, London.

All in all, it is a science career truly global in character.

Lincoln University is proud to award its Global Science Medal to Professor David Norris Palmer, acknowledging his distinguished contributions advancing international understanding of Batten disease and possible therapies.

Professor Grant Edwards
Vice-Chancellor

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