



Career pathway tracker

35 years of supporting early career research fellows

THE
ROYAL
SOCIETY

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President's foreword



Above
Venki Ramakrishnan,
President of the
Royal Society.

The Royal Society exists to encourage the development and use of science for the benefit of humanity. One of the main ways we do that is by investing in outstanding scientists, people who are pushing the boundaries of our understanding of ourselves and the world around us and applying that understanding to improve lives.

Thirty-five years ago, the Royal Society introduced our University Research Fellowships to support early-career researchers. We have also been supporting early postdoctoral researchers who need to work flexibly with our Dorothy Hodgkin Fellowships for 23 years. Our goal with both schemes has been to identify the most promising early-career researchers and give them freedom to pursue new and more innovative lines of research. This support, at a challenging career stage, has helped them to build independent research careers.

To mark the 35-year milestone we decided to ask those who have been supported by the schemes what difference it made to them. In scientific terms, we do not have a control group and the views of the respondents are just that – their own perceptions of how they have benefited from the schemes.

The vast majority of alumni who responded to the survey – 95% of University Research Fellowship and 88% of Dorothy Hodgkin Fellowship recipients – were still working within academia.

Among those we have supported are a Nobel Prize laureate and a Fields medallist, and just under 70% of University Research Fellows and over 40% of Dorothy Hodgkin Fellows in academia have become Professors. They include hugely successful entrepreneurs, researchers whose work has shaped domestic and international policy and scientists who inspire the public to engage with the wonder of science.

Very strong themes emerge from the survey about why alumni felt they benefited. The freedom they had to pursue the research they wanted to do because of the independence the schemes afford is foremost in the minds of respondents. The stability of funding and flexibility are also highly valued.

The Royal Society has long believed in the importance of identifying and nurturing the most talented individuals. The results of our survey would suggest we have a pretty good track record in doing that. Not only do the individuals believe they have benefited but the value to the UK's research endeavour and to our wider society, at home and abroad, is evident.

There is always room for improvement but the track record over the first 35 years is a remarkable achievement.

About this report

This report is based on the first Career Pathway Tracker of the alumni of University Research Fellowships and Dorothy Hodgkin Fellowships. This study was commissioned by the Royal Society in 2017 and delivered by the Careers Research & Advisory Centre (CRAC), supported by the Institute for Employment Studies (IES).

Data was collected through an alumni survey carried out in late 2017 and early 2018. The findings from the survey underpin this report, including quantitative data as well as qualitative data and quotes.

The full data report by CRAC, as well as an electronic version of this report, are available for download from the Grants pages of the Royal Society website: royalsociety.org/career-tracker.

The Royal Society intends to continue periodically tracking the career pathways of its research fellowship alumni.

Introduction

This report focuses on the professional, personal and societal impact of two major fellowships granted by the Royal Society to offer long-term support to outstanding, early-career researchers.

While there are many junior level scientists, making the jump from a postdoctoral researcher to a senior position such as a research group leader, can be difficult. This has become more and more of an issue as the number of doctoral students and postdoctoral scientists in academic research has greatly increased in the last 15 years in the UK and globally, while the number of permanent, senior roles has not.

The fellowships aim to help talented individuals bridge this difficult career step. The first is the University Research Fellowship, launched in 1983, which celebrates its 35th anniversary this year. Originally, it provided up to ten years of funding. From 2008 to 2013, funding was for eight years with the possibility of exceptional cases being extended to ten years. From 2013, eight years became the maximum. The second is the Dorothy Hodgkin Fellowship, launched in 1995, specifically aimed at supporting talented scientists needing flexibility in their careers, perhaps to care part-time for young families or elderly

relatives, or because of personal health reasons. This originally offered four years, going up to five years from 2012.

Together, these two fellowships have supported over 1,600 individuals in their careers, with about 1,400 individuals receiving the University Research Fellowship to date, and over 200 individuals receiving the Dorothy Hodgkin Fellowship. In recent years, around 50 – 60 new fellowships have been awarded annually. At present, 370 individuals are being supported by the two schemes.

This report, based on the first survey – in what will become a longitudinal study – of researchers who received the fellowships, will demonstrate how – for many scientists – the awards were pivotal, even life-changing, in terms of the opportunities, prestige and support they gave. Additionally, the vast majority of recipients have gone on to make significant contributions to the research community, government and policy, and societal, commercial and public life.

Detailed answers from past fellowship-holders reveal a range of career paths and achievements with a very strong focus on research leaders in academia. For example, among the alumni are a Nobel Prize laureate, a Fields medallist, 58 Fellows of the Royal Society, several best-selling scientist-turned-science-writers, a winner of the US\$1 million Eternity mathematics puzzle, a scientist whose disease programme contributed to the eradication of malaria from a country, a TV presenter of popular science shows and the founder of a spin-off company that was sold for US\$600 million.

While the fellowships appear to have bolstered early-career researchers in a practical sense – with the funding enabling them to focus on their research and innovate – they also seem to have provided a significant psychological boost in terms of confidence, prestige and the enhanced opinions of others, which seems to have had a positive knock-on effect even where researchers did not remain in academia.

“It was simply the most important career-defining moment of my professional life.”

University Research Fellowship recipient.

“The Dorothy Hodgkin Fellowship was absolutely critical in my career. I believe that I would not be a scientist now without it. The ability to work part-time during when my son was an infant was simply fantastic. I treasure that time in my career. It was instrumental in my success”

Dorothy Hodgkin Fellowship recipient.

Scientific achievements

96%

of University Research Fellows have published their first significant paper by the end of their fellowship.

The Royal Society's mission is to encourage and develop the use of science for the benefit of humanity.

One of the ways we do that is by attracting and retaining talented researchers to UK science. Our funding provides them with the freedom to follow their best research ideas. The study results suggest that the two fellowships support excellent researchers and boost recipients in this fundamental aim.

The vast majority of alumni who responded to the survey – 95% of University Research Fellowship and 88% of Dorothy Hodgkin Fellowship recipients – were still working within academia. The results suggest that early-career scientists supported by the schemes were able to reach what are considered markers of academic career success and research achievement.

80%

of University Research Fellows had secured their first significant research grant as a principal investigator by the end of their fellowship.

There are a variety of ways in which scientific achievement can be measured. For example, with discoveries which have changed the face of a particular field, or key research papers which have been cited by hundreds of other researchers, feeding into their work.

Alumni are likely to publish their first research paper as a principal investigator – a mark of scientific kudos – during their fellowship. They are also likely to gain their first significant research grant as a principal investigator during or soon after their fellowship

Achievement can also be recognised in public and prestigious ways, with the winning of national and international awards, by many of the fellowship alumni. These include: a Nobel Prize; the Fields Medal (often called the Nobel Prize of Mathematics), the Sackler Prize in the Physical Sciences, and the MacArthur Award.

The proportion of University Research Fellowship alumni publishing their first paper as principal investigator peaked around seven years before the end of their fellowship, with 96% having achieved this by the end. For Dorothy Hodgkin Fellowship alumni, who tend to be earlier in their career when appointed and are often part-time, the peak was about three years before the end of the scheme, with 72% having published this key paper by the time they completed the fellowship.

The other significant research milestone – securing a first significant research grant as a principal investigator or research leader – varied broadly in terms of timing between alumni in the survey. Overall, 80% of University Research Fellowship alumni reported that they had secured their first significant research grant as a principal investigator by the end of their fellowship.

“The University Research Fellowship I had gave some very useful freedom to try out a couple of new areas of research. This was invaluable as it really allowed me to reduce my perceived risk of doing something adventurous – and this worked out for me extremely well... [with the] invention of the ionothermal method of materials synthesis. This paper (published in Nature in 2004) led to a whole new field in materials synthesis that really cemented my international reputation. The technique is used by many researchers around the world. This was published while I was a University Research Fellow.”

Professor Russell Morris FRS, Professor of Chemistry at St Andrew's University, University Research Fellow (1998 – 2006).

1.7 million

The average viewing figures for *How to Grow a Planet*, a three-part BBC2 series based on Professor David Beerling's popular science book *The Emerald Planet*.

Professor Beerling, FRS (University Research Fellow, 1994 – 2002) is Director of the Leverhulme Centre for Climate Change Mitigation, as well as a leader in the relatively new field of land-based carbon dioxide removal with croplands and rocks.

OF MONSTERS AND MOONSHINE

A mathematical conjecture that tied together two unlikely mathematical structures was key to establishing Professor Richard Borcherds FRS (University Research Fellow, 1988 – 1992) as one of the world's top mathematical minds.

In 1998 he was awarded the Fields Medal (often called the Nobel Prize of Mathematics) for his work in algebra and geometry, especially for his proof of the so-called 'Monstrous Moonshine' conjecture.

Formulated in 1979 by John Conway and Simon Norton, the conjecture was given this name because it married together such vastly different mathematical entities. One partner in the conjecture is a gigantic structure known as the Monster Group; a purely mathematical object which captures a type of symmetry, and acts differently in different dimensions. The other is modular functions or 'j-functions', which are used to model structures in two dimensions.

Professor Borcherds, Professor of Mathematics at the University of California, Berkeley, produced a proof showing the two structures were linked, namely by harnessing string theory.

Professor Julia Gog is a mathematician who works on modelling the spread of pandemics. Her work has helped to understand how the 2009 flu pandemic spread across the globe and provides insights as to how we can tackle future outbreaks.

She told us the fellowship made a 'massive' difference to her career, with impact on her research on the mathematics of interacting multiple strains. "This was my main area before University Research Fellowship, and I was able to continue this as the longest active thread in my research career."

Professor Julia Gog, University of Cambridge, University Research Fellow (2004 – 2012).



CASE STUDY

Professor Sir Kostya (Konstantin) Novoselov FRS University Research Fellow (2006 – 2014)

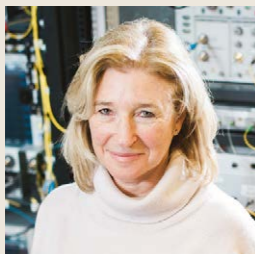
There are not many scientists who could say that their work has opened up an entire new field of research, but this is a feat to which Sir Kostya Novoselov FRS at the University of Manchester can lay claim.

Not only that, in 2010, while still a University Research Fellow, he shared the Nobel Prize in Physics with colleague Sir Andre Geim FRS, also at Manchester, 'for groundbreaking experiments regarding the two-dimensional material graphene'.

The pair isolated a one-atom-thick layer of ordinary carbon (such as that found in the graphite of pencil leads), and showed that it had extraordinary properties thanks to quantum effects. Called 'graphene', this new material is the thinnest, strongest conductor of heat known. Its properties have helped test the theoretical foundations of physics, and offer huge practical applications in electronics.

Sir Kostya Novoselov's research on graphene has led him to be named as one of the 'hottest researchers in the world' in terms of scientific citations. His work has been cited over 120,000 times, and his seminal 2004 Science paper on graphene is named as one of the top 100 papers cited in science ever, in all fields.

He is currently at the University of Manchester where he is a Royal Society Research Professor and director of the National Graphene Institute. Among numerous awards and honours, Sir Kostya Novoselov is also a Fellow of the Royal Society.



CASE STUDY

Professor Polina Bayvel CBE FREng FRS University Research Fellow (1993 – 2003)

Professor Polina Bayvel’s ‘revolutionary’ research since the 1990s on the high-speed transmission of data over optical fibres contributed to networks that underpin the internet, and digital communications infrastructure as a whole.

As a cornerstone of modern communications, optics network research has been pivotal in the massive societal and economic changes of the last 20 years.

Now Professor of Optical Communications and Networks and Head of the Optical Networks group at University College London, a group which she founded in 1994, Professor Bayvel has received numerous accolades for her influential research.

She has been awarded a CBE (Commander of the British Empire) for her ‘services to engineering’. She is also a Fellow of the Royal Academy of Engineering and a Fellow of the Royal Society.

She said of the University Research Fellowship scheme: “[It] has been invaluable in allowing me to establish research independence, a world-leading research group and experimental laboratory.”



CASE STUDY

Professor Claire Spottiswoode Dorothy Hodgkin Fellow (2008 – 2013)

In 2011, evolutionary biologist Professor Claire Spottiswoode and her colleagues solved a 100-year-old conundrum about brood parasite birds like cuckoos and African honeyguides.

These birds lay their eggs in the nests of other bird species, cheating them into doing the work of bringing up their babies. The parasites manage this by laying eggs that physically mimic the eggs of their host species, but how individual birds within the same parasitic species manage to inherit egg mimicry of different hosts was a much-theorised mystery.

Professor Spottiswoode and her team’s ‘groundbreaking’ field work confirmed that the African Greater Honeyguide has achieved this for millions of years through maternal inheritance of egg mimicry via the female (or W) chromosome in birds.

Based at both the University of Cambridge, and the University of Cape Town, Professor Spottiswoode has received recognition for her research, winning a 2017 Scientific Medal from the Zoological Society of London and a 2017

Bicentenary Medal from the Linnean Society of London for ‘excellent work done by a scientist under the age of 40 years’. In 2012, she was given a L’Oréal-UNESCO For Women in Science UK award, and has also received a European Research Council Consolidator Grant.

Professor Spottiswoode told the survey that the Dorothy Hodgkin Fellowship “has been absolutely crucial to my career”.

She explained: “It allowed me the freedom to properly establish my own independent research systems (in the field in Africa) ... and to focus almost completely on research for long enough to do things as well as I could: both to start new projects and to see them through to completion (and to think and to write...). This in turn made it relatively straightforward to be granted subsequent research funding and grow these projects further.”

Career achievements

“It was thanks to the fellowship that I managed to negotiate a permanent post in the University of Cambridge. Thanks to the time I could devote to research, I had many publications and grants, which subsequently helped me get promoted to full Professor faster.”

Professor Anna Korhonen, University Research Fellow (2005 – 2010), Professor of Computational Linguistics at the University of Cambridge and holder of a European Research Council Consolidator Grant. Her CRAB text mining system assesses the cancer risk of chemicals.

If career achievements can be measured by a person’s seniority of employment, their ability to gain a permanent, tenured position in academia where many posts are contract-only, the speed of their progression up the career ladder, the management of other staff and success outside academia, then the University Research Fellowship and Dorothy Hodgkin Fellowship schemes seem to go hand-in-hand with career success.

The study suggested that over two-thirds of University Research Fellowship alumni are currently either Professors or in a role more senior than a Professor (Heads or Directors of centres and institutions). Among the Dorothy Hodgkin Fellowship alumni, who tended to have a shorter fellowship and to be earlier in their career when appointed and are often part-time, over 40% of those working in academia were at Professor level or higher (see figure 1).

Nearly four-fifths of University Research Fellowship, and over half of Dorothy Hodgkin Fellowship alumni who stayed in academia had managed to secure a permanent post before they completed their fellowship, or in that same year.

The vast majority of alumni of both schemes successfully supervised a doctoral researcher during or soon after their fellowships.

There were also some notable gender differences with 73% of male University Research Fellows and 58% of female University Research Fellows having become Professors. It also appeared to take women longer to progress to senior roles, with women taking 5.8 years from completing their fellowship to become a Professor, and men taking 4.6 years.

Almost three-quarters of University Research Fellowship respondents to the survey were male, while 95% of Dorothy Hodgkin Fellowship respondents were female.

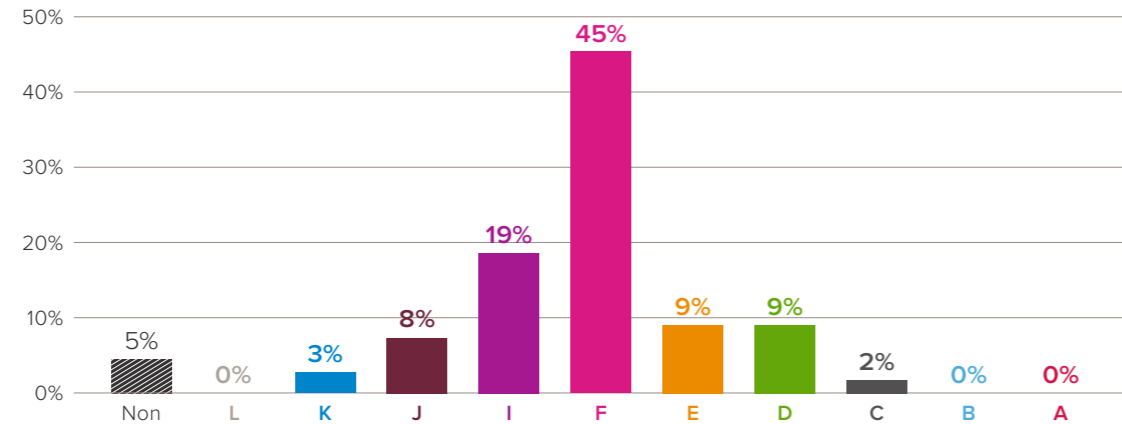
“I would not have stayed in academia without the fellowships. Moreover, with the help of the fellowships I have been able to focus on a specific research topic without having to switch every few months following a new focused call for funding...”

Professor Nicole Grobert, Professor of Nanomaterials at the University of Oxford, Dorothy Hodgkin Fellow (2003 – 2006) and University Research Fellow (2006 – 2014).

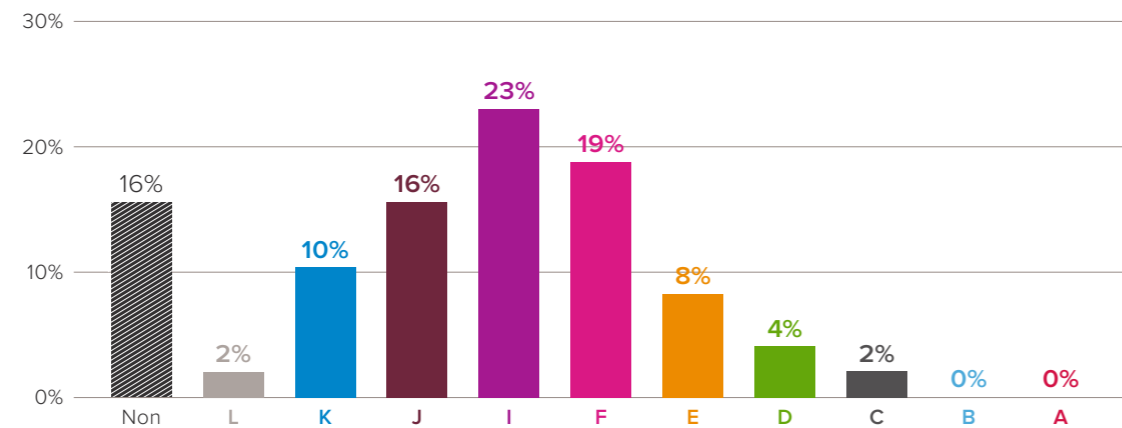
Professor Grobert is working on nanomaterials and their potential use in healthcare, energy and other industries. She has advised the British Government, is on the European Commission’s Group of Chief Scientific Advisors and is currently a Royal Society Industry Fellow.

Figure 1: Current level of employment

Current employment levels of 780 University Research Fellowship respondents



Current employment levels of 96 Dorothy Hodgkin Fellowship respondents



Level	Description	Example job title or descriptor
A	Head of institution	Vice-Chancellor
B	Highest level of manager reporting to Head of institution	Deputy/Pro Vice-Chancellor
C	Head/Director of major academic area; Director of function/s	Executive Dean; Dean, Head of College; Finance Director; Director of Research
D	Head of an academic centre	Head of Department; Associate Dean; Director
E	Head of small centre; senior function head	Director; Division Leader; Head of Human Resources
F	Professor; function head	Professor; Functional Manager
I	Senior academic lead	Associate Professor; Reader; Principal Lecturer; Principal Research Fellow
J	Senior academic staff	Assistant Professor; Senior Lecturer; Senior Research Fellow; Royal Society Research Fellow
K	Academic staff	Subject Lecturer; Postdoctoral Research Fellow; Research Fellow; Research Associate
L	Academic staff	Lecturer; Researcher; Postdoctoral Research Fellow/Associate/Assistant; Research Officer



CASE STUDY

Dr Maxine Gowen

University Research Fellow (1986 – 1992),
President and Chief Executive Officer of Trevena, Inc.

Dr Maxine Gowen spent 15 years at GlaxoSmithKline (GSK) in key leadership roles before founding her own biotech company, Trevena, Inc. She also held a tenured academic post in the School of Pharmacology at the University of Bath from 1989 – 1992.

While at GSK, Dr Gowen established a team of 40 scientists working on all aspects of bone and cartilage disease. She and her team researched more than a dozen novel molecular targets as potential approaches for the treatment of osteoporosis, rheumatoid arthritis and osteoarthritis, publishing more than 75 papers.

Her team at Trevena, Inc filed a new drug application with the US Food and Drug Administration for a novel drug for severe acute pain (which is currently being reviewed), and has two other drug programmes in the pipeline. Trevena, Inc has raised more than US\$350 million to finance this research.

She said of her fellowship: “It enabled me to get a start as an independent researcher, to focus my grant-writing efforts on building a research team, rather than having to fund my own research and salary or be dependent on another senior researcher for funding.”



CASE STUDY

Professor Andrew Cooper FRS

University Research Fellow (1999 – 2006), Professor of Materials Chemistry, University of Liverpool and Director of Materials Innovation Factory (MIF).

New materials – especially porous organic materials for energy applications, are the key focus of Professor Andrew Cooper’s group at the University of Liverpool.

His scientific work and publications have influenced the way other research teams design materials and have garnered hundreds of citations, but Professor Cooper’s career achievements extend beyond the purely scientific.

He joined the University of Liverpool in 1999 as a recipient of the University Research Fellowship, and is now Academic Director at the University’s MIF, which has around 100 industry researchers and 200 academic researchers. He said this is the single largest industry-university collaboration in chemistry in the UK.

As well as this, Professor Cooper added: “I combined the role of Head of Physical Sciences in Liverpool (Chemistry, Maths and

Physics, with over 120 academics and over 1,200 students) with growth of my research activity in the period 2007 – 2011. I still don’t know how I did this.”

Made a Fellow of the Royal Society in 2015, Professor Cooper has received numerous honours and awards including the Macro Group Young Researcher’s Award in 2002 and the Royal Society of Chemistry Corday Morgan Medal in 2009. He has also held a Royal Society Wolfson Research Merit Award, and was listed as one of the world’s ‘Top 100 material scientists’ of the past decade by Thomson Reuters in 2011, 2014 and 2017.

He said of the University Research Fellowship: “It allowed me to get started independently at a very early stage in my career.”

Leadership

90%

The proportion of survey respondents currently supervising at least one postgraduate researcher.

Career success often comes not only from academic talent, but also from strong scientific leadership skills. The ability to lead and successfully manage staff – both individuals and teams – is another key dimension that the study investigated.

The study has highlighted the fact that Heads and Deputy Heads of universities or academic societies and CEOs of private companies all feature among recipients of the two Royal Society fellowships.

For academic scientists, managing your own postgraduate research student through to the successful completion of their own PhD is a significant career milestone. The survey looked at when our alumni achieved this.

It found that the vast majority – 98% – of University Research Fellowship alumni working in academia had supervised a doctoral student through to gaining their PhD. For Dorothy Hodgkin Fellowship alumni in academia, 83% had achieved this milestone.

Another key facet of scientific leadership is the recruitment of a first team member, or a ‘direct report’ to line manage. Again, a greater proportion of University Research Fellowship alumni – over 80% – had done this by the year they completed their fellowships. It was also achieved by 56% of Dorothy Hodgkin Fellowship alumni. Many alumni identified the success of their students and postdocs as among their proudest achievements, including one whose student had gone on to become a Chancellor in one of the top universities in Shanghai.



CASE STUDY

Professor Dame Nancy Rothwell DBE FMedSci FRS University Research Fellow (1984 – 1992)

Professor Rothwell FRS became the first woman to lead the University of Manchester when she became its President and Vice-Chancellor in 2010. At that time she was the only female vice-chancellor of a Russell Group university. Under her leadership, the university has grown its income significantly.

After being awarded a University Research Fellowship in 1984, she relocated to Manchester in 1987. She became chair in physiology at the university in 1994 and held a Medical Research Council research chair there between 1998 and 2010. She is still active as a Professor of Physiology, and the research focus of her scientific group is on stroke, brain haemorrhage and injury.

Professor Rothwell has held numerous leadership roles in the past including having been founding President of the Royal Society of Biology, serving as President of the British Neuroscience Association, being a council member of the Medical Research Council, BBSRC and Cancer Research UK and serving as a non-executive director of AstraZeneca.

She is currently co-chair of the Prime Minister’s Council for Science and Technology, a Deputy Lieutenant for Greater Manchester, a member of the Northern Powerhouse Partnership Board, and a member of the Greater Manchester Local Enterprise Partnership, among other posts.

Professor Rothwell is a Fellow of the Royal Society.



CASE STUDY

Professor David Price University Research Fellow (1983 – 1988)

Now Vice-Provost of Research at University College London (UCL), Professor David Price joined the university in 1983 as a mineral physicist on a Royal Society University Research Fellowship. At the young age of just 33 he was appointed as a Professor by UCL.

His leadership role has developed alongside his scientific successes. He was pivotal in establishing the field of computational mineral physics, and has published over 250 research papers or chapters, which have garnered over 12,000 citations.

Professor Price's other leadership roles have included being President of the Mineralogical Society of Great Britain and Ireland from 2004 to 2006, and having been a Vice-President of the European Mineralogical Union.

He is a council member of the UK's Science & Technology Facilities Council, Chair of the Vice-Rectors for Research Committee of the League of European Research Universities, and is Chair of Panel B (Physical Sciences, Engineering and Mathematics) for REF 2021.

Professor Tanya Monro, University Research Fellow (2000 – 2005)



Professor Monro is currently Deputy Vice-Chancellor Research and Innovation at the University of South Australia in Adelaide.

Professor Monro has over 600 scientific publications to her name and has had a very significant impact in the field of optical fibre technology. She is also a Fellow of the Australian Academy of Science, the Australian Academy of Technology Science and Engineering and the Optical Society of America.

She is a member of the Prime Minister's Commonwealth Science Council (CSC); a board member of Australia's national science body, CSIRO (the Commonwealth Science and Industrial Research Organisation); the South Australian Defence Advisory Board; and the South Australian Economic Development Board.

Speaking about her fellowship she said, "I cannot overestimate the impact the Royal Society University Research Fellowship made to my career. As an early-career researcher it gave me the mark of prestige and credibility that was irreplaceable as a 27-year-old female in a male-dominated area. It gave me the confidence to pursue my research ambitions. Without it, I would never have been a full (tenured) Professor at age 31."

Professor David Collison, Professor of Inorganic Chemistry at University of Manchester (University Research Fellow 1984 – 1994) describes one of his proudest achievements as:

"Training of a large number of research students who have had success in many different fields, e.g. academia, publishing, teaching, law, computing, chemical industry, research institutions, engineering, analytical science."

Commercialisation

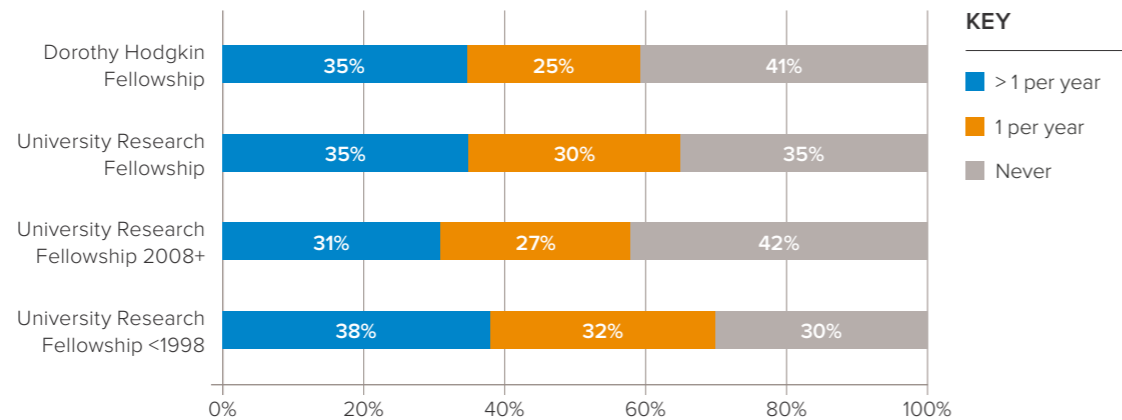
From revolutionary DNA sequencers, to flexible plastic electronics, ‘bendy’ displays and ‘sonic nets’ which stop birds colliding with aircraft, many of our fellowship alumni have commercialised their research with major economic and societal impacts.

A number of spin-off companies in a variety of fields have resulted from the work of alumni in this study; some with multi-million, even multi-billion net worths.

The majority of recipients of the fellowships also tell us they take part in some kind of ‘knowledge exchange’ or commercialisation on a regular basis. Just under two-thirds of alumni did this at least once a year, with those who had completed their fellowships over 20 years ago, doing this more frequently.

FIGURE 2: KNOWLEDGE EXCHANGE AND COMMERCIALISATION

% of respondents who work in academia engaging in knowledge exchange or commercialisation.



While the vast majority of scientists responding to the survey – 95% of University Research Fellows and 88% of Dorothy Hodgkin Fellows – currently work in academia, there was also some evidence that the fellowships had a positive impact on the careers of those who left academia – in some cases to launch their own companies.

FLUID MECHANICS TO FINANCE

It may not seem like an intuitive step but Dr Paul Wilmott went from a University Research Fellowship in fluid mechanics to setting up several businesses, all based around mathematical finance, including an education programme in quantitative finance and a magazine publishing original research. A mathematician by training, he is also an author of mathematical textbooks and a financial consultant for many organisations.

As well as applying mathematics to finance, he has also done a variety of media work, including working as an undercover reporter for the investigative TV documentary series Dispatches examining corruption in political parties. Dr Wilmott is a trustee of the charity Maths on Toast, which promotes mathematics for families and the community.

Dr Annabel Cartwright, Dorothy Hodgkin Fellow (2007 – 2011)



Dr Cartwright is Director of Undergraduate Studies, School of Physics and Astronomy, University of Cardiff

The Society is also keen to ensure that career pathways are not too rigid and to promote research careers that move between business and academia. Dr Cartwright founded a company called Oxford Metrics before she was awarded her Dorothy Hodgkin Fellowship.

She said: “In my early career I co-founded a company called Oxford Metrics which is now publicly quoted. We were the first in the world to manufacture 3D motion capture equipment, a technology now ubiquitous in movies, computer games and medical research. It is fantastic to see technology I worked on in its infancy now used all over the world, and contributing to a very healthy manufacturing sector in the UK.”

“It gave me an important and significant ‘kick-start’ in my research career,” said one male scientist awarded a University Research Fellowship in 2002. “Longer term, as I moved from academia into the pharmaceutical industry, it earned respect. Now I have left research and am establishing my own company, I can see that the early boost to my confidence the fellowship gave me was also valuable.”

Comments from alumni working in industry suggest that their experiences of being a fellow helped them establish themselves as independent researchers as well as giving them the confidence to succeed in commercial ventures.



CASE STUDY

Professor Sir Shankar Balasubramanian FMedSci FRS University Research Fellow (1993 – 1998)

When Sir Shankar Balasubramanian FRS and his colleague Professor David Klenerman FRS at the University of Cambridge launched their spin-off company Solexa in 1998, they had to convince their investors that there would be a market for their products.

It turned out that their fast, accurate and affordable DNA sequencing tools were ‘game-changing’ for private companies, research and society at large.

Solexa was acquired by US company Illumina Inc in 2007 for US\$600 million. And Illumina’s latest valuation, in June 2018, puts the company’s total market share value at nearly US\$40 billion.

When the pair set out on their venture, the idea of sequencing an entire genome quickly and cheaply was unimaginable. However, with the Human Genome Project to map out human DNA in full swing in the late 1990s, the pair realised their fundamental science research into DNA could have a valuable application.

At Solexa they developed a commercial DNA sequencer. And once they were with Illumina, they developed a ‘parallel sequencing’ method to analyse fragments of DNA simultaneously, thus massively slashing the costs and time needed for sequencing.

Today, Sir Shankar Balasubramanian and Professor Klenerman’s next generation DNA sequencing technology is used the world over, and has been transformative for biology and medicine.

Sir Shankar Balasubramanian was knighted in 2017 for ‘services to science and medicine’, and is a Fellow of the Royal Society. He still runs a research group which studies the fundamental science of DNA and RNA at the University of Cambridge.



CASE STUDY

Professor Henning Sirringhaus FRS University Research Fellow (1998 – 2000)

Research into the fundamentals of organic semiconductor transistors lead Professor Henning Sirringhaus at the University of Cambridge to co-found his company, Plastic Logic Ltd, in 2000 to develop ‘plastic electronics’.

He and his team had developed a way to ‘print’ transistors which led to them commercialising the process to develop lightweight, flexible electronic displays. Unlike other types of screens, these are not based on glass, but rather paper-thin bendy plastic sheets, with which Professor Sirringhaus hopes to transform the way people consume information.

Products by Plastic Logic Ltd include smartphone accessories, eReaders and ‘smart’ jewellery which allows wearers to change the displayed design on, for example, a bracelet, to match their mood and outfit. Plastic electronics is expected to become a multi-billion pound global industry in the next few years.

Professor Henning Sirringhaus noted in his response to our study that a key research paper he published in the journal Science in 2000, cited more than 2,000 times by other scientific publications, was pivotal in launching his spin-off company.

He says of his Royal Society fellowship: “The University Research Fellowship provided me with the opportunity to build up an independent research programme for which I became internationally recognised.”

Professor Sirringhaus is a Fellow of the Royal Society.

Public engagement

Public engagement is a vital part of the Royal Society’s objective to demonstrate the importance of science to everyone. It is an activity in which many of the fellowship recipients have actively participated.

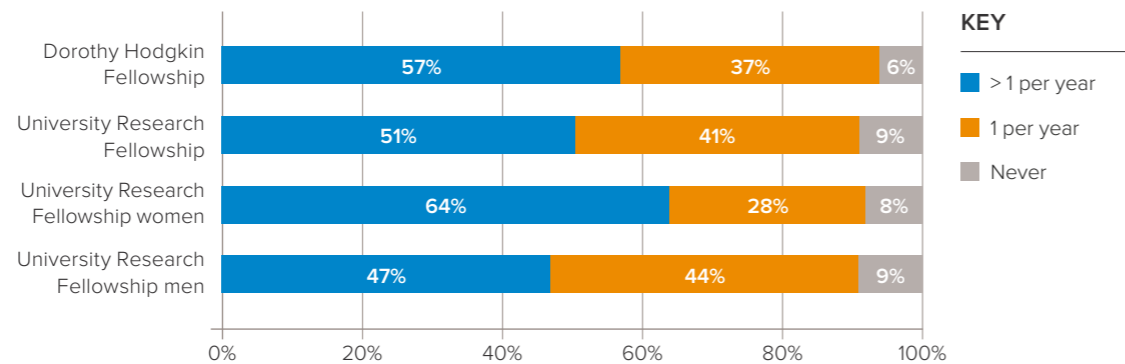
Their activities are diverse and broad in scope, from engaging in outreach with schools, giving public lectures or participating in public debates, writing both textbooks and popular science books, and presenting television programmes, to advising on a West End play.

The vast majority – almost 90% – of all recipients in the survey said they did some kind of public engagement activity at least once a year, if not more.

The most active group were the Dorothy Hodgkin Fellowship alumni and women scientists who had received the University Research Fellowship – almost two-thirds of them did some kind of public engagement work more than once a year.

FIGURE 3: PUBLIC ENGAGEMENT

% of respondents who work in academia involved in public engagement.



The levels of public engagement activity were similar for the least and most experienced recipients of the fellowships.

The alumni of the schemes include some notable public science communicators including physicist and presenter Brian Cox (see box), mathematician, author and presenter Marcus du Sautoy, author Sarah-Jayne Blakemore (see box), broadcaster Lucie Green and author Beth Shapiro.

The alumni have also gained prestigious honours for their public engagement work. For example, chemist Colin Pulham (University Research Fellowship alumnus), who is the current chair of the Science and Technology Facilities Council’s advisory panel for public engagement, was awarded the Royal Society’s Kohn Award and the Tam Dalyell Prize for science communication, among other accolades. Professor Lucie Green has been awarded the Royal Society’s Kohn Award for Excellence in Engaging the Public with Science and became the first ever female presenter of BBC’s *The Sky at Night*.

University Research Fellowship alumni Brian Cox and Marcus du Sautoy both received OBEs for their ‘services to science’ and are both past recipients of the Society’s Faraday Award for public engagement.

SCIENCE IN THEATRELAND

Biophysicist Professor Brian Sutton, King’s College London (University Research Fellow 1983 – 1987), found himself as an adviser to *Photograph 51* – a play starring Nicole Kidman as DNA pioneer Rosalind Franklin in 2015. The play ran in the West End and garnered critical acclaim, scooping a best actress theatre award for Kidman.

Professor Sutton, who won the King’s Award for Most Significant Contribution to Public Engagement in 2015, said: ‘Several public engagement events were associated with this advisory role and the subject of the play.’

“My first popular science book, *How to Clone a Mammoth*, was well received around the world, winning several prizes including the AAAS [American Association for the Advancement of Science] award for best popular science book of 2016, and the Prose Award.”

Beth Shapiro, University Research Fellow (2006 – 2007), evolutionary molecular biologist at the University of California, Santa Cruz. Her next book, *Wild(dish) Life*, will be published by Basic Books in 2019.



CASE STUDY

Professor Brian Cox OBE FRS University Research Fellow (2005 – 2012)

Professor Brian Cox FRS, a University Research Fellowship alumnus and the Royal Society’s Professor of Public Engagement in Science has presented a number of successful BBC science programmes, including the *Wonders of...* series, and *Stargazing Live* which he co-hosts with comedian Dara Ó Briain.

Professor Cox is also a prolific author, and has sold over one million popular science books worldwide. His sell-out 9,000-seat show held at Wembley Arena in London in 2017 holds the Guinness World Record for the largest science show ever performed.

Now Professor of Particle Physics at the University of Manchester, he teaches quantum physics and relativity and continues to pursue his research at the Large Hadron Collider at CERN.

Speaking about his fellowship he said: “The University Research Fellowship gave me freedom – freedom to research, to think, and also to spend time doing less-conventional but I think equally important things; writing books, making television and radio programs, and engaging with politicians and the public to advance the cause of science in the UK. The aim of the scheme is to produce the next generation of scientific leaders – perhaps also cultural and political leaders – and the breadth and scope of career a University Research Fellow is able to craft because of the freedom the award confers is crucial to that aim. It is a uniquely valuable award.”



CASE STUDY

Professor Sarah-Jayne Blakemore FBA Dorothy Hodgkin Fellow (2004 – 2007) and University Research Fellow (2007 – 2016)

Professor Sarah-Jayne Blakemore’s work on teenage brains has brought her into the public’s consciousness in a variety of ways. A Professor of Cognitive Neuroscience at University College London (UCL), Blakemore has received a number of awards for her academic work.

She is active in public engagement and often gives talks at schools, and public lectures. She acted as a scientific consultant on the BBC series *The Human Mind* in 2003 and co-wrote a book called *The Learning Brain: Lessons for Education* with Professor Uta Frith in 2005.

But it was Professor Blakemore’s 2012 TED talk on the adolescent brain that sparked a lot of public interest. She went on to work on a play called *Brainstorm*, written and performed by teenagers at the Islington Community Theatre, which then went on to run at the National Theatre in London.

Her latest book, *Inventing Ourselves: The Secret Life of the Teenage Brain*, has been shortlisted for the Royal Society Insight Investment Science Book Prize and has stimulated much public discussion on issues to do with the adolescent brain, such as risk-taking, sleep and mental illness. The book has gained widespread media attention, with excerpts running in the *Sunday Times Magazine*.

Professor Blakemore is also a member of the Royal Society’s Public Engagement Committee and has recently been elected a Fellow of the British Academy.

Policy contribution

Former University Research Fellows and Dorothy Hodgkin Fellows have also helped shape the way national governments make policy decisions in a variety of areas.

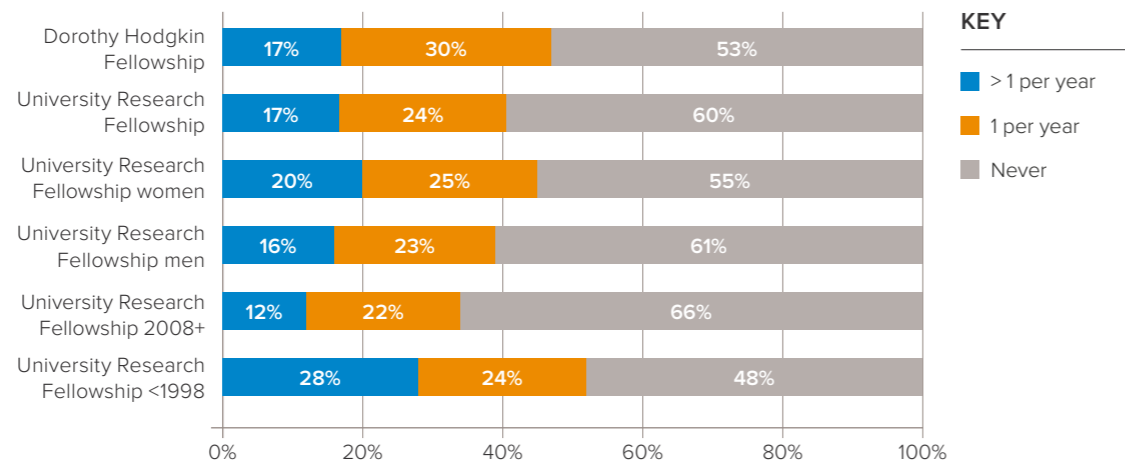
Pandemic planning, bioterror-related smallpox outbreaks, eradication programmes for diseases including malaria and rubella, the potential effects of climate change on marine ecosystems, research on traffic congestion and networks informing government policy on 'big data' and 'machine learning' and education and gender equality in science are just some of the areas in which scientists from

the schemes have had a major input, both nationally and sometimes internationally.

The most active group to take part in policymaking at a national level was, unsurprisingly, the most experienced group of University Research Fellowship alumni, of whom among half took part.

FIGURE 4: POLICYMAKING

% respondents who work in academia active in policymaking at national level.



Just over 40% of University Research Fellowship alumni told the survey they were involved in senior level policymaking at least once a year. A slightly higher proportion of Dorothy Hodgkin Fellowship alumni also did so.

The study revealed alumni who had advised national governments, including those of the UK, US and Australia, and other bodies with the power to make and change policy including the World Health Organization (WHO) and the Intergovernmental Panel on Climate Change (IPCC).

Professor Jason Hall-Spencer, University Research Fellow (2001 – 2008)



Professor Hall-Spencer is a Professor of Marine Biology at the Universities of Plymouth (UK) and Tsukuba (Japan),

Professor Jason Hall-Spencer’s research has informed policy and debate around the protection of marine life and the high seas. As well as impacting on policies to protect deep-sea coral reefs and other fragile habitats in the north-east Atlantic, his work has also informed high-level discussions on climate change.

“Informing UK and US governments, and the IPCC [Intergovernmental Panel on Climate Change] process to inform discussions around the Paris Agreement to help avoid dangerous climate change.”

Career milestone

Professor Hilary Ranson, Dorothy Hodgkin Fellow (2001 – 2004)

“Influencing WHO policy on the use of bednets that are more effective against insecticide-resistant mosquitoes. This was the culmination of approximately ten years of work, and included both the generation and evaluation of evidence. I presented in multiple WHO committees and this eventually resulted in a policy change. I have also been elected as a member of one of the key decision-making bodies for malaria policy as a result. I am proud of this as I believe it will have a major impact on malaria cases across much of Africa.”

Professor Hilary Ranson is based at the Liverpool School of Tropical Medicine, where she is Head of Department of Vector Biology.



CASE STUDY

Professor Neil Ferguson OBE FMedSci
University Research Fellow (1997 – 2005)

Pandemic influenza, Ebola and Zika, BSE/vCJD, foot and mouth disease, SARS and MERS – Professor Neil Ferguson has mathematically modelled some of the biggest disease threats to public, indeed global health, in recent decades.

A Professor of Mathematical Biology at Imperial College London, Professor Ferguson co-founded the MRC Centre for Outbreak Analysis and Modelling in 2008 in order ‘to consolidate and enhance our work on emerging infections and its translation to public health policymaking’.

As well as modelling how an emerging infectious disease might spread, he and his colleagues examine different scenarios and containment strategies. This work, in collaboration with major public health organisations such as the WHO, US Centers of Disease Control and Prevention and Public Health England, has fed into national and global public health policymaking.

Professor Ferguson’s research has been informing public health policy following the BSE outbreak in the UK and his work helped contain the foot and mouth outbreak in livestock in 2001, which had a devastating impact on rural UK economies – costing the public purse some £3 billion and the private sector over £5 billion. Professor Ferguson received an OBE in 2002 for his role in informing measures to control the outbreak.

He has also advised the UK government, the European Union and the US government on potential bioterror and smallpox events/ outbreaks.

Professor Ferguson is a Fellow of the UK Academy of Medical Sciences.



CASE STUDY

Professor Janet Hemingway CBE FMedSci FRS
University Research Fellow (1984 – 1993)

As an adviser to Sri Lanka’s malaria-control programme, entomologist Professor Janet Hemingway helped establish a resistance-management programme, which made a significant contribution to the country eliminating malaria.

With almost 40 years of research experience on tropical diseases and the control of their ‘vectors’ or carriers, she has had numerous roles advising policymakers in Africa and South America, as well as the WHO.

She has been director of the Liverpool School of Tropical Medicine since 2001, and has helped make it a world-leading research centre. The institute has 650 staff based in Liverpool, Malawi and other tropical centres.

Professor Hemingway’s major scientific contribution to policies combating the spread of tropical diseases was recognised in 2012 when she was awarded a CBE for ‘services to the control of tropical disease vectors’.

She is also a Fellow of the UK Academy of Medical Sciences, a Foreign Associate of the US National Academy of Sciences and a Fellow of the Royal Society.

Professor Hemingway said the University Research Fellowship scheme gave her the “freedom to set up an independent research programme with a relatively long stable timeline”.

How have the fellowships supported our alumni?

“[The fellowship] had an enormous impact in terms of prestige, flexibility, not having to teach unless I wanted to, generously funded without too much paperwork. All this made me feel valued and gave me true freedom and confidence to explore my research wherever it took me without worrying about the short term.”

Professor Shahn Majid, mathematician at Queen Mary University of London, on his University Research Fellowship (1993 – 2003).

The University Research Fellowship and Dorothy Hodgkin Fellowship appear to have guided early-career researchers to success, and in many cases have been career-transforming.

They have achieved this in a number of ways. One of the main benefits the study reported was that the schemes gave researchers the time and freedom to pursue innovative research – and to take the calculated risks needed for scientific discovery and creativity. Because of the fellowships’ long duration and flexibility of location, they offered this benefit while also reducing the worry over funding that plagues many scientists on short-term grants.

The fellowships also conferred important – but less tangible – benefits such as boosting confidence, giving prestige and allowing researchers the space to develop as independent leaders.

In the case of the Dorothy Hodgkin Fellowship scheme, which has flexibility built into it so that recipients can work part-time – perhaps to look after young children or elderly relatives or for health reasons – being awarded the fellowship sometimes stopped talented researchers leaving science altogether.

“The Royal Society’s warmly supportive yet unbureaucratic approach was just brilliant – I really appreciated the trust that the Royal Society places in its research fellows. I think this supportive yet light-touch approach is a really excellent and clearly productive strategy by the Royal Society... when I requested a shift to a part-time salary... the grants team were very helpful and understanding.

I really hope that the Royal Society will continue to invest in its fellowship schemes.”

Professor Claire Spottiswoode, Evolutionary Biologist at the University of Cambridge and the University of Cape Town on her Dorothy Hodgkin Fellowship (2008 – 2013).



“It allowed me to take risks that I couldn’t have done otherwise. Some of those risks failed. Others paid off spectacularly.”

Mathematician Professor Marcus du Sautoy FRS on his University Research Fellowship (1995 – 2005).



“It enabled me to take greater risks and therefore also to reap bigger returns in terms of innovative research, and has allowed me to focus on a bigger research theme than that which is feasible in a three-year research grant. Undoubtedly it has made my career by allowing me the intellectual freedom to pursue a more long-term research goal.”

Professor Nina Wedell, Professor of Evolutionary Biology and Director of Research, University of Exeter, on her University Research Fellowship (2000 – 2009).

Over 90%

The proportion of University Research Fellowship and Dorothy Hodgkin Fellowship respondents (in academia) that felt their fellowship had made a significant difference to their career path including facilitating faster career progression.

“I was one of the first generation of University Research Fellows and it enabled me to stay in the UK when otherwise I would have moved to the US where I held a faculty position. Otherwise my career would have been very different and not UK-based.”

Professor Dame Athene Donald FRS, Professor of Experimental Physics at the University of Cambridge, on her University Research Fellowship (1983 – 1985).

In some cases, both fellowships have stopped a ‘brain drain’ either away from science, or away from the UK.

Many alumni, especially Dorothy Hodgkin Fellowship recipients and women University Research Fellows, particularly valued the opportunity their fellowships gave to access the Royal Society’s training and social peer networks.

Even where alumni did not stay on in academia, the fellowships seemed to have brought about benefits in terms of self-development, confidence, prestige and leadership.

Overall, being awarded a University Research Fellowship or Dorothy Hodgkin Fellowship seemed to result in scientists making the leap to permanent positions; gaining professorships or senior roles early on; publishing research papers as principal investigator relatively quickly; managing graduate and postgraduate researchers successfully and engaging in other important spheres.

This includes high levels of engaging with the public on science, contributing to or informing government policy, engaging with commerce and exchanging knowledge with industry, and innovation – with some alumni founding spin-off companies.

SCIENCE AND PARENTHOOD

For many Dorothy Hodgkin Fellowship alumni, an additional benefit of being awarded the fellowship was that it enabled them to progress in their research career alongside parenthood.

“My Dorothy Hodgkin Fellowship enabled me to combine an academic career with starting a family – I had two periods of maternity leave during my fellowship and changed to part-time employment. Without this flexibility I would probably have left academia at this stage.”

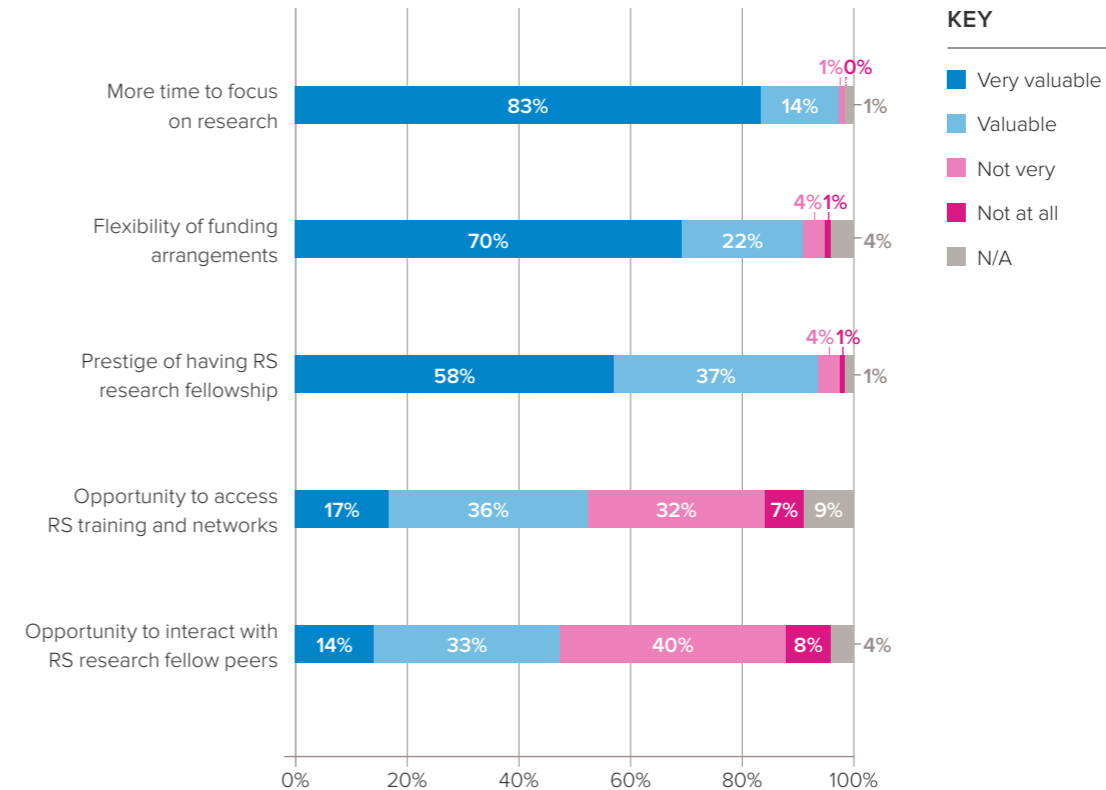
Dorothy Hodgkin Fellowship recipient (1999).

“[The] Royal Society fellowship was the most valuable and defining opportunity in my career. It is the best scheme of its kind I have ever seen in any country.”

University Research Fellowship recipient (2007).

FIGURE 5: MOST HIGHLY VALUED BENEFITS

Benefits of holding a Royal Society research fellowship most highly valued by respondents.



95%

The proportion of University Research Fellowship alumni who felt their fellowship was valuable in:

- offering freedom to pursue innovative research.
- boosting their self-confidence.
- giving flexibility of funding.
- conferring on them prestige.

70%

The proportion of Dorothy Hodgkin Fellowship alumni who had taken at least one break for maternity or paternity at some point in their career.

Who have we supported?

The Royal Society is committed to increasing diversity in science, technology, engineering and maths by seeking out participation from under-represented groups, in order to build and develop a world in which studying and working in science are open to all.

Over the 35 years of our University Research Fellowship scheme, the diversity of under-represented groups in science which have been awarded the University Research Fellowship has gone up slightly but not enough.

Overall, about three-quarters of University Research Fellowship respondents to the study were men, and about a quarter were women.

Before 2007, other Society sources suggest that about one-fifth of University Research Fellowships were awarded to women. The slightly higher proportions of women University Research Fellowship alumni before 1998 seen in the study may be an artefact of their higher response rate to the survey.

For the Dorothy Hodgkin Fellows, the gender balance was very different. In the early years of this scheme – which offers flexibility so that scientists can work part-time in their research careers – women were specifically encouraged to apply. Not unexpectedly, about 95% of Dorothy Hodgkin Fellowship alumni in the study were women.

Black, Asian, and minority ethnic (BAME) scientists were under-represented in the schemes. The proportion of those awarded a University Research Fellowship before 1998 who identified as BAME was less than 2%, rising slightly to 5% after this date.

Overall, just under 5% of UK survey respondents for both fellowships identified as BAME. While this reflects an under-representation of these communities in academia, it is low in comparison to the current make-up of the UK population (13% BAME), and to students in higher education (about 20% BAME).

Of the UK domiciled alumni who responded to the study, none were black.

Just over 3% of alumni responding to the survey said they currently had a disability, while 2% preferred not to say whether they did or not.

The survey has highlighted ongoing problems with diversity in the scientific workforce. This is something that is well recognised and the Society, along with many others in the science community, is committed to trying to address these issues.

SPACE AND TIME

It was while Professor Shahn Majid was a Royal Society University Research Fellow that he wrote a 640-page textbook called the *Foundations of Quantum Group Theory*, which opened up new horizons in the subject and, almost 25 years later, is still considered a standard text.

Now a Professor of Mathematics at Queen Mary, University of London, his research work focuses on the structure of space and time. He has also been involved in bringing science to the public with debates on the nature of space and time, popular science essays and blogs.

He was born in Patna, India and moved with his family to the UK when he was five.



CASE STUDY

Professor Sharon Ashbrook FRSC FRSE Dorothy Hodgkin Fellow (2003 – 2007)

As a Professor of Physical Chemistry at the University of St Andrews, Professor Sharon Ashbrook's work on nuclear magnetic resonance (NMR) spectroscopy – the powerful analytical tool used widely in chemistry on solid state materials – has won her multiple academic awards.

But she has also been lauded for championing the achievements of women in science. In 2017 she won a Suffrage Science Award following her work on a booklet titled *Academic Women Now*, which discusses the experiences of mid-career women in Scotland.

In 2016 she was made a Fellow of the Royal Society of Edinburgh in recognition of both her academic work and her contribution to education and the promotion of women in science.

She said of her Dorothy Hodgkin Fellowship: "I believe the fellowship allowed me to develop an independent research programme without the pressure of too much teaching (although I did have the opportunity to do choose to do some), the need to get significant funding ASAP [as soon as possible] or to publish ASAP.

I could actually think about the science I wanted to do. I was able to show independence and independent research, which I think was vital in getting my next position (an RCUK fellowship). I have been at St Andrews ever since, and was promoted to Reader in 2008 and Professor in 2013."



CASE STUDY

Professor Dame Carol Robinson DBE FMedSci FRS University Research Fellow (1995 – 2004)

As well as pioneering the application of mass spectrometry techniques to understand the structures of some of life's vital molecules, Dame Carol Robinson has scooped two notable firsts in her career. She was the first female Professor of Chemistry at both the University of Cambridge and then the University of Oxford.

Now she holds the Doctor Lee's Professorship of Chemistry at the University of Oxford, and her research team's work is focused on using mass spectrometry to reveal and understand the 3D structures of proteins, and how they interact and function.

In 2004, Dame Carol Robinson received the Royal Society's Rosalind Franklin Award – which recognises outstanding contributions to science and promotes women in STEM (Science, Technology, Engineering and Mathematics).

She was made a Dame Commander of the Order of the British Empire in 2013 for her 'services to science'. Dame Carol Robinson is a Fellow of the Royal Society, a Foreign Associate of the US National Academy of Sciences and is President of the Royal Society of Chemistry.

Where are they now?

Over the years the majority of those in the schemes have been from the UK (84%) but there has been a shift in recent years, partly as a result of changing eligibility criteria but also reflecting the increasing international nature of science.

While 14% of the overall number of alumni are from other EU countries, that has gone up to around a quarter of those completing their fellowship in the last ten years.

Overall the UK has had a small net 'brain gain' with more non-UK nationals staying to work here than UK nationals who are currently working overseas (in countries which include the US, Australia, South Africa and Singapore).

International collaboration has been a strong theme, with University Research Fellowship and Dorothy Hodgkin Fellowship alumni collaborating widely with international colleagues.

The study showed that overall more than half of alumni had spent a 'significant' period of their career living and working in another country that was not their home. This ranged from a minimum of three months to many years.

“During my University Research Fellowship, I was very proud to represent the UK on various panels for the International Ocean Discovery Program (IODP) - an international collaboration that uses scientific ocean drilling to understand the history and structure of the ocean basins. Through this work I feel I have helped shaped the efforts by my community to further our knowledge of how the ocean and climate systems have operated in the past; thereby highlighting the unprecedented nature of climatic and environmental change that we are observing at the present day.”

Dr Stuart Robinson (University Research Fellow 2005 – 2013), Associate Professor of Sedimentology and Stratigraphy at the University of Oxford.

A handful of University Research Fellowship alumni, whose normal place of residence was the UK, had lived and worked abroad for as long as 25 years.

Scientists who had received the fellowships were also extremely active in international collaborations. Over 90% of University

Research Fellowship, and over 85% of Dorothy Hodgkin Fellowship alumni were currently involved in at least one international research project in which they were a 'co-investigator'.

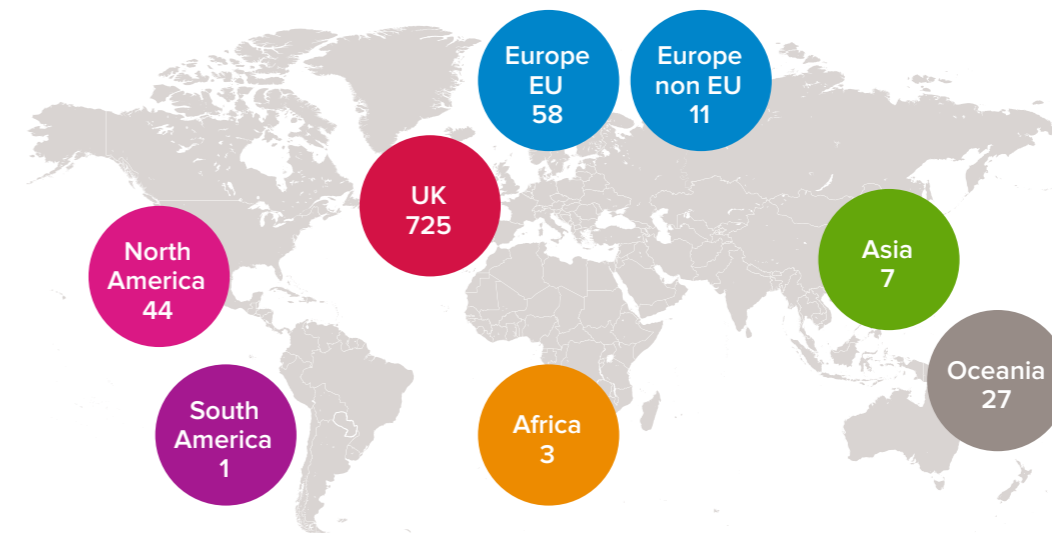
A wide number of such collaborations were reported by the scientists, and the average number for each fellowship was around four.

3 years

The average (mean) time a University Research Fellowship alumni, domiciled in the UK, spent working abroad.

FIGURE 6: LOCATION OF EMPLOYMENT

World map showing the employment location for 876 respondents.



Nationality of the same 876 respondents

UK 672	Other EU 133	Rest of world 31	Unknown 40
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CASE STUDY

Professor Artur Ekert FRS
University Research Fellow
(Royal Society Howe Research Fellow) 1994 – 2001

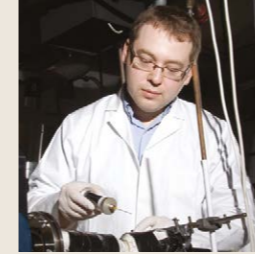
His groundbreaking work on quantum technology led Professor Artur Ekert to Singapore. He is the founding director of the Centre for Quantum Technologies at the National University of Singapore, set up in 2007.

The Singapore centre has over 200 staff and students, and its focus is harnessing quantum phenomena for technology and devices.

Professor Ekert, also Professor of Quantum Physics and Cryptography at the University of Oxford, is a co-inventor of quantum cryptography – which harnesses quantum properties for carrying information and promises super-secure communication networks.

His invention of cryptography based on the properties of ‘entangled’ particles lead to a plethora of research efforts worldwide to harness this phenomenon.

He is a Fellow of the Royal Society.



CASE STUDY

Professor Krzysztof Koziol
University Research Fellow 2008 – 2016, Professor of Composites Engineering and Head of the Enhanced Composites and Structures Centre, Cranfield University.

Having been awarded an MSc in Chemistry from the Silesian University of Technology in Poland, Professor Koziol moved to Cambridge, where he completed his PhD. In 2008 he was awarded a University Research Fellowship.

The fellowship allowed him to further specialise in carbon-based nanotubes and in developing the production of graphene.

He has started ten spin-off companies and headed UltraWire, a €3.3 million EU development consortium with industry partners including National Grid, PSA Peugeot Citroën and some of the world’s largest cable manufacturers.

Cambridge Nanosystems (CNS), one of Professor Koziol’s start-ups, with multimillion pounds investment and deployment of full production factory in 2015, is now one of the largest manufacturer of graphene, operating on a global scale.

Speaking about his fellowship, Professor Koziol said: “The fellowship gave me full independence to take my career forward, the way I wanted it to go. I was able to focus on research of my choice and succeed with a speed that I would not have been able to otherwise. This freedom allowed me to develop a deep scientific understanding which I used as a foundation to open new research directions for my academic colleagues, delivering real materials on a large scale to enable solutions for industry and benefits to the wider community. University Research Fellowship is the best research program which I had the privilege to experience in my academic career.”

Research Fellowship to Fellow



Professor Fraser Armstrong FRS
University of Oxford



Professor Frances Ashcroft FRS
University of Oxford



Professor David Attwell FRS
University College London



Sir Shankar Balasubramanian FRS
University of Cambridge



Professor Martin Barlow FRS
University of British Columbia



Professor Andrew Cooper FRS
University of Liverpool



Professor Brian Cox FRS
University of Manchester



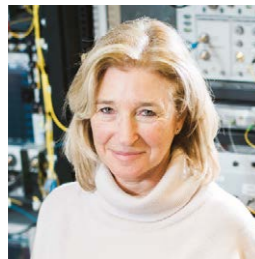
Professor Gideon Davies FRS
University of York



Dame Athene Donald FRS
University of Cambridge



Professor Marcus du Sautoy FRS
University of Oxford



Professor Polina Bayvel FRS
University College London



Professor David Beerling FRS
University of Sheffield



Professor Jean Beggs FRS
University of Edinburgh



Professor Jonathan Blundy FRS
University of Bristol



Professor Richard Borcherds FRS
University of California, Berkeley



Professor Artur Ekert FRS
University of Oxford



Professor Jeff Errington FRS
Newcastle University



Professor Lynn Gladden FRS
University of Cambridge



Professor Alan Grafen FRS
University of Oxford



Professor Roger Hardie FRS
University of Cambridge



Professor Tom Bridgeland FRS
University of Sheffield



Professor Neil Burgess FRS
University College London



Professor Michael Cates FRS
University of Edinburgh



Professor David Charlton FRS
University of Birmingham



Professor Tim Clutton-Brock FRS
University of Cambridge



Professor Janet Hemingway FRS
Liverpool School of Tropical Medicine



Professor Peter Holland FRS
University of Oxford



Professor Edward Holmes FRS
University of Sydney



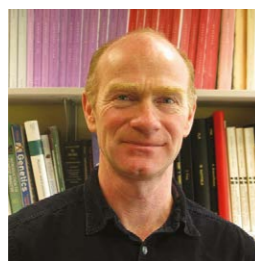
Professor Laurence Hurst FRS
University of Bath



Professor Malcolm Irving FRS
Kings College London



Professor Edith Yvonne Jones FRS
University of Oxford



Professor Peter Keightley FRS
University of Edinburgh



Professor Jane Langdale FRS
University of Oxford



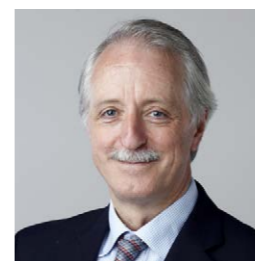
Professor Malcolm Levitt FRS
University of Southampton



Professor David Lilley FRS
University of Cambridge



Professor Michael Payne FRS
University of Cambridge



Professor John Pethica FRS
University of Oxford



Professor Sarah (Sally) Price FRS
University College London



Professor Sheena Radford FRS
University of Leeds



Professor David Richardson FRS
University of Southampton



Professor Andrew MacKenzie FRS
University of St Andrews



Professor Yadvinder Singh Malhi FRS
University of Oxford



Professor Angela McLean FRS
University of Oxford



Professor Gilean McVean FRS
University of Oxford



Professor Paul Midgley FRS
University of Cambridge



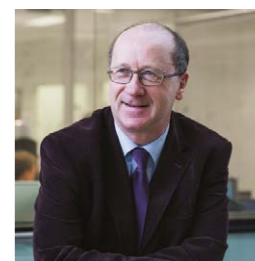
Dame Carol Robinson FRS
University of Oxford



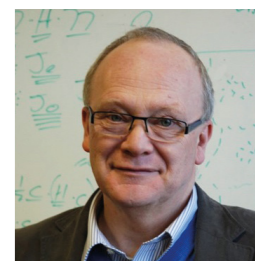
Dame Nancy Rothwell FRS
University of Manchester



Professor Henning Sirringhaus FRS
University of Cambridge



Professor Timothy Softley FRS
University of Birmingham



Professor Adrian Sutton FRS
Imperial College London



Professor Russell Morris FRS
University of St Andrews



Sir Konstantin Novoselov FRS
University of Manchester



Professor Andrew Orr-Ewing FRS
Bristol University



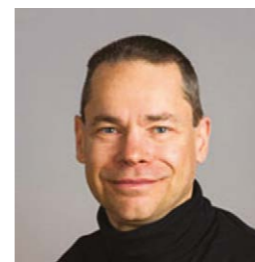
Professor Miles Padgett FRS
University of Glasgow



Professor Tracy Palmer FRS
Dundee University



Professor Richard Thomas FRS
Imperial College London



Professor David Wales FRS
University of Cambridge



Professor Colin Wilson FRS
Victoria University



The Royal Society is a self-governing Fellowship of many of the world's most distinguished scientists drawn from all areas of science, engineering, and medicine. The Society's fundamental purpose, as it has been since its foundation in 1660, is to recognise, promote, and support excellence in science and to encourage the development and use of science for the benefit of humanity.

The Society's strategic priorities emphasise its commitment to the highest quality science, to curiosity-driven research, and to the development and use of science for the benefit of society.

These priorities are:

- Promoting excellence in science
- Supporting international collaboration
- Demonstrating the importance of science to everyone

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