

Nurturing talent

to meet the needs of UK bioscience

BBSRC fellowship schemes help scientists follow their chosen career paths, either in academia, industry, or by applying their skills to another sector.

Our 2007 conference for BBSRC Fellows gave award holders an opportunity to meet with each other, as well as BBSRC Council and Strategy Panel members, to discuss their science and issues around funding and career development policies.

Professor Mary Bownes, Chair of BBSRC's Studentships and Fellowships Panel, said, "People are at the heart of developing a robust research base. There is an increasing need for scientists to learn new skills, collaborate with experts from other disciplines, and share knowledge with scientists in other parts of the world."

The following case studies highlight how opportunities available through BBSRC fellowship schemes are making a difference to researchers across the bioscience spectrum at different stages of their careers.

Professor Martin Sheldon's career at the Royal Veterinary College has undergone a major step-change recently, with the help of a **BBSRC Research Development Fellow**.

"The Fellowship has allowed me to take a new direction in my research to test how the biological systems governing immunity and reproductive hormone status are integrated in mammals," says Sheldon.

Having made the transition from a largely clinical and teaching role, where he specialised in bovine uterine disease, to a full-time research position, Professor Sheldon will test whether the concepts he has developed in cows apply across mammals.

"We have already shown that cells lining the uterus have receptors, which can detect bacterial infections in the genital tract, and these cells can affect the levels of uterine hormones that regulate the ovarian cycle. As well as this indirect effect

on the ovary, we have recently reported that other cells surrounding the egg itself can also detect bacterial toxins, and these bacterial toxins reduce sex hormone secretion. Our findings are important because they show that these cells, which are essential for mammalian reproduction, also have immune responsibilities and directly impact the ovary," explains Sheldon.

Now with funding through his Fellowship, Professor Sheldon has visited the Jackson Lab in the USA to acquire novel techniques, which will allow his research team to study uterine and ovarian function in mice. He is also collaborating with US scientists at Cornell University, to explore gene expression and the 'phylogeny' of bovine uterine pathogens.

"In the long-term, a better understanding of the mechanisms by which uterine infection disrupts the function of the female reproductive system could lead to new drugs that can prevent infertility in cattle and other animals, including humans," says Sheldon.



Following a first degree in physics and a PhD in biochemistry, **Dr Andrew Almond** spent two years on a Wellcome Trust Travelling Fellowship learning multidisciplinary research techniques, using powerful Nuclear Magnetic Resonance machines at the Carlsberg Research Centre in Copenhagen. Upon returning to UK, to work with Professor Iain Campbell FRS at the University of Oxford, he developed novel methods, in collaboration with scientists in Birmingham and the USA, for understanding the 3D structures of 'glycosaminoglycans' – complex sugar molecules, such as hyaluronic acid (HA) – and how they interact with proteins.

Over the last 20 years scientific attitudes towards HA have changed, from regarding it as a 'molecular goo' that fills certain extra-cellular spaces to an organiser of matrix molecules and a regulator of cellular function. HA is also medically important, since in a pure form it is non-immunogenic and has unique viscoelastic properties. Annual sales are estimated to be in excess of \$1 billion but its behaviour in solution, both at the macro- and microscopic level, is poorly understood.

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It was while at Oxford that Dr Almond was awarded a **BBSRC David Phillips Fellowship**. “The five-year nature of the David Phillips Fellowship, which included the ability to recruit a postdoctoral research assistant, allowed us to really push the boat out and do something novel,” says Almond.

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So much so that, three years into his Fellowship, Almond secured a position at the University of Manchester's Interdisciplinary Biocentre, with the opportunity to take up a permanent lectureship at the end of his Fellowship. By this stage, Almond and his team were entering a new area of research and the discoveries were coming almost daily.

Almond explains, “We realised that our findings were so novel that we had to commercialise, so I applied for, and won, a **BBSRC Enterprise Fellowship**. Our ultimate aim is to understand the molecular basis of diseases that result from tissue degradation, such as arthritis, and thereby improve our ability to engineer tissue and perform regenerative medicine.”

“Now, with funding through the Enterprise Fellowship, we're beginning to move from research to development. Commercialisation is not part of the normal day-to-day work of a university scientist, but it's just as important in my opinion, and it has its own rules! My focus is on writing patents rather than papers, to keep the intellectual property secure,” relates Almond. “I've still a lot to learn, but it's very exciting. I think seeing something going from the lab to the marketplace will close a loop for me. Importantly, the business training and access to networks of mentors will also help me to understand the needs of industry better and focus my future research in the right direction.”

Bridging disciplines requires time, energy and the funds and freedom to try out new experiments. **Professor Sheena Radford**, a structural biologist at the University of Leeds, has shown that it is possible to meet this challenge, with the help of a **BBSRC Professorial Fellowship**.

A Former Royal Society Research Fellow and Research Fellow at Linacre College Oxford, Professor Radford moved to the University of Leeds in 1995 to take up a lectureship. Within three years she had been promoted to Reader, and was appointed Professor of Structural Molecular Biology in 2000. During this period, her research interests in the field of protein folding and amyloidosis – a key area in the understanding of neurodegenerative disease – expanded beyond traditional protein biochemistry.

Aided by her BBSRC Professorial Fellowship, Professor Radford has gone on to assemble a talented multidisciplinary research team. Their studies have taken our understanding of the molecular mechanism of amyloid formation to a new integrated level, combining the analytical power of biophysical techniques with modern methods in cell biology.



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Their studies concentrated on the human amyloid-forming protein β_2 -microglobulin (β_2m). At the start of the Fellowship little was known about the mechanism by which β_2m assembles into amyloid fibrils. Today this protein sits amongst the best understood amyloidogenic proteins.

“With β_2m as a model for the study of amyloidosis, we are closer to establishing general principles for the development of the whole family of amyloid diseases,” Radford explains. “Although diseases such as Alzheimer’s and Parkinson’s have been known for more than a century, there is still much to learn. We have been able to address an important gap in knowledge, linking the molecular mechanism of amyloid formation, as observed *in vitro*, with the role of the biological environment in tailoring the assembly of fibrils in living cells.”

Professor Radford was made a Fellow of the Royal Society of Chemistry in 2003, and was also awarded the RSC’s 2003 AstraZeneca Proteins and Peptides Prize, for her ‘outstanding contributions to the understanding of protein folding mechanisms, and particularly the determination of the roles of intermediates in protein folding pathways’.

“The opportunities to explore new avenues were superb and the achievements made could not have occurred in such a timely, enjoyable and successful manner without the Fellowship award,” says Radford. “It provided flexible funding opportunities for me to move rapidly into new areas as they developed. Importantly, it gave me the time to talk to people: both in the lab, to learn with them, and more widely at international conferences, to shape fruitful collaborations.”



Dr Jurriaan Ton started his research career as an MSc student at Utrecht University in the Netherlands, studying resistance to *Fusarium* wilt in radish plants following treatment with root-colonising rhizobacteria. “I was fascinated by the idea that bacteria at the root surface somehow manage to ‘vaccinate’ an entire plant, so much so that I continued with a PhD in the same lab, studying this phenomenon in the model plant *Arabidopsis*,” says Ton. “Then, as a postdoctoral researcher in Switzerland, I examined the complex regulation behind plant defence against oomycetes and fungi, and also developed an interest

in the, often far-reaching, ecological consequences that interactions between plants and other organisms can have. Having been granted a fellowship from the Dutch government in 2004, I returned to Holland to study the molecular mechanisms of priming for defence.”

Priming by specific environmental cues allows the plant to acquire an enhanced defensive capacity that protects against future attack by pathogens or insects. Over the past three years, Dr Ton’s team has not only focused on the molecular regulation of priming, but also started to address more ecological questions concerning priming and induced resistance.

He was recently awarded one of BBSRC’s first **Institute Career Path Fellowships** at Rothamsted Research to further explore the regulation of priming, working within the Centre for Sustainable Pest and Disease Management, directed by Professor John Pickett, and with opportunities to collaborate with colleagues in the Departments of Biological Chemistry and Plant Pathology and Microbiology.

“The multidisciplinary character of Rothamsted will provide an excellent environment to continue my study on the molecular mechanisms and ecological implications of priming, with the long-term objective to develop novel agricultural strategies to optimise the plant’s innate immune system against harmful microbes and insects,” Ton explains.

Understanding the mechanisms behind priming of the plant’s ‘innate’ immune system will lead to new insights in the field of plant stress biology. Critically evaluating this fundamental knowledge under field conditions could provide an essential first step towards future exploitation of the priming phenomenon in sustainable agriculture.

BBSRC’s fellowship schemes provide personal funding to outstanding scientists at different career stages:

David Phillips and Institute Career Path Fellowships

– to help establish postdoctoral researchers as independent investigators

Research Development and Institute Development

Fellowships – to support academics seeking to pursue new research directions

Enterprise Fellowships – enabling researchers to concentrate on commercialising their research

Professorial Fellowships – awarded to outstanding scientists at the height of their research career

Further details can be found at www.bbsrc.ac.uk/funding/fellowships

We also support:

RCUK Academic Fellowships – to provide a clear career path from postdoctoral research to permanent academic positions

Collaborative Career Development Fellowships in Stem

Cell Research – specialised research training to support fundamental stem cell biology

European Molecular Biology Organisation Fellowships – for advanced postdoctoral research

Human Frontier Science Programme Fellowships – for early-career researchers who wish to work in other countries

Industry Fellowships – to enhance knowledge transfer between industry and academia

Daphne Jackson Fellowships – to support researchers returning from a career break