University of Bath Prize Fellows



Prize Fellowships are research focused positions for visionary scientists to kick-start their academic career in a supportive and well-resourced research environment.

Prize Fellows will pursue an independent programme of research, including publishing in top quality venues and securing external research grants.

The scheme begins with an initial appointment to a fixed-term Research Fellow post with the strong expectation to transition to permanent Lectureship after two years. Alumni of the scheme have become scientific leaders, progressing rapidly within the university to Senior Lecturer, Reader and Professor.

We aim to recruit six Fellows across the Faculty of Science to strengthen and develop existing research excellence. Applications are invited in priority areas listed here.

Keep reading to find out more about the University of Bath, the Faculty of Science and the Prize Fellow scheme.

UNIVERSITY OF BATH

Chemistry
- Digital Chemistry
- Sustainable Drug Discovery and Manufacture

Computer Science
- Machine Learning
- Visual Computing

Life Sciences
- Antimicrobial Resistance
- Healthcare Data Science (Bioinformatics / Epidemiology)
- Neurodevelopment, Mental Health, and Neurodegeneration

Mathematical Sciences
- Fluid Dynamics
- Number Theory

Physics
- Energy & Quantum Materials
- Physics for Healthcare

Milner Centre for Evolution
- Theoretical or empirical studies in evolution

Institute for Sustainability
- Sustainable chemical technologies

About the University of Bath



We are proud to be one of the UK's leading universities, with an international reputation for the quality of our research and teaching.

Our mission is to deliver world-class research and teaching, educating our graduates to become future leaders and innovators, and benefiting the wider population through our research, enterprise, and influence. The University of Bath is a globally recognised institution with over 19,000 students from 147 countries. It is one of the most innovative and high performing universities in the UK and consistently ranked in the Top 10 in the country.

We have a strong commitment to the people we employ and value the contributions made by all our staff. We aim to be an inclusive university, where **difference is celebrated**, respected and encouraged. We truly believe that diversity of experience, perspectives, and backgrounds leads to a better environment for our employees and students, creating a culture that enhances health and wellbeing across our community. We hold an Athena Swan Silver award and are very proud to have recently received Ambassadors for Autism certification and are an accredited Disability Confident Leader; committed to building disability confidence and supporting disabled staff.



Our research excels across science, engineering, management, social sciences, and the humanities. It influences national and international policy debates and contributes to sustainable development and technology. The 2021 Research Assessment Exercise affirmed Bath's position as one of the top research universities in the UK and 92% of our research was classed as world-leading or internationally excellent. Our research portfolio of grants and contracts is worth over £165 million.

We pride ourselves on the student experience we provide. Bath produces well rounded, highly successful graduates who command excellent jobs in the graduate market. In addition to ranking as one of the top universities for employability, our students have access to teachers who are themselves pushing back the boundaries of knowledge through research and innovation.

Looking ahead, we are making significant investments to grow excellence and enhance our global position within the top world-leading institutions. We'll do this in ways that respect and support our community, our values, and our environment. We aim to drive high-impact research by building on our power, impact, and achievements in all our areas of research. More information on the University of Bath strategy can be found here: https://www.bath.ac.uk/topics/the-university-of-bath-strategy-2021-to-2026

THE TIMES THE SUNDAY TIMES GOOD UNIVERSITY GUIDE 2023 UNIVERSITY OF THE YEAR

Ranked 9th best university in the UK in The Times and The Sunday Times Good University Guide 2022

Ranked 10th best university in the UK in the Complete University Guide 2022

Ranked 8th best university in the UK in the Guardian University Guide 2022

REF2021 92% research classed as world-leading or internationally excellent

About the University of Bath

The University of Bath's Royal Charter was granted in 1966 and most of the original building of the Claverton Down Campus were constructed during the following ten years. From the beginning, the University was designed to be different, innovative and inclusive, and the campus was built to support this.

We have continuously invested in new buildings and facilities, like the Sports Training Village (STV), opened by Princess Anne in 2004. The STV has since become one of Europe's best training centres for top-level athletes, hosting a number of international sports teams and Olympic medal winners. In 2015, The Edge theatre opened as a dedicated space for arts, education and events. 10 West opened in 2016, housing the Department of Psychology and the Institute for Policy Research.



Take a virtual tour of our campus:
go.bath.ac.uk/virtual-tour-23

360°

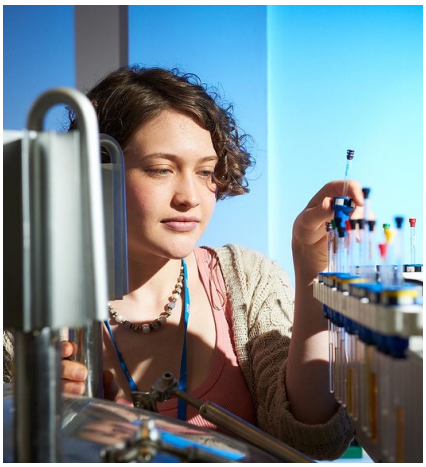
Watch the campus staff tour

We host world-class science facilities including the Material and Chemical Characterisation Facility (MC²), providing electron microscopy, mass spectrometry, bio-imaging, x-ray diffraction, NMR and other technologies for science research.



Faculty of Science

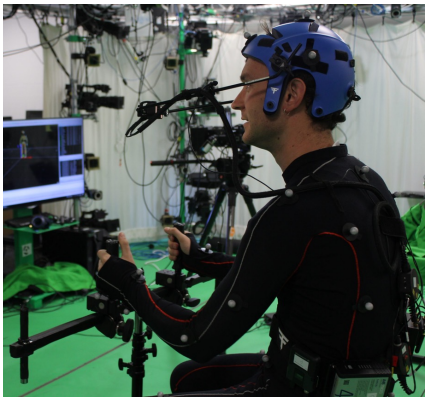
The Faculty of Science is the largest faculty in the University with over 3,500 undergraduate students, 650 postgraduate students and more than 300 academic and research staff.



The faculty is broad and comprises five research departments:

- Chemistry
- Computer Science
- Life Sciences
- Mathematical Sciences
- Physics

We have a world-leading research culture and are continuing to build and grow research strengths. We have been very successful in recruiting students and providing them with an exceptional student experience in recent years, not least as students benefit from very strong industry relationships.



The creation of the Department of Life Sciences, built from the former Department of Biology & Biochemistry and Department of Pharmacy & Pharmacology, presents an exciting opportunity to develop new areas of teaching and research.

In addition, several research centres and institutes are led out of the Faculty of Science, who often work cross-disciplinary on research priorities. Two areas for the University of Bath Prize Fellowships are situated in those. The Milner Centre for Evolution are a cross-faculty research centre bridging biology, health and education aiming to answer fundamental questions about evolution. And the new Institute for Sustainability,brings together academic expertise from the University of Bath with international, industrial, academic and stakeholder partners to work together for a sustainable future.



Prize Fellowship Scheme

Timeline

27 December 2022	Stage 1 applications open (CV and short questions)
29 January 2023	Stage 1 closing date
3 February 2023	Stage 2 applications invited (2-page research proposal)
12 February 2023	Stage 2 closing date
28 February 2023	Interviews
6 March 2023	Offers made
June – September 2023	Prize Fellows start in post
October 2023 – December 2024	Bespoke programme of career development opportunities
October 2025	Expected transfer to permanent lectureship

Transfer to lectureship

From October 2025 a new permanent position in one of our departments will be created, for which the Fellow will be the only eligible appointee. Appointment will be made on the basis of satisfactory performance and progress against the objectives of the Fellow's research programme. The Faculty of Science will seek to maintain its 100% successful track record in converting Prize Fellows to Lectureships.

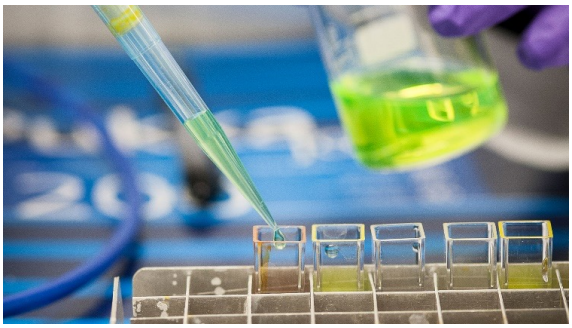


Hear from two recent Prize Fellows about their experience

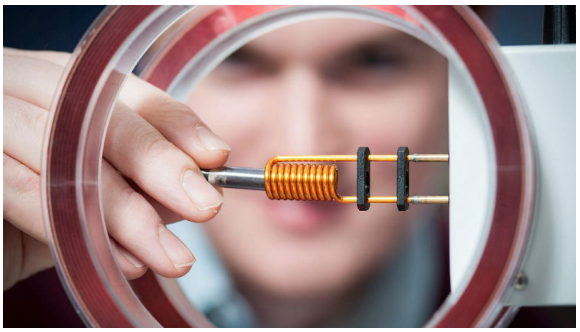
Department of Chemistry

Our research ranges from fundamental studies to highly cross-disciplinary initiatives targeted at solving global grand challenges. This approach forms the keystone of our achievements and is integral to our ongoing strategy.

We are supported by excellent infrastructure, sustainable and strategic staff growth, a substantial PhD student cohort, a strong funding portfolio and a wide range of national and international collaborations. 99% of our submitted research activity was ranked as ‘world-leading’ or ‘internationally excellent’ in the most recent Research Excellence Framework (REF2021). The department's standing has been acknowledged through excellent performance in national rankings based on publication metrics including a particularly noteworthy 1st in the UK for the QS World University Rankings by Subject 2022 (ranked by citations per paper).



Bath Chemistry research is organised into five overlapping and interdisciplinary themes, with flexible cross-theme membership by academics. These themes are **Materials**, **Interfaces**, **Transformations**, **Healthcare** and **Analytical**. The five themes are underpinned by the unifying concept of **Sustainability**, a particular strength in terms of both excellence and critical mass. Researchers in the department are major contributors to the university's newly established cross-disciplinary Institute for Sustainability, which evolved from the Centre for Sustainable and Circular Technologies which was created in 2008 and based in the department.



The department is well equipped to support a prize fellow. We have an advanced large-scale cloud supercomputing environment, supported by an on-site cluster for software applications that cannot be run in the cloud. A wide range of experimental instrumentation is available for hands-on use through the university's Materials and Chemical Characterisation Facility (MC^2). This includes NMR (seven instruments, 400-500 MHz), mass spectrometry (six instruments including ESI-QTOF and GC-MSD), X-ray diffraction (single-crystal, PXRD and SAXS) and electron microscopy (SEM, FESEM and TEM). We have access to Bath’s Dynamic Reaction Monitoring (DReaM) Facility which allows *operando* spectroscopic analysis under inert conditions using multi-nuclear high resolution FlowNMR, UV-vis, IR, Raman, polarimetry, MS and HPLC.

We have an outstandingly successful track record in developing Early Career Researchers, whose success reflects well upon the nurturing environment Bath offers. Currently ten members of academic staff hold research fellowships including six Royal Society University Research Fellows. Our commitment to providing an inclusive environment is reflected in our Athena Swan departmental Silver award. Our academic staff includes four past Prize Fellows who have moved onto permanent positions or further fellowships at the end of their Prize Fellowships.





Department of Chemistry

Prize Fellowship in Digital Chemistry

Digital chemistry encompasses advances in automation, machine learning, big data science and molecular modelling that is transforming practices in chemical sciences in both academia and industry. Digital Chemistry is poised to have a revolutionary impact in materials, biological and green chemistry. Machine learning opens the gate for high accuracy simulations to be applied to technologically relevant problems by significantly reducing the timescale of modelling. There is a critical need for designing new functionalised materials, evaluating their structure and stability, and finally, screening their technologically important properties, such as electronic properties (for sensors and photocells) and catalytic activity. Functionalised materials have great potential for the future. However, to achieve the required success we need to develop machine learning capability to evaluate the stability of functionalised materials and predict their efficiency.

The department has established links with pharmaceutical companies that support PhD students in the field of computational chemistry and machine learning through CASE, iCASE and industry-funded studentships (AstraZeneca and GSK currently fund students in the department in these areas). The recently established partnership with Corsham Science Ltd delivers a bespoke training and support package embedding Innovation and Impact into doctoral student cohorts, developing future research leaders in industry, academia and at the interface.

There is a real opportunity for an expert in Digital Chemistry to make a significant contribution to understanding and developing new functional materials that offer high levels of chemical selectivity and reactivity. A motivated and ambitious Prize Fellow in Digital Chemistry will help the department and the University to adapt to the quickly changing landscape of science and technology, where digitalisation is one of the main disruptive innovative forces. A new appointment in this area will enable the Department to develop a critical mass of researchers by being able to better guide the experimental programmes and add new computational developments to the Computational Science groups.

Prize Fellowship in Sustainable Synthesis for Drug Discovery and Manufacture

Breakthroughs in chemical synthesis and biocatalysis have revolutionised the discovery and manufacture of pharmaceuticals over the past two decades, providing incalculable benefit to human health. These chemical subdisciplines have been recognised with no fewer than 8 Nobel Prizes since 2000 (including 2018, 2021, and 2022), and they continue to be a vibrant and high-impact area of research. One of University of Bath's major industrial collaborators, AstraZeneca (AZ), is the UK's largest science-led biopharmaceutical company. It is also notable that at least 10 of the top-selling drugs worldwide have UK-trained organic chemists as named inventors.

One of the most significant challenges facing society is the changing way in which essential pharmaceuticals are prepared due to increased challenges in sustainability. The leading pharmaceutical companies each have ambitious net-zero targets, which will require increased research into the discovery of new and efficient synthetic techniques that use more sustainable starting materials, use less energy, and generate less waste, yet still allow us to discover and prepare new medicines. This vibrant research area is of global importance.

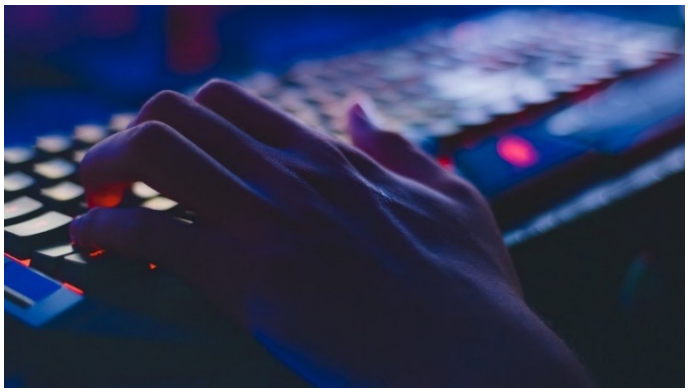
Bath Chemistry has long had a core strength in synthetic chemistry, with 40% of our last REF submissions being in the area of synthetic transformations (mostly experimental but also some computational) and a further 20% in the Health & Analytical area (e.g., chemical sensing, drug metabolite analysis). Both areas interface strongly with the pharmaceutical and biotech industries. Since 2018, the Department of Chemistry has attracted over £1M in industrial funding from pharmaceutical and healthcare companies to support research activities – primarily PhD studentships – in the area of drug discovery and synthetic organic chemistry.

The future Prize Fellow should be able to demonstrate the potential to launch an independent programme of high impact research in synthetic chemistry or biocatalysis, in areas that complement or strengthen the Department's existing critical mass. Collaboration with multinational pharmaceutical partners should be targeted, as well as cross-disciplinary collaborations with colleagues in the new Life Sciences department.

Department of Computer Science

We provide a vibrant, inclusive, supportive and effective environment for a broad range of computer science research. 98% of our submitted research activity was ranked as ‘world leading’ or ‘internationally excellent’ in the most recent Research Excellence Framework (REF2021).

We have strategically grown our department over recent years and established a critical mass in Machine Learning and Artificial Intelligence, which we are looking to expand further. Recruitment of staff, capturing significant funding to support our research, and strategic investment in physical and technical infrastructure all sustain our collegial and supportive environment that nurtures, recognizes and rewards the efforts of our staff to deliver high quality research with impact.



Our department is structured in four groups:

Artificial Intelligence (AI) and Machine Learning (ML): data driven and classical approaches to the creation, application and evaluation of intelligent machines and their integration into larger systems and society;



Human-Computer Interaction (HCI): theoretical, empirical and practical aspects of the design, development and evaluation of interactive systems to support human activities;

Mathematical Foundations: using mathematics to understand programs, programming languages, systems and their components, and developing systems to do mathematics;

Visual Computing: the intersection of computer vision (interpreting and understanding images and video) and computer graphics (the generation of visual content), with applications in the creative industries (films, games and entertainment) as well as healthcare, science and education.

The modern building in which we sit houses dedicated labs for our research, the CAMERA studio, and labs for our taught students. The HCI lab includes a wide range of equipment including VR systems, biomonitors and eye trackers. The CAMERA studio is a state of the art motion capture studio. Beyond this building, a maker lab and physical interfaces lab include fabrication facilities including laser cutting, soldering, PCB etching and 3D printing), enabling the creation of specialist devices for research and teaching. We also have a 600m^2 off campus motion capture studio dedicated to engagement with industry associated with the CAMERA project.

Our increasing strength in Machine Learning research has led to an increase in computationally intensive work. To meet this demand, we jave established our own in-house compute cluster, with 20 GPUs, 14TB of solid-state storage and 24TB of magnetic storage. This facility is available to staff, PGR students and appropriate taught students, and has supported the computational needs of research projects leading to outputs in Machine Learning and Visual Computing. Fundamental to our strategy on the use of this infrastructure to support research is an inclusive and collaborative approach that invites and supports participation from people at all levels from Professor to undergraduate.

Department of Computer Science

Prize Fellowship in Machine Learning

Machine learning (ML) underlies many of the recent developments and excitement in AI. Bath's strength in this field has been growing in recent years and there is a critical mass of research and impact activity in this area. We are continuing to grow our machine learning staff base and research portfolio and benefit from teaching very capable and enthusiastic students.

We are home to the UKRI Centre for Doctoral Training in Accountable, Responsible and Transparent AI (ART-AI, https://cdt-art-ai.ac.uk/). ART-AI offers a uniquely interdisciplinary doctoral training approach, recruiting PhD students from a wide range of backgrounds across computer science and artificial intelligence, engineering and technology, and humanities and social sciences. ART-AI brings these students together in interdisciplinary teams with ML researchers and leading researchers in other fields from across the university and partners. Our MSc Data Science attracts the best students and was listed by Forbes in the top 10 best AI and Data Science courses in the world for 2021.

Additionally, there are strong synergies with the Department of Mathematical Sciences, who host a new £3.3 million EPSRC Programme Grant in the Mathematics of Deep Learning. The Centre for Mathematics and Algorithms for Data is an interdisciplinary group working at the intersection of ML and Numerical Methods, and the Institute for Mathematical Innovation interfaces with companies and applied scientists requiring ML expertise.

This Prize Fellowship will support an early career ML researcher with the potential to become a global leader of the field, allowing them to focus exclusively on building their research momentum, both individually and in collaboration with existing ML talent at Bath, and in interdisciplinary collaborations where ML has an important role to play. The AI & ML group will provide mentoring, support and opportunities to help the Prize Fellow to fulfil their research potential and build the foundations for a successful career.

Prize Fellowship in Visual Computing

Bath has a long and successful research record in visual computing, in particular combining computer vision and graphics approaches with a human centric focus. This opens up a wide range of exciting opportunities for the technologies we develop to be translated into new fields with high impact applications. The Centre for the Analysis of Motion, Entertainment Research and Applications (CAMERA, www.camera.ac.uk) embodies this focus and provides unique, state of the art facilities and equipment that underpin fundamental visual computing research and our engagement with many external partners including industry, international research institutes and charitable organisations.

We have a large funding portfolio, with a net worth of £17 million in directly managed grant income, with a further £30 million in partner funding. We are well connected, with many external partners. Of these, over 20 are industry facing, including: Foundry, Bristol Old Vic Theatre School, Sony, The Ministry of Defence, Qualisys, Lawn Tennis Association, British Athletics, British Bobsleigh & Skeleton Association. We also have partnerships with international research institutes including Max Planck Institute for Informatics, Saarbrucken; Zhejiang Lab, Tsinghua University; University of Auckland; National Institute of Informatics, Tokyo; and VISTA (York University, Toronto).

Our facilities centre around two state of the art motion capture studios. Other facilities include our photogrammetry rig for avatar and more general shape capture, a 4D volumetric capture system as well as a number of smaller bespoke systems. We are also establishing a new virtual production system in our new studio as part of a significant national research and impact collaboration.

The Prize Fellowship in Visual Computing will allow the successful candidate to focus exclusively on research to enhance our core technology that will not only lead to high quality publications but comes with a direct route to high quality impact case studies through our partners. They will have access to the extensive facilities and equipment of CAMERA including the opportunity to work immediately with one of our postdoctoral researchers as well as PhD students and Research Software Engineers. The group has an excellent record in securing funding and will provide guidance and mentorship to help the successful candidate build their career as an independent researcher.

Department of Life Sciences

The new Department of Life Sciences was recently formed from the merger of the Departments of Biology & Biochemistry and Pharmacy & Pharmacology. This brings together 92 Principal Investigators and 300+ scientists that undertake cutting-edge research that spans the full range of the life sciences, from health to environmental sustainability, and utilising bioengineering technologies and big data approaches.

Our research is supported by excellent facilities and equipment including sequencing, imaging, animal facilities and access to cloud computing. The breadth of this research is demonstrated by the diverse sources of our grant funding, including BBSRC, MRC, EPSRC, Wellcome Trust, Royal Society and the Leverhulme Trust, and which together totals > £30 million in the last 5 years.

The strength of the department is also reflected in excellent results in the recent Research Excellence Framework (REF2021). Building upon this success, we have set an equally ambitious research vision that builds on existing strengths: to be recognised as a Top 10 UK Life Sciences department with world-class research and teaching infrastructure and partnerships for conducting cutting-edge transformative research and education.





Research within our department is split into five cross-disciplinary research themes (https://www.bath.ac.uk/topics/department-of-life-sciences-research/).

Evolution and biodiversity: Applying evolutionary concepts to fundamental questions in biology with a drive to address real world challenges through research, education, and outreach.

Biotechnology: Advancing knowledge and delivering products and solutions with medical, industrial and agricultural impact, via study and use of molecules, cells and organisms.

Cells, development and disease: Understanding the molecular and genomic processes regulating cell function in development, health and disease

Microbiology, infection & inflammation: Understanding the role of microbes, and the host response to them, in health and disease.

Diagnostics, medicines and patients. Optimising patient and population health outcomes through translational research

We have an outstandingly successful track record in developing Early Career Researchers with current members of staff across the research themes having obtained research fellowships from the Royal Society (2), Wellcome Trust and BBSRC. Our commitment to providing an inclusive and nurturing environment is reflected in our Athena Swan departmental Silver award.

Department of Life Sciences

Prize Fellowship in Antimicrobial Resistance

Antimicrobial Resistance (AMR) has been declared by the WHO as one of the top 10 global public health threats facing humanity. Misuse and overuse of antimicrobials, combined with poor sanitation and inadequate infection prevention, has led to an acceleration in treatment failures due to the emergence and global spread of multi-resistant 'superbugs'. Similarly, crop management is severely affected by increasing resistance to anti-fungal and other treatments. AMR thus represents an urgent challenge for public health and food security, and an existential threat to welfare and the global economy.

Our research expertise in Bath encompasses multiple aspects of AMR, including the genetic basis and mechanisms of resistance, global epidemiological surveillance (in hospitals, agricultural and environmental settings), genomics and evolution, chemistry of drug delivery / development, pathogenesis, as well as public understanding, social science and ethnographic drivers of AMR spread. Many of the world's hotspots for AMR emergence and spread are in resource poor areas (LMICs), primarily in South Asia, and we have multiple collaborations with colleagues working in these regions.

The Microbiology, Infection & Inflammation (MI3) theme of the newly formed Department of Life Sciences includes multiple research groups with a focus on the genomics and epidemiology of AMR, evolution, genetics and mechanisms, pathogenesis and drug discovery/ delivery. In total, we identified over 170 active researchers (including ECRs) across the faculties of Science, Engineering and Humanities who have a research interest in this global challenge. We would encourage applicants who's research interests are multi-disciplinary, to take advantage of the breadth of AMR expertise at the University.

Prize Fellowship in Healthcare Data Science (Bioinformatics / Epidemiology)

Access to large longitudinal linked UK health data records (notably the Clinical Practice Research Datalink, NHS Digital, SAIL and UK Biobank) allows massive opportunities to address key research questions at the centre of UKRI and NIHR strategy

The epidemiology research group form a major part of one of the five research themes 'Diagnostics, Medicines and Patients. The Prize Fellow will benefit from existing structures to support cross-department collaborations in health data science. The Centre for Mathematics and Algorithms for Data will provide opportunities for the fellow to develop wider links with on-going data science research in the Departments of Mathematical Sciences and Computer Science.

The department has current strong links with several industrial partners (e.g. Pfizer, AstraZeneca, UCB, Eli-Lilly, Janssen, Novartis), with many of these having funded epidemiological projects in recent times. Pharma companies are particularly eager to access epidemiological expertise and 'real-world' data to assess disease trajectory and the effectiveness of current therapy and new agents coming to the market. There are also strong links with NHS partners, national and local charities who have funded projects recently, and with national and international consortia that allows access to relevant biobanks and datasets.

The fellow will complement and add to the existing strengths in health data science and benefit from interaction with colleagues in bioinformatics, systems biology and machine learning both within Life Sciences as well as within Mathematical and Computer Sciences.

Prize Fellowship in Neurodevelopment and Neurodegeneration

As global populations age, we are faced with the pressing challenge of finding cost-effective approaches to tackle the impacts of mental illness, cognitive decline associated with brain ageing and dementia-related neurodegeneration. Despite the clear therapeutic need there are no disease-modifying interventions available for any of the key neurodegenerative or neurodevelopmental disorders and available symptomatic treatment options for dementia and mental illnesses such as depression, schizophrenia and anxiety are limited in their effectiveness. Improved therapeutic options will only emerge from a much better understanding of the underlying molecular mechanisms.

Bath has a well-established international reputation in all these research areas with excellent facilities for animal and cell culture-based research, and can offer a strong, supportive, interdisciplinary environment for a Prize Fellow to develop an independent career in this area of global importance. Access to human brain samples is possible via the Brain Bank at Southmead and there is the potential to work with RICE at the RUH on human clinical studies.

Neuroscience research at Bath is underpinned by funding from UKRI, numerous charities and industry. The prize fellow will benefit from excellent opportunities to first secure follow-on research fellowship funding.

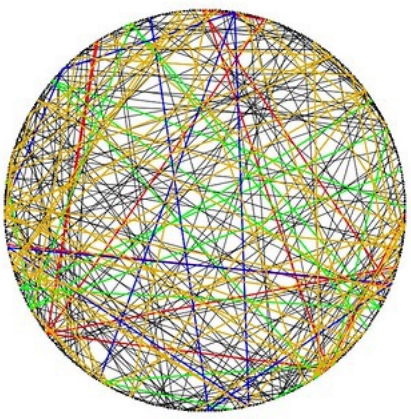
Department of Mathematical Sciences

Our department is strongly research-driven, and our research is internationally competitive both in mathematics (pure and applied, including probability and statistics), and in inter-disciplinary and industrial collaborations with real-world impact.

We are organised in six interlinked and overlapping research groups: **Algebra, Geometry and Number Theory** (AGeNT), **Analysis, Applied and Inter-disciplinary Mathematics** (AIMS), **Numerical Analysis and Scientific Computing**, **Probability**, and **Statistics**. Interaction with other departments within the University is facilitated by University Research Centres led by the department in Mathematical Biology, Nonlinear Mechanics, Mathematics and Algorithms of Data, and the Probability Laboratory. In 2015 the University made a £3 million investment in the future of the department by creating the Institute for Mathematical Innovation (IMI) to catalyse inter-disciplinary and industrial research collaborations.



Algebra, geometry and number theory (**AGeNT**) are interlinked in multiple ways and our research strongly reflects these interconnections, relying upon advanced algebraic methods in geometry as much as geometrical ideas in algebra. Our research in algebraic geometry meets representation theory, homological algebra, and moduli spaces, while work in discrete differential geometry ties in with algebraic and Lie groups, discrete groups and combinatorics. In recent years there has been a growing strength in number theory that has close ties with algebraic geometry and analysis. Bath plays host to the famous wandering COW algebraic seminar. We also host the Group Pub Forum that currently has over 1100 group theory subscribers worldwide.



Research in applied and interdisciplinary mathematics (**AIMS)** includes continuum mechanics alongside industrial mathematics, mathematical biology and networks. Particular strengths in the area of continuum mechanics include the study of water waves, and the overlap with our successful **Analysis** group in the study of PDEs. The industrial applications of Machine Learning make it an increasing area of focus for the group (as well as for **Numerical Analysis and Scientific Computing**, **Probability**, and **Statistics**). We host a new £3.3 million EPSRC Programme Grant in the Mathematics of Deep Learning. The Department of Mathematical Sciences would be open to supporting applicants to the Machine Learning Prize Fellowship advertised under the Computer Science heading.

Our staff have a strong track-record in winning research funding, including EPRSC programme grants, a Royal Society Research Professorship, and we are holders of £1 million of a Simons Collaboration “Special Holonomy in Geometry, Analysis and Physics”. We host a large number of externally funded research fellows, and five Prize Fellow alumni. There is a strong culture of inclusivity and diversity in the department, evidenced by our Athena Swan Silver Award.

Department of Mathematical Sciences

Prize Fellowship in Fluid Dynamics

Fluid Dynamics, or the study of fluid flows, encompasses a vast research area that spans through many disciplines: Engineering, Environmental Sciences, Natural Sciences and Mathematics. Specifically in Mathematical fluid dynamics is, in itself, a large research area with healthy knowledge exchange between rigorous and applied mathematics, and application areas. On the mathematical side, from Laplace's work on tides to modern analysis of the Navier-Stokes equation (one of the Clay Millennium problems) fluids have traditionally provided steady fuel to the development of Mathematics. Conversely, mathematical research has had immeasurable impact on other fields: Von Neumann's work for example laid the groundwork for the vast field of numerical methods in partial differential equations, with transformative impact on science.

Fluid dynamics in a mathematical context involves the spectrum from rigorous mathematics to impactful applications. This full spectrum is represented and well-integrated at Bath where the area is world leading and encompasses researchers across three of the six research groupings in Mathematics. In the Analysis group there is expertise in PDE theory, singularity formation and singular structures and nonlinear elliptic problems related to fluids. The AIMS group has strengths in geophysical, and bio-physiological fluid dynamics, waves, asymptotic analysis, complex fluids and modelling for industrial problems. In the Numerical analysis and Data Science group we have expertise in high performance computing for meteorology and simulation of complex flows. There is a strong track record of success in funding in fluid mechanics: four of our academics have current fellowships linked with fluid dynamics, complemented with recent substantial EPSRC funding.

We welcome applications from candidates across the spectrum of Fluid Dynamics either strengthening the current areas listed above or opening new directions. Potential new directions include the interface between Data Science and Fluid Dynamics (leveraging strengths in our Centre for Mathematics and Algorithms for Data). The candidate would incorporate the group in the Department most suitable to their research.

Prize Fellowship in Number Theory

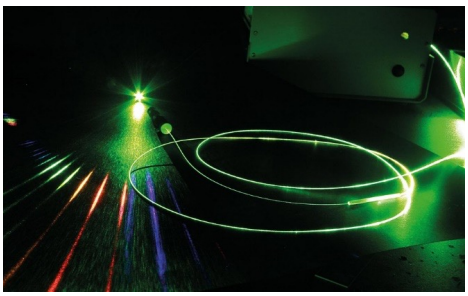
Number Theory is one of the oldest areas of mathematics and concerns the study of the whole numbers. It is of fundamental theoretical importance with deep connections to Algebra, Analysis, Geometry, and Probability, and has found spectacular applications to modern society through cryptography. Number theory captures the public imagination in a way that mathematics cannot always do. Wiles' 1990's proof of Fermat's Last Theorem and the recent results around the Twin Primes Conjecture are examples. Two of the 7 Clay Millennium Prize Problems in Mathematics concern problems in Number Theory: six of the last sixteen Fields Medallists are number theorists.

Bath has a small group in Number Theory that we hope to expand. Loughran and his students and postdocs form the main part of it: others such as Sankaran in algebraic geometry and Davenport in computer science also take part in activities. We collaborate closely with other number theory groups in the region, including the Heilbronn Institute for Mathematical Research in Bristol. There is great scope for deepening these links but also for widening our number theory research and building new collaborations.

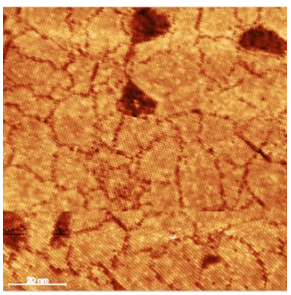
The Prize Fellow is an ideal opportunity for an ambitious early career academic to grow our research in Number Theory and to solidify its place in the University. We welcome applications in all areas of Number Theory including those with links with other research areas including Algebra, Geometry, Probability, Analysis and Computer Science.

Department of Physics

The scope of our research ranges from answering big questions in fundamental Physics to solving problems of global significance which are increasingly cross-disciplinary. We have a strong track record in publishing in high-impact journals and working with industry to realise real-world impact.







Research activity is organised across four research groups in **Astrophysics**, **Nanoscience**, **Photonics** and **Theoretical & Computational Physics**. Within each group, members share common research interests, experimental facilities, materials and intellectual knowhow. The groups provide a collaborative environment for supporting the career development of postgraduate students and staff through group seminars, grant pipeline events and joint PhD supervision. Several academics are members of more than one group.

Our vision is to deliver world-leading research in Physics by identifying and promoting the emergence of novel research themes, especially at the interface with other disciplines, while fostering research depth and rigour in our core research areas.

To support the emergence of multidisciplinary research our department has recently prioritised the development of two themes: **Healthcare** and **Energy & Quantum Materials**. These areas offer outstanding opportunities for fundamental discoveries at the interface with biology and chemistry, and for translational research. Both themes align our research strengths with UKRI priorities and are increasingly supported by a widening network of national and international stakeholders. Our healthcare research stream builds on our strengths in photonic materials for medical diagnostics and semiconductor physics for bioelectronic medicine. The energy materials stream encompasses solar cells, batteries and innovative methods for scavenging or converting energy.

Our staff are leading six international consortia totalling €21.8m and contribute to a further 32 research hubs on quantum technology, solar energy, extragalactic exploration and biomedical devices. Our department supports impact creation by (i) recognizing that interdisciplinary research opens up important avenues for impact especially when done in collaboration with clinical partners, and (ii) by treating impact as having an equal value to research. Our department's research funding strategy focuses on alignment with national and international research agendas, leadership of large consortia and programme grants, and support for Fellowships.

The **Nanoscience Group** focusses on how the quantum mechanical and thermodynamic properties of molecules, nanostructures, multilayers and glassy materials can be modified. Its research activities have a strong emphasis on quantum devices, biomedical nanoscience and scanning probe microscopy. The **Centre for Photonics and Photonic Materials** hosts the department's unique optical fibre drawing towers, which enable the fabrication of optical fibres with novel structure and properties. Its research activities focus on medical photonics, quantum optics, nanoscale photonics as well as the theory of light-matter interactions. The **Theoretical and Computational Physics Group** studies the emergence of novel collective phenomena from the complex interactions between many components. This exploits methods such as Monte Carlo simulation, network analysis and density functional theory to investigate a wide range of systems, from electrons and molecules to living organisms. The **Astrophysics Group** studies exploding stars, growing galaxies and feeding black holes in an expanding Universe. It develops cutting-edge simulations and theory and pushes the observational frontier via programmes on some of the leading instruments worldwide, including the James Webb Space Telescope, and partnership in an array of ground-based facilities.

Department of Physics

Prize Fellowship in Energy and Quantum Materials

Advanced materials for quantum technologies and novel energy technologies with a focus on thin-film and solid-state device applications is a fast-growing area in condensed matter physics worldwide. The research activities span from materials synthesis, characterisation and implementation in novel devices for new disruptive information and energy technologies which will revolutionise computing, sensing, telecommunications, electricity generation and storage.

The research area of quantum materials is not only gathering interest from industry because of the manufacturing aspects for future data storage and data hardware technologies but also has several unaddressed fundamental aspects in electron and lattice dynamics, magnetism and superconductivity with many possibilities for fundamental studies of high impact. This interdisciplinary area includes aspects of Physics, Materials Science and Engineering. We aim to attract a candidate capable of working at the interface with several disciplines and benefitting from existing collaborative links on campus at Bath and state of the art facilities such as the David Bullett Nanofabrication clean room.

Developing Sustainable Energy Technologies has been the focus of research globally in recent years. Energy materials have emerged as a key technological enabler. Polymer-based materials and their (nano)composites are being investigated for various applications from energy production and harvesting to energy storage. Examples include solar cells, batteries, capacitors and super-capacitors, where polymers play a major or a dominating role. For every application, a certain type of polymer is used.

Bath is strategically positioned to become a world-leader in experimental polymer nanocomposite research, in particular for applications in solid-state batteries, polymer energy harvesting devices and polymer (super)capacitors for high-temperature electricity storage applications. The Nanoscience group in the Department of Physics has several active industrial and academic collaborations on energy and quantum materials. Across Bath, the Departments of Chemistry and Mechanical Engineering have active research in batteries and energy harvesting polymer composites. To build an unrivalled capacity and strengthen our position in this field of research, we need to recruit a candidate with a strong experimental background in polymer materials for energy applications or in experimental studies of quantum materials and their implementation in next generation quantum devices.

Prize Fellowship in Physics for Healthcare

The area of Physics for Healthcare could include bioelectronics and biophotonics for bio/medical/healthcare applications of photonics, neural networks and sensor technologies. Applications could range from the purely biological through to clinical medicine. Key physical effects underlying this research area are the interaction of light with matter, the ability of light to image, including remotely and at small scale, and quantitative and multiscale approaches which have previously provided key understandings of brain function leading to novel diagnosis methods and informing the design of neuronal devices for bioelectronic medicine. These effects are of fundamental interest to a large body of physicists and are areas where we at Bath have a well-established reputation and capability. The Physics research strategy has identified Biophotonics and Bioelectronics as an interdisciplinary theme to be developed through the REF2028 period. This research area is growing with over £10M in current funding (Proteus, CresPace, Royal Society, donations).

Bioelectronics is a fast-growing research area which the appointee might be expected to expand. Bath researchers have made breakthroughs in predicting neuronal behaviour, building the first neuronal cardiac pacemaker, ferroelectric synapses for unsupervised-learning, and nanoengineering biosensors. Their research has created two start-ups (Transdermal diagnostics, Ceryx Medical). Research is underpinned by the David Bullett Nanofabrication Facility, atomic probe laboratory for designing bio-interfaces and workstations supporting computer intensive data assimilation. Possible directions range from the theory & multiscale modelling of dynamical network adaptation in the context of supervised learning, the development of memristive or organic materials for unsupervised learning, and functional nanomaterials for sensor applications.

Our past photonics research has had high impact and through this appointment we see significant potential to continue that. Relevant current research in our Centre for Photonics and Photonic Materials includes the development of new pathways to chiral imaging, novel endoscopic devices (being commercialised through a proposed spin-out company) and the use of hollow fibres to both generate and deliver ultraviolet light in clinical applications for which no adequate therapy exists. Our nationally unique optical fibre drawing tower and our other shared equipment base, our experience in clinical engagement/trials and our broader expertise in applied photonics opens a range of possible directions for the right appointee, from novel imaging techniques through all-fibre or lab-on-a-chip instruments to new forms of light source for biomedical applications, and our current research programmes provide an array of existing collaborators both within physics and across the discipline base.

Intended outcomes might range from techniques to speed the development of new drug compounds, ways to sense physical measures of health (including ways to sense the presence of specific compounds or bacteria) either in vivo or in a laboratory, or ways to treat specific medical conditions. We therefore expect that the appointee would wish to collaborate with researchers either in the life sciences or in a clinical setting, or both. They may also identify pathways to take their work further, either through innovation activities, through pure IP exploitation, or through collaboration with existing businesses.

Milner Centre for Evolution

The Milner Centre is a cross-faculty research centre, bridging Life Sciences, Mathematics, Health, and Education. We are driven by three core objectives: to ask the big evolutionary questions, to find new technological and clinical research applications, and to take evolutionary research into the community. Our world-leading evolution education research is helping to shape the agenda in schools, and our popular science and outreach articles are amongst the most highly accessed across the University.

Housed in new (as of 2018), purpose-built facilities on the south of the Claverton Down campus, the Milner Centre for Evolution offers outstanding lab and office facilities for a group of 15 PIs and fellows, along with their associated lab members. Our research interests span the full range of evolutionary scales, from genes to populations, species, higher taxa and communities. In the latest Research Assessment Exercise our research was highlighted as being of especially high quality.



Prize Fellowship in the Milner Centre for Evolution

We intend to recruit in any area of evolutionary science. Evolution is valuable simply because it asks blue skies fundamental questions, be these macro -or micro-evolutionary. In this regard, the field (and the centre) have had considerable success. More recently, the lessons that we have learnt, and the tools developed, through such fundamental research have been applied to solve real-world problems. This includes real-time tracking of disease outbreaks, design of transgenes for gene therapy and improved application of anti-cancer drugs. We encourage applications in both fundamental and applied research. In addition, research in the centre has a strong theoretical and empirical basis and applications from both areas are encouraged.

Bath is well placed to be a Centre for pure and applied evolutionary research along with research into how best to educate in the genetics/evolution sphere. Our past research has had high impact and we expect the successful candidate to continue in this tradition. The Centre has good connections with microbiological and mathematical research.

We expect that the appointee would seek to collaborate with researchers within the Milner Centre or more broadly. They would be encouraged to research at world class levels but also to identify pathways to progress their work further, whether this be through innovation/IP activities or through engaging with the community.

Institute for Sustainability

As an evolution of the long-established and internationally renowned Centre for Sustainable and Circular Technologies (www.csct.ac.uk), the University of Bath's new Institute for Sustainability brings together a unique range of expertise to address the core focus of sustainability. Our research spans curiosity-driven molecular science, challenge-led science and engineering, and whole systems approaches.

We take an interdisciplinary approach to research, innovation, PhD training, and development of Early Career Researchers. Core members of the Institute lead a number of large EPSRC initiatives, including the CDT in Sustainable Chemical Technologies, the UK Catalysis Hub, the Industrial Decarbonisation Research and Innovation Centre, (IDRIC) and the Centre for People-led Digitisation (P-LD). The Institute is also home to the Innovation Centre in Applied Sustainable Technologies, (iCAST), and the UKRI Co-ordinator in Hydrogen and Alternative Liquid Fuels.

Our research, training and innovation programmes are underpinned by world-class facilities housing state-of-the-art equipment for chemical and material characterisation, analysis and testing, computation, and digitisation as well as for scale-up of chemical, biochemical and materials manufacturing and processing.

With strategic support from the University, the Institute will be launched formally in January 2023 with the goal to lead the academic community in Bath to work together on ambitious ideas to deliver against the UN SDGs by growing capabilities in areas such as small molecule activation, industrial decarbonisation, circular economy, sustainable manufacturing and digitalisation.



Institute for Sustainability



Prize Fellowship in Sustainable Chemical Technologies

We aim to recruit an exceptionally motivated and qualified scientist or engineer to build an independent research career and become a leader within their chosen field. The successful candidate will have postdoctoral experience in any area of sustainable chemical technologies but will be expected to build independent research in at least one of the following areas in order to complement the strategic direction of the Institute:

- modification and utilisation of biopolymers;
- sustainable polymer engineering and processing;
- electrocatalysis for sustainable transformations;
- analytical and systems aspects of pollution and toxicology.

The Institute has a critical mass of around 60 PhD students and links with over 70 companies in the field of sustainable chemical technologies. Within the areas in which we are seeking to appoint a Prize Fellow, we also have critical mass research activities with which the Prize Fellow will find opportunities for mentoring and collaboration.

The strategic ambition together with the collaborative research culture of the new Institute provides an exciting opportunity for the right candidate to develop their academic career rapidly. With strong support from the Institute, we will expect the new Prize Fellow to quickly establish a research group and an international reputation in a distinctive area of sustainable chemical technologies.