

THE UNIVERSITY OF MANCHESTER
PARTICULARS OF APPOINTMENT
FACULTY OF SCIENCE & ENGINEERING
SCHOOL OF NATURAL SCIENCE
DEPARTMENT OF PHYSICS & ASTRONOMY
RESEARCH ASSOCIATE IN COSMIC MICROWAVE BACKGROUND RESEARCH
(SIMONS OBSERVATORY:UK PROJECT) (FIVE POSTS AVAILABLE)

VACANCY REF: SAE-019471

Salary: £31,406 to £49,210 per annum across various universities, depending on relevant experience

Hours: Full Time

Duration: Fixed term from 1 October 2022 until 30 September 2025

Location: Multiple (Manchester, Cambridge, Oxford and London)

Enquiries about the vacancy, shortlisting and interviews:

Manchester positions: Professor Michael Brown

Email: m.l.brown@manchester.ac.uk

Cambridge position: Professor Anthony Challinor

Email: a.d.challinor@ast.cam.ac.uk

Oxford position: Professor Angela Taylor

Email: angela.taylor@physics.ox.ac.uk

Imperial College London position: Professor Andrew Jaffe

Email: a.jaffe@imperial.ac.uk

Background

The Simons Observatory:UK (SO:UK) collaboration seeks five Post-Doctoral Research Associates (PDRAs) to work on the [Simons Observatory](https://simonsobservatory.org/) (SO <https://simonsobservatory.org/>). SO is a next-generation Cosmic Microwave Background observatory currently under construction in the Atacama Desert in Chile and due to begin early science operations in early 2023. The positions will be based at The University of Manchester (two positions), The University of Cambridge (one position), The University of Oxford (one position) and Imperial College London (one position). The successful candidates will work with the local SO:UK

Investigators at each institute on the development of the SO data processing pipeline and on the preparation and delivery of the Science Ready Data Products (SRDPs) for SO.

SO:UK is a coordinated UK contribution to the US-led SO project consisting of (i) a data centre (at the University of Manchester); (ii) a program of algorithm development contributing to the SO data processing pipeline; and (iii) a significant contribution to the observatory infrastructure/instrumentation. A key area of activity for both the data centre and algorithm development work is the delivery of the SO Science Ready Data Products (SRDPs).

One of the Manchester appointments will manage the UK-based data centre and will play a lead role in coordinating the associated delivery of the SO SRDPs. Given the responsibilities of this role we seek candidates with demonstrated experience in managing/coordinating the efforts of distributed teams of scientific researchers, graduate students and/or software engineers. They should also have experience in high-performance and/or high-throughput computing on high-specification hardware.

The four other Research Associate appointments will focus on algorithm development in the following areas:

- Map-making and validation of the SRDPs for Sunyaev-Zel'dovich analysis at The University of Manchester.
- Simulations and validation of the SRDPs for gravitational lensing analysis at the at the University of Cambridge.
- Time-ordered data processing and validation of the SRDPs for B-mode polarisation analysis at the University of Oxford.
- Transient pipeline development, simulations and validation of the SRDPs for B-mode polarisation analysis at Imperial College London.

For all five roles, we seek candidates with significant theoretical and analytic skills and who have experience in developing and applying analysis techniques for precision CMB studies. In particular we are interested in applicants who have experience of modern coding practices and software techniques. Working as part of the SO Data Management team, Pipeline Working Groups and Analysis Working Groups, the successful candidates will collaborate closely with international SO colleagues in order to deliver on the overall objectives of the SO project.

Key Responsibilities, Accountabilities or Duties

For all five positions, the range of duties will include:

- Design, implementation and testing of specific modules for incorporation into the overall SO data processing pipeline.
- Original theoretical research and the development of new techniques for modelling the data from modern Cosmic Microwave Background (CMB) experiments.
- Original research on data analysis and scientific interpretation using data from CMB experiments.
- Collaboration with PhD students involved in the SO project.

- Regular presentation of work and results at SO collaboration meetings, international conferences and events.
- Report on results of research in peer-reviewed journals, in particular writing of 1st author papers.

In addition to the above, the Data Centre Manager's duties will include:

- Day-to-day management of the data centre staff and activities.
- Coordination of the interaction of the data centre activities with the wider SO:UK and SO teams, including oversight of the production of the SO SRDPs.

Person Specification

Essential (for all positions):

- Have, or be about to obtain, a relevant PhD (or equivalent).
- Specialist knowledge and experience of CMB analysis techniques.
- Proficiency in modern coding languages and practices including Python, C, C++, Github etc.
- Experience in working with data from CMB telescopes.
- Experience in working in large collaborations.
- Excellent communication and interpersonal skills.
- Excellent time management and organisational skills.
- Ability to work independently and as part of a team.
- Ability to liaise confidently and effectively with a range of individuals.
- Flexible approach to dealing with research problems as they arise.
- Willingness to learn and develop.
- Ability to present in both written and oral publications.
- Ability to meet deadlines.
- Strong journal publication record.
- The ability to evaluate complex data.
- Ability to contribute to broader management and administrative processes.
- Ability to assess and organise resources.
- Understand equal opportunity issues as they may impact on areas of research content.

Additional Essential criteria for Data Centre Manager position:

- Experience in high-performance and/or high-throughput computing techniques and in the use of high-specification computing clusters.
- Experience in managing teams of scientific researchers, graduate students and/or software engineers.

Additional Essential criteria for Imperial College London position:

- Specialist knowledge and experience of time-series analysis and transients.

BACKGROUND INFORMATION FOR THE UNIVERSITY OF MANCHESTER POSITIONS:

The University of Manchester

The University of Manchester (www.manchester.ac.uk) enjoys a global reputation for its research and its innovative approach to learning, with an on-going £1 billion investment in facilities, staff and buildings. This builds on our tradition of success that stretches back over 180 years. The birth of the modern computer, the splitting of the atom, the founding principles of modern economics, the discovery of graphene, and the birthplace of chemical engineering – these and many more world changing innovations have their roots at our University. We are at the forefront of the search for solutions to some of the world's most pressing problems, boasting strong collaborative links with industry and public services.

Manchester has the largest student community in the UK, with more than 28000 undergraduates and 11000 postgraduates attracted by the high international standing of the academic staff, by the superb research and teaching facilities, and by the cultural assets both of the university and the city of Manchester itself. For further information, please consult www.manchester.ac.uk.

Faculty of Science and Engineering

The Faculty of Science and Engineering is one of the largest in the UK with over 10,000 students, 2,000 staff and strategic links with over 300 industrial companies. We are leading research efforts in energy, nuclear science and technology, computer science, atmospheric science, bioscience and biotechnology, photon science and photonic materials, imaging and visualisation, security, and advanced materials, attracting an annual income of over £200 million.

Founded in 1824, we have a history of breaking new ground in science and engineering. Rutherford began his work here on splitting the atom and later received the Nobel prize in 1908 for his work on radioactivity. The 'Baby', the world's first stored-program computer, and Manchester Mark 1 came into being here. It is the birthplace of Chemical Engineering. The world's first steerable radio telescope at Jodrell Bank was built here by Bernard Lovell. Since 1906, when former student Joseph Thomson won the Nobel prize for physics, the University has produced more than 20 Nobel Laureates, the most recent of which were Professor Andre Geim and Professor Konstantin Novoselov in 2010 - for their pioneering work with the world's thinnest material, graphene.

Department of Physics and Astronomy

The Department of Physics and Astronomy is one of five Departments in the School of Natural Sciences which is in the Faculty of Science and Engineering. There are 95 academic staff in the Department with expertise in areas such as condensed matter physics (which includes Prof. Andre Geim and Prof. Konstantin Novoselov who won the 2010 Nobel Prize in Physics for their work on graphene), atomic physics, liquid crystal physics, biological physics, accelerator physics, nuclear physics, particle physics, astrophysics, astronomy, cosmology, complexity and theoretical physics. Jodrell Bank Observatory (part of Jodrell Bank Centre for Astrophysics) also forms part of our Department. We have approximately 150 research staff, 250 PGR students and 1200 UG/PG students.

The Department has ranked in the top fifteen in the Academic Ranking of World Universities for Physics since 2011. In the Research Excellence Framework (REF) 2014 the Department was in

the top three institutions for its proportion of “world-leading” components and was first for non-academic impact.

The Department values teaching highly and scored 90% in the 2019 National Student Survey. The Department has the largest undergraduate intake of any Physics department in the UK. Student cohorts are around 1120 and 100 for undergraduate and postgraduate taught programmes respectively. Taught postgraduate courses include Masters programmes in Photon Science, Nuclear Science and Technology, and Radio Imaging and Sensing.

P&A research is based in four topical divisions: Accelerator, Nuclear and Particle Physics; Condensed Matter (which includes Prof. Andre Geim and Prof. Konstantin Novoselov who won the 2010 Nobel Prize in Physics for their work on graphene); and Jodrell Bank Centre for Astrophysics. The Department operates the world-renowned Jodrell Bank Observatory (JBO). The Jodrell Bank site also provides the permanent home for the international headquarters of the Square Kilometre Array (SKA) Organisation. The Department is deeply involved in the £61 million National Graphene Institute (NGI), opened in 2015. The NGI building has 7350 m² research space over five floors and includes 1500m² of cleanrooms, lab facilities, office space and seminar rooms.

The Department of Physics and Astronomy is committed to promoting Equality, Diversity, Inclusion and Access through contributing to the University’s social responsibility agenda, demonstrating a commitment to its policies, activities and delivery of initiatives including the Athena SWAN charter for promoting women’s careers in STEMM subjects (science, technology, engineering, mathematics and medicine) in higher education. The Department has held JUNO Champion status since 2016 for its commitment to achieving gender equality which positively promotes inclusivity for all.

Further information on the Department of Physics and Astronomy can be found at www.physics.manchester.ac.uk.

Jodrell Bank Centre for Astrophysics

Jodrell Bank Centre for Astrophysics (JBCA) is one of the largest academic astronomy research groups in Europe, studying a very broad range of astrophysical research, in particular Cosmology, Galaxy formation and evolution, AGN and Star-formation, Galactic Astronomy, Time-domain astrophysics (including Pulsars, Masers and Exoplanets) and Solar Physics. Research staff are located in the Alan Turing Building on the main Manchester campus, and comprises around 30 academic staff, 50 postdoctoral researchers, and 60 post-graduate students. The Group publishes in excess of 400 refereed papers per year with many appearing in the highest impact journals. Academic staff are involved in many international collaborations with colleagues in Europe and North America but increasingly involves developing countries in Africa, Asia and South America. JBCA operates both the 76-metre Lovell Telescope, and the UK national radio astronomy facility, e-MERLIN/VLBI. JBCA’s telescope facilities are located at Jodrell Bank Observatory, which also hosts the Headquarters of the Square Kilometre Array (SKA) organisation. JBCA and SKA staff have close links, with several SKA staff enjoying honorary university appointments. Several large compute facilities are operated by the group both on campus and at the observatory.

BACKGROUND INFORMATION FOR THE UNIVERSITY OF CAMBRIDGE POSITION:

The University of Cambridge

The University of Cambridge is one of the world's oldest and most successful universities. We are a renowned centre for research, education, and scholarship that makes a significant contribution to society. The University is consistently ranked amongst the top universities in the world. Our affiliates have won more Nobel Prizes than any other University.

Our sustained pursuit of academic excellence is built on a long history of first-class teaching and research within a distinctive collegiate system. For eight centuries our ideas and innovations have shaped the world. Our principal goal is to remain one of the world's leading universities in an increasingly competitive global higher education sector. Today the University of Cambridge is at the centre of a cluster of over 4,300 businesses employing 58,000 people.

Our capital investment projects include the West Cambridge site, the North West Cambridge development and the growth of the Biomedical Campus in the south of the city. The North West Cambridge development includes the opening of a primary school – the first in the UK to be managed by a University. So we are deeply embedded in, and committed to serving, our local community. These are all conspicuous signs of a University that is not only adapting to new needs, but also anticipating the future.

About Us

<https://www.jobs.cam.ac.uk/offer/>

The University is one of the world's leading academic centres. It comprises 150 faculties and departments, together with a central administration and other institutions. Our institutions, museums and collections are a world-class resource for researchers, students and members of the public representing one of the country's highest concentrations of internationally important collections. The University has an annual income of £2 billion. Research income, won competitively from the UK Research Councils, the European Union (EU), major charities and industry, exceeds £500 million per annum and continues to grow.

The Colleges and the University remain committed to admitting the best students regardless of their background and to investing considerable resources both in widening access and financial support. The 31 Colleges are self-governing, separate legal entities which appoint their own staff. Many academic staff are invited to join a College as a Teaching Fellow, which provides a further social and intellectual dimension. The Colleges admit students, provide student accommodation and deliver small group teaching. The University awards degrees and its faculties and departments provide lectures and seminars for students and determine the syllabi for teaching and conducting research.

Our instinct for seeking out excellence and setting up enduring and mutually beneficial collaborations has led us to establish strategic partnerships across the globe. Whether it is the successful Cambridge-Africa Programme involving universities in Ghana, Uganda and elsewhere on the African continent; or the close association with the government of India to pursue new research in crop science; or the creation, with Germany's Max Planck Institutes, of a Cambridge-based centre for the study of ethics, human economy and social change – international partnerships are now an inextricable part of the University's make-up

Kavli Institute for Cosmology, Cambridge

The Kavli Institute for Cosmology, Cambridge, or KICC, was founded in 2008 and comprises astrophysicists and cosmologists from across the University of Cambridge. The Institute consists of members from the Institute of Astronomy, Cavendish Astrophysics Group of the Department of Physics, and the Centre for Theoretical Cosmology in the Department of Applied Mathematics and Theoretical Physics. KICC has a dedicated building located between the Institute of Astronomy and the Battcock Centre for Experimental Astrophysics.

KICC provides an extremely lively and stimulating scientific environment, bridging the gap between the parent departments and furthering our understanding of cosmology and the Universe.

The scientific programme of KICC is organized around the following science themes:

- The cosmic microwave background and the early Universe
- The formation and evolution of galaxies and of supermassive black holes
- The epoch of reionization
- Evolution of the intergalactic medium
- The nature of dark matter
- Large-scale structure and precision cosmology
- Gravitational waves

Situated two kilometres west of the centre of Cambridge, in extensive gardens and woodland, the site provides an extremely pleasant working environment.

The KICC has been made possible by an endowment from the Kavli Foundation. The donation has been used to establish a number of prestigious Kavli Institute Fellowships, which are awarded to outstanding postdoctoral researchers. Fellows will be affiliated with one of the three parent departments.

Additional information about KICC can be found at <http://www.kicc.cam.ac.uk>.

Institute of Astronomy

The Institute of Astronomy (IoA) represents the largest concentration of research astronomers in the United Kingdom. The original Observatory building has been extensively renovated, the Hoyle building has been modernised and extended, while the community has recently been extended and enriched by the addition of new buildings to accommodate the Kavli Institute for Cosmology and the Battcock Centre (Cavendish Astrophysics) on the Institute's site.

The research complement of the Department consists of 18 permanent university teaching staff, approximately 75 post-doctoral researchers, fellows and long-term visitors, and some 45 graduate students. The Institute is characterised by an extremely broad range of research interests; theoretical work spans aspects of cosmology, high-energy astrophysics and exoplanet, stellar, Galactic and extragalactic astronomy, and observational work encompassing a similar range of topics is carried out using ground-based (Vista Hemisphere Survey, Local Volume Legacy) and space-borne facilities in the X-ray, ultra-violet, optical and infra-red spectral regions (XMM, Gaia, Planck).

There is an active visitor and conference programme. Several seminars per week are held during term time. In most years, one, and often two, international conferences are held, embracing a wide range of subject areas.

The IoA hosts the Cambridge Astronomical Survey Unit, which is a leading participant in data reduction and analysis for survey astronomy, including development of the Astrophysical Virtual Observatory, and its application to major ground and space projects.

Additional information is available at <http://www.ast.cam.ac.uk/>.