UNIVERSITY OF SUSSEX

1 Advertisement Ref: 1471

School of Mathematical and Physical Sciences
Department of Physics and Astronomy
Lecturer in Experimental Physics (Full time, Permanent)
Salary range: starting at £39,324 and rising to £46,924 per annum
Expected start date: 01 January 2016 or soon after

As part of a new strategic development in the School of Mathematical and Physical Sciences, the Department of Physics at the University of Sussex is seeking to appoint a Lecturer in Experimental Physics. Targeted research areas include quantum physics and technologies with a focus on cold atomic systems in connection with solid state or other quantum systems.

Candidates should be thoroughly experienced in relevant areas of experimental physics and have a research and teaching track record in atomic, molecular and optical physics and related fields. Undergraduate and postgraduate teaching may be required across a wide range of the Department’s curriculum in various forms, including lectures, small group teaching and laboratory supervision. The successful candidate is expected to spend a majority of his/her time on research.

The appointment will be made at grade 8 (Lecturer B), salary point depending on demonstrated experience and skills.

Closing date for applications: 23 November 2016

For full details and how to apply see www.sussex.ac.uk/jobs

The University is committed to equality and valuing diversity, and applications are particularly welcomed from women and black and minority ethnic candidates, who are under-represented in academic posts in science, engineering and mathematics at Sussex.

2. Senior leadership and management

The Vice-Chancellor (Professor Adam Tickell) is the senior academic officer and, as Chief Executive, is responsible to the University Council for management of the University. He is supported by an executive group which includes the three Pro-Vice-Chancellors, the Registrar and Secretary, the Director of Finance and the Director of Human Resources. The Heads of the Schools of Studies at Sussex report to the Pro-Vice-Chancellors.

3. The School / Division

The School of Mathematical and Physical Sciences

The School of Mathematical and Physical Sciences was created in 2009 as part of a University wide restructuring. It brings together two outstanding and progressive departments — Mathematics, and Physics & Astronomy. The School aims to capitalise on the synergy between these subjects to deliver new and challenging opportunities for faculty and students.

The School of Mathematical and Physical Sciences combines pioneering research and stimulating teaching in an interdisciplinary academic setting. The faculty work at the frontiers of their fields, as is reflected in the recent growth of both subjects. Each department has a number of thriving research groups and links with outside agencies.
Acting Head of School is Professor Philip Harris.

**The Department of Mathematics**

The Department of Mathematics currently has 23 faculty divided into six research areas: Analysis and PDEs including Financial Mathematics, Mathematics Applied to Biology, Numerical Analysis and Scientific Computing, Geometry and Topology, and Probability and Statistics.

In the 2014 research excellence framework (REF), 81 per cent of the research outputs in Mathematics at Sussex were rated as world-leading (4*) or internationally excellent (3*). Mathematics at Sussex was ranked 22nd in the UK in a recent league table (Guardian 2016). It also repeatedly scores well in the UK National Student Survey.

The Department has more than 350 undergraduate students, 64 MSc students, more than 60 PhD students and 2 research fellows.

**Research Areas**

Research in Mathematics at Sussex is currently supported by international and national grants. The Department coordinates an Innovative Training Network (Makridakis, EU H2020) and is partner of another Innovative Training Network (Madzvamuse, EU H2020). The Leverhulme Trusts funds two research projects (Duering and Madzvamuse). EPSRC funds several PhD positions and a first grant (Koch). The Icelandic Research Fund contributes to the research activities of Giesl and Scalas. Faculty at Sussex recently organised specialised meetings and conferences hosting distinguished researcher with support from the London Mathematical Society.

**Analysis and PDEs**

Research in this group spans a broad spectrum underpinned by the rigorous treatment and analysis of linear and nonlinear partial differential equations (PDEs). This ranges from PDEs arising in geometry, physics and mechanics to those in control theory, finance and material sciences. A core of our activities is on calculus of variations and geometric and harmonic analysis and there are subgroups with major interests in geometric measure theory, spectral theory, function spaces, dynamical systems, fluid mechanics, nonlinear elasticity and homogenisation. Current members are: Dr Filippo Cagnetti, Dr Miroslav Chlebik, Dr Masoumeh Dashti, Dr Peter Giesl, Dr Gabriel Koch, Prof Michael Melgaard, Dr Mariapia Palombaro, Dr Qi Tang, and Dr Ali Taheri (coordinator).

Web site: http://www.sussex.ac.uk/apde/

**Mathematics Applied to Biology**

The Mathematics Applied to Biology research group develops new theoretical, mathematical and computational frameworks, as well as cutting-edge techniques and software algorithms for problems arising in a wide range of disciplines, such as cell motility and cell morphology, cell biology, developmental biology, biomedicine, epidemiology, immunology, neural systems, genetics networks and engineering.

The group's mathematical expertise is at the interface of dynamical systems, geometric PDEs, bulk-surface reaction diffusion systems, stochastic processes, graph/network theory and time-delayed systems. Current members are: Dr Konstantin Blyuss, Dr Istvan Kiss (coordinator) Dr Yuliya Kyrychko and Dr Anotida Madzvamuse.

Web site: http://www.sussex.ac.uk/mab/
Numerical analysis and scientific computing

Research concentrates on the modelling and analysis of problems coming from the physical and life sciences, engineering and finance, leading to partial differential equations. The interests of the group spans from the mathematical analysis of mathematical (mainly differential) models to their computer implementations (scientific computing), passing through the development and analysis of novel numerical methods. Current members are: Dr Bertram Duering, Dr Max Jensen, Dr Omar Lakkis, Prof Charalambos Makridakis (coordinator) and Dr Vanessa Styles.

Web site: http://www.sussex.ac.uk/nasc/

Geometry and Topology

Research interests are in the theory of knots, braid groups, topology, combinatorics of finite projective spaces, coding theory and its connections between finite geometry and algebraic geometry, combinatorial structures, algebraic geometry over finite fields, classical algebraic and projective geometry. The group comprises Research Faculty: Prof James Hirschfeld, Dr Roger Fenn, and Research students: Awss Al-Ogaidi, Salam Alabdullah, Zainab Hamed, Mohammad Hazzazi, Fatma Karaoglu.

Probability and Statistics

Research interests are in probability theory, discrete-time and continuous-time stochastic processes, rigorous statistical physics, optimal strategies in diverse games and gambles, the mathematics of spread betting and the development of statistical methodologies for problems arising in engineering and medicine. The group comprises Research Faculty: Dr Andrew Duncan, Dr Nicos Georgiou, Prof Enrico Scalas (coordinator), Dr Dimitrios Tsagkarogiannis, Emeritus Faculty: Prof Charles Goldie, Dr John Haigh, Dr Derek Robinson, and Research Students: Stephen Ashton, Panagiota Birmpa, and Mailan Trinh.

The Department of Physics and Astronomy

The Physics & Astronomy Department currently has 39 faculty divided into four research groups: Astronomy; Theoretical Particle Physics; Experimental Particle Physics; and Atomic, Molecular & Optical Physics.

We are part of the South East Physics Network (SEPNet) - a consortium of nine physics departments of the University of Sussex, University of Kent, Queen Mary University of London, Royal Holloway University of London, Southampton University, University of Surrey, University of Portsmouth, University of Hertfordshire, and the Open University. This has been awarded substantial government funding (from HEFCE) to support vital UK science research, teaching and development.

In the highly acclaimed Thomson Scientific 2006 ranking of the research impact of all departments in UK universities, the University of Sussex came top in Physics and in Space Science/Astronomy. It was ranked 8th in the UK in the Research Assessment Exercise of 2008. It was ranked 5th in Great Britain and 37th in the world according to the Times Higher Education World University Rankings (2010). Sussex is ranked 5th in UK for Physics in the Times Good University Guide (2013), and scored 100% for overall satisfaction in the 2013 National Student Survey.

The Department has approximately 350 undergraduate students, 30 MSc students, over 110 PhD students and 41 postdoctoral fellows.
Research groups
4.1. The Astronomy Centre

Current research interests are: physics of the early Universe; constraining cosmological models; numerical simulations of structure formation; extragalactic survey science; and galaxy formation and evolution. The first of these has strong overlaps with the Theoretical Particle Physics group.

The Centre consists of 12 permanent faculty members: Chris Byrnes (Royal Society URF), Ilian Iliev, Antony Lewis, Jon Loveday, Seb Oliver (Director of Research & KE for the School), Kathy Romer, Mark Sargent, David Seery, Robert Smith, Peter Thomas (Director of the Astronomy Centre), Stephen Wilkins; there are currently 8 postdoctoral researchers and 22 PhD students. The group’s main source of funding comes from a consolidated grant Science and Technology Facilities Council (STFC) and EU funding in the form of Starting, Consolidator and Cooperation grants.

The Centre’s activity is focussed around three themes: Theoretical cosmology, with focus on inflationary cosmology, the cosmic microwave background, dark energy, and statistical methods; Simulations/modelling of reionization, large-scale structure, galaxy and cluster formation; Observations; surveys of galaxies and clusters from the infra-red through to X-ray.

We have major roles in extra-galactic surveys: Seb Oliver coordinates the Herschel Multi-tiered Extra-galactic Survey (HerMES) and EU funded Herschel Extra-galactic Legacy Project (HELP); Kathy Romer leads the XMM Cluster Survey (XCS); Jon Loveday leads the Galaxy Mass Assembly (GAMA) spectra working group. We are partners in various supercomputing collaborations including COSMOS and VIRGO. We have key roles in Cosmology and Dark Energy studies including Planck and the Dark Energy Survey.

The Centre has access to substantial computing resources, including locally and various supercomputing consortia.

The Astronomy Centre’s web site is http://www.sussex.ac.uk/astronomy/

4.2. The Atomic, Molecular & Optical (AMO) Physics Group

Research in the AMO group at Sussex is devoted to the study of fundamental physics and quantum effects and technologies using the techniques of atomic and laser physics. The research covers both experimental and theoretical AMO physics.

There are five experimental faculty in the AMO group. Winfried Hensinger is developing new quantum technologies, looking at novel ways to trap and manipulate ions for large scale quantum computing. These experiments provide a basis for efficient quantum information processing in large scale quantum networks. Matthias Keller is investigating the interaction of single photons and ions assisted by optical cavities with the aim of generating large scale entangled states and developing quantum networks. His work also includes the physics of trapped molecular ions. Alessia Pasquazi is working on ultra-fast photonics and also on optical sources for quantum technologies. Marco Peccianti's research is focussed on Tera-Hertz Imaging and applications of Tera-Hertz radiation. Jose Verdu's team is developing a novel Penning trap technology based upon superconducting microwave transmission-lines. This work has applications to circuit-QED with trapped electrons, quantum metrology and mass spectrometry.

There are four theorists in the AMO group. Jacob Dunningham is investigating Bose-Einstein condensates and quantum technologies with a particular emphasis on quantum metrology, sensing, and imaging. Claudia Eberlein works on quantum field theory applied to atomic, optical, and nano-physics. Barry Garraway (AMO group leader) is developing new kinds of atom traps
with applications to quantum information and quantum metrology and in addition works on cavity QED and non-Markovian dynamics. Diego Porras applies the techniques of quantum optics to condensed matter systems.

With the nine faculty there are currently five research fellows and 23 PhD students in the AMO group. Sources of funding include the European Union, EPSRC and European and national research networks on quantum information processing. The Atomic, Molecular & Optical Physics group web site is http://www.sussex.ac.uk/amo

In addition, we have just appointed Professor Peter Kruger, who is starting a major activity in the areas of Quantum Systems and Technologies. This will involve a range of experiments and device development at the interface of cold atomic and condensed matter physics.

4.3. The Experimental Particle Physics (EPP) Group

The Sussex EPP group counts ten permanent faculty members, plus one Emeritus Professor. The group's main source of funding is the Science and Technology Facilities Council (STFC), with additional support from the European Research Council (ERC) and the Royal Society.

Antonella De Santo, who is also the EPP Group Leader, together with Fabrizio Salvatore has established and leads a fast-growing team working on the ATLAS experiment at the CERN Large Hadron Collider (LHC). The other ATLAS faculty members are Lily Asquith, Alessandro Cerri and Iacopo Vivarelli. The group has a long-standing leadership in the search for supersymmetry at ATLAS, and also leads in the areas of jet physics, Higgs physics, flavour physics, and top physics. Sussex also holds key responsibilities in the ATLAS High-Level Trigger (HLT) system, including in view of future LHC and ATLAS upgrades. It also has a major role in the proposed Level-1 tracking trigger project, for use by ATLAS at the High-Luminosity LHC.

Historically, the Sussex EPP is world-renowned for its high-precision measurement of the neutron electric dipole moment (EDM). The EDM is uniquely sensitive to physics beyond the Standard Model, and the group is currently involved in the nEDM experiment at the PSI. Philip Harris leads this effort at Sussex together with Clark Griffith and Visiting Senior Lecturer Mike Hardiman.

Sussex EPP also boasts a vibrant and expanding programme of neutrino physics. Sussex is one of the leading UK institutes involved in the SNO+ experiment, which seeks to determine whether the neutrino is its own antiparticle by searching for neutrino-less double-beta decays. Simon Peeters leads the SNO+ effort at Sussex, together with Lisa Falk and Jeff Hartnell. Additionally, Jeff Hartnell was recently awarded substantial ERC funding to work on the Fermilab-based NOνA neutrino oscillation experiment and the future long-baseline programme (LBNE/LBNF). Peeters and Falk are also involved in LBNE/LBNF.

Sussex EPP currently has ten postdoctoral level researchers, eleven PhD students, three engineer/technician posts directly involved in EPP research, and a Linux system administrator. We have a number of well-equipped laboratories, and we enjoy good access to the University's technical facilities, including shared technicians. Sussex EPP researchers have uncontended access to a dedicated Grid Tier-3 cluster, and Sussex is a member of the SouthGrid Tier-2 grouping of Grid-enabled research institutions in the South of England.

Sussex EPP has close links with colleagues in the Sussex Theoretical Particle Physics group and with other partners in the SEPnet consortium.

The Experimental Particle Physics group web site is http://www.sussex.ac.uk/epp
4.4. The Materials Physics Group

This is a new research group set up by Professor Alan Dalton who joined the Department from Surrey University in February 2016.

A number of new appointments are underway.

The group will focus on understanding the fundamental structure-property relationships in materials containing one- and two-dimensional structures such as carbon nanotubes, graphene and other layered nanomaterials. Prof Dalton is particularly interested in developing viable applications for nano-structured organic composites (mechanical, electrical and thermal). He is also interested in the directed-assembly and self-assembly of nanostructures into functional macrostructures and more recently interfacing biological materials with synthetic inorganic and organic materials and associated applications.

The Materials Physics group webpage is http://www.sussex.ac.uk/materials-physics/

4.5. The Theoretical Particle Physics (TPP) Group

The current research activities in the group are: particle astrophysics and cosmology, including cosmological phase transitions, baryogenesis, topological defects, inflation, dark matter, and dark energy; collider and low-energy phenomenology, including Higgs and BSM physics, flavour, QCD, supersymmetry and extra dimensions; and quantum field theory, including quantum gravity, tests the asymptotic safety conjecture, the renormalisation group, effective theory and strong coupling phenomena,

The group consists of Andrea Banfi, Xavier Calmet, Francesco Hautmann, Mark Hindmarsh, Stephan Huber, Sebastian Jaeger, Daniel Litim (group leader), Veronica Sanz, Emeritus Professors David Bailin and Norman Dombey, three Postdoctoral Research Fellows, and about 20 PhD and MSc students. The group maintains a research consortium with Royal Holloway (Nikolas Kauer, Stephen West). The group’s research funding comes mainly from the UK Science and Technology Facilities Council (STFC), and is also supported by the European Science Foundation and the Higher Education Funding Council for England.

The group has close links with both the Experimental Particle Physics and Astronomy research groups, and is a member of the NExT Institute, a regional collaboration for particle physics phenomenology. It benefits from excellent computing resources including a Linux-based system of workstations and servers and access to the University’s High Performance Computing cluster.

The Theoretical Particle Physics group web page is http://www.sussex.ac.uk/tpp/
JOB DESCRIPTION

Job Title: Lecturer in Experimental Physics
Grade: Lecturer B, Grade 8
School: School of Mathematical and Physical Sciences
Location: Pevensey 2
Responsible to: Head of School
Direct reports: n/a
Key contacts: Students, other members of Faculty within the School and University, School Officers, academics in the field in other institutions.

Role Description
Lecturer B is a career-grade teaching and research position. Post-holders will be expected to take full responsibility for the design, management and delivery of their own teaching, be able to demonstrate an established research portfolio, and a growing reputation in their field of study. They will also be expected to provide support and guidance to less experienced members of staff.

PRINCIPAL ACCOUNTABILITIES

1. To design and deliver high-quality teaching programmes that are attractive to students.

2. To engage in individual and collaborative research activity resulting in high-quality publications to be submitted to the REF at acceptable levels of volume and academic excellence, and to obtain research funding and/or knowledge exchange income as appropriate to the discipline.

3. To contribute fully to the School and University by playing a significant role in working groups, committees, and other School and University activities.
KEY RESPONSIBILITIES

1. **Teaching & Student Support**

   1.1 Engage in the planning, delivery and assessment of innovative high-quality undergraduate and postgraduate teaching, in liaison with the relevant programme and course convenors.

   1.2 Identify, design, develop and manage new curriculum proposals that are attractive to students.

   1.3 Develop high-quality inclusive teaching materials, methods and approaches, take responsibility for their quality, and ensure that they meet defined learning objectives.

   1.4 Ensure that teaching materials remain up-to-date and relevant, incorporating advances in the subject area into the course of study, and utilising appropriate technology.

   1.5 Set, mark, and assess coursework and examinations; select appropriate assessment instruments and assessment criteria, and provide constructive and comprehensive feedback to students.

   1.6 Undertake continuous professional development to maintain an understanding of appropriate pedagogy in the subject area.

   1.7 Supervise the work of undergraduate and taught postgraduate students, providing advice on study skills.

   1.8 Contribute to the accreditation of courses and quality-control processes.

   1.9 Undertake and complete administrative duties required in the professional delivery of teaching.

   1.10 Undertake academic advising duties, and provide first-line support for sensitive issues, referring on as appropriate to services providing further assistance.

   1.11 Adopt an approachable and accessible attitude towards students, offering office hours, informal advice etc.

3. **Research, Scholarship & Enterprise**

   1.1 Contribute to School research strategy and themes.

   1.2 Develop research objectives and proposals for own or joint research.

   1.3 Conduct research projects individually and in collaboration with others.

   1.4 Assess, interpret and evaluate outcomes of research, and develop ideas for their application.

   1.5 Produce high-quality research outputs that have impact in the field, for publication in monographs or recognised high-quality journals, or performance/exhibition, as
appropriate, and contribute to the School’s REF submission at acceptable levels of volume and academic excellence.

1.6 Lead small research projects and/or identified parts of a larger project, including supervising the work of others and managing or monitoring a research budget, if appropriate.

1.7 Make presentations at conferences, or exhibit work in other appropriate events, and identify ways to disseminate research outputs informally via the internet, the media, and other forms of public engagement.

1.8 Identify sources of funding and secure or contribute to the process of securing bids.

1.9 Identify and secure opportunities for enterprise activity, knowledge exchange income and/or consultancy.

1.10 Actively build internal and external contacts, and play a key role in internal networks and relevant external networks in order to, for example, identify sources of funding, secure student placements, and build relationships for future activities.

1.11 Supervise doctoral students as part of a supervision team.

1.12 Contribute to a relevant national professional body or recognised events.

1.13 Continually update knowledge and understanding in field or specialism, and engage in continuous professional development.

1.14 Conduct risk assessments, and take responsibility for the health and safety of others, if required.

4. Contribution to School & University

3.1 Attend and contribute to School meetings.

3.2 Engage in activities beyond day-to-day teaching duties, for example Admissions Days.

3.3 Assist with undergraduate and postgraduate recruitment.

3.4 Play a key role in School or University working groups or committees, as required.

3.5 Advise and provide support to less experienced colleagues.

3.6 Undertake additional administrative duties, as required by the Head of School.

4. Role-specific duties

4.1 Developing, convening, delivering and assessing undergraduate and postgraduate modules as required by the Head of Department, including teaching laboratory supervision and expansion.

This Job Description sets out current duties of the post that may vary from time to time without changing the general character of the post or level of responsibility entailed.
INDICATIVE PERFORMANCE CRITERIA

- A record of development of new modules/groups of modules, course or significant components of schemes of study or CPD courses.
- Proven and sustained track record of successful teaching at the levels appropriate for the post.
- A high standard of teaching performance as judged by standard evaluation methods.
- Evidence of using feedback information from a range of sources to improve the student experience.
- Evidence of using knowledge arising from research and scholarship to enhance teaching and curriculum development.
- Evidence of engagement in advising students and proactively responding to student problems.
- Regular published output of original research at international level (refereed journal papers, monographs, book chapters, text-books).
- Other evidence of original research contributions to the field, such as through invited conference contributions, membership of editorial panels etc.
- Evidence of successful postgraduate masters and doctoral research supervision i.e. to completion.
- Sustained success in obtaining competitively awarded research grants and contracts, and knowledge exchange income.
- Involvement in the creation, transfer and use of the results of research through a range of knowledge exchange activities.
- Success in transferring research results to commercial, professional, public sector or other practical use.
- Evidence of contributions to a relevant national professional body or recognised event.
PERSON SPECIFICATION

ESSENTIAL CRITERIA

1. Normally educated to doctoral level, or other equivalent qualification, or appropriate level of experience, as appropriate to the discipline (see role-specific criteria below).

2. Excellent interpersonal skills, with the ability to engage with students using a variety of different methods.

3. Experience of teaching at undergraduate and taught postgraduate level.

4. Evidence of significant independent contribution to the design and execution of research.

5. An emerging track record of publications in reputable journals and other appropriate media of similar standing.

6. Excellent presentation skills, with the ability to communicate effectively, both orally and in writing, with students, colleagues and external audiences.

7. Ability to work individually on own initiative and without close supervision, and as part of a team.

8. Ability to exercise a degree of innovation and creative problem-solving.

9. Excellent organisational and administrative skills.

10. Ability to prioritise and meet deadlines.

11. A willingness to participate in support activities beyond normal classroom duties.

12. Excellent IT skills, with the ability to produce high-quality learning support materials.

ESSENTIAL ROLE-SPECIFIC CRITERIA

1. PhD or equivalent in experimental physics.

2. Extensive experience in laboratory management in the area of Quantum Technologies and supervision of undergraduate and graduate students.

3. Extensive experience in cold atoms experimental physics, particularly in areas of atom chips, ion trapping, cavity QED, and/or photonics.

4. Ability to engage with non-academic actors in view of knowledge transfer and building impact cases relevant to the research area of the group, particularly related to Quantum Technologies, and atomic physics/bio-medical interfaces.

DESIRABLE CRITERIA

1. Experience of successful curriculum design or re-design.
2. A recognised higher education teaching qualification.
3. Experience of generating research or knowledge exchange income.
4. Experience of supervising postgraduate research students.

Oct 2016