Physics & Astronomy

Postgraduate Opportunities 2017

Influencing the world since 1583
“Edinburgh isn’t so much a city, more a way of life... I doubt I’ll ever tire of exploring Edinburgh, on foot or in print.”

Ian Rankin
Best-selling author and alumnus
Influencing the world since 1583

For more than 400 years the University of Edinburgh has been changing the world. Our staff and students have explored space, won Nobel Prizes and revolutionised surgery. They’ve published era-defining books, run the country, made life-saving breakthroughs and laid the foundations to solve the mysteries of the universe.

Our distinguished alumni include NASA astronaut Piers Sellers, former MI5 Director-General Dame Stella Rimington, Olympians Sir Chris Hoy and Katherine Grainger and historical greats such as philosopher David Hume, suffragist Chrystal Macmillan, who founded the Women’s International League for Peace and Freedom, and physicist and mathematician James Clerk Maxwell.

International collaboration
An internationally renowned centre for academic excellence, we forge world-class collaborations with partners such as the California Institute of Technology (Caltech), Stanford University, the University of Melbourne, Peking University, the University of Delhi and the University of KwaZulu-Natal. As a member of the League of European Research Universities and the Coimbra Group, we link up with leading institutions across Europe.

Linking research and commerce
We were one of the first UK universities to develop commercial links with industry, government and the professions. Edinburgh Research and Innovation (ERI) promotes and commercialises our research excellence and can assist you in taking the first step to market, through collaborative research, licensing technology or consultancy.

Enhancing your career
We are committed to embedding employability in your University experience and have one of the Russell Group’s best track records for graduate employment. From volunteering schemes to our sector-leading Careers Service, we provide you with opportunities to develop your skills, knowledge and experience, giving you an edge in the competitive job market.

TOP 50
We’re consistently ranked one of the top 50 universities in the world. We’re 19th in the 2016/17 QS World University Rankings.

4TH
We’re ranked fourth in the UK for research power, based on research quality and breadth.*

83%
The majority of our research – 83 per cent – is considered world leading or internationally excellent.*

23RD
We’re ranked 23rd in the world for the employability of our graduates.**

£305m
In 2014/15 we won £305 million in competitive research grants.

20
We’re associated with 20 Nobel Prize winners, including physicists Peter Higgs, Charles Barkla and Max Born, medical researcher Peter Doherty and biologist Sir Paul Nurse.

137 NATIONALITIES
Students from two-thirds of the world’s countries study here.

* Research Excellence Framework (REF) 2014
** Latest Emerging Global Employability University Ranking
**High Performance Computing**

**Programme description**
You will study at EPCC, the UK’s leading supercomputing centre. EPCC is the major provider of high performance computing (HPC) training in Europe with an international reputation for excellence in HPC education and research. Our staff have a wealth of expertise across all areas of HPC, parallel programming technologies and data science. Our two MSc programmes have a strong practical focus and provide access to leading-edge HPC systems such as ARCHER, which is the UK’s largest, fastest and most powerful supercomputer, with more than 100,000 CPU cores.

**MSc High Performance Computing**
HPC is the use of powerful processors, networks and parallel supercomputers to tackle problems that are very computationally or data intensive. You will learn leading-edge HPC technologies and skills to exploit the full potential of the world’s largest supercomputers and multicore processors. This is a well-established programme that has been successful in training generations of specialists in parallel programming.

**MSc High Performance Computing with Data Science**
Data science involves the manipulation, processing and analysis of data to extract knowledge, and HPC provides the power that underpins it. You will learn the multidisciplinary skills and knowledge in both HPC and data science to unlock the knowledge contained in the increasingly large, complex and challenging data sets that are now generated across many areas of science and business.

**Programme structure**
Both programmes take the form of two semesters of taught courses followed by a dissertation project. Your studies will have a strong practical focus and you will have access to a wide range of HPC platforms and technologies, including the UK’s national supercomputer ARCHER. You will take seven compulsory courses, which provide a broad-based coverage of the fundamentals of HPC, parallel computing and data science. The option courses focus on specialist areas relevant to computational science. Assessment is by a combination of coursework and examination.

**Entry requirements**
A UK 2.1 honours degree, or its international equivalent ([www.ed.ac.uk](http://www.ed.ac.uk); international/graduate-entry), in a relevant subject. You must also be a competent programmer, for example in C, C++, Fortran, Java or Python. We will also consider your application if you have equivalent work experience.

**English language requirements**
For fees see page 16 and for funding information see page 18. The School offers four John Fisher HPC Masters Scholarships, open to all nationalities. Each scholarship will have a value of £4,750. The MSc HPC programme is also eligible for the Postgraduate Tuition Fees Loans, administered by SAAS.

More information: [www.epcc.ed.ac.uk/msc/faqs](http://www.epcc.ed.ac.uk/msc/faqs)

Contact MSc Administrator
Tel +44 (0)131 651 7076
Email msc@epcc.ed.ac.uk

---

**Mathematical Physics/ Theoretical Physics**

**Programme description**
These programmes are designed to prepare you for a research career in academia or industry by introducing advanced ideas and techniques that are applicable in a wide range of research areas, while emphasising the underlying physics concepts.

The programmes are a core part of the Higgs Centre for Theoretical Physics, which has been created to mark the start of a new era in theoretical physics research, following the discovery of the Higgs boson at CERN. You will take part in the centre’s activities, including weekly seminars, colloquia and workshops involving physicists from around the world, and you will be involved in research-level projects as part of your dissertation.

**Career opportunities**
Through EPCC’s strong links with industry, we also offer you the opportunity to undertake your dissertation project with one of a wide range of companies.

**Entry requirements**
A UK 2:1 honours degree, or its international equivalent ([www.ed.ac.uk](http://www.ed.ac.uk); international/graduate-entry), in physics or mathematics with sufficient knowledge of one or more of the following areas: cosmology, statistical physics, condensed matter physics, quantum field theory and the standard model of particle physics. You may also take courses drawn from a wider pool including specialist courses in mathematics, computing and climate science. For Mathematical Physics, mathematics courses can account for up to half of the taught course element.

Following the taught component of the programme, you will undertake a three-month research project leading to a dissertation.

**Contact**
MSc Administrator
Tel +44 (0)131 651 7067
Email msc.deptm@ph.ed.ac.uk

---

“EPCC’s MSc in High Performance Computing has always been a leader in its field. Coupling it to data science responds to the huge increase in demand for graduates with both HPC and data skills from both science and business.”

Professor Mark Parsons, Executive Director, EPCC
Research opportunities and support

We offer a diverse range of PhD degrees across all of our areas of research. You will be supported by courses designed for PhD students, in addition to those offered by the Scottish Universities Physics Alliance (SUPA) Graduate School and the Institute for Academic Development.

A Graduate School Forum provides an interface between students and the Graduate School where issues concerning students can be discussed and resolved.

All PhD students are automatically members of the Physics Intergroup Postgraduate Committee (PIPC), which combines seminars and workshops in specific and general subject areas. PIPC organizes an annual residential trip to the Fortissbu Ichte Point Centre, on the shores of Loch Tay in the Scottish Highlands. With everything from cycling to canoeing on offer, this is the perfect opportunity to blow away the cobwebs and get to know your fellow research students.

For further information on the PhD programme, see: www.ph.ed.ac.uk/studying/postgraduate-research/research-opportunities

You can ‘meet’ current students and find out what they think about their programmes at: http://youTube.byfjX/7msY/s

Entry requirements

You should have a UK 2:1 honours degree, or its international equivalent (www.ed.ac.uk/international/graduate-entry) in a related discipline. Please check the specific entry requirements for your programme online before applying.

Career opportunities

Recent graduates have gone on to postdoctoral research posts at universities internationally or are now working for employers such as BAE, EY, HMRC and Moody’s Analytics.

See also...

You may be interested in postgraduate opportunities elsewhere within the University, in particular programmes offered by the schools of Biological Sciences, Chemistry, Informatics or Mathematics, or the CPD programmes offered by the Moray House School of Education. www.ed.ac.uk/studying/prospectus-request

www.ed.ac.uk/pg/189

Condensed Matter & Complex Systems

Astronomy Technology Centre (ATC) – the UK’s leading astronomical research. We share our picturesque site on Blackford Hill with the UK Astronomy Technology Centre (ATC) – the UK’s leading astronomical Instrument maker – so as a postgraduate student you will be joining a vibrant community of specialists. There are around 90 PhD students based at the ATC at any given time.

Research environment

The scope of our research is as wide as the cosmos we explore. Thanks to our affiliation with the UK RCUK and our strong links with related research centres in the School of Physics & Astronomy, we are in a rare position to accommodate a diversity of research specialisms.

The particular areas of research that are currently being pursued are too numerous to list here, but they include: cosmology (large-scale structure in the universe, galaxy formation, dark matter and dark energy, particle cosmology); active galactic nuclei and related objects; nearby galaxies (large-scale star formation, structure, content and evolution of galaxies); stellar astronomy (parallax and proper motion studies, the stellar luminosity function, stellar structure, star formation (observation and theoretical studies, star formation in external galaxies); planet formation (disc and planet formation in protostars, discs around pre-main sequence stars); exoplanets; and computational astrophysics (through the Edinburgh Centre for Computational Astrophysics). Observational PhDs use large telescopes in Chile, Hawaii, the Canary Islands and Australia, plus space missions and observatories including the Hubble Space Telescope and Gaia.

An inspiring setting

Not only will you be surrounded by a wealth of expertise at the Royal Observatory Edinburgh, but our historic setting also provides a constant reminder of the importance of astronomical advancements throughout the centuries.

Excellence prospects

Graduates from the IA are among the most highly sought after candidates for academic and commercial positions. Your degree will see you well placed to take up a rewarding role that applies your knowledge to the advancement of astrophysics.

English language requirements

See page 16.

Fees and funding

For fees see page 16 and for funding information see page 18.

www.ph.ed.ac.uk/pg/190

Condensed Matter & Complex Systems

The Institute for Condensed Matter and Complex Systems encompasses a diverse range of scientific fields from quantum ordering to astrophysics. Our interests overlap with computational materials science and biological and soft sciences. We lead new developments in statistical physics, novel simulation methodologies and cutting edge experiments. The challenge is to understand out of equilibrium behaviour for which no general theory exists and for which experiments consistently reveal unexpected phenomena.

Research environment

The Institute divides into 10 broad research groups:

- Soft Matter
- Statistical and Biological Physics
- Quantum Ordering and Physics at Extreme Conditions
- Condensed Matter and Complex Systems
- Quantum and Soft Matter
- Quantum Physics
- Statistical Physics
- Condensed Matter
- Complex Systems
- Soft Matter, Statistical and Biological Physics

Soft matter research concerns liquids, solids, and viscoelastic materials (such as polymers and suspensions). We harness their properties to create novel materials in the laboratory and seek to understand the microscopic origins of their properties. Statistical physics describes the behaviour of large numbers of microscopic constituents and provides the theory of condensed matter and complex systems. Our challenge is to understand systems out of equilibrium through the analytical and numerical study of simple model systems as well as real world applications such as bacterial evolution. Our research in biological physics and in active matter spans aqueous solutions of small bioactive molecules via proteins and DNA to single cells, cell–cell interactions, and collections of organisms in ecosystems. We use state-of-the-art optical techniques and have dedicated wet labs.

QUANTUM ORDERING AND PHYSICS AT EXTREME CONDITIONS

Quantum ordering is manifested in the collective quantum states of electronic, magnetic and structural degrees of freedom. We examine how and why particular states form and investigate their novel properties, including unusual forms of superconductivity. We investigate new materials in which completely unexpected types of quantum ordering may occur. In future, TXD can allow materials with these novel properties to be engineered. Extreme conditions provide a unique window of very high pressures and temperatures. By changing the density, the properties of matter can be dramatically altered. We aim to understand these phenomena and characterise new behaviours. We use high light spectroscopy, x-ray and neutron diffraction at facilities worldwide, including the European Synchrotron Radiation Facility; the Spallation Neutron Source, Tennessee; and high-powered lasers like the national ignition facility in California.

Leading centres

We have access to the resources of some of the top facilities in Europe and the UK. We host the UK Centre for Astrobology, where the responses of molecules to life in extreme environments are studied. We examine the structure and properties of materials at extremes of pressure and temperature in internationally leading facilities at the Centre for Science at Extreme Conditions. Our computer simulators and theorists can access ECP’s 800-teraflop IBM-RC-O supercomputer, and Eddie, the University’s 2500+ core multipurpose machine. Our condensed matter theorists are full participants in the Higgs Centre for Theoretical Physics.

Careers success

Our graduates have pursued highly diverse and successful careers in academia and industry. Recent graduates have secured positions at the Diamond Light Source in the UK, and further afield at the European Spallation Source (lund), ANSTO (Sydney) and HPSM (Shanghai).

English language requirements

See page 16.

Fees and funding

For fees see page 16 and for funding information see page 18.

The team’s contributions directly supported IBM’s requirement to improve the impact and uptake of HPC.

See more online: www.ed.ac.uk/research/impact

Healthcare research using high performance computing

When creating their groundbreaking Blue Gene project, aimed at bringing high performance computing (HPC) to the healthcare industry, IBM Research recognized the need for specialist expertise in the field. With researchers at the University’s School of Physics & Astronomy acknowledged as leaders in this area of computing, the HPC giant called on our team to enter into collaboration on the project.

Project background

This university-industry collaboration of HPC and life sciences came about when IBM identified the potential market for the partnership. In 2001 the company began serious efforts to exploit transformational opportunities that information technology and materials simulation held for the healthcare industry. The aim was to create a petalQ supercomputer to address major problems, with a particular focus on life sciences and biomolecular structure prediction.

The School of Physics & Astronomy team was chosen for their expertise in computational methods development coupled with carefully coordinated experimental measurements – neither of which IBM was able to perform in-house. The team’s contributions directly supported IBM’s requirement to improve the impact and uptake of HPC in the life sciences.

Project results

As a result of the work of our School of Physics & Astronomy researchers, IBM has significantly expanded the HPC division of its business and is now a leader in providing HPC for the life science market. These studies of molecular dynamics were developed initially for the first generation of IBM’s Blue Gene supercomputers, then led to improved algorithms and improved software and data analysis tools that IBM were (and are) able to offer customers. The improved HPC systems, created with the assistance of research from the School, are of great benefit to the pharmaceutical and life science markets.
Edinburgh Parallel Computing Centre (EPCC)

PhD 3 yrs FT

EPCC offers the opportunity to study for a PhD in topics related to high performance computing.

Research environment
Founded in 1990, EPCC is one of the leading supercomputing centres in Europe and a major provider of training in high performance computing. EPCC’s expertise includes advanced research, technology transfer, commercial consultancy and the provision of supercomputer services to academia and business.

EPCC hosts the ARCHER (Advanced Research Computing High End Resource) national supercomputing service. EPCC has a team of experienced consultants and software engineers who have a wealth of expertise in the latest technologies. Our computing research covers software for future HPC systems, modelling and simulation, performance characterisation and benchmarking, and developing a pan-European HPC service.

We are working on several big data research projects, ranging from earthquake prediction and astronomical data analysis to the development of international data infrastructure for managing today’s immense growth in data generation. Meanwhile our software specialists have an impressive portfolio of projects, including many industrial applications. We remain at the forefront of the field, for example through our leadership of the UK’s Software Sustainability Institute, ensuring that today’s new software continues to be improved and supported in the future.

Pathway to progress
Graduates from EPCC have found rewarding employment in the computing industry, universities and government organisations.

English language requirements
See page 16.

Fees and funding
For fees see page 16 and for funding information see page 18.

Specific studentships are available for PhDs in high performance computing. More information: www.epcc.ed.ac.uk/education-training/phds-high-performance-computing

Nuclear Physics

PhD 3 yrs FT

We have established an enviable reputation for producing impactful work and sought-after graduates. Our group boasts the greatest breadth of expertise in the UK, which creates a research environment that allows for diversity, collaboration and a high level of understanding of the field as a whole. We encourage small collaborations that enable you to become involved in all aspects of your experiments, including design, construction, implementation, data analysis and presentation of the results.

Research environment
Our experimental research includes studies to identify both the baryonic and non-baryonic constituents of the universe, the influence of nuclear reactions on stellar explosions, and the quark substructures of hadrons. The main areas of our research include photonuclear research, exotic nuclei, nuclear astrophysics, silicon detector devices and dark matter research.

We have an in-house development programme of advanced particle and photon detection systems, and state-of-the-art simulation software and analysis techniques. Much of this has been made possible by our work with commercial company Micron Semiconductor. Another recent collaboration, with Imperial College and the Rutherford Appleton Laboratory, aims to establish the first direct evidence of non-baryonic dark matter.

Creating networks
Most of our projects are undertaken in international collaborations. Should your research warrant it, you will have the opportunity to develop your work at one of a number of high-profile research facilities and worldwide institutions, such as TRIUMF in Canada, Thomas Jefferson National Laboratory, Oak Ridge National Laboratory and Argonne National Laboratory in the US, CERN in Switzerland and Mainz University in Germany. These partnerships will not only help you develop your research to an international standard, but will also give you the chance to establish valuable contacts in the world of nuclear physics.

An asset for any career
Research degrees in nuclear physics from the University of Edinburgh have taken many of our graduates into international appointments. Should your research warrant it, you will have the opportunity to develop your work at one of a number of high-profile research facilities and worldwide institutions, such as TRIUMF in Canada, Thomas Jefferson National Laboratory, Oak Ridge National Laboratory and Argonne National Laboratory in the US, CERN in Switzerland and Mainz University in Germany. These partnerships will not only help you develop your research to an international standard, but will also give you the chance to establish valuable contacts in the world of nuclear physics.

English language requirements
See page 16.

Fees and funding
For fees see page 16 and for funding information see page 18.

“...The year I spent in Edinburgh was one of the most enjoyable of my life. Very friendly staff and classmates, together with excellent facilities and a beautiful city created a welcoming and supportive environment. I am very thankful to EPCC for such a wonderful experience.”

Alan Richardson, MSc in High Performance Computing graduate
Particle Physics

PhD 3 yrs FT

Exploring nature at the tiniest scale, the Particle Physics group seeks to add to our understanding of the make-up of our universe. By joining our research group, you’ll be following in the footsteps of our celebrated Emeritus Professor, Peter Higgs, whose groundbreaking Higgs mechanism has excited the world of physics for decades and has been the focus of operations at the Large Hadron Collider at CERN. You’ll also have the opportunity to confer and work with some of the greatest minds in physics today, through our visitor programme, conferences and international facilities.

Research environment

Our research group works in two areas – Experiment and Theory.

**PARTICLE PHYSICS – EXPERIMENT**

We look to understand the fundamental particles of nature and the interactions that govern their behaviour. In particular, from understanding the symmetries present in the universe, we seek to explain the dominance of matter over anti-matter, and mechanisms of symmetry breaking that lead to the creation of mass via the Higgs boson and non-Standard Model particles. Researchers from our group are working on two experiments at the Large Hadron Collider; the LHCb experiment and the ATLAS experiment.

**PARTICLE PHYSICS – THEORY**

Our research concerns fundamental physics at all energy scales, from hadronic binding energy to the massive forces at play in the first instants of the universe’s existence. We collaborate with leading facilities, such as the Large Hadron Collider at CERN and the WMAP and Planck satellites. We are working on topics in both perturbative and non-perturbative field theory, with applications in predictions for the LHC, flavour physics, the structure of gauge theories, physics beyond the standard model, cosmology and turbulence. We have also developed a collaboration with Intel, hosting a prestigious Intel Parallel Computing Centre for the development of QCD simulation code for next generation systems.

A universe of opportunities

The Particle Physics group offers prospective PhD students exciting opportunities to study at the very frontier of understanding. Fully funded studentships are available for a wide range of theoretical and experimental projects, plus opportunities to travel to CERN for long and short visits.

English language requirements

See page 16.

Fees and funding

For fees see page 16 and for funding information see page 18.

“Aside from the opportunities to travel around the world, being part of the Institute of Condensed Matter & Complex Systems research group exposed me to a broad range of scientific fields and approaches to research.”

Justin Whitehouse, PhD Condensed Matter Physics
About the School of Physics & Astronomy

As the birthplace of the Higgs mechanism and the prediction of the Higgs boson, the University of Edinburgh’s School of Physics & Astronomy has a strong track record of innovation and research excellence.

Our research – which was ranked fourth in the UK in the Research Excellence Framework (REF) 2014 with 96 per cent rated world leading or internationally excellent* – pushes the frontiers of scientific thinking. From the smallest to largest scales, the School’s pioneering work regularly attracts global attention. Not only have we played a vital role in the world’s largest scientific experiment – to find the Higgs boson – but we have also carried out the biggest exercise yet to map dark matter, spanning billions of light years across the universe.

New discoveries, and more to come

The discovery of the Higgs boson at CERN prompted the creation of a new centre at the School – where Peter Higgs remains an Emeritus Professor – to support research in theoretical physics. The Higgs Centre for Theoretical Physics brings together scientists from around the world to seek deeper understanding of the workings of the universe and its contents, through its extensive visitor and workshop programmes.

Our researchers work in four institutes:

**The Institute for Condensed Matter and Complex Systems**
At the Institute for Condensed Matter and Complex Systems we explore everything from the motion of microorganisms to the behaviour of matter under the extreme pressures found at the centres of stars.

**The Institute for Particle and Nuclear Physics**
The work of the Institute for Particle and Nuclear Physics includes the giant experiments of the Large Hadron Collider at CERN, Switzerland, which are revealing the secrets of the building blocks of the universe.

**The Institute for Astronomy**
Our researchers work in four institutes:
- **The Institute for Condensed Matter and Complex Systems**
- **The Institute for Particle and Nuclear Physics**
- **The Institute for Astronomy**
- **The Institute for Condensed Matter and Complex Systems**

* As part of PHYESTA, a joint submission with the University of St Andrews.

Edinburgh Parallel Computing Centre (EPCC)
EPCC is home to some of Europe’s most advanced supercomputing systems, including ARCHER, the national facility for academic and industrial computational simulation.

Facilities and resources

Our School, home to around 100 academics devoted to research and teaching, offers the breadth of expertise and world-class facilities that will inspire you to produce groundbreaking work.

You’ll be encouraged to explore the best the world can offer in your field of interest. Our connections with organisations such as CERN can widen your horizons, as can visits to international conferences and events. Thanks to our reputation as a centre for research excellence, we regularly play host to specialist conferences, and you can expect to have access to some of the most respected names in the field.

World leading facilities

World leading research requires exceptional facilities to help fulfil your academic ambitions. While we have established strong connections with many prestigious global research centres, a number of internationally recognised facilities are based here at Edinburgh. They include:

**The Higgs Centre for Theoretical Physics**
The discovery in July 2012 of the Higgs boson at CERN, almost half a century after Peter Higgs’ prediction in 1964, is a milestone in the history of theoretical physics. The theoretical ideas put forward by Peter Higgs, Francois Englert, and Robert Brout, inspiring thousands of physicists and putting in motion the experimental searches for the Higgs boson, were celebrated with the Nobel Prize in Physics awarded in October 2013.

The discovery marks the start of a new era in theoretical physics. While the Standard Model of elementary particle physics is now complete, many fundamental questions remain unanswered. We still don’t understand the intricate structure of charges and flavours in the Standard Model, or what determines the values of its parameters. We are still struggling to build a compelling theory of quantum gravity, and understand the role played by the vacuum in the formation of the early universe. We have no idea what dark matter and dark energy are, and we have difficulty understanding structure formation and complexity.

The Higgs Centre for Theoretical Physics has been established by the University to seek answers to some of these questions, by creating opportunities to formulate new theoretical concepts to take us beyond the limitations of current paradigms.

**UK Centre for Astrobiology**
We are affiliated with the NASA Astrobiology Institute and have a mission to advance our understanding of molecules and life in extreme environments on Earth and beyond. We do this with a combination of theoretical, laboratory, field and mission approaches. We apply this knowledge to improving the quality of life on Earth and developing space exploration as two mutually enhancing objectives. Our work is underpinned by broad and compelling questions: How did life originate? Is there life elsewhere in the Universe? What are the limits of the Earth’s biosphere? Can we establish a permanent human presence beyond the Earth? We study the responses of molecules to extreme environments, including the space environment, simulate extra-terrestrial environments, and maintain a 1.5km-deep subsurface biology laboratory at the Boulby Mine in Yorkshire, England.

**EPCC**
EPCC is one of Europe’s foremost supercomputing centres. Its aim is to accelerate the effective exploitation of novel computing throughout industry, academia and commerce. This is achieved through activities including research training programmes and commercial contract work.

The Centre provides access to novel computing expertise and houses an exceptional range of specialist computing facilities: from enterprise-level servers to world-class high performance computers, including UK national supercomputing services.

**The Centre for Science at Extreme Conditions (CSEC)**
At this highly specialised laboratory, the physical properties of materials can be measured at extremely high pressures. CSEC, which has risen to international prominence over the past 20 years, provides the infrastructure needed to explore the effects of pressure on structure at interatomic distances.
Community

As you would expect from one of the largest physics research centres in the UK, our academic community spans a broad range of subject areas.

Our staff includes a number of Fellows of both the Royal Society and the Royal Society of Edinburgh, and you’ll have access to experts from other institutions through our membership of the Scottish Universities Physics Alliance (SUPA).

This means you’ll be undertaking your research in an environment that encourages discovery through collaboration. You’ll be part of a vibrant and motivated group of researchers, and will be able to participate in events aimed at developing strong collaborative links.

Social networking

You’ll have plenty of opportunities to leave your office or lab to enjoy the company of your peers. Edinburgh University Students’ Association (EUSA) has a host of societies, sporting activities and social events waiting for you, and is an excellent way of getting to know other students. EUSA is one of the oldest students’ associations in the UK.

SUPA connections

Our membership of SUPA helps ensure exposure to as broad a range of thinking as possible. SUPA features courses, guest lectures and online events aimed at bringing together the expertise of Scotland’s physicists and astronomers. You’ll have the opportunity to connect with your peers from other Scottish universities and establish your place within the wider scientific community.

Social networking

You’ll have plenty of opportunities to leave your office or lab to enjoy the company of your peers. Edinburgh University Students’ Association (EUSA) has a host of societies, sporting activities and social events waiting for you, and is an excellent way of getting to know other students. EUSA is one of the oldest students’ associations in the UK.

SUPA connections

Our membership of SUPA helps ensure exposure to as broad a range of thinking as possible. SUPA features courses, guest lectures and online events aimed at bringing together the expertise of Scotland’s physicists and astronomers. You’ll have the opportunity to connect with your peers from other Scottish universities and establish your place within the wider scientific community.

Employability and graduate attributes

As well as the specific skills you will gain throughout your studies, you will also develop techniques and abilities that will give you a head start in any career. We offer outstanding services to enhance your employability and make the most of your time here.

Institute for Academic Development

All postgraduate students benefit from our Institute for Academic Development (IAD), which provides information, events and courses to develop the skills you will need throughout your studies and in the future. IAD events also offer the perfect opportunity to meet and network with other postgraduates from across the University.

Further information is available online: www.ed.ac.uk/iad/postgraduates

For taught postgraduates, IAD provides a popular study-related and transferrable skills support programme. It is designed to help you settle into postgraduate life, succeed during your studies and move confidently to the next stage of your career. We offer on-campus and online workshops and one-to-one study skills consultations, plus online advice and learning materials. Workshops and learning resources cover key topics tailored to different academic stages, including getting started with your studies; critical reading, writing and thinking; managing your exams; and planning for and writing up your dissertation.

IAD also provides a comprehensive programme of transferrable skills training, resources and support for researchers completing a doctorate. The workshop programme is designed to help you successfully prepare for the various milestones of your PhD, from getting started with your research, to writing up and preparing for the viva. Workshops cover topics such as writing skills, reference management tools, statistics, preparing for conferences, delivering presentations, time and project management, and personal development. IAD also offers online resources and planning tools to help get your research started, plus expert one-to-one tutoring and demonstrating and research public engagement and communication.

Careers Service

Our Careers Service plays an essential part in your wider student experience at the University, offering world-class careers and personal development guidance and support. We support you to recognise the wealth of possibilities ahead, while at university and after graduation, helping you explore new avenues, tap into your talents and build your employability with confidence and enthusiasm.

The Service provides specialist support for postgraduate students. From exploring career options to making decisions, from CV writing to interview practice, from Employ.ed internships to graduate posts and from careers fairs to postgraduate alumni events, we help you prepare for the future.

We sustain and continually develop links with employers from all industries and employment sectors, from the world’s top recruiters to small enterprises based here in Edinburgh. Our employer team works with hundreds of students to assess their ideas and develop their business skills and helps many start their businesses. We have helped Edinburgh students and alumni launch almost 100 new businesses in the last three years, ranging from language tuition to robotics companies.

More information: www.iad.ed.ac.uk

Connect.ed

Edinburgh encourages its alumni to stay in touch with current students who share an academic background or are interested in a similar career path. Connect.ed is a networking system run by the Careers Service that provides an informal and confidential opportunity for alumni to share their occupational knowledge and experience with current students, who can contact them for advice and guidance on their future career.

More information: www.ed.ac.uk/careers/connected

Backing bright ideas

LAUNCH.ed is the University’s award-winning programme for student entrepreneurs. Each year, LAUNCH.ed works with hundreds of students to assess their ideas and develop their business skills and helps many start their businesses. We have helped Edinburgh students and alumni launch almost 100 new businesses in the last three years, ranging from language tuition to robotics companies.

More information: www.LAUNCH.ed.ac.uk

Equality recognition

The School has been awarded Athena SWAN Silver status and Juno Champion status in recognition of our ongoing commitment to advancing women’s careers in education and research.

More information: www.ecu.ac.uk/athena-swan
www.iop.org/juno

“I’m very pleased to support the two MSc programmes in theoretical and mathematical physics. This initiative will greatly help the University of Edinburgh to play a major role in training the next generation of theoretical physicists.”

Peter Higgs, Emeritus Professor of Theoretical Physics, University of Edinburgh
Applications and fees

We have an online application process for all postgraduate programmes. It’s a straightforward system with full instructions, including details of any supporting documentation you need to submit.

When applying, you will set up an account, which will save your application and continue at another time. Full guidance on our application system is available at: www.ed.ac.uk/postgraduate/applying

General requirements

Our usual entrance requirement for postgraduate study is a UK 2:1 honours degree, or its international equivalent (www.ed.ac.uk/international/graduate-entry), in a relevant field, such as physics, astronomy, computer science, mathematics or engineering.

If your background is not directly related to physics or astronomy, you may still be considered. Please contact the programme administrator to discuss your suitability.

You will also need to meet the University’s language requirements (see right).

Entry requirements for individual programmes can vary, so check the details for the specific programme you wish to apply for.

References

For applications to taught programmes, the normal requirement is one reference, although an additional reference may be requested in individual cases. For Mathematical Physics/Theoretical Physics and applications to research programmes, two references are required. You should check the entry online for exact requirements for your intended programme of study. For general guidance on references, visit: www.ed.ac.uk/postgraduate/references

Deadlines

Taught programmes

Some programmes have application deadlines. Please check the programme entry online for details. For all other programmes, you are encouraged to apply no later than one month prior to entry to ensure there is sufficient time to process your application. However, earlier application is recommended, particularly where there is a high demand for places or when a visa will be required. Should you wish to submit a late application, please contact us for guidance. Most scholarships (including the Masters

Scholarships in High Performance Computing) have application deadlines in early May, and in most cases you need to apply for your University place before you can be considered for scholarships.

Research programmes

You may apply for admission to PhD studies at any time but we encourage you to make your application by the end of January. This is so that you can be notified of scholarship application deadlines if you need to apply for these to support your studies.

English language requirements

Students whose first language is not English must show evidence of one of the qualifications below:

- IELTS Academic: total 6.5 (at least 6.0 in each module).
- TOEFL-iBT: total 92 (at least 20 in each module).
- PTE(A): total 61 (at least 56 in each of the Communicative Skills sections).
- CAE and CPE: total 176 (at least 169 in each module).
- Trinity ISE: ISE II (with distinctions in all four components).

Please note:

- English language requirements can be affected by government policy so please ensure you visit our degree finder to check the latest requirements for your programme: www.ed.ac.uk/postgraduate/degrees

Tuition fees

The following table provides an overview of indicative fee levels for programmes commencing in 2017.

Figures marked * show the fee level set for the 2016/17 academic year. All other figures are indicative of expected fee levels for your studies during the 2017/18 academic year. Because these figures are indicative, it is important you check online before you apply and check the up-to-date fee level that will apply to your specific programme: www.ed.ac.uk/student-funding/tuition-fees/postgraduate

Please note:

- International students starting full-time taught programmes of study lasting more than one year will be charged a fixed annual fee.
- All other students on full-time and part-time programmes of study lasting more than one year should be aware that annual tuition fees are subject to revision and are typically increased by approximately five per cent per annum. This annual increase should be taken into account when you are applying for a programme.
- In addition to tuition fees, your programme may be subject to an application fee and additional costs/programme costs may apply. Please check the latest programme information online.

Tuition fees for EU students

EU students enrolling in the 2017/18 academic year – and possibly the following academic year – will be admitted as eligible for tuition fee support from the Student Awards Agency for Scotland (SAAS).

Future changes to the fee status of EU students enrolling in the 2017/18 academic year for the duration of their course. However there is a risk that EU students enrolling in the 2017/18 academic year may become subject to international tuition fees for any years of study which follow the UK exit from the EU. In those circumstances we are committed to working with the Government to ameliorate the impact of that change for individual students.

The Scottish Government has already confirmed that the fee status of existing students and students enrolling in the 2016/17 academic year will remain unchanged for the duration of their studies.

For UK/EU students

<table>
<thead>
<tr>
<th>Programme Type</th>
<th>Fee Level</th>
<th>Annual Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>All taught programmes, 1-year FT</td>
<td>£10,600</td>
<td></td>
</tr>
<tr>
<td>All taught programmes, 2-years FT</td>
<td>£15,900</td>
<td></td>
</tr>
<tr>
<td>All taught programmes, 3-years FT</td>
<td>£3,600</td>
<td></td>
</tr>
<tr>
<td>MPhil 2-years FT</td>
<td>£4,121*</td>
<td></td>
</tr>
<tr>
<td>MPhil 4-years FT</td>
<td>£2,061*</td>
<td></td>
</tr>
<tr>
<td>MSc by Research FT</td>
<td>£2,400</td>
<td></td>
</tr>
</tbody>
</table>

For international students

<table>
<thead>
<tr>
<th>Programme Type</th>
<th>Annual Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>All taught programmes, 1-year FT</td>
<td>£25,700</td>
</tr>
</tbody>
</table>

Excludes:

- Mathematical Physics | £19,300 |
- Theoretical Physics |
- MPhil 2-years FT | £19,100 |
- PhD 3-years FT |
- MSc by Research FT | £23,700 |

* Figure shown is the 2016/17 fee level

All other fees quoted are indicative of 2017/18 fee levels. Because these figures are indicative, it is important you check online before you apply and check the up-to-date fee level that will apply to your specific programme: www.ed.ac.uk/student-funding/tuition-fees/postgraduate

Abbreviations: IELTS – International English Language Testing System; TOEFL-iBT – Test of English as a Foreign Language Internet-based Test; PTE(A) – Pearson Test of English (Academic); CPE – Certificate of Proficiency in English; CAE – Certificate in Advanced English; Trinity ISE – Integrated Skills in English.

www.ed.ac.uk/english-requirements/pg
Funding

A large number of scholarships, loans and other funding schemes are available for your postgraduate studies. It is only possible to show a small selection in print. To see the full range, please visit: www.ed.ac.uk/student-funding/postgraduate.

Scholarships at the University of Edinburgh

- Beit Trust
  - Beit Trust and the University of Edinburgh Scholarships jointly fund postgraduate students from Malawi, Zambia and Zimbabwe to undertake a masters: www.beittrust.org.uk
- Edinburgh Global Research Scholarships
  - These scholarships are designed to attract high-quality international research students to the University: www.ed.ac.uk/student-funding/global-research
- Edinburgh Syrian Postgraduate Scholarships
  - A number of scholarships are available to postgraduate students from Syria studying a full-time one-year masters: www.ed.ac.uk/student-funding/postgraduate/syria
- Higgs Centre MSc Prize Scholarships
  - The Higgs Centre for Theoretical Physics offers up to two scholarships in Theoretical or Mathematical Physics. These scholarships will be awarded on the basis of academic merit to students of all nationalities who are accepted for admission to MSc programmes in High Performance Computing (HPC) for promising students from all backgrounds. The scholarships will be awarded to students who show an outstanding record of achievement and strong motivation to do research in theoretical physics. All areas of theoretical physics will be considered: www.ph.ed.ac.uk/studying/postgraduate-research/funding-students
- The University of Edinburgh PhD Scholarships
  - A number of scholarships, open to UK, EU and international PhD students: www.ed.ac.uk/student-funding/development
- Scottish Universities Physics Alliance (SUPA) Prize PhD Studentships
  - These prestigious and competitive awards are intended to attract outstanding students from around the world, irrespective of nationality, to undertake research for a PhD: www.apply.supa.ac.uk/prize
- SFC Higgs Centre Studentships
  - The Higgs Centre will offer at least two PhD studentships each year, funded by the Scottish Funding Council and subject to annual confirmation. The opportunities are open to students from any Commonwealth country: www.ed.ac.uk/student-funding/sfc-hw
- John Fisher HPC Masters Scholarships
  - Up to four John Fisher HPC Masters Scholarships are available, commemorating EPCC’s head of user support from 1994 to 2007. These awards are aimed at widening access to MSc programmes in High Performance Computing (HPC) for promising students from all backgrounds. The scholarships will be awarded based on the basis of academic merit to students of all nationalities who are accepted for admission to MSc or HPC with Data Science: www.epcc.ed.ac.uk/msc-fees-scholarships/funding-sf-epcc-masters
- Julius Nyerere Masters Scholarships (Tanzania)
  - One scholarship is available to citizens of Tanzania who are normally resident in Tanzania who are accepted on a full-time masters programme: www.ed.ac.uk/student-funding/nyerere
- The Scottish Doctoral Training Centre for Condensed Matter Physics
  - The Scottish Doctoral Training Centre in Condensed Matter Physics is a tri-institutional collaboration between the universities of St Andrews, Edinburgh and Heriot-Watt. It offers more than 10 four-year PhD fully funded studentships each year: http://apply.supa.ac.uk
- Colombia
  - Administrative Department of Science, Technology and Innovation (Colciencias): www.colciencias.gov.co
- Ecuador
  - Secretaria Nacional de Educacion Superior, Ciencia y Tecnologia (SENESCYT): www.educacionesuperior.gob.ec
- Iraq
  - Ministry of Higher Education and Scientific Research: www.iraqculturalattache.org.uk
- Mexico
  - National Council of Science and Technology of the United Mexican States (CONACYT): www.conacyt.mx
- Scholarships available to students undertaking a masters programme in High Performance Computing (HPC) or HPC with Data Science:
  - Universidad de los Andes (Bogota, Colombia)
  - Universidad de los Andes (Bogota, Colombia)
  - Universidad de los Andes (Bogota, Colombia)
- The University of Edinburgh is a participating institution in the following loans programmes, meaning we can certify your student status and can help with the application process:
- The Canada Student Loans Program
  - The University is eligible to certify Canadian student loan applications: www.ed.ac.uk/student-funding/canadian-loans
- Erasmus+
  - An Erasmus+ loan supports students accepted for a masters programme in an Erasmus+ country. For more information: http://ec.europa.eu/education/opportunities/higher-education/masterstoons_en.htm
- Postgraduate Loans (PGL)
  - England
    - Eligible students from England, undertaking a taught or research masters can apply to Student Finance England for a loan of up to £10,000 towards fees or maintenance costs: www.gov.uk/postgraduate-loan
- Postgraduate Loans (SASS)
  - Scotland and EU
    - The Student Awards Agency Scotland offers tuition fee loans to eligible students undertaking full- or part-time postgraduate study. For a full list of eligible programmes: www.sass.gov.uk
- US Student Loans
  - The University is eligible to certify loan applications for US loan students. Full details on eligibility and how to apply can be found online: www.ed.ac.uk/student-funding/us-loans

Other sources of funding

The following are examples of the many scholarships and support schemes available to students from particular countries who meet certain eligibility criteria.

- Chevening Scholarships
  - A number of partial and full funding scholarships are available to one-year masters students: www.chevening.org
- Commonwealth Scholarships
  - Scholarships available to students who are resident in any Commonwealth country, other than the UK: www.dfid.gov.uk/escuk
- Durham Centre for Doctoral Training in Soft Matter and Functional Interfaces (SOFI CDT)
  - The SOFI CDT combines expertise from the three universities comprising the Centre, one of which is Edinburgh: www.dur.ac.uk/softmatter/softfcdguide
- Fulbright Scholarships (USA)
  - Scholarships open to US graduate students in any subject wishing to study in the UK: www.fulbright.org/fulbright
- Marshall Scholarships (USA)
  - Scholarships available to outstanding US students wishing to study at any UK university for at least two years: www.marshallscholarship.org
- Scotland’s Saltire Scholarships
  - A number of scholarships open to students who are citizens permanently and ordinarily resident in Canada, China, India, Pakistan and the USA for one year of masters study: www.ed.ac.uk/student-fundingsaltire

“A large number of scholarships, loans and other funding schemes are available for your postgraduate studies. It is only possible to show a small selection in print. To see the full range,” please visit: www.ed.ac.uk/student-funding/postgraduate.

Robert Starr, MSc High Performance Computing, Scotland’s Saltire Scholarship

Key
- TAught masters programmes
- Masters by Research programmes
- Research programmes

Research council awards

Research councils offer awards to masters, MPhil and PhD students in most of the Schools within the University of Edinburgh. All postgraduate applications from the research councils must be made through the University, through your School or College office. Awards can be made for both taught and research programmes. Normally only those UK/EU students who have been resident in the UK for the preceding three years are eligible for a full award. For some awards, candidates who are EU nationals and are resident in the UK may be eligible for a fees-only award. www.ed.ac.uk/student-funding/research-councils

The University also offers a number of scholarships in partnership with the following overseas government agencies:

- Chile

The University of Edinburgh

Physics & Astronomy Postgraduate Opportunities 2017

The University of Edinburgh

Physics & Astronomy Postgraduate Opportunities 2017
The School of Physics & Astronomy’s teaching and administration centre is in the James Clerk Maxwell Building, on the University’s King’s Buildings campus, about two miles south of the city centre. The Institute for Astronomy is based at the Royal Observatory, also in the south of the city.
On 23 June 2016 the UK electorate voted in a national referendum to leave the European Union. At the time of going to print, there was no immediate, material change known that would impact applicants for 2017 entry. However we recommend that you check online for the latest information before you apply: http://edin.ac/eu-news

The University’s standard terms and conditions will form an essential part of any contract between the University of Edinburgh and any student offered a place here. Our full terms and conditions are available online: www.ed.ac.uk/student-recruitment/terms-conditions

© The University of Edinburgh 2016. No part of this publication may be reproduced without written permission of the University. The University of Edinburgh is a charitable body registered in Scotland, with registration number SC005336.