Physics and Astronomy
Postgraduate Study

ph.qmul.ac.uk
Examining the diffraction pattern through an interferometer in the physics laboratory

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**RUSSELL INTERNATIONAL EXCELLENCE GROUP**


ph.qmul.ac.uk 3
The Queens’ Building, Mile End has a proud association with not one, but four Queens: Queen Victoria; Queen Mary (wife of King George V); Queen Elizabeth The Queen Mother; and our Patron, Queen Elizabeth II.

Queen Mary highlights
- Member of the Russell Group – the UK’s 24 leading universities
- World-class research and teaching by international leaders in their field
- In the top one per cent of the world’s universities
- Attractive residential campus in the heart of London
- Commitment to financial support – £6m in research studentships last year
- Distinguished history dating back to the foundation of St Bartholomew’s Hospital in 1123 and the start of teaching at the London Hospital Medical College, England’s first medical school in 1785.
Welcome to Queen Mary

Do you want to contribute to an area of cutting-edge research? Explore your academic interests in depth? Develop new knowledge and skills? Advance your career, or embark on a completely new path? Whatever your motivation, a postgraduate degree from Queen Mary University of London (QMUL) can help you achieve your ambitions.

We are one of the world’s leading universities, with first-class academics, inspirational teaching, and a distinguished 229-year history of preparing men and women for rewarding careers. Our postgraduate degrees are informed by the latest academic research in everything from cancer therapeutics to business management, and from aquatic ecology to commercial law. Our doctoral and masters by research programmes emphasise original and independent scholarship, while our taught masters programmes prepare you for professional life or further study.

Postgraduate study with us has a number of distinctive features: a high level of engagement with our internationally recognised academics, a campus environment in east London that fosters a real community, a commitment to financial support – more than £6m last year in the form of research studentships and scholarships – and programmes with demonstrable success in preparing you for professional life.

We offer plenty of opportunity for research and collaboration between different disciplines, regularly attract inspiring and high-profile speakers, and work closely with a range of cultural organisations, social enterprises, businesses and industry. A postgraduate degree with us will be a challenging, stimulating, and often life-changing experience.

Russell Group university
We are a member of the Russell Group of leading UK universities, testament to our excellence in research and teaching. The Group attracts the brightest students from all over the world and almost two-thirds of research funding in the UK. Graduates from Russell Group universities are especially valued by employers.

Visit us
The best way to get a feel for Queen Mary life is to join us for one of our Postgraduate Open Evenings. You can explore our campus, meet our tutors and students, and get a taste of what studying here will be like. If you are unable to visit us in person we run virtual open days, where you can speak online to current staff and students. We also have representatives in 35 countries and staff who regularly travel overseas. For more information, see page 33 or qmul.ac.uk/visitus
From our location in the heart of east London – one of the capital’s most dynamic areas – to our stunning campus, world-leading research and inspiring teaching, there’s a host of reasons to choose Queen Mary.

World-class university
Queen Mary is a world-class university (we are in the top one per cent of universities in the world, according to the Times Higher Education World University Rankings in 2013), helping us to attract some of the very brightest minds to study, teach and undertake research here.

Innovative research
We conduct world-leading research. In 2012, we won the Times Higher Award for Research Project of the Year for our work into the development of a self-screening kit for the human papilloma virus. In 2013, we were shortlisted for the same award for our research into a 1,500-year-old genetic mutation connected to extreme growth (gigantism).

Career success
We are focused on ensuring that you leave Queen Mary with the enhanced skills and knowledge necessary to develop your career. Our postgraduates have an average salary of £32,942 on completing their course.

Friendly campus lifestyle
We are the only university in London able to offer a completely self-contained residential campus at our Mile End home. You will be able to enjoy all the benefits of a campus lifestyle – safety, convenience and a friendly atmosphere – while being just minutes from central London.

High-quality teaching
Our teaching is inspired by our world-leading research and you will be taught by academics who are genuine leaders in their field. Our academics embrace innovative teaching methods and receive national awards for their teaching (see page 8).
Exceptional facilities
We have spent more than £250m on new facilities in the past 15 years. From some of the largest open-plan laboratories in Europe in the Blizard Building, to our recently opened £21m ArtsTwo Building, award-winning Lockkeeper’s Cottage Graduate Centre – housed in an historic building alongside the Regent’s Canal – and our acclaimed student village, we offer an exceptional learning environment.

Great location
We are a short walk from fashionable Brick Lane and Shoreditch, and close to London’s financial centres, the City and Canary Wharf. Set beside the Regent’s Canal in Mile End, our main campus is within walking distance from the Olympic Park (see pages 10-11), and minutes from the West End on the Underground.

University of London
Queen Mary is part of the internationally recognised University of London (UoL). You will be able to use UoL’s extensive facilities, including Senate House Library and the University’s many specialist institutes and archives.

International outlook
We welcome students and staff from more than 150 countries who play a vital part in the life of the university. Our staff also conduct collaborative international research, travel to international conferences and we have links with many leading universities overseas. We were recently described by Times Higher Education as “one of the world’s 20 most international universities.”

Generous support
We can help you to secure funding for your postgraduate degree. We also offer a generous package of bursaries and studentships to our most highly qualified applicants, ensuring the brightest students receive a first-class education, regardless of their background.
Our academics undertake world-leading research. Their work is original, informative and significant – both within specialist areas of knowledge and to wider society. It also directly informs the content of our postgraduate programmes.

Reputation for excellence
We recruit the best academics in their disciplines from around the world and have an impressive track-record of winning generous research funding. Following the most recent national assessment of research (RAE 2008), the Guardian placed us 11th in the UK.

What does this mean for you?
Our academics publish in leading journals, organise conferences, speak at public events, comment in the media, engage with our local community, and collaborate with international partners. As a postgraduate with us, you will be learning from experts in their field, who will involve you in their latest research, and share their wealth of knowledge and experience.

Teaching excellence
Our academics receive national recognition for their excellent teaching. Eight members of staff have been awarded National Teaching Fellowships – a highly prestigious national award recognising exceptional teaching – making us the most successful College in the University of London since we joined the Teaching Fellowships scheme in 2006.

Research that makes a difference
From our involvement in this century’s most exciting scientific breakthrough, the discovery of the Higgs boson, to our work exposing the problems of poverty among low-paid workers, to our award-winning cardiovascular and stroke research, we conduct research that genuinely makes a difference to society – improving health, social and living conditions, advancing our knowledge and understanding in specialist fields, and influencing public policy and debate.

We are now preparing to embark on our most ambitious project for a generation – an innovative new Life Sciences Institute. Life sciences is the interface between the natural, social and biomedical sciences and aims to provide innovations in healthcare. This initiative will bring together academics, industrial partners and the NHS to improve health and wellbeing for patients. Find out more: qmul.ac.uk/lifesciences

Research in numbers
• £100m – total research income per year
• 11th in the UK overall for research quality (Guardian analysis of RAE 2008)
• Top 10 in UK for: English, drama, geography, law, economics, materials, Hispanic studies, Russian, medicine, dentistry (Guardian analysis of RAE 2008)
• £6m per year in research council funding for PhD students
• 55 academy and society fellows
• 6 Nobel Prize-winning alumni
Carrying out an experiment using a gas chamber in our teaching laboratory
We are based in east London, the hub of London’s creative community, and home to its financial centres, Canary Wharf and the City. The area is steeped in history, yet always looking to the future, and is uniquely British in its diverse character. The 2012 Olympics has sealed its status as “the place to be” in the capital. Here’s our guide to the best of the east.

Mile End and surrounding area
EAT… the area around Queen Mary has a range of good value cafés, restaurants and pubs.

VISIT… Mile End Park, an unusual 90-acre linear park in the heart of the East End with a ‘green bridge’, a terraced garden, and ecology, arts and sports parks; the independent Genesis Cinema (go on Wednesday night for a student discount).

Stratford
VISIT… the Olympic Park has undergone an amazing £300m transformation and re-opened as the Queen Elizabeth Olympic Park in the spring of 2014. There are five state-of-the-art sporting venues: the Stadium, the London Aquatics Centre, the Copper Box Arena (a leisure centre and venue for basketball, volleyball, etc), the Lee Valley VeloPark and the Lee Valley Hockey and Tennis Centre. There are also cafés, restaurants, cultural venues and lots of green space – around 4,000 trees are being planted as part of a plan to double the green space in the park. queenelizabetholympicpark.co.uk

SHOP… Westfield Stratford City – Europe’s largest urban shopping centre, with over 300 shops, from high-street staples such as Uniqlo to high-end designers such as Armani. There are also over 70 restaurants (including GBK, Busaba Eathai, and Pho), a 17-screen cinema and a 14-lane bowling alley.

Old Street, Shoreditch and surrounding area
EAT… Ginger Pig Café on Hoxton Street (great for a leisurely brunch); Big Apple Hot Dogs, a mobile cart selling amazing hot dogs; also in Hoxton – the Breakfast Club, the perfect spot for a slap-up breakfast after a night out; Cây Tre, a delicious, reasonably priced Vietnamese restaurant on Old Street.

VISIT… Ibid Projects gallery on Hoxton Street; Hales Gallery off Shoreditch High Street (this area is the epicentre of the East End’s art scene); The Geffrye Museum of English domestic interiors.

SHOP… the Columbia Road Flower Market on Sunday mornings; KK Outlet art and design book shop.
Brick Lane, Spitalfields and Whitechapel

EAT... Brick Lane is London’s ‘Curry Capital’– an entire street lined with Indian and Bangladeshi restaurants; Brick Lane Beigel Bake, open 24-hours (great for beigel emergencies).

VISIT... the Old Truman Brewery, a converted brewery and home to numerous fashion designers, artists and trendy bars; All Star Lanes, a boutique bowling alley serving burgers and cocktails; the acclaimed Whitechapel Gallery.

SHOP... Spitalfields market, with arts and craft stalls, restaurants and high-street shops. Nearby is Urban Outfitters, a great spot for sourcing retro fashions.
Docklands and Canary Wharf
EAT… Jamie’s Italian (part of Jamie Oliver’s growing empire); Wagamama for noodles; Canteen for good-value British food in a stylish setting.

VISIT… Museum of London Docklands, which explores the story of the docks from Roman settlement through to its recent regeneration.

Bethnal Green and Victoria Park
EAT… E Pellicci, on Bethnal Green Road, an Italian café and local institution which has been around since 1900. Near Victoria Park, Lauriston Road has some great cafés and restaurants including: Su Sazzagoni (Sardinian), the Fish House (posh fish and chips) and The Empress (a gastropub).

VISIT… the art galleries on Vyner Street; The V&A Museum of Childhood on Cambridge Heath Road; Bethnal Green Market, a daily street market with fresh fruit and veg, clothes and other essentials.

Charterhouse Square and surrounding area
EAT… bars and restaurants abound in Farringdon and the historic Smithfield Market. Two affordable favourites for lunch are the old-school Quality Chop House and The Farm Collective café.

VISIT… the Barbican, London’s most stylish brutalist performing arts centre. With galleries, cinema, theatre and live music.

Lincoln’s Inn Fields and surrounding area
EAT… the restaurants, cafés and bars of Covent Garden and Soho are minutes away, as is the Southbank Centre at Waterloo, home to the Royal Festival Hall, the Hayward Gallery and the Queen Elizabeth Hall.

VISIT… relax in the beautiful grounds of Lincoln’s Inn, watch a trial in the public galleries at the Royal Courts of Justice, or get lost in time at the nearby British Museum.
We are a short bus ride from Canary Wharf and only minutes from the West End on the Underground.
The School of Physics and Astronomy has an international reputation for its research across areas such as experimental particle physics, nanotechnology, organic electronics, superstrings and astrophysics. We provide a first-class education, conduct ground-breaking research, and offer a stimulating and supportive study environment.

We have an unrivalled reputation for conducting pioneering research – from early studies in radioactivity, which led to Rutherford’s discovery of the atomic nucleus; to involvement in the Nobel Prize-winning discovery of the W and Z elementary particles and in developing superstring theory; to our current work with the ATLAS Experiment at CERN, which has led to the discovery of the Higgs boson. You will be taught by leaders in their field, working at the forefront of physics and astrophysics research.

You will learn in a research-rich environment benefiting from the work done by our world-leading researchers as they incorporate their work into their teaching. Our areas of research strength are broad, and include particle physics, astronomy, condensed matter and materials physics and theoretical physics, allowing you to gain a degree with a wide knowledge of physics or the opportunity to specialise in a particular area.

We are part of the South East Physics Network (SEPnet), which is a group of nine universities committed to boosting postgraduates’ employability through a dedicated cross-university graduate school, delivering transferable skills training and building strong relationships with relevant employers. As part of this, you can choose options from our intercollegiate programme with modules taught at other London institutions including UCL, King’s College London and Royal Holloway, University of London.

Our academics
Our academics are leaders in their field, working on high-profile international research projects including the ATLAS Experiment at the Large Hadron Collider at CERN, surveys with the VISTA survey telescope at ESO (whose build was led by QMUL) and the NASA/ESA Cassini mission to Saturn. They publish in leading journals such as Nature, write books, lead international conferences and comment in the media. To find out more, including information on our staff’s research interests, visit: ph.qmul.ac.uk/directory/academics

Postgraduate resources
We offer both full-time and part-time postgraduate taught programmes. You will have access to a range of excellent facilities and resources. Comprehensive computing facilities are provided along with state-of-the-art equipment for materials research and particle physics detector development. Research groups have a range of facilities including clean room laboratories featuring state-of-the-art organic deposition systems, optical and magneto-electrical characterisation facilities, photolithography and ellipsometry.
The GO Jones building which houses the School has recently undergone extensive refurbishment. The new design divides research groups into their own floor with break-out rooms and meeting rooms where postgraduates and staff can mingle and exchange ideas. Comprehensive computing facilities are connected by a fast LAN to central computers and from there to JANET and other WANs.

There are also state-of-the-art materials research and laser laboratories, which add to the existing lithographic facilities, including ebeam for nano-lithography, various atomic force microscopes and extensive organic-film deposition equipment. There are laboratories for optical spectroscopy, including tuneable nanosecond pulsed lasers, and various materials and semiconductor characterisation equipment. Modern rooms are provided for molecular electronics and particle physics detector development.

We have also replaced the dome of our observatory on our roof, which is used in astronomy research projects. This now houses a Celestron C14 mounted on a CGE Pro mount. The telescope is equipped with a Starlight Xpress H18 CCD camera, off-axis autoguider and filter-wheel. Also housed within the observatory is a Coronado solar telescope equipped with CCD camera for solar observing.

**Partnerships**

Queen Mary has a long-standing strategic partnership with Sichuan University in China. This began with professors from the School of Physics and Astronomy establishing a joint research centre at Sichuan University: The Sino-British Materials Research Institute. From there, the relationship has expanded to include several other collaborative activities such as: various programmes of study across both the Faculty of Science and Engineering, and that of Humanities and Social Sciences, whereby students can begin their degree at Sichuan, and complete it at Queen Mary; a Summer School held at Sichuan for Queen Mary students and on which Queen Mary academic staff often teach; and opportunities for Sichuan students to conduct short-term research projects in London with supervision from Queen Mary staff. The partnership has seen a vast student and faculty exchange over the last few years and this collaboration will continue to grow in the future.

**School highlights**

- Involved in pioneering international research, including the discovery of the Higgs boson
- Part of the South East Physics Network (SEPnet)
- Generous financial support, including around 20 fully funded PhD studentships and fee support for MSc students.
- All of our degree programmes are accredited by the Institution of Physics
- An active physics student society which organises visiting academic speakers, a trip to the LHC in CERN, a Ball and a summer barbeque for staff and students
A significant proportion of our graduates pursue their interest in physics and astronomy by undertaking research, and then go on to apply their knowledge directly, working as university lecturers or researchers. Others use their transferable skills – excellent problem solving, broad intellectual and analytical ability, the ability to communicate complex ideas, and mathematical modelling and data analysis skills – to work in areas such as engineering, finance, management consultancy, science communications, patent examining, renewable energy, software engineering and teaching.

The most recent national destination survey confirmed that 82 per cent of our graduates were in employment and/or study six months after graduation. The range of skills gained through our programmes has enabled students to move into careers such as:

- Science Communicator Royal Observatory
- Risk Analyst Equifax
- Maths Lecturer King’s College London
- Campaign Analyst Financial Times

You will also be able to benefit from our membership of SEPnet, which has its own employability programme. As part of this, each university has a dedicated Employer Engagement officer supporting a range of employability initiatives and skills training. Queen Mary also has a strategic partnership with IBM to identify areas of mutual interest and spark new ideas for collaboration in research, teaching and recruitment.

Recent careers events for postgraduates have included talks about pathways into teaching and working as a data scientist, delivered jointly with industry professionals and alumni. Organisations that have recently come to meet our students on campus include EADS Astrium, Ultra Electronics Ltd and Teach First. Other tailored career events have included workshops on applying for a PhD and Academic Career Planning.

Read more about our careers programmes and range of work experience opportunities on the QM Careers and Enterprise Centre pages: careers.qmul.ac.uk

**ALUMNI PROFILE: Eleanna Asvestari**

**Studied:** MSc Astrophysics  
**Currently:** Studying for a PhD at the University of Oulu, Finland, researching the modulation of cosmic rays in the heliosphere.

**Why did you choose Queen Mary and what have you gained from your time here?**

I chose Queen Mary for the programme, its quality, its academic staff, its reputation and its diversity. My degree has not only provided me with knowledge useful for my future career, but also helped me develop skills and become a competitive candidate in the field of interest. Queen Mary offered me knowledge, skills and experience both on a scientific and a social context. It also enhanced my motivation for science.
“I came here to quench my thirst for knowledge about the universe. I enjoyed the new concepts that we were introduced to and the beautiful pictures of the universe that we studied”

Saad Mehmood, MSc Astrophysics
Research areas
Research in the School is conducted across four dedicated research centres, with lots of interaction between the centres.

The centres are:
• Particle Physics Research Centre: conducts fundamental research in experimental particle physics, playing a leading role in major international experiments including ATLAS at the Large Hadron Collider (LHC), T2K and SNO+, as well as hosting a major component of the LHC Computing Grid.

• Centre for Research in String Theory: focusing on string theory and its many applications in physics and mathematics, this Centre works on areas such as M-theory, branes and their dynamics, twistor string-gauge theory, emergent D-branes and new geometries in string theory.

• Centre for Condensed Matter and Materials Physics: improves understanding of materials’ properties and behaviour, through both experimental and theoretical approaches. Key topics include opto-electronic materials, organic semiconductors, nanoscale materials and the glass transition.

• Astronomy Unit: conducts fundamental research into cosmology, formation and dynamics of planetary systems, solar and stellar physics, astronomical and solar plasmas, and survey astronomy.

Research programmes
The School of Physics and Astronomy has up to 25 funded PhD studentships available, spread across four research centres. We have a variety of funding sources available, some of which are also available to international students. Applications are welcome from those with a good degree in physics, mathematics, chemistry or related disciplines. Details on how to apply can be found on our website.

The Particle Physics Research Centre is seeking high-calibre PhD students to join our teams working on large international collaborations including the long baseline neutrino experiment T2K in Japan and the ATLAS experiment at CERN’s Large Hadron Collider. You will be expected to participate in data analysis and will have an opportunity to travel to the labs, and attend topical workshops and conferences. For more details please visit: http://pprc.qmul.ac.uk/postgraduate/phd-programme

The Centre for Condensed Matter and Materials Physics is currently recruiting exceptional science students to begin their PhD studies. Our extensive research programme spans experimental, computational and theoretical physics, with projects ranging from investigations of the fundamental physics of condensed matter to applications of materials physics to important technological challenges. Projects are currently available in topics including organic
semiconductors and spintronics, phase transitions, liquids and glasses, supercritical matter, radiation damage, carbon, optoelectronic materials, structure-property relationships of inorganic, organic and hybrid materials, high-pressure physics, nucleation, multiferroic materials, nanoparticles, and properties of metals. Application areas include energy, transport, medicine and the environment. For more details please visit: http://ccmmp.ph.qmul.ac.uk/phd/welcome

The Astronomy Unit offers research opportunities across a wide range of areas in Astronomy and Astrophysics. Current research programmes cover the areas of cosmology; planetary formation and dynamics (including exoplanets); astrophysical, space and solar plasma physics; and survey astronomy. Most research programmes are theoretical or use computer simulation, but we also welcome applications for observational projects, for example using data from VISTA or Cassini. For more details please visit: http://astro.qmul.ac.uk/phd/astonomy-unit-phd-programme

The Centre for Research in String Theory has a number of PhD positions available. Areas of research include: scattering amplitudes, supersymmetry, string cosmology, D-branes, AdS/CFT, dualities. For information on deadlines and how to apply please visit: http://strings.ph.qmul.ac.uk/postgraduate/phd-crst

“I work on theoretical particle physics, string theory, and quantum field theory. I’m particularly interested in ‘conformal field theories’, which are theories that have the same behaviour at all distance scales. Although they do occasionally exist in nature (or the lab), I’m interested in them because the extra symmetry is useful for studying otherwise difficult problems. Most of the theories I study also have ‘supersymmetry’, which gives additional calculational power. In this way, they’re useful theoretical laboratories for questions related to particle physics and field theory”

Dr Brian Wecht, Physics Lecturer
Astronomy and Astrophysics
Postgraduate Certificate PgCert
One year part-time
qmul.ac.uk/cert-astro-phys

MSc Astrophysics
One year full-time, two years part-time
qmul.ac.uk/msc-astrophysics

The PgCert programme provides an opportunity to study topics in modern astrophysics either for personal interest or as a first step towards a professional career in astronomy for those with degrees with sufficient mathematical or physics content. The MSc programme offers the chance to study more advanced content for those with a degree with substantial mathematical or physics content. Both programmes provide a broad coverage of relevant research topics, including modules on research methods, exoplanets, stellar structure, galaxies and cosmology.

Unique in the UK in terms of the scope of material covered, these programmes give you a detailed overview of the fundamentals of the subject as well as an up-to-date account of recent developments in research. The range of topics offered reflects the breadth of research interests pursued by staff in our large and friendly research group. Lectures cover diverse topics such as the origin of the universe, dark matter, the life and death of stars, black holes, extrasolar planets and space and solar plasma physics. MSc students will also write a dissertation, which may be a critical review of an astrophysical topic or a project of an observational, theoretical or computational nature. Those who have performed sufficiently well in the Certificate have had their registration changed to the MSc, allowing their work to count as the first year of the MSc, and some have even gone on to do PhDs.

Modules include:
- Research Methods for Astrophysics
- Cosmology
- Stellar Structure and Evolution
- Solar System
- Extrasolar Planets and Astrophysical Discs
- Astrophysical Plasmas
- The Galaxy
- Electromagnetic Radiation in Astrophysics
Programme structure
Both programmes start in late September. The PgCert is offered part-time over one year, the MSc full-time over one two-semester year, or part-time over two years.

Lectures are on Tuesday and Thursday afternoons (14.00-16.00) and evenings (18.30-20.45), with topics swapping in alternate years between day of week and between afternoon and evening. See http://astro.qmul.ac.uk/postgraduate-taught-astrophysics-modules

PgCert students
You will take four taught modules (each module comprises 24 hours of lectures and 12 hours of tutorials given over a 12-week semester), normally two of the four modules available in each semester would be chosen.

You will attend either:
• lectures on both Tuesday and Thursdays on either afternoons or evenings (the latter typically chosen by those in full-time employment); or
• lectures on both afternoons and evenings on either Tuesday or Thursday.

MSc students
You will take eight taught modules (each module comprises 24 hours of lectures and 12 hours of tutorials given over a 12-week semester). The dissertation is completed during the summer and handed in at the end of August.

Part-time students attend:
• lectures on both Tuesday and Thursdays on either afternoons or evenings (the latter typically chosen by those in full-time employment); or
• lectures on both afternoons and evenings on either Tuesday or Thursday.

Full-time students attend all lectures.

Further information
email: astro-pg@qmul.ac.uk

Please note: the availability of the modules listed in this section is subject to change. Please contact us to confirm the availability of specific modules before you make your application.
"I like the challenge of research, and the fluidity of the work – plans change depending on your results, so you never know what to expect”

Ruth Sandbach, PhD in Particle Physics

As part of her PhD, Ruth is working on the ATLAS experiment at the Large Hadron Collider in CERN, Geneva.
MSc Physics (three pathways: Theoretical Physics, Particle Physics and Condensed Matter Physics)

One year full-time
http://ph.qmul.ac.uk/postgraduate/masters-programmes

This programme teaches you the fundamental laws and physical principles, along with their applications, of your chosen pathway. It will develop strong research skills and your ability to communicate complex scientific ideas, concisely, accurately and informatively. You will also learn how to use mathematical analysis to model physical behaviour and interpret the mathematical descriptions of physical phenomena. All of which is excellent preparation for those wishing to do a PhD.

The aim of the programme is to deepen your understanding of your chosen branch of contemporary physics, covering advanced concepts and techniques, leaving you well prepared for further doctoral-level study and research. The programme will also enable you to develop skills transferable to a wide range of other careers.

This programme will:
• Teach you the fundamental laws and physical principles, along with their applications, of your chosen area of physics
• Introduce you to research methodology, and how to manage your own research, making use of journal articles and other primary sources

• Allow you to communicate complex scientific ideas, concisely, accurately and informatively
• Instruct you how to use mathematical analysis to model physical behaviour and interpret the mathematical descriptions of physical phenomena.

Programme outline
You will take 120 credits of taught modules (each worth 15 credits) and a 60-credit research project. Many of these modules are associated with the existing intercollegiate programme taught by lecturers from Queen Mary, UCL, Kings and Royal Holloway. Each pathway has compulsory modules and in some cases option modules chosen from an approved list: http://ph.qmul.ac.uk/intranet/undergraduates/msci-module-index

MSc Physics (Theoretical Physics)
qmul.ac.uk/msc-physics-tp

Semester A
• Electromagnetic Theory
• Relativistic Waves and Quantum Fields
• Plus two further modules, chosen from a list of approved modules

Semester B
• Advanced Quantum Field Theory
• Functional Methods in Quantum Field Theory
• Plus two further modules, chosen from a list of approved modules
• MSc Research Project
Our taught programmes

MSc Physics (Particle Physics)
qmul.ac.uk/msc-physics-pp

Semester A
• Particle Physics
• Particle Accelerator Physics
• Relativistic Waves and Quantum Fields
• Plus one option

Semester B
• Standard Model Physics and Beyond
• Advanced Quantum Field Theory
• Relativity and Gravitation
• MSc Research Project
• Plus one option

MSc Physics (Condensed Matter Physics)
qmul.ac.uk/msc-physics-cmp

Semester A
• Phase Transitions
• Physics at the Nanoscale
• Plus two further modules chosen from a list of approved modules http://ph.qmul.ac.uk/intranet/undergraduates/msci-module-index

Semester B
• Electronic Structure Methods
• Order and Excitations in Condensed Matter
• Statistical Mechanics
• MSc Research Project

Further information
Dr Rodolfo Russo
Tel: +44 (0)20 7882 5810
email: r.russo@qmul.ac.uk

MSc Physics (Euromasters)
Two years full-time
qmul.ac.uk/msc-physics-euro

This programme benefits from teaching across the SEPnet partner institutions (see page 14), with a strong emphasis on research-based learning. You will deepen your understanding of a chosen branch of contemporary physics or astrophysics, covering a wide variety of themes at the forefront of both fundamental and applied physics research. The programme consists of taught modules and an in-depth research project, leaving you well prepared for further doctoral-level study and research. There are two pathways in the programme: Physics and Astrophysics.

This programme will:
• Enable you to develop skills transferable to a wide range of other careers
• Allow you to gain a deep understanding of your chosen area through the combination of advanced taught programmes and an extended research training project
• Give you the option to study at other SEPnet universities.

You will learn in a research-rich environment benefiting from the work done by our world-leading researchers as they incorporate their work into their teaching. Our areas of research strength are broad, and include particle physics, astronomy, condensed matter and materials physics and theoretical physics, allowing you to gain a degree with a wide knowledge of physics or the opportunity to specialise in a particular area.
• This programme is only available within partner universities in the SEPnet.
• The SEPnet consortium institutions each offer programmes, which are mutually compatible (for more information, see www.sepnet.ac.uk).
• The programme will provide 120 ECTS credits, which will allow you to enter doctoral-level programmes in other EU countries.

Programme outline
There are around 50 modules to choose from on this programme. Many of these are associated with SEPnet, an intercollegiate programme taught by lecturers from Queen Mary, UCL, King’s College London and Royal Holloway, University of London.

Astrophysics
Taught modules (worth 15 credits each) to a total of 120 credits, taken from the following MSc Astrophysics modules:
• Solar System • The Galaxy • Research Methods for Astrophysics • Relativistic Astrophysics and Gravitation • Cosmology • Stellar Structure and Evolution • Astrophysical Plasmas • Extrasolar Planets and Astrophysical Discs • Advanced Research Methods (30 credits) • Physics (Euromasters) Project (90 credits)

Physics
An agreed combination of taught modules, a research review project and a programme of skills training, to the value of 120 credits.

Modules (worth 15 credits) may be selected from the indicative list below:
• Phase Transitions • Solitons • Statistical Mechanics • Advanced Quantum Field Theory • Relativistic Waves and Quantum Fields • Advanced Quantum Field Theory • Electromagnetic Theory • Numerical Methods in Quantum Field Theory • Electronic Structure Methods • Physics (Euromasters) Project (90 credits)

Further information
Dr Rodolfo Russo
Tel: +44 (0)20 7882 5810
email: r.russo@qmul.ac.uk

Related programmes

MSc Medical Electronics and Physics
One year full-time, two years part-time
qmul.ac.uk/msc-medep

The programme encompasses the design of modern electronic equipment, monitoring patients, life support and surgical equipment and appropriate clinical measurement techniques for recording the variety of signals produced by the human body. The electrical safety requirements for medical equipment connected to patients are stringent and these aspects of design are emphasised.
Funding a masters
Faculty of Science and Engineering
Taught Scholarship
We are pleased to offer tuition fee discounts of £1,500 to every Home/EU student who has been accepted onto one of our masters programmes and obtained a UK first class bachelors degree or equivalent. All eligible applicants will automatically be considered for a scholarship at the point of offer.

International Science and Engineering Excellence Award
We offer tuition fee discounts of £2,000 or £5,000 to every overseas student who has been accepted onto one of our programmes. To be eligible to receive an award of £2,000 you must be on track to meet or exceed our minimum entry requirements for the programme of your choice at the point of offer. To be eligible to receive an award of £5,000 per year, you must have achieved grades equivalent to a UK first class bachelors degree or overseas equivalent. All eligible applicants will automatically be considered for a scholarship at the point of offer.

Funding a PhD
There is a variety of funding sources available to PhD students. These include: QMUL Studentships; Research Council Studentships; and external funding bodies. For more information, see qmul.ac.uk/postgraduate/funding

QMUL Studentships (Home and International)
We offer a number of research studentships each year, which are normally tenable for up to three years. The studentships cover tuition fees and provide maintenance at the basic research council level (for guidance: £15,726 during the 2013-14 session). The School of Physics and Astronomy has up to 25 funded PhD studentships available, spread across our four research centres. See: http://ph.qmul.ac.uk/phd/phd-opportunities

Further information
Recent Queen Mary graduates can also benefit from £1,000 alumni scholarships, and may be eligible for the Simon and Deirdre Gaskell Scholarships. For full information on funding, see qmul.ac.uk/postgraduate/funding

Accommodation
We are the only university in central London to offer a completely self-contained residential campus, with a 2,000-bed award-winning Student Village at Mile End. There is also a good range of private accommodation in the area around the Mile End campus, and we can provide advice and information to help you find a convenient place to stay.

For more information:
Tel: +44 (0)20 7882 5522
email: residences@qmul.ac.uk
residences.qmul.ac.uk

Tuition fees
You can find a full list of both UK/EU and overseas tuition fees here: qmul.ac.uk/tuitionfees

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How to apply and entry requirements

How to apply
All applications should be made online at http://ph.qmul.ac.uk/postgraduate/masters-programmes. Documents such as references and transcripts can be uploaded directly into the online application system.

Entry requirements
Students for the MSc Physics (three pathways) require at least an upper second class honours degree in physics or a closely related discipline; in exceptional circumstances students may be admitted with a lower second class degree (although students with a lower second class degree will not be considered for the theoretical physics stream).

Entry to the Euromasters requires a minimum of an upper second class honours degree in physics, or its equivalent. Direct entry to the second year of the programme requires students to have achieved the equivalent of a postgraduate diploma in physics at a SEPnet partner. Entry to either year is subject to the availability of appropriate courses and/or projects and the suitability of the applicant for the intended programme.

Students wishing to take the MSc Astrophysics should normally have a first- or second-class honours degree (or equivalent) in a subject with substantial physics, mathematics and/or astronomy content.

Students wishing to take the Postgraduate Certificate in Astronomy and Astrophysics should normally have a degree (or equivalent) in a subject with a substantial physics, mathematics and/or astronomy content.

Students accepted for postgraduate research study usually have a first, or good upper-second class, honours degree in mathematics, physics, electronic engineering, computer science, or a related discipline from a British university, or the equivalent from an overseas university. Students with upper-second class (or better) BSc honours degrees, or equivalent, are eligible to apply for admission to research degrees.

Contact us
For more information about our physics and astronomy programmes:
Tel: +44 (0)20 7882 6958
email: physics@qmul.ac.uk or for Astrophysics: astro-pg@qmul.ac.uk
ph.qmul.ac.uk

For general admissions enquiries:
Freephone: 0800 376 1800
From outside the UK: +44 (0)20 7882 5533
e-mail: admissions@qmul.ac.uk
Queen Mary has a cosmopolitan postgraduate community, with students from over 150 countries making a valuable and active contribution to academic and social life. Wherever you are from, you will find a very warm welcome at the university.

Entry requirements
Each application received at Queen Mary is evaluated on a case-by-case basis, comparing international and UK qualifications. We look at your qualifications, the institution you have attended, and any relevant work experience. You can find detailed country-specific entry requirements here: qmul.ac.uk/international/countries

Support for international students
We offer a range of support services to help you feel at home:

Airport collection
New international students are offered a free airport collection service before the start of term in September 2015. This service will be advertised on our website, along with an online booking form: qmul.ac.uk/prearrival

The welcome programme
A welcome programme will be provided for all new international students before the start of term in September 2015. This is an opportunity to meet other international students studying a variety of programmes and gain practical advice about living and studying in London. Following the welcome programme, you can take part in a number of social events throughout the year. In 2014, these included trips to Amsterdam, Bruges, the Scottish Highlands, Wales, and the Wye Valley.

Advice and counselling
The Advice and Counselling Service offers professional advice and support to international students. We can advise you on finance and funding, Tier 4 Entry Clearance, Tier 4 extensions, immigration problems, UK work schemes after study, and offer counselling support for personal issues, such as homesickness. For further details, see: welfare.qmul.ac.uk

International Student Society
As a new International Student at Queen Mary the International Office pays your membership fee to the International Student Society (ISS). The ISS will organise a number of social and cultural events throughout the academic year to help you immerse yourself into student life at QMUL.

Healthcare
There is a Student Health Service on campus. You (and your spouse and children if they are in the UK with you as your dependants) are entitled to free medical treatment on the UK National Health Service (NHS) if you are registered on a programme lasting six months or longer (please note: from September 2015 this may change – International Students may face a small charge to access NHS services). If your programme lasts for less than six months, you should make sure you
have adequate medical insurance cover. If you are an EEA national, you should obtain a European Health Insurance Card (EHIC) before coming to the UK, which entitles you and your family to full NHS treatment. For more information, visit: studenthealth.qmul.ac.uk

**Living costs**
International students will need to show evidence of having at least £9,000 for living costs plus 100 per cent of your tuition fees in order to obtain Entry Clearance under Tier 4 of the UK Visas and Immigration’s points-based system of immigration. Additional amounts need to be shown for dependants. £9,000 is based on nine months of study and is an immigration requirement only – most students require more money than this for 12 months’ living costs – normally around £11,000. For further information, visit: welfare.qmul.ac.uk/international/money

**Scholarships**
We want to attract the best students to Queen Mary. In recognition of the important investment that international students are making in their education, we are pleased to offer a range of scholarships to reward outstanding academic achievement. For more information, visit: qmul.ac.uk/international/feesfinance

**Representatives in your country**
In many countries we have offices or representatives who you can visit to discuss applying to Queen Mary. Contact details can be found at: qmul.ac.uk/international/countries

**QMUL International**
Members of staff at Queen Mary regularly make visits overseas to meet students and their families.

To see when we will be visiting your region or for more information on any aspect of life at Queen Mary, see: qmul.ac.uk/international/events

**Contact us**
Tel: +44 (0)20 7882 6530
email: international-office@qmul.ac.uk
qmul.ac.uk/international

**English language**
All tuition and examinations at the university are in English, so a sound command of the language is essential for success. Queen Mary provides a number of programmes in English for academic purposes to help you get the most out of your study. You need to be able to cope with reading; note-taking from lectures, books, journals, and other materials; to speak well in seminars, discussion groups, and tutorials; and to present yourself effectively in written assignments and examinations.

**English language requirements**
If your first language is not English, you must provide evidence that your English skills are sufficient by including details of recognised language qualifications with your application. If you are an international applicant you are strongly advised to contact your local British Council Office, take the academic IELTS (International English Language Testing Service) test and submit the results with your application. Queen Mary’s minimum
requirement for postgraduates is an IELTS score of 6.5 or PTE Academic 62. However, some courses require a higher score. For detailed English language entry requirements for all of our programmes, including individual component scores, see: qmul.ac.uk/international

For many nationals, it is now also an immigration requirement that you sit a secure English language test and meet minimum component scores as set by the UK Visas and Immigration service.

If you have English language scores slightly below the required band you may be eligible to attend one of our pre-sessional English language summer programmes before the start of your course.

**English language summer programmes (pre-sessional programmes)**
From June to September, we arrange a series of English language programmes for students who wish to improve their proficiency in English before starting university. The programme aims to improve your listening, speaking, reading, and writing skills; teach study skills such as note-taking, academic writing, and seminar participation; develop skills essential to working independently; and to introduce you to life in Britain. We encourage independent work and use of English by setting individual projects. Queen Mary academic staff and other visiting lecturers will give a series of lectures. We provide some residential accommodation on summer programmes in our halls of residence. Find out more: http://language-centre.sllf.qmul.ac.uk/presessionals

**In-sessional English language support**
The Language Centre runs a series of insessional English programmes in academic writing, grammar and vocabulary, lecture comprehension and seminar skills, and general English during the main teaching periods of the academic year. These are free of charge. Find out more: http://language-centre.sllf.qmul.ac.uk/in-sessionals

**Academic study support**
To help you with the transition to higher degree study, the Library runs a programme of short courses, tutorials, and drop-in classes in skills such as organisation and time management, research and note-taking, oral communication and presentation, academic writing, personal development planning and revision, and examination skills. For more information, see: library.qmul.ac.uk/academic_study_tutorials

**English Language and Study Skills Office**
Tel: +44 (0)20 7882 2827
email: elss@qmul.ac.uk
http://language-centre.sllf.qmul.ac.uk
A postgraduate open evening in the Octagon at our Mile End campus, historically the university’s library and now an event space.
Campus tours
We organise campus tours throughout the year. Restricted to small groups so that everyone has the chance to ask questions, these informal events are a great way to find out about living and studying here. They normally last an hour and you will be shown around by a current student. To book your place, please visit qmul.ac.uk/visitus

Postgraduate open evening
Our postgraduate open evening is held at the Mile End campus. You will be able to meet academics, see subject-specific facilities, tour research and learning facilities and speak to our support services, including Careers staff.

To book your place, please visit: qmul.ac.uk/pgopenevening

Virtual events
We also hold virtual events during the year. For dates, virtual tours of the campus, videos and more, visit: qmul.ac.uk/postgraduate/virtualopenday

“Astronomy has been a life-long passion of mine. The constant array of new discoveries, driven by technological innovations and the ingenuity of astronomers, means that it never becomes stale or boring. It always gives me enormous pleasure to share the knowledge and experience that I have gained from a 25-year career working as a researcher in this fascinating and ever-changing subject”

Richard Nelson, Professor of Astronomy and Mathematics and Director of the Astronomy Unit
How to find us

The easiest way to get to Queen Mary is to use public transport. There are two Underground stations and many bus stops within a few minutes’ walk of the Mile End campus.

**Underground**
Queen Mary’s Mile End campus is located between Mile End station (Central, District, Hammersmith and City lines) and Stepney Green station (District, Hammersmith and City lines). Both stations are in London Underground Zone 2.

Our Whitechapel campus is right behind the Royal London Hospital on Whitechapel Road. Whitechapel Underground station (Hammersmith and City, and District lines) is directly across the road from the Hospital.

Based in the City of London, close to the Barbican, Queen Mary’s Charterhouse Square campus is five minutes’ walk from Barts Hospital. The nearest Underground station is Barbican (Hammersmith and City, Metropolitan and Circle lines). Farringdon is also not far away.

The nearest Underground station to the Postgraduate Law Centre at Lincoln’s Inn Fields is Holborn (Central and Piccadilly lines).

**Buses**
All of our campuses are well served by London bus routes. To plan your journey, visit: tfl.gov.uk

**Docklands Light Railway (DLR)**
The nearest DLR station to Queen Mary is Bow Church.

**Travelcards and Oystercards**
The most cost-effective and convenient way to pay for public transport in London (buses, trains, tubes, boats, trams, and DLR) is to get an Oyster card. As a student at QMUL, you are eligible for an 18+ Student Photocard which gives you 30 per cent off the price of adult-rate Travelcards and Bus and Tram Passes.

A discounted Zone 1-2 Travelcard – which gives you unlimited travel on buses, trains, tubes, and the DLR within Zone 1 (Central London) and Zone 2 (which includes Mile End) – is approximately £84. For more information, please see: www.tfl.gov.uk/oyster
Cars
Traffic is heavy and parking difficult, making driving in London an unattractive option. There are no parking places for students on campus, with the exception of students displaying an authorised blue disabled sticker (who have applied for and received a Queen Mary parking permit). Contact the Disability and Dyslexia Service for advice on: +44 (0)20 7882 2756.

Taxis
Black cabs use a meter to calculate your fare and you can hail one in the street. They are safe to use, but can be expensive. Mini-cabs are normal cars and charge a fixed price. Only use registered mini-cab firms.

Trains
London is very well served by overground train stations, all within easy reach of Queen Mary’s campuses. The closest is Liverpool Street, just two stops from Mile End on the Underground (Central line). Trains from Liverpool Street run to Stansted Airport, as well as other destinations. King’s Cross and St Pancras International (for Eurostar services to mainland Europe) are both a short journey from Mile End on the Underground’s Hammersmith and City line. London Bridge and Fenchurch Street are also close by.

Airports
The closest airport is London City Airport – just five miles away – which offers regular flights to UK and other European cities.

Heathrow, Gatwick, Luton, Stansted and Southend are within easy reach of Queen Mary, and all can be reached in anything from one to two hours by train or Underground.

Student travel in London
For more information about discounted travel, safety information and how to use the travel planning tools on the tfl website, visit: tfl.gov.uk/campaign/student-guide-to-travel-in-london
Contact
Queen Mary University of London, Mile End Road,
London E1 4NS qmul.ac.uk

We would like to thank the students who took part
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Jonathan Cole (JonathanColePhotography.com)

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