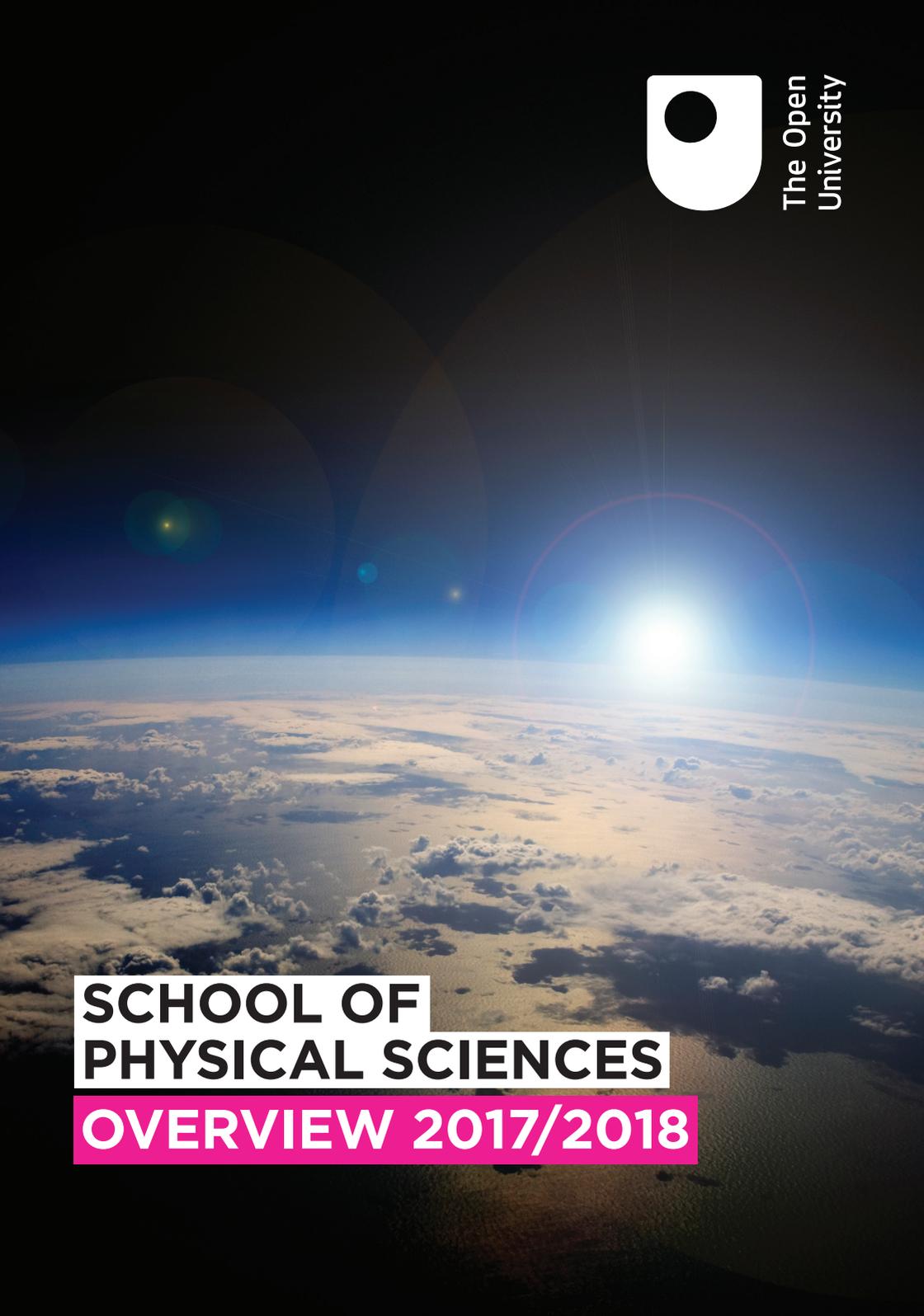




The Open  
University

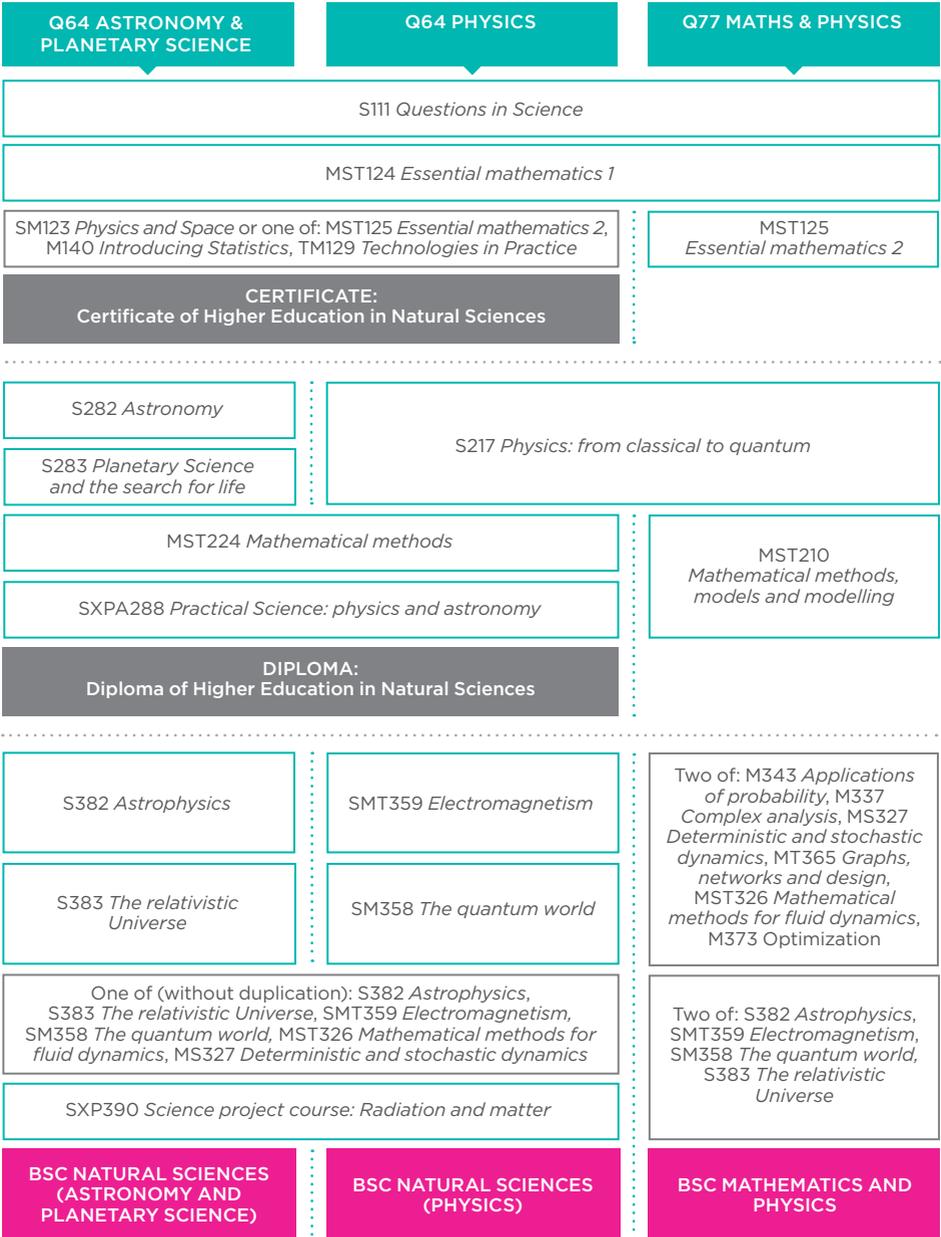
A background image showing a view of Earth from space, with a bright sun or star in the upper right, creating a lens flare effect. The Earth's surface is covered in clouds and oceans, with the horizon line visible.

# SCHOOL OF PHYSICAL SCIENCES

## OVERVIEW 2017/2018

# UNDERGRADUATE QUALIFICATIONS

- Compulsory modules
- Intermediate qualifications
- Specialism/subject choice
- Option modules
- Awarded qualifications





**WELCOME**

© Ben Dryer, The Open University

The Open University's School of Physical Sciences is a lively and innovative community based predominantly at the University's main campus in Milton Keynes with around 80 staff and 70 research students drawn from across the globe.

Our teaching materials used in physics, astronomy, planetary and space science modules are developed and produced by school members. As a result, we are consistently at the forefront of many innovations in distance

education. Teaching is delivered by associate lecturer staff, based throughout the UK and Ireland, who support hundreds of undergraduate students all over the world. We also contribute to introductory and

interdisciplinary science modules being studied by several thousand students.



**MORE ONLINE**

Find out more  
[www.open.ac.uk/science/physical-science/](http://www.open.ac.uk/science/physical-science/)

“

*Welcome to the Open University's School of Physical Sciences, a community of staff and students with common interests in the physical world around us and the Universe beyond. We have particular research interests in physics, astronomy, planetary and space science, and space instrumentation, and we aim to provide exciting and effective teaching in these subjects, for students studying all over the world. Our commitment to diversity is reflected in our Juno Champion status and our Athena SWAN Silver Award.”*

**Professor Sally Jordan, Head of School**

OpenLearn aims to break the barriers to education by reaching millions of learners around the world, providing free educational resources and inviting all to sample courses that our registered students take – for free!

## **GALAXIES, STARS AND PLANETS:**

This course will describe our position in the cosmos, zooming out to the largest scales, and also zooming the other way into microscopic scales. Throughout the journey, the course introduces some of the processes that are seen when viewing the Universe at these sizes.

## **MOONS:**

This course will explore the many moons of our Solar System. You will find out what makes each one special and consider the question 'Should we send humans to our Moon again?'

## **TELESCOPES AND SPECTROGRAPHS:**

This course looks at how these instruments are designed to improve our ability to observe the universe. You will examine how different technologies have been developed over the last four hundred years to enable us to look deep into space.



## **SCATTERING AND TUNNELLING:**

This course investigates examples and the applications of both of these fascinating concepts. Scattering is fundamental to almost everything we know about the world, such as why the sky is blue while tunnelling is entirely quantum-mechanical and gives rise to such phenomena as nuclear fusion in stars.



## **MORE ONLINE**

This is a very small selection of the many courses available at: [www.open.ac.uk/openlearn/](http://www.open.ac.uk/openlearn/)

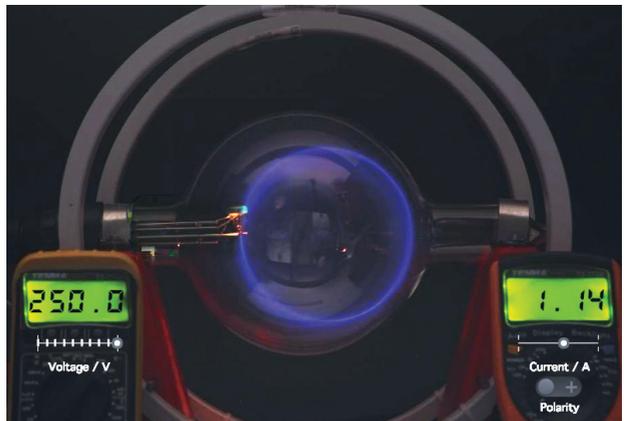


# OpenSTEM Labs

This online laboratory brings interactive practical science, technology, engineering and mathematics to students anywhere and anytime. Through remotely accessible hardware for laboratory and exploratory studies ranging from electronics to chemical synthesis and from microscopes to telescopes, students are able to access the various instruments and other remote controlled resources virtually via a basic internet connection.

The Open STEM Labs encompass the Open Science Laboratory, the Open Science Observatories, the Open Engineering Lab and the onsite teaching labs with School of Physical Sciences Staff involved in all aspects.

For example; the Fine Beam Tube experiment (pictured right) allows you to determine the charge to mass ratio of the electron by studying the deflection of an electron beam into a circular path in a low pressure environment.



*We are using the speed and reach of the internet to connect distance learning students with opportunities for discovery learning - we are driven by a commitment to provide access to real data through authentic interfaces. This way we are able to give opportunities for using research grade telescopes, microscopes and bench experiments - individually and collaboratively."*



**MORE ONLINE**

Find out more  
[www.opensciencelab.ac.uk](http://www.opensciencelab.ac.uk)

Professor Nicholas Braithwaite, OpenSTEM Labs Director



## UNDERGRADUATE STUDY

The School leads a wide variety of physics, astronomy, planetary science and space science modules and qualifications – from introductory modules accessible to most, right through to a choice of degrees that can take you on to professional work in these areas.

### S111 QUESTIONS IN SCIENCE:

This introductory module encompasses all of the sciences and through a series of questions, starting with ‘Can you make a hole in water?’ and ‘How do you know what is alive?’, teaches scientific thinking.

You will also undertake a significant number of practical experiments, both ‘hands-on’ in your own home and online.

Find out more: [www.open.ac.uk/courses/modules/s111](http://www.open.ac.uk/courses/modules/s111)

“

*S111 is a superb course to be involved with as the students are always asking interesting and insightful questions, especially on the national forum, where peer support is substantial. Physicists and Astronomers exploit maths as a language to explain their science - but if maths isn't yet their forte there is no need to worry as S111 leads students from the start with maths skills and teaching embedded in the science topics.”*

Dr Helen Fraser, S111 Module Team Member

## MST124 ESSENTIAL MATHEMATICS 1:

This introductory module teaches you the essential ideas and techniques that underpin university-level study in mathematics and mathematical subjects. You'll study a range of fundamental topics –

including calculus, vectors, matrices and complex numbers – and use mathematical software to solve problems.

Find out more: [www.open.ac.uk/courses/modules/mst124](http://www.open.ac.uk/courses/modules/mst124)



*Essential Mathematics 1 is an enjoyable module which will support you in identifying and filling any gaps in your previous knowledge. The aim is that you'll be well equipped with mathematical techniques for all of your future studies."*

Dr Jimena Gorfinkiel, MST124 Module Team Member



Image © TimArbaev/Thinkstock

## S282 ASTRONOMY:

This module considers the structure, origin and evolution of stars, galaxies and the Universe as a whole, asking questions such as: How are stars born, and what happens when they die? How do galaxies form, and how do we know that the universe began in a 'Big Bang'?

Find out more: [www.open.ac.uk/courses/modules/s282](http://www.open.ac.uk/courses/modules/s282)

## S217 PHYSICS: FROM CLASSICAL TO QUANTUM:

This wide-ranging module teaches general physics with an emphasis both on the concepts and their basic numerical description, as well as their application.

Find out more: [www.open.ac.uk/courses/modules/s217](http://www.open.ac.uk/courses/modules/s217)

## EQUALITY AND DIVERSITY

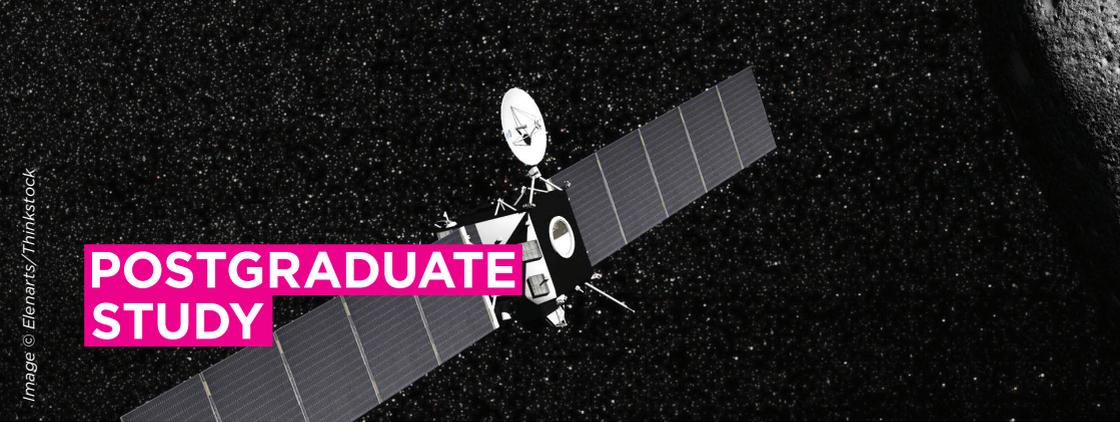
We are committed to equality of opportunity, for both our students and staff, in keeping with the mission of the Open University to be 'open to people, places and ideas'. This underpins the School's values and is reflected across

all research, teaching and other activities we engage in. In recognition of our support for women in STEM, we hold an

Institution of Physics Juno Champion award and an Athena SWAN Silver award.

**IOP** | Institute of Physics  
Juno Champion

**Athena SWAN**  
Silver Award



# POSTGRADUATE STUDY

We offer a range of postgraduate taught and research degrees – you can study a MSc, PhD or MPhil on a full-time or part-time basis.

For many years the Schools space scientists have played key roles in iconic missions, with the Rosetta Mission being the latest example.

Our new MSc in Space Science and Technology is your chance to study for a taught qualification alongside them or for the latest PhD opportunities please visit

[www.open.ac.uk/science/physical-science/job-and-studentshipopportunities](http://www.open.ac.uk/science/physical-science/job-and-studentshipopportunities)

## MSC IN SPACE SCIENCE AND TECHNOLOGY:

This postgraduate qualification is designed for those with an academic or professional interest in space science and the technology that underpins this discipline. It equips students with the skills to carry out scientific investigations using space-based instrumentation, both individually and as a team. Key features of the course include: Developing the skills in conducting science in the space environment through the use of robotic

experiments; Exploring the current debates in space and planetary sciences using data from space missions and developing technical and professional skills according to individual needs and interests. The masters culminates with an in-depth individual research project in space science or space technology.

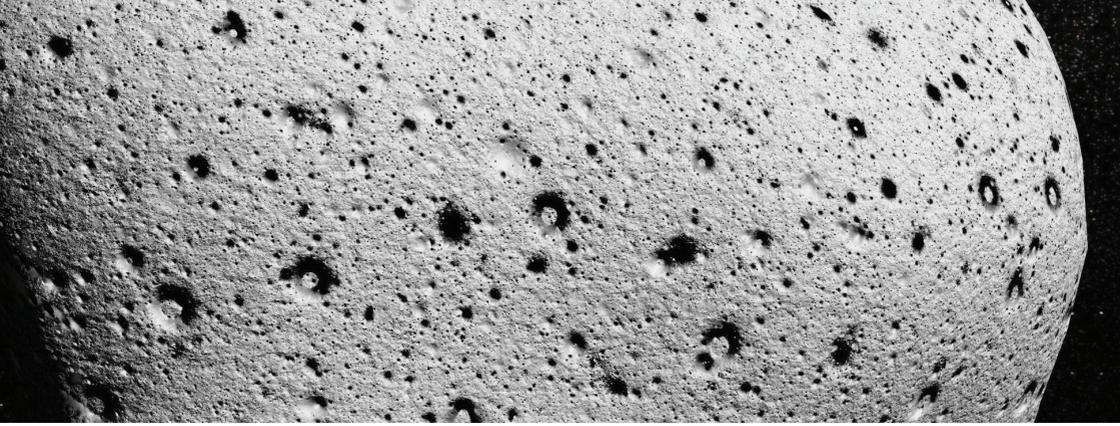
Find out more: [www.open.ac.uk/postgraduate/qualifications/f77](http://www.open.ac.uk/postgraduate/qualifications/f77)

“

*Studying physics or astronomy & planetary science with The Open University is a journey that can take you from the first appreciation of what science is about to the very cutting-edge of research. Our learning resources combine the best of latest technologies and traditional media. They are prepared by academics who are passionate about their subject and experts in their field.*

*Our flexible approach to learning and individual support gives you the best chance to succeed, no matter if you are studying for interest, personal development or a career change.”*

Dr Ulrich Kolb, Director of Teaching



### S818 SPACE SCIENCE:

Spacecraft missions play a vital role in the exploration of the Solar System and the more distant universe, and are at the forefront of scientific inquiry. This module provides an in-depth introduction to

the methods of conducting scientific measurements and observations in the space environment and the technologies needed for space missions. A key feature of this module is the use of remotely

operated experiments to develop your skills in conducting space-based scientific investigations.

Find out more: [www.open.ac.uk/postgraduate/modules/s818](http://www.open.ac.uk/postgraduate/modules/s818)

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## POSTGRADUATE QUALIFICATIONS

Compulsory modules

Intermediate qualifications

Option modules

### F77 MSc IN SPACE SCIENCE AND TECHNOLOGY

S818 *Space Science*

One of: T848 *Managing technological innovation*, M815 *Project management*, T849 *Strategic capabilities for technological innovation*

Plus one of: T804 *Finite element analysis: basic principals and applications*, T805 *Manufacture material design*, M813 *Software development*, M814 *Software engineering*

### POSTGRADUATE DIPLOMA: Space Science and Technology

S810 *MSc Project Module*

# RESEARCH AREAS

Research in the School of Physical Sciences is broadly divided into four disciplines - Astronomy, Physics, Planetary and Space Sciences and Space Instrumentation - together with cross-discipline physics education. Our research covers a wide range of subjects, from the behaviour of atoms at temperatures close to absolute zero to the mergers of distant galaxies.

We participate in many high profile space missions and have an unparalleled suite of analytical, simulation and development laboratories, advanced computing and regular use of multi-national facilities such as synchrotrons and large telescopes. A common thread that runs through all our research is a desire to understand the origin of matter, and how it has evolved from the Big Bang almost 14 billion years ago to what we can observe and measure today.

## ASTRONOMY

We have international programmes of observational, theoretical, laboratory based and mission based astronomy research, focussing on all four of the key science questions of European astronomy. The Astronomy Discipline is a member of the UK SALT Consortium, and operates the OpenScience Observatories.

The OU leads the Dispersed Matter Planet Project which is discovering rocky exoplanets orbiting bright nearby stars, while our laboratory work addresses how small particles aggregate to form planets. We study the most massive stars in our Galaxy and beyond, and examine the physics underlying stellar variability through

large-scale archive studies and rapid response OpenScience Observatory observations of transient alerts from Gaia and gravitational wave detections. The composition and energetics of jets in active galaxies is a new focus for the group and allows the effect of jets on galaxy evolution to be examined. Members of our group are part of the guaranteed time consortia of the Japanese AKARI infrared survey mission and the Herschel SPIRE instrument. We coordinate an EU Network in Astrobiology and act as co-investigators in the future Japan/ESA SPICA mission and the UK LOFAR Consortium.



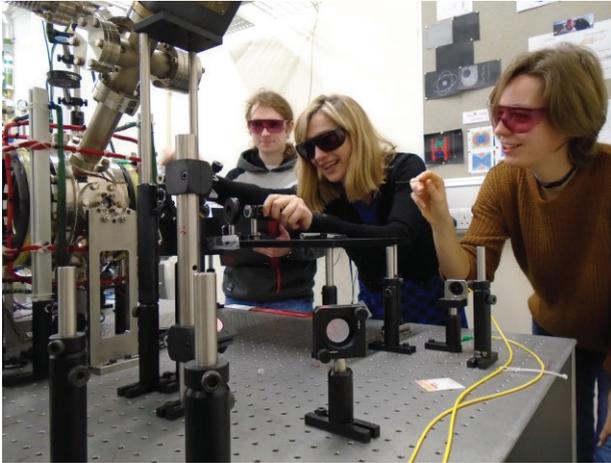
*The PIRATE and COAST telescopes on Tenerife*

## PHYSICS

Our research ranges from the study of the quantum mechanical behaviour of atoms, plasma and complex molecules to clusters and solid state. Combining theoretical methods and experimental techniques, we explore the behaviour

of matter at the nanoscale to help understand electron-driven processes in plasma technology, for nanofabrication and in cancer radiation treatment; we also investigate the use of nanoparticles for cancer therapy. Other important

applications of our research are the development of quantum enhanced devices in quantum technologies, the development of multi-purpose software to treat electronic continua and the functionalization of materials.



## SPACE INSTRUMENTATION

The activities of our discipline span basic research into Space Science, and the investigation and development of new technologies for use in space, to Space Projects, in which we develop flight hardware and provide support for many space missions both in development and operation. Our research is broken into three main themes; imaging sensor research including space weather, the impact of defects of silicon including

the design and characterisation of advanced sensors, analytical instrumentation based on mass spectroscopy and the development of new instrumentation techniques, the development of spectroscopic and imaging techniques for planetary atmospheres. We have growing interest in space resource exploitation, including the use of 3D printing for development of space habitats on the moon and mars.

## PLANETARY & SPACE SCIENCE

Our research covers a wide range of Solar System science and exploration. We investigate the origin and evolution of the Solar System, through the physical, geological, chemical and biological processes that drive it. We use laboratory and space mission experiments, remote observation, environmental simulation and modelling to investigate the surfaces and atmospheres of the terrestrial planets, the Moon, asteroids and comets, as well as potential habitats for life. We apply our extensive suite of micro-analytical facilities to extra-terrestrial samples to study planetary evolution, solar system formation and pre-solar processes. The discipline has a long history of involvement in major Solar System exploration missions such as Cassini Huygens, Stardust, Genesis and Rosetta, that continues into most of the on-going and planned planetary missions.

**openuniversity.co.uk**

**Twitter @OUPhysSci**

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**Fax: +44 (0) 1908 655667**

## GET IN TOUCH

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WALES, THE CHANNEL  
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MAN AND BFPO  
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THE UK**

- Go to **openuniversity.co.uk**
- Call our Student Recruitment Team on **+44 (0)300 303 5303**

Lines are open (UK time)

Monday to Friday:

08:00 – 20:00

Saturday: 09:00 – 17:00

Calls are charged at the UK local rate when calling from a UK mobile phone or landline.

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OF IRELAND**

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- Email us **ireland@open.ac.uk**

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- Call us on **+44 (0)300 303 0266**

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Os ydych yn siarad Cymraeg a byddai'n well gennych drafod eich anghenion astudio drwy gyfrwng y Gymraeg, cysylltwch â:

Y Brifysgol Agored yng Nghymru, 18 Heol y Tollty, Caerdydd, CF10 1AP

- Ffoniwch ni ar **029 2047 1170**
- Ebost **wales-support@open.ac.uk**