

Department  
of Physics

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Undergraduate studies in

**Physics**

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## Important information

The programme information published in this brochure was correct at time of going to print (June 2024) and may be subject to change. Prospective students are advised to check the definitive programme information, including entry requirements, that is available on our website before making an application, to ensure that the programme meets their needs.

# Welcome

There has been a long tradition of teaching Physics and Astronomy at Aberystwyth since the University was first established in the Old College on the sea front in 1872. Over 150 years later, we continue to offer our students a high quality teaching and learning experience and are rated in the Top 15 in the UK for Student Experience for the subject of Physics & Astronomy (The Times and Sunday Times, Good University Guide 2023).

Our aim is to provide the highest quality education in a friendly and supportive environment and to undertake internationally competitive, collaborative research in Space Physics, Materials Physics and Quantum Physics. Our lecturers are research-active, involved in projects ranging from engineering new materials and novel instruments to planetary missions and ground-breaking studies of the Sun's activity. Their research feeds into their teaching so that you can be assured that you will be taught the latest ideas by some of the leading experts in the UK in their fields.

The Department is housed in one of the most distinctive and architecturally renowned buildings on Penglais campus, where lecture theatres, laboratories, study areas and the Physical Sciences Library are located together. Recent refurbishment ensures that we continue to provide a stimulating learning environment for a growing body of students from all over the world.

A degree in Physics is an excellent preparation for careers in areas such as teaching and engineering as well as providing the first step to becoming a professional scientist. The majority of our Physics courses are accredited by the Institute of Physics (IOP) and the curriculum enables you to take joint courses with other departments in the university and to specialise in areas such as mathematical physics and astrophysics. Our single honours courses are also available as Integrated Masters courses, and some are available with an integrated year in industry, enabling you to gain a head start when entering the competitive job market.

Working closely with Coleg Cymraeg Cenedlaethol, the Department plays a leading role in the provision of physics in higher education through the medium of Welsh.

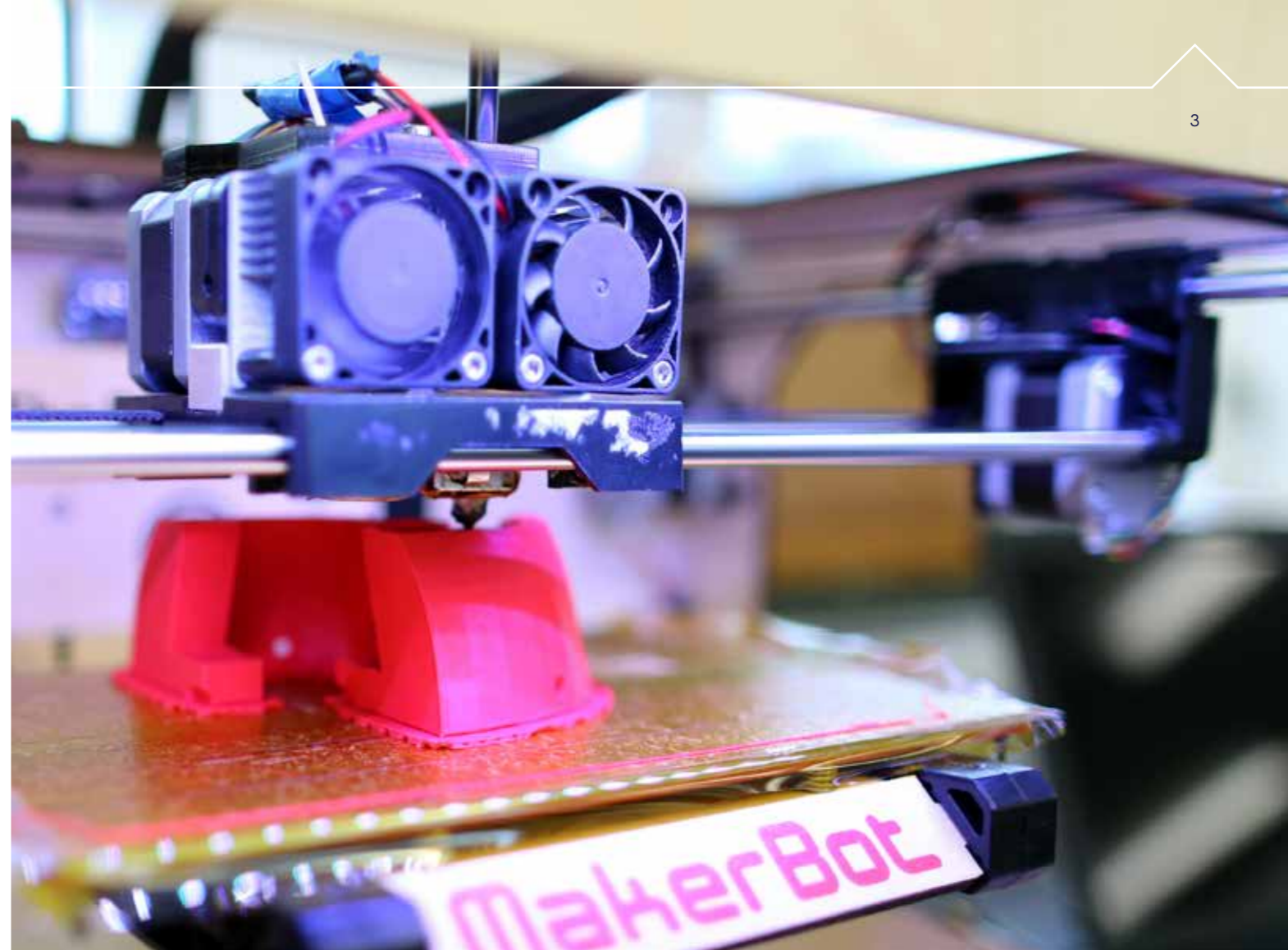
Why not visit us to see for yourself what makes Aberystwyth such an incredible place to study.

We look forward to welcoming you to the Department.

**Professor Andrew Evans**  
Head of Department



# The Department



# Our courses

## Single Honours

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## Astrophysics

BSc (Hons) | F510 | 3 years

The Astrophysics degree at Aberystwyth incorporates current topics in astronomy alongside a core of fundamental physics to explore the interaction of energy and matter in the near and far universe.

The degree includes areas such as the formation and evolution of the solar system, gas giant and terrestrial worlds, planetary interiors and surfaces, planetary atmospheres, the solar wind, the Sun as a star, comets, red giants, white dwarfs, neutron stars, black holes, galaxies, quasars and cosmology.

You will benefit from:

- studying a degree accredited by the Institute of Physics
- linking your final year project to a current research project within the Department in areas such as space physics and astronomy
- access to specialist astronomical equipment
- being taught by researchers who are involved in the current space missions.

### Employability

A degree in Astrophysics will prepare you for career destinations such as space scientist, physicist, scientific laboratory technician, radiation protection practitioner and research scientist. Other career paths may include systems developer, product development scientist, technical author or meteorologist.

Accredited by:



## Module list

Below is an indicative list of modules that you may study on this course.

### First year:

- Algebra and Differential Equations \*
- Astronomy
- Calculus \*
- Dynamics, Waves and Heat \*
- Electricity, Magnetism and Matter \*
- Further Algebra and Calculus \*
- Laboratory Techniques for Experimental Physicists and Engineers \*
- Modern Physics
- Physics Career Planning and Skills Development \*

### Second year:


- Electricity and Magnetism \*
- Mathematical Physics \*
- Numerical Techniques for Physicists
- Optics
- Practical Research Skills \*
- Principles of Quantum Mechanics
- Stars and Planets
- Thermodynamics


### Final year:

- Astrophysics I: Physics of the Sun
- Astrophysics II: Galaxies, General Relativity and Cosmology
- Concepts in Condensed Matter Physics
- Particles, Quanta and Fields
- Project \*


\* also available partially or entirely through the medium of Welsh.

## Key Facts

 **Typical offer:**  
**BSc - UCAS tariff points:** 120-112 to include B in A level Physics and Mathematics  
**IB:** 30-28 with 5 points in Physics and Mathematics at Higher Level

 **Assessment weighting:** 60-40% coursework and 40-60% exams

 **Field trips/fieldwork:** Away day careers workshops

 **Also available:**  
**F511** Integrated Masters  
**F512** Integrated foundation year

# Engineering Physics

BEng (Hons) | 179H | 3 years

Engineering Physics focuses on the application of physical principles and techniques to engineering and technology – two demanding industries. At Aberystwyth, we prepare you with the knowledge and skills of physics training that are required for producing engineering solutions in real-world situations.

This course has a strong practical IT element and an opportunity to gain expertise in specialist topics such as micro and nano-electronics, applied photonics, materials design and production, quantum technology, robotics, solar energy and space instrumentation. With the opportunity to take a year in industry we are confident that our innovative teaching and opportunities can equip you for the future.

The Integrated Masters (MEng) degree (168F) includes an integrated industrial placement and an additional year of study where you will gain professional training and research skills.


You will benefit from:


- studying a degree accredited by the Institute of Physics
- the option of a year in industry to develop practical experience of applying the skills acquired in the first two years of study
- specialist facilities include mechanical, electronics and robotics workshops, materials fabrication and characterisation, optical and space instrumentation and analogue planetary terrains
- being taught by researchers who are involved in the current space missions and engineering low dimensional materials (eg graphene).

## Employability

A degree in Engineering Physics will prepare you for a career as an engineer or scientist in areas such as industrial research and development, product development and national research laboratories. Employment sectors include energy, photonics, space, IT, health and education.

## Key Facts

 **Typical offer:**  
BEng - UCAS tariff points: 120-112 to include B in A level Physics and Mathematics  
IB: 30-28 with 5 points in Physics and Mathematics at Higher Level

 **Assessment weighting:** 60-40% coursework and 40-60% exams

 **Field trips/fieldwork:** Away day careers workshops

Accredited by:



## Module list

Below is an indicative list of modules that you may study on this course.

### First year:

- Algebra and Differential Equations \*
- Calculus \*
- Communication and Technology
- Dynamics, Waves and Heat \*
- Electricity, Magnetism and Matter \*
- Further Algebra and Calculus \*
- Laboratory Techniques for Experimental Physicists and Engineers \*
- Modern Physics
- Physics Career Planning and Skills Development \*

### Second year:

- Electricity and Magnetism \*
- Mathematical Physics \*
- Numerical Techniques for Physicists
- Optics
- Practical Research Skills \*
- Principles of Quantum Mechanics
- Sensors, Electronics & Instrumentation
- Thermodynamics

### Final year:

- Concepts in Condensed Matter Physics
- Engineering Control Theory
- Particles, Quanta and Fields
- Professional Skills in Engineering
- Project (with Project Management) \*
- Semiconductor Technology
- Systems Engineering

\* also available partially or entirely through the medium of Welsh.

# Mathematical and Theoretical Physics

BSc (Hons) | F340 | 3 years

Mathematical and Theoretical Physics explores the more theoretical parts of physics and provides a solid grounding in mathematics. At Aberystwyth, you will study a wide range of themes including abstract and linear algebra, calculus, differential equations, quantum mechanics, dynamics and thermal physics.

This combination of mathematics and physics links to many spheres of interest and reflects our research expertise in applied mathematics, quantum control, solar physics and condensed matter physics.


You will benefit from:


- studying a degree accredited by the Institute of Mathematics and its Applications
- joining two departments each with over 140 years experience in excellence and teaching
- being taught by lecturers who are also researchers working at the cutting edge of their respective fields, so you can be confident that your learning experience will be informed by the latest specialist knowledge in modelling and techniques.

## Employability

Graduates in Mathematical and Theoretical Physics are highly valued by employers for their skills in numeracy and problem-solving. The four-year Integrated Masters (MMath) degree also offers research skills. Career opportunities include engineering, scientific writing and publishing, risk analysis, operational research, business consultancy, medical physics, meteorology, accounting and finance.

## Key Facts

 **Typical offer:**  
BSc - UCAS tariff points: 120-112 to include B in A level Physics and Mathematics  
IB: 30-28 with 5 points in Physics and Mathematics at Higher Level

 **Assessment weighting:** 60-40% coursework and 40-60% exams

 **Field trips/fieldwork:** Away day careers workshops

Accredited by:



Recognised by:



## Module list

Below is an indicative list of modules that you may study on this course.

### First year:

- Algebra \*
- Calculus \*
- Coordinate and Vector Geometry \*
- Differential Equations \*
- Dynamics, Waves and Heat \*
- Further Algebra and Calculus \*
- Mathematical Analysis \*
- Modern Physics
- Probability \*
- Statistics \*

### Second year:

- Complex Analysis \*
- Distributions and Estimation
- Electricity and Magnetism \*
- Introduction to Abstract Algebra
- Linear Algebra \*
- Mathematical Physics \*
- Principles of Quantum Mechanics
- Real Analysis \*
- Thermodynamics

### Final year:

- Particles, Quanta and Fields
- Group Theory
- Norms and Differential Equations \*
- Partial Differential Equations \*
- Probability and Stochastic Processes

\* also available partially or entirely through the medium of Welsh.

 **Also available:**  
F341 Integrated Masters

# Physics

BSc (Hons) | F300 | 3 years

Understanding the laws of physics underpins the whole of modern science and technology. It involves the application of abstract concepts expressed through mathematics to model and predict the behaviour of systems ranging in scale from the subatomic to the galactic. Physics at Aberystwyth explores areas as diverse as quantum technology, the theory of relativity and solid-state physics.

Our research-led teaching staff will provide you with specialist knowledge and practical skills, covering exciting topics such as quantum technology, relativity, computational physics, advanced materials, nanoscience, optics, lasers and instrumentation.


You will benefit from:


- studying a degree accredited by the Institute of Physics
- the option to link your final year project to research specialisms in materials, quantum and space physics
- being taught by researchers that are involved in current space missions and engineering low dimensional materials (graphene).

## Employability

Physics graduates are well equipped for a wide range of career options. Some of our graduates are now pursuing careers as diverse as meteorology, accountancy, computing, geophysics, medical physics, teaching in schools and universities, research in materials physics and in the astronomical, space and planetary sciences.

## Key Facts

 **Typical offer:**  
**BSc - UCAS Tariff Points:** 120-112 to include B in A level Physics and Mathematics  
**IB:** 30-28 with 5 points in Physics and Mathematics at Higher Level

 **Assessment weighting:** 60-40% coursework and 40-60% exams

 **Field trips/fieldwork:** Away day careers workshops

Accredited by:



## Module list

Below is an indicative list of modules that you may study on this course.

### First year:

- Algebra and Differential Equations \*
- Calculus \*
- Dynamics, Waves and Heat \*
- Electricity, Magnetism and Matter \*
- Further Algebra and Calculus \*
- Laboratory Techniques for Experimental Physicists and Engineers \*
- Modern Physics
- Physics Career Planning and Skills Development \*


### Second year:

- Electricity and Magnetism \*
- Mathematical Physics \*
- Numerical Techniques for Physicists
- Optics
- Practical Research Skills \*
- Principles of Quantum Mechanics
- Sensors, Electronics & Instrumentation
- Thermodynamics

### Final year:

- Concepts in Condensed Matter Physics
- Materials Physics
- Modern Optics and Photonics
- Particles, Quanta and Fields
- Project \*
- Semiconductor Technology

\* also available partially or entirely through the medium of Welsh.

 **Also available:**  
**F304** Integrated year in industry  
**F301** Integrated foundation year  
**F303** Integrated Masters  
**F305** Integrated Masters with integrated year in industry

# Physics with Planetary and Space Physics

BSc (Hons) | F364 | 3 years

The Physics with Planetary and Space Physics degree at Aberystwyth provides you with a core of physics alongside a detailed exploration of the physics of the solar system. Physics with Planetary and Space Physics is one of the most established space physics courses in the UK. You will be taught by experts in this field and have access to specialist astronomical equipment.

You will study the evolution of the solar system, planetary interiors and surfaces, the Sun as a star, comets and red giants. You will also cover atmospheric physics, thermal physics and quantum mechanics.


You will benefit from:


- linking your final year project to a current solar system physics research project
- studying a degree accredited by the Institute of Physics
- being taught by researchers who are involved in current space missions
- the possibility of spending a semester studying in the Arctic Circle on the island of Svalbard.

## Employability

A degree in Physics with Planetary and Space Physics at Aberystwyth will prepare you for such career destinations as space scientist, physicist, scientific laboratory technician, radiation protection practitioner, and research scientist. Other career paths may include systems developer, product development scientist, technical author or meteorologist.

## Key Facts

 **Typical offer:**  
**BSc - UCAS Tariff Points:** 120-112 to include B in A level Physics and Mathematics  
**IB:** 30-28 with 5 points in Physics and Mathematics at Higher Level

 **Assessment weighting:** 60-40% coursework and 40-60% exams

 **Field trips/fieldwork:** Away day careers workshops

Accredited by:



## Module list

Below is an indicative list of modules that you may study on this course.

### First year:

- Algebra and Differential Equations \*
- Calculus \*
- Dynamics, Waves and Heat \*
- Electricity, Magnetism and Matter \*
- Further Algebra and Calculus \*
- Laboratory Techniques for Experimental Physicists and Engineers \*
- Modern Physics
- Physics Career Planning and Skills Development \*

### Second year:

- Electricity and Magnetism \*
- Mathematical Physics \*
- Numerical Techniques for Physicists
- Optics
- Practical Research Skills \*
- Principles of Quantum Mechanics
- Stars and Planets
- Thermodynamics

### Final year:

- Astrophysics I: Physics of the Sun
- Concepts in Condensed Matter Physics
- Particles, Quanta and Fields
- Physics of Planetary Atmospheres
- Project \*

\* also available partially or entirely through the medium of Welsh.

 **Also available:**  
**F366** Integrated Masters

# Space Science and Robotics

BSc (Hons) | FH56 | 3 years

The unique Space Science and Robotics degree will expose you to the foundations of space exploration and equip you with the skills that meet the requirements and challenges of the space industry. This course combines expertise in solar system and space physics with the space robotics and artificial intelligence of the Department of Computer Science to consider the challenges to be met in robotic exploration of the solar system and their solutions.

You will be taught by experts in their field and exposed to the foundations of space exploration. You will be equipped with the skills that meet the requirements and challenges of the space industry, as well as the planning and development of future Space Physics and Astrophysics missions.

You will benefit from:

- studying the only degree of its kind in the UK
- the opportunity to undertake a project linked to current research in space physics or robotics
- being taught by researchers who are involved in current space missions.

## Employability

This degree perfectly equips you with the necessary skills for careers in the space industry. A number of our graduates have gone on to specialise in space robotics or a related field of astrophysics or robotics. Other potential careers include software and systems development, computer programming, engineering or teaching.

## Key Facts



**Typical offer:**  
**BSc - UCAS Tariff Points:** 120-112 to include B in A level Physics and Mathematics  
**IB:** 30-28 with 5 points in Physics and Mathematics at Higher Level



**Assessment weighting:** 60-40% coursework and 40-60% exams



**Field trips/fieldwork:** Away day careers workshops

Recognised by:



## Module list

Below is an indicative list of modules that you may study on this course.

### First year:

- Introduction to Programming \*
- Programming Using an Object-Oriented Language \*
- Algebra and Differential Equations \*
- Calculus \*
- Dynamics, Waves and Heat \*
- Electricity, Magnetism and Matter \*
- Laboratory Techniques for Experimental Physics \*

### Second year:

- C and C++
- Practical Research Skills \*
- Robotics and Embedded Systems
- Scientific Python \*
- Sensors, Electronics & Instrumentation
- Stars and Planets

### Final year:

- Physics of Planetary Atmospheres
- Professional Skills in Engineering
- Agile Development and Testing
- Computer Vision
- Fundamentals of Machine Learning
- Robotic Applications
- Space Robotics

\* also available partially or entirely through the medium of Welsh.

# Joint Honours

Subject	Available with...	Joint Honours
Physics	Mathematics	FG31





# Employability

A degree in Physics will prepare you for such career destinations as medical physicist, scientific laboratory technician, radiation protection practitioner, research scientist and more. Other career paths may include systems developer, product development scientist, technical author or meteorologist. Further study at postgraduate level will open doors into research, lecturing and teaching, and our Integrated Masters degrees will set you on course to achieve this.

To further enhance your employability prospects, some of our courses are available with an integrated year in industry, ensuring that you graduate with the necessary skills and experience to give you a head start when entering the job market. The University also offers the Year in Employment Scheme (YES), enabling students from any subject discipline to undertake a year in employment between the second and third year of their undergraduate study.

## Transferable skills

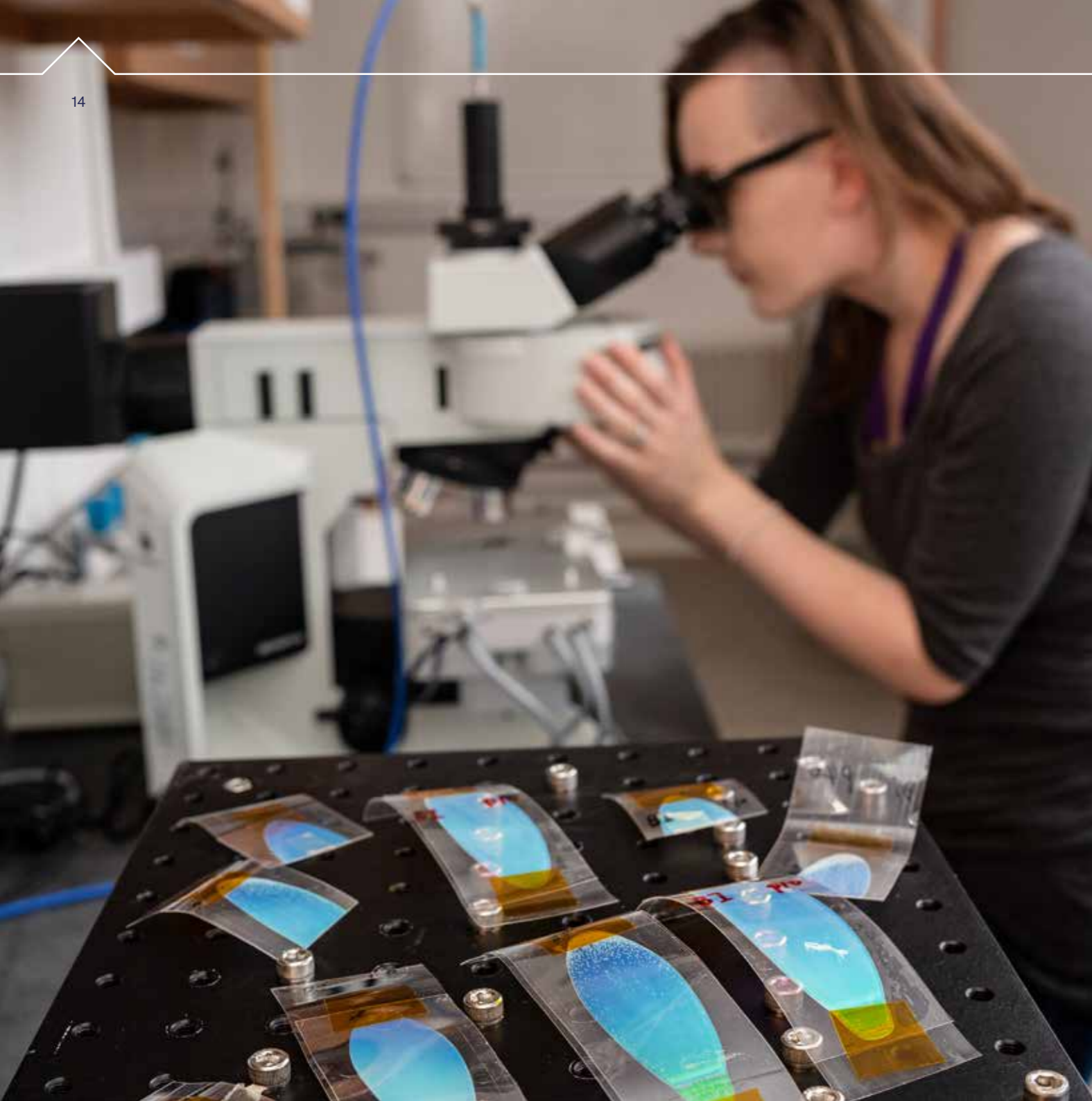
Studying for a degree in Physics will equip you with a range of transferable skills which are highly valued by employers.

These include:

- Research and data analysis skills
- Enhanced mathematical and computational skills
- Effective problem-solving and creative thinking skills
- Facility to deal with abstract concepts

- Thorough grounding in information technology skills
- Ability to work independently
- Time-management and organisational skills, including the ability to meet deadlines
- Ability to express ideas and communicate information in a clear and structured manner, in both written and oral form
- Self-motivation and self-reliance
- Team-working, with the ability to discuss concepts in groups, accommodating different ideas and reaching agreement





# Studying through the medium of Welsh

Aberystwyth University offers a high level of provision for students to be able to study through the medium of Welsh - one of the highest in Wales.

The Department of Physics provides all students with the opportunity to study part of their course through the medium of Welsh by offering a number of modules which can be studied partially or entirely through the medium of Welsh. You can study some modules in Welsh, even if you are studying mainly in English, and you can choose to submit your coursework in Welsh.

There are opportunities for students who are fluent in Welsh, in addition to those who are less confident or are learners. There are variations in undergraduate course modules and the amount that can be studied through the medium of Welsh.

'Addewidion Aber' is Aberystwyth University's commitment to develop Welsh-medium provisions following the University's Welsh-medium academic strategy. This is the most comprehensive plan of its kind by any university in Wales.

These pledges highlight what is special about Aberystwyth and how the University offers a complete Welsh experience to students, including:

- Flexible opportunities to study through the medium of Welsh in all departments
- Guaranteed Welsh-speaking Personal Tutor
- Bilingual work experience
- Guaranteed Welsh-medium accommodation
- Support for learning and improving your Welsh
- Money in your pocket for following between 5 and 40 credits in Welsh
- Free membership of the Welsh Students' Union (Undeb Myfyrwyr Cymraeg Aberystwyth)
- Space for Welsh-medium societies to meet



# Departmental Research

Our mission is to provide the best learning environment for our students, informed by world-leading research in space, quantum, materials and engineering physics.

Our lecturers are research-active in their fields, involved in projects ranging from engineering new materials and novel instruments to planetary missions and ground-breaking studies of the Sun's activity. Our staff actively encourage undergraduate students to become involved in their work throughout their studies. Our research is organised into two main groups:

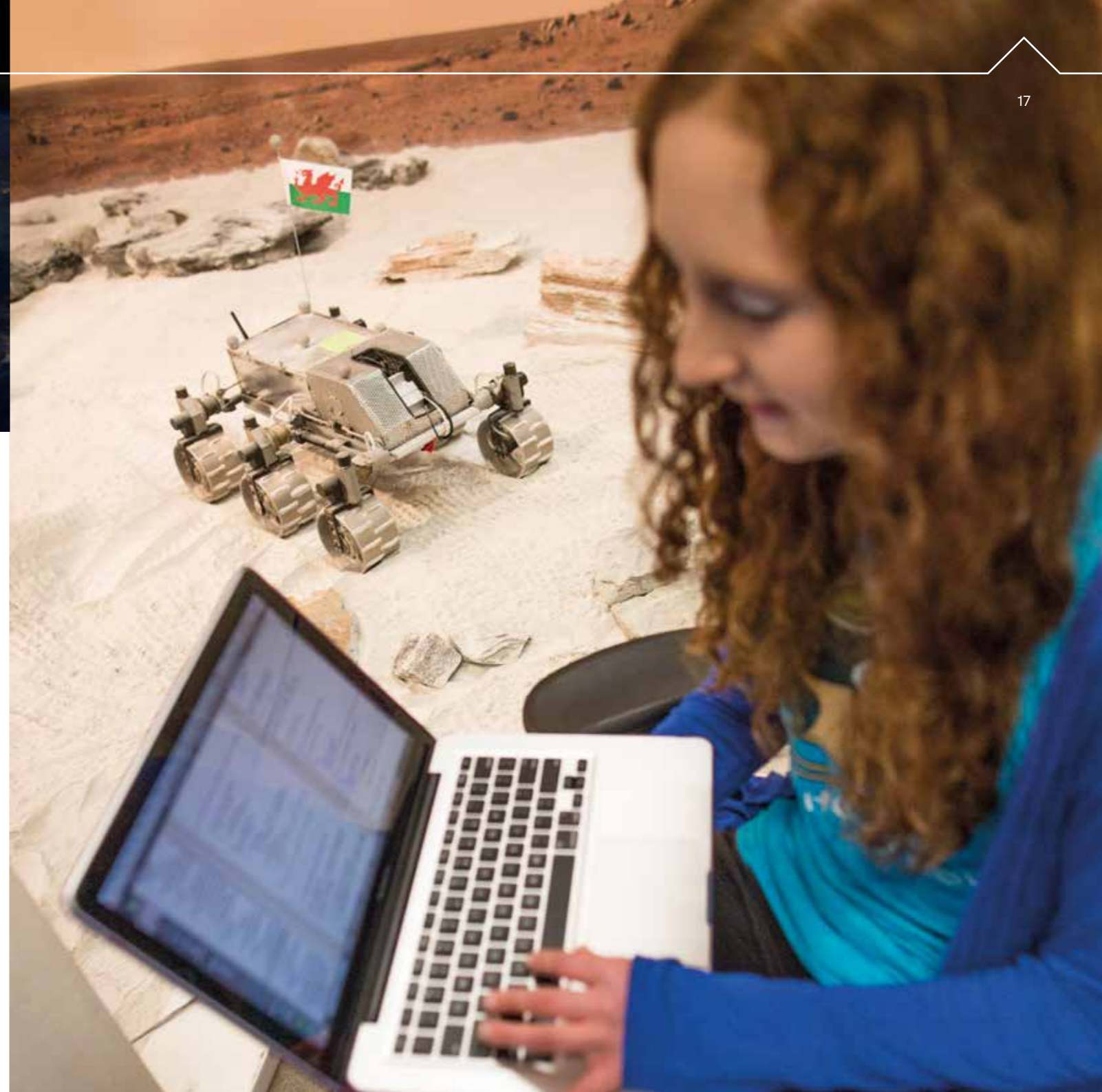
## Space Physics

Energy and matter emerge from the Sun and flow through our heliosphere, interacting with planetary atmospheres and surfaces, powering many of the processes which shape our world and define the planetary environment we live in. The Space Physics Group studies this system from the formation of stars elsewhere in the galaxy, the development of eruptive features on the Sun, the evolution and structure of material in the solar wind, and the impact of this flow on the environments of the planets. Our research increasingly uses machine learning as a tool to interpret large datasets. The group is involved in several current or planned space missions, and has a programme of developing novel optical systems and robotic components for space exploration.

Our computational modelling, data processing and instrument development expertise is recognised in international collaboration and missions including ExoMars, JUICE, BepiColombo, PUNCH, and a project to develop operational space weather capability for the UK Met Office.

## Materials & Quantum Physics

Our research expertise lies in measuring and predicting the properties of materials at the atomic level using unique combinations of experimental and theoretical methods including bespoke instrumentation developed within the Department, and linking to macroscopic applications in photonic, radio and quantum technology. This has enabled interdisciplinary projects in sectors such as photonics (polymer opals), health (nanoparticles), space (camera calibration), energy (transparent conductors), and digital technology (quantum control). We have funded research partnerships in several key fields including low-dimensional materials, solar photovoltaic research, photonics, radio spectrum technology and quantum information/control.



# Study in the High Arctic



## Svalbard: Land of Polar Bears and Aurorae

Students taking MPhys Physics with Planetary and Space Physics have the unparalleled opportunity of spending the second semester of their final year (January-May) on the Norwegian island chain of Svalbard. Study is undertaken at the University Centre on Svalbard (UNIS), which is the world's northernmost higher-education institution, located in the town of Longyearbyen at 78°N.

Svalbard is the ideal place to study space physics. Dramatic phenomena, such as the aurora and the connection of the Earth's magnetic field to interplanetary space, occur at these high latitudes and are often inaccessible elsewhere.

Students from across Europe meet to study advanced courses in polar science (all teaching is in the common language of English and there are no additional tuition fees). Longyearbyen is a lively town with restaurants, pubs, an art gallery and museum, a sports hall and swimming pool, and a cinema. Students live in purpose-built modern accommodation and are taught by an international team of staff, world leading in their area of expertise.

Much of Svalbard is covered in glaciers and is home to wildlife including polar bears, reindeer, walruses, seals, and arctic foxes. Students will have the once in a lifetime opportunity to experience polar night and live in the land of the midnight sun.

# Global opportunities

Aberystwyth's Global Opportunities team offer an exciting range of options for you to go overseas as part of your degree: from short courses and volunteering opportunities in the summer, to a full semester or year abroad studying your chosen subject at one of our partner universities.

The University also offers a number of courses which include an integrated year studying abroad, enabling you to study at one of our European or international partner universities for one or two semesters during your third year, returning to Aberystwyth for your final year and graduation.

Reports have shown that students who study abroad are more attractive to employers and earn more than their peers. Take advantage of the opportunity of a lifetime while improving your critical skills by choosing to study abroad.



# The application process

- 1 Apply through UCAS.com**  
 Check the UCAS deadline on UCAS.com. Aberystwyth University institution code: A40.  
**TOP TIP:** You'll be given a 10-digit UCAS ID number. Keep this to hand as you'll be asked for it many times.
- 2 The University will consider your application**  
**TOP TIP:** Use UCAS Hub to keep an eye on your application. At Aberystwyth we aim to make a decision within seven days.
- 3 The offer will show on UCAS Hub**  
 The University's decision will show on UCAS Hub - if you've been made an offer, it will tell you what grades you need to achieve to secure your place.
- 4 Decide where to go**  
 Once you've received all your offers, you'll need to decide which university you want to go to, within a set time. This is when you'll need to note which universities will be your Firm and Insurance choices.
- 5 Accommodation**  
 Once you've chosen your Firm/Insurance choice you'll be invited to apply for accommodation.
- 6 Results day**  
 UCAS Hub will tell you whether your place is confirmed at your Firm choice. If you don't get the grades you'd hoped for, you may want to consider entering Clearing.
- 7 Start packing!**  
 Remember to keep an eye on your emails for information about arrival and welcome activities.



Department of Physics,  
 Aberystwyth University,  
 Penglais,  
 Aberystwyth,  
 Ceredigion, SY23 3BZ

☎ +44 (0)1970 62 2802

@ phys@aber.ac.uk

✂ @AberPhys

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