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# Open Day 2019

## Physics and Astronomy

Nia Hunter - 3rd yr Undergraduate Physics

Gediminas Glemza - 4th yr Undergraduate Theoretical Physics

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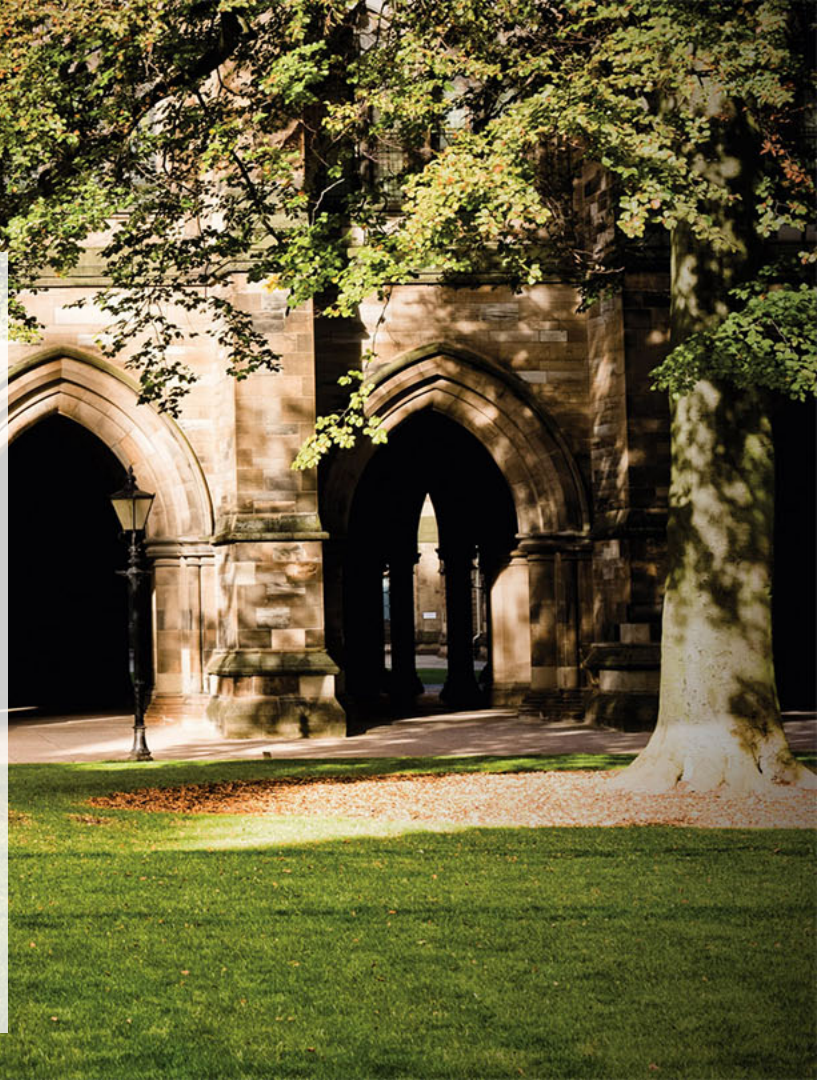




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## Why physics and astronomy at Glasgow?

- The study of physics and astronomy offers a fundamental understanding of the way the Universe works.
- It brings you to the very forefront of technology, and Glasgow is at that forefront.
- Some of the technologies you might be working on in the future do not yet exist.
- It opens career paths in science, engineering, industry, finance, teaching, and many more sectors.







## Why is Physics important?

- >1,000,000 employee jobs in UK in sectors where the use of physics-based technologies or expertise is critical. This is equivalent to 4% of all jobs in the UK.
- Gross value added (GVA) due to the physics-based sectors is about £77 billion, making up 8.5% of the economic output of the UK.
- Productivity levels in physics-based sectors in Scotland almost twice as high as the UK average.



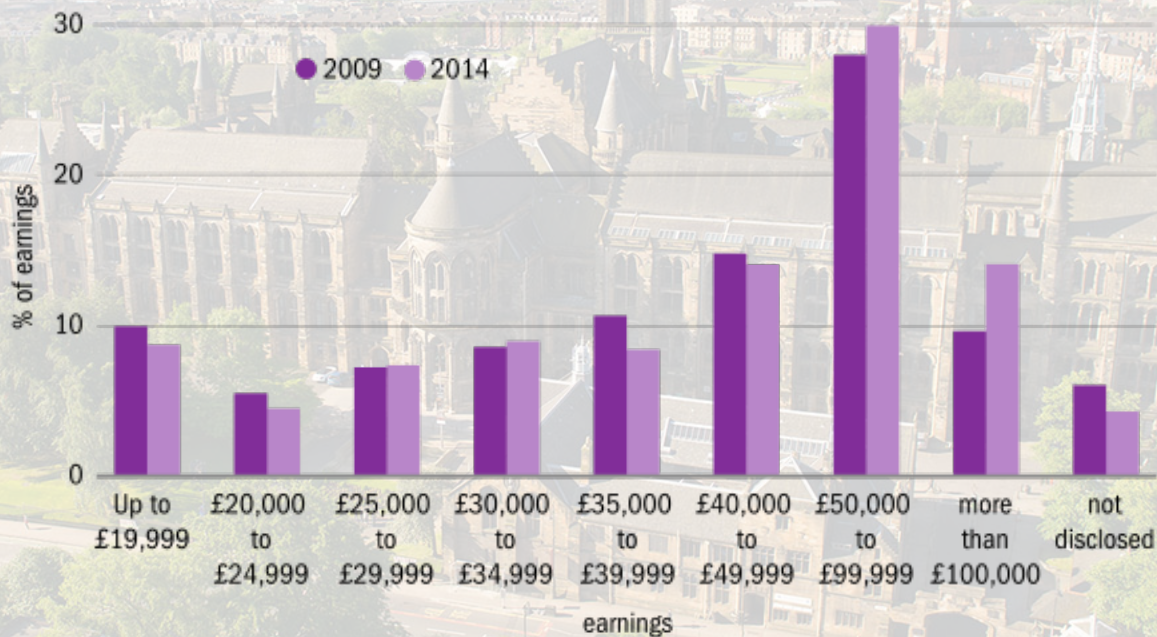




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# Why study physics?

Figure 8: Comparison of stated earnings between 2009 and 2014



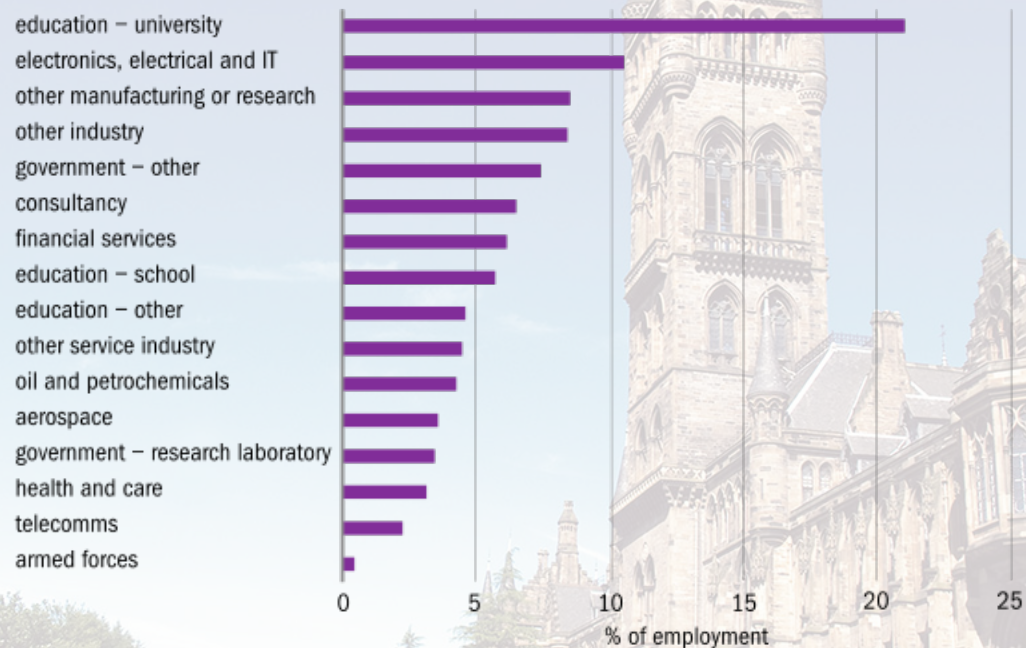
Source: IoP, *Physics in Scotland: the brightest minds go further*, 2014





# Why study physics?

**Figure 4:** Current sector of employment of respondents (%)



Source: *IoP, Physics in Scotland: the brightest minds go further, 2014*

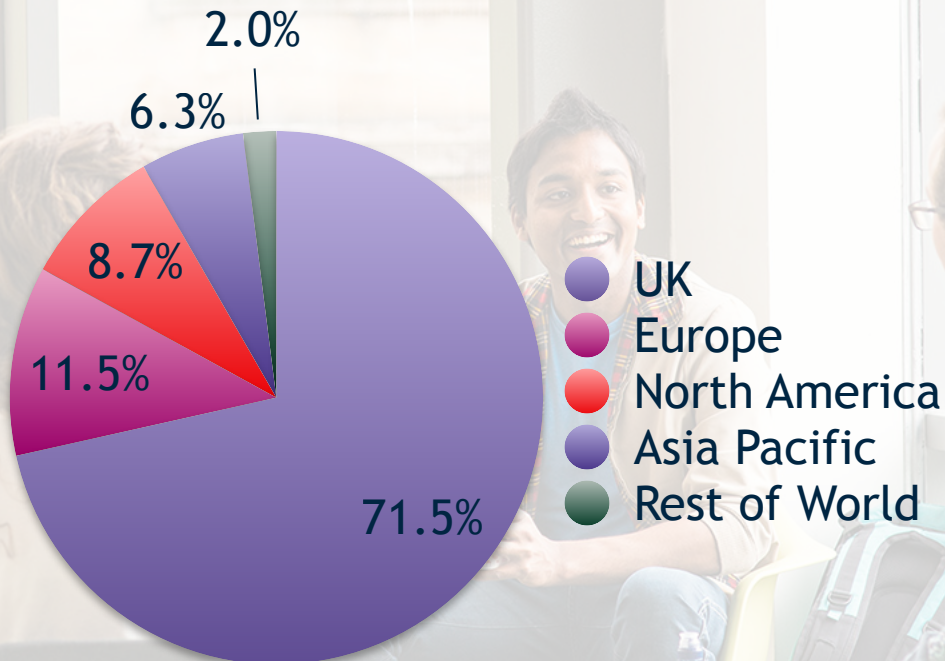




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# Why study physics?

Figure 7: Comparison of location of respondents between 2009 and 2014



Source: IoP, *Physics in Scotland: the brightest minds go further*, 2014





## Learning & teaching

- We teach our students to use physics and maths to investigate and explore the nature of the universe.
- We strive to encourage an in-depth and integrated understanding of modern physics and astronomy.
- We promote a wide range of transferable skills to prepare students for many possible careers.
- At the heart of our learning and teaching strategy are the concepts of:
  - Student-centered learning
  - Graduate attributes
  - Research-led teaching







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## Research groups



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## Research groups

- Astronomy and Astrophysics

A vibrant astronomical image of a nebula, showing swirling clouds of gas and dust in shades of blue, green, and orange, with a bright light source on the right.

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## Research groups

- Astronomy and Astrophysics
- Institute for Gravitational Research



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## Research groups

- Astronomy and Astrophysics
- Institute for Gravitational Research
- Optics:
  - Imaging concepts
  - Optics
  - Quantum information



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## Research groups

- Astronomy and Astrophysics
- Institute for Gravitational Research
- Optics:
  - Imaging concepts
  - Optics
  - Quantum information
- Materials and Condensed Matter Physics

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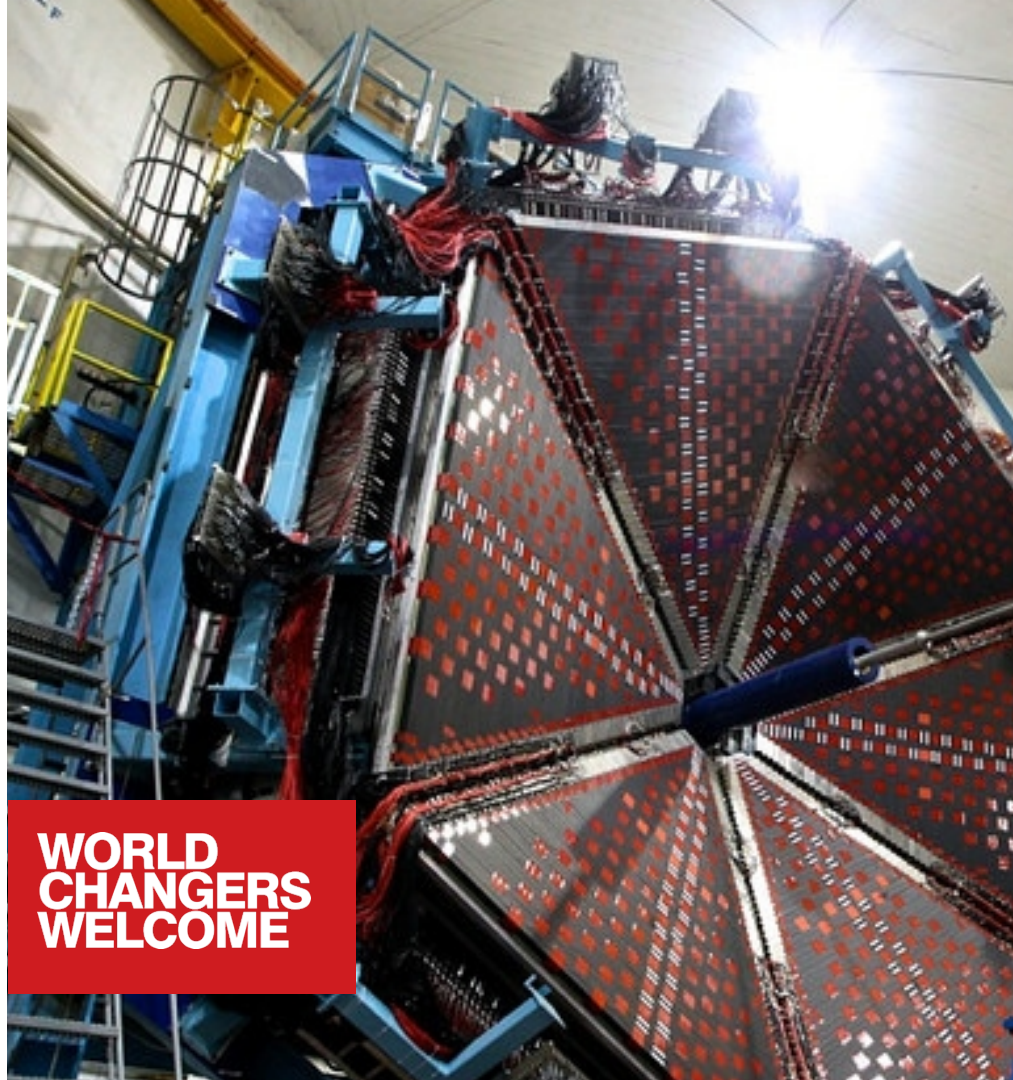




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## Research groups

- Astronomy and Astrophysics
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- Optics:
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  - Quantum information
- Materials and Condensed Matter Physics
- Nuclear Physics



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## Research groups

- Astronomy and Astrophysics
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- Optics:
  - Imaging concepts
  - Optics
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- Materials and Condensed Matter Physics
- Nuclear Physics
- Particle Physics
  - Experimental
  - Theoretical



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## Research Highlights

### Discovery of the Higgs Boson

In 2012, teams of scientists at the LHC in CERN announced the discovery of the Higgs Boson - the final piece of the Standard Model of Particle Physics. The Glasgow group has played a leading role in the ATLAS programme for over twenty years.

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## Research Highlights

### **The detection of gravitational waves**

After more than thirty years leading international research, the Glasgow team was at the heart of the revolutionary 2016 discovery of gravitational waves. Ultra-sensitive detectors in the US observed two black holes colliding 1.8 billion years ago. The energy released in the collision was more than the energy from all the stars in the universe.

The Royal Swedish Academy of Sciences has decided to award the  
**2017 NOBEL PRIZE IN PHYSICS**



Rainer Weiss  
Barry C. Barish  
Kip S. Thorne

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## Degree Programmes

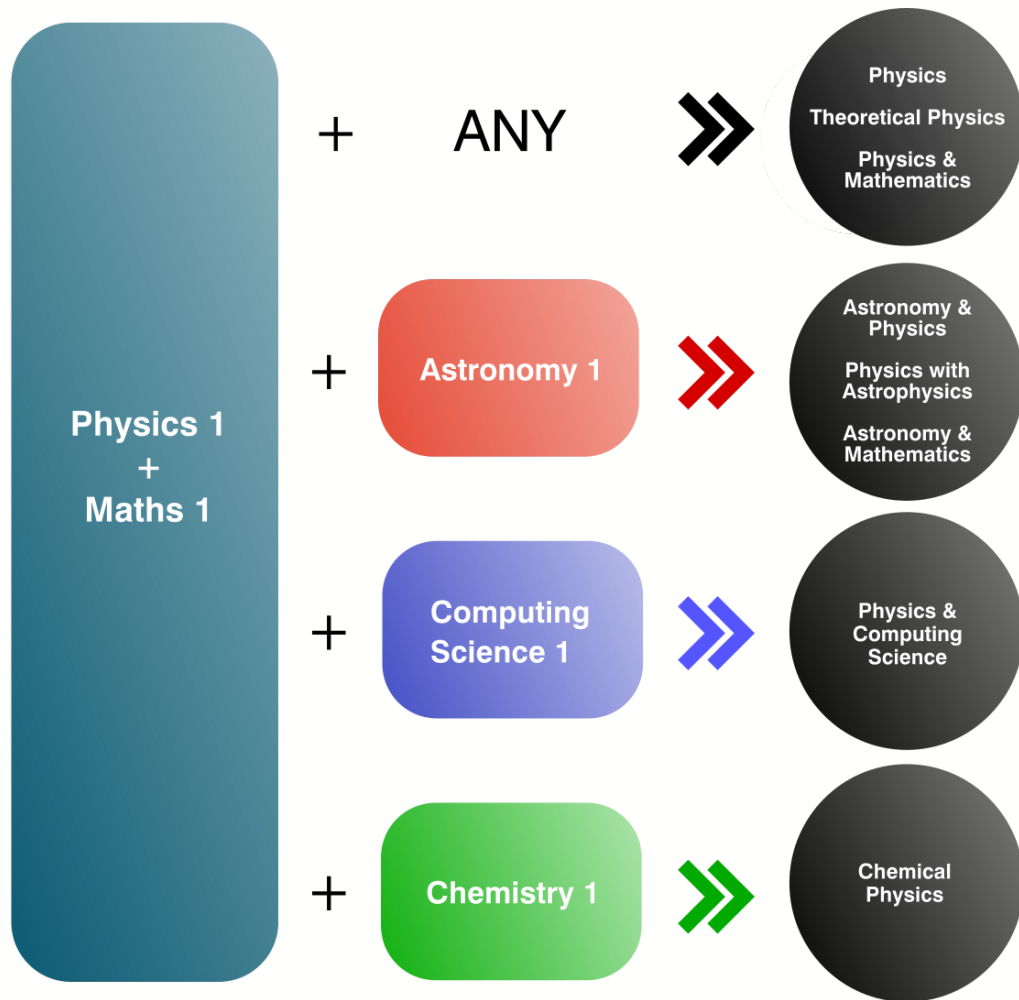
- The Glasgow ethos is to allow students to keep their options flexible for as long as possible.
- The choice of degree subjects can be made at the end of 2nd year.
- The choice of whether to study for a **BSc (4 years)** or **MSci (5 years)** degree can be made in the middle of 3rd year.
- All BSc and MSci degrees offered in Physics and Astronomy are **accredited by the Institute of Physics**.
- Several specialised Postgraduate Taught Masters programmes have recently been introduced.





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## Degree Subjects







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## Physics 1

- The class meets daily, with lectures at 9am or at 1pm.
- There are weekly tutorials, and weekly laboratory workshops
- Topics studied include:
  - optics, waves and lasers
  - dynamics and relativity
  - quantum phenomena
  - electricity and magnetism

A student wearing yellow safety glasses and a lab coat is working in a laboratory. They are holding a small black component with a red laser dot on it, which is mounted on a stand. The background is blurred, showing other lab equipment.

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## Astronomy 1

- The class meets daily at 10am.
- There are **fortnightly tutorials** and **practical sessions** at the observatory.
- Topics include stellar physics, positional astronomy, cosmology and astronomical observations.

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# Physics 1 Example Timetable

|    | Mon   | Tue  | Wed  | Thu  | Fri  |
|----|---|--|--|--|--|
| 8  |   |  |  |  |  |
| 9  | 09:00 to 10:00<br>PHYS 1001 - LC01<br>Physics 1<br>Lecture<br>Kelvin Building 312             | 09:00 to 10:00<br>PHYS 1001 - LC01<br>Physics 1<br>Lecture<br>Kelvin Building 312        | 09:00 to 10:00<br>PHYS 1001 - LC01<br>Physics 1<br>Lecture<br>Kelvin Building 312      | 09:00 to 10:00<br>PHYS 1001 - LC01<br>Physics 1<br>Lecture<br>Kelvin Building 312        |  |
| 10 | 10:00 to 11:00<br>ASTRO 1001 - LC01<br>Astronomy 1<br>Lecture<br>Graham Kerr Building 224     | 10:00 to 11:00<br>ASTRO 1001 - LC01<br>Astronomy 1<br>Lecture<br>Kelvin Building 312     | 10:00 to 11:00<br>ASTRO 1001 - LC01<br>Astronomy 1<br>Lecture<br>Kelvin Building 312   | 10:00 to 11:00<br>ASTRO 1001 - LC01<br>Astronomy 1<br>Lecture<br>Kelvin Building 312     | 10:00 to 11:00<br>ASTRO 1001 - LC01<br>Astronomy 1<br>Lecture<br>Kelvin Building 312     |
| 11 | 11:00 to 12:00<br>MATHS 1002 - LC02<br>Maths 15<br>Lecture<br>Thomson Bldg (Anatomy) 236      | 11:00 to 12:00<br>MATHS 1002 - LC02<br>Maths 15<br>Lecture<br>Thomson Bldg (Anatomy) 236 |  | 11:00 to 12:00<br>MATHS 1002 - LC02<br>Maths 15<br>Lecture<br>Thomson Bldg (Anatomy) 236 | 11:00 to 12:00<br>MATHS 1002 - LC02<br>Maths 15<br>Lecture<br>Thomson Bldg (Anatomy) 236 |
| 12 |   |  | 12:00 to 13:00<br>MATHS 1002 - TU25<br>Maths 15<br>Tutorial<br>Adam Smith Building 706 |  |  |
| 13 |   |  |  |  |  |
| 14 | 13:30 to 16:30<br>ASTRO 1001 - LB05<br>Astronomy 1<br>Laboratory<br>Acre Road Observatory 203 |  | 14:00 to 17:00<br>PHYS 1001 - LB03<br>Physics 1<br>Laboratory<br>Kelvin Building 220   |  |  |
| 15 |   |  |  |  |  |
| 16 |   |  |  |  |  |



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## Physics 3 Group Project

- Students gain laboratory and computational research skills, experience in team work, presentations and report writing.
- The range of projects include:
  - X-ray radiography
  - Biophysical thermography
  - Compton camera
  - Holography
  - Temperature stabilization
  - Java programming

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## Final year project

- Students spend a significant portion of their final year working on an independent research project.
- Embedded in one of our 9 research groups, students can make a lasting contribution to world leading research.
- Examples from recent years include:
  - Top quark physics
  - Blood flow imaging
  - Quantum encryption techniques
  - Advanced Sagnac interferometers



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## Summer Internships

- The first experience in the research environment for many of our students is during a summer internship within the school.
- These are usually six-week long paid placements, during which students can further improve their research and interpersonal skills.
- The research covered during these internships covers the full range of our research groups: from applied to fundamental research; from the smallest to the largest distance scales.

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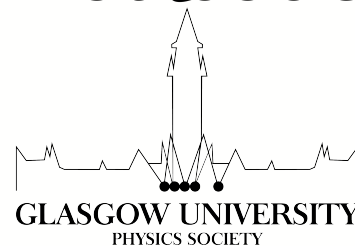




## Student Societies

- There are two student societies which organise a programme of guest lectures and social events for students and staff.
- Physoc has an annual ceilidh.
- Astrosoc has an annual dark sky camping trip
- Other events include beer & doughnuts, Burns' supper, 7 Minutes of Science, and observing nights...

Glasgow University Astronomy Society  
**Astrosoc**





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**IOP** | Institute of Physics  
**Juno Champion**

**Athena  
SWAN**  
Silver Award

**Stonewall**  
SCOTLAND  
DIVERSITY CHAMPION

## Diversity and Equality

- 25 - 30% of our students are female
- We are committed to ensuring all members of the School are welcomed, and can flourish and succeed
- Our **Athena SWAN Silver**, and Institute of Physics **Juno Champion** awards recognise our work in gender equality
- We were the first physics department in Scotland to win these, and now we're Going for Gold!
- There is a Women in Physics society in the university, and also oSTEM.







## Why Physics and Astronomy?

- Our flexible degree programmes promote:
  - A **logical and numerate** mind;
  - The ability to solve problems;
  - **Communication skills**, developed through report-writing and presentations;
  - **Cutting-edge** computational and experimental skills;
  - **Teamwork, planning, initiative and flexibility** (essential for lab work and projects).

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## Why Glasgow?

- An attractive campus in a cosmopolitan city
- Student-centered learning
- Excellent teaching
- One-to-one student support
- A research-led department
- Student research opportunities







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# Thank you!

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