ROYAL
OBSERVATORY
GREENWICH

Programme for Secondary Schools

2011 - 2012

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The Royal Observatory Greenwich

The Royal Observatory Greenwich was founded by Charles II in 1675 and is one of the most important historic scientific sites in the world. Today the Royal Observatory is a museum and science centre which provides schools and the wider public access to information about space. A visit to the Observatory offers students an inspiring, curriculum-linked experience, with unparalleled opportunities to meet astronomers, engage with cutting-edge science and explore big ideas. We offer a wide range of facilities for visiting schools including the award winning Time Galleries, the interactive Weller Astronomy Galleries, the Lloyd's Register Educational Trust Learning Centre and the Peter Harrison Planetarium.

Our sponsors

Our education facilities and programmes are sponsored by The Lloyd's Register Educational Trust. The Lloyd's Register Educational Trust is an independent charity working to achieve advances in transportation, science, engineering and technology education, training and research worldwide for the benefit of all.

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What we offer

We offer a full-day programme for secondary school groups which includes:

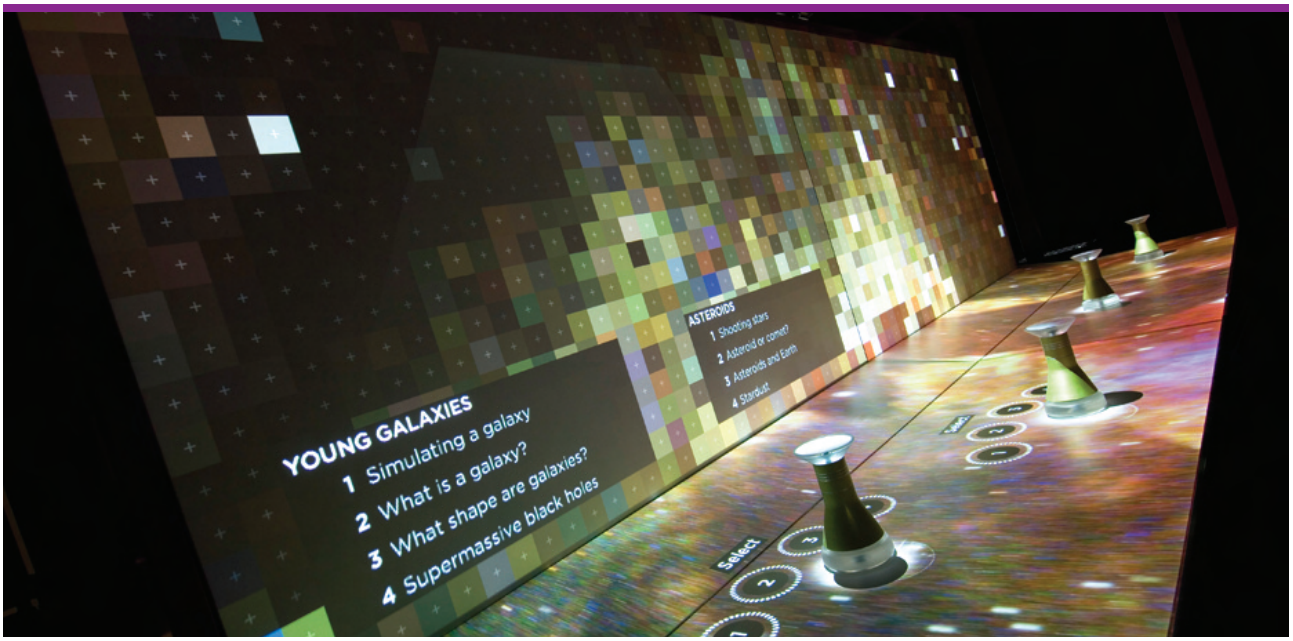
- a workshop in the Lloyd's Register Educational Trust learning centre
- a self-facilitated visit to the amazing Weller Astronomy Galleries
- a planetarium show in the Peter Harrison Planetarium
- a time-slot in the lunch room

Key Stage 4 and Post-16 groups can book up to two additional sessions on selected dates to extend this standard programme into a specially-tailored Study Day, including:

- an Astronomy Masterclass on a choice of curriculum-linked topics
- a careers-based talk and Q&A session with a research astronomer

*Our programmes for schools are **free**, with the exception of planetarium shows, which carry a charge of £45 for groups of up to 15 children or £90 for groups of up to 30.*

Workshops and planetarium shows suitable for different year groups are available on different days, with a choice of sessions available on most days to best meet the learning objectives of your group. Detailed descriptions of workshops and planetarium shows are given in the following pages of this guide. Use the table overleaf to find the sessions best suited to your students.



Age	Day	Workshop	See page	Planetarium show	See page
Key Stage 3	**Monday, Wednesday** and **Tuesdays** until 31 Oct 2011	Seasons, Phases and Eclipses	6	Meet the Neighbours	14
	Thursday	Exploring Exoplanets	9	Solar Systems, Galaxy, Universe	15
	Friday	Seasons, Phases and Eclipses	6	Solar Systems, Galaxy, Universe	15
		Solar System & Beyond	8		
		Exploring Exoplanets	9		
		Maths in the Milky Way	7		
Key Stage 4	Thursday	Exploring Exoplanets	9	Solar Systems, Galaxy, Universe	15
		Studing Starlight	10		
		The Expanding Universe	11		
	Friday	Solar System & Beyond	8	Solar Systems, Galaxy, Universe	15
		Exploring Exoplanets	9		

Age	Day	Workshop	See page	Planetarium show	See page
	Selected Thursdays*	Astronomy Masterclass and/or Meet the Scientist			12
Post-16	Thursday	Exploring Exoplanets	9	Solar Systems, Galaxy, Universe	15
		Studing Starlight	10		
		The Expanding Universe	11		
	Friday	Exploring Exoplanets	9	Solar Systems, Galaxy, Universe	15
	Selected Thursdays*	Astronomy Masterclass and/or Meet the Scientist			12

**Extended study day options are available for KS4 and Post-16 groups on:*

29 September 2011
20 October 2011
24 November 2011
15 December 2011
26 January 2012
9 February 2012
23 February 2012
1 March 2012
8 March 2012
15 March 2012
22 March 2012
29 March 2012
26 April 2012
31 May 2012
28 June 2012

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Workshops

Our workshops take place in one of three purpose-built learning spaces in The Lloyd's Register Educational Trust Learning Centre and are designed to encourage active learning and hands-on scientific enquiry. Each session is led by a Royal Observatory astronomer and lasts 45 minutes. Sessions offered at more than one Key Stage will be tailored to link to the curriculum of your group and can be further customised through the inclusion or exclusion of more challenging mathematics and physics content. Please speak to our Bookings Unit about any special learning needs or objectives when you book.

Seasons, Phases and Eclipses

Session level: KS3
Session length: 45 minutes

In this interactive session students use both large scale astronomical models and digital simulations to:

- review their understanding of the Sun-Earth-Moon system
- explore concepts of light, shadow, reflection and transmission
- combine their knowledge to explain the more complex natural phenomena of the seasons, the phases of the Moon, and solar and lunar eclipses

The session begins with a general discussion of the objects in the Solar System and how they move. The presenter then invites students to critically assess a large-scale physical model of the Sun-Earth system as an introduction to three linked segments of interactive study.

In the first segment, students are led to examine the tilt of the Earth's axis of rotation and how its orientation with respect to the Sun changes throughout the year. Using an on-screen digital simulation, students observe how the apparent path of the Sun through the sky changes with the seasons and go on to discuss the resulting variation in hours of sunlight and temperature.

In the second segment, students take part in an interactive demonstration of the Sun-Earth-Moon system which explores the interplay of light, shadow and orbital motion which gives rise to the phases of the Moon. Student volunteers use light sources and model Moons to demonstrate light and dark on the Moon from different perspectives and link what they see to an on-screen digital simulation of lunar phases.

In the final segment, students use the large-scale models to explore the alignments which cause solar and lunar eclipses. The presenter will show students what eclipses look like from the Earth and space, describe the unique relative sizes and distances of the Sun, Earth and Moon, and prompt students to use an on-screen digital simulation to understand how and when eclipses are observed.

Curriculum links

KS3: The Solar System & Beyond (Sci7L); Light (Sci8K).

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Maths in the Milky Way

Session level: KS3
Session length: 45 minutes

In this session, students will explore the scale and variety of planets in our Solar System and in other planetary systems in our Milky Way Galaxy using a range of mathematical techniques – including calculations, unit conversions, and the construction and interpretation of graphs and charts.

In the first part of the session, students will split into pairs to work through calculations using the distance-time-speed relationship to learn how long it would take to travel to the planets in our Solar System using various modes of transport.

Pooling their data, the class will construct a scatter graph of distance versus time, discussing where and why a linear relationship is found in the data. They will go on to use this understanding to read from their graph the travel time to a new place in space.

Next, pairs of students will calculate how long they would need to travel in a spaceship to reach one of the extrasolar planets now known to orbit distant stars in the Milky Way. They will compare these values with those obtained earlier, noting the vast difference in scale between interplanetary and interstellar travel.

Time permitting, they will go on to use real size and mass data for each planet to calculate the strength of the gravitational field on the surface of their alien world relative to ours here on Earth. They will consider how much heavier or lighter an everyday object would be on their planet and have an opportunity to feel this weight difference in the classroom.

As a class, they will consider how graphs and charts would allow them to compare the properties of exoplanets with those of planets in our own Solar System, addressing questions such as “Are currently known exoplanets similar to our own?” and “How much do the properties of planets vary in our Milky Way?”. Constructing bar charts of size, mass and/or local gravity in the session or back in school, they’ll be able to explore these questions through maths.

Curriculum links

KS3: Mathematical Processes and Applications: 1.4, 1.5; Number: 2.1, 2.3, 2.4, 2.8; Algebra: 3.2; Geometry and Measures: 4.4; Statistics: 5.2, 5.3; The Solar System & Beyond (Sci7L); Gravity and Space (Sci9J).

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Solar System & Beyond

Session level: KS3, KS4
Session length: 45 minutes

In this interactive ICT-based session, students use astronomical software to travel through the Solar System, investigate the orbits of the planets, and explore how the mathematics which describe planetary orbits has been used to discover a massive black hole at the centre of our Milky Way Galaxy.

The workshop begins with an overview of the discovery of the planets and how the structure of the Solar System was determined by observers throughout history. Students are introduced to Johannes Kepler, the famous 17th century astronomer, and to his work trying to understand the motions of the planets.

Pupils then make some observations of their own, using freely available astronomical software to visit each planet virtually and find out its distance from the Sun. Using the data they collect, they then carry out an analysis to explore the relationship between the distances of planets from the Sun and their orbital periods.

Students are led in a discussion of their results, learning how Newton's work on gravity explained this relationship 80 years after Kepler's work. They end the session by taking a virtual journey to observe stars in centre of our galaxy and learning how understanding orbits allows today's astronomers to discover and 'weigh' these amazing objects.

Time permitting, KS4 students will end the session by travelling further afield in their virtual Universe, to distant nebulae within our Milky Way and beyond to other galaxies. Converting between various distance units suitable for astronomical distances (e.g., light years, parsecs, astronomical units), they explore the scale of the known Universe.

Curriculum links

KS3: The Solar System & Beyond (Sci7L); Gravity and Space (Sci9J); Mathematical Processes and Applications: 1.3, 1.4, 1.5; Number: 2.1, 2.2, 2.7; Algebra: 3.1, 3.2; Statistics: 5.2, 5.3.

KS4: AQA Physics: P3 13.3; Edexcel Physics: P1b 12.10, 12.15, 12.16; Edexcel Astronomy: 2.1a, b, e, f, h, 2.3 a-f; OCR 21st Century Science: P1.1, P7.1; OCR Gateway Science: P2f, P2g, P2e; National Strategies: Mathematical Processes and Applications: 1.3, 1.4, 1.5; Number: 2.1, 2.2, 2.7; Algebra: 3.1, 3.2; Statistics: 5.2, 5.3.

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Exploring Exoplanets

Session level: KS3, KS4, Post-16
Session length: 45 minutes

In this hands-on, ICT-based session, students learn how astronomers discover planets orbiting distant stars by making and discussing measurements of their own exoplanet system, and applying their knowledge of light and gravity.

The workshop begins with an introduction to the challenges of detecting small, faint extrasolar planets around bright stars which are extremely far away. Successful detection methods are discussed and students are encouraged to consider the physics they rely on.

Students will go on to explore the transit method, in which exoplanet systems are identified by a regular slight blocking of starlight by the orbiting planet, in more detail by:

- constructing their own model exoplanet system using a light source and balls to understand the physical processes behind the transit method
- making and discussing lightcurves (plots of brightness over time) for their model exoplanet using a light sensor, data logger, and graphing software
- performing a lightcurve analysis on data from NASA's Kepler space telescope to determine the orbital period of an exoplanet

At KS4, students go on to use the Kepler lightcurve to calculate the drop in brightness of the star as the planet passes in front of it, which allows them to determine the diameter and therefore the volume of the exoplanet.

At KS5, the majority of the session is spent using the Kepler lightcurve and additional information about the host star to determine a full range of exoplanet properties, including orbital period, average orbital distance, volume and density. Students conclude by applying knowledge of gravity and the Doppler Effect in an alternative method of exoplanet detection to improve their estimate of exoplanet density.

Curriculum links

KS3: The Solar System & Beyond (Sci7L); Light (Sci8K); Gravity and Space (Sci9J); Number: 2.1, 2.2, 2.7; Algebra: 3.1, 3.2; Statistics: 5.2, 5.3.

KS4: AQA Physics: P3 13.2-3; Edexcel Physics: P1b 12.14, P1b 12.20, P2 10.9-11; Edexcel Astronomy: 3.20-22, 2.23-24, 4.17; OCR 21st Century Science: P1.3-7; OCR Gateway Science: P5a; National Strategies: Mathematical Processes and Applications: 1.3; Number: 2.1, 2.2, 2.3, 2.7; Algebra: 3.1, 3.2; Statistics: 5.2, 5.3.

Post-16: AQA Physics A: Unit 3 3.2, Unit 4 4.2, Unit 5A 1.3, 1.4; AQA Physics B: Unit 1 1.2 E, Unit 4 4.1 A; Edexcel Physics: Unit 2 2.3 47 Unit 4 4.3 73, Unit 5 5.6 126, 134; OCR Physics A: G481 1.2.3, G482 2.5.4, G484 4.2.2, G485 5.5.1; OCR Physics B: RF 1.2.

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Studying Starlight

Session level: KS4, Post-16
Session length: 45 minutes

In this hands-on workshop, students learn how astronomers determine the properties of distant stars by examining spectra and applying their knowledge of the electromagnetic spectrum, the reflection, absorption and emission of light, and the Doppler Effect. The mathematical content of this session can be tailored to the group.

The workshop begins with a demonstration of the dispersion of visible light through a prism and an investigation of the students' understanding of the properties of waves and the electromagnetic spectrum. The presenter will introduce or review the concept of wavelength, different kinds of light, and the wavelengths of visible colours.

Students then progress through a number of hands-on activities to explore how astronomers study starlight, including:

- matching pictures of common objects to their absorption spectra (graphs of absorption versus wavelength) to consider how an object's colour depends on its absorption and reflection of the visible wavelengths of light
- matching images of stars in the Sloan Digital Sky Survey to their emission spectra (graphs of light intensity versus wavelength) to become familiar with the temperature dependent continuum emission of stars
- observing the distinct spectral lines emitted by different gases in commercial 'neon' signs with hand-held spectrographs and applying knowledge of the wavelengths of visible light to identify the gas used in each sign by its chemical signature
- if weather permits, looking at daylight through the spectrographs to observe the Sun's continuum emission and the Fraunhofer absorption lines which were used to determine the composition of the Sun
- optionally, examining real astronomical spectra and applying knowledge of the Doppler Effect and the laws of gravity to determine the properties of a star or a stellar system

Curriculum links

KS4: AQA Physics: P1b 11.5, P1b 11.7, P3 13.10; Edexcel Physics: P1b 11.14-15, P1b 11.18-19, P1b 12.12; Edexcel Astronomy: 5.12-20, 4.26-27; OCR 21st Century Science: P2.1 1-3, P1.3 6, P7.4 6-10, P7.4 15-21; OCR Gateway Science: P5 f.

Post-16: AQA Physics: Unit 5A 1.1-3; Edexcel Physics: P2.3 28-30, P2.3 37-38, P2.3 41, P2.3 44-45, P2.3 47, P2.5 64, P2.5 68-69, P5.6 131, P5.6 133-134; OCR Physics: G482 2.4.1-3, G482 2.5.4, G485 5.5.1 c-e.

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The Expanding Universe

Session level: KS4, Post-16
Session length: 45 minutes

In this session students are introduced to the Citizen Science online project Galaxy Zoo, whereby members of the public can classify galaxies and contribute to scientific research. Students are given real data on galaxies from the Sloan Digital Sky Survey and use basic equations to determine large-scale properties of the Universe.

During the course of the workshop students are introduced to the concepts of luminosity and intensity and how they relate to distance. They also look at real spectra of galaxies and see how these give us their velocities. They will then combine these two sets of measurements to produce a velocity-distance graph and be asked to explain what this result tells us about the nature of the Universe.

Students will practice applying mathematical techniques such as:

- using the data from a sample of galaxies to plot a velocity-distance graph
- converting between different units
- finding the gradient of their best-fit line to determine the Hubble constant and the age of the Universe in billions of years
- thinking about the scatter in their graph and how this affects their result

Students at Post-16 level will practise applying mathematical techniques such as:

- Using the relationship between luminosity and intensity and understanding their units
- Measuring the wavelength of a hydrogen emission line and using the Doppler equation to obtain velocity
- Converting between different units including astronomical units such as parsecs
- Plotting a graph to determine the Hubble constant and the age of the Universe in billions of years
- Considering the statistical significance of their result

Curriculum links

KS4: AQA Physics: 10.4-7, P1b 11.7; Edexcel Physics: P1b 12.8, P1b 12.16, P1b 12.18, P1b 12.20; Edexcel Astronomy: 4.14-16, 4.18-20, 4.41-44; OCR 21st Century Science: P1.3 2, P1.3 6-7, P1.3 10-14, P6.3 1-4, P7.4 1-4; OCR Gateway Science: P2 h.

Post-16: AQA Physics: Unit 5A 1.3-4; Edexcel Physics: P2.3 41, P2.3 47, P2.5 68-69, P5.6 129, P5.6 132-133, P5.6 135; OCR Physics: G482 2.4.3, G482 2.5.4, G485 5.5.1 k-n, G485 5.5.2 a-h.

Extended Study Day options

Extended Study Day options are available for KS4 and Post-16 groups on the following dates: 29 September, 20 October, 24 November, 15 December, 26 January, 9 February, 23 February, 1 March, 8 March, 15 March, 22 March, 29 March, 26 April, 31 May and 28 June.

Both sessions are delivered in The Lloyd's Register Educational Trust Learning Centre, are 50 minutes long, and are free of charge. Content can be tailored to suit students at KS4 or Post-16 level. Please discuss any special learning needs with our Bookings Unit. Groups may book either or both extension sessions and may choose to include a visit to the historic galleries as their schedule allows.

Astronomy Masterclasses

Session level: KS4, Post-16
Session length: 45 minutes

Taught by a Royal Observatory astronomer, masterclasses link to areas of the KS4 and Post-16 specifications and draw on cutting-edge observations and current astronomical research. Choose from: Galaxies & Cosmology, Stellar Evolution, Astrobiology, Cosmic Impacts, and Observational Astronomy.

Meet the Scientist

Session level: KS4, Post-16
Session length: 45 minutes

In this inspiring session, students will hear about exciting areas of on-going astronomical research from a scientist who has worked in that field, learn about the wide range of careers open to science graduates, and have the opportunity to ask questions about astronomy and working in science.

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Planetarium shows

Planetarium shows take place in the Peter Harrison Planetarium and are delivered live by Royal Observatory astronomers. Our state-of-the-art digital planetarium provides an inspiring, immersive and interactive learning experience, allowing students to examine the day- and night-time sky, choose how to fly through our Solar System or enjoy visually stunning pre-recorded shows about the latest discoveries in astronomy. Shows are 45 minutes long and can accommodate up to two classes of 30 students.

Meet the Neighbours

Session level: KS3
Session length: 45 minutes

This amazing interactive show begins with an introduction to the sky. Pupils observe day and night time skies and examine the apparent motion of the Sun and stars. They then lift off from Earth to hover over the North Pole and watch our planet spin on its axis, bringing night and day to different parts of the world.

Going on to visit our nearest neighbour, the Moon, students first explore the origin of its phases and then land on the lunar surface. Flying out to view the entire Solar System, pupils learn or review the general appearance and arrangement of the planets, their relative sizes, and how fast they orbit around the Sun.

Students then pick one rocky planet to explore in depth, voting with their voices. Depending on the planet chosen, students may land on the surface to explore an alien panorama or examine stunning images from NASA and ESA probes. After a brief trip through the asteroid belt, pupils go on to select a gas giant planet. Again, a range of content is available, allowing students to investigate the planet, its moons and its rings.

Following a brief trip through the outer solar system, where comets and plutoids are found, the show concludes with a journey beyond the Solar System. Starting from our own night-time sky, students consider the hundreds of extra-solar planets now known to orbit stars other than our Sun. The presenter explains how these alien worlds are discovered and how astronomers are working to find more.

As they zoom farther and farther from home, students observe that our Sun and all the stars in our night time sky make up just a small part of a much bigger shape in space – the Milky Way Galaxy. Travelling beyond the Milky Way, students look back at this vast disc of dust, gas and stars from the outside before flying out past nearby galaxies to observe some of the hundreds of billions of galaxies which form the cosmic web of our Universe.

Curriculum links

KS3: Sci7L - The Solar System & Beyond; Sci8K - Light; Sci9J - Gravity and Space.

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Solar System, Galaxy, Universe

Session level: KS3, KS4 & Post-16
Session length: 45 minutes

In this inspiring interactive show, an ROG astronomer will take your students on a bespoke tour of the cosmos, exploring our place in space and the contents of our solar system, our Milky Way Galaxy and the larger Universe.

Starting at Earth, students will examine the motions of the Sun, Moon, stars and planets - seeing the sky as ancient astronomers did and exploring what can and can't be learned from naked eye observations. They will hear how ground-breaking observations by early astronomers led to a modern understanding of the Solar System. Travelling out through space, they'll examine the Sun and other objects in our solar system held in orbit by its gravitational pull.

Looking further afield, students will learn how astronomers measured the distances to the nearest stars, learning that the scale of our solar system is tiny compared to the vast distances between the stars. Using real astronomical data, the presenter will introduce a range of objects in our Milky Way Galaxy, such as brilliant star clusters, glowing nebulae, and black holes. Students will then fly out of the Milky Way to examine its huge disc-like structure from afar.

Moving even further away, students will see distant galaxies as they appear to powerful telescopes, glimpsing the range of shapes, colours and environments of galaxies. They will hear how relatively recently the distances of these 'island universes' were determined and the incredible scale of our Universe understood. Flying through the galaxies in our Local Group and beyond, students will examine the largest structures in the Universe – vast clusters and super-clusters of galaxies.

The final segment of the show, selected through audience choice or teacher request, will allow students to examine a topic relating to either Solar System, Galaxy or Universe in more depth, focusing on planetary science, star formation, or cosmology.

Curriculum links

KS3: Sci7L - The Solar System & Beyond; Sci8K - Light; Sci9J - Gravity and Space.

KS4: AQA Physics: P1b 11.5, P1b 11.7, P3 13.10; Edexcel Physics: P1b 11.14 -15, P1b 11.18 -19, P1b 12.12; Edexcel Astronomy: 5.12 -20, 4.26 -27; OCR 21st Century Science: P2.1 1 -3, P1.3 6, P7.4 6 -10, P7.4 15 -21; OCR Gateway Science: P5 f.

Post-16: AQA Physics: Unit 5A 1.3 -4; Edexcel Physics: P2.3 41, P2.3 47, P2.5 68 -69, P5.6 129, P5.6 132 -133, P5.6 135; OCR Physics: G482 2.4.3, G482 2.5.4, G485 5.5.1 k -n, G485 5.5.2 a -h.

Galleries

Weller Astronomy Galleries

A visit to the Weller Astronomy Galleries is a standard component of our schools offer. Three galleries comprise the middle floor of the Modern Astronomy Centre and contain a host of interactive exhibits allowing students to explore our current understanding of the Universe and how astronomers gather evidence to learn more.

Astronomy Inspires gallery

The Astronomy Inspires gallery showcases two models of the Universe. One is a beautiful 19th century orrery demonstrating the motion of the planets known at that time. The other is a state-of-the-art projection wall summarising our current understanding of the formation and evolution of the Universe, from the Big Bang to the present day in 4 minutes.

Astronomy Questions gallery

The Astronomy Questions gallery features an interactive table-top which allows visitors to pursue their own line of questioning with a panel of on-screen experts about some of the most exciting open questions in the Universe. Is there life on other planets? Do black holes exist? What is dark matter? Come to the Astronomy Questions gallery to find out.

Astronomy Explores gallery

The Astronomy Explores gallery highlights the many different techniques astronomers use to learn about the Universe and allows visitors to try some out for themselves. Learn how planets around distant stars are discovered through the interplay of light and shadow. See how different kinds of light reveal what distant stars are made of or try your hand at pointing a telescope or commanding a space mission.

The Royal Observatory Micro-gallery

Housing a rotating series of temporary exhibitions, the Micro-gallery is found on the bottom floor of the Modern Astronomy Centre, on the way to the Peter Harrison Planetarium. During the 2011/12 academic year, this gallery will house two exhibitions. *Astronomy Photographer of the Year 2011* (Sept 2011 - May 2012) showcases the winning photographs of this year's astrophotography competition, ranging from images of our Earth's atmosphere to snaps of distant galaxies.

The Historic Observatory

The Prime Meridian

Every place on Earth is measured in terms of its distance east or west from the Greenwich Meridian, which divides the eastern and western hemispheres of the Earth, just as the Equator divides the northern and southern hemispheres. Since the late 19th century, the Prime Meridian at Greenwich has served as the reference line for Greenwich Mean Time. It can now claim to be the centre of world time, and was the official starting point for the new Millennium.

Flamsteed House

Flamsteed House is the original Observatory building at Greenwich, designed by Sir Christopher Wren in 1675 on the instructions of King Charles II. Take a fascinating glimpse into the apartments where the Astronomers Royal and their families lived and worked. Tour the beautiful Octagon Room, designed to observe celestial events including eclipses, comets and planetary movements. See one of the world's earliest public time signals, the bright red Time Ball, on top of Flamsteed House.

Time Galleries

The award-winning time galleries explore our need for accurate timekeeping and the role it plays in our everyday lives. Find out about two British solutions to the longitude problem, including Harrison's famous chronometers. Watch our horology conservators at work and learn about the provision of accurate timekeepers for the Navy. Explore the history of the development of timekeeping and find out about the role of time in our everyday lives.

The Meridian Galleries and 28-inch telescope

Explore a display of historic telescopes, including the 28-inch Greenwich refracting telescope, which is the largest of its kind in the UK and the seventh largest in the world. Completed in 1893, it was designed to keep the Royal Observatory at the forefront of contemporary astronomy.

Planning your visit

Book early

Our sessions are very popular, time slots are limited and all sessions must be booked in advance. We recommend booking as early as possible to avoid disappointment. All sessions must be booked in advance. See page 19 for full details on how to book.

Make a preliminary visit

In order to work out practical details and become familiar with the layout of Observatory facilities, we advise teachers and group leaders to visit prior to bringing students. Entrance to the Observatory for teachers making preliminary visits is free of charge. See pages 20 - 23 for site information.

Plan your journey carefully

While we can do all we can to accommodate school groups who are delayed in transport, we regret it is not always possible to reschedule learning sessions and planetarium shows for groups who arrive late. See page 20 for information on travel to our site.

Brief accompanying adults

You will need one adult for every eight children at KS3 or KS4 to accompany your group. Please ensure adults are briefed on their responsibilities and provided with a copy of the timetable for the day. See page 21 for scheduling information.

Prepare for emergencies

Please remind students to act responsibly while on site and ensure they know what to do if they get lost. Gallery staff are fully briefed on 'lost child' procedures and are always on hand to help. Risk assessment information can be requested from our Bookings Unit.

Prepare for learning

Full information on each of our learning sessions, pre- and post-visit resources and extension activities for Gifted and Talented students is available online at **nmm.ac.uk/schools**. Please check back frequently as this website is currently under development.

How to book

Please telephone or e-mail to arrange your visit, ensuring you have completed the following check list.

- You have your preferred date and time of arrival for your visit ready, with a range of possible alternatives
- You can provide a description of the learning needs of your group, including any special educational needs
- The number of adults attending is sufficient to meet the minimum required of one adult for every eight students at KS3 and KS4

Information on how to pay for planetarium shows will be provided on contacting the bookings team.

Please remember to ask about relevant support materials for your visit and enquire about the availability of the lunch room.

Bookings staff will be happy to provide advice on getting around the site and will post resources, site plans and an itinerary with your confirmation to allow you to brief students and group leaders prior to your visit.

Cancellation

Cancellation of a pre booked session less than 28 days before your visit, or bringing in less than half your booked numbers, will incur a fee of £150.00 for a full study day, or a fee of £75.00 for a session. All cancellations must be received in writing, by post or e-mail, by our bookings team.

For planetarium bookings payment by card must be received 14 days before your visit. Unfortunately, we can no longer invoice schools for visits to the planetarium. We regret that no refunds can be made if numbers are reduced after making a booking or in the case of late arrivals and cancellations.

Getting here

The Royal Observatory is situated in the middle of Greenwich Royal Park. If you are arriving by coach or on public transport the observatory is reached by a 5 to 10 minute walk through the park.

As preparation for the 2012 Olympics will be taking place in the park from April 2012, we advise all teachers visiting in this period to consult the Royal Parks website, **royalparks.gov.uk/Greenwich-Park**, for up-to-date information prior to your visit.

By Rail

- Cutty Sark, Docklands Light (15 minute walk via King William Walk)
- Maze Hill, British Rail (15 minute walk via Park Vista)
- Blackheath, British Rail (20 minute walk across the heath)
- Greenwich, British Rail (20 minute walk via King William Walk)

By Road

Recommended road connection from the M25 via A2 Junction 2 or M11 / A12 Blackwall Tunnel.

By Bus

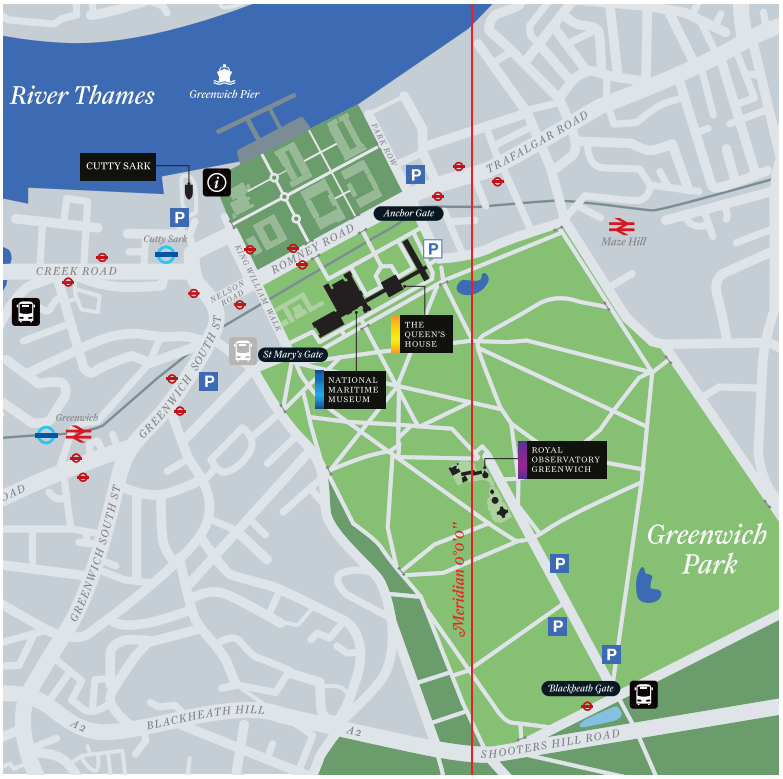
To Blackheath 53/54/202/380
To Greenwich 177/180/188/199/286/386

Coach Parking

Free coach parking is available on Charlton Way.

London Travel Information

Telephone: 020 7222 1234
Website: tfl.gov.uk



Your schedule

When you have booked, our Bookings Unit will forward a confirmation letter outlining the schedule of activity for your group/s. Please review the Visit Schedule in this letter carefully and contact our Bookings Unit immediately if you have any questions.

Each class of up to 30 students will follow a separate timetable; these groups are denoted in the Visit Schedule by letters A, B, C and D. The Visit Schedule lists start time, end time, and venue for each segment of your day. Venues for all schools activities are listed in the table below and those in the Astronomy Centre are labelled in the site map on page 23.

In preparing for your visit please ensure that:

- children have been split into lettered groups prior to arrival at the Observatory
- accompanying adults have been given a copy of the Visit Schedule and the site map on page 23
- accompanying adults remain with their students and are responsible for maintaining discipline at all times on site
- groups allow adequate time to transfer between activities in different parts of the site
- groups plan to be in the Planetarium foyer at least 10 minutes prior to the start of their planetarium show

Activity	Space	Location
Workshop	The LRET Learning Centre Digital Space or Discovery Space	Astronomy Centre, Level 1
Lunch	The LRET Learning Centre Activity Space	Astronomy Centre, Level 1
Astronomy Galleries	Weller Astronomy Galleries	Astronomy Centre, Ground Floor
Planetarium	Peter Harrison Planetarium	Astronomy Centre, Lower Ground Floor
Historic Galleries	Meridian Courtyard, Flamsteed House, Meridian Building and 28” Telescope	Historic Observatory North Site

Site information

Arrival and Departure

On arrival you will be greeted by a member of our schools hosting team, who will provide you with orientation and take you to a place where you can store bags and coats. You may visit the PHP foyer to collect bags and coats at the end of your programme, before you leave the Royal Observatory. Note that if you intend to visit the historic site you may leave your bags and coats and collect them later.

Storage Facilities for Bags and Coats

Bags and coats are stored in cages in the Planetarium Foyer for groups who have booked a lunch space, with one cage used for bags (lunches) and another for coats. At lunch time you are responsible for transporting the cage in which lunches are stored to the Activity Space which also serves as our lunch room. These cages must return to the planetarium foyer after lunch. The space is permanently occupied, so possessions are secure. However, many students like to take small bags and valuables with them.

Lunch Facilities

If you require a lunch space, please make sure you have one booked prior to your visit. Lunch facilities are provided in the Activity Space, which is situated on the first floor of the Astronomy Centre. Capacity is limited and groups must adhere strictly to the lunchtime listed on the Visit Schedule. Please ensure the lunchroom is left clean and tidy after use. In good weather, many groups choose to enjoy a picnic in Greenwich Park.

Toilet Facilities

A disabled toilet is available next to the lunch room for emergencies or use during lunch time. The main toilets are on the lower ground floor, next to the micro-gallery. An early morning toilet stop is advised before programmes commence.

The Shop

The shop is also on the lower ground floor. If you would like to visit the shop you are advised to do so at lunch time or at the end of your visit. You are strongly advised not to visit the shop just prior to your planetarium show, as show start times cannot be delayed to accommodate students in the shop.

The Café

Hot drinks and food are available for teachers in the café. However, please note that you are legally bound to ensure that the requisite number of teachers remain with your groups. Older students are welcome to make purchases from the café if they so desire.

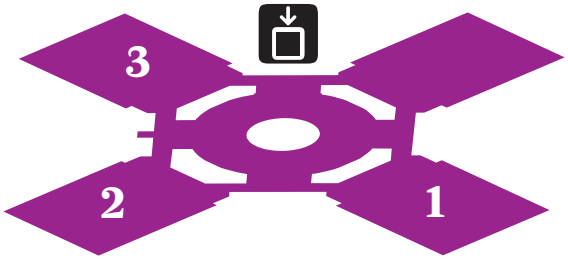
ROYAL OBSERVATORY GREENWICH

Site map

Level 1

The Lloyd's Register Educational Trust Learning Centre

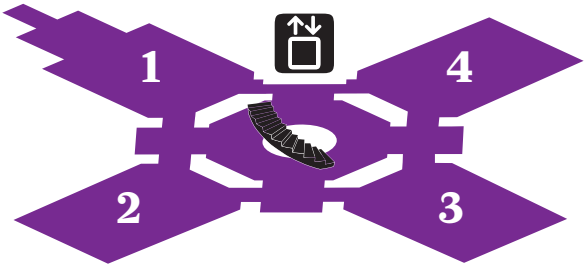
1: Activity Space
2: Discovery Space
3: Digital Space

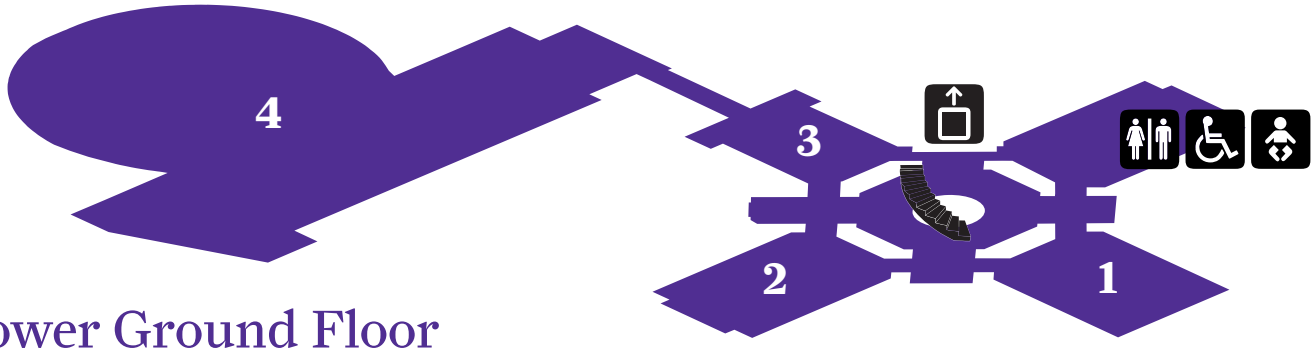


Ground Floor

The Weller Astronomy Galleries

1: Entrance
2: Astronomy Inspires gallery
3: Astronomy Explores gallery
4: Astronomy Questions gallery





Lower Ground Floor

The Peter Harrison Planetarium

1: Astronomy Shop
2: Observatory Café
3: The Royal Observatory Micro-gallery
4: The Peter Harrison Planetarium