



Programme for Primary Schools

2011 - 2012



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.





What we offer

We offer a full-day programme for foundation stage and primary 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

*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.*

Curriculum-linked workshops and planetarium shows suitable for different age groups are available on different days, with a choice of sessions available on some days to best meet the learning objectives of your group.

Detailed descriptions of workshops, planetarium shows and galleries are given in the following pages of this guide. Use the table below to find the session best suited to your students.

Age	Day	Workshop	See page	Planetarium show	See page
Early Years Foundation Stage	Tuesday from 31 Oct 2011	Moon Walking	4	Space Safari	10
Key Stage 1	Tuesday from 31 Oct 2011	Stella's Story	5	Space Safari	10
Key Stage 2	Monday, Wednesday and Tuesdays until 31 Oct 2011	Shadows and Sundials	6	Meet the Neighbours	11
		or Sun, Earth and Moon	7		
		or Shadows on the Moon	8		



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.

Workshops for Early Years Foundation Stage and Key Stage 1 students were developed for the Royal Observatory by Little Bubbles Outreach. These sessions are 30 minutes long and are led by specialist early years facilitators who introduce basic ideas of light, dark, night and day through physical activity, music and story.

Key Stage 2 workshops are 45 minutes long and delivered by Royal Observatory astronomers. They focus on concepts of light and shadow and the Sun-Earth-Moon system through interactive exploration of large-scale astronomical and/or digital models and student experiment.





Moon Walking

SESSION LEVEL: EYFS

SESSION LENGTH: 30 MINUTES

This session introduces children to simple concepts relating to space and space exploration through music, song and role-play.

The session begins with a chant-style introductory song, with more detail added verse by verse. This will include opportunities to incorporate the name of their school or teacher as appropriate. A physical warm-up will follow, with children moving around the space and using their bodies in different ways.

The children will then be seated and introduced to the stars, planets, Sun and Moon using images. Simple rhymes and songs will be used for each image and the children will accompany the singing with some hand-held instruments, including bells and shakers.

Using fabric the presenter will then invite the children to build a spaceship and role-play a journey to the Moon. Once on the Moon children will explore how differently their bodies would move in low gravity, with the presenter leading the group on a moonwalk to music.

At the end of the moonwalk the countdown will be repeated and the ship will set off for home, with a landing activity based on parachute play. This section will use original music and songs and genuine NASA footage from the *Apollo* Moon missions.

The session will conclude with a goodbye song based on the welcome song, but slower and calmer.

CURRICULUM LINKS

EYFS (40 - 60 months): Knowledge and Understanding of the World;
Physical Development; Creative Development; Communication; Language and Literacy.



Stella's Story

SESSION LEVEL: KS1

SESSION LENGTH: 30 MINUTES

This session introduces children to basic concepts relating to light, shadow, day and night using sounds, imagery, music, song, story-telling and role-play.

At the start of the session the lights will be turned off. The children are then led on an imaginary journey starting in an egg. Using images and atmospheric sound effects, the children will be introduced to a baby dinosaur, Stella, who has hatched out of her egg in a dark cave. The dark is all she knows.

Stella then discovers the starlit sky beyond her cave and begins to explore this new world. Leading the group in a song the presenter will tell how Stella discovers the Moon in the sky and believes that the beautiful star-filled, moon-lit sky is all there is to the world. Children will accompany the song with triangles and bells.

With audiovisual accompaniment, the landscape of Stella's world begins to brighten and the Sun rises. Stella is frightened by this bright new world. She can still see the moon but the stars, her friends, have gone. Stella is scared of her own shadow, but soon learns to play with this strange new friend. Using a large light the presenter will invite the children to explore their own shadows, moving around the space.

Finally, Stella's mother finds her and explains how the stars are still in the sky, just not visible in the daytime. She sings a soothing song to her baby reassuring her that the stars are always with us, even when invisible. As the Sun goes down Stella and her mother spot the stars returning as the light of the Sun recedes.

CURRICULUM LINKS

KS1: Science Unit 1D – Light and dark; Music: Unit 1 – Ongoing skills.



Shadows and Sundials

SESSION LEVEL: KS2

SESSION LENGTH: 45 MINUTES

In this interactive session students revise the concept of shadows, the motion of the Sun and its use as a timekeeper. Sundials are introduced and students will have the opportunity to make their own.

During the course of the workshop the relationship between shadows and the Sun's position in the sky is explored. A very big sundial here at the Royal Observatory is used to demonstrate local time deduced from the direction and size of shadows. Students are introduced to the idea of longitude and how this enables us to calculate local time in other cities. Students then construct and design their own sundial.

Students will be involved in:

- finding the position of the Sun by looking at real images of shadows using a whiteboard, a globe and a torch
- guessing the time of day from looking at certain properties of shadows
- calculating the local time in other cities using their longitude and Greenwich Mean Time (KS2: Maths)
- looking at some real sundials and then making their own. These can be taken home and used on a sunny day

CURRICULUM LINKS

KS2: Sci 1D – Light and Dark; Sci 3F – Light and Shadows.



Sun, Earth and Moon

SESSION LEVEL: KS2

SESSION LENGTH: 45 MINUTES

In this interactive session properties of the Sun, Earth and Moon such as relative size, distance and orbital periods are discussed. Objects are used to demonstrate the Sun and Moon's motion across the sky and the concept of shadows is revisited.

During the course of the workshop students will be asked about similarities and differences between the Sun, Earth and Moon and think about the relative scale of these objects. They will take part in a series of interactive elements that encourage them to think about our motion through space and the concepts of days, months and years. They will look at the properties of shadows cast on a rotating model of the Earth and why the Moon goes through phases. They will also have a chance to explore the phenomena of solar and lunar eclipses.

Students will be involved in:

- guessing the size of the Earth compared to the Sun
- working out the time of day from looking at the position of the Sun relative to a model Earth
- guessing how shadows change over the course of a day (as the Earth rotates)
- using a tellurium to model the Earth orbiting the Sun and show how the phases of the Moon are created
- demonstrating how solar and lunar eclipses arise

CURRICULUM LINKS

KS2: Unit 5E Earth, Sun and Moon, Unit 3F Light and Shadows.



Shadows on the Moon

SESSION LEVEL: KS2

SESSION LENGTH: 45 MINUTES

In this hands-on session students consider how an understanding of light and shadow in the Earth-Sun-Moon system allowed Galileo to discover mountains on the Moon and even measure their height.

The session begins by reviewing what students already know about the Moon. The presenter then describes the understanding of the Sun-Earth-Moon system in Galileo's time, including the incorrect beliefs that all celestial objects circle the Earth and are perfect spheres.

The remainder of the workshop explores how Galileo was able to make fundamental discoveries about the Moon by observing it through his telescope and applying his knowledge of how light and shadow work here on Earth.

Students will take part in:

- an interactive whiteboard game using shadows seen in lunar craters, to learn or recall that shadows point away from light sources
- a plasticine modeling exercise using an image of Plato Crater, to learn or recall that changing the height of a light source changes the shadow length
- a measurement of shadow length in Plato Crater and a simple calculation, to find that its height is comparable to that of the tallest mountains on Earth

CURRICULUM LINKS

KS2: Light & Shadow (Sci3F); Earth, Sun, & Moon (Sci6F); How We See Things (Sci6F).



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 nighttime sky, choose how to fly through our Solar System or enjoy visually stunning pre-recorded shows about the latest discoveries in astronomy. Shows are 30 minutes long at Early Years Foundation Stage and Key Stage 1 and 45 minutes long at Key Stage 2. Each planetarium show can accommodate up to two classes of 30 students.





Space Safari

SESSION LEVEL: EYFS, KS1

SESSION LENGTH: 30 MINUTES

This charming, interactive show for younger visitors follows Ted the Bear in his search for the Great Big Bear in the night time sky.

You students will meet Ted in his bedroom, waiting for the sky to get dark so he can begin his journey. After noting what can be seen in the sky in the day and in the night, children travel with Ted to the Moon and then the Sun, discovering some basic science of light and shadow along the way.

Next, the children follow Ted as he explores the Solar System, visiting all eight of the planets from Mercury to Neptune. Children learn simple facts about the planet which relate to basic concepts such as light and dark, hot and cold, and colour. Each time Ted fails to find the Great Big Bear, children help him travel further by singing his special song.

Finally the children return to earth with Ted, where he discovers the Great Big Bear in the stars overhead before returning to his room and waving goodbye. With original music produced by Trinity College of Music in collaboration with Wolfendale Primary School, this show is an engaging and educational experience for younger visitors.

CURRICULUM LINKS

EYFS: Understanding the World Around You.

KS1: Light and Dark.



Meet the Neighbours

SESSION LEVEL: KS2

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 nighttime sky, students consider the hundreds of extrasolar 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. Traveling beyond the Milky Way, students look back at this vast disk 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

KS2: Sci3F – Light & Shadow; Sci5E – Earth, Sun, & Moon; Sci6E – Forces in Action;
Sci6F – How We See Things.



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 summarizing 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 15 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 18-19 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 16 for information on travel to our site.

Brief accompanying adults

You will need one adult for every five children at EYFS and KS1 or one adult for every eight children at KS2 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 17 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 five students at EYFS and KS1 and one adult for every eight students at KS2

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

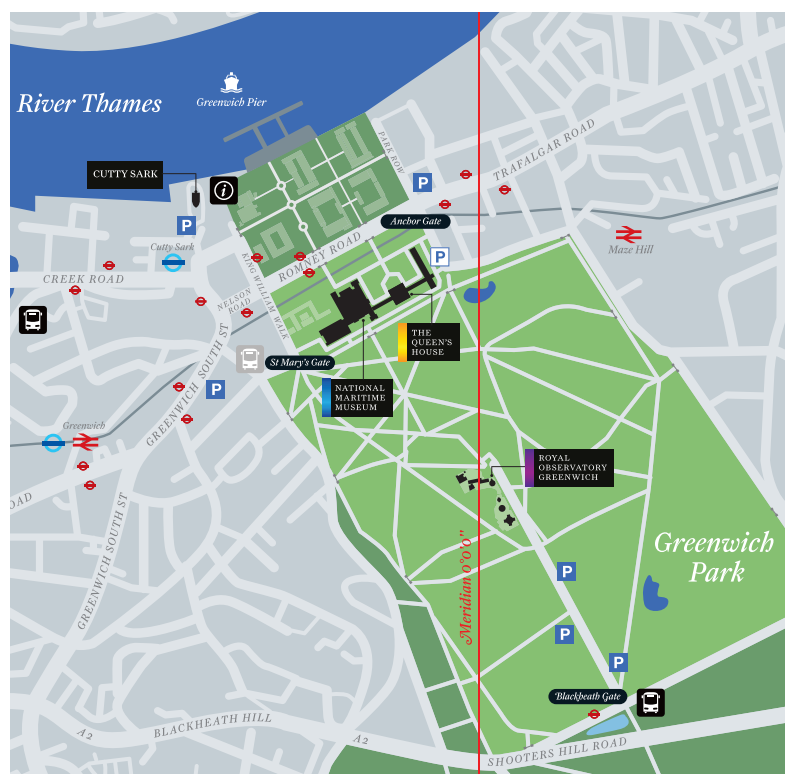
Coach Parking

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 19.

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 19
- 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 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. To simplify purchases for primary school children, goody bags are available at £1.00 and £2.00.

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.

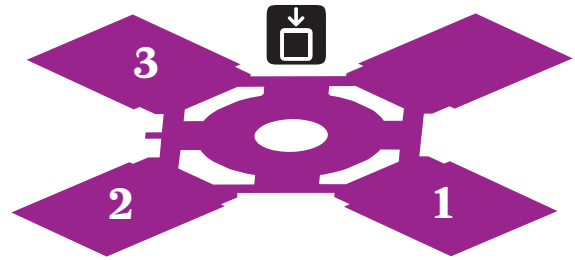


Site map

Level 1

The Lloyd's Register Educational Trust Learning Centre

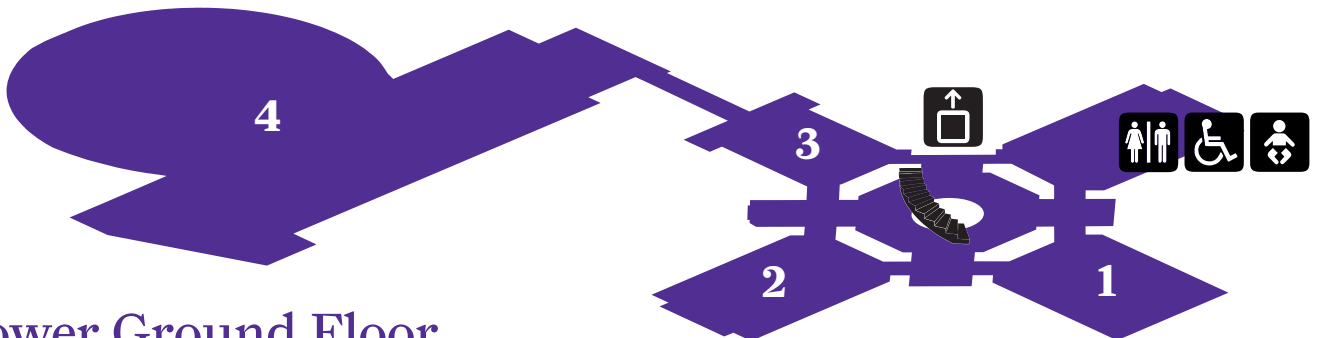
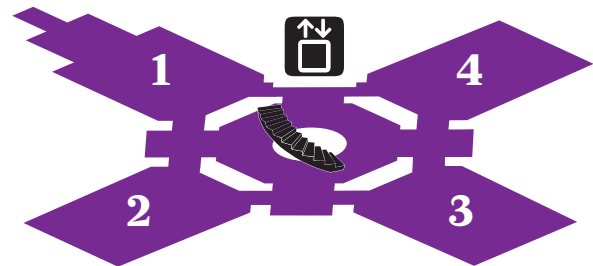
- 1: Activity Space
- 2: Discovery Space
- 3: Digital Space



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