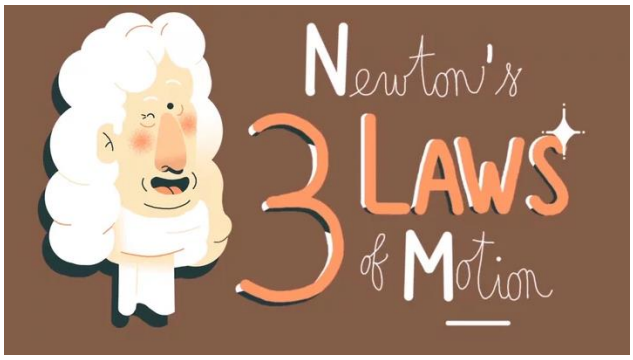
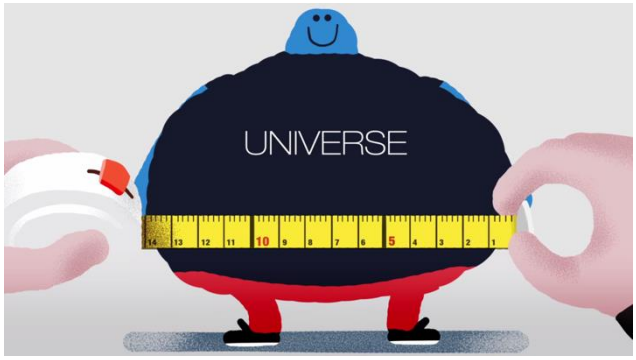
ROYAL OBSERVATORY GREENWICH

school travel AWARDS 2023 finalist Best Venue for STEM Learning

Image: European Space Agency | Webb's first deep field

Secondary Programme Workshops and Planetarium Shows 2024/2025





INTRODUCTION

This document details the content of the workshops and planetarium shows we have on offer to choose from for your students' unique astronomy learning experience.

For secondary groups, we offer a ***Discovery Day***, or a ***Digital Outreach Session*** for K3 – KS5 groups. **Space Spectacular Days** are available for KS3 groups only. Depending on which onsite option you choose your visit can be made of: a planetarium show, an interactive workshop, a self-facilitated astronomy activity, a self-facilitated visit to the historic north site and a timeslot in the lunchroom. For a digital outreach session, we have a selection of workshops available for KS3-5.

If you haven't already, please read through the *Primary Programme Guide* which explains how the programme works, how much each option costs, and how to book your sessions.

OUR SECONDARY PROGRAMME WORKSHOPS AND PLANETARIUM SHOWS

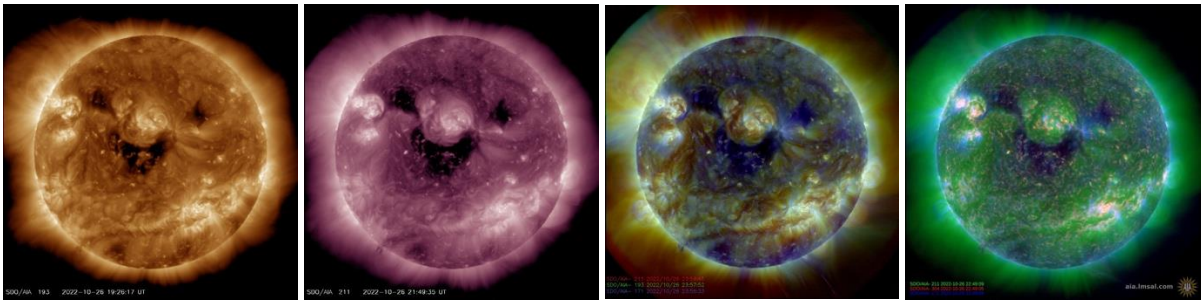


Image: SDO | Solar Dynamics Observatory (nasa.gov)

WHO DEVELOPS AND RUNS THE SESSIONS?

All of our content is developed by the Astronomy Education team in collaboration with the teacher's forum. All sessions are tested and evaluated with the teacher forum and also with school groups to ensure that the content developed is exactly what teachers are looking for and what students will thoroughly enjoy! The sessions are then run by real astronomers so there is always an expert available to answer any questions your students have about astronomy.

Our interactive workshops take place in one of three purpose-built learning spaces on, and are designed to encourage active learning and hands-on scientific enquiry. They are 45 minutes long and delivered by Royal Observatory astronomers. 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 team about any special needs requirements for your pupils.

ONSITE SCHOOL PROGRAMME
WORKSHOPS

Title: Exploring Ocean Worlds *This workshop runs during Space Spectacular Weeks only.* **Session level: KS3** **Session length: 45 minutes**
Key points covered - Evolution, exploring ocean life, gravity – force acting at a distance (tidal heating – friction and heat), pressure in fluids, states of matter
Workshop summary – our understanding of the conditions required for life to exist is based on our studies of life found in different regions on the Earth. The surprising discovery of life at the depths of the oceans has changed the targets for our search for life elsewhere in the Solar System. In this workshop, students will explore the oceans of the Earth before heading out into our Solar System, using images taken by satellites and spacecraft to search for other ocean worlds. Through the use of demonstrations and activities, students will learn about the physics of pressure, the extreme conditions of the ocean depths, and how life might be able flourish in similar conditions on distant ocean worlds.

The Solar System and Beyond **Session level: KS3 and KS4** **Session length: 45 minutes**
Key points covered – Kepler's laws of planetary motion, orbits, Newton's laws of gravity, mathematical calculations and graph work.
Workshop summary – students learn about the different ways that planets in our solar system were discovered. They then use real astronomical data in this session to travel through the solar system investigating the orbits of the planets. They will also explore how the mathematics used to describe planetary orbits has been used to discover a supermassive black hole at the centre of the Milky Way Galaxy.

Maths in the Milky Way **Session level: KS3 and KS4** **Session length: 45 minutes**
Key points covered – mathematical techniques including calculations, unit conversions, drawing and interpreting graphs / charts, the relationship between speed, distance, and time.
Workshop summary – in this session students see how maths can be used to find out more about the world around us and beyond. They learn about calculating travel times to other planets along with how to draw and interpret graphs. They will also then look at how the knowledge they build up in the workshop can even be used to help them find the travel time from extrasolar planets to our planet so they see how long alien life forms might have to travel if they were headed our way.

Studying Starlight **Session level: KS4 and Post-16** **Session length: 45 minutes**
Key points covered – the electromagnetic spectrum, reflection, absorption and emission of light, and for Post-16, the Doppler Effect.
Workshop summary – 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 at Post-16 the Doppler Effect. They also look through spectroscopes to identify gases and see the spectrum of the Sun.

PLANETARIUM SHOWS

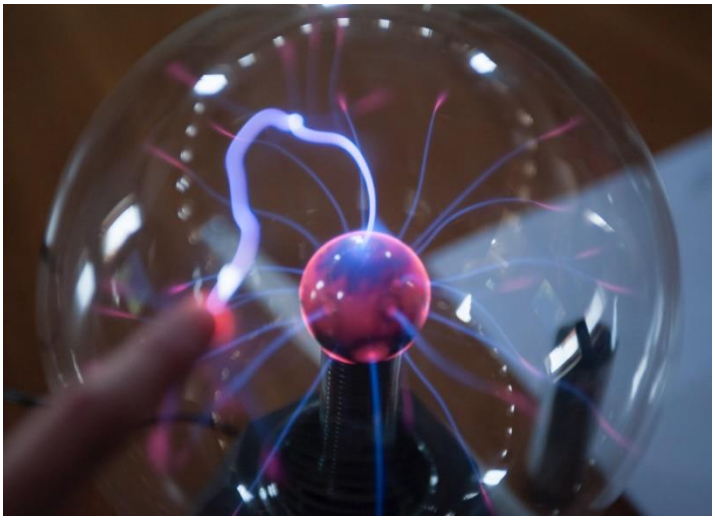
Planetarium shows take place in the Peter Harrison Planetarium and are delivered live by Royal Observatory astronomers. Our state-of-the-art digital planetarium provides an inspiring, immersive, and interactive learning experience, allowing students to examine the day and night-time sky, fly through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

Solar System Galaxy Universe **Session level: KS3, KS4 and Post 16** **Session length: 45 minutes**
Key points covered – contents and structure of the Solar System, our Milky Way Galaxy, and the larger Universe. KS4/Post-16 – also includes the electromagnetic spectrum and spectroscopy.
Show summary – in this inspiring interactive show, a Royal Observatory 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. The show explores the different classes of objects in the Universe, the variety found within each category and how they compare to what is most familiar to us: the Earth, the Sun, and the Milky Way. At the higher Key Stage, the show also highlights how observing at different wavelengths of light allows astronomers to unravel the mysteries of the Universe

Final Frontier *This show runs during Space Spectacular Weeks only.* **Session level: KS3** **Session length: 45 minutes**
Key points covered – aspects of our solar system, lunar phases, size and scale of different stars, forces in action.
Show summary – Final Frontier is a show all about space exploration – amazing! This action-filled show packs a lot, so buckle up and get ready to do some serious exploring. It looks at the challenging conditions of space, the types of things we must be prepared to encounter should we travel there, and the distances and scales involved in going on such a mission. This show also highlights the people involved in space science and showcases some of the greatest contributions and ambitions of scientists and engineers. Final Frontier shows us just why using our imagination is very important when it comes to heading out on our adventure into space.

SPECIAL EDUCATIONAL NEEDS AND DISABILITIES: AURORA DAYS

Aurora Days for the 2024/25 academic year will typically run twice a term and include specially designed sessions for SEND groups.



While you are of course welcome to visit at any time with SEND groups ***Aurora Days*** are dedicated slots where we hand the Observatory over to you without any other school groups on site. This means that we are able to dedicate more time to you answering your space questions and making you visit as enjoyable and as easy as possible.

We are always looking for feedback to develop our ***Aurora Day*** programme further and have a SEND forum to help inform the programme. If you would like to join, please take a look at our website for more details (https://www.rmg.co.uk/schools-communities/networks-forums), we would love to have you with us. ***Aurora Days*** are made up of the following components where you can choose one workshop and one planetarium show.

PLANETARIUM SHOWS

Planetarium shows take place in the Peter Harrison Planetarium and are delivered live by Royal Observatory astronomers. On ***Aurora Days*** we have:

Show Name: Starry Skies **Session Level: there is flexibility to tailor this show to fit your needs.** **Session length: 45 minutes**
Show summary – this show takes the audience on a tour of some of the most beautiful aspects of our Solar System. It was developed in collaboration with our local autism spectrum disorder visitors and their families and has consistently received fantastic feedback since it launched. It is presented live by one of our astronomers and runs at a much calmer pace than many of our other school shows. The lighting levels used are higher for this show, so the planetarium never becomes pitch black, and the music and narration are kept to a minimum. If your students have any questions about space at the end, our astronomer will be there to answer them.

Show Name: Audio Universe **Session Level: KS2 (as this show includes pre-recorded narration it can't be tailored to suit different needs, but may also be suitable for students working at other levels).** **Session length: 45 minutes**
Show summary – Prepare to be transported inside a special spacecraft to the European Southern Observatory's Very Large Telescope (VLT) to view the stars in the night sky, before lifting off into space to visit the Earth, Moon, Sun and all the planets of the Solar System. Unlike traditional planetarium shows, in Audio Universe the soundtrack takes the lead role. Each of the objects in space are represented with sounds as well as being presented with incredible visuals. This means that this show is an immersive experience that can be enjoyed irrespective of level of vision. This show is a great option if some or all or your students are visually impaired, and can't access a planetarium show that relies on imagery.

Alternative shows can be offered that suit your students' needs – please speak to our astronomers before booking for more information.

WORKSHOP

Our multi-sensory, interactive workshop takes place in one of three purpose-built learning spaces and is designed to encourage active learning and hands-on scientific enquiry.

Workshop Name: Searching the Solar System **Session level: these workshops are linked to the KS2 curriculum** **Session length: 30 minutes**
Workshop summary – in this workshop students will be encouraged to compare the similarities and differences between our planet Earth and other planets in our Solar System. We will explore parts of the Solar System using multi-sensory demos and practical activities to help students understand more about some of their closest neighbours in space. There are a number of different activities that can be done as part of this workshop. Different activities are pitched at different levels, from KS1 up to KS3, so we can tailor this workshop to suit your needs. Please be sure to chat to a member of the ROG Education team when you are planning your visit so they can advise.

DIGITAL OUTREACH PROGRAMME

ONLINE WORKSHOPS

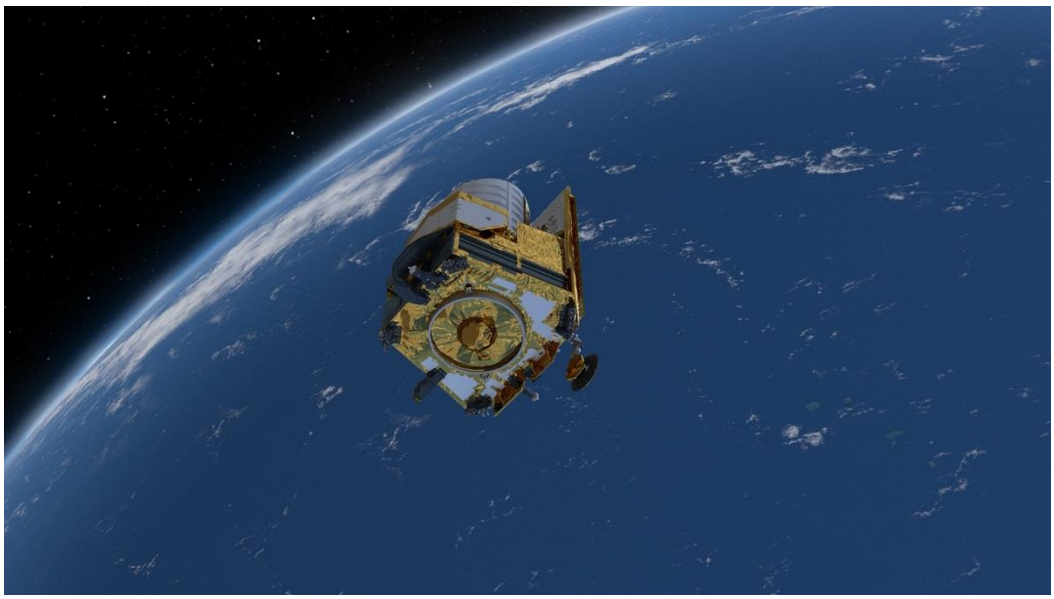
Our interactive online workshops are delivered via Zoom or Teams and are designed to encourage learning and scientific enquiry through participation.

Key Stage 3 / Key Stage 4 / Post-16 digital workshops are 45 minutes long and delivered by Royal Observatory astronomers. They focus on the curriculum science in an astronomical context covering forces, stellar evolution and measuring distances in space. Each online session uses interactive elements like video clips and activities to help get your students thinking and inquiring about space.

Forces and Space Exploration **Session level: KS3** **Session length: 45 minutes**
Key points covered – forces, gravity, mass, weight, environment, and planet surface features.
Workshop summary – in this digital session, students will explore the difference between mass and weight and look at what determines the strength of the force of gravity. They'll apply their learning to see how gravity affects space exploration on the International Space Station, the Moon and Mars before diving into some of the Mars missions of 2020. Delivered by a Royal Observatory Greenwich astronomer, this session will include a range of interactive activities such as video clips and activities to help explain the scientific concepts in a real-world context. The session finishes up with a question-and-answer segment, so students have the opportunity to ask any questions they have. Post-session activities will also be supplied for your students to try afterwards and test what they have learned.

Life Cycle of Stars **Session level: KS4** **Session length: 45 minutes**
Key points covered – stars and galaxies, sun, star formation and evolution (nebula, main sequence, red giant/supergiant, planetary nebula, white dwarf, supernova, neutron star, black hole).
Workshop summary – stars are born, live out their lives and die all throughout the universe, but what determines the path they take? What makes some stars meet an explosive end, while others simply quietly fizzle out? In this interactive digital workshop, a Royal Observatory Greenwich astronomer will walk your students through the life cycle of a star the size of our Sun, as well as the life cycle of stars much larger too. In the question-and-answer session students will have the opportunity to ask questions about stars or indeed anything astronomical, as well as being provided with post-workshop exercises to ensure they understand the key stages of a star's life.

Cosmic Distance Ladder **Session level: Post-16** **Session length: 45 minutes**
Key points covered – radar, speed of light, parallax, standard candles (variable stars and Ia supernovae), redshift and Hubble's law.
Workshop summary – how do we measure distances in space? We can't exactly pull out the tape measure to work out the distance between the Earth and the Moon, so astronomers have had to develop various methods to calculate distance on cosmic scales. In this interactive digital session, an astronomer from the Royal Observatory Greenwich will describe these methods and explain how they build on each other to create the cosmic distance ladder that allows us to measure the most distant of objects. Towards the end of the session students will have the opportunity to ask any astronomy or careers questions they may have, and we will provide follow-up activities to stretch their knowledge of space even further.



SUPPORTING RESOURCES FOR TEACHERS

We have a large selection of resources available on the website that have been developed with our teacher's forum. They can be used after your session as a follow-up or before to introduce new topics. Resources linked to our workshops which include background reading for teachers, discussion questions, classroom activities and extension work for advanced students are available online on the website. We also have brand new videos that can be used as part of a science lesson:
https://www.rmg.co.uk/schools-communities/all-astronomy-science-resources
https://vimeo.com/royalobservatory

We also have a number of FREE digital blogs and podcasts with guest scientists and astronauts to keep your students excited and intrigued with all things space science and astronomy:
https://www.rmg.co.uk/stories/astronomy/guide-night-sky
https://www.rmg.co.uk/schools-communities/royal-observatory-greenwich-schools-podcasts

If your group wants to get more involved after their ***Study Day***, you can bring them back to one of our Think Space lectures. Pitched at students at KS4 and above, the lectures are led by a guest researcher from in the field of astronomy and space science. They run on selected evenings after school from autumn through spring. Places are limited so booking is essential. Think Space Lectures may take place online, but you'll find more details on the website.
https://www.rmg.co.uk/whats-on/online/think-space-lectures

You can also find FREE trails for KS3, KS4 and Post-16 on our website:
https://www.rmg.co.uk/schools-communities/visit-guides-activities

All you need to do is download, print, and bring along on the day! These trails are great if you are looking for help structuring your group's time during the self-directed parts of your visit.

For more information on accessibility please have a look at our website https://www.rmg.co.uk/plan-your-visit/facilities-access, as well as our dedicated Aurora Day page which contains our visual story for anyone that would like to show see in advance what to expect when visiting the site:
https://www.rmg.co.uk/schools-communities/special-educational-needs-aurora-days

CONTACT US

For any queries regarding the booking process or making any changes to your booking, please contact the Bookings team on bookings@rmg.co.uk or call 0208 312 6608.

For content related questions please contact the Astronomy Education team on rogeducation@rmg.co.uk.