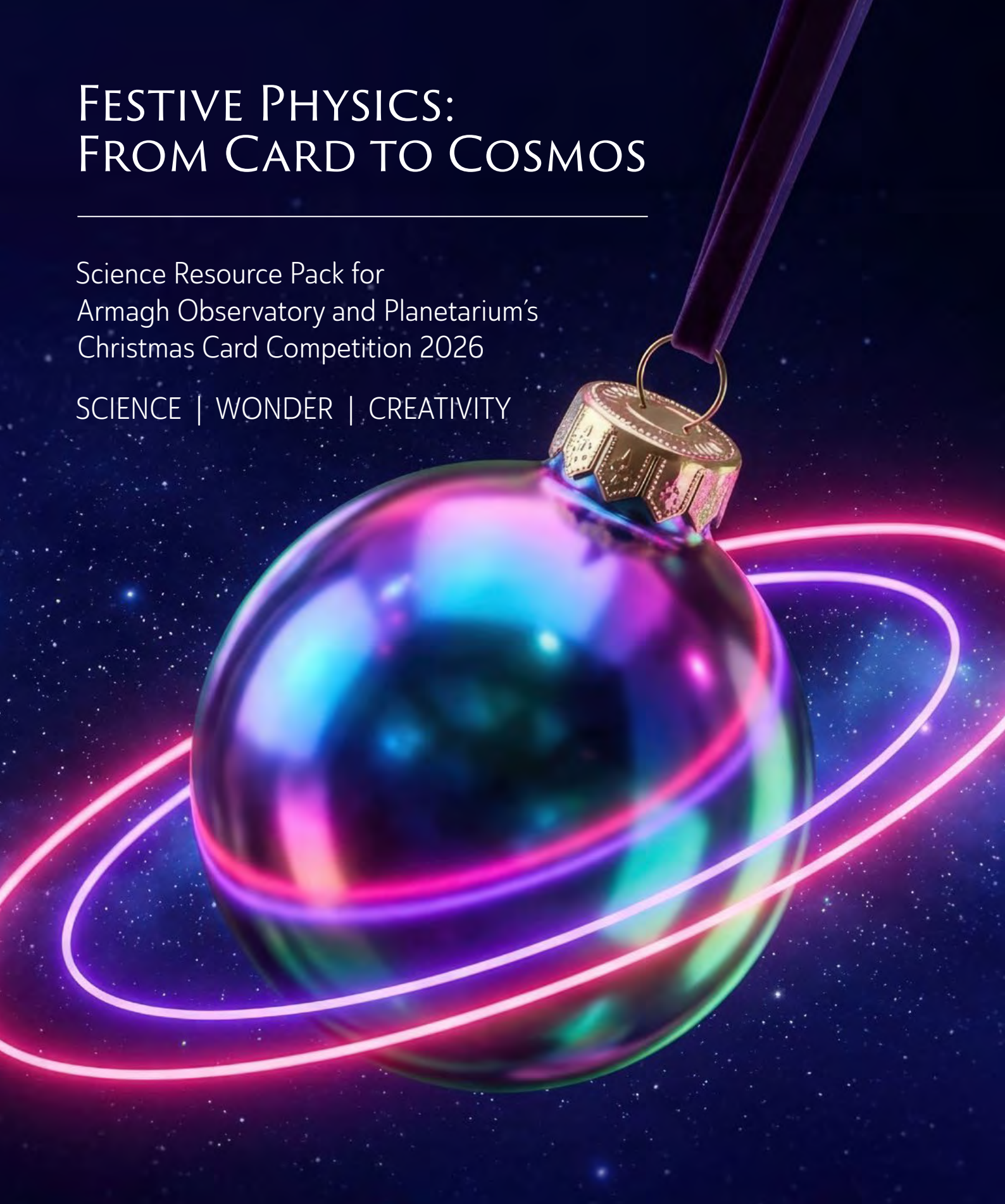


FESTIVE PHYSICS: FROM CARD TO COSMOS

Science Resource Pack for
Armagh Observatory and Planetarium's
Christmas Card Competition 2026

SCIENCE | WONDER | CREATIVITY



YOUR MISSION



Can you turn science into a Christmas card?

Your mission is to design a Christmas card inspired by science and space. Think about what you've discovered about light, colour, forces, stars, planets, the winter sky, rockets or space exploration.

- Could Santa fly through the aurora?
- Could his sleigh blast off like a rocket?
- Could you use rainbows and light to create a magical scene?
- Could the Moon, stars or planets become part of your Christmas design?

Be curious. Be creative. Think like a scientist and an artist!

- Open to primary-school-aged children
- Artwork should be A4 size or less, and can be portrait or landscape
- Designs can be drawn, painted or digitally created, and **should not** be AI generated
- Artwork should be inspired by Christmas and one or more of the physics themes in this resource pack
- Schools should submit entries by email to educationteam@armagh.ac.uk or via post to:
FAO: Sinead Mackle, Armagh Observatory and Planetarium, College Hill, BT61 9DB.
- **Please include** on the back of the design the following:

School Name:

Pupil Name:

Age / Key Stage:

My card idea and the science I have shown:

Key Dates		
Competition launches: Monday 28 September 2026	Artwork submission deadline: Thursday 5 November 2026	Winners announced: Monday 23 November 2026

CHRISTMAS IN SPACE - A REAL SCIENCE STORY



Christmas in space is not just science fiction. The Apollo 8 crew were the first humans to spend Christmas in space and the first crew to leave Earth orbit, doing so while circling the Moon in December 1968. Astronauts aboard the International Space Station have also celebrated Christmas with shared meals, decorations, family messages and holiday traditions adapted to microgravity.



Decorations

Loose objects can float in microgravity, so decorations need to be secured. Astronauts have used stockings, banners and lightweight decorations.



Food

Space food is specially packaged and designed for the spacecraft environment. Some foods are ready-to-eat and others are rehydrated.



Candles

Open flames are not suitable for a spacecraft environment. A “candle” could instead be represented by an LED light.



Gifts

Small items can be passed around in microgravity, but everything needs to be managed so it does not interfere with equipment.



View from space

Astronauts can see Earth from orbit which is a powerful reminder that Christmas traditions can travel with people even when they are far from home.

FESTIVE PHYSICS: FROM CARD TO COSMOS

A teacher-friendly resource to help pupils discover the science behind festive ideas then turn what they have learned into imaginative Christmas card artwork.

This pack is designed to help introduce physics and science concepts to assist in your class making a creative Christmas card - blending art and science.

Each topic includes accessible science, key facts, vocabulary, questions, an activity and creative prompts.

Suggested use

Use each topic as a short lesson, discussion starter, practical activity or launchpad for artwork. The resource can support KS1 or KS2, with questions and vocabulary adapted to the age of the class.

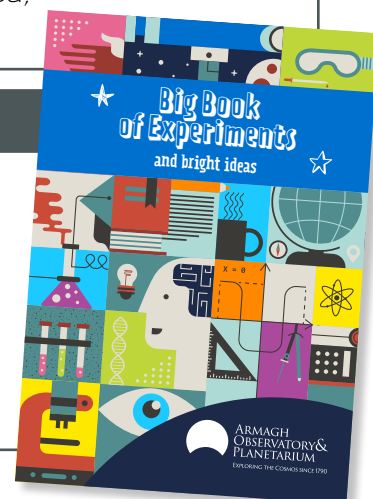
How to use this pack

1. Wonder	Start with the big question. Let children predict before you explain.
2. Discover	Use the simple science explanation and key facts.
3. Investigate	Try the suggested demonstration or activity.
4. Imagine	Ask: "How could this science become part of a Christmas card?"
5. Create	Pupils explain their science idea, then make their final card.

Big Book of Experiments

Use this pack alongside the Big Book of Experiments and Bright Ideas. The existing resource provides Science@Home experiments with easy instructions, walkthrough videos and "Did you know?" facts. Teachers can use it for a deeper practical follow-up after the short activities in this pack.

[experiment-book-grid-final-ref.pdf](#)



1. LIGHT

Colour, reflection and shadows



The science in simple words: Light helps us see. When light reaches an object, some of it can be reflected, absorbed or transmitted. A shadow forms when an object blocks light travelling from a light source. White light contains many visible colours, and different wavelengths are seen by our eyes as different colours.

Key facts	Key vocabulary
Visible light is only a small part of the electromagnetic spectrum.	light reflect shadow wavelength colour spectrum aurora rainbow
Red light has a longer wavelength than blue light.	
A shadow is an area where light from a source has been blocked.	
Objects look coloured because they reflect some wavelengths of light more strongly than others.	
Smooth, shiny surfaces can reflect light like mirrors.	



Light in nature: Rainbows and aurora

Rainbows:

A rainbow forms when sunlight enters raindrops and is refracted, reflected and separated into different colours because different wavelengths of light bend by different amounts.



Aurora:

An aurora happens when charged particles from the Sun interact with gases in Earth's atmosphere, causing them to give off colourful light.



Talk about it

Can you make a shadow bigger or smaller? How?

Yes. Move the object closer to the light to make the shadow bigger, or closer to the wall to make it smaller.

Why does a white object look white?

Because it reflects most or all of the colours of visible light into our eyes.

Why can we see ourselves in a mirror?

Because the mirror reflects light from our face back into our eyes.

What might happen if two different coloured lights shine on the same place?

The colours can mix to make a new colour. For example, red and green light can make yellow light.

Colours of light mixed

New colour

■ Red + ■ Green = ■ Yellow

■ Red + ■ Blue = ■ Magenta

■ Green + ■ Blue = ■ Cyan

■ Red + ■ Green + ■ Blue = □ White

Remember: Mixing coloured light is different from mixing paint.

Red, green and blue are the three primary colours of light.

TRY IT: Shadow detective

In a dim room, shine a torch towards a wall. Place a toy or cut-out between the torch and wall. Move the object closer to the torch, then closer to the wall. Compare the shadow size and sharpness. For a colour extension, use red/green/blue torches or coloured transparent film to explore colour mixing.

Turn science into art

Design a Christmas scene where the science is visible: a lantern casting a long sleigh shadow, Santa reflected in ice, coloured lights mixing over a snowy village, or a Moon-lit scene with dramatic shadows, Santa flying through a rainbow, with the colours explained by refraction and dispersion or Santa's sleigh travelling beneath colourful aurora lights, linking the artwork to charged particles and light emission.

2. FORCES & MOTION

Gravity, rockets and launching into space



The science in simple words: A rocket changes its motion because forces act on it. The main forces on a rocket during flight are thrust, weight, drag and lift. For a launch, the rocket needs enough upward thrust to overcome its weight and climb through the atmosphere. Once in space, there is no air resistance, but gravity still acts.

Key facts

Thrust is the force that pushes a rocket forward.

Weight is the force of gravity pulling on the rocket.

Drag is air resistance that acts against motion through the atmosphere.

Rockets carry their own fuel and do not need air from the atmosphere to burn their rocket propellant.

Gravity gets weaker with distance, but it never suddenly switches off.

Key vocabulary

force
thrust
gravity
weight
drag
motion
launch
orbit

Talk about it

Why does a rocket need a pointed shape and fins?

The pointed shape reduces air resistance and the fins help keep it stable.

Would a rocket feel drag in the same way once it is far above the atmosphere?

No, because there is no air in space, so there is almost no drag.

If Santa jumped from his sleigh near Earth, what force would pull him back?

Gravity would pull Santa back towards Earth.

TRY IT: Balloon rocket

Thread a straw onto a long piece of string. Tape the inflated balloon to the straw without tying it. Let go of the balloon and watch it move. Ask pupils what pushes the balloon forward. Explain that a real rocket uses controlled thrust from rapidly moving exhaust gases, not balloon air.

Turn science into art

Imagine Santa's sleigh as a spacecraft. Add arrows to your sketch showing thrust, gravity and drag. How might the sleigh look different if it were designed to travel through an atmosphere on another planet?

3. ASTRONOMY

Stars, planets, the Moon and our Solar System



The science in simple words: Our Solar System contains the Sun, eight planets, moons, asteroids, comets and other objects. The Sun is a star: it produces its own light. Planets do not make their own visible light; they reflect light from the Sun. The Moon is Earth's natural satellite and shines because it reflects sunlight.

Key facts

- The Sun is the closest star to Earth.
- Earth is a rocky planet and the third planet from the Sun.
- Jupiter is the largest planet in our Solar System.
- The Moon takes about a month to go through its phases.
- Planets orbit the Sun because gravity keeps them moving along their paths.



Key vocabulary

star
planet
Moon
satellite
orbit
Solar System
gravity
phase



Talk about it

How is a star different from a planet?

A star makes its own light and heat, while a planet orbits a star.

Why can we see the Moon even though it does not make its own light?

We can see the Moon because it reflects light from the Sun.

What would happen to the Solar System if there was no gravity?

Without gravity, the planets would fly off in straight lines instead of orbiting the Sun.

Which planet would you choose for a Christmas visit - and why?

At AOP we would choose Saturn as its beautiful rings would make a magical Christmas visit.



TRY IT: Planet or star?

Give groups cards showing the Sun and planets. Ask pupils to sort them to arrange the planets in order from the Sun. Challenge: explain why a planet can look bright in the night sky even though it is not a star.

Turn science into art

Set Christmas on another world: Santa delivering presents on Mars, an icy Christmas on Uranus, a Moon base with Earth in the sky, or a sleigh flying between planets. Encourage pupils to show scientifically sensible features.



4. THE WINTER SKY

What can we observe on winter nights?



The science in simple words: As Earth travels around the Sun, the part of space we see in our night sky changes through the year. In Northern Hemisphere winter, familiar patterns such as Orion are easy to spot in the evening. Stars can appear to twinkle because their light passes through moving, uneven layers of Earth's atmosphere.

Key facts

Orion is a prominent constellation in Northern Hemisphere winter.

Orion's Belt is a row of three noticeable stars.

Sirius is the brightest star in Earth's night sky.

The Winter Triangle links Sirius, Procyon and Betelgeuse.

Stars do not really switch their brightness on and off when they twinkle; Earth's atmosphere changes how their light reaches us.

Key vocabulary

constellation

star

horizon

atmosphere

twinkle

observe

pattern

light pollution

Talk about it

Can you find three stars that make a pattern?

Why might stars near the horizon twinkle more?

Stars near the horizon twinkle more because their light passes through more of Earth's atmosphere.

Why do we see different constellations at different times of year?

We see different constellations because Earth moves around the Sun.

How could light pollution change what we see?

Light pollution makes faint stars and constellations harder to see.

TRY IT: Make a winter constellation

Give pupils black card and a white pencil. Ask them to invent a constellation by connecting star dots. Then compare it with a real pattern such as Orion. For a simple observation task, record the time and direction of one bright STAR and look again later. Has the star moved?

Turn science into art

Build a Christmas night scene around a real winter pattern. Use Orion's Belt as a trail for Santa, make a starry sleigh route, or hide a constellation inside the shape of a Christmas tree.

5. SPACE EXPLORATION

Astronauts, spacecraft and exploring other worlds



The science in simple words: Humans and robots use spacecraft, instruments and carefully planned missions to explore space. Astronauts need air, water, food, temperature control and exercise. Robots can explore places that are difficult or risky for humans. NASA's Artemis programme is building experience for future human exploration of the Moon and, eventually, Mars.

Key facts

Artemis II became the first crewed Artemis flight, carrying four astronauts around the Moon and back in 2026.

Artemis III is planned as a crewed demonstration mission in low Earth orbit in 2027.

Future Artemis missions are intended to support lunar exploration, including the lunar South Pole region.

Spacecraft need systems to provide breathable air and manage water and waste.

Robots can carry cameras and scientific instruments to places humans cannot easily visit.

Key vocabulary

astronaut

spacecraft

mission

rover

habitat

microgravity

exploration

Artemis

Talk about it

What does an astronaut need to stay alive in space?

An astronaut needs oxygen, water, food, warmth, and protection from space.

Why might a robot be useful before humans visit a new world?

A robot can explore dangerous places before humans arrive.

How could scientists use a rover to find out about Mars?

Scientists can use a rover to collect rocks, take pictures, and study the Martian surface without needing to send a human to this dangerous environment.

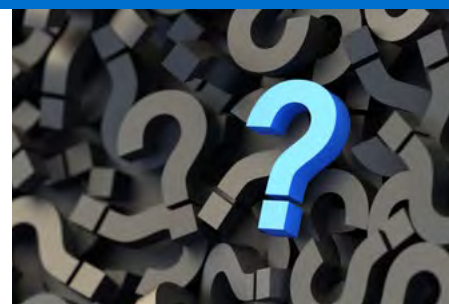
TRY IT: Design a Moon or Mars habitat

Give teams a simple "mission shopping list": air, water, food, power, shelter, communication and science equipment. They must design a habitat that fits all seven needs. Add a Christmas celebration item but explain how it would work safely in microgravity.

Turn science into art

Imagine Christmas on the Moon or Mars. Show astronauts, a habitat, a rover, Earth in the sky, solar panels or an Artemis-style spacecraft. Ask pupils to include at least one detail that is based on real space technology.

BIG QUESTIONS: TEACHER ANSWERS



Why is the sky dark at night?

Earth rotates. When your part of Earth faces away from the Sun, direct sunlight is blocked by Earth. The night sky can still contain light from stars, planets and the Moon. On Earth, the atmosphere makes daytime skies bright by scattering sunlight; space itself looks black because there is no atmosphere to scatter sunlight.

Why do stars appear to twinkle?

Stars are so far away that they look like tiny points of light. As their light travels through moving, uneven layers of Earth's atmosphere, the light is bent slightly in changing directions. This makes the star appear to change brightness very quickly.

How does a rocket get into space?

Rocket engines create thrust. During launch, the rocket must produce enough upward thrust to overcome its weight and climb through the atmosphere. As the rocket rises, it also has to gain enough sideways speed to enter orbit if that is its mission.

If you jump, what makes you fall back to Earth?

Gravity. Earth's mass creates a gravitational pull that attracts you towards Earth's centre. Gravity also keeps the Moon in orbit around Earth.

Why do we see different colours?

Visible light contains different wavelengths. Our eyes and brain interpret these wavelengths as colours. Objects can absorb some wavelengths and reflect others; the reflected light is what helps determine the colour we see.

How do astronauts live in space?

Spacecraft provide air, pressure, temperature control, water, food, power and waste management. Astronauts also exercise to help maintain muscle and bone health.

What would Christmas look like on Mars?

Mars has a thin atmosphere, dusty landscapes, lower gravity than Earth and no natural liquid-water surface like Earth's. A Christmas celebration would need to happen inside a protected habitat or spacesuit environment. A tree, decorations and food would need to be designed for the habitat. Near the Martian poles there could be snow on the ground, made of carbon dioxide and not water ice.

Do astronauts spend Christmas in space?

Yes. Astronauts have spent Christmas in space many times. The Apollo 8 crew celebrated Christmas while orbiting the Moon in 1968, and crews aboard the International Space Station have celebrated with meals, decorations, messages to Earth and time with crewmates.

Terms and Conditions | Festive Physics: From Card to Cosmos

1. Eligibility

The competition is open to primary-school-aged pupils. There will be separate judging categories for KS1 and KS2.

2. Entry Period

Entries must be received by Thursday 5th November 2026. Entries received after the closing date cannot be considered.

3. Theme

Entries should be inspired by Christmas and one or more physics themes in the resource booklet.

4. Original Artwork

All entries must be the original work of the pupil entering the competition. Artwork should not be copied from existing artwork or created by another person.

5. Format

Artwork should be created on A4 paper or less, either portrait or landscape.

6. Entry Submission

Entries must be submitted by the participating school by email, post or left at our reception. Each entry must include the pupil's name, age/year group and school details on the back of the artwork. Entries also accepted from individuals parents/guardians.

7. Parental/Guardian Consent

Schools are responsible for ensuring that appropriate parental/guardian consent has been obtained for pupils entering the competition and for the uses of artwork and pupil information described in these Terms and Conditions.

8. Use of Artwork

Copyright in the original artwork will remain with the pupil and/or their parent or guardian. By entering the competition, permission is granted to Armagh Observatory and Planetarium to reproduce, display, publish and adapt selected artwork for the purposes of the competition, including:

- public exhibition;
- inclusion in the immersive fulldome planetarium sequence;
- Armagh Observatory and Planetarium/AOP websites and social media;
- promotional and publicity materials relating to the project;
- future educational or public engagement activities directly associated with the project.

9. Fulldome Adaptation

Selected artwork may be digitally edited, animated, cropped or otherwise adapted as necessary to incorporate it into the fulldome planetarium experience.

10. Pupil Information

Unless we have received explicit requests not to, the pupil's first name, age/year group and school may be used alongside their artwork for exhibition, publicity and project-related purposes. No unnecessary personal information will be published.

11. Judging

Entries will be judged by a panel selected by Armagh Observatory and Planetarium. Judging will consider creativity, originality, engagement with the competition theme and how effectively the artwork communicates or is inspired by physics and space.

12. Winners

There will be one winning entry in each of the KS1 and KS2 categories. The judges' decision will be final and no correspondence will be entered into regarding the judging decision.

13. Prizes

KS1 and KS2 winners will each receive a free class visit to AOP, subject to availability and any applicable booking restrictions. Additional Runner-Up Prizes will include 10 child memberships and 1 family membership. Details of how these prizes are awarded will be provided when winners are announced.

14. Prize Conditions

Prizes are non-transferable and cannot be exchanged for a cash alternative. AOP reserves the right to substitute a prize with an alternative of equivalent value where necessary.

15. Changes to the Competition

AOP reserves the right to amend, suspend or cancel the competition, or change the competition arrangements, where circumstances outside its reasonable control make this necessary.

16. Data Protection

Personal information collected as part of the competition will be handled in accordance with AOP's applicable data protection and privacy policies and will only be used for legitimate purposes connected with administering, delivering and promoting the competition, subject to appropriate consent.

17. Acceptance of Terms

Submission of an entry confirms that the school has read and agrees to these Terms & Conditions and has obtained the necessary permissions and consents from the pupil's parent or guardian.