



Engage Teacher Conference

Primary free and accessible STEM resources showcase

Leading experts from the STEM sector are coming together to showcase their top free resources. Find inspiration for STEM enrichment that is easy to implement and supports you engage underrepresented audiences in science.

Elizabeth Chambers, The Royal Society
Catherine Davies, The British Science Association
Rebecca Olajide & Peter Jeffrey-Bourne, Science Museum Group
Karen Letten, The Woodland Trust
Paul Tyler, My Science Club

Welcome, please be aware:

- Talks are recorded
- You can ask questions in the chat throughout
- There will be time for questions at the end



Engage

Royal Society – STEM resources and Partnership Grants

Elizabeth Chambers
Schools Engagement
Officer

A circular inset image showing a close-up of a microscope's objective lens and stage. The text 'THE ROYAL SOCIETY' is overlaid in a red, serif font. The background of the slide features large, abstract, curved shapes in shades of yellow and orange.

THE
ROYAL
SOCIETY

@Kkolosov

Brian Cox

School Experiments

THE ROYAL SOCIETY

Does carbon dioxide affect the pH of seawater and the strength of shells?

Objective

In this practical, students are investigating the effect of carbon dioxide (CO_2) on the ocean. In the first experiment, they observe the effect of increasing the concentration of CO_2 on the acidity of seawater. In the second experiment, they are investigating the effect of acidity on the shells of sea creatures.

Introducing the experiment

Write the words ACID and ALKALI on the board and invite students to work in pairs to list as many facts and examples as they can related to acids and alkalis.

During the experiment

Discuss with the students the difference in ease and accuracy of using a pH meter compared with litmus solution. You may also decide to try UL paper or even litmus paper to demonstrate the effectiveness of certain indicators. Students are unlikely to see any changes with litmus paper.

This is an activity that easily lends itself to having students design their own experiment if time allows.

Discussion points after the experiment

Ask students to prepare an elevator pitch – give them one minute to explain what ocean acidification is and what the results of their experiment showed – Some students may want to prepare an elevator pitch on the limitations of the experiment.

BRIAN COX SCHOOL OCEAN ACIDIFICATION TEACHER NOTES

The science behind this experiment

The ocean absorbs some of the CO_2 we emit as a carbon cycle. CO_2 dissolves in sea water to form acid, which lowers the pH of the water making it more acidic.

As the amount of CO_2 in the atmosphere increases, it means that more CO_2 will dissolve in sea water making it more acidic.

The point of the lesson is to think about the rise in CO_2 levels due to human effects – ie more fossil fuel use. CO_2 in the environment leads to more CO_2 dissolving in water, ultimately making the sea more acidic.

Many of the plants and animals living in the oceans have skeletons or shells made out of calcium carbonate. So ocean acidity increases, their shells and skeletons may start to dissolve, affecting their ability to build and repair their shells. This could ultimately affect the survival of some species. Physiological processes within organisms, for example growth and reproduction, are also sensitive to changes in pH. Microscopic plankton at the bottom of the food chain, shellfish and molluscs, and plants that cement the coral reef together may all be affected, with wider implications for the marine food web, habitats, and the food security of many human populations.

Do all types of chocolate melt at the same temperature?

Lots of chocolate is stored on shelves in shops. If the shop is too warm will the chocolate melt? If you hold a piece of chocolate in your hand too long will it melt, but do all types of chocolate melt at the same temperature? Does the percentage of cocoa solids affect its melting point?

In this experiment, students heat different types of chocolate in a water bath, to see how long it takes them to melt. You could give them time to come up with a method for testing this themselves, perhaps in a previous class, or give them an exact method to follow.

Hot water for the water bath can be taken from a kettle or wall heater. Cold water should be added to achieve the target temperature of 50°C , and then taken to the classroom, in a suitable container, by staff. The container should be stood on an insulated mat in the classroom to minimise cooling during the lesson.

It is essential that you have sufficient hot water for each group readily available at the beginning of the activity. The hot water must be carefully dispensed by a supervising adult into the students' containers, which should be filled to a level so that the foil cases are touching the hot water.

Each group of students could have all the types of chocolate to investigate or you may choose for each group to have only one type of chocolate and compare between groups.

Health and safety considerations:

- The chocolate must not be eaten;
- students undertake activity on a tray in case of spillage and paper towels should be available;
- only staff are to handle suitably enclosed containers with warmed water;
- avoid splashes to skin, wipe off quickly or use cold running water if splashes occur; and
- have cold running water readily available in case of any incidents.

For up-to-date advice on health and safety, particularly in regard to heating and hot water, please refer to CLEAPSS (England, Wales or Northern Ireland) or SSERC (Scotland) guidelines.

Suggested sequence

45/60 minutes

- Lead a class discussion topic of changing temperatures
- Students should be given time to research for each chocolate type to liquid and record
- Each group attach a piece of the plastic tape to a single piece of chocolate to separate pieces of chocolate
- Place the tape on the chocolate into the water should be touched but not carried out to
- Students then take the water has been stirred gently careful not to
- Each group of chocolate must so it

Alternative At what time

This could be done as an experiment sufficient to demonstrate the same follows

- Attach the chocolate to the plastic tape
- Pour the water into the container
- The water should be heated to the target temperature
- Wipe off the chocolate
- Wipe off the chocolate

Teacher notes

ACTIVITY

Name Date

Do all types of chocolate melt at the same temperature?

Lots of chocolate is stored on shelves in shops. If the shop is too warm which chocolate will melt first?

If you hold a piece of chocolate in your hand too long it will melt, but do all types of chocolate melt at the same temperature? Does the percentage of cocoa solids affect its melting point?

Your task

Find out whether different types of chocolate melt at the same speed.

You will need:

- 3 deep foil pie cases (approx. 3cm deep);
- 3 large paper clips;
- 1 clear plastic take away food container or similar (approximately 20cm x 10cm);
- timer (showing seconds); and
- 3 lollipop sticks (to stir the chocolate).

Your teacher will bring you pieces of three different types of chocolate and hot water.



Student activity

Do all types of chocolate melt at the same temperature? | Primary

Primary level resources available

Strong links to the curriculum

Clear careers links (short videos)

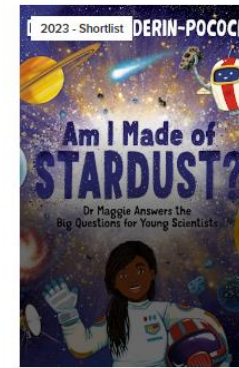
Free to download

Videos and printable resources at:

[www.royalsociety.org/
schoolexperiments](http://www.royalsociety.org/schoolexperiments)

Contact education@royalsociety.org

Young People's Book Prize 2024



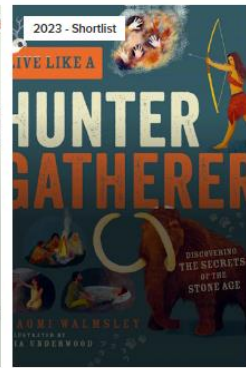
Am I made of Stardust?
Dr Maggie Aderin-Pocock
Chelen Eclja



Bodies, Brains and Bogies
Paul Ian Cross
Steve Brown



Ben Rothery's Deadly and Dangerous Animals
Ben Rothery



Live Like a Hunter Gatherer
Naomi Walmsley
Mia Underwood

Climate Change and Biodiversity Q&A cards / posters



Why Science is for me animation / poster



Other Royal Society resources for schools

What is the Partnership Grants scheme?

“The partnership part is really something that stands out. It is great for both sides...without the scheme you wouldn't necessarily think of setting up a project in partnership. You might go on visits, but you would not be engaging with a school as much as in a sustained project.” Partnership Grant STEM partner

The Partnership Grants scheme provides UK schools and colleges (aged 5 -18) up to £3,000 to work in partnership with STEM professionals from academia or industry to run a long-term investigative STEM project.

The grant goes to the school and covers the equipment needed, with a small amount supporting teacher cover and CPD if needed.

Information about the grants can be found on our website:

www.royalsociety.org/partnership



What are the benefits of the grant scheme?



- £3,000.
- Help smash stereotypes.
- Choose your project topic – including cross-curricular.
- Develop students working scientifically skills - by carrying out some or all of the enquiry types dependant on the project.
- Non-competitive grants - lots of support for schools.
- You can use your Partnership Grants project work towards students CREST awards if it fulfils criteria for both*.
- Opportunities to share your grant work wider – events in-person and online.

Engage

The British Science Association – CREST Awards

Catherine Davies
Education Resources Manager



CREST Star and SuperStar projects are typically completed by children aged 3-11, or those working at this level

Practical

Fun

Engaging

Inspiring

Student-led

Relatable



Why run CREST projects with your pupils?

- Activities are designed to be low-cost and easy to run
- Free to use and download from our resource library
- Can be completed in 45 minutes - 1 hour
- No need for specialist knowledge or equipment
- Relatable contexts
- Children are inspired to think and behave like real scientists!
- Certificates give children a sense of pride and achievement

"The lessons you get taught are just amazing. When we done the spinners, we learnt about leadership and stuff. Doing the rafts, we learnt about craftsmanship. It's really good."

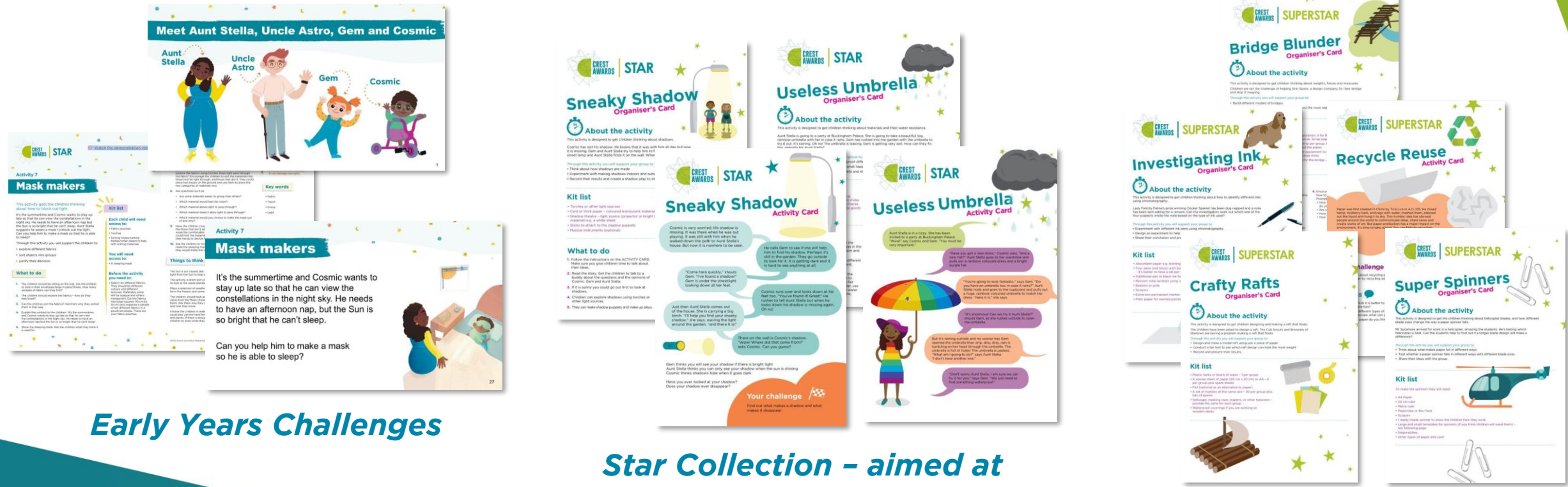
Participating pupil



"Because the activities are so varied and quite good fun, I think they have sort of had the impact of making everyone excited about STEM."

Participating teacher

Resources are free to use and download from our resource library
<https://primarylibrary.crestawards.org>



Early Years Challenges

Star Collection – aimed at
 children aged 5-7 / KS1

SuperStar Collection – aimed
 at children aged 7-11 / KS2



Engage Teacher Network

Your pupils can track their progress using a CREST Star or SuperStar passport...



...when they have completed 8 projects, they can earn a CREST Award!

Apply for an Engage Grant in September and receive funding and free CREST Awards for your class!

1
3

Engage

Science Museum Group

Rebecca Olajide

Learning Resources Producer

Peter Jeffrey-Bourne

Academy and Resources

Developer



**SCIENCE
MUSEUM
GROUP**

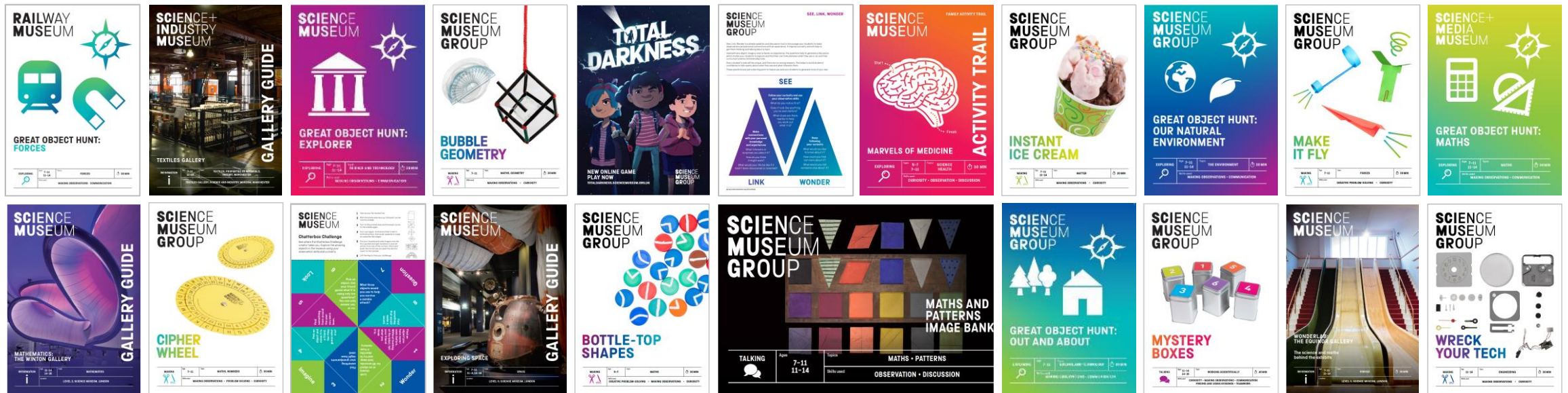
SCIENCE CAPITAL

- Engaging people with science is at the heart of the work we do at SMG.
- Science Capital is a concept that helps us to better understand why some people engage with science and why others think that science isn't for them.
- Science Capital is made up of...
 - What you know about science/STEM
 - What you do – different science related activities
 - Who you know who uses and talks about science
 - How you think and feel about science
- We don't want everyone to become scientists, but we want people to feel like science is something for them and something that they can do.
- Positive, meaningful experiences of science learning in early life will have a big impact in how children relate to science later in life.



SCIENCE MUSEUM GROUP RESOURCES...

- Are shaped by science capital and wider cultural and STEM engagement research-informed best practice and learning outcomes
- Enable people to use – and recognise using – a wide range of STEM skills (e.g. making observations, communication, curiosity, asking questions, creative problem solving, finding and using evidence, teamwork, etc.)
- Invite and encourage people to investigate further and find out more
- Are intuitive to use, with simple and clear instructions, and use easily sourced, recycled, reusable or sustainable materials



HANDS-ON ACTIVITIES

KEY FEATURES

Builds confidence and ownership
(in adults)

Builds confidence and ownership
(easy to follow images etc)

SCIENCE MUSEUM GROUP



ROCKET MICE


MAKING	Age 5-7	Topic FORCES	30 MIN
MAKING OBSERVATIONS • CURIOSITY			

Highlights and develop skills

Overview for adults

There's an old saying: what goes up must come down. This activity is a perfect chance to challenge that idea, shooting a rocket high into the air by rapidly squashing a plastic bottle launcher. You'll never get this rocket into space – but some real rockets do go fast enough to prove the saying wrong.

What's the science?



The bottle used as the rocket launcher is not really empty: there is air inside it. Air is elastic (squashy), and when you compress it, it pushes back and the pressure inside increases. In the activity, the sudden increase in air pressure inside the bottle pushes hard on the bottom of the rocket, sending it flying high into the air. There are also two other forces acting on the rocket: air resistance and gravity. Air resistance always pushes in the opposite direction to the rocket's movement, and its strength depends on the rocket's shape and its speed. Gravity always pulls downwards, slowing the rocket's climb but speeding up its descent.

Science in your world

Just as increasing the air pressure in the bottle sends the rocket flying, you use air pressure when you squeeze shampoo or ketchup from a plastic bottle. It's not usually as exciting as watching the rocket shoot into the air in the activity... unless you're having a food fight!

Did you know...?


In order to keep going straight upwards and never fall down again, a rocket must reach a speed called escape velocity, which is 11.2 kilometres per second.

Links to everyday examples of STEM

SCIENCE MUSEUM GROUP

Make your very own rocket mouse and launcher – see how high your mouse can fly!

You will need...




Think and talk about...

- What makes your rocket fly?
- What makes it come down again?
- How do you think a real rocket works?

Investigate...

- How could you make your rocket travel higher?
- How could you make your rocket go more slowly?
- Can you make your rocket spin as it falls?

Promotes science talk



- 1 Cut out a template along the dotted lines.
- 2 Roll it into a cone shape and secure it with tape – this is your rocket.
- 3 Decorate your rocket any way you like...
- 4 Now pop it on top of the bottle.
- 5 Hit the sides and launch your rocket into the air!

Science in your world

Just as increasing the air pressure in the bottle sends the rocket flying, you use air pressure when you squeeze shampoo or ketchup from a plastic bottle.

learning-resources.sciencemuseum.org

Everyday examples of STEM

GREAT OBJECT HUNTS: OVERVIEW



COVER PAGE

(Note: the downloadable version uses less colour for self printing)

Follow your curiosity and things that interest you to explore the fascinating world around you. Use your observation and questioning skills to get thinking and talking about the science in all of our lives. See how many challenges you can complete in 30 minutes.

Top tips for exploring...

- Find different objects for each challenge
- Look up, down and up close and see what you find
- Work together as a team and talk about your choices
- Write down or draw the different things that you find

TEAM NAME:	
NAMES OF TEAM MEMBERS:	
FINISHING TIME:	MEETING POINTS:

For more ideas and activities visit:
learning-resources.sciencemuseum.org.uk

INTRODUCTION PAGE

Find something...

<input type="checkbox"/>	you can make a noise with
<input type="checkbox"/>	that could fit in your pocket
<input type="checkbox"/>	that is alive
<input type="checkbox"/>	that is made from natural materials
<input type="checkbox"/>	that would keep you dry in the rain

TICK BOX CHALLENGES

Find something for each of the colours of the rainbow

Red	Orange	Yellow	Green	Blue	Indigo	Violet
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FEATURE CHALLENGES

Engage

The Woodland Trust

Karen Letten
Schools & Communities
Engagement Manager



WOODLAND
TRUST

woodlandtrust.org.uk/schools

SCHOOLS GO WILD



Discover free
resources to
inspire young
people about
woods and
trees

Karen Letten
Woodland Trust





woodlandtrust.org.uk/schools

Green Tree Schools Award



"The outdoor classroom
is the best; we get to
wear special clothes and
wellies and it doesn't
matter if we get dirty."

Dylan Parry (pupil),
Ysgol y Llŷs, Prestatyn

Free trees for schools & community groups

woodlandtrust.org.uk/schools

Welcome to **Tree Tools for Schools!** Here's everything you need to plan, plant and care for your free Woodland Trust tree pack.



Planning



Planting planner

Before you order, experiment by planting virtual tree packs on your land.



Order tree packs

Once you have your plan, order your **FREE** trees from the Woodland Trust.

Activities



Tree
identification



Trees and
wildlife



Working with
wood



Nature
crafts



Free assembly
download



Green Tree
Schools Award



Activity finder

Find an activity by curriculum link, keyword or topic.

Planting and tree care



Tree planting and care advice

Find out how to plant and look after your saplings.



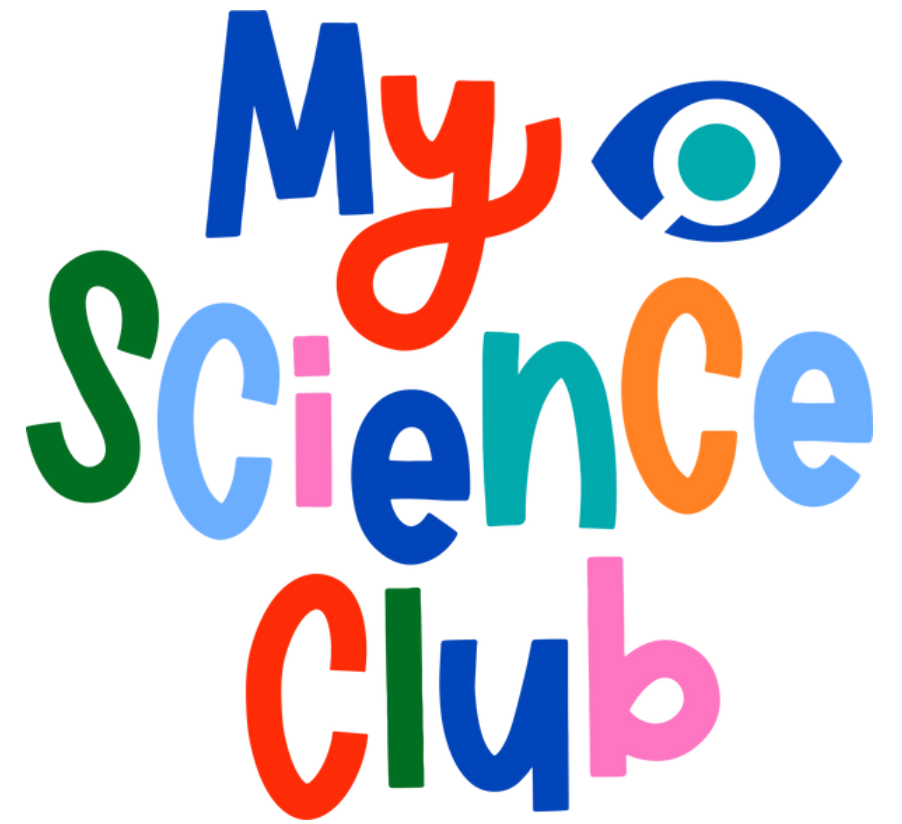
Watch me grow!

Fast forward through the seasons and help your trees flourish.

Engage

My Science Club

Paul Tyler
Founder



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**Running
My Science
Club**

**Topical
Science
Updates**

**Up Close
and
Personal**

**Sample
Sessions**

Blogs

News

**Limited
Resource
Challenges**



CAN YOU BALANCE THE WHITEBOARD ON A SHEET OF PAPER SO IT IS AT LEAST 10CM OFF THE DESK?



Mini whiteboard

A4 Paper

2 Paperclips



LIMITED RESOURCE CHALLENGES
created by
My Science Club

CAN YOU BALANCE THE WHITEBOARD ON A SHEET OF PAPER SO IT IS AT LEAST 10CM OFF THE DESK?

Focus:

Building strong structures
Resilience

Guidance:

- Children work in pairs.
- Let children struggle at the start and see how they cope with not being able to do it.
- After a few minutes drop some hints about strong shapes (cylinders, zig-zags).
- Suggest that they try and get the paper to stand up on an edge first - what shapes work for that?

Conclusions:

- Even weak materials can be strong in certain shapes and structures.
- Cylinders are very strong 3D shapes.
- Resilience is about how we deal with failure - there are 3 responses to failure - Give up, Try and try again, Borrow ideas from others.

Possible Solutions:

- If the paper is rolled into a cylinder, and paper clipped, it stands up and is strong enough to support the weight.



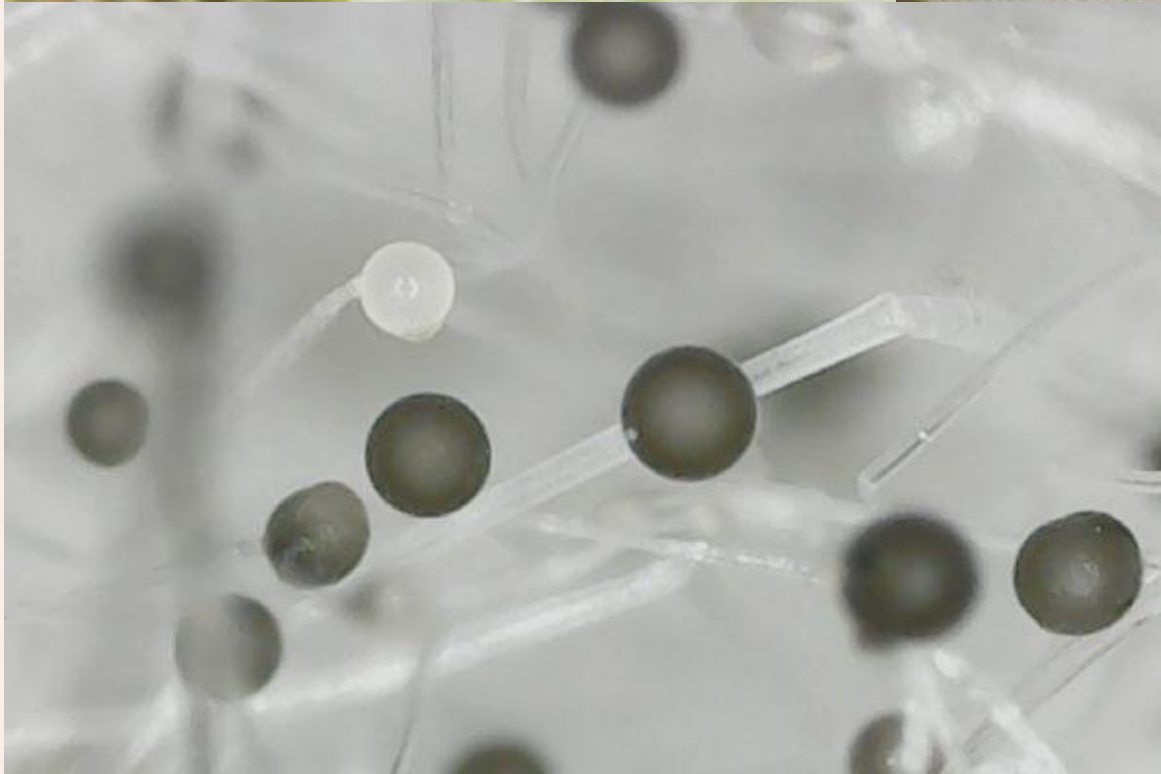
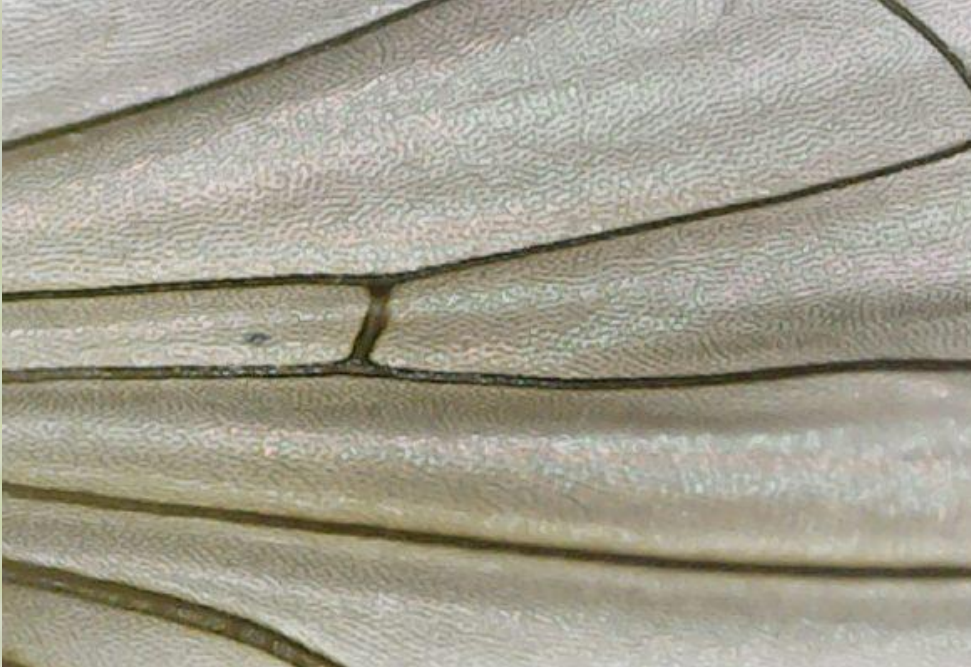
- The paper can be concertina folded, or folded into a triangular prism and it will work too.



LIMITED RESOURCE CHALLENGES

created by
My Science Club

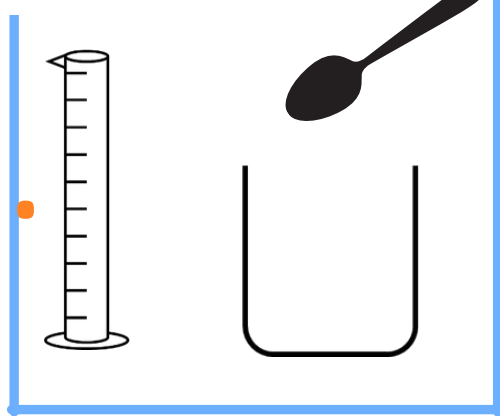






Activity 3 Evaporation

1



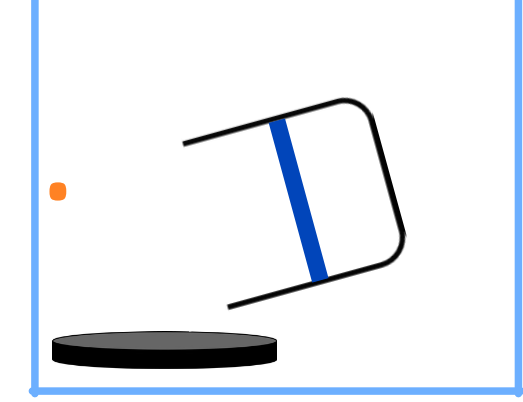
Mix a heaped teaspoon of salt with 50mls of warm water.

2



Mix vigorously with a fork for 30 seconds.

3



Pour 20mls of the salt solution into a petri dish.

4



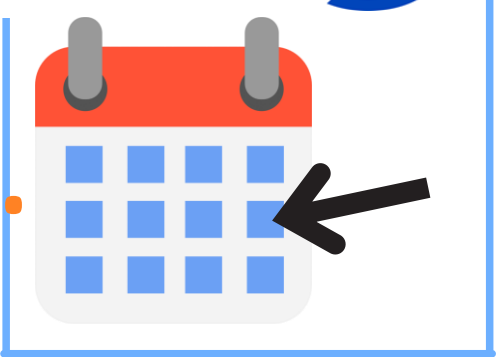
Put 20mls of tap water into another petri dish.

5



Place both petri dishes on a windowsill in direct sunlight.

6



Check back on the petri dishes in the next session to see what has happened.

Engage Teacher Conference

Thank you



The Royal Society:

education@royalsociety.org
www.royalsociety.org/partnership

My Science Club:

hello@myscienceclub.com
www.myscienceclub.com

CREST & Engage:

 crestawards.org/engage
 crest@britishscienceassociation.org

The Woodland Trust:

KarenLetten@woodlandtrust.org.uk

Science Museum Group:

SMGacademy@sciencemuseum.ac.uk
Learning Resources: sciencemuseumgroup.org.uk/resources
Academy courses: sciencemuseumgroup.org.uk/academy

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Managed by

