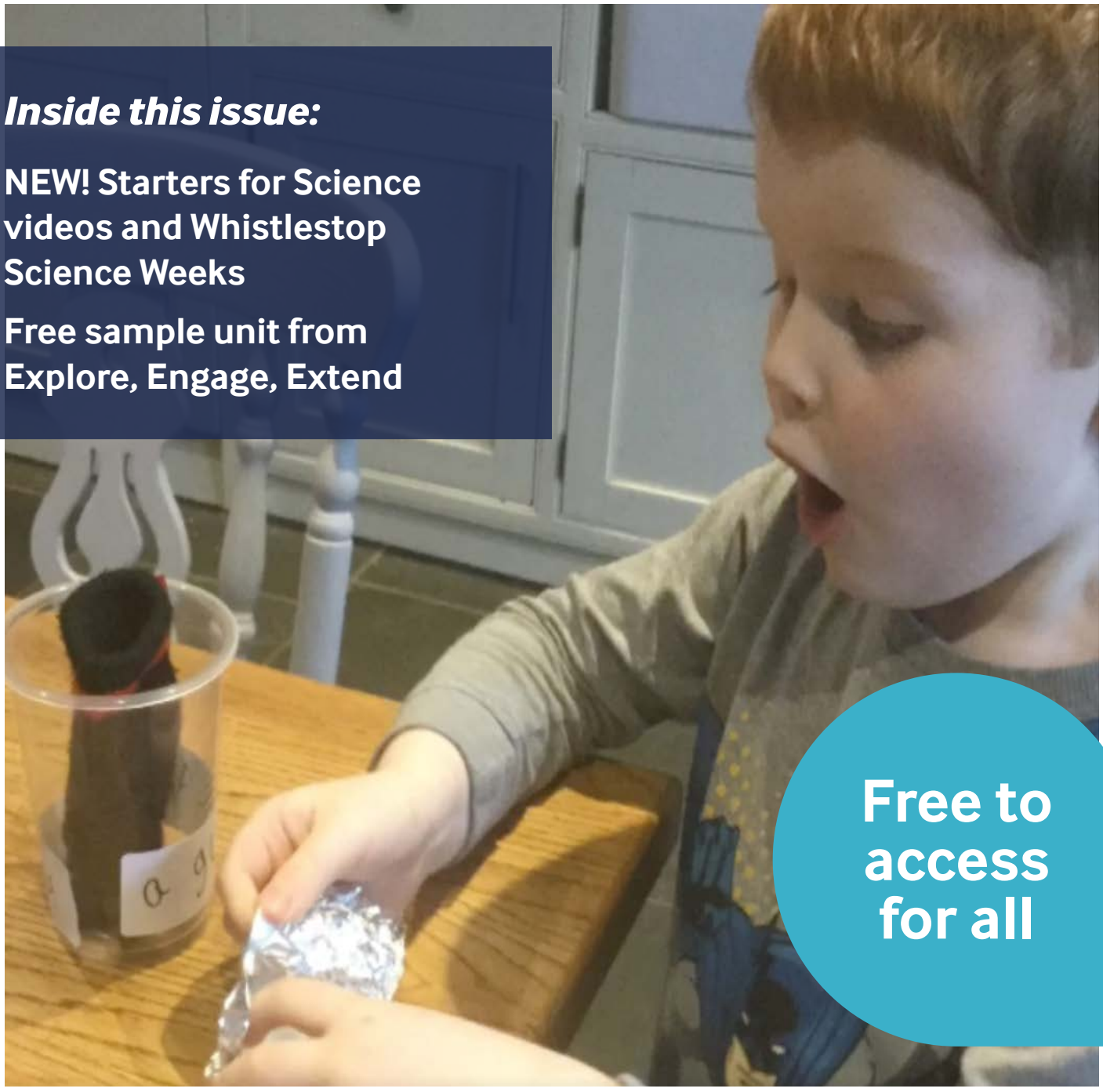
Why & How?

Spring 2021 *Issue 11*

The Primary Science Teaching Trust Newsletter

Supporting excellent teaching and learning in primary science



Inside this issue:

Free to access for all

CONTENTS

Click to jump to article

WELCOME

Welcome to the 11th issue of the Primary Science Teaching Trust's termly newsletter, Why and How?

We are now several weeks into this second period of school closures and we are extremely proud of all our PSTT College Fellows who continue to do outstanding work to share best practice and resources to support colleagues across their primary science networks. Evidence is clearly emerging to show that many primary children are being given home learning consisting mostly of maths and English, and with little or no science. At PSTT HQ we have responded with the creation of additional free resources, in particular to encourage practical science exploration at school and at home. **Starters for Science** is a series of 16 videos to support teachers to get started with practical science enquiry. Using minimal resources, these can be used either in school or at home. We are delighted to be offering Welsh language versions of these videos and the supporting guidance for teachers. Our newest resource, **Whistlestop Science Weeks**, offers a range of suggestions for giving science a 'lockdown boost' across the whole school with a themed mini science week. Find out more in our **Free Resources** section, where we also feature our regulars: **Picture for talk** and **From PSTT's own collection**.

Why & How? is the brand name of the Primary Science Teaching Trust
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Click to go back to contents

Many other organisations have also been busy producing a wealth of primary science materials to support teachers with school closures and home learning and we are really pleased to bring you details of some of these in the **Support from other organisations** section. Lots of these resources are ready to use and have been created to make it straightforward for teachers to share with children who are learning at home.

In **News** we are absolutely delighted to be able to congratulate PSTT Fellow and Regional Mentor Sarah Eames for not just one, but two, national awards: one from Enthuse and the other from the Royal Astronomical Society.

This issue features another of our **Common misconceptions** articles. PSTT Fellow Amanda Poole brings her wealth of classroom experience to this, giving ideas for addressing children's alternative ideas about sound. With an ever-increasing choice of resources to support **Climate Science** education, it can be difficult to find the best ones to use. In this section, three PSTT Fellows make recommendations about the resources they consider to be the most user friendly and effective.

PSTT Fellow Paul Tyler shares his expertise and enthusiasm for new and exciting ventures in primary science in two different articles in this issue. In **I bet you didn't know** he explains research into trophic cascades and the impact of declining numbers of predators on ecosystems. Paul also shares his new found passion: **Finding stardust**. He describes how tiny spherical particles from space reach Earth, and how children might find and identify them using magnets and microscopes. We are also delighted that in **A fully electric future!** PSTT Fellow Fran Long shares how the Faraday Institution's work and resources support primary science.

In our **Collaborator Update** we are very pleased to be sharing some of the outcomes of the **Exploring and Exemplifying Creativity** project led by Oxford Brookes University. Their video exemplars of PSTT Fellows teaching creatively and teaching for creativity are an inspiring and useful resource for teachers and teacher educators. We also draw your attention to Issue 20 of the ASE's **Journal of Emergent Science** which brings you a selection of research reviews and research guidance as well as original research, all of which have relevance for primary science practitioners.

Key Dates to note include the Great Science Share for Schools, and if you are not already signed up to take part, or you want to know more, please do visit their website. The nomination process for next year's Primary Science Teacher Awards is now open.

Our newsletter is for anyone who has an interest in primary science, offering practical support, news and updates about PSTT and our projects and research. We value feedback from our readers so please do continue to keep us posted about what you find most useful and interesting in our newsletter, and please do keep sharing it with anyone else who would like to receive free resources, classroom support, news and PSTT updates.

Prof. Dudley Shallcross
CEO

Ali Eley
Outreach Director

Dr. Sophie Franklin
Research Director

Sue Martin
Programme Director

Peter Sainsbury
Cluster Director

NEWS

Awards successes for Sarah Eames

We send warm congratulations to PSTT Fellow and Regional Mentor Sarah Eames, and her colleagues at Sandfield Close Primary School in Leicester, who received the **BP award** for outstanding contribution to developing science capital and social mobility in the recent **STEM Learning ENTHUSE Celebration Awards**. The award recognises their work in engaging both pupils and families in science/STEM activities, creating a real buzz for the subjects, and continuing this throughout 2020 with video lessons and activities set for home learning.

Sarah's passion for science education is evident to all who meet her and we are delighted that she has recently also been recognised by the **Royal Astronomical Society's Patrick Moore Medal for Education** in their awards presentation, January 2021. We would like to share their 'short' citation, which clearly sums up why Sarah's award is so well-deserved:

"Sarah Eames is an acclaimed primary science lead, and her achievements in astronomy education have positively impacted her school community and influenced teaching practices nationally.

She shares her brilliant ideas and practices widely and through many organisations, not only inspiring her students with a range of amazing opportunities but also supporting many teachers.

Her passion for all things space is an inspiration to pupils, colleagues and all those who have the pleasure of working with her. For these reasons Sarah Eames is awarded the RAS Patrick Moore Medal, 2020."

We encourage you to read Sarah's full citation **here.**

New PSTT resources

PSTT has launched two new resources to support practical science enquiry and whole school engagement with science. See pages **12** and **13** for details of Whistlestop Science Weeks and Starters for Science. Both resources are suitable for home learning.

STARTERS FOR SCIENCE

WHISTLESTOP SCIENCE WEEKS

COMMON MISCONCEPTIONS

Sound

Amanda Poole

Amanda Poole, PSTT Fellow, tells us how she addresses children's misconceptions about sound.

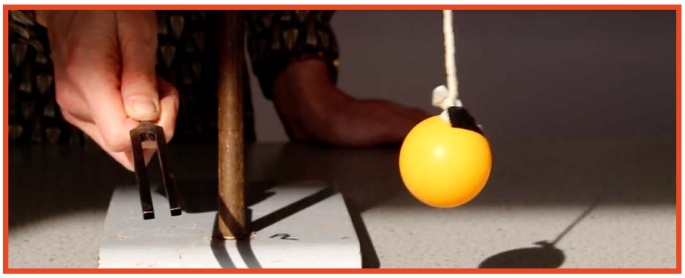
What children need to know:

- Our ears detect sounds so that we can hear.
- Loud sounds can damage our ears.
- Some materials are effective at muffling sounds.
- Sounds are made when something vibrates.
- Vibrations from sounds need a medium (solid, liquid or gas) to travel through to reach our ears.
- There is a link between the features of an object and the pitch of sounds that it produces.
- There is a link between the strength of the vibrations and the volume of the sound that is produced.
- Sounds get fainter as the distance from the sound source increases.

Common misconceptions:

1. Children do not always recognise that vibrations are the cause of a sound being produced.
2. Children may think volume and pitch of a sound are the same thing or mix them up.
3. Children may think that sound only travels through air, not solids or liquids.
4. Children may think sound is slowed down by physical obstructions.
5. Children may think that sound gets quieter as it travels further because it has 'faded out' or run out of 'energy'.

WHAT IS SOUND?



It can take some time for children to develop the idea that all sounds are caused by vibrations and they may hold ideas that sound is produced by an object because of its physical features, such as the tightness of a string or drum skin (Driver et al, 1994; Asoko, Leach and Scott, 1991). This is likely to be because of the abstract nature of the idea of vibrations, as they are NOT readily observed. Providing opportunities for children to observe the vibrations that are causing sounds can be effective in developing their understanding, through demonstrations such as rice on the surface of a drum, a tuning fork held so it just touches the surface of water or with a ping pong ball suspended by a string. The **Ogden Trust Phizzi Practical: Seeing Vibrations** describes how these demonstrations can make vibrations observable. I find that a large demonstration tuning fork is really effective for demonstrating how tuning forks produce sounds, as well as encouraging children's curiosity about hearing range.

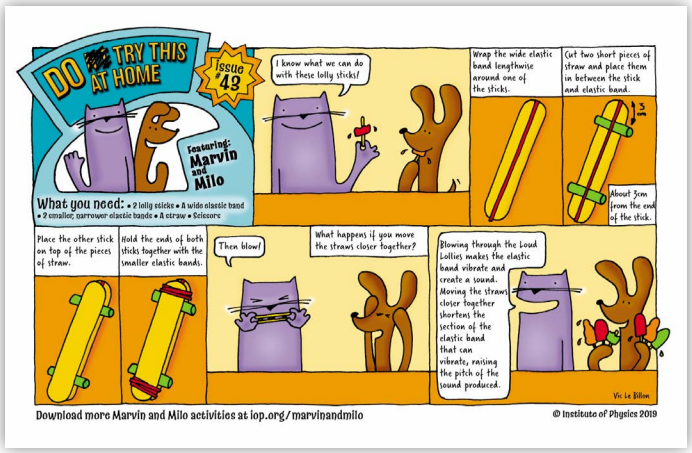
Enquiry-based learning provides valuable opportunities to notice children's misconceptions and to address these. A good place to start with sound is by investigating musical instruments. Musical instruments are a fantastic resource for exploring how sounds are created and how they can be changed. Children can make and record their observations of materials from which the instruments are made; how they can produce

louder and quieter sounds; and explore higher and lower-pitched sounds. A resource that I have found helpful is The Royal Society's **Brian Cox School Experiments,** which suggests other ways to explore sounds with home made instruments and interesting ways to relate learning to real world experiences.

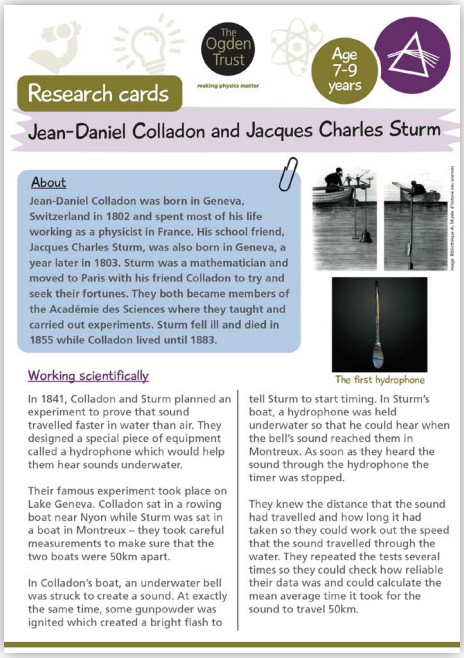
Even when children get the idea that sounds are caused by vibrations, there are still contexts where they will struggle to identify what is vibrating, such as air in a brass instrument, or two stones being hit together. It is really useful to provide opportunities for children to generalise their findings when investigating sound and apply their ideas about how sounds are created to a range of diverse real-life situations.

COMPARING SOUNDS

Once children understand that sounds are created by vibrations, they are ready to compare sounds. A pattern-seeking enquiry that explores the relationship between the size of a musical instrument and the sound it makes can build on prior learning and help develop an understanding of pitch. It is then valuable for children to plan and carry out their own investigations into pitch, such as filling bottles with different amounts of water and blowing across the top or tapping the side. There are some wonderful free measuring apps that can be used to collect data to compare sounds, such as Google Science Journal. This can be used to measure the volume of sounds in decibels or the pitch in hertz (where 1 hertz means one vibration per second). I find these really helpful for developing children's working scientifically skills while they answer their own scientific questions through data collection, recording and analysis.



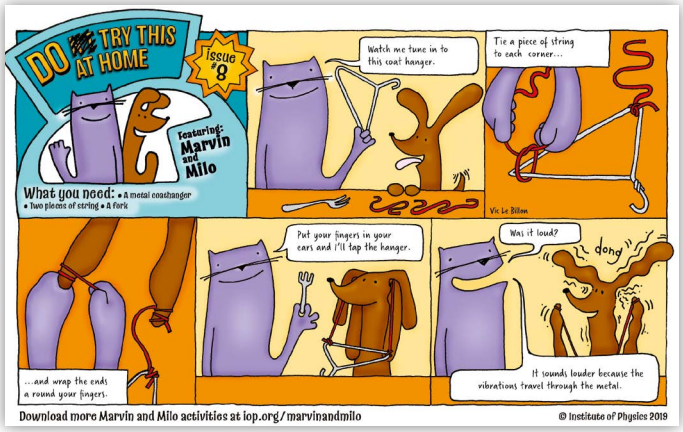
The institute of Physics' Marvin and Milo resources also has a series of cards with simple practical activities that are effective for addressing children's misconceptions. **Loud Lollies** is a fantastic activity for children to compare sounds by changing variables. Changing the force with which they blow through the 'Loud Lollies' varies the volume of the sound made, whilst moving the straws closer together shortens the length of elastic band that can vibrate and changes the pitch of the sound. Children can make their own Loud Lolly and use it to make measurements and to collect data in the classroom; then they can take it home to share their learning with their family. Using the slo-mo video function of cameras on tablets/phones to make close-up observations of phenomena such as the Loud Lollies is another way of using technology to enhance children's understanding and curiosity.



The more time that children can have to use scientific vocabulary to describe and compare sounds, the more likely that language will be secured, so developing further opportunities for enquiry that draws upon these ideas is important. Children could use secondary sources to research the hearing ranges of different animals and use graphs to compare with the hearing ranges of humans. Additionally, children could research how scientific ideas have changed over time using the Ogden Trust research cards as secondary sources of information: **Research Cards: Helping us hear** explores the history of hearing devices and **Research Cards: Sound** explores how various scientists worked scientifically to develop new ideas about sound.

SOUNDS AND MATERIALS

Research suggests that it is common for students to think of sound as a material substance that moves from one place to another (Barman, Barman and Miller, 1996) and many children develop the misconception that sound travels through air but not liquids or solids. Identifying and classifying materials that sound can travel through helps children develop their understanding that sounds need a material through which to travel. As well as the 'string telephone', the Institute of Physics' Marvin and Milo activity, Musical Coat Hanger, can be easily adapted for children to investigate the materials that sound can travel through. Replacing the two pieces of string with other materials such as foil, wire, wool, thread, paper or plastic provides an effective simple test to classify materials. In addition, the Ogden Trust's Phizzi Practical: Make a hydrophone provides an interesting way for children to observe that sounds also travel through liquids.



A simple way of demonstrating that the only occasion when sounds cannot travel is in a vacuum is to use a good quality vacuum food container. If you place a sponge at the bottom of the food container and then place a mobile phone playing music (or similar) on top of this, then place the lid on top and pump out all the air, children will observe that the more air is pumped out, the quieter the sound becomes, and when all the air has been removed, the music can no longer be heard. When the valve is opened and the air is allowed back into the container, the music can be heard again.

Children develop their thinking further by investigating the ability of different materials to muffle sound. This can be achieved by wrapping a sound-making object, such as an alarm clock, in different materials and using a sound sensing app such as Decibel X, or a data logger, to measure the volume of the alarm clock outside each of the materials.

TRAVELLING SOUNDS

Research shows that children often think sound becomes become quieter as they travel further from the source because it 'faded and died out' or 'ran out of energy'; very few give the correct explanation, which is that sound spreads out. Children should investigate this property of sound themselves and this is an ideal opportunity to take learning outdoors where children can use data loggers or sound sensors to measure the volume of a musical instrument at various distances away, measured with a tape measure. By having one source of sound, and children measuring its volume in different directions from the source, children will observe that the sound is travelling out in all directions, spreading out over a larger and larger area.

REFERENCES

Asoko, H. M., Leach, J. and Scott, P. H. (1991).

Barman, C. R., Barman, N. S. and Miller, J. A. (1996).

Driver, R., et al. (1994).

Whittaker, A. (2012).

Don't forget our previous 'Common Misconceptions' articles are still available. Click links below:

Autumn 2017 - Light

Spring 2018 - Electricity

Summer 2018 - Evolution

Spring 2019 - Levers, gears and pulleys

Summer 2019 - Changing materials

Amanda Poole is the Resource Development Lead for **the Ogden Trust;** she is also a teacher at Radford Primary Academy and an independent science education consultant.

CLIMATE SCIENCE

Recommended classroom resources

As young people increasingly engage with the issues the planet is facing due to changing climate, more and more supporting resources for schools are appearing and it can be difficult and time consuming to find the most appropriate ones to use. In this issue, PSTT Regional Mentor Ruth Shallcross asks three PSTT Fellows for their top recommendations for resources that support climate science education.

Angharad Pass
Tranmere Park Primary School, Leeds

I think the Changing Climates resources from **ThoughtBox** are really great. They take into consideration children's eco-anxiety and try to harness it to empower the children. These resources are part of the free suite of lessons that ThoughtBox provides for young people aged 5-18, and include differentiated lesson plans, schemes of work, teacher guides and parent guides for each key stage. They have everything you need to be able to start this discussion with your pupils.

For each age group, the materials share stories and videos, feature key information about climate change, and develop children's critical thinking and questioning skills. They are organised in four areas: Immerse; Understand; Perspectives; and Empowerment. Each area builds on the children's understanding of climate change and equips them with practical tools to enable them to be part of the movement of change. The scheme considers their feeling and emotions, how they can support each other and build resilience, and with the exploration of new and innovative solutions and inventions that are helping to tackle the problem, it also brings hope.

There are many cross-curricular links to the UK national curricula and strong links to PSHE and to Spiritual, Moral, Social and Cultural (SMSC) teaching and learning.

In the Climate Science section of previous issues of our newsletter, we have offered background knowledge, practical ideas and resources to support children to make informed decisions about looking after the planet, and guidance about helping children to manage eco-anxiety. Click here to access these articles.

Vanessa Seehra
Highlands Primary School, London

Practical ACTION

The **Practical Action** Challenges are one of my favourite resources to use when teaching Climate Science. They support children to explore a range of real-life scenarios around the world and to think about how science can help to develop suitable ways forward. Many of the STEM challenges bring to life the impact that climate change is having within a strong global context and open up the opportunities for great discussions and collaborative work within the classroom. They are a fantastic vehicle for developing children's empathy alongside learning science, something which I feel is vital when exploring this topic. Many of the challenges explicitly link to the UN Sustainable Development Goals, providing further opportunities for children to think about sustainable changes that can be made within school and home.

Nicola Connor
RAISE Primary Science Development Officer, West Lothian

I recommend the weather and climate resources on the **Royal Society of Chemistry Education website.** There are lots of examples of experiments and lesson plans that can help to teach the weather/climate and support children's scientific understanding. There are workshops for primary teachers, providing professional learning and giving ideas for practical experiments for using in their classrooms, e.g. exploring ideas about carbon dioxide. The resources also include webs of science ideas and demonstration videos that can be used to support teachers to carry out the practical experiments in their classroom. The United Nations Climate Change Conference for 2021 (COP26) is being hosted in Glasgow in November. Dr Stephen Hendry, from the Royal Society of Chemistry, has put together a COP26 workshop and there will be further new climate and sustainability focused primary resources made available in the run up to this event, so keep an eye out for these.

Ruth Shallcross works full time for the Primary Science Teaching Trust as Regional Mentor for London and the South East. She is currently leading the development of PSTT's Climate Science Project 'Educating for a Future'

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FREE RESOURCES

Pictures for talk in primary science

A picture can be a very good stimulus for children to engage in effective talk in science. Using pictures is an inclusive approach which facilitates high levels of participation. Pictures can also be used as a starting point for inquiry. The discussions the children have will generate questions that they want to investigate.

Asking the children carefully chosen questions about the picture will support them with learning to:

- construct explanations and link their ideas with evidence
- make confident challenges to the ideas of others
- explore scientific terminology and use it with genuine understanding

Pictures for talk in science activities are designed to be very open ended and usable with any age of children. The activities can be done as a quick ten minute starter, or extended into a longer and more in-depth lesson.

WHAT TO DO

Download the image overleaf by following the **link** and either display on a whiteboard or give children printed copies.

Ask the children to work in groups of three to discuss the following questions:

WHAT DO YOU THINK HAS HAPPENED TO THIS BUBBLE?

WHY DO YOU THINK THIS?

WHAT DO YOU THINK MIGHT HAPPEN TO THE BUBBLE OVER TIME?

WHY DO YOU THINK THIS?

OTHER QUESTIONS TO GENERATE AND PROMOTE THINKING AND EXPLAINING

Where are the crystals forming?

What do you notice about the crystals on the surface of the bubble (e.g. are they all the same shape or size)?

What do you see happening at the base of the bubble?

What do you notice about the top of the bubble?

Looking carefully at the whole image, can you find examples of three different states of matter/can you find examples of solids, liquids and gases?

When do you think this photograph was taken?

FOLLOW UP QUESTIONS THAT YOU MIGHT CONSIDER INVESTIGATING:

Are bubbles always spherical?

Does this depend on the shape of the device used to form them?

Does the colour of water used to create the bubble mix change the colour of the bubbles produced?

CLICK TO DOWNLOAD IMAGE

FREE RESOURCES

Whistlestop Science Weeks

WHISTLESTOP SCIENCE WEEKS

Ready-to-go mini science events to liven up lockdown

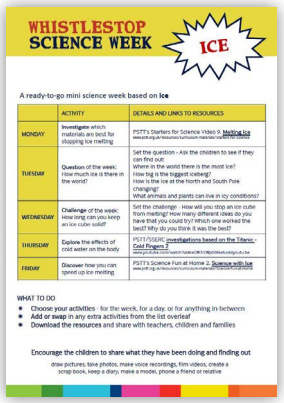
Whistlestop Science Weeks are:

- **ready-made themed daily suggestions** for short science activities, questions and challenges that children can do at home or in school
- **completely adaptable** - schools can choose to:

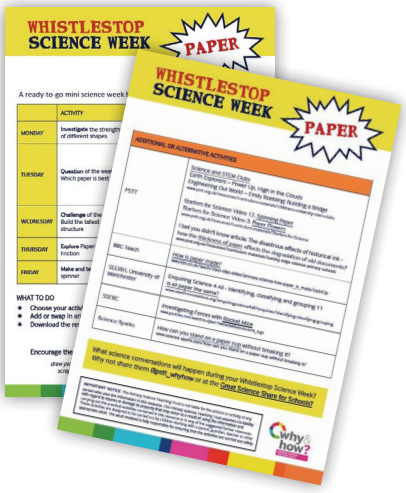
  do a whole week or just a day

  switch the days around

  add or swap in some of the additional activities
- **science conversation starters** for children, their parents, carers and families



WHISTLETOP SCIENCE WEEK THEMES - CHOOSE FROM:	
PAPER	COLOUR
ICE	SPORT
MUSIC	OCEANS
TIME	SPACE



Click here to download the two page theme sheets.

What science conversations will happen during your Whistlestop Science Week?

Why not share them **@pstt_whyhow** or at the **Great Science Share for Schools?**

FREE RESOURCES

Starters for Science

STARTERS FOR SCIENCE

- Short videos to get started with practical science enquiry
- Can be used in school or at home
- Minimal resources needed

Starters for Science is a series of five-minute videos to support teachers to get started with practical science enquiry.

They require minimal resources and can be used in school or at home. This means that teachers can do science enquiry with a class and any children who are at home can do the same lesson.

Each video is presented by a PSTT Fellow and includes:

- A question or scenario related to the real world
- Time for children to think about what they already know
- A demonstration of a starter practical activity
- Time for children to think of their own questions
- Ideas about what they could find out for themselves
- Encouragement to share what they found with others

The videos are intended to give children valuable practical experiences that they will then be able to draw on once they meet the relevant concepts in a more formal learning situation. As such, they are not age specific, nor directly aligned to any particular curriculum unit.

WHY NOT TRY INVESTIGATING ...

Making music with Hannah Osueke

Paper Friction with Jenny Lister

Pendulum Timers with Alex Farrer

Mirrors and Light with Rufus Cooper

Straw Planes with Tom Jones

Paper Flowers with Vanessa Seehra

There are 16 videos in total, all available to watch **here**. An overview of the video content and resources needed, and some supporting notes for teachers (including some of the science behind the video starters) are also available to download. Both these documents, and the videos themselves are also available in Welsh language versions.

For further information, please visit **www.pstt.org.uk/resources/curriculum-materials/Starters-for-Science**

Starters for Science was created by Kate Redhead and Ali Eley

Kate Redhead
Regional Mentor

Ali Eley
Outreach Director

Grateful thanks to all the PSTT Fellows involved in the making of this resource.

Particular thanks go to Alex Farrer for her expertise and support, and to Haf Hayes for her work on the Welsh versions.

FREE RESOURCES

from PSTT's own collection

Try a free unit from Explore, Engage, Extend: an ideal resource to support teachers with recovery planning in science once children return to school. Written by PSTT Fellow Tracy Tyrrell, Explore, Engage, Extend enables teachers to elicit children's knowledge and understanding in science and use this to inform the planning of appropriate new learning experiences.

WHAT TEACHERS SAY ABOUT EXPLORE, ENGAGE, EXTEND:

"The children are more engaged and motivated and make good progress."

"Explore, engage, extend is excellent assessment for learning."

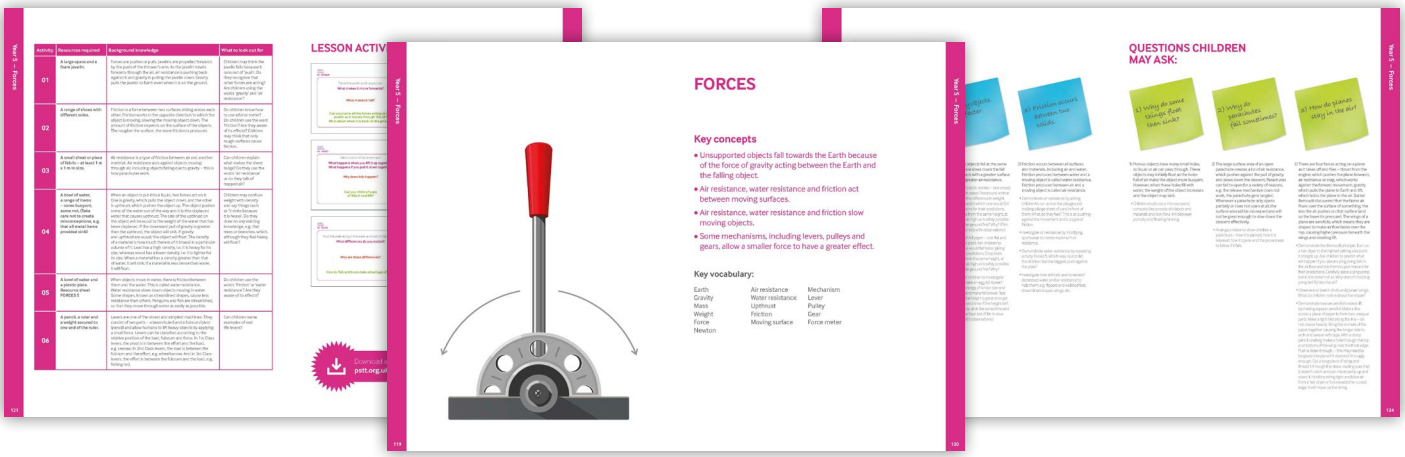
"Science in my classroom is now much more child-led."

Explore, Engage, Extend includes twenty sets of highly engaging practical activities to support teachers with assessment for learning in science. The activities generate rich assessment data, enabling the teacher to plan the topic in response to the children's specific needs. The topics presented cover the topics in the upper primary age range based on the English National Curriculum, but they are transferable across year groups, and can be easily adapted for the particular curriculum being followed by the school. The activities are intended to be used at the start of a topic, but are equally valuable for providing a practical approach to learning at any stage of a topic. For further information please visit **www.pstt.org.uk/resources/resources-available-through-tts/explore-engage-extend.**

Another free sample unit based on Sound is already available on the PSTT website – **click here** to access this.

Here we bring you a free unit based on Forces

Click here to download the free Forces unit.



FREE RESOURCES

Support from other organisations

Our Summer 2020 issue of this newsletter featured primary science support for school closures and home learning that was being offered by a range of other organisations. Here we bring you an update on this support with many new resources and ideas.

THE WELLCOME TRUST - EXPLORIFY

Explorify at home is a special series of science activities for primary school children who are now learning at home.

Teachers can sign-post parents & carers to these 10 fun and easy-to-do curriculum-linked activity collections. Each collection covers a different science topic and has specially selected Explorify activities, as well as simple hands-on activities using things around your home. Everything can be found **here**.

The activities are arranged by age and curriculum topics in Explorify, however these collections are also suitable to do all together as a family of mixed aged children. Or if your little scientist just wants to explore further, pick something from the other age sections for inspiration! The collections are: Properties of Materials, Plants, Classification, Forces, Habitats, Materials and their uses, Human Body, Sound, Fossils & Evolution, Seasons, Light & Space, and link to the BBC's Bitesize Daily science content (ready to watch every Wednesday).

#ScienceFromHome: Don't forget to look out for our simple daily activities on **Twitter** and **Facebook** that children can do from home.

THE ROYAL SOCIETY

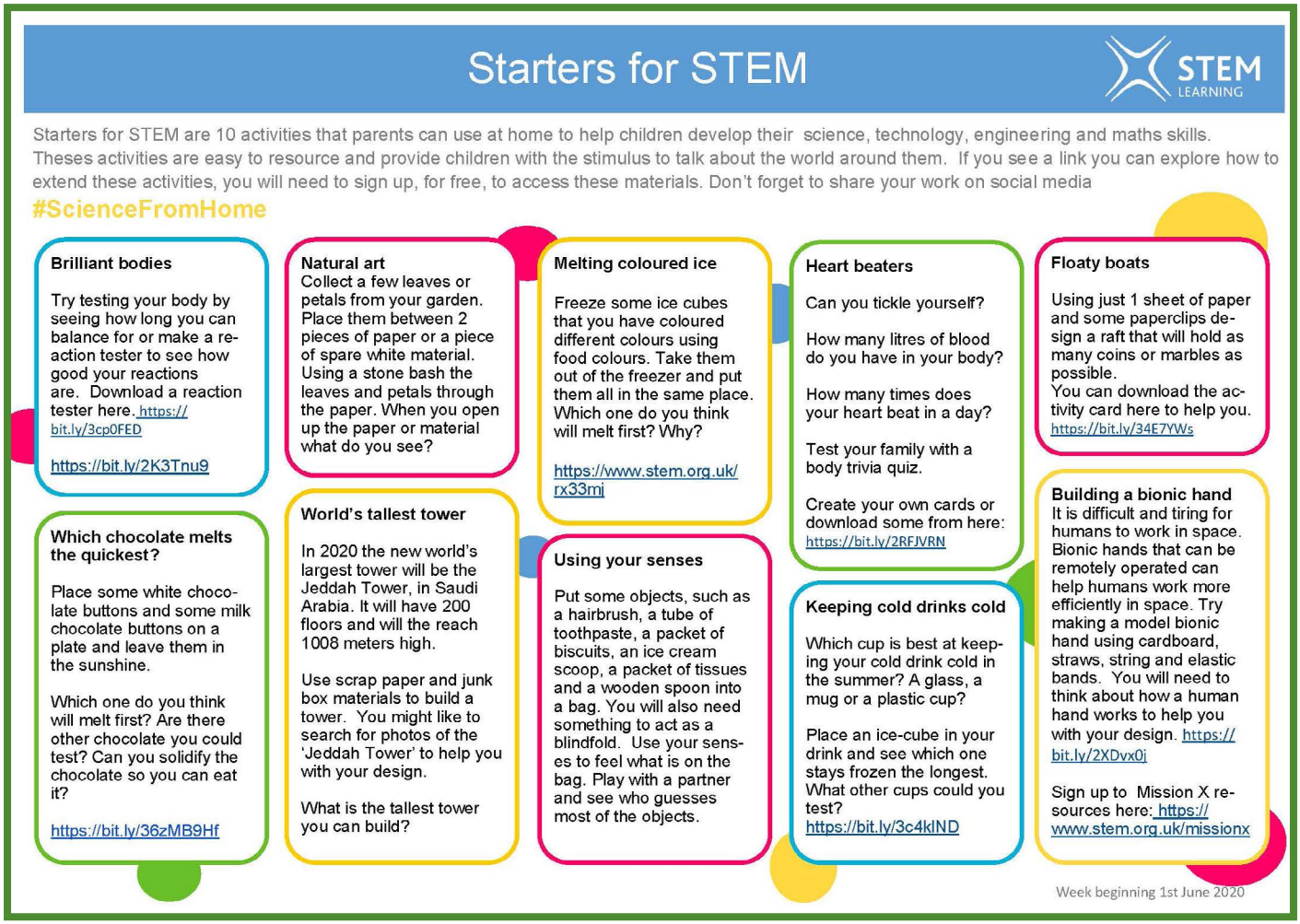
At The Royal Society, we have resources for primary and secondary students as well as an extended resources section which is geared towards those students who are passionate about science and want to explore more themselves. You will also find links on here to other widely-available resources. **Click here for our newsletter.**

STEM LEARNING

STEM Learning's online support includes a home learning section which is designed to help families continue educating young people while they are at home – including free, engaging, curriculum-linked resources: https://www.stem.org.uk/home-learning

The 'Starters for STEM' resources are particularly useful if you're looking for something quick and easy to share with parents: **https://www.stem.org.uk/resources/elibrary/resource/468235/starters-stem**
STEM Learning's teaching and professional development support for teachers includes information on our bursary funded residential CPD (which is currently being held remotely), live remote and online courses, career pathways and support in narrowing the attainment gap**: www.stem.org.uk/teacher-support#cpd-**

Launched this week, STEM Community is a safe, professional space to collaborate with fellow primary teachers to find and explore ways to improve the quality of your teaching. It's free to join and quick and easy to sign up: **www.community.stem.org.uk/**



STEM LEARNING

ROYAL SOCIETY OF CHEMISTRY

You can now find all the primary science resources from the Royal Society of Chemistry in one place: our new Steps into Science website.

At the RSC we believe that engaging young learners with scientific concepts at an early stage in their education can help spark a lifelong enthusiasm for science, and that by inspiring young minds, we can help ensure that STEM higher education and careers opportunities are available to everyone.

Designed to help primary teachers simplify science and bust misconceptions, Steps into Science can help build your confidence in teaching science with high-quality resources, curated, primary-specific information and ideas for making science engaging and accessible – whether you're in the classroom or teaching online.
Steps into Science launches at the end of February, and will help you:

- Link your science teaching to numeracy and literacy
- Engage your young learners with fun, simple investigations
- Inspire a future generation of scientists with ideas for careers in science
- Open up science to all your students with inclusive, versatile resources

Visit our existing primary web page to browse all our primary resources ahead of the new website launch.

edu.rsc.org/resources/primary

ROYAL SOCIETY OF CHEMISTRY

INSTITUTE OF PHYSICS

Explore free resources from the Institute of Physics with our Do Try this at home hub:

- KS2 science resources designed for home learning
- 14 simple experiments with videos, step-by-step instructions and explanations
- Winter Activity Pack with challenges, fact files and literacy-building features

At the Institute of Physics, we work with schools to support teachers and develop the teaching of physics. Last year when teaching moved into people's homes for the first time, we created Do Try This at Home to help parents and carers.

This series of fun science experiments was created by our team of expert science communicators, based around the UK and Ireland and filmed in their kitchens and living rooms. Do Try This at Home uses basic household materials to demonstrate physics in an easy-to-replicate way. The experiments are great for the classroom or for home learning and can be enjoyed individually or as a whole set. Each experiment has been produced in multiple formats to be as accessible as possible: watch the videos, read the online instructions, download a printable text version, or do all three! Also available to download is our new Winter Activity Pack, designed to support a recovery curriculum. This pack is filled with activities and challenges for the whole family to do together along with interesting articles and word puzzles to build children's literacy and grow their vocabulary.

Do Try This at Home has been created as part of IOP's Limit Less campaign, which aims to support young people to change the world and fulfil their potential by doing physics. To find out more about our Limit Less campaign and how teachers can be a part of it, **visit www.iop.org/LimitLess**

For the full collection of Do Try This at Home activities, along with resources from our friends visit **www.iop.org/athome**. We want to make it easy for parents and carers to get their children excited about learning – so please do try these at home!

IOP Institute of Physics

THE ODGEN TRUST

The Ogden Trust provides support for the teaching and learning of physics topics in primary science (forces and motion, light and sound, earth and space, and electricity).

Our **resources page** has a range of activities for all ages from 3-11, many of which can be carried out with simple things around the house. You can filter the resources by age group and topic to find what you are looking for. We have also put together a list of **great home learning resources** by others, broken down by key stage.

THE FARADAY INSTITUTION

The Faraday Institution has researchers across the UK aiming to design new pioneering batteries to improve electric vehicles, mobile phones and other applications as we strive for a more sustainable future.

Why not learn more about going fully electric. For schools still open for key worker children, check out the Faraday 'Fully Charged Battery Box'. For home science try 'Crunchie Bar Batteries' – videos of fun experiments which come with easy to follow instructions. For further information contact Fran Long, PSTT Fellow **fran.long@faraday.ac.uk.**

See also the article on **page 25** for further information about the work of the Faraday Institution and how they can support primary science.

SSERC

SSERC continues to provide support through the Early Years and Primary Home Learning section on their website sserc.org.uk.

You can access helpful videos and SSERC bulletins as well as updates and advice. New videos will be uploaded regularly, with a range of practical ideas to support STEM learning, using easy to obtain materials.

Don't miss the **series of short videos** to illustrate practical science activities based on the story of the Titanic. Created by the SSERC primary team, the videos offer a step by step guide to carrying out scientific enquiries in the context of one of the most famous ships in the world.

ROYAL SOCIETY OF BIOLOGY

At the RSB we have responded to the Covid-19 pandemic by creating new education website pages to provide advice and support to teachers, parents and students. These web pages offer advice for students age 5-19. Alongside the web pages are links to resources and details of how to access our online **Gopher Science Lab.**

THE INSTITUTION OF ENGINEERING AND TECHNOLOGY

The Institution of Engineering and Technology (IET) has a whole range of free home learning teaching resources and activities for 4-11 year olds including lesson plans, handouts and videos.

We've also got activities just for students who want to carry out fun, STEM experiments with everyday objects as part of a piece of schoolwork or to explore in their own time. From designing a shadow puppet show to creating a treasure hunt, why not browse all our **downloadable primary activities** to see which will work best for you?

This season we have also extended our **Faraday Challenge Day programme** to bring you a Virtual Faraday Challenge open to anyone aged 7-15 years to do at home, school, individually or as a family. Based on a real-world problem to assist Network Rail, students will help to sustainably manage the increasing numbers of passengers using their network and minimise their impact on the environment. This challenge brings STEM subjects together in an engaging way and encourages the development of young people's problem solving and communication skills.

IET The Institution of Engineering and Technology

SCIENCE OXFORD

At Science Oxford we continue to update our Science Oxford Resources page with new content to support primary science learning both at home and at school.

These include activities to stimulate thinking through discussion such as **'Think the Link'** and 'Odd One Out' as well as challenge activities such as the **'Guess What?'** game and 'Creature Creations'. All our resources are founded on our evidence-based 'Thinking, Doing, Talking Science' (TDTS) ethos that we developed with Oxford Brookes University. We are also now able to offer our **Thinking, Doing, Talking Science Taster 1** 90 minute CPD session to schools as an online format. If your school is interested in booking this virtual CPD for a cohort of teachers, please contact **Andrew.Kensley@scienceoxford.com** to find out more. The full 4-day TDTS CPD programme is currently being run with educational partners in Cumbria, Kent and Stoke-on-Trent, and an effectiveness re-trial of the impact of TDTS when delivered on a national scale via a network of trained trainers is being funded by the Education Endowment Foundation during 2021-23.

Thinking Doing Talking Science

SCIENCEOXFORD

THE LIGHTYEAR FOUNDATION

The Lightyear Foundation's Virtual Lab is an opportunity for young science enthusiasts with Special Educational Needs to expand their STEM learning and have fun with science. Each Virtual Lab runs on Zoom for 4 sessions, led by Dr. Sarah Bearchell.

Together, we take part in kitchen science experiments using equipment sent to you in the post (including a lab coat, which can be personalised!) If you know someone who would be interested in our Virtual Lab, please get in touch with Rhiannon for more info.
rhiannon@lightyearfoundation.org

https://www.lightyearfoundation.org/virtual-lab

lightyear foundation | SENSORY SCIENCE

THE ASE

The ASE Primary Science committee has written lessons for primary-aged children which are designed to be directly accessible to children and parents at home to help deliver a structured series of topic-based primary science lessons in a home environment.

The key learning objectives are aligned to the National Curriculum for England but are also relevant to learners across the UK. There is guidance for parents, explanations of key concepts, suggested activities for children and examples of possible learning outcomes to make it easier for parents to support the learning. Throughout the lessons, we have provided links to video clips and resources hosted by external organisations. The primary resource on the ASE coronavirus hub can be found **here**.

The Association for Science Education

I BET YOU DIDN'T KNOW...

About biodiversity and trophic cascades

Paul Tyler,
PSTT College Fellow, links **cutting-edge research** with the **principles of primary science**

topicalscienceupdates@gmail.com

Populations of some of the world's largest carnivores are declining to such an extent that it is having a damaging effect on *biodiversity* in their *ecosystems* (Figure1).

Figure 1. Nearly all wild lions live in Africa below the Sahara Desert. Lions eat birds, hares, turtles, mice and much larger animals such as antelopes, cheetahs, baby elephants and even tall giraffes.

Large carnivores such as lions, leopards, hyenas and wild dogs are the *apex predators* in their *ecosystems*. If they were removed, then the populations of *herbivores* that they hunted would have nothing to control their numbers, they would become less fearful and start to occupy new habitats. This can lead to potentially damaging changes in *biodiversity* in ecosystems.

Research scientists were interested in studying the effects of removing the apex predators in an ecosystem on the behaviour of the herbivores that would normally have been their prey. They were also interested in the knock-on effect on plant life in the ecosystem and whether they could reverse the effect through targeted *rewilding*.

The Mozambique Case Study

Opportunities to study whole ecosystem changes do not come around very often; the researchers in a recent study focused on what happened in Mozambique's Gorongosa National Park following the Mozambican Civil War (1977–1992). During the civil war, large mammal populations declined by more than 90% with leopards, hyenas and wild dogs being wiped out and the lion population being severely reduced.

The research team took advantage of the carnivore-depleted system to study the behaviour of the bushbuck antelope (Figure 2). The bushbuck is normally a closed habitat feeder, which means it likes areas with lots of plant cover to help it hide from predators. It is not normally found in the open floodplains where there is very little plant cover to hide it. Following the removal of the apex predators, the bushbucks were observed feeding freely in open landscapes on the Urema floodplains – this behaviour had not been observed pre-war (Figure 3).

Figure 2. A bushbuck antelope.

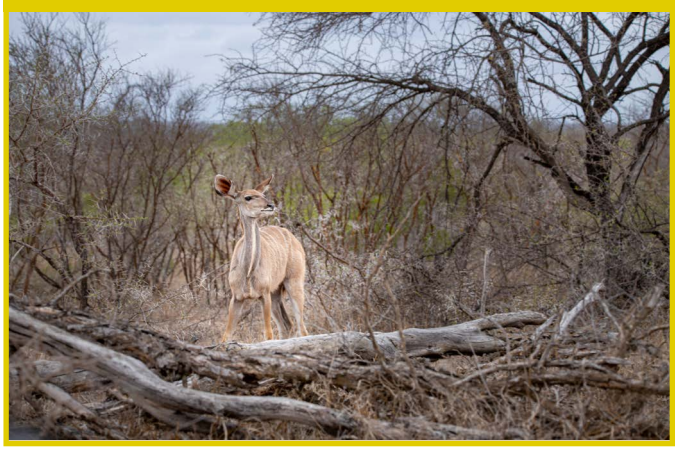


Figure 3. Aerial view of the Urema flood plain.

Map data © 2020 Google Maps.

Data was collected using the satellite-based global positioning system (GPS) to monitor the bushbucks' movements, wildlife counts in specific areas, and DNA analysis of their diets to see what they had been eating. This data allowed the researchers to build up a picture of the bushbucks' changing habits in response to the lack of predators.

Clear evidence was found showing that, once the threat of predation was removed, the bushbucks were moving into the open floodplain areas to feed on the more abundant, and nutritious, plant growth found there. One consequence of the change in diet was that the floodplain bushbucks were in better condition and consistently larger than their woodland feeding counterparts.

The researchers studied the effect on plant growth caused by the change in bushbuck behaviour. They caged off some of the plants in the floodplains so the bushbuck could not eat them and they monitored the size of various plants against the control ones. They observed an increase in 'browsed stems' (stems which have been eaten) in the uncaged plants and a decrease in the number of flowers and leaves as well as a lower average height of the plants. The study showed that even in a relatively short amount of time, the bushbucks were having a significant effect on an ecosystem that they usually did not inhabit.

The final part of the study involved observing how the bushbucks would react to the reintroduction of predators into the ecosystem. This was done by simulating predator presence and monitoring the bushbucks using GPS trackers. The research team used recordings of the predator calls, sprayed areas with their scent, put down artificial lion scat (animal droppings) and carnivore urine to mimic the presence of predators in the area. They also set up a control experiment using generic white noise and herbivore urine and dung. The results from the two different areas were able to be directly compared.

The bushbucks strongly avoided all the predator signs but ignored the herbivore signs and the white noise. Scientists also monitored the plants in both areas and found that plants in the areas the bushbucks avoided showed rapid regrowth compared to in the areas where the bushbuck continued to feed.

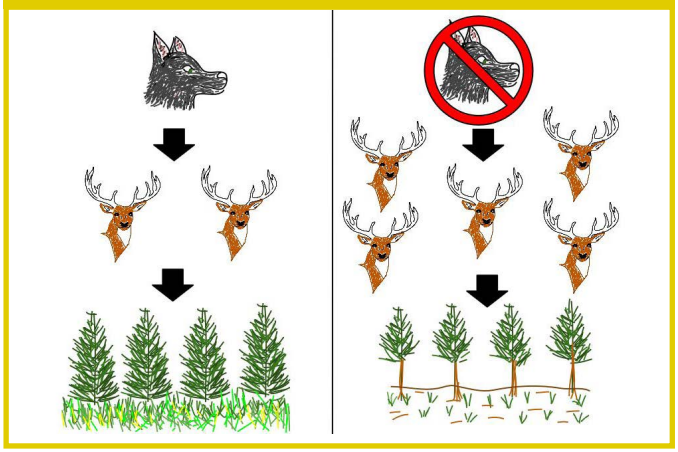
This evidence shows that the bushbucks retain their natural instincts and fear of predators. They revert to their pre-war behaviour whenever the threat of predation is present. The next phase of the research is to reintroduce wild dogs into the National Park and monitor the bushbucks' behaviour. The hypothesis is that they will vacate the floodplains and return to feeding in the more densely covered woodland areas.

Why are trophic cascades important?

It was always thought that if *apex predator* numbers in an ecosystem were reduced, then the numbers of the organisms in the *trophic levels* below would increase and there would be a net benefit to the biodiversity of the system. This was part of the reasoning behind hunting wolves to extinction in Yellowstone National Park in the USA, culling magpies in the UK, and hunting whales in the Pacific Ocean to increase fish stocks.

What American zoologist Robert Paine found in his research, culminating in the 1980s, was the opposite. Eradicating the apex predators led to a decrease in the number of species thriving in the ecosystem and in many cases caused irreparable damage. He coined the term 'trophic cascade' to describe the changes in ecosystems when populations of apex predators are changed, most often by human interference; for example, the wolves in Yellowstone National Park (Figure 4). The Teacher Guide that accompanies this article explain how the biodiversity of their ecosystems was changed.

Figure 4. Trophic cascades describe more complex relationships than a simple food chain, or web. They describe the importance of every trophic level in the ecosystem to the success of it.



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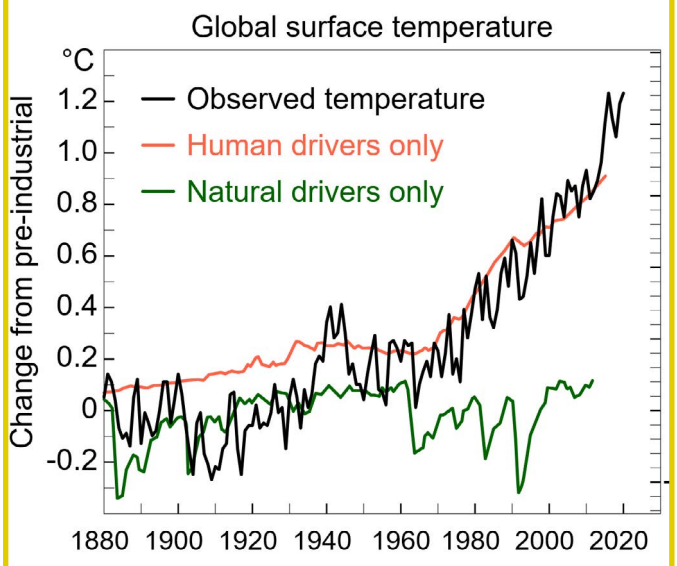
Top-down trophic cascades explain the importance of apex predators in ecosystems for ensuring that every organism, at every trophic level, thrives.

So why does rewilding matter?

In the 200,000 years since human beings have existed, they have had a greater impact on Earth's ecosystems than any other species; they are the 'ultimate ecosystem engineers'. This impact has accelerated rapidly in the last 200 years since the industrial revolution and it has mostly been negative (Figure 5).

Figure 5. The graph shows the change in global temperature (observed by NASA) against the 1850-1900 average as a pre-industrial baseline. The red line shows that the main driver for the temperature rise over the last 150 years is human activity.



Deforestation, species extinctions, natural resource exploitation and fossil fuel use have all increased almost dramatically. Unfortunately, most of this has happened without a real understanding of the impact. Ecosystems are very finely balanced, and the slightest human interaction can be the trigger for the rapid decline of biodiversity and functional species interactions.

Rewilding is simply a way of trying to return ecosystems to their pre-human interaction states by letting nature find the right balance at each trophic level. Each ecosystem is different, and cases need to be considered on their own merits but, so far, rewilding projects round the world have shown great potential in increasing biodiversity that had been adversely affected.

GLOSSARY

apex predator
top predator in an ecosystem

biodiversity
the number of different species found in an ecosystem

ecosystem
a community of living things (e.g. animals and plants) in a habitat, together with the non-living parts of the environment (e.g. air and water)

ecosystem engineer
animal that alters the ecosystem in a specific way to create habitats for other species

habitat
the place that an animal or plant lives, providing all essentials for life

rewilding
the act of introducing specific species back into an ecosystem that they once inhabited

trophic cascade
the indirect effect of changes to apex predator and herbivore populations on levels of plant life

trophic levels
the stages in a food chain

The paper that inspired this work was:

Cascading impacts of large-carnivore extirpation in an African ecosystem .

By Justine L. Atkins[1], Ryan A. Long[2], Johan Pansu[1,3,4], Joshua H. Daskin[1], Arjun B. Potter[1], Marc E. Stalmans[5], Corina E. Tarnita[1], Robert M. Pringle[1].

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COLLEGE FELLOW ACTIVITY

A fully electric future!

Fran Long

Fran is a **PSTT College Fellow** and the **Education and Training Lead** at the **Faraday Institution.**

The drive towards increased use of green technology to combat environmental issues and the plan to end the sale of new petrol and diesel cars in the UK by 2030 prompt numerous interesting discussion points in the primary classroom that can provide a basis for science/STEM-related practical exploration and discovery. PSTT Fellow and Education and Training Lead at the Faraday Institution, Fran Long explains more about the 'Fully Charged Battery Box' project and its outcomes.

In early 2020, a group of PSTT Fellows toured the Faraday Institution and undertook CPD related to the 'Fully Charged Battery Box', providing initial feedback. Subsequently, other Fellows have had an opportunity to pilot and review these new resources aimed at supporting teachers to lead such activity with children in their classrooms.

The resources and a royal visit!

The Faraday Institution's 'Fully Charged Battery Box' is a resource designed to enable researchers and teachers to share ideas relating to battery research, in a relatable way, with 7 to 11 year olds.

The boxes are packed full of 'hands-on' activities for pupils to learn about energy and batteries. They are designed to inform young people about real world problems that the research community is tackling and to light a spark in curious young minds about STEM (Science, Technology, Engineering, Maths) careers, particularly in the energy storage sector. The Faraday Institution collaborated on this project with **Renee Watson of Curiosity Box.**

The boxes are designed to highlight real world links for 'electricity and circuits' requisite primary-level content, whilst building science capital and raising STEM career aspirations. Designed to help teachers, researchers and STEM Ambassadors have access to quality resources, also included is a curriculum-linked guide.

CAN YOU IMAGINE A WORLD WITHOUT BATTERIES?

Each box contains resources for teachers, a quiz, and, most importantly, ample materials to aid pupils to:

- use their knowledge of electrical circuits to make a gift card that lights up;
- make a lemon battery, enabling them to explore different sources of power by constructing a simple circuit that powers a digital clock without using store-bought batteries; and
- make an 'eco e-racer', a prototype electric car. Pupils can race cars they construct that move using energy stored in rubber bands, then try and power the cars using energy from a battery.

Features:

- Teacher/Leader kit with easy instructions & curriculum mapping
- Set in the context of a real global challenge
- Researcher spotlight videos highlighting STEM careers
- Links to other curriculum areas like art, literacy, maths, geography and history
- STEM resources that can be reused

7590	Number of boxes placed in schools
8500+	Number of pupils reached

WHAT PUPILS SAY:

"I loved making the battery out of lemons - it was so much fun!"

"I really enjoyed the Electric Art workshop. I love art, so it was really fun to use electricity in a different way!"

"This lesson was great! The best bit was testing to see if our connections worked! I never knew lemons were so cool."

"I loved how I wasn't told the answer straight away and it made my brain really think."

"I also enjoyed making the rubber band racers and racing them across the floor!"

"Can we do something like this again when we are back in school please?"

WHAT TEACHERS SAY:

"Excellent for application of teaching the National Curriculum - especially energy and electricity."

"The problem-solving activities provide opportunities for children to apply their learning to real life contexts and these activities have strong cross-curricular connections too which help to immerse children in their learning."

"It gave an excellent context in which to put their understanding of circuits to the test."

"They have used the scientific vocabulary a lot more."

"Seeing the videos of people with careers in STEM showed the pupils the wide-ranging career opportunities and that a career in science isn't just wearing a white coat and pouring coloured liquids from one container to another!"

"This is exactly what we need! It's so topical, and the fact that it's all in one box is so useful!"

Check out a **blog** from Gurnard Primary School on the Isle of Wight where PSTT Fellow Claire Loizos used the resources with 3 classes.

Further details about the boxes can be found here: **www.stemday.co.uk/Faraday**

PSTT is grateful to Fran, Renee and the Faraday Institution for its support.

Pupils discovering how batteries work and meeting a Faraday Institution Battery Researcher

COLLEGE FELLOW ACTIVITY

Finding stardust

Paul Tyler teaches at Kirkhill Primary School in East Renfrewshire. He is a PSTT fellow and an active member of the ASE.

topicalscienceupdates@gmail.com

Incredible but true ... every year Earth is hit by around 10,000 tonnes of material from space! Most of this consists of very small spherical pieces called micrometeorites. You can find them in your garden, in the street and in the school playground. In fact if you know how to search, you'll find them almost anywhere you look. Here, PSTT Fellow Paul Tyler explains how you can find these amazing fragments of the origins of the Solar System.

WHERE TO LOOK

Gutters, downpipes and areas where puddles usually form are all good places to start your search as they are places where material from a large area gathers. Choose a dry day to go hunting. It is much more difficult to collect magnetic material from a wet surface, although in places like gutters this is harder as they are often wet. You can also place buckets in places where rainwater runs off a roof. Leave them for 5 or 6 months and then use a magnet to see what has collected at the bottom of the bucket. Many successful micrometeorite hunters use this method.

A gutter makes a perfect place to start hunting for micrometeorites as rainwater carries material from a large area and concentrates it here.

WHAT YOU NEED

Micrometeorites are rich in iron and nickel, so they are magnetic. All you need to start your hunt is a strong magnet and a plastic zip-loc bag. Place the magnet into the bag, the bag is to stop the magnetic material from coming into direct contact with the magnet. You will need to change bags from time to time as rubbing them against abrasive surfaces will make holes in them.

WHAT TO DO

With the magnet inside the bag, carefully work it along the gutter taking time to break up big lumps and free any magnetic material.

The simple tools of the micrometeorite hunter. I use a neodymium magnet; you can buy these encased in plastic which makes them safe for children to use.

Safety point – neodymium magnets can be dangerous, and children should be fully briefed on using them safely. Primary aged children should only ever use neodymium magnets that are plastic, or rubber coated, and have a pull of less than 2kg.

Click here or use this code for a video demonstrating collecting the sample:

To wash the material, place the bag into a beaker of water and slowly remove the magnet from it. All the collected sample can then be washed off the bag. Add a tiny amount of washing up liquid and stir the sample gently with something wooden. Place the magnet back in the bag and work it through the water to collect all the magnetic material.

For the second, and any subsequent washes, use a shallow dish with a small amount of water in. Remove the magnet from the bag and wash the material off the outside into the dish. Gently stir the water and then use the magnet, in the bag, to collect the magnetic material again. This step can be repeated a few times.

Click here or use this code for a video demonstrating washing the sample:

As you collect the magnetic material after each wash watch closely how different objects are attracted to the magnet. They appear to have different magnetic properties and are attracted at different distances. It is possible to separate different samples at this point based on the relative magnetism of the debris. The more magnetic each object is the more iron it is likely to contain. Some micrometeorites are almost all iron while others are mostly rock with small amounts of iron in them.

Click here or use this code for a video demonstrating reclaiming the sample:

Click here or use this code to watch this video in slow motion:

After the last wash step reclaim the material using the magnet in the bag and transfer it to a sheet of paper or shallow plate. Leave the material to dry naturally somewhere it won't be disturbed.

Micrometeorite hunting in a gutter.

The magnet attracts any magnetic debris that is in the gutter and this now needs to be washed several times to clean the magnetic material in the sample.

The magnetic material has been washed 3 times and is now ready to be dried.

Once the material is properly dry use the magnet in the bag to collect all the magnetic material and transfer it to a shallow dish ready for examination; a Petri dish is perfect for this.

At this point it is a good idea to label your sample, record the date it was collected and the location. This will help you organise your material collection as you go along and identify which samples contain possible micrometeorites.

IDENTIFYING WHAT YOU HAVE FOUND

Examining the material requires a microscope as micrometeorites are less than 0.4mm in diameter so you'll never see them with the naked eye. For initial observation and identification, a basic optical, or digital USB, microscope is sufficient. Start off at 40 – 50x magnification and start scanning the material sample, move slowly over the surface looking for spherical objects. Use a toothpick to separate them from surrounding debris, so you can look more closely.

When you have identified a potential candidate, increase the magnification to about 100x and have a closer look. There are certain things to look for on the surface of spherical objects that will tell you whether they might be micrometeorites.

Tip: When you transfer the material from one place to another make sure you use the magnet inside a plastic bag to stop the magnetic material from coming into direct contact with the magnet.

Four common types of micrometeorite that you might find and be able to identify:

Barred Olivine: appear to be covered in tiny grooves or scratches (striations), have crystal grains on the surface.

Porphyritic Olivine: glassy looking, range in colour from black to brown, green and colourless. Surface can be irregular, and they often have visible metallic beads on the surface.

Cryptocrystalline: glassy looking with very fine crystalline grains, often elongated rather than spherical and with metallic beads on the surface. Some of these have a characteristic 'turtleback' appearance of humps on the surface.

Glass: often not found as they are not always magnetic, look like tiny glass marbles and those you do collect with a magnet will usually have a visible metallic bead on the surface.

Hi-resolution images taken using special equipment. Images by kind permission of Jon Larsen and Jan Braly Kihle.

HOW DO YOU KNOW IF THEY REALLY ARE MICROMETEORITES?

You have to be prepared to accept that not every spherical object you find in your sample is going to be an extra-terrestrial micrometeorite. There are many other sources of magnetic spherical objects that you will also find and sometimes it is very difficult to separate them.

Many industrial and mechanical processes, such as grinding, cutting and welding metal, produce microscopic metallic beads that are found in many urban areas.

Fireworks also spray microscopic metallic beads into the environment and other contaminants come from asphalt road surfaces, roof tiles and other human activities.

To be really sure that your discoveries are micrometeorites you will need to be able to take hi-resolution images and have then checked by an expert in the field. Jon Larsen's Facebook group is idea for this. However, the process of hunting for them is fascinating, there is so much learning along the way and you will find all sorts of incredible looking objects in your samples.

Some examples of the different types of spherical objects you might discover in samples you collect. These were from one sample from a gutter and photographed at a magnification between 40 and 80 using a digital USB microscope.

MORE ABOUT MICROMETEORITES

Let's face it, as far as places to live go, our Solar System is pretty amazing. There are 8 incredibly diverse planets, 5 dwarf planets, 200 moons and an asteroid belt full of dust and rock left over from its formation. It is all held together by the gravitational pull of the Sun, our star, and on a 200 kilometre per second journey round the distant centre of the Milky Way galaxy. It's awe inspiring just thinking about it.

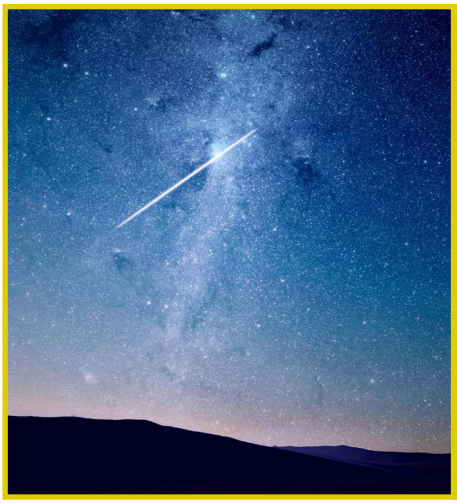
Our Solar System with its diversity of planets and asteroid belt held together by the gravitational pull of the Sun.

Think that's amazing? Well, our Solar System was born! It was created in a stellar nebula from the remains of other solar systems that had died. In about 4.5 billion years, our Solar System will die too, and its remains will one day be reborn in a new star and associated planets and moons. It's hard to get your head round, but it's true.

METEOROIDS, METEORS AND METEORITES

Just beyond Mars, and before you arrive at Jupiter, you find the main asteroid belt. It is about 225 million km across and contains millions of rocks left over from the creation of the planets. They vary in size from sand-sized particles to asteroids over 100 km in diameter and the dwarf planet Ceres. Even with so many objects in it, most of the asteroid belt is actually empty space; there's an average of 965,000 km between objects, and many human space probes have passed through on their way to the outer Solar System.

Every now and then objects in the asteroid belt collide and change direction, flying out through the Solar System: these are called meteoroids. Some of these meteoroids hit Mars, some hit the Moon and some of them hit Earth. As they pass through a planet's atmosphere they burn up and are visible from the surface: these are called meteors, or shooting stars. Some of them survive and hit Earth's surface and these are called meteorites.



When a meteoroid passes through Earth's atmosphere it is called a meteor. As it heats up in the atmosphere is creates a beautiful bright streak in the night sky - this is often called a shooting star.

Every year Earth is hit by about 10,000 tonnes of material from space although estimates of this amount vary hugely as there has never been a real attempt to measure it. Very occasionally there are large meteorite collisions with Earth such as the Chelyabinsk meteorite in 2013 where a 20m wide meteor exploded in the atmosphere and several large chunks impacted around the area. In 1947 a huge iron meteorite impacted in the Sikhote-Alin Mountains in Russia. To date 23 tonnes of material have been recovered from it.

If a meteor survives its journey through the atmosphere and hits Earth then it is a meteorite. This iron-based meteorite has a smooth surface indicating that it has been heated and then rapidly cooled.

MICROMETEORITES

Most of the material that lands on Earth from space is much smaller though and these spherical objects are called micrometeorites. They are categorised as micrometeorites when they are under 0.4mm in diameter. Most of those found have been iron and nickel rich. The first micrometeorites were found in 1891 in sediment samples collected from the ocean floor, since then they have been discovered in Antarctica and desert areas across the world.

Until fairly recently it was thought that it was only possible to find micrometeorites in 'sterile' environments such as Antarctica, deserts and seabeds. It was a chance discovery of a micrometeorite in an urban environment by Norwegian jazz musician Jon Larsen, in 2009, that changed the hunt for these elusive rocks from space.

Jon gave up his career in music and over the next 12 years went on to show that micrometeorites could be found in any environment if you know where, and how, to look.

MEET JON LARSEN – A WORLD EXPERT IN MICROMETEORITES

Jon Larsen was a highly successful jazz musician in Norway. He founded the band Hot Club de Norvege in 1980 and had a string of hits. In 2009 Jon's life was changed when he found a tiny metallic fleck on a table in his garden. Being an amateur astrogeologist, he suspected that the fleck wasn't terrestrial and so he set out to try and discover more.

Jon Larsen is now the world's leading expert on micrometeorites having discovered what many before him claimed was impossible. Image by kind permission of Morten Bilet & Jon Larsen

Over the last 11 years he has become the leading expert on micrometeorites and is described as a truly inspirational Citizen Scientist by Professor Donald Brownlee, a leading astronomer at the University of Washington. He is now based at the University of Oslo and works with astrogeologists from all over the world on Project Stardust.

What he has discovered is giving scientists an insight into the earliest particles of matter that our Solar System is made of: a window to look back 4.5 billion years and study the origins of our Solar System.

Jon has published 3 books on his search for Stardust and runs the Stardust Project Facebook page to showcase his amazing findings. He also collaborates with scientists around the world to hunt for, categorise, and record micrometeorites. Jon has estimated that one micrometeorite hits every square metre of Earth every year. That might not sound like much but if you can find locations which are rarely accessed, or where debris from a large area collects then you have a good chance of finding them.

FURTHER SUPPORT

There is a free resource for primary teachers under development from Topical Science Updates and this will be advertised across social media platforms when it is completed.

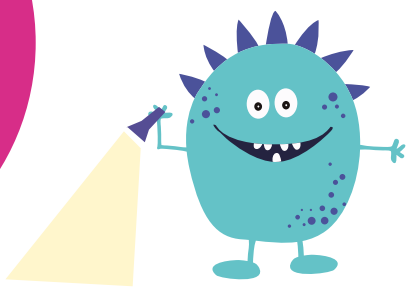
The Project Stardust page on Facebook is brilliant and Jon Larsen is very generous with his expertise and support for amateur micrometeorite hunters across the world.

FURTHER READING

In Search of Stardust	Jon Larsen	ISBN: 978-0-7603-5264-9
On the Trail of Stardust	Jon Larsen	ISBN: 978-0-7603-6458-1

PROJECT UPDATE

Wow Science



WOW SCIENCE

Searching out the best primary science activities

If you are looking for excellent resources to support planning engaging science lessons or to recommend to families to use at home, don't forget our sister website Wow Science. This project is a collaboration with Learning Science and we regularly add new recommendations to the site.

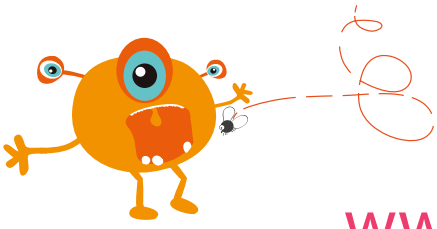
Activities | Experiments | Videos | Websites | Games | Apps

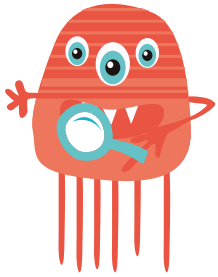
Wow Science links to the very best primary science materials for children to explore, and for teachers to use in the classroom.

All materials have been **quality checked by the Primary Science Teaching Trust** to ensure they are high quality, age appropriate and scientifically accurate.

We provide links to web-based resources and apps that **engage children in science** through games, quizzes, videos and other activities.

Additionally, Wow Science provides **links to recommended sites for teachers** to access many excellent resources and points to the latest news and developments via social media.





www.wowscience.co.uk

Learning Science

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COLLABORATOR UPDATE

Oxford Brookes University

OXFORD BROOKES UNIVERSITY

Colleagues at Oxford Brookes University are delighted to be sharing some of the outcomes of their PSTT funded project, 'Exploring and Exemplifying Creativity'.

In this project, Prof. Deb McGregor and Dr Sarah Frodsham worked with PSTT Fellows to identify moments in science lessons where teachers were teaching creatively, and also where they were teaching for creativity, i.e. developing their children's creativity. These moments are illustrated through a series of web pages that include: i. explanatory text regarding the creative approaches; ii. annotated video episodes illustrating aspects of creative practice; iii. reflective commentary from the teachers; iv. excerpts of the children's responses to the tasks and questions, demonstrating their creativity too, and v. secondary pupils' reflections of the legacy of their creative experience in primary school. The website can be found on the Illustrating Aspects of Creative Practice in Primary Science website – please **click here**.

The website with the illustrative video clips exemplify a range of creative strategies and techniques that a teacher could employ, and the various ways that children might respond. Each clip shows bite-size events in everyday classrooms, with real children demonstrating creativity as it naturally arises. These excerpts from real schools (pre-the Covid pandemic) are presented as such to provide ideas for teachers in primary classrooms to extend and develop creative approaches to teaching and support creativity in learning science.

The website pages are organised so that teachers can search for particular PSTT award winning teachers, lesson topics, or specific features of creative practice. Throughout the website each teacher shares their reflections about their own lesson, and their children's responses are also included.

Click below on the PSTT College Fellow's name to see excerpts of their lessons

PSTT FELLOW	LESSON TOPIC	CREATIVE APPROACHES AND LESSON CONTENT
JULES POTTLE	Evolution through storytelling: The bat who learnt to click	Storytelling, poems, literacy, experimentation with unusual range of materials to explore sound
CLARYSLY DELLER	Evolution: The life and investigations of Charles Darwin	Drama conventions: on the table top, monologue, hot seating, modelling
JO MOORE	Classification: Classifying various types of mint	Use of unusual plants, observation, using and creating a classification key
NEIL MCALLISTER	Tea tasting: Who is the best taster?	Examining something not easily visible (taste-buds), accuracy, observation, fair testing
EMMA CHARNOCK	Electrical circuits: Thinking outside the box	Bright ideas time : Odd One Out, Positive Minus Interesting, Big Question, Problem Solving
ROBIN JAMES	Sound: Insulation, amplification and improving hearing	Use of junk materials, problem solving, modelling, using a game
PAUL TYLER	Forces: Breaking a world record – keeping a paper aeroplane in the air	Creating and devising ways of testing paper aeroplanes: how long can they stay in the air?

Some examples of what you will find on the 'Exploring and Exemplifying Creativity' website

Creative approach: using a dramatic duologue

Clarysly Deller

"...the dramatic duologue at the beginning ... the children were so wrapped by that, you know, 'What? What's happening here? These adults are doing something different"

Mrs Deller and her teaching assistant (Deb McGregor) perform a dramatic duologue (a prewritten script) between Charles Darwin and his wife Emma. This introduces the class to Charles Darwin's hypothesis that a moth with a 30cm proboscis exists. An excerpt from this script and a video of the complete performance are available on the website **here.**

Creative approach - using open-ended teaching

Emma Charnock

"...the beauty of peer to-peer conversations is you never know where it's going to go... it goes back to your skill as a teacher and how you steer the conversation back into science..."

Miss Charnock invites the children to consider the question, *'What would life be like with no electricity?'*

After thinking on their own and talking in pairs the children are invited to share and challenge each other's ideas. Their responses can be viewed **here.**

Miss Charnock explains why she teaches in an open-ended way.

"I allow children to decide on their own areas for investigation... plan their own investigation because very often we give them a formula in science. I think, actually for some children, they need that structure, but you get a much more creative response if you're quite broad... I've seen quite magical moments where children have gone off in a completely different direction to the one I'd perhaps anticipated."

The project also explored the legacy of the PSTT Fellows' science teaching. Secondary school children who had previously been taught by the Fellows were interviewed by the project team, and their reflections about the impact of having experienced creative science lessons are shared. Here are some of the secondary students' responses:

"...if it wasn't for the creative ways of how Mrs Pottle made us learn, I wouldn't have remembered stuff later on in secondary schools, and apply that to my own work, it's already stuck in my mind, you can put pieces back together which is important for your GCSEs".

"'...I think those lessons in primary definitely stirred my curiosity for science and not just thinking that like the grass is cause it is, but making me think why is it green. That definitely helped me choose science and why I still do science to advanced levels. I think it was all down to the science that Mr Tyler taught".

Dr. Sarah Frodsham is a Senior Lecturer, Research Associate, Research Convener and Ethics Officer at Oxford Brookes University. Her research focuses on creativity at different moments and in different places in science education, from primary school through to being an eminent scientist working at an academic institution.

Professor Deb McGregor taught in schools in the Midlands, holding posts of responsibility in Biology, Science and ICT. She has also worked as an LEA advisory teacher and taught in university for twenty years. Deb has written books and articles related to thinking skills, creativity, metacognition, reflective practice, science teaching, learning and leadership.

COLLABORATOR UPDATE

Journal of Emergent Science

The Journal of Emergent Science (JES), published by the ASE in partnership with the Primary Science Teaching Trust, bridges the gap between research and practice. The journal is open access and covers early years through to the end of the primary phase. Issue 20 (January 2021) is now published and is available here.

Dr Sarah Earle, the Lead Researcher on the PSTT funded Project TAPS, is the newly appointed editor of JES. She aims to draw together research from across the primary science education sector, providing support for all those involved.

ARTICLES ARE ORGANISED INTO THE FOLLOWING CATEGORIES:

- **Research review:** a summary of a larger project or perspective piece reviewing current research in the field. These articles will provide a review of current literature in the field or an accessible summary of research that has been reported in more depth elsewhere.
- **Original research:** articles describing both small-scale practitioner research and larger projects are welcome for this section. These articles will include descriptions of how the research was carried out, as well as discussions of findings and literature.
- **Research guidance:** utilising relevant examples to provide support for practitioner research. These articles will consider research processes and methodology, supporting researchers at all levels to reflect on their practice.

Issue 20 of JES, published January 2021, is available **here**

In Issue 20, Gina Rippon considers the origins and impact of gender stereotyping in STEM and the role that primary education plays in this. The research review section also includes a summary of findings from The Wellcome Trust's primary science campaign by **Louise Stubberfield.** Original research is presented by **Derek Bell** and **Denis Mareshal**, who share the results of the UnLocke project that supports children to 'stop and think', and by **Jeannette Morgan** and **Dudley Shallcross**, who explore the use of sound sensors as a proxy for air pollution in an urban school environment. Research guidance in this issue is provided by **Lynne Bianchi**, who discusses the process of constructing a research frame with her project team.

WIDER COLLABORATIONS

Great Science Share for Schools

ASE's Primary Science special issue journal celebrates the impact of the Great Science Share for Schools

This month, the **Association of Science Education** released an open-access Special Issue showcasing the many ways educators from across the UK and internationally have engaged with the campaign. With many PSTT College Fellows heavily involved, you can find out about the scope and impact of this annual campaign and discover the inspiring ways educators have unlocked children's interest in asking and sharing scientific questions.

Among the articles, is one from PSTT Fellow **Neil McAllister,** describing how his school in Northern Ireland has grown its involvement in GSSfS since 2017, now involving other schools in their local community.

"With PSTT support, I set up a cluster of five local primary schools in Ballyclare. Staff and pupils talked about the Great Science Share for Schools all year – what they would share, whether they could have more than one table to share their science" — Neil McAllister, Deputy Headteacher of Fairview Primary School (Northern Ireland).

GSSfS launches weekly resources from early May and culminates on 15th June. As an award-winning campaign that invites 5-14 year olds to share their own scientific questions and investigations, it aims to raise the profile of science in schools and communities and inspire young people into science and engineering.

Since its inception, the campaign has reached over 200,000 young people nationally and internationally.

"GSSfS stands apart by valuing children's scientific curiosity and communication – placing it front and centre of this fast-growing campaign." — Dr Lynne Bianchi, GSSfS Director, Faculty of Science and Engineering.

You can access a wide range of professional learning through the brand new GSSfS Webcasts – podcasts and webinars released each week from 25th February 2021.

Access the SPECIAL ISSUE **here**.

To keep up to date with the Great Science Share for Schools campaign, visit the website **www.greatscienceshare.org** and follow us on Twitter **@GreatSciShare**

ROYAL SOCIETY PARTNERSHIP GRANTS 2021 UPDATE

The 2021 round has opened early and will remain open for new applications until the end of May to ensure teachers are supported to access the grant during this challenging time. As well as the **free online training events**, the **Partnership Grants website** has detailed information and guidance you can access any time, including application tips and example project ideas. Support is available throughout the application process from the Royal Society Schools Engagement team who can be reached via **education@royalsociety.org** or on 0207 451 2531.

To receive monthly updates direct to your inbox about all of our programmes, resources and funding opportunities supporting UK teachers in 5 – 19 education, including opening and closing dates for the Partnership Grants scheme, please sign up to the Society's **UK teachers newsletter** today.

KEY DATES

Primary Science Teacher Awards 2021

14th January 2022

Nominations are open via the **PSTT website**

Do you know an outstanding, creative and innovative primary science teacher who not only supports science in their own school, but also supports teachers more widely? Our annual awards recognise their contributions to the development of primary science provision throughout the UK.

Click here to nominate a primary science teacher.

British Science Week

5th - 14th March 2021

#BSW21

Great Science Share for Schools

15th June 2021

#GreatSciShare

As a sponsor of the Great Science Share for Schools, PSTT supports four Regional Great Science Share Champions across the UK. PSTT encourages all primary schools to take part in the next GSSfS, which is now confirmed for 15th June 2021.

Click here to find out more.

Get connected and use the hashtag #GreatSciShare

Twitter: **@GreatSciShare**
Email: **greatscishare@manchester.ac.uk**

sharing
&learning

excitement
&exploration

discovery
&delight

investigating
&questioning

www.pstt.org.uk

The Primary Science Teaching Trust (formerly the AstraZeneca Science Teaching Trust) was fully endowed with a grant from AstraZeneca PLC

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PRIMARY SCIENCE TEACHING TRUST

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