SCIENCE

Teachers Resource Pack
Key Stage 2

Blackhorse Workshop Presents Atomic 50:
Time Travels in Tin created with Abigail Conway

ATOMIC 50
WALTHAM FOREST LONDON BOROUGH OF CULTURE 2019
ARTS COUNCIL ENGLAND
Supported using public funding by ARTS COUNCIL ENGLAND
BLACKHORSE WORKSHOP

Background

Welcome to this resource pack for teachers that aims to provide activities inspired by the themes behind the unique project: ATOMIC 50: TIME TRAVELS IN TIN created for the first ever London Borough of Culture 2019.

There are 4 resources in total: History, Science, Art & Design and Literacy, each targeted at children aged 7-11, and linking to Key Stage 2 of the curriculum. These guides are intended for use either by teachers with pupils attending the production, or by any teacher looking to explore the science aspects related to this fascinating metal.

Waltham Forest has an extensive heritage of metalworking and manufacturing, largely thanks to the number of companies that were based in the area in the 20th Century.

As the Atomic 50 Ghost Factory comes to life, we have a chance to investigate the history of tin making in Waltham Forest, as well as the need and opportunities to recycle materials.

The concept of the factory and the Material Spirits who run it is to generate new ideas and inventions. In the following Science activities, your pupils can look at the properties of metal and consider reusing materials, including to recreate a gramophone cone, similar to the one your class will contribute to in the Atomic 50 factory.

Curriculum Links

The following areas of the Key Stage 2 curriculum are covered by this resource:

Year 4: States of Matter / Sound

Year 5: Properties and changes of materials

Music Booster:
Making your smartphone louder

Science Context

- Sound is produced by anything that vibrates. As an object vibrates, the air around it does so too. The vibrations spread through the air as waves until they hit your eardrums.

- A music booster can work in two possible ways. If your music booster is touching the source of the music, the booster vibrates too. Boosters can also work to channel the sound waves in one direction, halting them from spreading out.

Questions to talk about...

Which items will make the best sound boosters? Why? Which ones won't work so well?

Why is sound different when using the boosters?

Where have you noticed sound being amplified or muffled?

Making a Music Booster

Duration:
Allow one-two hours

Resources:

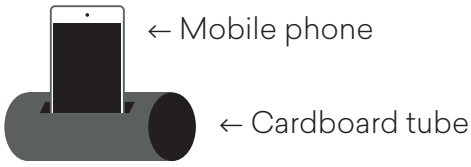
- A plastic milk bottle
- Sticky tape
- Scissors
- A glass bowl and other containers
- A small cardboard box
- Plastic cups
- A rigid cardboard snack tube
- A smartphone to play music from
- Recording sheet
- Data logger (optional)

1. Play a song on the phone. Record on recording sheet how loud the sound is. Children could measure the volume using a data logger. If so, consider where to measure the volume from and how to make this reading fair in subsequent measurements.

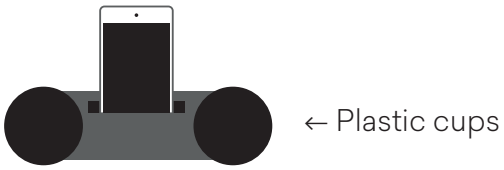
2. Play to the music when the phone is placed in different bowls and containers, listening to (or measuring) the volume from different containers. Record notes or data on recording sheet.

3. Make a horn out of paper and attach it over the speaker of the phone using sticky tape. How does this affect the sound? Again, record data or notes on the volume.

4. Using an open-ended cardboard box or tube, cut a hole for the phone to hold the phone. The speaker of the phone should be inside the box or tube (see illustration). Does this make a good music booster?



5. Try sticking other objects and materials, such as plastic cups or bottles, to make a more complex music booster (see illustration).



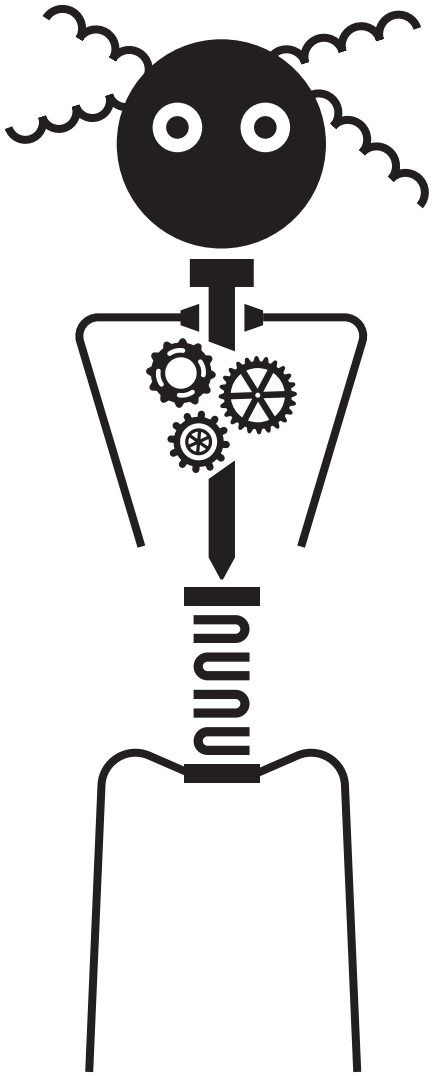
Further Exploration

- Experiment with different shapes and materials to see what affect they have on the volume, such as felt versus aluminum foil.
- What happens if you create a booster made of two materials (such as paper and glass)?
- Can you design a muffler for the sound (something that will dampen the sound instead of amplifying it)?
- Investigate how sound was amplified by Thomas Edison's phonograph.

Build a Magnetic Metal Robot

Science Context

- Not all metals are attracted to magnets; only those containing iron, steel and nickel will be magnetic. A common misconception is that all metals are magnetic, but they need to contain steel, iron, nickel or cobalt.
- Magnets are made with metals containing iron, cobalt, nickel or steel that has been exposed to a magnetic field, which rearranges the metal's molecules in north-south pattern. This polarisation results in the metal being magnetised.
- Magnetic materials can become magnetised when near or touching another magnet. Such materials are attracted to both ends of the magnet and are never repelled. This ability to repel is the main difference between a magnet and a magnetic material.



Questions to talk about...

What is recycling?

Discuss the pros and cons of reusing objects

Build a Magnetic Robot

Duration:
Allow one and a half hours to two hours

Inspiration:
Visit the link below for images and ideas:
https://www.adventure-in-a-box.com/build-magnetic-metal-robots-steam-activity-kids/

Resources:

- Variety of small metal objects, such as mini springs, screws, old Allen keys, gears, bolts, wire*
- Metal cylinder (old coffee tin or can) as a base
- 10-20 small to medium magnets – cylinder and rod magnets are ideal, and old fridge magnets could also be used**

* You could ask your class to ask their parents for old Allen keys or spare screws, as well as metal cans and tins for the robot 'bodies'.
** Mini magnets can be purchased relatively cheaply online.

1. Establish which objects are metallic and which are not. Put those that are not magnetic to one side.

2. Using objects and the magnets, attached the various elements using small magnets. You could use a metal cylinder as a body. This does not have to be magnetic but magnets can hold the robot features in place from inside the cylinder.

3. Use wire or unfurled paperclip for the hair.

NOTE: Remind children how the robots you have made are not suitable toys for young children.

Further Exploration

- Watch the film WALL-E, a fictional tale about the last robot on earth.
- Create a short video using stop-motion software with the robots moving, growing or disintegrating!
- Investigate using the Internet ways of reusing and repurposing tin cans. There are lots of ideas on Pinterest.

Oxidation Investigation

Science Context

Rust is formed by a process called oxidation. It occurs when iron and oxygen react with water and air, creating rust, or iron oxide. Galvanised metal has a protective zinc coating that prevents rust occurring.

The following clips give an overview of what rust is, how and why it is formed:

What is rust?
https://www.bbc.com/bitesize/clips/zc89wmn

How rust is formed
https://www.bbc.com/bitesize/clips/z4d9wmn

Questions to talk about...

How many different metals can you name?

How does metal change over time and why?

What do you know about how they are different?

Oxidation Investigation

Duration:
Allow one to one and a half hours set-up
Plus 5 minutes daily checking and recording before final observation at the end of the experiment

Resources:

- A selection of small metal objects, such as paperclips, pins, nails, screws, hairgrips, small coins, butterfly pins
- Paper or plastic cups
- Water

1. Place one object in each cup and add water. How can you make the test fair? Record how the object looks.
2. Leave the objects in one place. Why do they need to be in the same location?
3. Check the objects daily and record any changes in appearance.
4. After one week has elapsed, drain the water and observe the objects. Record their appearance on recoding sheet.

Further Exploration

- Try different solutions, such as salty water. How does this affect the oxidation process?
- You could try one object (e.g nails) with different liquids (lemon juice, cola, salty water, milk).
- Discuss process of galvanising metal. See clip: Why galvanise steel? https://www.bbc.com/bitesize/clips/zj4rkqt

Taking it Further

Below are some additional resources for exploring the material properties of metal, and themes of recycling resources that are touched on by Atomic 50.

Materials, including metals:

- Facts about tin for teachers
  https://www.livescience.com/37355-tin.html
- Comparing and classifying materials and their properties
  https://www.dkfindout.com/uk/science/materials/
- BBC Bitesize KS2 Characteristics of Materials information for children
  http://www.bbc.co.uk/bitesize/ks2/science/materials/characteristic_materials/read/1/
- BBC Bitesize KS2 Characteristics of Materials lesson plan
  http://www.bbc.co.uk/schools/teachers/ks2_lessonplans/science/characteristics_of_materials.shtml
- Various BBC Video Clips on Types of Materials
  https://www.bbc.com/bitesize/topics/z4339j6/resources/1

Recycling processes and issues:

- Wastebuster recycling resources, including videos and classroom ideas
  http://resources.wastebuster.co.uk/Resource/Collection/32
- Information and lesson ideas based around the issues associated with plastic packaging
  https://www.countrysideclassroom.org.uk/storage/resource/downloads/302e157e-438a-4360-ab10-d98df70a2529/original/plastic-packaging-compressed-2.pdf
- How aluminium cans are recycled (video)
  https://www.pepsicorecycling.com/SchoolResources/46/educate/340/life-of-an-aluminum-can-animated-video
- Recycling ideas for the classroom and schools
  https://www.weareteachers.com/21-ideas-big-and-small-to-bring-recycling-into-the-classroom/

Credits

This resource has been created by Hannah Magee a teacher
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For further information, visit:
www.blackhorseworkshop.co.uk
www.blackhorseworkshop.co.uk/atomic-50/

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