With thanks to

The Julia and Hans Rausing Trust

University of Southampton

Catalyst

Resource 1: Discovery

Teacher / leader notes:

- 1a Listen, learn, communicate
- 1b Modelling a core

Age: 10-14 years old

Aims of the activities

To develop:

- an understanding of how scientists investigate the past using core samples.
- curriculum areas: geology, ecology, mathematics, materials, grouping of living things, changes over time, climate change, scientific enquiry, working scientifically.
- skills: listening, communication, extracting information; focussed observation; resource gathering; scientific method, measuring; creative writing.

Key terms:
Pollution, ecosystems, maritime archaeology, core, model

Activities 1a and 1b can be stand-alone or run in series.
Additional resources are provided online. Activity 1b requires some common items which can be found at home, outdoors or purchased in bulk.

Background information
The Black Sea Maritime Archaeology Project (BSMAP) was a three-year interdisciplinary expedition researching ancient coastlines and the seafaring history of the Bulgarian Black Sea. Watch Film 1, "Exploring the Past: An Introduction to Black Sea MAP", for an introduction to the project.

Black Sea MAP linked to learning
Scientists need to listen and record important information and ideas discussed in meetings with the project team and chief scientist.

Scientists must observe and record the details of any materials or objects that they bring up from the bottom of the sea. Any changes that happen once the object is brought up also need to be recorded. It is important to communicate science accurately and clearly to a variety of audiences.

Archaeologists must interpret the objects left behind by people from the past, to understand how they lived their lives. This helps us understand our cultural evolution.

Activity 1a: Listen, Learn, Communicate (30 minutes)

This activity develops the skill of gathering information from a film. Students write captions for a series of stills from the film, aimed at a specific audience.

Resources

- Film 1 (06:22)
- PowerPoint 1a
- Student sheet 1a

Running the activity

1. Students read through Student Sheet 1a. Clarify any points about what they have to do.
2. Read the questions for first viewing ahead of watching Film 1. Allow time for answering questions after the first viewing. The technologies that might be observed include: **computer modelling, sonar, digital photography, SCUBA diving, Remotely Operated Vehicles (ROV's), fiber optics, cores / coring machines, excavations, cranes, and underwater cameras.**
3. Students are shown a series of photos from the film (PowerPoint 1a). They write captions under the sketches of the images or onto a piece of paper, explaining what is happening in each photo. Agree the target audience for the captions first (or let students each choose their own) and discuss the specific needs of this audience.
4. Allow time for students to write a first draft of their captions ahead of a second viewing of the film.
5. Students refine their captions, and can watch the film for a third time if this is needed.
6. Student reflection can be followed by a class plenary to draw out what has been learnt about the science of the expedition and the skills needed for this task. including writing for a specific audience.

Activity 1b: Build a core (40 minutes plus a break of at least 30 minutes)

The task develops understanding how scientists use cores to learn about the past. Key ideas include: how materials look different when dry or to wet; how compaction changes materials; and what different materials in a core tell us about a particular area through time.

The number of layers in the model can be varied to make the activity complex or simple. Materials can be collected from the school grounds, on a field trip, or from home.

Resources

- Film 1
- PowerPoint 1b with photos showing real and model cores
- Teacher Appendix 1- Coring information
- Student sheet 1b

Additional materials needed:

Per student (or pair/ small group)

- one glass jar (with lid)
- small ruler

For the class

- For ease, we recommend using the following types of contrasting material to make the example core used in the guide. Many of these materials can be collected from school grounds or at home.
  - Soil, grass, flowers, compost, shells, gravel, sand and a coin or other small object.

Did you know? … Facts

Over 96 cores were taken over the course of the Black Sea MAP project.

The cores taken are all frozen and stored at the British Ocean Sediment Core Research Facility (BOSCORF) alongside cores taken onboard the RSS Charles Darwin and RSS Earnest Shackleton.

- If using not using the above, at least four different types of contrasting material should be used. You will need to ensure you specify what each material represents in the core.

Running the activity

1. Watch Film 1 to provide background (if students haven't already watched it) and ask them to answer questions a-c on the student worksheet.
2. Use PowerPoint 1b to show the photos of what a real core looks like, the materials that can be used to make a model core and the differences between a wet and dry core.
3. Students fill in a table to link examples of materials in the model shown in the PowerPoint to the environments these represent in the example model core. The third column shows whether the environment is water or land-based. Student pairs could fill in the table then check their answers with another pair.
4. Show students the materials available for their model. In the example core, these are:
    - Soil (buried land surface)
    - Grass and flowers (old vegetation on buried land surface).
    - Coin (settlement)
    - Compost (peat – local wetland as area gets wetter)
    - Shells and gravel (marine inundation and beach)
    - Sand (marine sands, slightly lower energy environment than the beach).
5. Students fill in a second table to link the materials available to environments in the model they will create. They sketch how they will layer the materials in a glass jar and provide a rationale for their decision.
6. Discussion between students about the order of the layers will be useful here. If you are not replicating the example core, facilitate discussion on what each layer could mean and how this might change the history of the site.
7. Students make the model by layering the materials into the jar. They should record their observations on the depth, material type and colour of each layer.
8. Students then fill their jar with water and leave for a period of at least half an hour. (They could use this time to do Activity 1a or another resource in this pack). Jars can be left until another class session – the longer the time, the more changes there will be.
9. Students note any changes in the layers. There will be mixing and blurring of the layers due to the effect of water dissolving some organic materials and suspending small mineral particles. The layers may have become narrower due to settling and compaction, or some materials may swell up in water.

Plenary

10. Discuss how well the jar model represents a real core taken from the Black Sea.
11. Discuss the changes that took place in the jar due to the water. How well does this model represent cores taken from the Black Sea? (i.e. there will have been some mixing of the layers and compaction over time, and as the area flooded).
12. How did the sea cores help the Black Sea MAP answer the main aims of the project?
    - The Black Sea Maritime Archaeology Project seeks to enhance understanding of the origins of the Black Sea basin addressing geological, environmental and human histories. Over three years, the team investigated the ancient environment of the Black Sea region, including the impact of sea level change on the coast and prehistoric people living there after the last Ice Age.

Lesson reflection

13. Allow time for students to reflect on their work.
    - How could they improve their observation skills?
    - How well did they follow the instructions on making a model core?
    - Write three things they have learnt about what maritime archaeologists can learn from cores.

Student Sheet 1a: Listen, Learn, Communicate

Task: You will use information from a film to write captions for a picture book about the Black Sea Maritime Archaeology Project (BSMAP).

1. First Viewing

Think about the following as you watch the film.

i. What are the main aims of the Black Sea MAP project?
ii. What technologies are being used?
iii. What scientific techniques do you see?
iv. Write down three questions you have about the Black Sea MAP project.

Complete your notes after watching the film.

2. Second Viewing (see page 2)

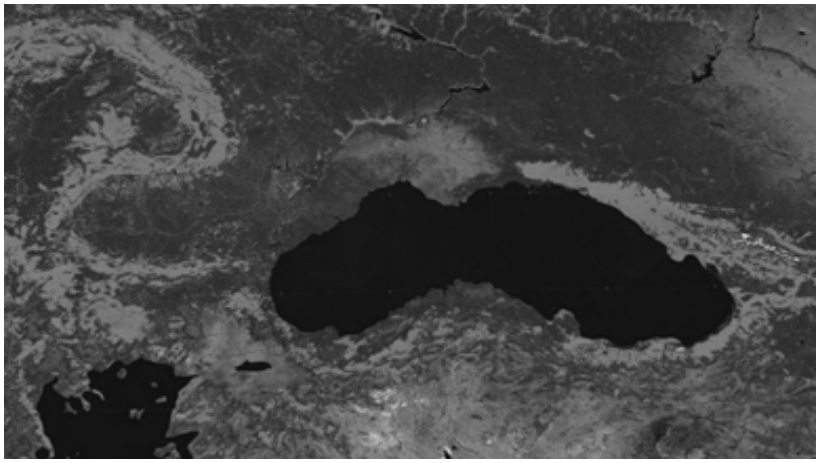
i. Look at the images of the expedition. Decide on the audience for your picture book. Write a caption to explain what is happening in each of the pictures. The language must be suitable for your chosen audience.
ii. Watch the film a second time. Focus on any additional detail that you need.
iii. Edit your captions. Request a third viewing of the film if you think you need it.

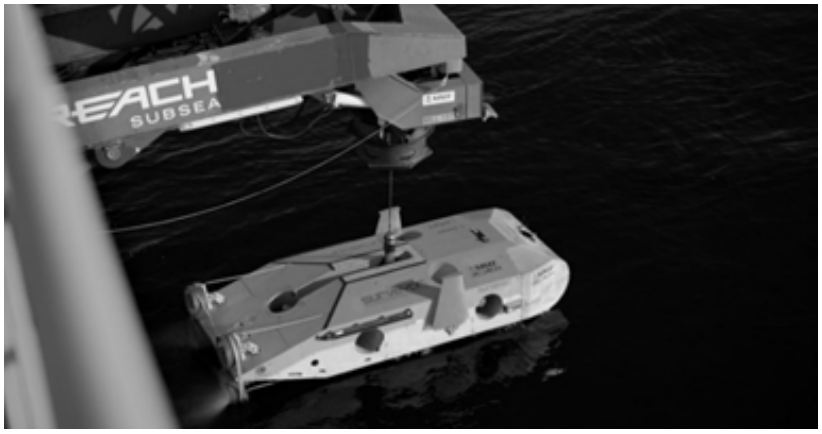
3. Sharing your work

Share your captions with another student. Give each other feedback on one thing you like and one area for improvement.

4. Reflecting on your work

i. How well could you take in and remember important ideas from viewing the film?
ii. What tips would you give to someone who needs to get information from a film?
iii. How could you improve how you write for this chosen audience?
iv. Write three things you have learnt about what maritime archaeologists do.

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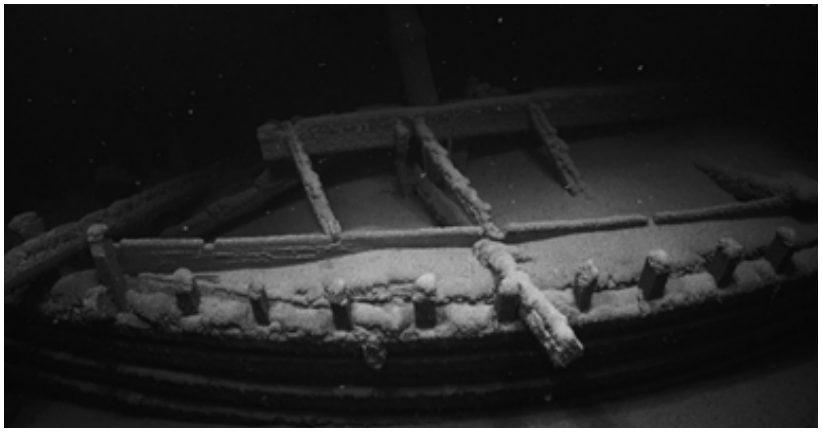


Student Sheet 1b: Build a core

Task: You will make a model of a sea core then 'analyse' it in the same way archaeologists on the Black Sea MAP project have. While watching the film, answer the following questions:

A) What are the main aims of the Black Sea MAP project?
B) What is a core?
C) What do the scientists learn by looking at the cores?

1. Using materials to model layers in a core

The model uses different materials to represent the layers found at different depths in a sea core.

i. Write one phrase from the environment list into each row of the second column below. This shows the environment each material stands for in the model.

Environment list: buried land surface, old vegetation, settlement, ancient wetland, flodding and beach, marine sands

ii. Write one word from the object list into the last two rows of the second column. This shows what the object stands for in the model.

Object list: manufactured objects, organic object (like a shell or a flower)

iii. Write W or L into the third column to describe the four types of environment.

Material in model	Environment this represents	Description of environment e.g. underwater (W) or land (L)
Soil		
Grass		
Compost		
Sand		
Gravel / rocks		

Objects in model	Object this represents	
Coins		
Flowers		
Shells		

iv. Look at the materials you have been given. Make a similar table to the one above. Show the environment or manfactured object that each material will represent in your model

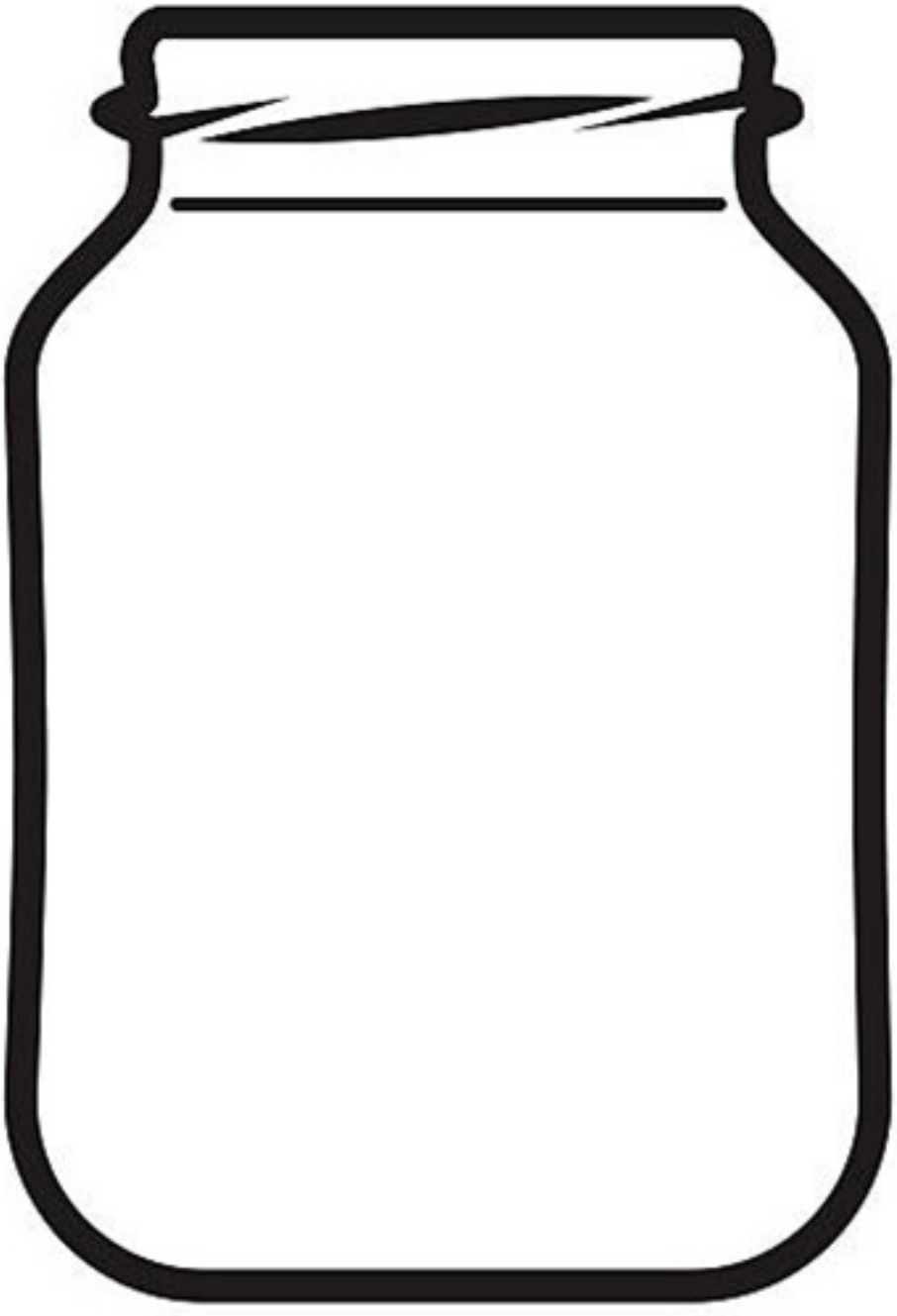
Material in model	Environment this represents	Description of environment e.g. underwater (W) or land (L)

Objects in model	Object this represents	

1. Making your model

i. First choose the layers that you will put into your jar. Explain to another student why you have chosen this order.
ii. Put the materials into your jar into horizontal layers to make the model core.
iii. Make a sketch of your dry model, showing how clear the layers are, or any mixing of the materials.
iv. Label
    - the different layers
    - the colour and depth of each layer (measure from the top down)
    - the position of any man-made object

Dry Model Sketch

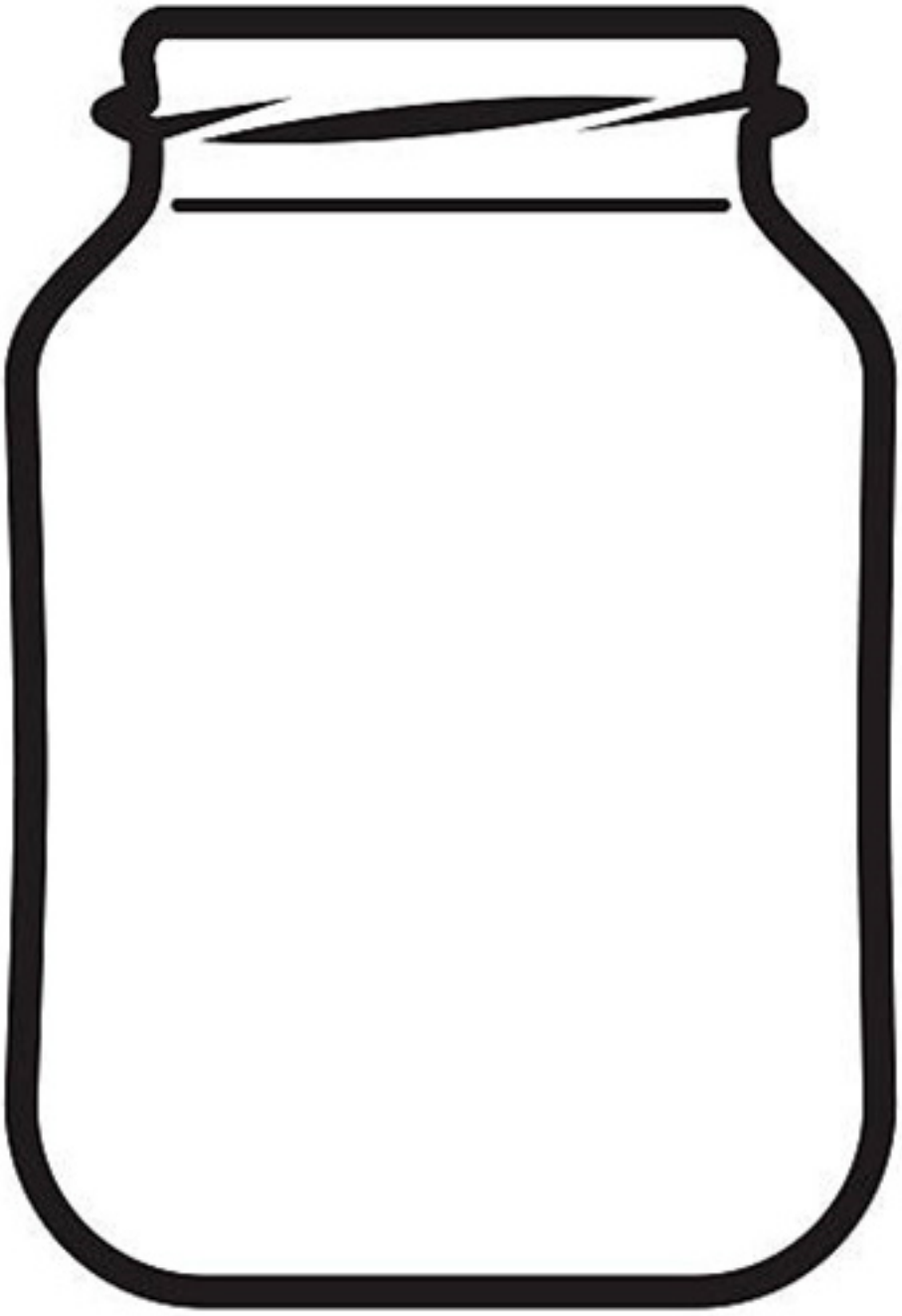


v. Slowly add water to your core model.
vi. Note any immediate changes to the layers.
vii. Note whether the water is clear or cloudy.
viii. Write notes to explain your observations.

Analysing the core

i. After leaving your model to settle, make a new sketch and label your new observations of:
   - the different layers
   - the colour and depth of each layer
   - the position of any manfactured object.

Wet Sketch of Model



ii. Compare the wet core with the dry core, before you added water. Write notes on how your core has changed. Can you see every layer and object that you added? Why is this?

iii. Explain what pouring water on the layers represents in your model.

iv. Which features in your model suggest that people lived in the area at a point in history?

2. Reflecting on your work

i. How well did you follow the instructions on making a model core?

ii. How could you improve your observation skills?

iii. Write three things you have learnt about what maritime archaeologists can learn from sea cores.