Curious creatures
Using fossil and modern evidence to work out the lifestyles of extinct animals

Try comparing the features of animals today with those of fossils - can you predict the lifestyles of the extinct animals?

Divide the pupils into groups. Give each group a copy of the diagrams of animals shown below and a copy of the reconstruction of life on page 3. Tell the pupils that all of these creatures lived in the sea about 515 million years ago before there were any plants or animals on land.
(Further background information is given for teachers on page 2).

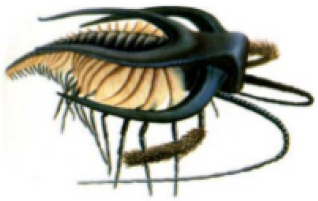
For each of the five animals shown in the diagram, **ask the pupils** to answer the following questions and to list the evidence they have used:-

- Of what animal(s) alive today does it remind you?
- How did the animal move? *(swim, crawl, float, wriggle, hop).*
- How did it catch its food? *(predators often have grasping limbs for catching prey. Not all animals are herbivores or carnivores; some are filter feeders (like mussels) or deposit feeders (like worms).*
- Could it see? *(predators often have large eyes for hunting).*
- Is there evidence of other organs that could sense the environment around? *(feelers).*
- Look at the diagram on page 3. Where do you think it lived? *(swimming around, on the seabed, burrowing, on another animal or plant).*
- Can you deduce anything else about the lifestyles of these five animals?

Opabinia

Hallucigenia

Pikaia



Marrella

Aysheaia

The back up:

Title: Curious creatures

Subtitle: Using fossil and modern evidence to work out the lifestyles of extinct animals

Topic: A snapshot of the history of life on Earth

Age range of pupils: 10 - 18 years

Time needed to complete activity: 20 minutes

Pupil learning outcomes: Pupils can:
- relate characteristics of marine animals today to similar characteristics shown by fossil evidence from long-extinct creatures;
- realise that there are no right answers to this activity. Palaeontologists can only infer how extinct

animals lived from the fossil evidence and comparisons with modern organisms;
- appreciate that the history of life on Earth is a long and complicated one.

Context:
Life on Earth suddenly diversified around 500 million years ago when shells and skeletons appeared for the first time in the fossil record. All animal life today probably evolved from some of these creatures while others became extinct.
Evolution is often thought of as a simple line or chain of ancestors and descendants, when it actually consists of many branches, most of which have become extinct.

Following up the activity:
- investigate the 'Cambrian Explosion' when life suddenly diversified and all major modern groups appeared within a few million years.
- describe life in the sea, or on land, at other times in the geological record. For example, what animals would you expect to find living with Jurassic marine reptiles (ichthyosaurs and plesiosaurs) 150 million years ago?

Underlying principles:
- the ecology of extinct animals can be predicted by careful examination of the fossil evidence and by comparison with modern animals.

Thinking skill development:
- Studying the development of life on Earth involves construction.
- Cognitive conflict may be caused when it is realised that Pikaia was one of our earliest ancestors.
- Discussion of the topic is metacognition.
- Working out the lifestyles of extinct animals from comparison with modern animals involves bridging.

Resource list:
- copy of the diagrams on page 1
- copy of the diagram on page 3.

Useful links: By putting 'Burgess Shale' into a search engine, you will find many links and illustrations of these extraordinary animals.
Try http://www.burgess-shale.bc.ca

Source: Adapted by Elizabeth Devon from an activity in the Earth Science Education Unit's 'Dead and buried', Teaching KS4 Biology.
http://www.earthscienceeducation.com

Background information for teachers

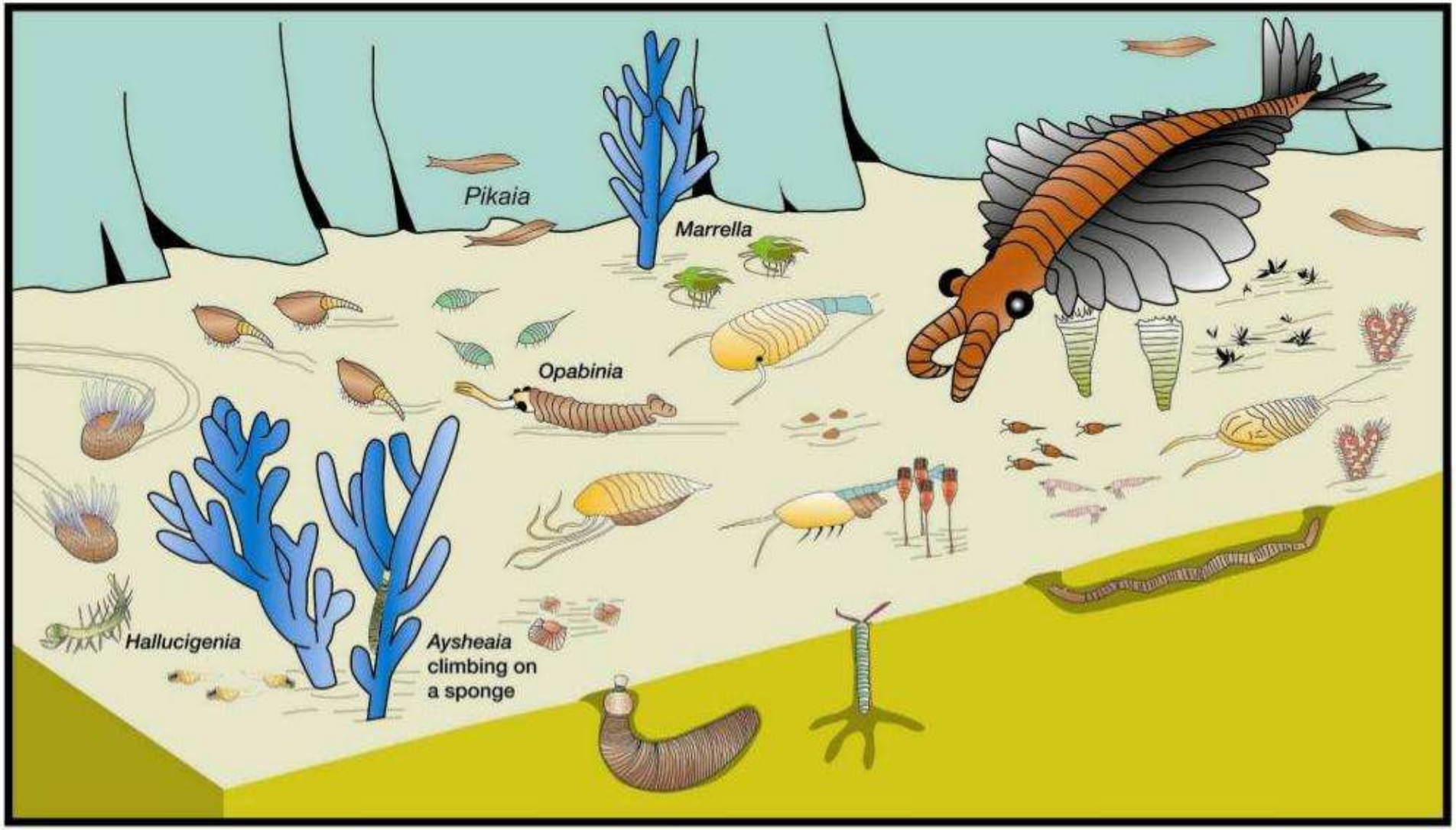
These animals have all been found preserved as fossils in the Burgess Shale. The Burgess Shale is found in the Canadian Rockies, not far from Banff. It was laid down as fine mud in a tropical sea 515 million years ago (the middle of the Cambrian period), and contains the preserved remains of soft-bodied animals which would not normally be preserved at all.

Many of the fossils from the Burgess Shale are arthropods. Some of them fit into well-known groups of arthropods (crustaceans, chelicerates, trilobites) but others (such as ***Marrella*** and ***Opabinia***) do not. Other groups still around today which are represented in the Burgess Shale include various types of worm, brachiopods, sponges and crinoids (sea-lilies), and ***Pikaia***, a primitive chordate (one of our earliest ancestors!).

Other fossils from the Burgess Shale are so bizarre that they cannot easily be classified within any of the major animal groups. ***Hallucigenia*** was for many years held up as the prime example of Burgess Shale weirdness; it is now thought to be related to the modern land animal *Peripatus* (velvet worm), as is ***Aysheaia***.

The diversity of organisms within the Burgess Shale is seen as part of the Cambrian Explosion, when life suddenly diversified and all major modern groups appeared within a few million years. Many of the weirder animals from the Burgess Shale can be seen as evolutionary experiments which were not successful, whereas our ancestor ***Pikaia*** was.

Reconstruction of life at the sea bed 515 million years ago



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