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Youth and Education in Science (YES)

Lesson Title	Make Your Own Crinoid Model
Grades	K-6
Length	Expected duration (45 minutes)
Topics	Geology, Oceanography, Fossils
Materials Needed	2 pipe cleaners per crinoid (cutting directions to follow) 1 piece of felt, 8.5 x 11 or smaller (sea floor) o-shaped cereal (stalk segments) Small feathers (filter-feeding arms)
NGSS Alignment	3-LS4-1, Biological Evolution: Unity and Diversity
Overview	Students learn about marine animals called crinoids and make their own model to easily see how they live and how they often break apart at the end of their life cycle. Depending on the age of the students, teachers can pre-cut the pipe cleaners. Students add o-shaped cereal to the pipe cleaners to represent the individual stalk segments and feathers to the top to represent the filter-feeding arms.

U.S. Department of Interior
U.S. Geological Survey

Related Links

www.usgs.gov/education,
https://pubs.er.usgs.gov/publication/fs20183054

Vocabulary

Crinoid, Tests, Stalk, Calcium Carbonate, Plankton, Phylum *Echinodermata,* Pentameral, Radial, Fossils, Geologic, Ordovician,

Teacher Background

Crinoids, also known as sea lilies, are marine organisms that live in shallow, marine environments. Most crinoids are sessile, meaning that they attach to a hard surface and do not move during their adult stage. Crinoid **tests** (skeletons) are made up of a **stalk** (stem) of stacked **calcium carbonate** ($CaCO_3$) discs. These tests often break apart at the end of their life cycle and are preserved in the fossil record.

Its feather-like, radial arms filter-feed **plankton** (floating plants and animals) from the water and guide the food into its mouth at the top of the stem. After the crinoid dies, the stem segments often break apart, and the individual discs look very similar to o-shaped cereal!

Crinoids are the same kind of sea life (*Phylum Echinondermata*) as sea stars, sea urchins, sand dollars and others that have **pentameral** (five-sided) **radial** (star-shaped) symmetry.

The oldest crinoid **fossils** (remains of ancient life) first appeared in the **geologic** (rock) record approximately 480 million years ago (Mya), during the **Ordovician** (~485 to 444 Mya) geologic period and are still on Earth today. Crinoids are very common in Mississippian (~359 to 323 Mya) limestones.

← Filter-feeding arms

← Stalk

← Sessile base attachment

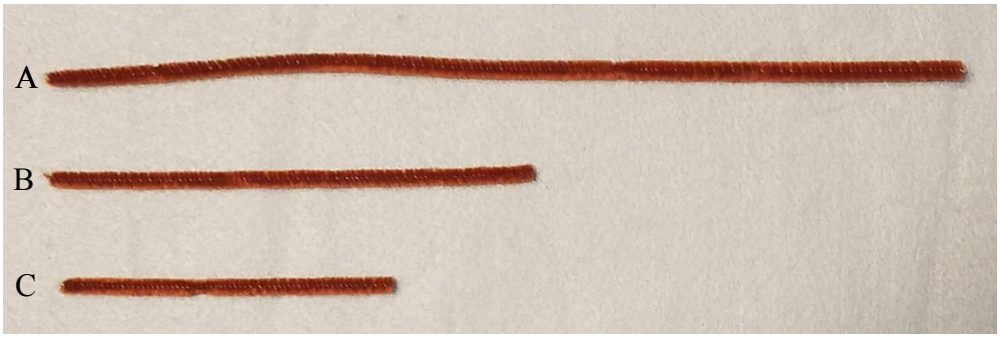
Lesson Plan

Explain what crinoids are and how they live and eat.

Sketch the body structure of a crinoid on the board and label the three main parts as shown in the diagram.

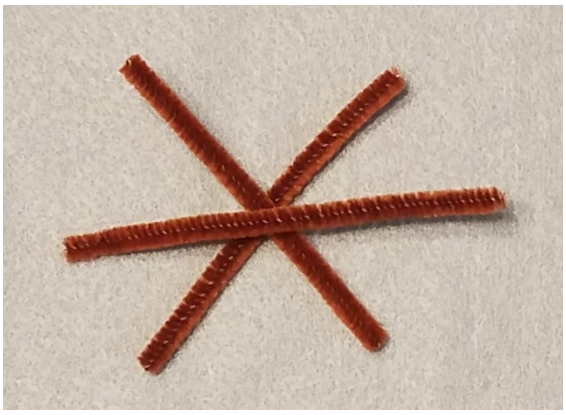
Activity. Students build the crinoid model to take home. Directions below are for one individual crinoid. Make as many as you want with the materials and time you have available. Follow steps 1-6 below.

Step 1: Cut two pipe-cleaners. Pipe cleaner #1: Cut into half (makes two long pieces, B). Pipe cleaner #2: Cut into equal thirds (makes three short pieces, C).

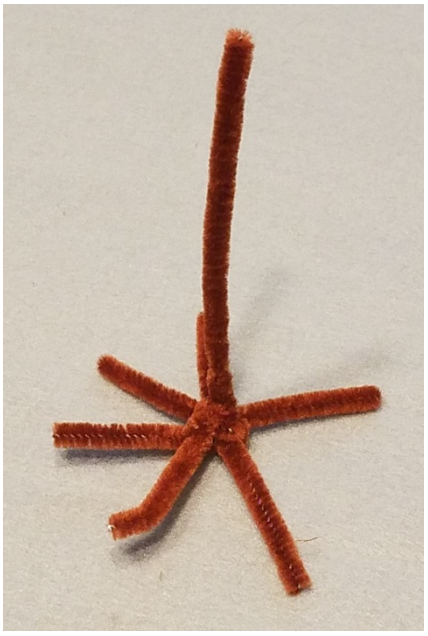


A: Un-cut pipe cleaner (need two). B: ½ pipe cleaner, becomes the stalk. C: 1/3 pipe cleaner, becomes base.

Step 2: Place the three short pieces (C) into a star pattern. Twist the pieces together until they connect. This becomes the base of the crinoid.



Step 3: Place one long piece (B) on top of the star pattern. Twist the long piece around the base and extend the long piece upward. This becomes the stem of the crinoid.



Step 4: Cut a small hole in the felt piece. Place the felt piece on top of the crinoid and pull the stem through.

Step 5: Place o-shaped cereal on top of the stem.

Step 6: Place 5 small feathers into the stem. The feathers become the filter-feeding arms. Secure with a small amount of glue if desired.

Optional Activity (if rock or fossil crinoid samples are available): allow students to view and touch a Mississippian limestone sample with crinoid fossils. Use a magnifying glass if necessary.

Optional Activity (if 10% or less hydrochloric acid is available): Place one drop of HCl onto sample to watch and hear it fizz (effervesce). Limestone and crinoids are made of calcium carbonate. Adding a weak acid breaks down the $CaCO_3$ to release carbon dioxide (CO_2).