Title: What is a Foram?

Grade: \_\_K-12\_\_\_\_\_

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| **Objective** | To understand what a foraminifera is  To be able to describe different foram morphologies with scientific vocabulary  To be able to analyze why models are important for scientists |
| **Standards** | ***NGSS:***  **K-5**  [Structures & Processes](https://www.nextgenscience.org/dci-arrangement/1-ls1-molecules-organisms-structures-and-processes)  [Biological Evolution](https://www.nextgenscience.org/pe/3-ls4-1-biological-evolution-unity-and-diversity)  **6-8**  [Biological Evolution](https://www.nextgenscience.org/pe/ms-ls4-1-biological-evolution-unity-and-diversity)  **9-12**  [History of Earth](https://www.nextgenscience.org/topic-arrangement/hshistory-earth)  [Earth and Human Activity](https://www.nextgenscience.org/pe/hs-ess3-5-earth-and-human-activity)  [Earth’s Systems](https://www.nextgenscience.org/topic-arrangement/hsearths-systems)  ***CCS:***  [Speaking & Listening](http://www.corestandards.org/ELA-Literacy/SL/introduction/) for K-12  [Literacy in Science & Technical Subjects](http://www.corestandards.org/ELA-Literacy/RST/introduction/) for 6-12 |
| **Required Materials** | * Access to [myFOSSILwebsite](https://www.myfossil.org/members/sumrall-labgroup/ac_media/) or 3D printed foram models * Print copies of “Compare & Contrast Shapes” worksheet |
| **Science Background** | Foraminifera, also referred to here as *forams*, are a type of microscopic organism, that live in the ocean. Forams can be either benthic, meaning they live on the ocean floor, or planktic, meaning they float in the water column. There are over a hundred different species of foraminifera, all with very different morphologies. Fossilized forams can be used by scientists in a variety of settings because they can be found across a wide range of geologic history, in abundant localities, and because they have steadily evolved over time. These fossils are preserved at the bottom of the ocean floor, or in regions that used to contain marine environments at some point in geologic history. Since forams are often only a few millimeters in length, it can be very difficult for students to observe them, since microscopes are often difficult to access and use. By making enlarged 3D models of these organisms, it is easy for students to make observations and comparisons of them! Foram morphology is important for several reasons. Some shapes and sizes can be unique to the environment where the organism lived. For example, differences in temperature can cause some species to coil their outer shell in different directions. Planktic (live floating in the water) species typically have different sizes than benthic (live on or near the sea floor) species. Additionally, it is understand for paleobiologists, or scientists who study the biology of fossilized organisms, to be able to identify different foram morphologies in order to be able to identify the relative ages of rock units. Since fossils of forams are so unique by species and have gradually changed over time, they are useful for making these identifications because scientists can find foram fossils in rock layers and use them to interpret the age of the layers. |
| **Before the Lesson** | **Lesson Launch Activity:**  Comparison of foram models as representing a small thing, the same way that a globe represents a big thing. Both are not the size of the actual object, but are *models*.  **Discussion Questions to be asked during activity:** |
| **During the Lesson** | **I do:**  The teacher will give a lesson about what a foram is, emphasizing that 1. They are as small as a grain of sand;  2. They live in the ocean;  3. There are many different shapes and sizes of forams.  For younger students, the teacher will make verbal observations about the shapes, sizes, and characteristics of different objects around the classroom in order to model what it looks like to make observations. For older students, the teacher will lead the class in a discussion of the fact that different foram morphologies are related to the environment where they live. Then, the teacher will make comparative observations between foram models.  **We do:**  In pre-selected groups, students will complete a graphic organizer comparing and contrasting the characteristics of foram morphologies. Younger students will, with teacher support, write sentences to paragraphs about where forams live, the importance of using models for microscopic organisms, and the fact that their shapes and sizes are different across species. Word banks on the worksheet will suggest keywords for students to incorporate into their responses.  **You do:**  Older students will be able to independently write summaries of the information observed in their graphic organizers. Afterwards, they will write several paragraphs explaining how models help students learn about things like macro/micro concepts. Optionally, students will conduct independent research on the way that biostratigraphers, people who study time using fossils, use foram morphology in their age dating process.  Younger students will present to the class as if they are a scientist presenting to a research board, dress up, make props, etc. Students will read the sentences that they wrote about their observations. |
| **After the Lesson** | **Summary:**  **Assessment:**  A written analysis of foram models, which compares and contrasts different species, can be as short as a few written sentences which use scientific language, or as thorough as an essay about the importance of microfossil identification for biostratigraphy. |