Rolland Verreet, *Archaias angulatus* (Fichtel & Moll, 1798)

Inspiration Artists: Roland Verreet

Age Range: Secondary +

Subject Areas: Art, Science (Marine Biology)

PHOTOGRAPHING FORAMINIFERA

NATIONAL GALLERY CAYMAN ISLANDS

DART

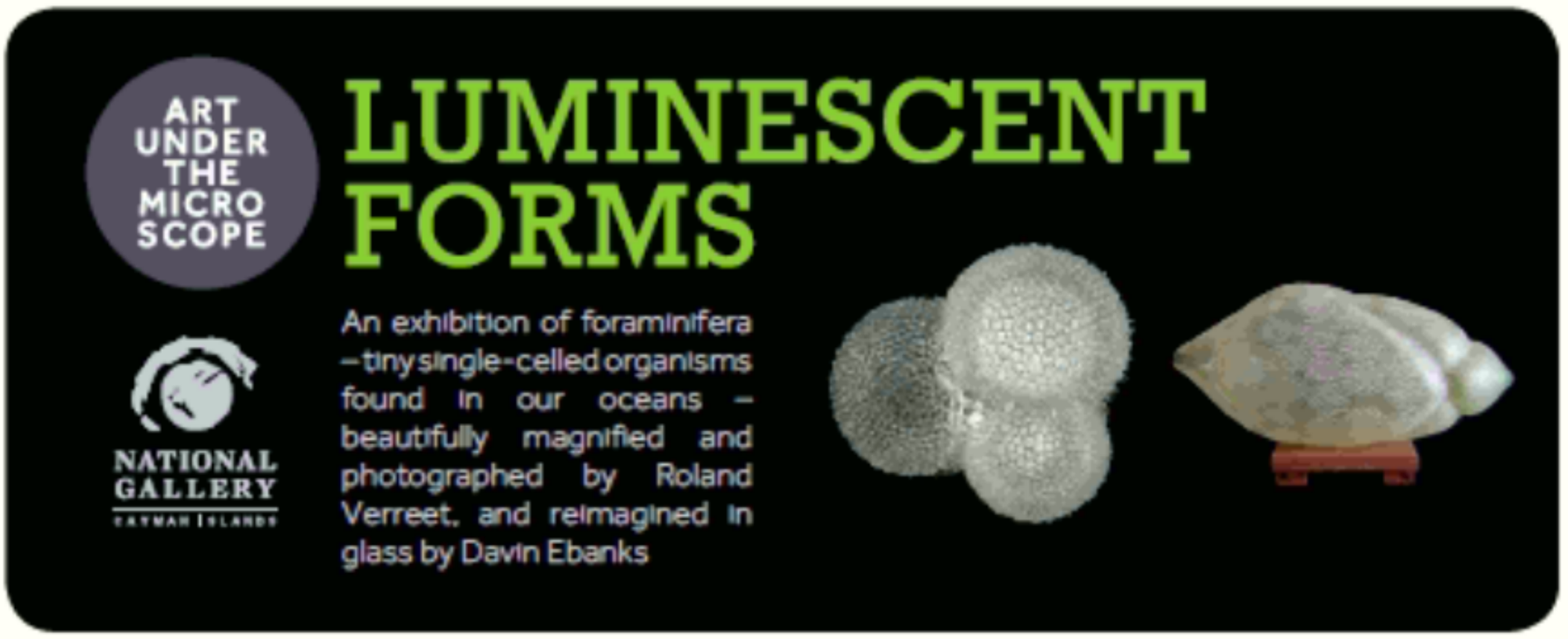
MINDS INSPIRED

In this Packet

In this lesson inspired by our *Luminescent Forms* exhibition (Grand Cayman 2014, Little Cayman and Cayman Brac 2019-2020), students will learn about foraminifera, tiny ancient life forms that make up much of our sand-structure. They will read about Roland Verreet, an artist who has captured these forams' natural beauty through photography.

In a follow-up art activity, students will create their own composition of Foraminifera by drawing clusters in unique forms.

Foraminifera and Their Role in Nature



What are Foraminifera?

Foraminifera (Foraminifers or, informally, just forams) are single-celled organisms which use minute tentacles to move about. Modern taxonomies rank the group as a phylum or subphylum in the hierarchy of biological classification. When the living organism dies it leaves behind what is known as a test, or the skeletal shell of the creature. These tests typically range in size from 0.05 mm to 0.5. Millions of these foram tests are what make up a large portion of the sands that wash onto our shores and form the sea bottom. Forams are abundant across all oceans. They either live on the sea bottom (benthic) or float in the upper water column (planktonic).

History of Study

For over hundreds of millions of years these tiny creatures have swarmed the ocean. The study of Foraminifera has a long history with their first recorded mention in writings from the ancient Greek historian Herodotus (fifth century BC), who noted that the limestone of the Egyptian pyramids contained a large benthic Foraminifer of the species Nummulites.

In 1835, French biologist Felix Dujardin formally recognised Foraminifera and shortly afterwards Alcide Charles d'Orbigny, a prominent French naturalist, produced the first full taxonomy for a Foraminifer. The famous 1872 HMS Challenger cruise, the first scientific oceanographic research expedition to sample the ocean floor, collected so many samples that several scientists, including foraminiferologists such as H.B. Brady, were still working on the material well in to the 1880s.

Work on Foraminifera continued throughout the twentieth century, with scientists such as Cushman in the USA and Subbotina in the Soviet Union, developing the use of Foraminifera as biostratigraphic (geologic dating) tools.

What role do they play?

Many scientists propose that Foraminifera are a key group in the marine food chain: they feed on miniscule organic matter and detritus mostly inaccessible for macrofauna like worms, gastropods and fish, for which the forams are prey.

They also act as biostratigraphic markers, meaning that they act as indicators for identifying relative ages of rock layers during geologic analysis. Both planktonic and benthic species are sensitive to changes in food availability as well as physical environmental parameters, such as salinity and temperature. Because of this sensitivity, forams are useful indicators of environmental change, both on local and global scales. For example, living foraminiferal assemblages have been used as bioindicators in determining coral reef health.

Fun Facts

Foraminifera are single-celled protists. They are not plants or animals, yet at times they seem to take on characteristics of both.

Because different species of foraminifera are found in different environments, paleontologists can use the fossils to determine past environments. Foraminifera have been used to map past distributions of the tropics, locate ancient shorelines, and track global ocean temperature changes during the ice ages.

Consider this:

The ratio of the human to the bee to the foraminifera: the bee is one million times smaller than a human, foraminifera are one million times smaller than a bee, and yet some of the greatest limestone structures on earth -the Egyptian pyramids of ancient Giza- are made of these tiniest of creatures.

Photographs of Forams by Roland Verreet

Roland Verreet, *Cymbaloporetta plana* (Cushman 1924)

Roland Verreet, *Quinqueloculina* sp, 2014

About the Artist: Roland Verreet

Roland Verreet lives in Germany and works as a self-employed professional engineer. He is one of the world's most knowledgable experts in the field of steel wire, having worked for over 40 years designing steel wire ropes for cranes as well as for aerial tramways, for mining and for offshore applications. Roland lectures at Clausal University, Germany on ropes and reeving systems; works world-wide as an expert witness in court; and consults for wire rope manufacturers and users. He is married to Regine, and they have two children.

In his forensic work relating to steel wire rope failures, Roland uses sophisticated digital and scanning electron microscopes. Experimenting one day, Roland used these instruments to look at samples of sand from the Cayman Islands, finding that most of the supposed grains of sand were actually of organic origin.

Fascinated by these foraminifera, tiny single-celled organisms, he started the painstaking process of cleaning, analysing and photographing them. Sharing these images with friends on Grand Cayman, his hobby ultimately led to an invitation to exhibit his work at the National Gallery of the Cayman Islands.

Roland considers photographing creatures that are smaller that 1mm a special challenge. He now studies the natural history of these creatures and the mathematical laws behind their geometry.

Learn more about Roland Verreet and the National Gallery's exhibition of his work at: https://www.nationalgallery.org.ky/whats-on/exhibitions/luminescent-forms-art-under-the-microscope-in-cayman-brac/

Art Activity

Materials:

- Paper – watercolor paper if available
- Drawing Materials – Pens, Pencils, Pastels,
- Crayons etc
- Optional: Cardboard
- Optional: Paint –Watercolour, Ready-Mix
- Scissors
- Glue Stick

1. Use the images by Roland Verreet and the example forams on the following page to draw a composition of foraminifera.

2. The forams you see in this lesson have little colour because they have died and become skeletons (tests). Imagine what colours you think these foraminifera might have if they were still alive.

3. Paint or colour your composition. Those who want a challenge can try painting with watercolours.

If you do not have a watercolour set, you can make watercolour paints with simple items found in the home:

https://www.marthastewart.com/265249/how-to-make-watercolor-paint

Roland Verreet, *Non-identified planktonic foraminifera*, 2014.

Roland Verreet, *Calcarina sp.* 2014.

FORAMINIFERA

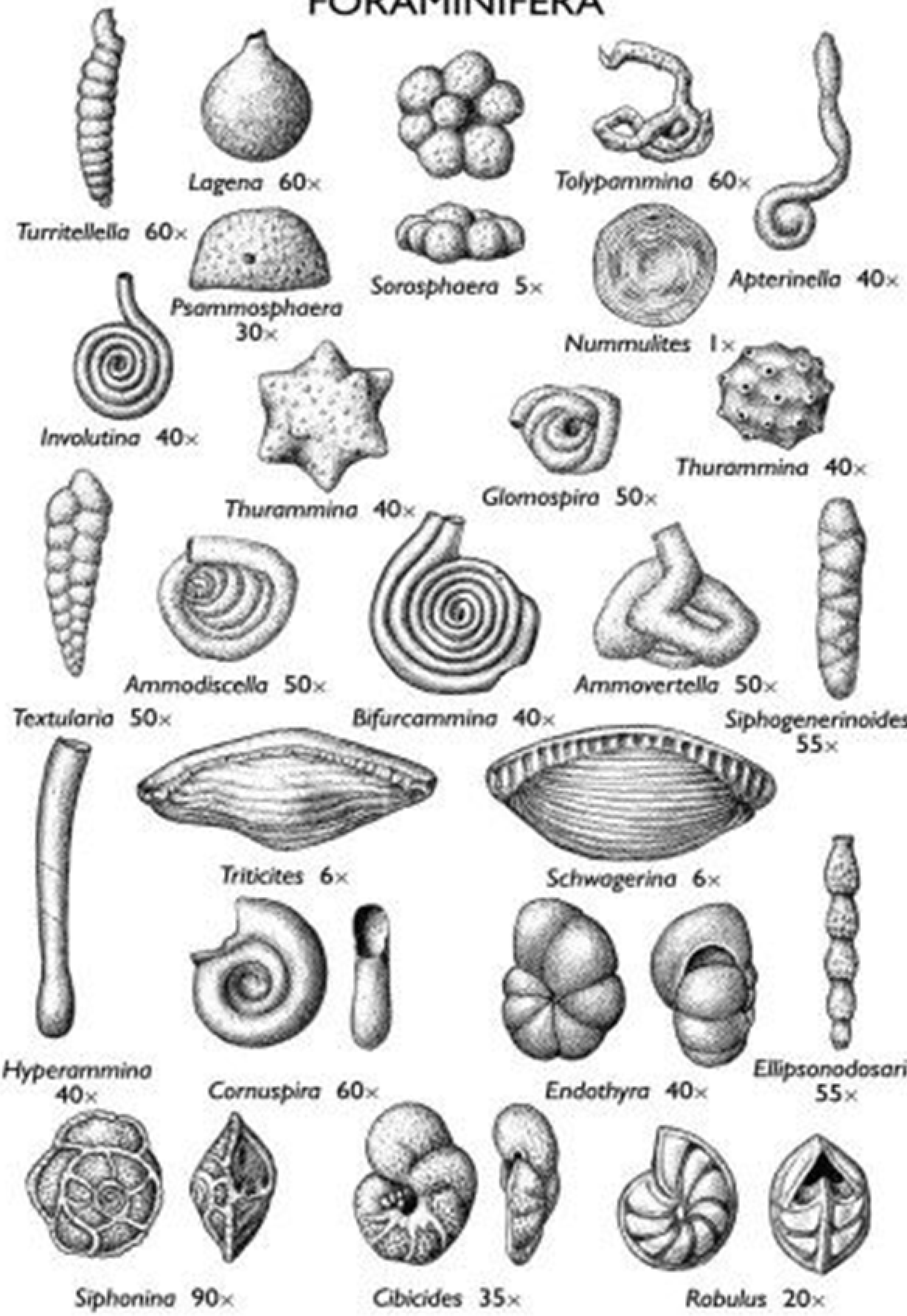


Image source: http://isgs.illinois.edu/outreach/geology-resources/foraminifera

Follow-up Questions

- Did you know such tiny creatures existed? Does it make you think differently about sand, rocks or soil?
- What natural patterns do you notice on the foraminifera?
- How can foraminifera help scientists understand more about the environment, past, present and future?
- Which of Roland Verreet's photographs shown in this lesson is your favourite? Why?
- Can you try taking magnified photographs of small objects in your home? What do you notice about the process of photographing these small objects?