

Article and
Images by

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A Macroscopic Exploration of **Sand**

Sand

A sample of sand can be described in terms of its color, texture, composition, morphology, and grain size. Several factors can determine grain size, including; weather conditions, coastline shape, distance from the water, and seafloor features. Despite its uniform appearance, the composition of sand is a complex mixture of various substances.

Classification

Biogenic sand: the result of the transformation of living organisms into sand grains. The components are the living or once-living parts of an environment such as skeletons, shells, coral, and forams.



Abiogenic sand: the result of the weathering of rocks and minerals by waves, wind, and rain. The components are the non-living chemical and physical parts of an environment.



Six Fundamental Grain Shape Types



Very
angular



Angular



Sub-
angular



Sub-
rounded



Rounded



Well
rounded

manoa.hawaii.edu

For this exploration, multiple samples of sand from around the world were collected and photographed. However, only four are highlighted in this article. For each sample, a brief description of its characteristics are discussed and noted.



5x magnification

Queens, New York

The types of minerals found within sand determine its color. The sample below is continental sand, with the most abundant component as quartz. It also contains other minerals like feldspar, mica, and biogenic grains. The shell above is an example of the biogenic grains that may be found in this type of sand. Continental sand usually appears as a light brown or yellow, but with a closer look its true colors can be seen.



2.5x magnification



Okinawa, Japan

Foraminifera, or forams, are the skeletons of protozoans, one-celled animals. They are typically white, dull or shiny, or covered in other sand grains. Their shells, mainly used for protection, are intricate and built from the calcium carbonate they collect while drifting through the water. The hundreds of tiny holes in the shells are called foramen, which are openings used to gather food. Forams are found in various shapes including; coils, discs, and even stars.



2.5x magnification



Northwest, Ireland

Biogenic sand is composed of the skeletal remains of plants and animals that use calcium carbonate minerals as part of their body. The parts that remain are either whole or broken up and range in their size, color, and shape. Size of the skeleton is dependent upon the skeleton they came from and the amount of exposure to wind and waves. Some of the skeletons seen below include; sea urchin fragments, coral, and forams. Sea urchin spines may be white, purple, black, beige, or green.



2.5x magnification



5x magnification

Corfu, Greece

The size of the particles on a beach are often a reflection of the energy of the waves that hit the shore. Sandy beaches are found in locations where the water is shallow and the waves have less energy. The larger, more pebble-like particles shown below are a characteristic of higher-energy beaches. The shapes of the grains range from very angular to well rounded. While the majority of the sample is pebble-like particles, there are some biogenic grains present, which are displayed above.



2.5x magnification

Photographic Process

Various samples of sand were collected and placed into Petri dishes for easy, uniform containment and transportation. When taking images of individual pieces of sand, a tweezer was used to place the piece on a sheet of black velvet for a dark background. The Petri dish images on the cover page were taken using a 100mm macro lens at a reproduction rate of approximately 1:5 to capture the entire sample. All other images were taken using a 2.5-5x lens.

Set-Up

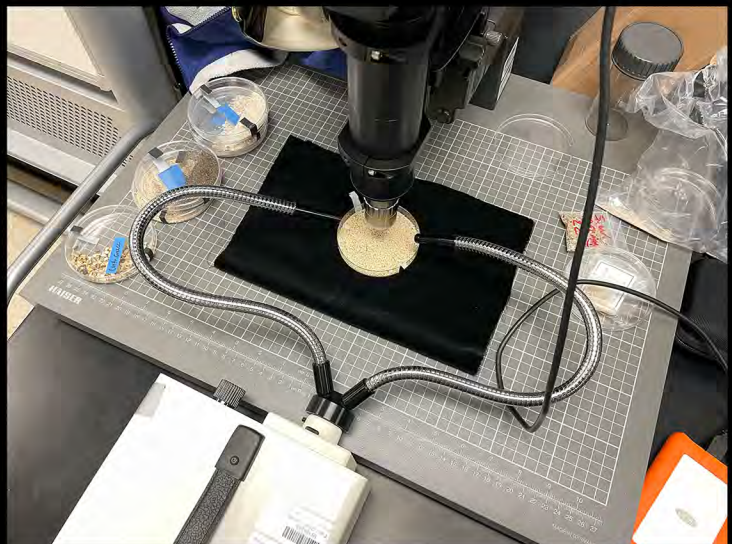
The camera and StackShot device were placed on an adjustable vertical copy stand with the lens of the camera facing downwards pointed towards the sand samples. The fiber optic lights illuminated the samples from above. The camera was tethered to a laptop through Adobe lightroom for live image review.

Post-Processing

Each image was created using the technique of focus stacking. The StackShot device was responsible for moving the camera in minute increments, therefore changing the focus for each image in the series of images. With an approximate range of 10-20 images for each final image, the series of images were combined, or blended together in one layer using either Adobe Photoshop or HeliconFocus. Once the final image was exported, any necessary exposure, contrast, or color adjustments were made.

Equipment

Canon 7D Mark II
Canon 100mm macro lens
Nikon 25mm 2.5-5x macro lens
Copy Stand, Fiber Optic Lights
Stackshot Device



About



Annie Schmitt is a photographer from Queens, NY. A current Junior at Rochester Institute of Technology, Annie is pursuing a BS degree in Photographic Sciences with an immersion in visual culture. She approaches her work with attention to detail and with the importance of self-expression in mind. With a passion for both the arts and sciences, Annie has created a diverse and unique portfolio of work that draws in an audience with a range of interests.

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Resources

<http://sandgrains.com/>

<https://coastalgadnr.org/sand>

<https://www.sandatlas.org/sand-types/>

[https://www.splendidsands.com/biosandmix\](https://www.splendidsands.com/biosandmix/)

<https://www.surfertoday.com/environment/how-is-sand-formed>

<https://manoa.hawaii.edu/exploringourfluidearth/physical/coastal-interactions/beaches-and-sand>