

Sands of the World

A comparison of composition by Laurel Buchanan



Overview

Sand is a sediment found all over the world. And like anything that global, it exists in many different forms, all of which are specific to the environment they form in. Several samples of sand have been collected and photographed for this article in order to illustrate some of these various types of sand. The composition may differ in ingredients, proportion of these ingredients, or by how maturely eroded the sand is. While there is no official classification of sand types, there are commonly appearing patterns that are used to distinguish one from another.

On a beach with the naked eye, types of sand that are actually incredibly different on a basic compositional level often appear more-or-less identical. For this article, all samples were shot at a magnification of 5:1 in order to better differentiate the contents of the sand. This magnification results in a frame full of the sand, to demonstrate the sample's overall composition as much as possible. A greater magnification would have led to microscopy work, and limited the amount of visible sample to individual grains, which was not the intention of this collection.

Some samples are from the same geographic location, with less than a mile inbetween sources. The purpose of these comparisons is to as directly as possible see the differences even this slight transposition makes. Sand collected near the water of a beach may be radically different from that only a little further inland.

The samples shown here by no means attempt to encapsulate all types of sand from around the world, but instead provide a narrow glimpse of several types from across the spectrum.

Hong Kong, China



This beach of China presents standard continental sand, which is typically what one will find on continental shores, due to the lack of sea life and minerals in the area that could contribute additional ingredients. The sand is composed largely of quartz, but also contains other minerals, and it typically has a pale yellow appearance, rather than a pale white that pure quartz would display. There is almost no material from sea shells here, just pure minerals. This informs us that this is from an area without local coral, or common sea life that yields shells.

Sanibel Beach, Florida



High on beach

Sand beaches can be made of almost entirely smooth pieces of quartz simply because the mineral is so resistant to regular and chemical wear, so over time it will be the only thing left. These minerals are very old, having formed millions of years ago. The fine, clear quartz sand of this beach is littered with biogenic shell fragments, indicating an environment rich in sea life.



Low on beach

Closer to the water of Sanibel beach, the quartz sand has been almost completely replaced by shell fragments, making it biogenic sand. These large pieces are primarily exoskeletons of dead sea creatures, though the creatures vary largely in biogenic sand. Vital portions usually include sea snails, sponges, coral, and clams, though this mixture has muted colors.

Oregon



High on beach

The beaches of Oregon are composed of immature rock that hasn't been broken down much from weathering, especially high up on the beach. This sand still resembles the rocks it came from, as seen in the large pebble-like grains. This very rocky sand is called lithic sand, since it has very little quartz or biogenic material. Visible elements include hornblende, a black mineral mixture.



Low on beach

Further down the shore, the sand is composed of similar pieces of rock, except it has been thoroughly exposed to weathering and eroded down to a finer grain. More quartz is visible, indicating a more classic beach environment and more mature sand, as more quartz means other minerals have been eroded away. The presence of feldspar provides some orange color to this sand.

Hawaii



Maui

Much of the unique sand found around Hawaii comes from the marine life around the islands. Biogenic sand is very common here. It largely comes from mollusks, sea urchin, and rounded pieces of coral. This sand is a hybrid, because some darker grains appear as well, which derive from volcanic residue. Porous volcanic rock called pumice is visible, as well as black basalt.



Waipio Valley

Certain islands of Hawaii are famous for their black beaches, one of which is along Waipio Valley, on the big island of Hawaii. This black sand is primarily composed of rocky volcanic debris, formed when lava comes into contact with ocean water and cools rapidly, often shattering into pieces. These pieces are broken down by the sea and pushed to shore, where they eventually become fine grains of sand.

Bermuda



The sand of Bermuda is famous for its pink tinge, which, upon closer inspection, is due to it being littered with relatively large pieces of debris, giving it the unique appearance and color usually associated with these tropical beaches. This assortment includes different types of tiny shells that are actually broken off and pulverized pieces of deceased marine organisms and their exoskeletons, including coral, clams and sea urchin spines. The vivid red shells are from pink foraminifera, which thrive in Bermuda's local coral reef and have shells composed of calcium carbonate, the secret ingredient to Bermuda's pink beaches.

Production

Sample Preparation

Dry samples of collected sand were poured into individual miniature glass Petri dishes. A generous amount was put in, to fully cover the bottom of the glass and ensure a full frame of sand. The dishes were tapped until the sand lay as flat and level as possible inside. Some thicker samples were pressed down manually to form a flatter surface, to aid in achieving a uniform focus across the frame.

Equipment

A Canon 5D Mark II camera body was used, attached to a Canon 65 mm MP-E macro lens. The lens can zoom from 1x to 5x, but was maintained at its full 5x magnification for the entire duration of this photo shoot so there was no variation.

A Canon lens-mounted ring flash was used to illuminate the samples.

Set Up

The camera was tethered to a desktop computer, and capture was done through Adobe Lightroom in order to minimize camera shake and for instant image review. The camera was attached to an adjustable vertical copy stand, with the lens facing the sample downwards, and ring flash attached to lens and hot shoe, triggered whenever a picture was taken.

The sample, in its Petri dish, was placed on an adjustable mechanical stage that allowed for fine height adjustments, in order to easily create focus stacks.

Post Processing

Depending on the size grains of the sample, between 5-20 photographs were taken of each type of sand, all at different, consecutive, levels of focus. These images were then combined using the focus stacking function in Adobe Photoshop CS5 in order to create images with focus from top to bottom.

Once combined, the image would be flattened so it was only one layer, then exposure and color adjustments were made, if necessary, using the levels function in Photoshop.

Resources

<http://www.sandatlas.org>

<http://www.sandgrains.com>

<http://vulcan.wr.usgs.gov>

<http://coastalcare.org>

About

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