Fun Sand Facts

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- Fourteen phyla of tiny creatures, including microbes and sand fleas, live in sand. They keep beaches clean; without the tiny scavengers beaches would be mucky swamps.

- Surface tension is the principle that allows water droplets to form.

  "The two main components are compaction and moisture," says professional sand sculptor Lucinda Wierenga. To compact sand, you scoop up wet sand and press it into a bucket, letting water ooze between sand grains like glue. "When you add liquid to sand, each drop of water seeks contact with the surface of two or three grains," explains physics professor Peter Schiffer at Pennsylvania State University. Then surface tension (clinging force on the surface of a liquid) builds tiny bridges that make grains stick together.

- Some sandcastles will stand up when they're dry. This happens if the water used to moisten the sand contained salt or other minerals. The minerals form a crust between sand grains, holding them together even when water evaporates.

- The perfect water-to-sand ratio for building your dream castle takes experimenting. Too little water and there won't be enough surface tension to counter the force of gravity--so the sand collapses. Too much water dissolves the bridges created by surface tension, and the castle becomes a soupy mess. "The best sand is fine grained," says Wierenga. The smaller the grains, the better they stack up.

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A sandy beach is really trillions of tiny grains of two substances: quartz, a hard mineral composed of the chemical compound silicon dioxide; and a compound called calcium carbonate that comes from seashells. Sand is worn down, or eroded, by millions of collisions between grains. To be classified as sand, a grain must measure between 1/12 and 1/20 of an inch across. Smaller particles are called silt or clay; larger particles are gravel.

During the day the sand gets very hot, up to 90ºC (195ºF). That is almost hot enough to boil water and too hot for alcohol. It changes into a vapour around 80ºC (176ºF).

Sand is classified as any particles between 0.125 and 2.0 millimeters. The size of sediment particles can be measured by visual estimation or by use by a set of sieves.

Sand is usually measured by sieving. A sand sample of known weight is passed through a set of sieves of known mesh sizes. Boulder, cobbles, and gravel are best measured manually with a tape measure or ruler. Silt and clay can be differentiated by whether they are crunchy or plastic between ones teeth but keep in mind when tasting any sand that it may be toxic!

The soft sand that we sink into on the beach, is actually rock. Sand is what a rock becomes after years of being worn down by rivers. Years of sea waves crashing against huge rocks and cliffs makes rocks break into small particles. And ultimately, they end up as sand. The colours of sand - yellow, red, grey, black - depend on the kind of rock it comes from. Sometimes, desert sand is carried by winds across great distances, to seasides, increasing the amount of sand in the sea.

The biggest sand dunes are in Algeria in the Sahara Desert. They are up to 430m (1,411 ft) high, nearly three times the height of the Greatest Pyramid of Cheops in Egypt or nearly or twice as high as Canary Wharf.

Green turtles live in the sea but they travel up to 3,000 kilometers to their island breeding grounds. The females crawl up the beach and lay their eggs in a pit in the sand.

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The world's largest sandcastle was built on the beach at the Myrtle Beach Pavilion Amusement Park and stands 3 inches taller than a castle built in 2003 in Falmouth, Maine.

A small helicopter with a camera flew over the 60-foot-wide 32-1/2 foot high castle to record the event.

It took six professional sand castle builders from Team Sandtastic of Florida took eight days to build the castle which contains 130 dump truck loads of sand.

The rarest sands are found at the sites; Pitcairn's island and Easter island.

Molecularly speaking, water is actually much drier than sand.

Glass is made from common ordinary sand. Most sand contains a high amount of silica. This is the clear, colorless minerals you often see in sand. If the sand contains a lot of silica, it can be melted down into glass with high heat.

An arenophile (also called psammophile) is one who collects sand samples, the interest of the hobby lying in the variety of texture, colour, mineralogy and location.

Waves are caused by the wind blowing on the sea. Waves can travel thousands of kilometers, provided there is no land in the way to stop them. Waves which begin in the Indian Ocean may travel 19,000km (11,807 miles) all the way to Alaska.

Some sand is magnetic. If you happen to have a sample of sand that tends to have black particles in it, try running a magnet across it. These minerals may be iron or magnetite. Magnetite is also very common in sands that contain gold.

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Sand Dunes

Sand dunes are classified by their shape. Crescentic, linear and star are the three basic dune forms. All other types of sand dunes are a subset of one of these.

The strength and direction of the wind is one of the most important factors in determining the shape of a sand dune. But it isn't the only. Moisture, vegetation and landforms affect shape too.

Sand dunes migrate and can move as much as 100 meters a year. The wind carries fine grains of sand and bounces heavier sand grains along. And while the wind isn't strong enough to move really heavy grains of sand, bouncing sand push the heaviest grains forward.

Sand dunes have two faces. Sand builds up on a dune's windward face and slips down its leeward side, also known as the slip face.

When a sand dune gets too steep it collapses under its own weight. A sand dune's angle of repose, the maximum slope before it starts to slide, is 34 degrees.

Sand sheets and giant ripples are also formed by wind but they are not the same as sand dunes. Sand sheets, flats plains of sand, form when the grains are too heavy for wind to carry or bounce.

Giant ripples, also called Zibars, don't have a crest they are rounded like the hump of a whale.

Sand dunes exist on other planets too. There are sand dunes on Mars, Venus and Titan, Saturn's moon.

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Hourglass

The hourglass is sometimes referred to as a sand clock or a sandglass. Like other timepieces, it needs to be carefully calibrated. The hourglass maker must test the instrument and fine tune it to measure the correct length of time.

There are many factors that contribute to the ability of an hourglass to accurately measure time.

The type and quality of sand is key. It must have a rate of flow that does not fluctuate. Sand that is too coarse will wear away the glass, eventually making the neck too large. Most important is the ratio of the neck (the hole, or tube) width to the diameter of the sand particles.

Here are the other factors that affect the accuracy of an hourglass:

- The amount or volume of sand used;
- The size and angle of the glass bulbs;
- The quality of the sand or granular material. It must be fine, dry and consistently formed so it can flow smoothly. (Some substances used in the past were fine grain sand, powdered eggshells, and powdered marble.);
- The width of the neck;
- A tight seal so no moisture can get into the chambers. Moisture can add weight to the sand or clog up the neck.
- A flat and level surface on which to rest the hourglass;

We still use the hourglass to keep track of time. Just think of its many uses for cooking and for playing games!

Singing Sand

Some sands will actually "sing" or make noise.

Often referred to as singing or booming sand, this rare sand produces a tone when walked on or blown around by the wind.

Some sands will even create sparks of light at night when walked or driven across. This sand creates sound waves by the friction caused between the grains of this sand's unique crystalline structure.

Singing sand is becoming harder and harder to find as modern pollution tends to coat the sand particles and destroy its ability to produce sound.

Now, after five years of research, visiting sand dunes in Morocco, Chile, China and Oman, a team of scientists from the United States, France and Morocco say they have the answer as to what makes sand sing.

The scientists say that collisions between sand grains cause the motions of the grains to become synchronized. The outer layer of the dune vibrates like the cone of a loudspeaker. The particular note depends primarily on the size of the grains.

Singing sand, whistling sand or barking sand is sand that produces sounds of either high or low frequency under pressure. The sound emission is usually triggered by wind passing over dunes or by walking on the sand. The sound is generated by shear stress.

Certain conditions have to come together to create singing sand:

- The sand grains have to be round and between 0.1 and 0.5 mm in diameter;
- The sand has to contain silica;
- The sand needs to be a certain humidity.

The most common frequency emitted seems to be close to 450 Hz.

Importantly, there are still scientific controversies on the details of the singing sand. It has been proposed that the sound frequency is controlled by the shear rate.

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Others have suggested that the frequency of vibration is related to the thickness of the dry surface layer of sand. The sound waves bounce back and forth between the surface of the dune and the surface of the moist layer creating a resonance that increases the sound's volume.

Other sounds that can be emitted by sand have been described as "roaring" or "booming".

The particular note produced by the dune, between 60 and 105 Hertz, is controlled by the rate of collision in the shear band separating the avalanche from the static part of the dune.

For spontaneous avalanches, the frequency is controlled by gravity and by the size of the sand grains.

Sand Dollars

Sand dollars (order Clypeasteroida) are flat, round marine animals related to sea urchins (echinoids), sea stars, and other echinoderms.

The most common sand dollar, Echinarachnius parma, is widespread in circumpolar ocean waters in the northern hemisphere, from the intertidal zone to considerable depths.

A sand dollar has a rigid skeleton known as a "test", and the word sand dollar is also used for the test when it is found washed up on the beach after the death of the animal.

When sand dollars are living, they have a skin of moveable spines covering the entire test.

Movement is accomplished by the coordinated action of the spines. Like its close relative the sea urchin, the sand dollar has a set of five paired rows of pores; in sand dollars they are arranged in a petal-like pattern.

These pores are perforations in the endoskeleton through which the podia, used in gas exchange, project from the body.

Different Types of Sand

ABIOGENIC SANDS

Abiogenic sands are mineral sands which derive from non-living sources. Abiogenic sand particles are formed as rocks from the earth's crust break down through weathering and erosion. Weathering is the slow breakdown of rocks caused by water, chemicals in the air, from plants, and by temperature changes. Erosion refers to the work that water and wind do to level the land.

Volcanic islands, such as the Hawaiian Islands, are made of basalt. Basalt is a dense, dark rock that contains metals such as iron and manganese. Basalt may also contain olivine (green) and glassy obsidian (black volcanic glass) sands.

The crust of continental land masses (for example, the U.S. mainland) are composed mostly of granite. Mineral sands formed by the breakdown of granite usually contain quartz and feldspar.

Quartz and feldspar break down slowly and are referred to as resistant minerals. The sands of most beaches along the coasts of the U.S. mainland are called quartz sands because quartz is their most abundant component.

BIOGENIC SANDS

The skeletal remains of plants and animals are a second source of sands. Biogenic sands are also called organic sands or biological sands because they come from the remains of organisms which were once alive. They are also sometimes called calcium sands because the skeletons and bones of animals are made from a substance that contains calcium.

Most biogenic sands are composed of fragments of corals, coralline algae, and mollusks. Usually, biogenic sands are described by their most abundant component -- for example, coral sand or coralline algae sand.

Some of the components are the skeletal remains of entire organisms, such as the micro-mollusks or the single-celled Foraminifera.

Biogenic sands also include other resistant biological fragments, such as sea urchin spines and sponge spicules. Fossil remains such as tiny teeth and parts of jawbones are sometimes found in beach samples.

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