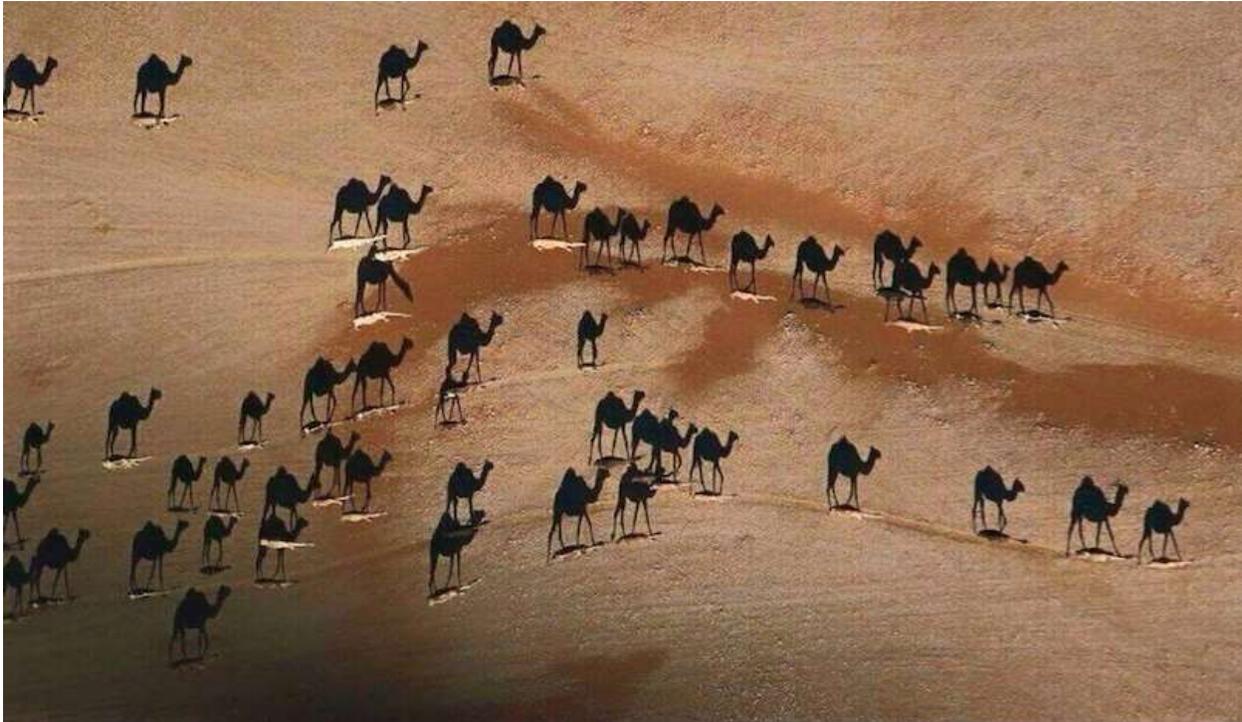


Keeping Track of Your Shadow
by Michelle Negrón Bueno



What do you see in this photo?

Do you see a caravan of black camels crossing the desert in this photo? At first glance it might seem so. But take a closer look and you discover that what you are seeing are the camels' shadows. Since the photographer took the photo from above, you can only see the small, white tops of the camels!

What do you think causes the camels' shadows to loom so long? Have you ever observed other shadows during the course of your day and wondered what makes them change? If you have ever played outside and noticed your own shadow, I bet you observed that sometimes your shadow is excessively tall, and at other times your shadow is scarcely there at all. Why do you think this phenomenon occurs?

What is a Shadow

In order to answer these questions, it is critical to examine what exactly is a shadow. A shadow is created by two elements: light and something that obstructs the light. When light collides with something solid and cannot penetrate it, a shadow is produced in a shape congruent to the object, and when an object, such as our self, blocks the light of the sun, a shadow is generated.

Shadow Changes

The changes in the length of our shadows have to do with the position of the sun. Assuming you are standing still outside all day long, the sun would appear to rise and set. When the sun's light is blocked while it is low on the horizon, either in the morning or the evening, your shadow will be longer. As the sun approaches midday, shadows become shorter and shorter until the sun is overhead.

As you may have noticed, shadows don't look exactly the same every time we go out to play. They change in size throughout the day. If we have recess at lunch time, our shadows may look pretty small or may barely be there at all. When we play right before sunset, our shadows are so tall that we look stretched out like a giant rubber band.

Depending on the time of day, shadows change in size and direction. As you make your way to school in the morning, you might observe that the sun's rays hit on one side of you, generating an elongated shadow on the other side of you. If you venture outside during lunch, when the sun is overhead, it shines down on your head. Your shadow may look relatively short or may scarcely be there at all. If you are outside at sunset, your shadow is elongated again, stretched out in the opposite direction than in the morning. This is because the sun's light is hitting you from the opposite side of the sky.



This diagram shows how the Earth blocks the sun's light. Because the Earth rotates every 24 hours, you see both night and day.

Did You Know?



Shadows exist in space, too! Scientists from NASA were concerned a spacecraft called MESSENGER would get overheated by the sun while in space. Before launch, they used a large piece of fabric to create a sunshade. **The shadow from the sunshade kept cool the side of the craft that faced the sun.**

Have you ever observed anything else about shadows? If you have been at a park or at the beach on a very hot day, have you noticed where people gather to have lunch or place their towels or chairs on the sand? Most people sit near trees or under umbrellas because they are looking for shade. Shadows can keep us cool. The sun's energy not only produces illumination, but it also generates heat, and when an object, like an umbrella, is blocking the light, it is also blocking some of the heat.

The Biggest Shadow of All

Just like in the park or on the beach, large objects like trees and umbrellas create large, corresponding shadows. Can you think of another object that makes one of the biggest shadows of all? A hint is that you see its shadow every night. If you guessed the Earth, you are right!

When the Earth blocks the sun's light from reaching the side of Earth facing away from the sun, a very large shadow is created, which we call night. I bet you can guess why it's cooler at night than in the day. As the Earth blocks the sun's light, the heat from the sun is also blocked, which is why the day grows warmer and warmer as the sun rises and becomes cooler and cooler after sunset.



Sundials are the first instruments humans used to tell time.

Day and Night

Have you wondered how day and night actually happen? While we might perceive that the sun is moving over us, in fact, it is the Earth that is moving while the sun is still. When the Earth rotates on its axis, the sun appears to “move” across the sky, rising in the East and setting in the West, and causes objects to cast shadows. The Earth rotates completely every 24 hours or once every day. People on Earth see both day and night during that time.

Telling Time

The movement of the Earth is so predictable that for centuries people have used it to tell the time. In order to track time more accurately, they invented what is called a sundial, one of the oldest instruments created to tell time. Take a look at the sundial photo and guess what you think it uses to indicate the time of day? It's something you're an expert on now. Shadows!

A sundial is made of a flat platform called a plate with etchings for each hour of daylight and a piece that stands up like a thin rod and points north called a **gnomon**. As the sun's position changes, the gnomon blocks the light and casts a shadow on the sundial's face. The shadow points to a specific place on the plate, corresponding to the time.

Now if you look back at the photo of the camels, what time of day do you think it is? As the sun descends toward the western horizon, do you think the camels have just woken up and started their journey or are they close to the end of their day? If you guessed evening and they are about to get some sleep, you're an expert! The picture was taken at sunset!