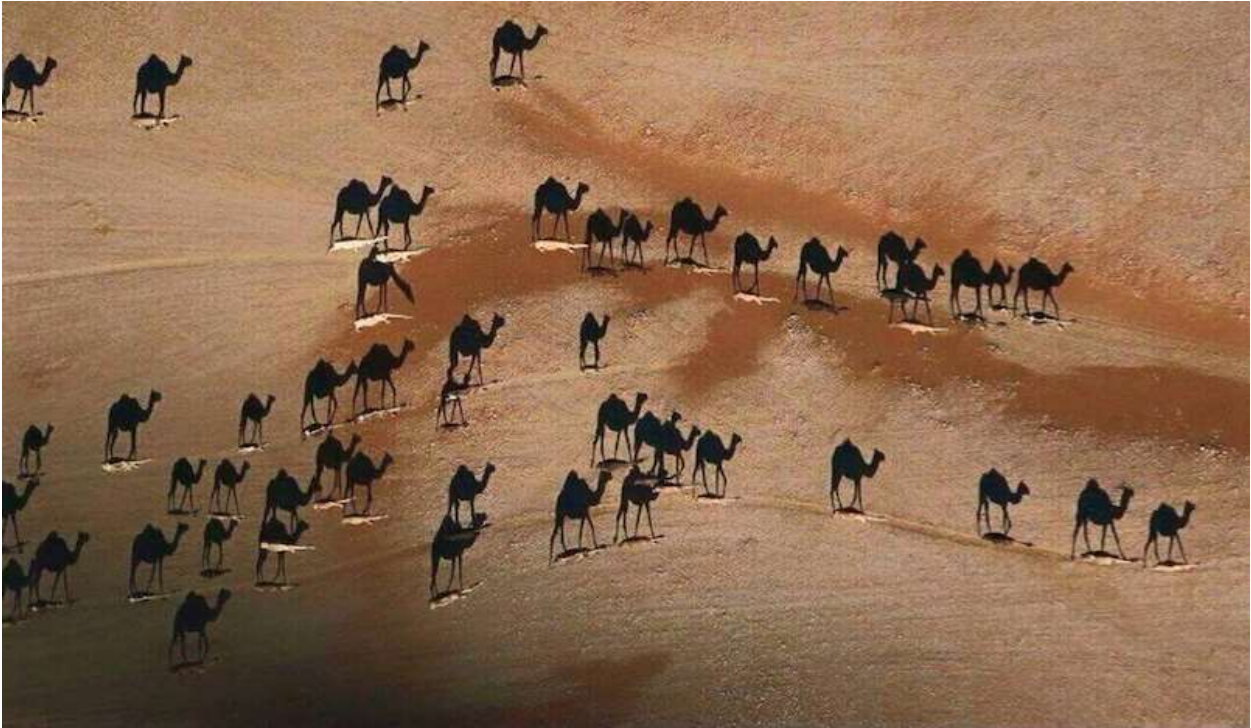


Keeping Track of Your Shadow
by Michelle Negron Bueno



What do you see in this photo?

What do you see in this photo? Most people see large, black camels crossing the desert. But if you look closer, you discover that what you are seeing are the camels' shadows. The actual camels are small and white, located at the shadows' feet. This photo was taken directly from above. You can only see the tops of the camels!

Why do you think the camels' shadows are so large? Have you ever seen other really long shadows? Have you ever been playing outside in the evening and noticed that your shadow is really tall like a giant? Have you ever noticed that at other times of the day your shadow is closer to your size or hardly there at all? Why is that?

What is a Shadow?

To answer these questions, let's find out what exactly is a shadow. A shadow is created by two things. The first is light. The second is something that blocks the light. When light hits something solid and cannot go through it, a shadow is produced in a shape similar to the object. Outside, shadows are created when an object, such as our self, our bike, or a basketball hoop, is blocking the light of the sun.

Shadow Changes

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

Our changing shadows have to do with the position of the sun. If you stand still outside all day long, the sun would seem to rise and set. When the sun is near the horizon in the morning, our shadows are long. This is also the same in the evening. As the sun moves up in the sky, shadows become shorter and shorter until the sun is overhead.

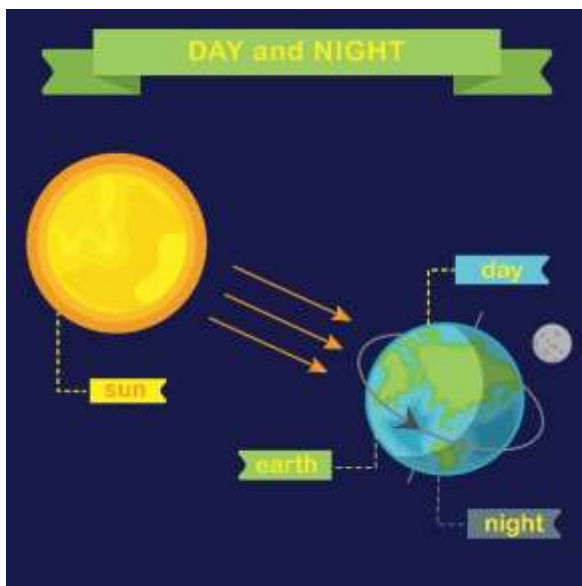
Shadows also change in direction throughout the day. When the sun is behind you, where is your shadow? You guessed it! It is in front of you. When you are facing the sun, your shadow trails behind you. If the sun is to your left, then shadows form on your right. If the sun is on your right, shadows appear on your left.

What else do you notice about shadows? Have you ever been at a park or at the beach on a very hot day? Where do people sit 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 on a hot day. The sun's energy not only produces light but also heat. When an object, like an umbrella, is blocking the light, it is also blocking some of the heat.

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.**



The Biggest Shadow of All

Just like in the park or on the beach, large objects like trees and umbrellas make large 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!

Nighttime is created by a very large shadow. Earth blocks the sun's light from reaching the side of Earth facing away from the sun. I bet you can guess why it's cooler at night than in the day. Without the sunlight, there is no heat

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

from its rays. That is why the day gets warmer and warmer as the sun rises. It grows cooler after sunset.

Day and Night

How does this happen? Is the sun moving over you? It sure seems that way, doesn't it? But it is the Earth that is moving. The Earth turns completely once every 24 hours. People on Earth see both day and night. During that time, the sun appears to rise in the East and set in the West.



Sundials are the first instruments humans used to tell time.

Telling Time

The movement of the Earth is so predictable that people have long used it to tell the time. If you walk outside and see the sun just above the eastern horizon, what time of day do you think it is? Morning! If the sun is high in the sky, what meal do you think you might eat? Probably your lunch, because it is around midday. It is pretty easy to know what time of day it is in a general way.

A long time ago people wanted a better way to track the time. They invented what is called a sundial. A sundial is round and flat like a clock. But it doesn't have moving parts. It has numbered lines for each hour of daylight. What do you think it uses to track the time of day? It's something you're an expert in now. Shadows!

A piece that stands up on the face of the sundial points north. It is called a **gnomon**. As the sun's position changes, the gnomon blocks the light. The shadow that it makes points to the time.

Now look back at the photo of the camels crossing the desert. The camels are walking as the sun is low on 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 that they are about to have dinner and get some sleep, you're an expert time keeper! The picture was taken at sunset!