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The Shadow of the Dog

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Question: The dogs I know like to be walked at least twice a day -- once in the morning, and once in the evening. But even though I'm the same person and it's the same dog in the morning and evening, our shadows change...

In the morning, our shadows point in one direction. This is true regardless of which way we are facing. The shadows of trees, buildings, cars, fire hydrants, and blades of grass all point in the same direction as ours. In the evening, our shadows all point in approximately the opposite direction.

And if we happen to take our walk closer to sunset, our shadows are longer than if we go out in mid-afternoon.

What makes shadows act this way?

Discussion: Direct sunlight travels in nearly a straight line from the sun to the ground. You can imagine a line stretching along the direction of the sun, reaching the ground. Or use a piece of string to show the line. Shadows occur when an object blocks some of this light from hitting the ground. (Please remember never to look directly into the sun.)

So the shape of the shadow resembles the shape of the object that is blocking the sun's rays, whether your shoulder or your dog's tail is involved.

The direction of the shadow is set by the position of the sun. If you face the sun, your shadow falls behind you; with the sun at your back, your shadow will be right in front of you, and easy to look at. Since the sun is in the eastern part of the sky in the morning, morning shadows point toward the west.

And the smaller the angle between the sun and the ground, the longer the shadow. Low sun, long shadow. It is easy to show why with the string.

Other notes: There are all kinds of other things to notice about shadows. For example, they appear darkest when the sun is high in the sky, near mid-day, provided it is a clear day. On a hazy or cloudy day, shadows are less distinct, or entirely absent. Explanation: To produce a distinct shadow, you need light traveling in one direction, such as light from a single spotlight, a flashlight at night, or from the sun. During the day, in addition to sunlight, there is skylight, which comes from many directions. [Skylight is produced when sunlight hits molecules of air, or dust or cloud particles in the atmosphere, and is scattered in all directions.] Skylight "dilutes" shadows. Clouds may weaken the direct rays of the sun, and they may also increase the amount of skylight.

My favorite type of shadow occurs at night. When the sky is clear and the moon is large, you will see Moonshadows. They are very dark -- there is no skylight to dilute them.

