

# Warm- or Cold-Blooded?

The ways different animals cope with temperature changes

By Cynthia Graber

The fierce sun beats down on you, and beads of sweat form on your forehead. You step inside and give an involuntary shiver as the cold air hits. These reactions are no cause for alarm. They're just mechanisms we human beings use to regulate our body temperature. Animals that have such mechanisms—mammals and birds—are called warm-blooded. Those without them—fish, amphibians, reptiles and insects—are called cold-blooded.

If either kind of animal overheats or gets too cold, the chemical reactions its life depends on can go awry, making it harder to survive. Cold- and warm-blooded animals both have ways of preventing that, but the techniques are very different.

These techniques—not the blood's actual temperature—form the distinction between the two kinds of creatures. (In fact,

under certain circumstances some cold-blooded animals are warmer than their warm-blooded neighbors.)

An animal's body temperature is influenced by many factors, internal and external. Most things animals do—running, climbing, eating—generate heat that warms the body from inside. Outside influences, such as a cold wind or intense sunlight, can cool or heat the body.

Warm-blooded animals deal with these influences via an organ in the brain called the hypothalamus. It detects the temperature of the blood circulating through it, which is roughly the same as body temperature. If the body is too cold or too warm, the hypothalamus sends out signals to start up mechanisms that warm or cool the animal.

If the animal is too hot, blood vessels under the skin open wider, letting more blood pass so that heat can escape through the skin. Some animals also sweat; drops of moisture absorb heat from the skin and evaporate away, taking the heat with them. Dogs and related animals stick their tongues out and pant. That works like sweating, but the moisture evaporates from the tongue, mouth and nose instead of the skin. If the body is too cold, on the other hand, blood vessels near the skin contract, so that the blood can retain its heat. The animal may shiver, a muscle action that generates heat. Because of these internal mechanisms, scientists call warm-blooded animals endotherms, from the Greek *endon* (inside) and *therme* (heat).

Cold-blooded creatures lack these mechanisms, so their temperature rises and falls to match that of their surroundings. (They are



therefore called ectotherms, from the Greek *ektos*, or "outside.") As a result, they must adjust their temperature manually, by moving to a warmer or cooler place. If the sun is too

hot, for example, a lizard may find shade to rest in. If the weather is cold, it may bask in the sun. Fish and other sea creatures can't do that, of course, so they have to live in water that's neither too warm nor too cold.

Since ectotherms' body temperature depends so strongly on their surroundings, they aren't always able to perform at their best. When it gets very cold outside, for example, they get slow and lethargic. Neighboring endotherms simply crank up their bodily heating mechanisms and go right on running, hunting and eating.

Ectotherms do have one advantage, however. Regulating one's temperature requires a great deal of energy. Where food is particularly scarce, it makes sense to save energy for other vital functions. That's why most desert creatures are ectothermic. Perhaps it's because cold-blooded creatures need fewer resources to survive that there are so many more of them than there are of us warm-blooded types. ❖

## EXPLORE SOME MORE

*The Magic School Bus Gets Cold Feet: A Book about Warm- and Cold-Blooded Animals*, by Tracey West, illustrated by Bruce Degen (Scholastic). Kids become reptiles and see what it's like to be cold-blooded.

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