

ME AND MY SHADOW

**Sex, not shadows, might be responsible
for luring groundhogs out of their holes**

by Joan Arehart-Treichel

On Feb. 2, the thoughts of many Americans turned to groundhogs—those furry little mammals that are supposed to pop out of their holes on this day and look for their shadows. If they see their shadows, they are supposed to return to their burrows, and winter continues six weeks longer.

Several groups of scientists throughout the United States, however, are interested in groundhogs (alias woodchucks) for scientific reasons. They are trying to learn why and how these mammals hibernate. Such probing should give them a better idea of how groundhog hibernation compares to that of some other mammals. It may also eventually benefit organ preservation and even manned space travel.

Four years ago, T. F. Albert and A. L. Ingling, veterinarians at the University of Maryland, started a groundhog colony on a piece of turf close to the university's campus. They managed to get the groundhogs to reproduce in captivity—a feat that scientists had not been able to bring off before. As the animals reproduced, their colony grew to some 50 animals. Albert and Ingling started studying the behavior and physiology of the animals before, during and after hibernation and soon they had a pretty good idea of why groundhogs hibernate.

The groundhog's food source is fresh green grass. Since it has little access to fresh green grass during the winter, and it cannot migrate south, it stuffs itself with food in the fall, then retires to a hole in the ground around mid-



November. There, with its metabolism lowered, it sleeps and does not have to eat again until mid-March. Or as Ingling puts it: "The groundhog is pretty flat out. You would think that it is

dead." But when March comes, the groundhog pops out of its hole. Hibernation is over. It looks for grass and a mate.

The groundhog has essentially three ways to lower its metabolism during hibernation. These processes have been long known, but Albert and Ingling have confirmed them. One is by reducing its heartbeats from 150 beats per minute to 5 or 10. Another is by reducing the flow of blood to the part of its body behind the rib cage. Still another is to lower the temperature of its body from 98 degrees F. (normal temperature for mammals) to 38 to 40 degrees F.—burrow temperature.

How the groundhog regulates its body temperature during hibernation isn't entirely understood. But Frank South and his physiology team at the University of Missouri have some ideas. They have been experimenting on the rockchuck (a cousin of the woodchuck). They have found that the rockchuck's spinal cord seems to influence temperature regulation during hibernation. So do nerve cells in its brain. If the hypothalamus region of the brain is warmed in a cat or rat, the animal becomes sleepy. But if the hypothalamus in a rockchuck is warmed when not hibernating, it does not become sleepy. "So the relationship between the normal sleep situation and temperature is not direct in the rockchuck," South concludes.

Once the groundhog hibernates, however, it only stays that way for about 10 days, Albert and Ingling have found. Its temperature rises to 98 degrees F. During the next 12 hours, its temperature stays at 98, and it is awake. After that, its temperature once again drops to 38 to 40 degrees, and it goes back to sleep for another 10 days or so. Then it wakes up for another 12 hours, and so on.

Albert and Ingling have no sure-fire explanation for this sleeping-waking pattern in the hibernating groundhog. During its awake periods, it does not eat. One possible explanation is that the sodium pump in the cell membranes in the hibernating animal slows down to such a point that the membranes are in danger of depolarization. Depolarization could kill the animal. So

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A hibernating groundhog taken from burrow. Its temperature is 40°F., its heart beat 10 beats a minute. It feels cold to the touch.

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... Groundhogs

it wakes up periodically to get its sodium pump working again.

There also seems to be some chemical substance in the blood of the hibernating groundhog that is crucial for hibernation. Albert R. Dawe, a zoologist with the Office of Naval Research in Chicago, took a dialysate of the blood of the hibernating groundhog and froze it. The next summer, he injected the dialysate into the blood of nonhibernating groundhogs or ground squirrels. The injected material induced the nonhibernating animals to hibernate. Several other scientists have reported finding a similar hibernating substance. "But," Dawe admits, "no one has said flatfootedly that he has confirmed our work."

The groundhog is one of the few mammals that truly hibernates. Others include the ground squirrel, chipmunk and some bats. Raccoons, badgers and skunks appear to be more like bears—partial hibernators. Scientists found the hard way that bear are partial hibernators—by attempting to slip rectal thermometers into drowsy bears in caves. "The animals revived pretty damn quickly," Albert says, "demonstrating that they were not truly hibernating, but only engaging in carnivorian lethargy." What the bear actually does during periods of lethargy, scientists have found, is to lower its body temperature only 8 to 10 degrees. That way, it can not only conserve energy but can also wake up quickly if endangered.

Research into groundhog hibernation may give scientists some idea of how to successfully preserve human organs at low temperatures for organ transplantation. Currently such organs cannot be frozen and remain viable. For instance, if the chemical material in Dawe's dialysate that causes hibernation is ever isolated and characterized, it might be used to enhance preservation of human organs. Eventually the hibernating substance might also be given to astronauts on long space trips, in order to reduce their food needs and the monotony of travel.

Meanwhile, there is the perennial question: Does the groundhog really pop out of its hole on Feb. 2? And if it sees its shadow, does that mean six more weeks until spring? Albert doesn't believe Feb. 2 is all that significant. But as winter draws to a close, he says, the groundhog does sometimes emerge from its burrow and look around. But when the animal does so, it is probably less interested in weather forecasting than in checking out nearby groundhog burrows for a suitable mate. Or as Albert puts it: "He's interested in the lady in the next burrow, and how curious is she?"

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