

## ZOOLOGY

# Secret of Hibernation

Space scientists are watching certain animals' preparations for hibernation to learn more about the mysterious deep sleep that slows down life.

By BARBARA TUFTY

## See Front Cover

► AS THE FIRST cool winds of autumn blow across the land, squirrels and woodchucks scurry to their nests where a marvelous process begins to take place.

Rolling up into a tight ball, their fur erect and their tails wrapped closely around their bodies, they sink into a coma-like state of deep sleep in which the breathing, heart-beat, circulation and respiration drop to a low ebb.

Life slows down to a point where it seems almost to end.

## Aid to Space Travel

This age-old phenomenon of hibernation is being carefully watched and studied by biologists and space scientists with an exciting new purpose: deep sleep would be an excellent solution to the astronauts' problem of spending long monotonous years traveling through space.

Yet hibernation in the warm-blooded creatures is still a mystery to scientists who are trying to understand the natural phenomenon and induce it artificially—and even duplicate it in animals which are not hibernators.

So far, scientists have not been very successful in inducing hibernation. Even though temperatures have been dropped, light regulated and the food supply lowered to simulate the coming of autumn, hibernating animals stubbornly do not sleep if the season is not right.

On the other hand, whenever that magic time of autumn arrives, no matter what laboratory conditions of warm air, lights and plentiful food are offered, the little animal turns his back on it all, rolls up and calmly drops off into deep sleep.

Only the popular household pet, the hamster, can be lulled into hibernation at any time of the year, when exposed to cold in laboratory tests. Some other tiny rodents, such as the western pocket mouse, enter hibernation if they can find no food or water.

## Nature's Way of Protecting

Hibernation is one of nature's methods for protecting certain grain- and nut-eating animals from long months of winter hardship when weather is cold and little food can be found. During this coma, when life processes are physically slowed down to such a point that very little body energy is burned, animals need little or no food as fuel and a minimum of oxygen for breathing—an intriguing fact for space scientists who calculate that the sleeping astronauts'

food and oxygen requirements might be dropped to only a hundredth that of normal. This would solve enormous problems of food and air storage in the spaceship.

But many years of hard study and research lie ahead before such slow-action sleep can be brought to man—if ever.

Meanwhile, scientists probe carefully into those few curious animals which behave so casually in this remarkable manner.

The list of hibernators is not long—only about five of the 18 living orders of the earth's mammals contain species that hibernate, according to Dr. Charles P. Lyman of Harvard Medical School and Museum of Comparative Zoology at Harvard.

Most of them live in the temperate climate of the Northern Hemisphere, although recently some small opossum-like marsupials from South America and Australia and the tennec of Madagascar have shown deep sleep behavior.

The hedgehog and lemur have long known the secret, and also the badger and the marmot. Even bats sleep numbly in their upside-down beds on cave ceilings, literally hanging down by frosty toenails.

The largest number of hibernators are found in the rodent family, and include such well-known sleepyheads as the woodchuck, seen on this week's front cover, chipmunks and ground squirrels. The tiny dormouse—named from the French word *dormir*, which means to sleep—curls up like a marble in his nest of grass.

Strangely enough, scientists have now found several species of feathered friends entering a state similar to that of hibernation. Swifts, poorwills and hummingbirds have been discovered in a deep protective coma during winter in northern lands. The curious thing about this is that most birds use their ability to fly and migrate each fall to lands where the sun is warm, and grain and insects are abundant.

Those that do not hibernate are the larger animals—the leaf-chewing mammals such as deer and rabbits, and the meat-eaters such as foxes, wildcats and bears.

## Bears Do Not Hibernate

Contrary to popular belief, the bear does not truly hibernate—he only goes into a sound sleep. With tummy well fattened by many berries, roots and small animals of summer, he can last the winter without much food, but rouses himself every once in a while to grumble and sniff the air. The female keeps busy by giving birth to her young.

No one yet really knows what triggers hibernation, believes Dr. Lyman, who has been studying hibernation patterns for years. Certainly the autumnal fattening seems to be related, he observed, for fat animals tend to start hibernating sooner than thin ones. Also the cooling earth helps start the process, although the times of hibernation vary within the species.

Other scientists suggest that automatic control centers in the brain or the central nervous system may help trigger the hibernation.

Whatever causes it, hibernation always  
(Continued on p. 269)



U.S. Forest Service

**COZY HIBERNATOR**—This bright-eyed chipmunk eating melon seeds in Glacier National Park, Mont., knows the secret of a deep quiet sleep through the long winter months ahead—but he's not telling. Scientists seek to learn his secret so astronauts can relax in their long journeys toward the stars.

## Secret of Hibernation

(Continued from p. 262)

comes with the autumn. One by one, as the streams freeze and the woods fill with leaves, the tiny creatures drowsily creep to their burrows or nests and prepare themselves for their naps.

Sometimes they slip off into the coma-like sleep in one smooth sweep, Dr. Lyman observes. Sometimes they reach it by a series of steps, dipping deeper and deeper into sleep with each try, like a timid bather dipping into a cold ocean.

Entering hibernation is an active process in which vital body processes such as heartbeats, breathing, and the metabolic rates slow down, resulting in lowering of body temperatures as much as 40 degrees.

This behavior is in contrast to that of the cold-blooded animals preparing for cold weather—the snakes, lizards, frogs, toads and fish. These creatures cannot produce their own body heat, and must depend upon warmth they get from air, water, rocks, earth and any other material upon which they creep, crawl or swim.

When the climate cools down, their whole body cools down with it, with a resulting lowering of heartbeats, respiration and other processes. Finally the animal is as cold as his frigid environment, with his body temperature fluctuating with the temperature of the weather.

### Body Cools Down

Body temperature of a warm-blooded animal in hibernation also fluctuates, Dr. Lyman states, and passively follows the temperature changes that occur in the cave or burrow. His temperature remains a few degrees above that of the air, the two rising and falling together in a range from about 38 to 55 degrees Fahrenheit. If the temperature of the environment approaches the freezing point of water, however, a remarkable increase in metabolic rate sets in to warm his body just enough to keep him from freezing.

Once a small animal is in a hibernating trance, the breathing rate, which normally can be as rapid as one to two hundred times a minute, is reduced to less than one per minute. The tiny creature usually takes a series of two or three quick gasps, then rests for a while.

His heart rate may drop to one, two or three beats per minute, compared to a normal 200 or 350 beats per minute. Even with this slow beating, however, the blood pressure remains normal. During the sleep, very little cell growth has been observed.

When spring's fair winds start to melt the snows, the hibernator awakens with a stupendous physiological effort. With shakings and shiverings, his metabolic rate speeds up as much as if he were doing violent exercises—almost a hundred times as fast as its rate in dormancy. During this bursting awakening, clumps of brown fat in specialized body tissues seem to be the key to supplying the heat and energy necessary for such action.

In a process that may take two or three hours, or maybe a few minutes, the animal awakens to the world again—a world of

warm sun, germinating plants and resurgence of life.

### Man Seeks Secret

In an effort to protect himself from the stern vicissitudes of winter, man has imitated various activities of animal life. He sometimes goes south like the swallows and whales, or simply puts on heavier coats like the caribou or asses. Like mice and other rodents, he has learned to store excess food in the pantry when outdoor fields lie barren. He seems to have balked, however, at calmly passing the winter simply by freezing, like fish, frogs or mosquito larvae.

Now, with his eyes on space travel and the stars, man is also watching the humble earthy woodchuck to understand his mysterious secret of hibernation.

• Science News Letter, 84:262 Oct. 26, 1963

### GENERAL SCIENCE

## Monkey Research Center To Cost About \$2,000,000

➤ IF MONKEYS could talk, the chief topic of status symbol conversation these days would be about the awarding of a contract for building the Delta Regional Primate Research Center near Covington, La.

The Perrillat-Rickey Construction Company, Inc., of New Orleans was given the contract for the center, which will be built at a cost of \$1,918,842. Architects are Freret and Wolf, also of New Orleans.

Six universities will be associated with Tulane University, which is responsible for the center's operation and administration under a \$5,461,000 grant from the National Institutes of Health, Bethesda, Md.

Director of the center, whose initial research will include infectious diseases, developmental biology, genetic development and behavioral problems, is Dr. Arthur J. Riopelle. Dr. Riopelle was formerly director of the Yerkes Laboratories of Primate Biology, Orange Park, Fla.

The primates would chatter away in anticipation of the animal food preparation room, two operating rooms, recovery room, 45 individual laboratories and a nursery.

Not only will the animal primates serve as models for humans, their own physical and psychological problems will be studied.

The six universities to be associated with Tulane in the research are Louisiana State University, Loyola University, University of Alabama, University of Mississippi, University of Texas and University of Arkansas. Other universities are expected to participate later.

• Science News Letter, 84:269 Oct. 26, 1963



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### VETERINARY MEDICINE

## New Virus Discovered In Race Horse Disease

➤ A NEW INFLUENZA VIRUS has been linked to a highly infectious respiratory disease involving large numbers of race horses in Florida.

This virus is different from previously recognized respiratory viruses of horses, reported Dr. G. H. Waddell of the Variety Children's Research Foundation in Miami, Fla., Dr. M. B. Teigland, veterinarian from Opa-locka, Fla., and Dr. M. M. Sigel, department of microbiology, University of Miami, Coral Gables.

Outbreak of the disease occurred suddenly last year, and affected as many as 70% of all race horses three years of age and older stabled in Southern Florida, the doctors reported in the Journal of the American Veterinary Medical Association, Sept. 15, 1963.

They suggest that the virus be called A/equi/Miami/63.

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