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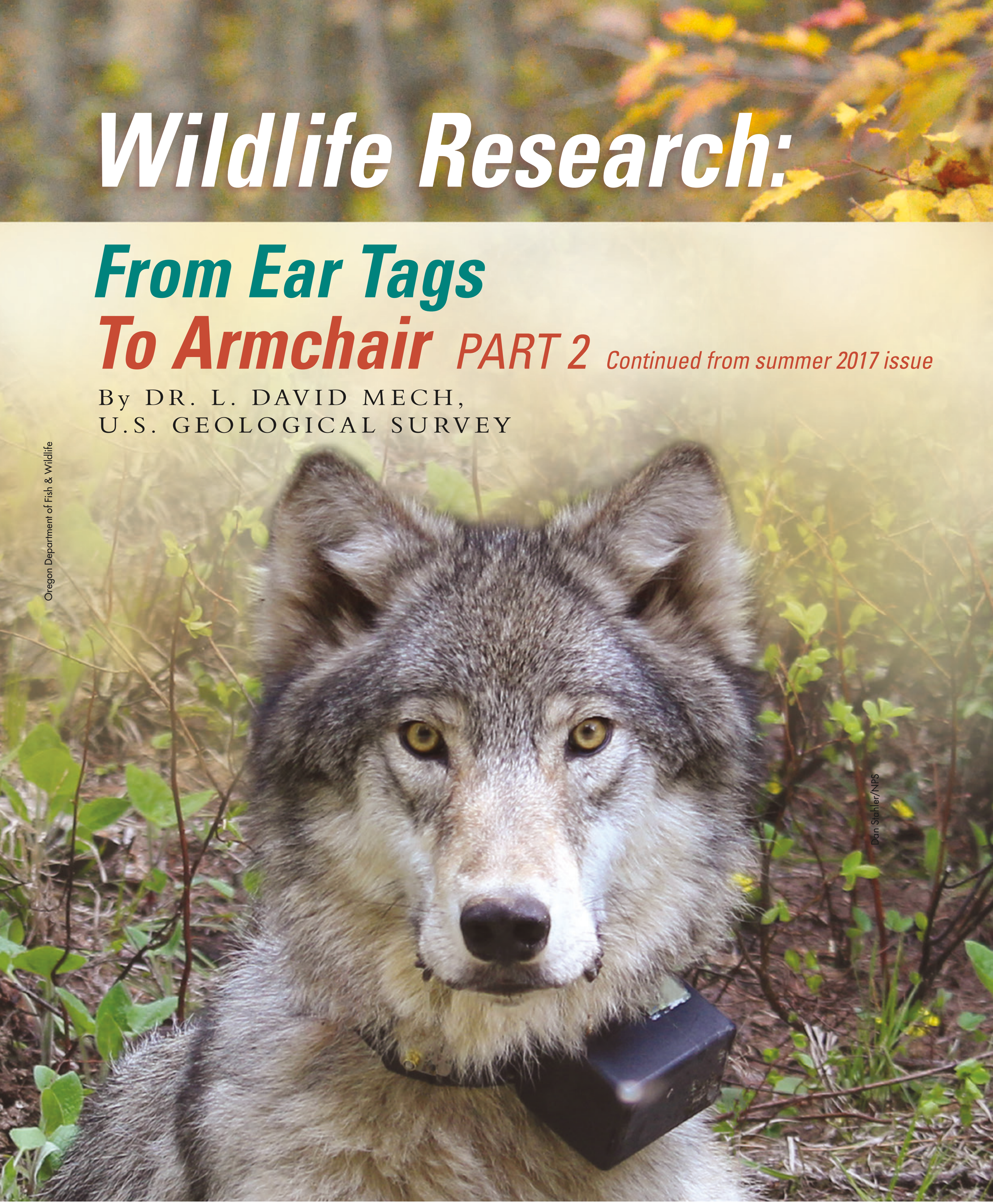
Wildlife Research:

From Ear Tags To Armchair PART 2

Continued from summer 2017 issue

By DR. L. DAVID MECH, U.S. GEOLOGICAL SURVEY



Oregon Department of Fish & Wildlife

Dan Stahler/NPS

In Part 1, veteran biologist L. David Mech described how, before the development of more modern techniques of darting animals, radio-collaring them and studying their locations by radio-tracking, biologists could only ear-tag or band them and hope they were found again elsewhere. To track bears, they had to catch them, tie them up and inject the drugs into the abdomen. In Part 2, the author brings us up to date on current methods of studying wildlife movements.

Of course, for every species of wildlife a different technique was used. Not all had to be tied up and injected intraperitoneally (in the abdomen). Smaller animals could be captured in cage traps and anesthetized with ether or chloroform. Other species were too large to be tied up and couldn't be ear-tagged at all. Not until better drugs became available, that is.

In the early 1970s drugs were developed that could safely be injected into an animal's muscles. One could mount a syringe full of these drugs on the end of a stick and barely poke the trapped bear or other animal caught in a steel-foot trap or a cage trap. Or such drugs could be delivered by darts from a special dart gun. For years biologists had been experimenting with darting procedures, using a drug that could be injected intramuscularly. That drug was dangerous to an animal's heart and not practical to use on most species, but the drug-delivery technology was already available when the newer, safer drugs appeared.

So began the era of television documentaries featuring folks darting lions, rhinos and even elephants. As indicated in Part 1, things don't always work so smoothly as on TV. Hit the animal in the wrong place—for example, the belly—and the dart can drive right into the animal and kill it. Even with a well-placed hit in the muscular hip, it takes several minutes for the drug to take effect and the animal to drop. In the meantime the creature can run great distances and might not ever be found.

Some animals present special problems. For example, drugged elephants often remain standing, and the biologist must push them over. This practice requires keen judgment to be certain the animal is really drugged. One acquaintance of mine tried to push over an elephant he had darted in Kenya, and to his great dismay found the animal fully conscious. The elephant whacked him over with his trunk and stepped on his thigh, crushing it. Only after many surgeries did my acquaintance ever get back to walking—albeit with quite a limp.

Just as anesthetic drugs have greatly improved since I began tying up bears, so, too, has technology for studying animal movements. Even in the late 1950s, when we were handling spread-eagled bears, we were measuring their neck circumferences because we were already anticipating the invention of tiny radios that could be mounted in a collar. By the early 1960s several groups were trying to develop such a device. A biologist with the Illinois Natural History Survey, Rexford D. Lord, inquired of a budding electronic genius, William W. Cochran, if he could make such a device for a cottontail rabbit. Cochran replied "You mean no one has done it yet?" He then proceeded to produce such a collar, and their jointly-published paper *A Radio-tracking System for Wild Animals*, launched a radio-tracking revolution in 1963.

It took a few more years for biologists and engineers, working together, to refine the radio-tracking technique, including building collars that would withstand not only the elements but also wear-and-tear inflicted by the animal. And to work on a great variety of wild species, radio attachment devices had to be tailored differently for various creatures. Rabbits scratched through collars with their hind feet until tough-enough compounds were found to protect the collar. External "whip" antennas worked perfectly well on deer but snapped off quickly when used on wolves. Birds posed a separate set of problems. Tiny harnesses were developed for them. Some transmitters were attached with glue to the back of a bird, and others to a bird's leg. For animals without much of a neck, like badgers, transmitters had to be implanted inside their bodies.

Nevertheless, after several years techniques were perfected, and species from dragonflies to whales are now being tracked by radio. Although there have been many improvements and refinements in radio-tracking devices over the years, a basic VHF (very high frequency) radio-tracking transmitter is now the

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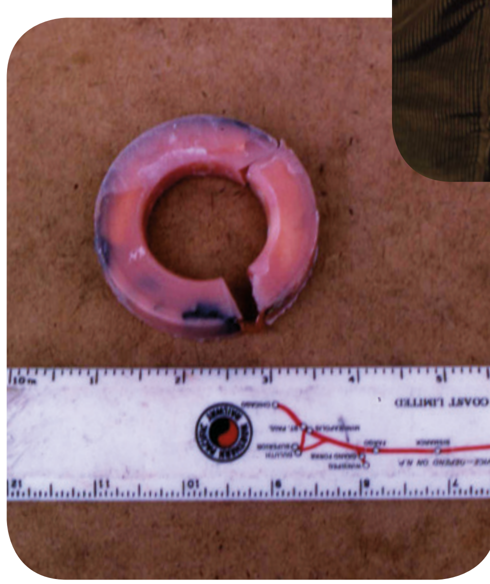
Above – Transmitters are often glued to a bird's back, such as the one on this saw whet owl.



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Left – One of the first radio collars successfully used for long periods on cottontail rabbits was molded in dental acrylic.

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most commonly used wildlife research device. Manufacture of radio-tracking equipment is an annual multi-million-dollar business.

One of the ingenious refinements that flourished for several years in the 1960s was an automatic radio-tracking system, yet another invention developed by Bill Cochran, whose earlier work launched the tracking revolution. This system involved two towers one-half mile apart with directional antennas that rotated every 45 seconds. The antennas fed signals from radio-tagged animals living within a few miles of the towers into a bank of radio receivers where the signals were converted to optical displays that were then recorded on microfilm. Thus, the locations of these animals were recorded every 45 seconds, leaving virtual trails of the animals' movements. Foxes, deer, raccoons, rabbits, snowshoe hares, skunks and badgers were all tracked with this system, and much interesting information about their movements was learned.

Another major variation on the basic radio-tracking idea soon came along in the form of tracking radioed animals from satellites. Instead of a biologist listening for an animal's signal from the ground or from an aircraft, a satellite detected such signals, and using the Doppler shift (the same principle that changes the sound of an aircraft flying by) the satellites calculated where on Earth the signal came from. Because it takes far more power to send a signal from an animal's collar to a distant satellite than it does to merely send a signal a mile or so to a listening biologist, satellite transmitters had to use much larger, heavier batteries. The first such collars weighed over 20 pounds, and thus could be used only on the largest animals. Continual advances in technology now allow satellite transmitters to track birds as small as an ounce.

Fancier versions of wildlife telemetry (used for more specialized purposes) included a backpack system attached to monkeys or other primates that allowed researchers to send radio signals to the creatures' brains via lead wires attached to their skulls. Another innovation was a capture collar containing two darts hooked to the radio-tracking system; it allowed a biologist to remotely dart an animal by sending a signal to the collar, firing one of the darts. The other dart was a backup in case the first failed. It was an interesting sight, indeed, to be watching from an aircraft as a wolf-pack member wearing such a collar experienced the dart firing. As the pack would travel along single file over a frozen lake, suddenly the darted member would jump, star-

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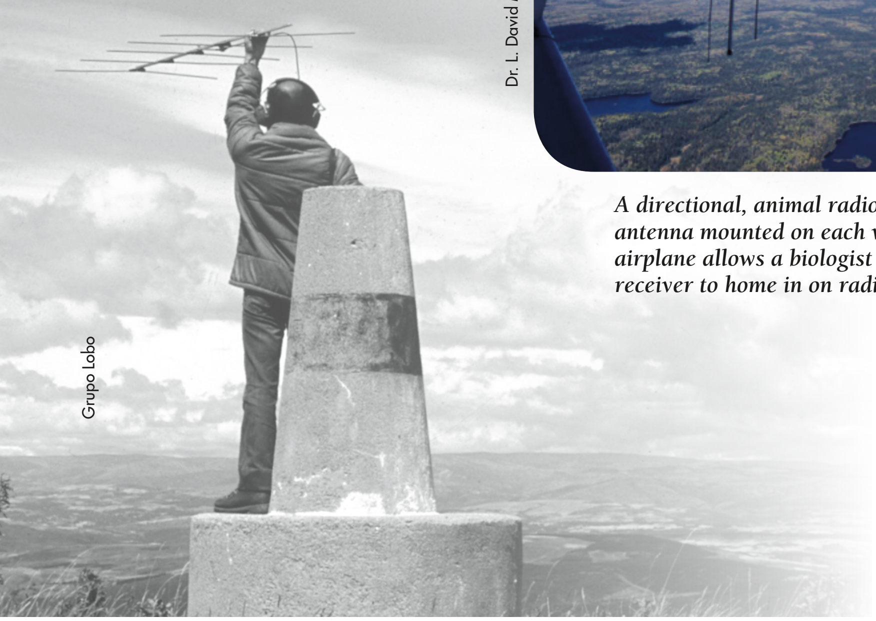
A directional, animal radio-tracking antenna mounted on each wing strut of an airplane allows a biologist with a special receiver to home in on radioed animals.



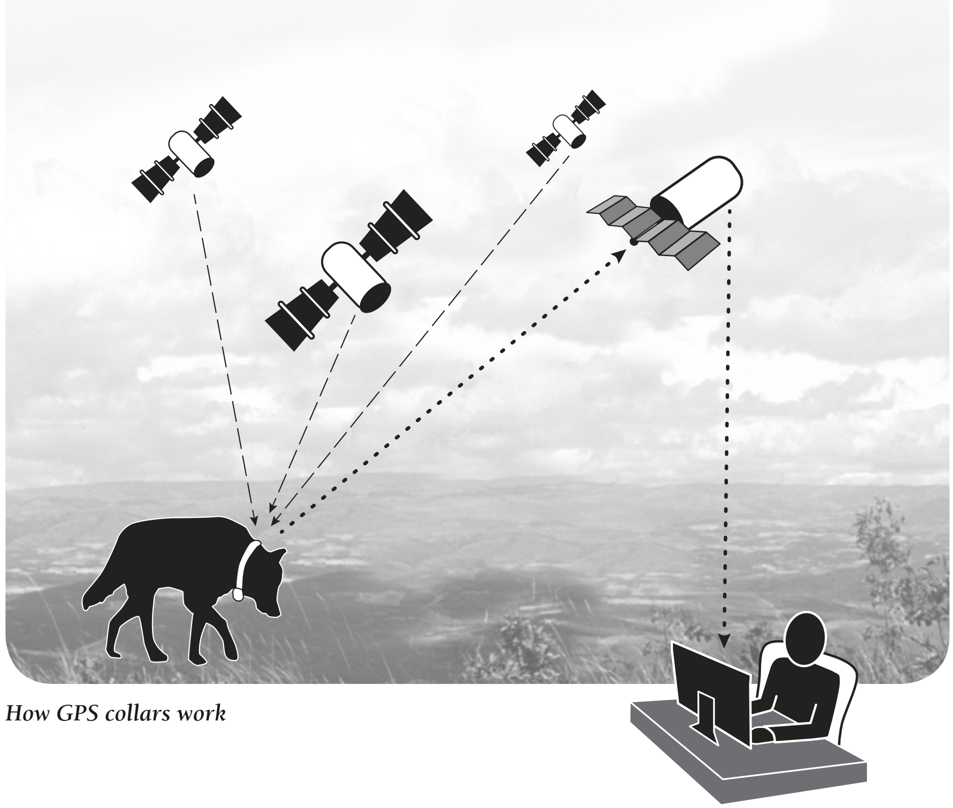
Grupo Lobo

tling his associates, stumble around and finally collapse. As the dazed wolf dozed off, the other pack members appeared to think it was taking a nap and continued on their merry way.

Biologists on the ground would home in by radio on the wolf's collar and begin their regular examination of the wolf, including weighing and blood-sampling. Being able to capture the same animal regularly over long periods allows scientists to keep close track of the animal's condition over time, as well as to collect several other kinds of data.

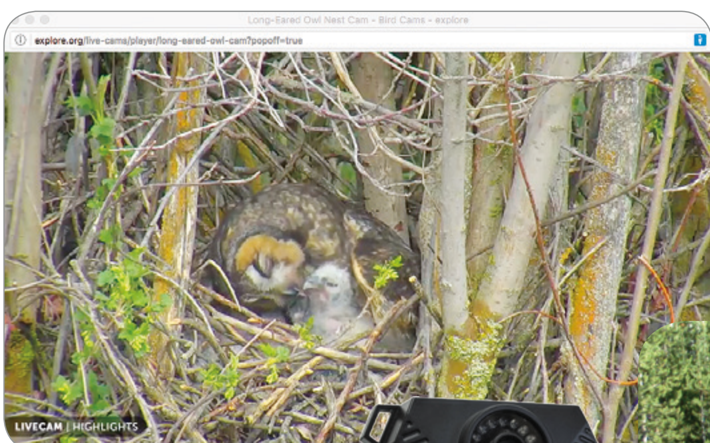
The current rage is use of the GPS collar. Versions small enough for Canadian lynx now allow tracking an animal every hour or so for several months. Larger, heavier collars (with more batteries) used on wolves, bears, elk and similar-sized species record the animal's location, date and time via one set of satellites and then relay those data back to the biologist's computer by a different satellite. A special program allows the biologist to superimpose the data points on a map of the area or even on a detailed satellite photo from Google Earth. This space-age spying, now being put to good use by scientists like Doug Smith in Yellowstone, along with Dan MacNulty's experimental webcam system at the University of Minnesota, promise to greatly accelerate our knowledge-gathering about various elusive denizens of the wilderness.

As we modern biologists sit back in armchairs and scrutinize the wealth of data coming in, pondering the meaning of it all, I think back on the days of the spread-eagled bears and their shiny ear tags and marvel at how far we've come with wildlife research in this past half-century. It is truly mind boggling to imagine where we will be with these techniques 50 years from now. ■



How GPS collars work

Dr. L. David Mech is a senior research scientist for the U.S. Geological Survey and founder and vice chair of the International Wolf Center. He has studied wolves for more than 50 years and has published several books and many articles about them.



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Trail cams and webcams are all the rage now, providing information formerly difficult or impossible to get. Trail cams have documented wolves in California, and webcams commonly allow the public to peek into eagles' nests.