

# Smithsonian

March 1992



**William Harnett's art**  
A century later, it still  
fools our eyes (p. 52)

By Nancy Shute

## The lab sleuths who help solve crimes against wild animals

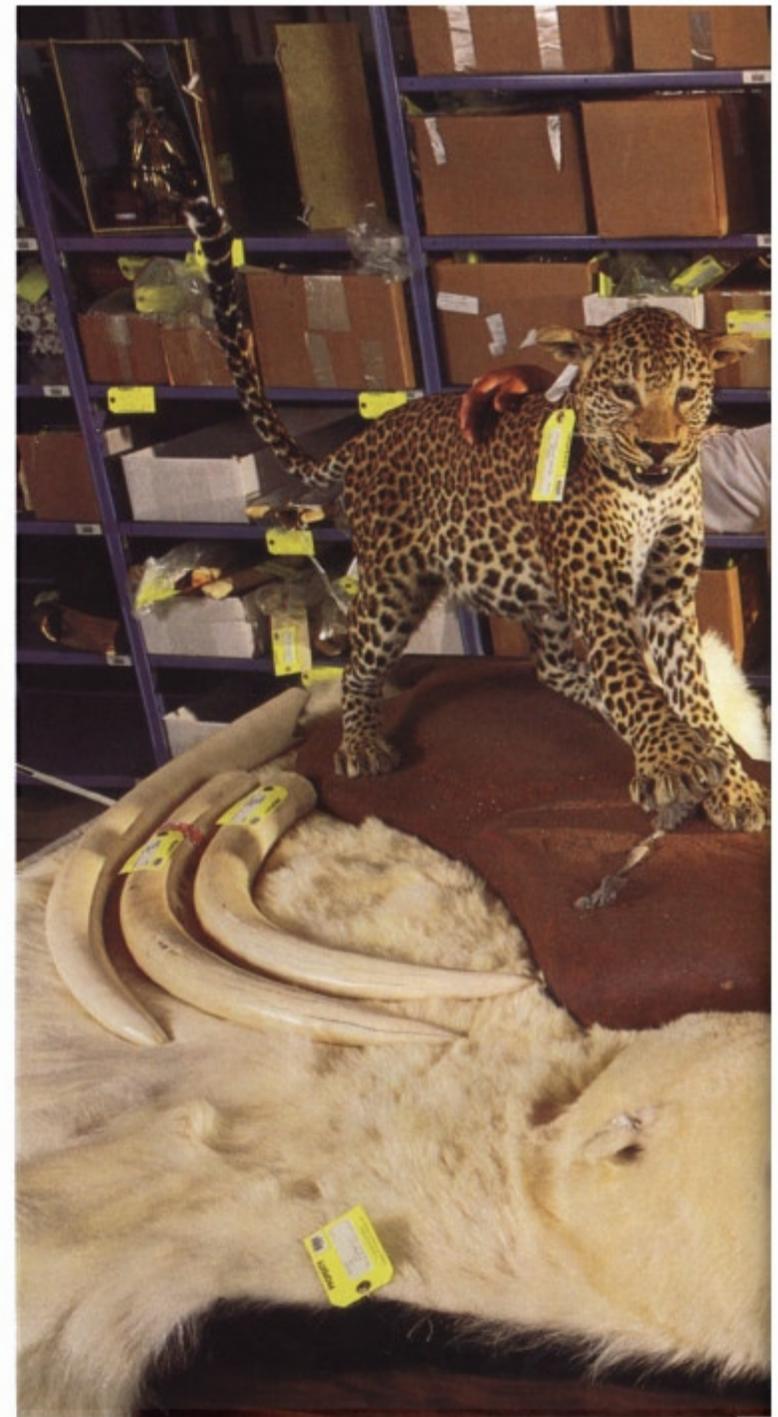
*It's not yet three years old, but already this state-of-the-art forensics lab is hailed as the Scotland Yard of endangered species*

The Bengal tiger staring balefully from the top of the stainless-steel counter is in no condition to harm anyone who ventures near, since all that remains of him is his head. The creature, dead for eight months, was killed under suspicious circumstances in Texas, and now three criminal investigators at the National Fish and Wildlife Forensics Laboratory in Ashland, Oregon, are about to find out how. Nancy Thomas, a veterinary pathologist with the U.S. Fish and Wildlife Service (USFWS), steps up to the counter. Thomas is on loan from the National Wildlife Health Research Center in Madison, Wisconsin. Wearing a lab coat, a plastic apron and latex gloves, she calmly peels back the big cat's orange-and-black fur, picks up a plastic-handled scalpel and starts carving into the massive musculature. Ed Espinoza, the lab's chief criminalist, holds a six-inch plastic ruler along the head for scale, while Kent Oakes, a senior forensic scientist, snaps pictures. A tape recorder protected by a plastic bag hums on the counter. "You see the perforation?" Thomas asks, pointing at the newly exposed ear canal.

She removes the ear. Espinoza picks it up and peers in. "These guys had an awfully good aim if none of this is scratched," he observes.

"Well," Oakes says, "if the tiger was sleeping . . ."

"They wouldn't bump into anything until they were pretty far down, where the ear canal would take a turn," Thomas comments, pointing to a bony ridge in the skull. "So somehow they found this and introduced the ice pick there, if that's what they did." She gently

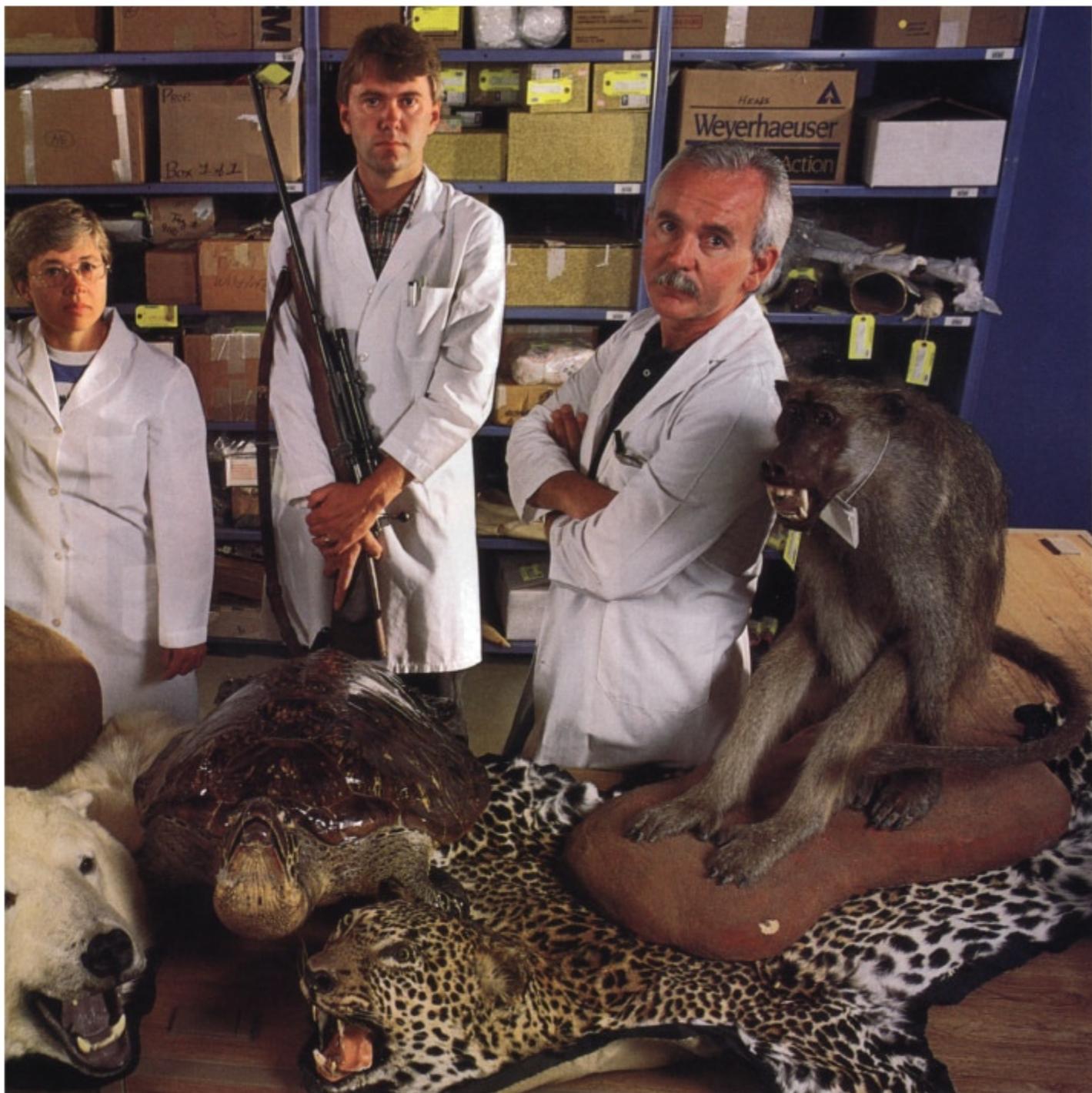


Illegal wildlife goods surround three staff members at the National Fish and Wildlife Forensics Laboratory.

scrapes more flesh from the skull, revealing a tiny perforation in the bone. "We didn't do that," she says.

Oakes cranes over her shoulder. "It is an interesting hole in that it's not consistent with a stabbing type," he notes. "There's no fracture."

"Yes there is, a bit," Thomas replies. She scrapes again. "Bingo!" she cries, pointing to a line of perforations running from the first. She stands back as Oakes takes a few more photographs. "What we've got to do



Both Rhoda Ralston and Darrell Hegdahl, holding a rifle used in tests, are technicians. Tom Rayl (right)

is chief of the lab's evidence and property section. The shiny creature in center is a mounted green turtle.

is find out whether the animal was alive when these holes were made," Thomas says. "I don't know if we'll be able to see much damage to the brain." She reaches for her bone saw.

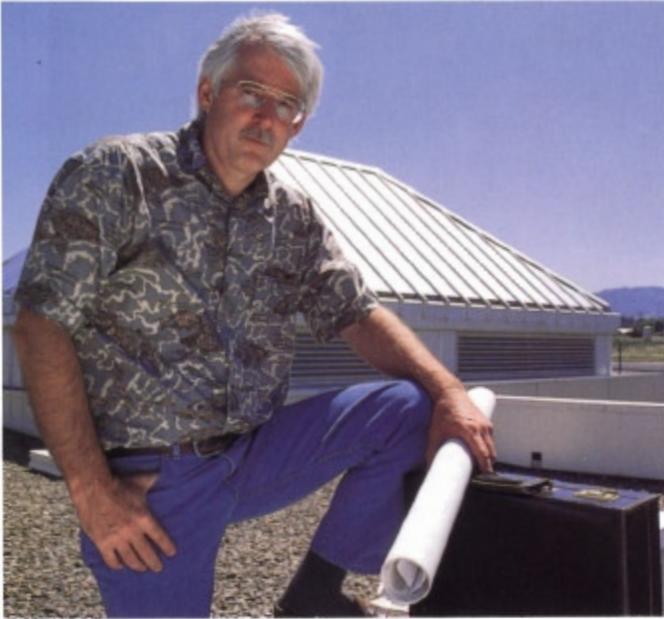
Half an hour later, the tiger's brain lies exposed on a plastic cutting board. "I think we've got it," Thomas declares, beaming. "These are the lateral ventricles, and they're all full of blood. Any jury member should be able to see this." The hemorrhaging visible there

and elsewhere in the brain indicates that the animal was indeed alive when the holes were made. The doctor bounces on her heels like a 5-year-old. "It's satisfying, it's just so satisfying."

Ed Espinoza takes a last look at the remains of the tiger in the sink. "When they first brought him in he looked so majestic."

Tiger necropsies are all in a day's work at the Oregon lab. Although it has been in operation for less than

*Photographs by Randall Hyman*



Director Ken Goddard holds blueprints of the facility that, jokers said, previously existed in his briefcase.

In serology lab, Steven Fain inspects blood and tissue samples used to ascertain animals' DNA "fingerprints."



three years, this highly specialized facility is already recognized as a key resource in the battle to curb contraband traffic in wild animals and wildlife parts and products—a worldwide problem that's getting worse. The legal trade in everything from Australian kangaroo hides and live lovebirds from Tanzania, to tropical fish from Southeast Asia and lizard shoes from Argentina, is a big business, with annual revenues conservatively estimated at about \$6 billion. The illicit traffic involves the smuggling and killing of endangered or protected species, and the illegal taking of other animals. It is thought to be generating somewhere between \$2 billion and \$3 billion a year. A "record book" elk head may bring \$20,000, a tiger skin \$10,000, and a bear's paw and gallbladder (used in Oriental medicines) up to \$5,000. Objects fashioned from unlawfully killed creatures range from the beautiful to the bizarre: elephant-trunk ice buckets, jewel-encrusted sea turtle heads, toad coin purses with zippers up the tummy, and stools made of elephant feet.

The lab gets involved in a case when federal, state or international law-enforcement officials uncover evidence—perhaps a finished product or maybe just the remains of a dead animal—that requires identification or forensic analysis. "These cases are complicated and difficult to prosecute," says James Kilbourne, chief of the agency in the Department of Justice that handles

violations of U.S. wildlife laws and international wildlife treaties. There are seldom any witnesses to such crimes; they usually take place in wild and remote areas; the evidence often does not turn up until long after the crime itself has been committed, and by then it may well have been damaged or radically altered. "The forensics lab gives us the capacity to become a great deal more sophisticated in our investigations," Kilbourne says.

Forensic science is the application of the physical sciences to the evaluation of evidence for judicial consideration. Its historical roots can be traced back to the origins of legal medicine in sixth-century China. However, it was Sir Arthur Conan Doyle's fictional detective Sherlock Holmes, according to Richard Saferstein's *Criminalistics: An Introduction to Forensic Science*, who "applied the newly developed principles of serology, fingerprinting, firearm identification, and questioned-document examination long before their value was first recognized and accepted by real-life criminal investigators." Today there are about 350 federal, state and local crime labs in the United States. They are able to analyze physical evidence ranging

*Nancy Shute wrote in August 1991 about a group of Unalaskans who crossed the Bering Sea for a reunion with their kinsmen in the Soviet Far East.*

from a simple set of fingerprints on a glass to the complex genetic “fingerprint” contained within a human cell. “In traditional testimony juries have to rely on the perceptions of others, but forensic evidence often proves irrefutable,” says John Hicks, assistant director of the laboratory division of the FBI, which pioneered the use of DNA fingerprinting in the United States.

Wildlife-crime busters have come to rely on this kind of evidence, too. Increasingly, they are finding themselves up against international networks armed with high-tech weaponry and electronic gear—poachers, for example, who use scientific tracking equipment to locate hibernating radio-collared bears in the Appalachians. Physical traces of such crimes are hard to come by and often fragmentary in nature. In the old days—five or ten years ago—agents found themselves begging for forensic backup. “We relied on museums and universities,” says John Neal, one of the 205 agents of the USFWS who investigate federal crimes against wildlife. “But they’re not forensics experts.” Some wildlife cases were lost because of delays in getting solid forensic evidence; others were never prosecuted.

#### *A biochemistry major turned cop*

In 1979, the USFWS hired Ken Goddard, then chief criminalist of the Huntington Beach, California, police department, to set up a wildlife forensics lab. A criminalist is an expert in the scientific study and evaluation of physical evidence in the commission of crimes. Before Goddard got into police work, the closest the genial biochemistry major had ever come to it was when he took a judo class from a Riverside County, California, deputy sheriff during college. After one particularly strenuous session, the deputy had to drive Goddard to the hospital. On the way, he leaned over and growled: “Ever think of becoming a cop?” He ended up chauffeuring his dazed recruit directly from the emergency room to a job interview.

Goddard spent the next ten years scouring the sites of humanity’s most heinous acts in search of the subtle clues that link victim, suspect and crime scene, the holy trinity of detective work. He was intrigued by forensic science’s heady mix of laboratory precision and true-crime thrills, but he never did master the macho imperatives of law enforcement. For example, helping other officers quell a disturbance in a saloon one day, he suddenly found himself facing an angry brawler wielding a beer bottle. “No, wait!” he yelled. “I’m the scientist!”

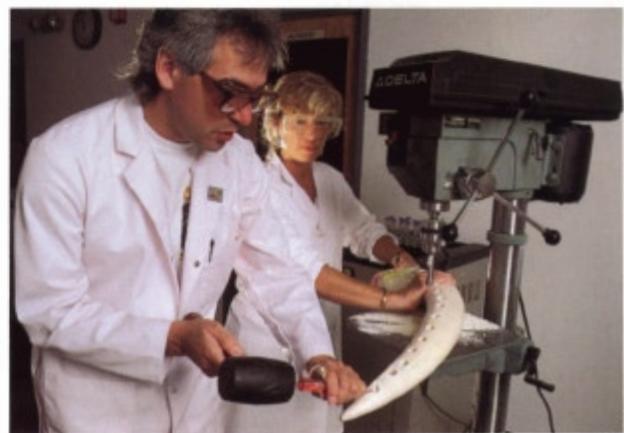
When he arrived in Washington, D.C., Goddard discovered that the USFWS had not yet asked Congress for funds to pay for the forensics lab. For eight long years, the joke at headquarters was, “Ken Goddard’s briefcase is the forensics lab.” He vented his frustra-



Forensic ornithologist Beth Ann Sabo matches feathers on a craft item with those of a snowy owl specimen.



Peter Dratch compares protein profiles of different deer species with profiles of unknown tissue samples.



Ed Espinoza and JoAnn Shafer take core samples from an elephant tusk as part of research on dating ivory.



Unlawfully imported snakeskin sneakers, python hide, were seized by inspection officials at ports of entry.

tions by writing *Balefire* and *The Alchemist*, a pair of crime thrillers notable not only for their vivid scientific methodology but also for an alarmingly high body count among law-enforcement officers.

It wasn't until the state of Oregon loaned land on the campus of Southern Oregon State College in Ashland, a bucolic little town of 16,000 tucked into the foothills of the Siskiyou Mountains, that Congress appropriated the \$4.5 million needed for a state-of-the-art laboratory. The 23,000-square-foot building was completed in the fall of 1988; it took more than another year for Goddard to recruit the dozen scientists and support staff he would need to create a new discipline: wildlife forensic science.

Half of the troops came from police crime labs, the other half, from museums and universities. "This had never been done before," says Goddard, a tall, white-haired 45-year-old who pads around the lab in jeans and sneakers, talking in overdrive. "It's fascinating research. The science is really cutting-edge. Then we immediately jump into the ice-cold real world of the judicial system. It's fun. It's a pure kick."

Wandering the lab's skylighted halls is a kick, too. In the conference room Irene Brady, a nature writer and illustrator in her spare time, huddles over a table with two special agents sorting slides of oil-blackened otters and eagles. Brady will use them to design courtroom exhibits for a federal oil-spill lawsuit.

#### *A freezer stacked with eagles*

The technical support section is stocked with video cameras, tiny microphones and homing devices for undercover operations. Tom Rayl, chief of the evidence and property section, presides over a cavernous warehouse at one end of the building that is cluttered with sea turtle mandolins, eagle-head paperweights and other gewgaws. Many of them have been confiscated from unwary tourists. A walk-in freezer is stacked to the ceiling with stiff bodies of bald and golden eagles. This is the National Eagle Repository. The birds, many of which were killed illegally or by accident, are kept here while they await distribution to native Americans, who convert them into religious artifacts.

The morphology lab is where wildlife and various parts and products are visually and microscopically identified. Chief morphologist Stephen Busack and geneticist Peter Dratch laugh and curse as they wrestle a six-foot-long cougar out of a freezer. Beth Ann Sabo, a forensic ornithologist who apprenticed for eight years with Roxie Laybourne, the legendary feather expert at the Smithsonian's National Museum of Natural History, sits quietly in a corner, sorting a stack of red-tailed hawk feathers. "In a wildlife crime, the evidence tends to be part of your victim," Goddard explains. "The big



Two examples of how grotesque illegal wildlife "products" can be: a bejeweled hawkbill turtle head (left) and the beak of a young bald eagle. They are meant to be used as paperweights.

job is to relate the parts and products to the species."

To that end, the morphology section is assembling a huge collection of animal feathers, skin and bones that can be used to help identify crime victims. It is also searching zoos and universities around the world for known specimens of wild animals that have commercial or sporting value. "Crocodilian purses come in all the time, but I don't have a complete 'library' of crocodilian standards," explains Busack, a herpetologist. "We have to demonstrate beyond a reasonable doubt what species a purse is made from. If we can't do that, we're going to lose cases."

The serology section and its DNA unit identify wildlife, too, but by a bit of blood or tissue or even a few cells. When he's not wrestling with frozen cougars in the morphology lab, Peter Dratch, an authority on deer genetics, is assembling a bank of tissue samples of the large game animals that are often involved in hunting violations. From that bank, Steven Fain, a DNA expert, is creating a genetic database of DNA "fingerprints" that can be used to identify crime victims. He figures it may take five years of collection and research before he can fingerprint and interpret a dozen species.

The lab's criminalistics section employs forensic techniques that are familiar to any viewer of *Quincy, M.E.* or other television crime dramas. These include detecting gunshot residues and mapping a bullet's trajectory through flesh.

The facility's first and greatest success involved the simplest of questions: What is ivory? In June 1989, a worldwide ban on trading ivory from the endangered African elephant went into effect. A similar ban on ivory from Asian elephants had been established in

1976. This meant law-enforcement officials had to be able to distinguish elephant ivory from other kinds. "The law caught us with our pants down," says Ed Espinoza, a chemist and criminalist who taught forensic science and consulted in homicide investigations in Northern California before joining the lab. "No one had ever defined ivory scientifically."

Ivory traders had it all figured out. Shortly after the ban went into effect, shipments of elephant ivory misleadingly labeled "mammoth" began showing up at ports around the world. The challenge for Espinoza and his colleagues: learn how to tell the difference between modern elephant ivory and Ice Age mammoth ivory, which is legal to trade. "We tried all kinds of stuff," Espinoza says, playing with the age-yellowed ivory carving of an old Chinese man that sits on his desk. "On very old samples, the outsides fluoresced under ultraviolet light. We were all excited about that until we got a shipment in which the outsides had been removed."

Eventually Espinoza noticed differences in the angles of the grain lines, called Schreger lines, in cross sections of ivory from ancient and modern beasts. "The biggest problem was explaining why." For that, Espinoza turned to his colleague Mary-Jacque Mann, a senior forensic scientist who spent ten years as a scanning electron microscopist at the Smithsonian. Schreger lines are created by undulating rows of hollow tubes, called dentinal tubules. Mann's microscope showed that in ancient ivory, these tubules were packed much more densely than in modern elephant ivory. When mammoth ivory is carved, cross sections are exposed to reveal Schreger lines that form angles of 90 degrees or



Peering into microscope and taking notes, Espinoza examines a polar bear skin for incriminating evidence.

less. In modern elephant ivory, they form angles of 115 degrees or more. Measure the angles and you've got your beast. Within five months, Espinoza and company had solved the mystery. "It's a very simple, nondestructive way of positively distinguishing these two kinds of ivory," he says.

But the work didn't stop there. Espinoza's people went on to look at all of the different types of ivory and ivory substitutes, and came up with a set of physical descriptions that distinguish one type from another. The result: a handy little guide that can be used by just about anyone.

When Rich McDonald got the call from Olympic National Park in Washington, he knew it was going to be bad. A ranger there had just found the carcass of a spotted owl nailed to a sign at the park entrance with a typewritten note attached to its breast: "If you think your parks and wilderness don't have enough of these suckers: plant this one." As a USFWS special agent covering the Pacific Northwest, McDonald had spent years patrolling the Olympic Peninsula's dense forests and remote logging towns. "It's one of the last strongholds of the old Wild West," he says. Killing the owl, a mottled brown-and-white bird that has become endangered as its old-growth forest habitat was logged, was a federal crime. Beyond that, it was an attempt to further inflame relations between the region's already-polarized loggers and preservationists.

The perpetrator didn't leave many clues: a Band-Aid, two beer cans, a soda can, a nail, a match. McDonald immediately shipped the evidence to Ashland. "It's just like an investigation of a human murder," the special agent says. "The only difference is you

can't go out and interview who the owl was drinking with the night before."

In the search for clues, the lab x-rayed and necropsied the owl carcass, tested the Band-Aid for blood, and scanned the note and cans for fingerprints. It reported back to McDonald that a high-powered rifle had been used to kill the bird, and told him that the creature, an immature male, had been kept in a freezer for some time. McDonald withheld the lab's findings from the press. He figured a \$16,000 reward might shake some information loose, and then maybe the lab's report could verify it. But nothing happened.

McDonald knew what he had to do next: get in his battered Chevy Blazer and go work the small towns of the peninsula, just as he had so many times before. In his long career as a special agent, he had spent countless hours routinely checking hunters' licenses and bag limits, but he had also hidden in an attic crawl space above a room where an informant was talking to a suspected poacher who had threatened to blow that informant's head off. McDonald had also arranged undercover wildlife "buys" as elaborate as those involved in any big-time drug bust. In the process, he had been shot at, and his family had been threatened. It's a grim fact that wildlife agents are more likely to be assaulted in the line of duty than are other law-enforcement officers. "Everyone we contact is armed with some kind of weapon," McDonald says. "And we're usually interfering with somebody's 'God-given right' to get out and hunt and fish." Still, he wouldn't trade his job for the world. "It's 99 percent dull routine—and 1 percent sheer terror."

#### *Elk proteins on a bloody knife*

Even when the lab is given next to nothing to work with, the experts there are often able to come up with amazing results. Take the case of the hunter who pleaded guilty to killing an elk out of season. A year later the case was overturned on a technicality and remanded for trial. But by then, the evidence, the elk, had been disposed of. The authorities still had a bloodstained knife, which they sent to Ashland for analysis. Using immunodiffusion (a common crime-lab technique that compares antibodies) and electrophoresis (a standard genetic technique that identifies different forms of proteins), the scientists were able to establish that it was indeed elk blood on the knife, and the defendant was found guilty.

McDonald also turned to the lab when he needed help explaining to a grand jury an intricate undercover operation against Columbia River sturgeon poachers. For a year he posed as an affable former logger who bought and sold illegally caught sturgeon out of the back of his truck, making deals 24 hours a

day with a cellular phone and an answering machine. The gigantic fish, many 150 or 175 years old, are sold for their caviar at prices up to \$3,100 each. Since the poachers concentrate on the older, breeding fish, the black market threatens the survival of the species.

When it was time to close down the operation, McDonald had to wear a concealed tape recorder and try to trick one of the bad guys into telling him where the records were kept. When 70 local, state and federal officers finally closed in, he had to maintain his cover. "I'm getting out of here," he yelled. His fellow officers searched him and nabbed his driver's license before setting him free. Subsequently, the lab prepared elaborate flow charts tracking the black market operation, based on the information provided by McDonald. Those exhibits helped make the complicated case clear to the jury and were instrumental in obtaining convictions.

Notwithstanding the lab's input, the mystery of the spotted owl on the Olympic Peninsula has not been solved. In fact, two more of the birds have been killed and two "look-alike" barred owls as well. On other

fronts, however, progress is being made. The demand in the Orient for medicinals concocted from bear gall-bladders has fueled a sharp rise in poaching in the United States. In response to that, the folks in Ashland have developed a foolproof way to identify bear gall-bladders, thus ensuring that enforcement activities will receive solid scientific support.

As for that Bengal tiger, the lab's investigation revealed that the drugged animal had been stabbed in the brain with an ice pick. The fastidiously documented findings backed up testimony that the defendant, once the proprietor of a business specializing in exotic wildlife decor, was killing tigers he had purchased from a petting zoo and selling the hides.

Faced with the evidence, the man pleaded guilty to a violation of the Endangered Species Act and was sentenced to a year in jail. "We're very happy," says agent John Neal. "The people at the lab made the case much, much stronger. Within two or three months they had done their research, they had people ready to testify, and they had prepared effective courtroom displays. It was a very professional job."

Bald eagle is one of many found dead and sent to the lab. The remains are held in a freezer until they

can be given to native Americans, who use them in preparation of artifacts for religious ceremonies.

