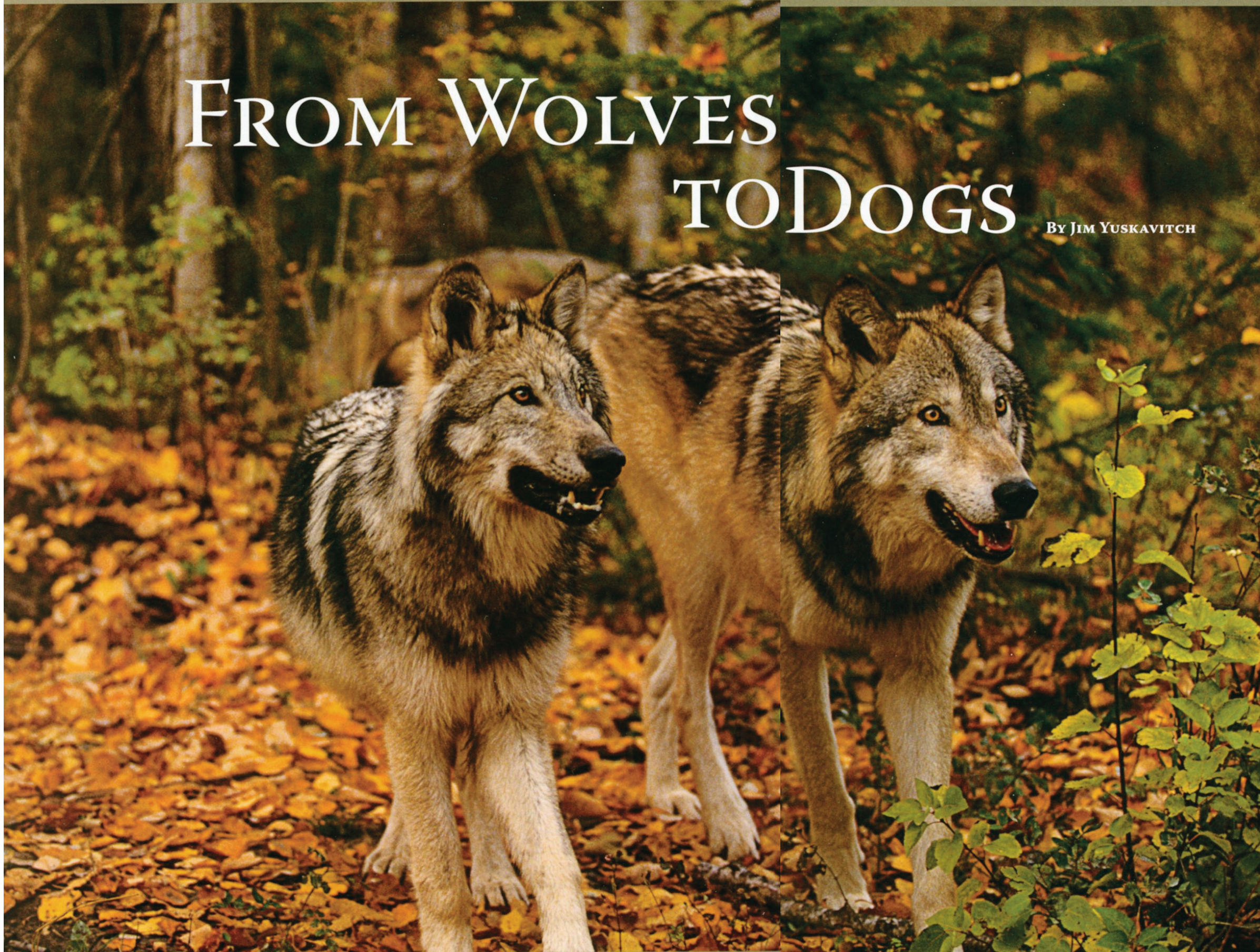


FROM WOLVES TO DOGS

BY JIM YUSKAVITCH



Scientists work to solve the puzzles of the origin of “man’s best friend”

How did a wild, wary and intelligent predator turn into one of humankind's most beloved companions?

One conventional story begins in Europe many millennia ago, with a band of Stone Age nomads gathered around their campfire as the primeval forest grows dark around them. The women roast mammoth meat over the flames while the men knap stone spear points, preparing for the next day's hunt. At the edge of the campfire's flickering glow, children play with a small creature—a wolf puppy the clan picked up on its travels, perhaps stumbling upon an orphan or stealing it from a den. That wolf pup will be tamed and eventually bred with other human-adopted wolves—out of which will arise the domestic dogs we know today.



There is little doubt that man's best friend—*Canis familiaris*, in the scientific parlance—descends from wolves, and it was likely the first animal to be domesticated. But much else about this conventional story of the origin of dogs has been thrown into doubt. In recent years, researchers using techniques ranging from DNA analysis to behavioral investigations have uncovered evidence that potentially paints a much different picture of when, where and how dogs first became an integral part of the human experience.

The idea that some kind of "wolf dog" may have been a companion to Stone Age peoples is derived from discoveries of

100,000-year-old canid bones and skulls at a European archaeological site. These finds hinted dogs may have diverged from wolves by that time and might have been domesticated as well. Some genetic research in the 1990s supported the notion that dogs split from wolves as far back as 135,000 years ago.

But until recently the evidence seemed stronger that domestic dogs originated not in Europe, but in the Middle East, and long after the Stone Age—perhaps 10,000 to 15,000 years ago. This belief was based on dog bones found together with human remains from that time and place, and because so many other things—both plant and animal—were tamed in



Some archeological evidence hints that dogs may have diverged from wolves in Europe in the Stone Ages. Other evidence suggests an origin in the Middle East 10,000 to 15,000 years ago. But an exhaustive analysis of DNA from dogs around the world points farther east for the birthplace of *Canis familiaris*—perhaps to someplace like Kekexili Nature Reserve in China, where wolves such as this still roam.

that part of the world, demonstrating its inhabitants had the requisite knowledge for such endeavors.

Both of these theories about domestic dogs' beginnings were challenged in 2002, when Peter Savolainen, a molecular biologist with the Royal Institute of Technology in Stockholm, Sweden, and his colleagues published the results of their research on dog DNA.

Savolainen's interest in the evolution of dogs began in 1992 when he worked with Sweden's National Laboratory of Forensic Science. There he analyzed dog hairs found at the scenes of two high-profile murders—hairs that investigators hoped would lead to the dog's owner and the killer. Although his work did not solve the crime, it led him to begin looking at the heredity of domestic dog breeds through a DNA analysis of dog hairs he collected from local dog shows. "We expected to see different DNA types within each breed," says Savolainen. "But we found the same type in all the breeds, whether it was a German shepherd or a poodle."

That suggested a common ancestor for the domestic dog, and Savolainen set out to find where that first dog came from. "I

sat down and thought it would be possible to study dog hair DNA," he continues. "All you would need was a sample from all the dog populations of the world. I was optimistic and stupid enough to think that I could do it."

DNA, or deoxyribonucleic acid, is a complex molecule that is the basic building block of genetic inheritance. Savolainen and colleagues focused on mitochondrial DNA, which is passed down from the mother to offspring, and is involved in supplying energy to cells.

The difference in size between Asian and European wolves may have had something to do with the East Asian origin of the dog.

By looking at the genetic variability exhibited by a living organism, scientists can determine its lineage. Greater genetic variability indicates an older origin.

In 1998 Savolainen began contacting colleagues, dog organizations and others, asking them to send him a few hairs from their dogs. He was able to collect and

examine 1,000 hair samples from 654 types of dogs from around the world, a task that took three years.

"We found more DNA types in hair samples from East Asian dogs and that larger variability suggests that domestic dogs originated in East Asia," Savolainen says.

This suggestion, if true, would place the origin of dogs several thousand miles farther east than many experts previously thought, and it would trace their source gene pool to a few female Asian wolves.

Savolainen speculates that the difference in size between Asian and European wolves may have had something to do with the East Asian origin of the dog. Since wolves from this part of the world are smaller than their European and northern Asian counterparts, they may have been easier for humans to handle, he says.



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Wild wolves are extremely wary of people, unlike most modern dogs. How did the change occur? A New England biologist thinks the answer is garbage—literally. Like the dog attracted to trash (opposite), braver wolves may have visited early human garbage dumps and eventually may have domesticated themselves.

DEFENDING WOLVES

We may never unravel all of the mysteries of the wolf's evolution into the dog, but one thing is certain: Wild wolves are imperiled in many places today and need our help.

In the northern Rockies, for example, wolves have made a dramatic comeback in the past decade thanks to the federal Endangered Species Act. But some state officials in this region are threatening to persecute wolves again if federal protections end. Idaho's governor "Butch" Otter says that he wants the first tag to kill a wolf and that Idaho will seek to kill hundreds of its wolves when they are removed from the endangered species list. Likewise, Wyoming plans to strip all protection for wolves across 90 percent of the state immediately upon delisting, allowing all wolves in this enormous "dead zone" to be killed on sight.

"Until all the states in the region commit to science-based conservation management of wolves, federal protections for wolves should remain in place," says Suzanne Stone, Defenders' northern Rockies representative.

Visit www.savewolves.org to learn more about the issues and what you can do to help protect these wolves.

Middle Eastern wolves are also smaller and figure similarly in the hypothesis of dog domestication in that region.

Savolainen and his colleagues were also able to project a probable time for the origin of domestic dogs, basing it on the known mutation rate over time of their genetic samples. That date—15,000 years ago—is consistent with the earliest known archaeological evidence of domestic dogs in association with humans.

If Savolainen's findings hold up to scrutiny, they imply that domestic dogs spread throughout the world from East Asia by trade or migrated with people—including to the Americas. That view is bolstered by a genetic study of New World dogs conducted by researchers at Sweden's Uppsala University around the same time as Savolainen's study. These researchers found that dogs in the Americas are genetically virtually identical to Old World dogs. That indicates Native Americans did not domesticate their dogs from local wolves. Instead, their forebears brought the animals with them when they crossed the Bering land bridge at least 12,000 years ago.

But what was the process that transformed wild wolf to dog? How would

some wolves that competed with humans for food and risked death from our ancestors' spears or clubs, cross over to the human camp? Raymond Coppinger, a biologist who recently retired from Hampshire College in Massachusetts, has studied the behavior of dogs and wolves for decades and believes he knows the answer to those questions.

His idea is that wild wolves domesticated themselves. "I describe domestication as being able to eat in the presence of human beings," says Coppinger. His hypothesis may seem dubious until you take a closer look at the period in Earth's history when domestication was commonly thought to have occurred, and the kind of human societies that existed at that time.

Coppinger dismisses the idea that people living more than 10,000 years ago could have had the time, inclination or expertise to domesticate wolves. Based on his own and his graduate students' work with wolves, Coppinger believes that to have any chance at all of "socializing" a wolf, a pup needs to be taken from its parents by the time it is 19 days old. According to Coppinger, if you try to socialize a wolf to humans later than that, the process never

really takes—and it will always remain a wild, and potentially dangerous, animal.

The fact that a 19-day-old wolf would need to be bottle-fed formula is only one of the problems our Stone Age tribe would have encountered trying to raise its wolf pup. These people, like the wild animals they hunted, were in a constant struggle for survival. "Hunter-gatherer societies were not time-surplus societies," says Coppinger. "They were not like us. There is no way they could isolate and breed domestic dogs from wolves. And they're a bugger to train."

Instead, Coppinger believes the domestication process—initiated by the wolves themselves—began around

found an acceptable trade-off over the dangers and rigors of catching wild prey.

At first the scavenging wolves probably ran off when humans approached, returning later when they thought it was safe. Some wolves, too frightened by the experience, never came back. But over time the wolves that stuck around became increasingly used to the presence of people and their "flight distance"—the distance at which a potential danger causes an animal to run off—narrowed, perhaps to the point that they just moved aside a bit when humans came to dump trash. Every now and then one of the braver villagers may have reached out and offered a morsel of food from his

and relying on them completely for food, shelter and protection, Coppinger argues. "A dog is a wild animal that can eat in the presence of human beings," he says.

Coppinger believes the domestic dog was ubiquitous in human societies by 7,000 to 8,000 years ago, noting that dog remains, including some wearing collars, are found in abundance at archeological sites from that period and after.

The questions about wolves and dogs are far from settled—some scientists disagree with Savolainen and Coppinger's conclusions, and there is always more to investigate. Savolainen has recently completed genetic research on dingoes in Australia—considered to be one of the "ancient" dog lines—and found that they were, as believed, established on that continent by humans about 5,000 years ago from just a handful of founding animals. He is continuing his genetic work on East Asian dogs and is especially interested in pinpointing more precisely where dogs arose and how they spread to the rest of the world. Coppinger, who says that *Canis lupus* and *Canis familiaris* have such an intimately entwined genealogy that they are virtually one and the same animal, is skeptical an exact location for the origin of domestic dogs can ever be ascertained.

It seems incongruous that the beginnings of an animal we know so well can remain a mystery for so long. From early theories based on archeological guesswork to the more recent use of DNA analysis, researchers will continue their scientific inquiries into the origin of the domestic dog. But wherever those studies may lead, dogs will always remain our faithful companions and direct links to their—and our—wild pasts.

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10,000 years ago as humans incorporated agriculture into their societies and established permanent or semi-permanent settlements. Wolves started visiting village garbage dumps to glean discarded food scraps. Although dump food was of poor quality, it was a steady and reliable source that some wolves would have

hand and it was warily accepted by one of the more trusting wolves, accelerating the socialization process.

Eventually, this tolerance for humans in close proximity would have been bred into successive generations of "trash-dump wolves" until the animals made the transition to living among the villagers