

# WHY WE OUTLIVE OUR PETS

Cats and dogs are revealing some surprising insights  
into how animals age *By David Grimm*



Lily, a long-haired dachshund,  
at 8 months, 2 years, 7 years,  
and 15 years.

PHOTO: DOG YEARS: FAITHFUL FRIENDS, THEN & NOW/ BY AMANDA JONES, PUBLISHED BY CHRONICLE

Downloaded from [www.sciencemag.org](http://www.sciencemag.org) on December 12, 2015



**J**eane Calment has nothing on Creme Puff, the cat. The oldest living human made it to the ripe age of 122—not bad for a species with an average life span of 71 years. But Creme Puff, a Texas feline that allegedly subsisted on bacon, broccoli, and heavy cream, more than doubled the longevity of her kind,

surviving a reported 38 years. Bluey, an Australian cattle dog, was no slouch either. At age 29, he became the oldest canine on record, living more than twice as long as the average pooch.

For centuries, scientists have tried to understand the human life span. What sets the limits? What can be done to slow down the clock? Now, they're beginning to ask the

same questions of our pets. As in humans, the answers have been hard to come by. But some intriguing hypotheses are emerging—ideas that may help explain everything from why small dogs live longer than big ones to why cats tend to outlast our canine pals.

Figuring out how animals age is a “fascinating problem,” says Daniel Promislow, an evolutionary geneticist at the University



of Washington, Seattle, and co-leader of the Dog Aging Project, which aims to extend the canine life span. “It integrates behavior, reproduction, ecology, and evolution. If we can understand how to improve the quality and length of life, it’s good for our pets and it’s good for us. It’s a win-win.”

**SCIENTISTS HAVE BEEN PONDERING** the mysteries of aging for more than 2000 years. “The reasons for some animals being long-lived and others short-lived, and, in a word, causes of the length and brevity of life call for investigation,” wrote Aristotle in 350 B.C.E. The Greek philosopher suspected the answer had something to do with moisture: Elephants outlast mice, he reasoned, because they contain more liquid and thus take longer to dry up. The idea hasn’t exactly held water, but Aristotle’s observation that bigger animals tend to live longer has. Indeed, it’s the only trend today’s scientists agree on.

“All of the other hypotheses have fallen apart,” says Steven Austad, a biogerontologist at the University of Alabama, Birming-

***“I don’t think there’s a set max. longevity for any species. ... Maybe a thousand years from now you could have a dog that lives 300 years.”***

**João Pedro de Magalhães,**  
University of Liverpool

ham. One of the most popular ideas of the past 100 years has been that animals with higher metabolic rates live shorter lives because they run out their body clock faster. But “it hasn’t held up,” Austad says. Parrot hearts can beat up to 600 times per minute, for example, but they outlive by decades many creatures with slower tickers. Other assumptions, for example that short-lived animals generate more tissue-damaging free radicals or have cells that stop dividing sooner, also lack strong evidence. “A lot of simple stories have vanished,” he says.

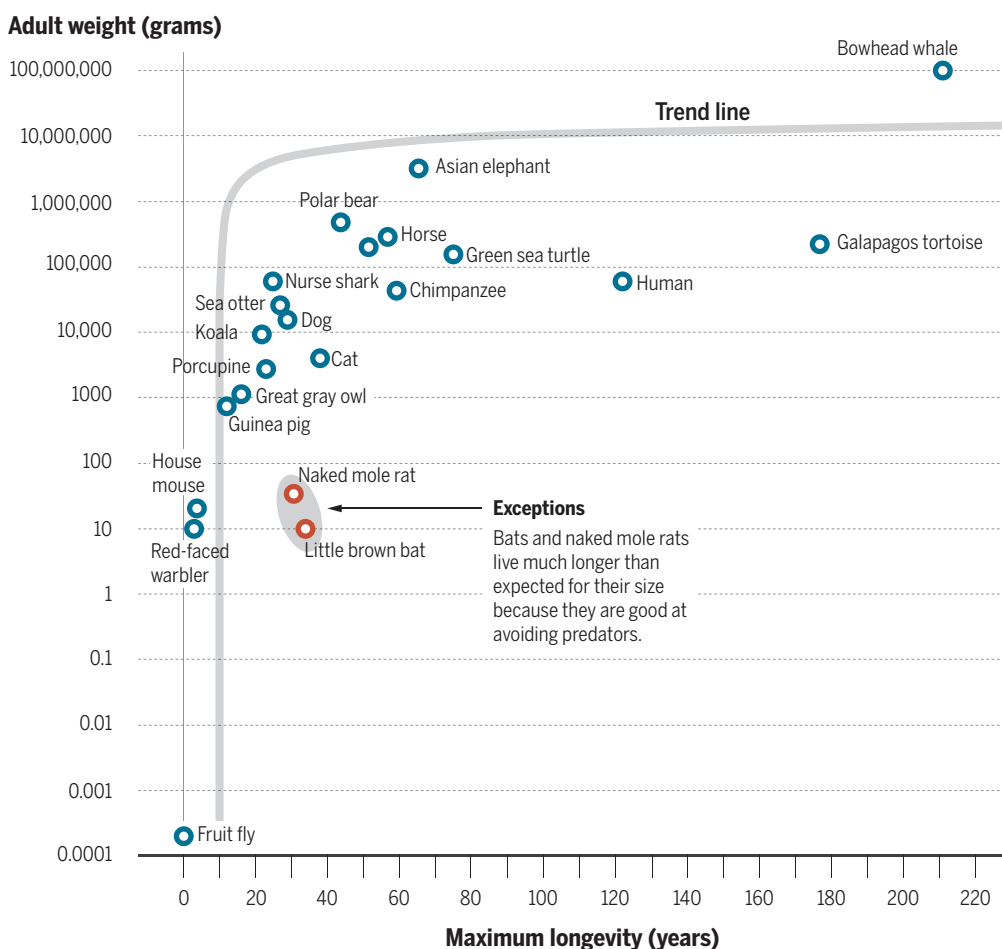
Austad should know something about animals. He worked as a lion trainer in the early 1970s, until one of the big cats tore up his leg—an injury that persuaded him to study, rather than tame, the world’s creatures. By the mid-1980s, he was observing opossum behavior in Venezuela as a postdoc when he began to notice how quickly the marsupials aged. “They’d go from being in great shape to having cataracts and muscle wasting in 3 months,” he says. Austad also noticed something even more intriguing: Opossums on a nearby island free from predators seemed to age slower—and live longer—than their mainland counterparts.

The observation helped explain why Aristotle’s key insight continues to hold true. Large animals tend to live longer, says Austad, because they face fewer dangers. It’s not a simple question of survival, he says, but rather the result of millions of years of evolutionary pressure. Whales and elephants can afford to take their time growing because no one is going to attack them, he explains. And that means they can invest

resources in robust bodies that will allow them to sire many rounds of offspring. Mice and other heavily preyed-on small animals, on the other hand, live life in fast-forward: They need to put their energy into growing and reproducing quickly, not into developing hardy immune systems, Austad says. “You wouldn’t put a \$1000 crystal on a \$5 watch.”

## Longevity favors the big guys

As a general rule, larger animals live longer than smaller ones.



**WHEN IT COMES TO OUR PETS,** the bigger-is-better theory gets flipped on its ear. Cats live an average of 15 years, compared with about 12 years for dogs, despite generally being smaller. And small dogs can live twice as long as large ones.

Yet the lesson of Austad’s opossums may still apply. Gray wolves, the ancestors of dogs, live a maximum of 11 or 12 years in the wild, whereas wildcats can live up to 16 years. This suggests that the two species face different evolutionary pressures, Austad says. Wolves are more social than cats and thus more likely to spread infectious disease, he says; wildcats, on the other hand, keep to themselves, reducing the spread of disease, and are adept at defending against predators. “Cats are so incredibly well-armed, they’re like porcupines”—an animal that notably also has a long life span for its size, more than 20 years. Indeed, two other small animals that are good at avoiding danger, naked



Poppy, recognized as the world's oldest cat in 2014, lived to the ripe age of 24.



mole rats and bats, can live 30 and 40 years, respectively. (Mole rats spend most of their time underground, whereas bats can simply fly away.) Mice, meanwhile, live just a couple of years—unless they're eaten first.

When it comes to why small dogs tend to outlive big ones, the story gets a bit more complicated. Large dogs like the 70-kilogram Irish Wolfhound are lucky to make it to age 7, whereas tiny pooches like the 4-kilo Papillon can live 10 years longer. Most dog breeds are less than a couple of hundred years old, so evolutionary pressure clearly isn't at work. Instead, hormones like insulin-like growth factor 1, which swells dogs to big sizes, may play a role; researchers have linked the protein to shorter life spans in a variety of species, though the mechanism is unclear. Larger canines also tend to grow faster, notes the Dog Aging Project's Promislow, which could result in "jerry-built" bodies that are more susceptible to complications

and disease. Big dogs do tend to have more health problems than small ones—German Shepherds are prone to hip dysplasia, for example, and Siberian Huskies are plagued by autoimmune disorders—though these could also be the result of inbreeding.

Despite the differences between cats and dogs, both pets are living longer than ever before. Dog life expectancy has doubled in the past 4 decades, and housecats now live twice as long as their feral counterparts. The reasons can largely be chalked up to better health care and better diet. Americans will spend \$60 billion on their pets this year, with a large chunk of that going to human-like health care (think annual physicals and open-heart surgery) and premium food. "The same things that allow us to live longer also apply to our pets," says João Pedro de Magalhães, a biogerontologist at the University of Liverpool in the United Kingdom who maintains AnAge, the world's largest

database of animal life spans. The trend may not continue, though: More than half of U.S. pets are overweight or obese, and they are exposed to the same pollutants and carcinogens we are.

All of this uniquely positions dogs and cats to solve the riddle of how we ourselves grow old. After all, we have more medical records on them than on any other animal, save humans, and we learn more about their biology and genomes every day. Perhaps they hold the clues to slowing down the body clock for all of us—and maybe even stopping it. "I don't think there's a set max. longevity for any species," Magalhães says. "The real question is, 'How far can we go?' Maybe a thousand years from now you could have a dog that lives 300 years."

That's good news, especially if our life spans increase dramatically as well. After all, who wants to live forever if you can't live with your best friend? ■