

The Future of Pets

In his 1915 guide to pets, Alpheus Hyatt Verrill, an American naturalist, lambasted the dog-keeping habits of his day. "There is no excuse for pampering, constant fondling, dressing up in clothing, and other ridiculous customs," he wrote. Dogs, Verrill insisted, should be treated like the animals they are.

A century later, Verrill's message has gone stupendously unheeded. Americans pamper their pets more than ever—treating them to such indulgences as air-conditioned doghouses, craft beer (albeit without the alcohol), video games, and even humpable sex dolls. Future technologies promise to bring us even closer to our pets—and to make pets' lives look more like human ones. Here's how our relationships with animals could change.

1. Pet Gadgets

Americans spend about \$60 billion a year on their pets. We now have, for example, technologies that help people stay connected to their animals when they're not home. A device called the iCPooch lets people videoconference with their dogs (and remotely dispense treats in order to persuade them to come to the camera). In a similar vein, a company called PetBot has developed a monitor that can sense when a pet approaches and record a short video—which it then e-mails to the owner. Future versions of the device will be able to post the videos directly to a pet's accounts on Instagram, Twitter, and Facebook.

Fitness gadgets are also big, likely because, as one recent survey found, more than half of American dogs and cats are overweight. A device called Kittyo allows owners to stream live video of their cats on a smartphone and, with the touch of a finger, make a laser dance around the room, keeping their cats entertained and active. A couple of companies offer what are essentially Fitbits for dogs; one device, called Voyce, keeps a record of a dog's activity levels and other health indicators, which a vet can later review. Treadmills for dogs exist, too—though they're nothing new. The first canine treadmills were invented in the United States in the early 1800s and used "dog power" to accomplish chores such as churning butter and grinding grain.

2. Canine Communications

At North Carolina State University, a group of computer scientists, electrical engineers, and veterinary behaviorists is developing a "smart harness" that collects a dog's

biometric data to help humans understand what the animal is thinking and feeling. The harness looks like a Kevlar vest for canines. It has sensors that monitor heart rate, respiratory rate, and other indicators, plus a microcomputer that can identify and interpret patterns in those biometric measures.

The smart harness is being developed for guide dogs, police dogs, and other service dogs. But David Roberts, a computer scientist working on the project, hopes a version will be available to the general public within five years. He says the harness could send owners alerts from their pets—a text message, perhaps, telling them that their dog is anxious or excited or scared. In a decade or two, the harness might be able to sync with a smart home, where sensors could triangulate information from inside the house (a lamp falling over in the living room, for instance) with data from the dog's vest (say, a spike in heart rate) to tell owners *why* their dogs are feeling the way they feel.

The harness can also help people train their dogs. An app can make the vest vibrate in certain places to remotely command the dog to sit, for example, or turn left. The harness can even be preprogrammed to train a dog on its own. For instance, a speaker in the vest might play a recorded command, and sensors could then determine whether the dog obeyed. The vest syncs to a treat dispenser, so that good behavior can be reinforced.

Other attempts to communicate with dogs border on the quixotic. Con Slobodchikoff, a professor emeritus of biology at Northern Arizona University and the CEO of a pet-technology company called Animal Communications, hopes to develop what he calls “a dictionary of barks” by collecting and interpreting videos of canine vocalizations. A Siri-like app could then, in theory, translate a dog owner's (very simple) words into *woofs* and *arfs*, or translate a dog's *woofs* and *arfs* into, say, English or Japanese. Owners could also use the app to interpret their dogs' body language, which is actually the primary means of canine communication. The project, Slobodchikoff admits, has a long way to go.

3. Dinosaur Chickens and Glowing Beagles

Humans have long used selective breeding to shape the appearance of their pets—that's how we ended up with Great Danes and dachshunds and pugs. But modern genetic-engineering techniques are enabling scientists to select for traits in a fraction of the time that traditional breeding requires, and with far greater precision.

These gene-editing techniques are already changing the way domestic animals look. GloFish—zebra fish, tetras, or barbys modified to produce fluorescent colors—have

been available in American pet stores since 2003. In 2009, South Korean researchers made four beagle clones that glow in ultraviolet light. More recently, scientists at BGI, a genetic-research center in China, have produced “micropigs.” Using enzymes called TALENs, the journal *Nature* reported, the scientists blocked a growth hormone in the fetal cells of Bama pigs, small, fuzzy swine native to China. The heaviest the micropigs will get is about 30 pounds—roughly the same weight as a Welsh corgi, and the perfect size for, say, your studio apartment, where they might just end up: In September, BGI announced plans to sell the tiny pigs as pets.

Another genome-editing technique, CRISPR, allows scientists to quickly and precisely modify DNA by cutting out undesired genes and pasting in new ones. CRISPR is cheap and has potential applications in medicine and agriculture, as well as in animals. Scientists have already used the technique to insert synthetic woolly-mammoth genes into elephant cells (the first hybrid embryos could be produced as early as 2018, though it’s unclear whether they will develop into actual animals) and to grow beagles with double the breed’s typical muscle mass, giving them Schwarzenegger-like physiques.

Maybe a retro look will come into vogue for pets. The paleontologist Jack Horner is attempting to genetically reverse-engineer chickens to look more like their Jurassic-period forebears—which had long tails, clawed fingers, and teeth. Horner has suggested that one day these ersatz dinosaurs might roam our backyards just like dogs and cats do.

4. Lovable Robots

Or perhaps the pets of the future won’t be biological creatures at all. Engineers are designing robots whose movements closely mimic those of real animals—no easy task. “There’s an almost infinite number of things we have to teach robots, things which animals and humans likely inherited in their genes,” Sangbae Kim, an associate professor of mechanical engineering at MIT, says. Even seemingly simple actions can prove difficult for robots. One challenge Kim notes is adaptability: A robotic dog might be able to jump, but to jump from a hardwood floor onto a human’s lap, it needs to know how to moderate its force—something that’s hard to capture in code.

But as Gail Melson, a professor emerita of developmental studies at Purdue University, points out, robotic pets don’t need to be perfectly lifelike. In fact, designers might choose to emphasize robot pets’ artificiality in order to avoid the pitfalls of what’s known as “the uncanny valley”—a sense of unease or even revulsion that overcomes

humans when they see robots acting in ways that seem *too* natural.

Melson and other researchers have studied how humans interact with the Sony Aibo, a small, artificially intelligent robotic dog. All of the subjects in these studies recognized that Aibo was a piece of technology, not a living animal. Yet that didn't stop them from seeing the robots as companions, with their own thoughts and feelings. In a study of kids ages 7 to 15, for instance, almost 80 percent said they felt an Aibo could comfort them if they were sad. In another study, one person described putting an Aibo to bed with a pink teddy bear, so the robot wouldn't wake up "distressed" in the middle of the night.

In 2014, a decade and a half after Sony released Aibo, the company announced that it would no longer produce replacement parts. A die-off ensued, and grief-stricken owners in Japan mourned their pets and even held funerals for them. One woman told a reporter that when she died, she wanted her Aibo cremated alongside her. Melson believes that robotic pets may come to occupy "a new ontological category"—that is, humans might see them as neither living creatures nor inanimate objects, but something in between.

A Brief Chronicle of Pets

800 B.C. to 200 A.D.: The Egyptians mummify millions of cats and dogs.

1807: Lord Byron brings a pet bear with him to the University of Cambridge.

1825: John Quincy Adams keeps a pet alligator in a White House bathtub.

Circa 1941: An Italian man rescues a dog named Fido, who later becomes world famous for his loyalty to his new master.

1985: A microchip implant for identifying lost cats and dogs is patented.

1991: A German countess leaves her dog, Gunther III, an estate reportedly worth \$80 million.

1996: Tamagotchis go on sale. Within two years, 40 million of the electronic pets are sold.

2004: A cat named Little Nicky is the world's first commercially cloned pet.

2030: The first genetically engineered dinosaur chicken hatches.

