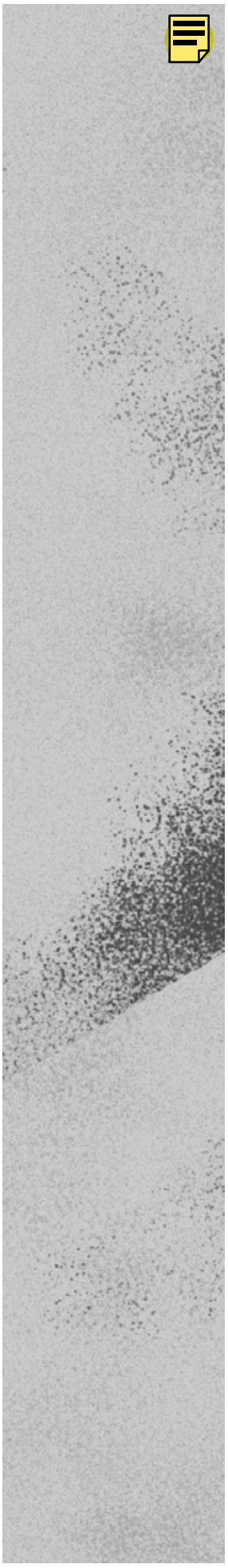
ANTHROPOLOGY

Survival of the Friendliest

Natural selection for hypersocial traits let Earth's apex species best Neandertals and other competitors

By Brian Hare and Vanessa Woods



Illustrations by Matt Harrison Clough

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WE ARE THE ONLY HUMANS, BUT NOT SO LONG AGO WE HAD COMPANY. In the roughly 300,000 years of our existence, *Homo sapiens* has shared the planet with at least four other human species. In hindsight, it seems obvious why we prevailed. We were the best hunters, the smartest, the most technologically savvy.

But that is only the story we tell ourselves. Some of the other human species were more technologically advanced, had been around for much longer—a million years—or had brains as big or bigger than ours. Going back 100,000 years ago, if you were going to guess which human species was going to make it, one of the other humans, perhaps Neandertals, would have been a good bet.

We shared a common ancestor with Neandertals. They were stronger than us, barrel-chested with muscle. They were highly skilled with weapons and hunted every large mammal in the Ice Age. They even shared with us a variant of a gene known as *FOXP2,* thought to be responsible for the finely calibrated movements needed for speech. Their culture demonstrated high levels of sophistication: Neandertals buried their dead, cared for the sick and injured, painted themselves with pigment, and adorned themselves with jewelry made of shells, feathers and bone.

The first *Homo sapiens* to arrive in Europe met a relatively large population of Neandertals who were well adapted to a cold weather climate. Later, as oncoming glaciers advanced, modern humans fled, and Neandertals stayed and thrived. Compared with our closest living relatives, bonobos and chimpanzees, our species has little genetic variation, which suggests that at some time, perhaps several times, we experienced a severe population bottleneck, which means we might almost have gone extinct.

If we were not the strongest or the smartest, how did we win?

HUMAN SELF-DOMESTICATORS

COMPARED WITH OTHER HUMAN SPECIES, it turns out we were the friendliest. What allowed us to thrive was a kind of cognitive superpower: a particular type of affability called cooperative communication. We are experts at working together with other people, even strangers. We can communicate with someone we have never met about a shared goal and work together to accomplish it. We develop this superpower before we can walk or talk, and it is the gateway to a sophisticated social and cultural world. It allows us to plug our minds into the minds of others and inherit the knowledge of generations. It is the foundation for all forms of culture and learning, including sophisticated language.

This friendliness evolved through self-domestication. Domestication is a process that involves intense selection for friendliness. When an animal is domesticated, in addition to becoming much

IN BRIEF

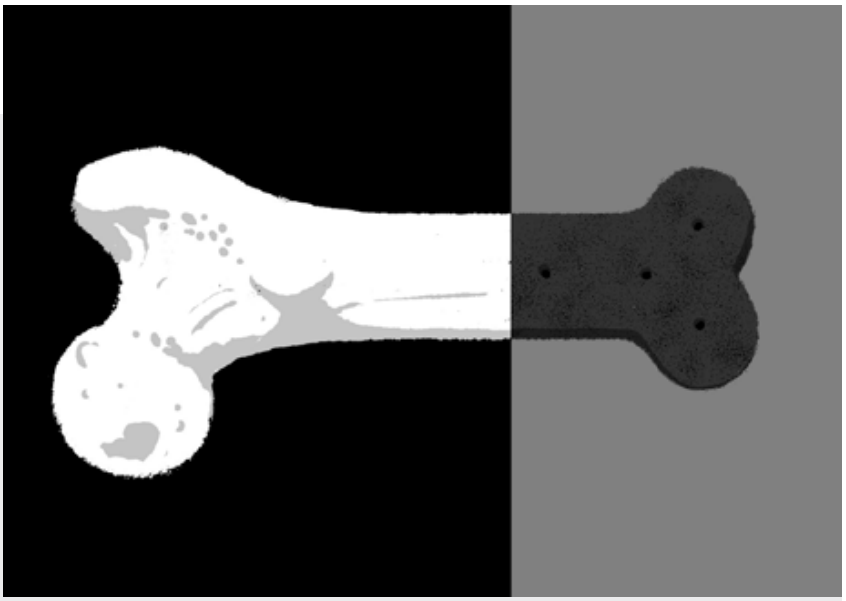
How did we become the last surviving human species? A hundred millennia ago Neandertals might have had a better chance to prevail.

Homo sapiens outlasted our kindred because we underwent a process of natural selection for friendliness, enabling high levels of group collaboration.

This social sophistication translated into the beginnings of cultural traditions and technologies that left us as the last humans standing.

From Wolf to Dog

An amicable disposition also governed the course of evolution for an animal that turned into a favorite pet



Humans are not the only ones who underwent self-domestication. So did our close relatives, the bonobos, and the species we call our best friend. A tiny fraction of the genome differentiates dogs from wolves, and yet millions of dogs are snugly curled up in our homes, while wolves slink around at the edge of extinction. True, dogs run into doors and drink out of our toilets, but they also protect our loved ones, fight our wars, detect drugs and cancer, calm autistic children, and give many of us unconditional love and a reason to go outside and exercise.

When our research group began its work almost 20 years ago, we discovered that dogs also have extraordinary intelligence: they can read our gestures better than any other species, even our closest relatives, bonobos and chimpanzees. Wolves, in contrast, are mysterious and unpredictable. Their home is the wilderness, and that wilderness is shrinking.

But not so long ago the evolutionary race between dogs and wolves was so close, it was unclear who would win. Dogs, in fact, did not descend from wolves. Instead dogs and wolves shared a wolflike ancestor, whom we will call Ice Age wolves to distinguish them from today's animals. These wolves were highly successful, they survived after every large carnivore—saber-toothed cats, cave lions and giant hyenas—had gone extinct. They spread throughout most of the Northern Hemisphere and became one of the most successful predators in the world.

Folklore supposes that some humans brought wolf puppies into camp and domesticated them. Or as wolf expert David Mech wrote, "Evidently early humans tamed wolves and domesticated them, eventually selectively breeding them and finally developing the domestic dog (*Canis familiaris*) from them."

But this story does not make sense. Taming an animal occurs during its lifetime. Domestication happens over generations and involves changes to the genome. That is only one difference between domesticating and taming an animal. Even today wolves eat too much meat—as much as 10 pounds a day—to be a sustainable hunting partner. Ice Age wolves were much larger than modern wolves. At the time of dog domestication, humans were hunter-gatherers, going out to forage and leaving their children in camp—no sensible human would have let them be unprotected against a carnivore of that size.

Dogs have shorter snouts and reduced versions of the long canine teeth compared with wolves. Their hair changes color to cover them in random splotches. Their tails curl, sometimes in a full circle—and they have floppy ears. Instead of having one breeding season, they can breed throughout the year.

Taken together, these traits are part of the domestication syndrome, an assortment of which appear in a domesticated species. But no one knew what tied these traits together, or if they were related at all, until a Russian genius decided to domesticate foxes in a remote outpost in Siberia.

In 1959 geneticist Dimitry Belyaev began breeding them using a single selection criterion—whether the fox would approach a human hand. After 50 generations, these friendly foxes would leap into your arms, lick your face and pee for joy.

When our research group tested the foxes, we found that, like dogs, they were better at reading intentions from our gestures. The foxes were only bred to be unafraid and attracted to humans. But other changes, including an increase in social intelligence, happened by accident.

So how did wolves turn into dogs? Back in the Ice Age, as our human populations grew more sedentary, we probably created more trash, which we then dumped outside our camps. These leavings would have included tempting morsels for hungry wolves. Only the friendliest wolves would have been able to scavenge, however. These animals would have had to be unafraid of humans, and if they displayed any aggression towards us, they would have been killed.

These friendly wolves would have been at a reproductive advantage and, because they scavenged together, more likely to breed together. After generations of selection for friendliness without intentional selection by humans, this special population of wolves would have begun to take on a different appearance. Coat color, ears, tails: all probably started to change. We would have become increasingly tolerant of these odd-looking scavenger wolves and would quickly have discovered that they had a unique capacity for reading our gestures.

Animals that could respond to our gestures and voices would be extremely useful as hunting partners and guards. They would have been valuable as well for their warmth and companionship, and slowly we would have allowed them to move from outside our camps to our firesides. We did not domesticate dogs. The friendliest wolves domesticated themselves.

In the 14,000 to 40,000 years during which this domestication process occurred, wild wolves were probably doing better than dogs in terms of numbers—after all, our dogs were probably another food source for humans when times became lean. The first written record of a wolf hunt was recorded in the sixth century B.C.E., when Solon of Athens offered a bounty for every wolf killed.

This event was the start of a systematic massacre that almost eradicated wolves permanently. In 2003 the estimate of their population was 300,000 worldwide. A 2013 estimate of the population of dogs worldwide totals a billion. The history of dogs and wolves demonstrates how friendliness as a trait translates into a winning evolutionary strategy. —*B.H. and V.W.*

friendlier, it undergoes many changes that appear completely unrelated to each other. This domestication syndrome shows up in the shape of the face, the size of the teeth and the pigmentation of different body parts or hair; it includes changes to hormones, reproductive cycles and the nervous system. Although we think of domestication as something that we do to animals, it can also occur through natural selection, a process known as self-domestication.

The self-domestication hypothesis was developed over the past 20 years from our work with anthropologist Richard Wrangham of Harvard University and psychologist Michael Tomasello of the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany. What we discovered through our research is that self-domestication also increases the key to our success—the ability to cooperatively communicate with others. The hypothesis predicts that if *H. sapiens* were self-domesticated, we should find evidence of selection for friendliness in the Pleistocene, the most recent glacial era. Although behavior does not fossilize, the neurohormones that regulate behavior shape our skeletons.

For example, the more testosterone you have available during puberty, the thicker your brow ridge and the longer your face becomes. Men tend to have thicker, more overhanging brow ridges and slightly longer faces than women, so we call a face with these traits masculinized. Testosterone does not directly cause aggression in humans, but its levels and its interactions with other hormones do modulate aggressive behavior.

Anthropologists have frequently remarked on the decreasing brow ridges, shortening faces and shrinking heads of humans throughout the Paleolithic. In our own research, we realized that if we documented those changes, they would point to when physiological changes occurred that shaped our behavior and our bodies at the same time.

Self-domestication is a scientific hypothesis that suggests *Homo sapiens* underwent selection for friendliness—as evidenced by both our behaviors and physical traits.

Together with researchers Steven Churchill and Robert Cieri, both at Duke University, we found that *H. sapiens* prior to the 80,000-year mark, the Middle Pleistocene, had longer faces and much larger brow ridges than in the Late Pleistocene. On average, skulls more recent than 80,000 years ago had a 40 percent reduction in how far their brow ridges projected from the face. They were also 10 percent shorter and 5 percent narrower than the older skulls before that dividing point. Although the pattern varied, it continued so that the faces of modern hunter-gatherers and agriculturalists grew more delicate in appearance, indicating a decrease in testosterone. Another neurohormone, serotonin, may have promoted a set of changes that led to smaller brains and less aggression. Increases in serotonin appear early on during the domestication syndrome—and the chemical may also be involved in skull development.

Drugs that increase serotonin availability in the brain, such as selective serotonin reuptake inhibitors (SSRIs), make people more cooperative and less willing to harm others when tested during social science experiments examining moral dilemmas and cooperation. Serotonin does not just change behavior. If exposure occurs early in development, it also appears to alter skull morphology. Women taking SSRIs are more likely to have babies with smaller skulls. Pregnant mice given SSRIs have babies with shorter, narrower snouts and skulls described as globular. Every other human species had a low, flat forehead and a thick skull.

Neandertals had heads shaped like footballs. Only we have the balloonlike skulls that anthropologists call globular. This shape indicates a possible increase in the availability of serotonin during our evolutionary development. Based on the fossil record, these changes started after we split from our common ancestor with Neandertals—and they have continued in the relatively recent evolutionary past. In fact, the work of one of us (Hare) with Churchill and Cieri suggests that our skulls—and hence brain size—have been shrinking over the past 20,000 years.

If testosterone and serotonin levels changed in *H. sapiens* as a result of domestication, another molecule probably did as well. Lower testosterone and higher serotonin enhance the effects of the hormone oxytocin on social bonding. Oxytocin floods through mothers during childbirth. It facilitates milk production and is passed on through breast milk. Eye contact between parents and babies creates an oxytocin interactive loop, making both parent and baby feel loving and loved. When psychologist Carsten De Dreu of Leiden University in the Netherlands and other researchers gave people oxytocin to inhale in an experiment, they tended to be more cooperative, empathetic, and trusting in financial and social games.

All these changes had lasting impacts on our social relationships. In fact, we think these changes produced a new social category: the intragroup stranger. Our closest relatives, bonobos and chimpanzees recognize strangers based only on familiarity. Someone who lives with them inside their territory is a group member. Everyone else is a stranger. Recognition is clear-cut. An individual is either familiar or an outsider.

Chimpanzees may hear or see their neighbors, but the interaction is almost always brief and hostile, in contrast, bonobos are friendlier with outsiders. We, too, respond to individuals who are unfamiliar in different ways, but unlike any other animal, we also have the ability to instantly recognize whether a stranger belongs to our group. Only humans can define our groups based on appearance, language or a set of beliefs. Our ever changing conception of group status allows us to recognize those like us—even if we have never met them. It also lets us to expand our social network far beyond the size of any other human species.

Every day, without thinking about it, we adorn ourselves in ways that make us identifiable to one another—donning sports jerseys, political pins or religious symbols on a necklace. This capacity dominates our modern lives. It encourages us to per-

form acts of kindness both great and small—donating an organ to a stranger or helping someone cross the street. It also helps us share and improve our best ideas.

THE LIGHTS STAY ON

EVEN THOUGH OUR NEANDERTAL COUSINS seemed to have an edge on us early on, around 80,000 years ago, signs that *H. sapiens* might not just prevail but flourish began to appear.

Glimpses of social sophistication and advanced technology can be found in archaeological remains from when we first emerged as a species in Africa as long as 300,000 years ago. But these sites were like lights blinking on and off. Technology and other signs of progress appeared, then disappeared. After 80,000 years ago these lights seemed to stay on and grow stronger. We think the new category of intragroup stranger appeared in our species around this time, when the fossil record suggests complex cultural traditions and technologies started to spread. Expanded social networks meant more cultural innovations could be shared at greater speed. Cultural and technological progress exploded.

From 50,000 years onward we began to leave evidence of our expanding social networks and cultural prowess wherever humans lived around the world. Jewelry made from shells has been found hundreds of miles inland, implying that an object with no practical value was either worth carrying some distance or was obtained from someone else who had traveled on one of our first trade routes. We painted animals on rocks so skillfully that the contours of the stone rippled beneath their bodies and seemingly gave them a third dimension.

The idea that friendliness led to our success is not new. Neither is the idea that as a species, we became more intelligent. Our discovery lies in the relationship between the two ideas: it was an increase in social tolerance that led to cognitive changes, especially those related to cooperative communication.

The arrival of human self-domestication would have led to both the increase in population and the revolution in technology we see in the fossil record. Friendliness drove these changes by linking groups of innovators together in a way other human species never could. Self-domestication gave us a superpower, and in the blink of an evolutionary eye, we took over the world. One by one, every other human species went extinct.

This optimistic view of our species is immediately at odds with the misery and suffering we still inflict on one another. If human self-domestication explains the best in us, does it also explain the worst? How do we reconcile our kindness with our cruelty?

Some of the same neurohormonal changes that underlie friendliness also support horrific violence. Oxytocin seems crucial to parental behavior, and it is sometimes called the hug hormone. But a better name would be the momma bear hormone. The same oxytocin that floods through a mother with the arrival of her newborn feeds the rage she feels when someone threatens that baby. For example, hamster mothers given extra oxytocin are more likely to attack and bite a threatening male. Oxytocin is also implicated in related forms of male aggression. Available oxytocin increases when a male rat bonds with his mate. He is more caring toward her but also more likely to attack a stranger who threatens her. This link connecting social bonding, oxytocin and aggression is seen widely among mammals.

As our species was shaped by self-domestication, our increased friendliness also brought a new form of aggression. A higher availability of serotonin during human brain growth increased the impact of oxytocin on our behavior. Group members had the ability to connect with one another, and the bonds among them were so strong, they felt like family. New concern for others came with a willingness to violently defend unrelated group members. Humans became more violent when those we evolved to love more intensely were threatened.

LOVE IS A CONTACT SPORT

DESPITE THE EVOLUTIONARY PARADOXES of human nature, the perception of who belongs in our group is malleable. *H. sapiens* as a species has already demonstrated its capacity to expand the concept of group membership into the thousands and millions.

It can be extended further. The best way to diffuse conflict among groups is to diminish the perceived sense of threat through social interaction. If feeling threatened makes us want to protect others in our group, nonthreatening contact between groups allows us to expand the definition of who our group is.

White children who went to school with black children in the 1960s were more likely, as they grew up, to support interracial marriage, have black friends, and be willing to welcome black people into their neighborhoods.

That formula still works in education. Pairs of roommates at the University of California, Los Angeles, who each were from a different race reported more comfort in mixed-race interactions and approval of mixed-race dating. One study found that imagining positive contact with one of the most dehumanized groups of people—the homeless—helps others to empathize with them. The friendships of individuals from different groups can also generalize beyond their friendship to other group members.

Most policies are enacted with the assumption that a change in attitude will lead to a change in behavior, but in the case of intergroup conflict, it is the altered behavior—in the form of human contact—that will most likely change minds. The self-domestication hypothesis explains why we as a species evolved to relate to others. Making contact between people of different ideology, culture or race is a universally effective reminder that we all belong to a single group called *H. sapiens*.

This gave us the edge we needed to outlast other members in the hominin line. In evolutionary terms, the definition of friendliness relates to positive behaviors, either intentional or unintentional toward others. It involves not only close physical proximity while group size expanded but also an ability to rapidly read people's intentions. The benefits of social interactions on our specie's success—the ability to solve problems better than individuals can on their own—proved so beneficial that it influenced the way selection shaped our bodies and minds. The resulting ability to share knowledge across generations produced the technology and culture that allowed us to populate every corner of the planet. SA

MORE TO EXPLORE

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