Animals Make Us Human

Creating the Best Life for Animals

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WHAT DOES AN ANIMAL NEED to have a good life?

I don't mean a good life physically. We know a lot about what kind of food, water, exercise, and veterinary care animals need to grow well and be healthy.

I mean a good mental life.

What does an animal need to be happy?

The animal welfare movement has been thinking about animals' mental welfare at least since the 1960s. That's when the British government commissioned the Brambell Report on intensive animal production. *Intensive animal production* means very big farms raising large numbers of animals for slaughter or egg production in very small spaces compared to traditional farms. The Brambell committee listed the five freedoms animals should have. The first three freedoms are about physical welfare, and the last two are about mental welfare:

- freedom from hunger and thirst
- freedom from discomfort
- freedom from pain, injury, or disease
- freedom to express normal behavior
- freedom from fear and distress

Freedom is a confusing guide for people trying to give animals a good life. Even freedom from fear, which sounds straightforward, isn't simple or obvious. For example, zookeepers and farmers usually assume that as long as a prey species animal doesn't have any predators around, it can't be afraid. But that's not the way fear works inside the brain. If you felt fear only when you are face-to-face with the animal that's going to kill you and eat you, that would be too late. Prey species animals feel afraid when they're out in the open and exposed to potential predators. For example, a hen has to have a place to hide when she lays her eggs. It doesn't matter that she's laying her eggs on a commercial farm inside a barn that no fox will ever get into. The hen has evolved to hide when she lays her eggs. Hiding is what gives her freedom from fear, not living in a barn that keeps the foxes out. I'll talk more about this in my chapter on chickens.

The freedom to express normal behavior is even more complicated and hard to apply in the real world. In many cases, it's impossible to give a domestic or captive animal the freedom to express a normal behavior. For a dog, normal behavior is to roam many miles a day, which is illegal in most towns. Even if it's not illegal, it's

dangerous. So you have to figure out substitute behaviors that keep your dog happy and stimulated.

In other cases, we don't know how to create the right living conditions because we don't know enough about what the normal behavior of a particular animal is. Cheetahs are a good example. Zookeepers tried to breed cheetahs for years with almost no success. That's a common problem in zoos. Breeding is one of the most basic and normal behaviors there is. There wouldn't be any animals or people without it. But a lot of animals living in captivity don't mate successfully because there's something wrong with their living conditions that stops them from acting naturally. The cheetah-breeding problem was finally solved in 1994, when a study of cheetahs on the Serengeti Plains came out and everyone realized male and female cheetahs didn't live together in the wild the way they did in zoos. When zoos separated the female cheetahs from the males, they turned out to be easy to breed in captivity. [1]

Animal distress is even more mysterious. What is distress in an animal? Is it anger? Is it loneliness? Is it boredom? Is boredom a feeling? And how can you tell if an animal is lonely or bored?

Although a lot of good work has been done on mental welfare for animals, it's hard for pet owners, farmers, ranchers, and zookeepers to use it because they don't have clear guidelines. Right now, when a zoo wants to improve welfare, what usually happens is that the staff tries everything they can think of that they have the money and the personnel to implement. Mostly they focus on the animal's behavior and try to get it acting as naturally as possible.

I believe that the best way to create good living conditions for any animal, whether it's a captive animal living in a zoo, a farm animal, or a pet, is to base animal welfare programs on the core emotion systems in the brain. My theory is that the environment animals live in should activate their positive emotions as much as possible, and not activate their negative emotions any more than necessary. If we get the animal's emotions right, we will have fewer problem behaviors.

That might sound like a radical statement, but some of the research in neuroscience has been showing that emotions drive behavior, and my own thirty-five years of experience working with animals have shown me that this is true. Emotions come first. You have to go back to the brain to understand animal welfare.

Of course, usually—though not always—the more freedom you give an animal to act naturally, the better, because normal behaviors evolved to satisfy the core emotions. When a hen hides to lay her eggs, the hiding behavior turns off fear. But if you can't give an animal the freedom to act naturally, then you should think about how to satisfy the emotion that motivates the behavior by giving the animal other things to do. Focus on the emotion, not the behavior.

So far, research in animal behavior agrees with the neuroscience research on emotions. A really good study on whether animals have purely behavioral needs was

done with gerbils. Gerbils love to dig and tunnel, and a lot of them develop a corner-digging stereotypy when they're around thirty days old. A *stereotypy* is an abnormal repetitive behavior (ARB for short), such as a lion or tiger pacing back and forth in its cage for hours on end. Pets and farm animals can develop stereotypies, too. Stereotypies are defined as abnormal behaviors that are repetitive, invariant (lions always pace the exact same path in their cages), and seemingly pointless.

An adult gerbil spends up to 30 percent of its "active time" doing stereotypic digging in the corner of its cage. That would never happen in nature, and many researchers have hypothesized that the reason captive gerbils develop stereotypic digging is that they have a biological need to dig that they can't express inside a cage.

On the other hand, in nature gerbils don't dig just to be digging. They dig to create underground tunnels and nests. Once they've hollowed out their underground home, they stop digging. Maybe what the gerbil needs is the result of the digging, not the behavior itself. A Swiss psychologist named Christoph Wiedenmayer set up an experiment to find out. He put one set of baby gerbils in a cage with dry sand they could dig in, and another set in a cage with a predug burrow system but nothing soft to dig in. The gerbils in the sand-filled box developed digging stereotypies right away, whereas none of the gerbils in the cage with the burrows did.[2]

That shows that the motivation for a gerbil's digging stereotypy is a need to hide inside a sheltered space, not a need to dig. The gerbil needs the emotion of feeling safe, not the action of digging. Animals don't have purely behavioral needs, and if an animal expresses a normal behavior in an abnormal environment, its welfare may be poor. A gerbil that spends 30 percent of its time digging without being able to make a tunnel does not have good welfare.

The Blue-Ribbon Emotions

All animals and people have the same core emotion systems in the brain. Most pet owners probably already believe this, but I find that a lot of executives, plant managers, and even some veterinarians and researchers still don't believe that animals have emotions. The first thing I tell them is that the same psychiatric medications, such as Prozac, that work for humans also work for animals.[3] Unless you are an expert, when you dissect a pig's brain it's difficult to tell the difference between the lower-down parts of the animal's brain and the lower-down parts of a human brain.[4] Human beings have a much bigger neocortex, but the core emotions aren't located in the neocortex. They're in the lower-down part of the brain.

When people are suffering mentally, they want to feel better—they want to stop having bad emotions and start having good emotions. That's the right goal with animals, too.

Dr. Jaak Panksepp, a neuroscientist at Washington State University who wrote the

book *Affective Neuroscience* and is one of the most important researchers in the field, calls the core emotion systems the "blue-ribbon emotions," because they "generate well-organized behavior sequences that can be evoked by localized electrical stimulation of the brain."[5] This means that when you stimulate the brain systems for one of the core emotions, you always get the same behaviors from the animal. If you stimulate the anger system, the animal snarls and bites. If you stimulate the fear system, the animal freezes or runs away. Electrodes in the social attachment system cause the animal to make separation calls, and electrodes in the "SEEKING" system make the animal start moving forward, sniffing, and exploring its environment. When you stimulate these parts of the brain in people, they don't snarl and bite, but they report the same emotions animals show.

People and animals (and possibly birds) are born with these emotions—they don't learn them from their mothers or from the environment—and neuroscientists know a fair amount about how they work inside the brain.

Here is a quick rundown of the four blue-ribbon emotion systems, which Jaak always writes in all caps:

SEEKING: Dr. Panksepp says SEEKING is "the basic impulse to search, investigate, and make sense of the environment." SEEKING is a combination of emotions people usually think of as being different: wanting something really good, looking forward to getting something really good, and curiosity, which most people probably don't think of as being an emotion at all.[6]

The wanting part of SEEKING gives you the energy to go after your goals, which can be anything from food, shelter, and sex to knowledge, a new car, or fame and fortune. When a cat stalks a mouse, its actions are driven by the SEEKING system.

The looking-forward-to part of SEEKING is the Christmas emotion. When kids see all the presents under the Christmas tree, their SEEKING system goes into overdrive.

Curiosity is related to novelty. I think the orienting response is the first stage of SEEKING because it is attracted to novelty. When a deer or a dog hears a strange noise, he turns his head, looks, and pauses. During the pause, the animal decides, Do I keep SEEKING, run away in fear, or attack? New things stimulate the curiosity part of the SEEKING system. Even when people are curious about something familiar—like behaviorists being curious about animals, for instance—they can only be curious about some aspect they don't understand. They are SEEKING an explanation that they don't have yet. SEEKING is always about something you don't have yet, whether it's food and shelter or Christmas presents or a way to understand animal welfare.

SEEKING is a very pleasurable emotion. If you implant electrodes into the SEEKING system of an animal's brain, it will press a lever to turn the current on. Animals like to self-stimulate the SEEKING system so much that for a long time

researchers thought the SEEKING system was the brain's "pleasure center," and some people still talk about it that way.[7] But the pleasure people feel when their SEEKING system is stimulated is the pleasure of looking forward to something good, not the pleasure of having something good.[8]

SEEKING might be a kind of master emotion. Jaak Panksepp says that SEEKING could be a "generalized platform for the expression of many of the basic emotional processes ... It is the one system that helps animals anticipate all types of rewards."[9] It's possible the SEEKING system helps you anticipate bad things, too. There is new research showing that one area in the nucleus acumbens, which is part of the SEEKING system, responds to negative stimuli the animal is afraid of.[10] The SEEKING system might turn out to be an all-purpose emotion engine that produces both positive and negative motivations to approach or to avoid. But until researchers learn more, SEEKING means the positive emotions of wanting, looking forward to, or being curious about something, and that's the way I will be using the term in this book. SEEKING feels good.

RAGE: Dr. Panksepp believes that the core emotion of RAGE evolved from the experience of being captured and held immobile by a predator. Stimulation of subcortical brain areas causes an animal to go into a rage.[11] RAGE gives a captured animal the explosive energy it needs to struggle violently and maybe shock the predator into loosening its grip long enough that the captured animal can get away. The RAGE feeling starts at birth—if you hold a human baby's arms to his sides, he will become furiously angry.

Frustration is a mild form of RAGE that is sparked by mental restraint when you can't do something you're trying to do. That's why you feel mild anger when you can't unscrew a tight lid from a jar or when you can't solve a math problem. In one case the action of opening the jar has been restrained, and in the other the mental action of solving the math problem has been restrained. Frustration from mental restraint evolved out of RAGE from physical restraint.

We should assume that some captive animals feel frustrated being locked up inside enclosures, barns, apartments and houses, yards, and cages, because being locked up is a form of restraint no matter how nice the environment is. Many captive animals try to escape as soon as they have an opportunity. That was something my dissertation adviser at the University of Illinois, Bill Greenough, used to talk about. Bill used to say that maybe when we created enriched environments for laboratory animals we were just creating an enlightened San Quentin prison. I think he was right.

FEAR: The FEAR system doesn't need a lot of explanation. Animals and humans feel FEAR when their survival is threatened in any way, from the physical to the mental and social.[12] The FEAR circuits in the subcortex of the brain have been fully mapped. Destruction of the amygdala, the brain's fear center, turns off fear.[13] The core emotion of FEAR motivated the gerbils I mentioned before to dig, because in the wild

gerbils who did not dig tunnels were eaten by predators.

PANIC: PANIC is Jaak's word for the social attachment system. All baby animals and humans cry when their mothers leave, and an isolated baby whose mother does not come back is likely to become depressed and die. The PANIC system probably evolved from physical pain. When you stimulate the part of an animal's brain that regulates physical pain, the animal makes separation cries. Opioids are even more effective at treating social pain than they are at treating physical pain. Jaak says that's probably why people say it "hurts" to lose someone they love.

Dr. Panksepp also writes about three other positive emotion systems researchers don't know as much about, and that don't necessarily run through an animal's entire life. He calls these three emotions "more sophisticated special-purpose socioemotional systems that are engaged at appropriate times in the lives of all mammals."

LUST: LUST means sex and sexual desire.

CARE: CARE is Dr. Panksepp's term for maternal love and caretaking.[14]

PLAY: PLAY is the brain system that produces the kind of roughhousing play all young animals and humans do at the same stage in their development. The parts of the brain that motivate PLAY are in the subcortex.[15] No one understands the nature of playing or the PLAY system in the brain well yet, although we do know that play behavior is probably a sign of good welfare, because an animal that's depressed, frightened, or angry doesn't play. The PLAY system produces feelings of joy.

Taken together, these seven emotions—especially the first four—explain why some environments are good for animals (and people) and others are bad. In a good environment you have healthy brain development and few behavior issues.

Pigs in Disneyland

The Brambell Report said animals should be free to express normal behaviors, but it didn't say animals have to have natural environments. For as long as I've been working in the field of animal behavior and welfare, "enriched environments" have been the main approach to giving animals a good emotional life.

The idea that animals are happier in enriched environments first came from research psychologists working with lab rats. In the 1940s, Donald Hebb, a Canadian psychologist, raised some young rats in his house instead of in a laboratory cage. Later on, when he tested them, they had higher intelligence and better problem-solving abilities than the rats that grew up in cages.

Twenty years later, in the 1960s, a research psychologist named Mark Rosenzweig was the second major researcher to study lab rats in enriched environments.[16] No one

in the general public has ever heard of him even though he showed that an adult brain could grow new cells, a finding that went totally against everything neuroscientists believed. Dr. Rosenzweig's enriched adult rats had an 8 percent increase in thickness of the cerebral cortex.[17] That was an amazing finding, but nobody picked up on the idea that the brain could be plastic (could grow and change) in adult rats as well as juveniles.

Bill Greenough's experiments in the late 1960s and 1970s raising baby rats in stimulating environments were the studies that became famous. Bill raised one group of rats in a standard plastic laboratory cage with shavings on the floor. The other group lived in an enriched environment filled with lots of toys and old wood boards. He brought in new toys every day and changed the position of the boards, so the enriched environment also included a lot of novelty and change. When he looked at the brains, he found that the rats in the enriched environment had greater dendritic growth in their visual cortex.[18] Dendrites are tiny little threads that branch out from brain cells and conduct electrical impulses into the cell body. Rats living in stimulating environments had more brain growth.

Bill's work had a huge effect on me, and I think he influenced the whole field of animal welfare, because researchers have been studying barren and enriched environments for thirty years now. I went to the University of Illinois in 1981 to work with Bill because of that study.

When I sent in my application, I was especially concerned about the way farms were treating their pigs. There was a lot of controversy, which is still going on today, about the sow stalls where mama pigs were kept locked up for their whole pregnancy. The sow stalls were so narrow the pigs didn't even have enough room to turn around. I thought that maybe if I duplicated Bill's rat research in pigs I would have a biological test researchers could use to prove that barren environments are bad for pigs. I would be able to show that pigs raised on hard plastic floors they couldn't root in had fewer dendrites than pigs raised in nice straw-bedded pens.

So, for my dissertation research, I copied Bill's enriched rats experiment using young pigs. Twelve of my piglets lived in six baby pens with perforated plastic floors and nothing much to do. The other twelve lived in a Disneyland for pigs with lots of straw to root in and toys to play with: plastic balls, old telephone books they could rip up, boards, and a metal pipe they could roll around the floor. Every day I was putting new things in and taking old things out. New things were the key. The pigs loved fresh, new straw, which they found very interesting. The old straw was boring. You would think straw is straw, but it isn't. New straw was exciting; old straw wasn't.

My hypothesis was that the brains of the Disneyland pigs would show more dendritic growth than the brains of the barren-environment pigs. Back then the only way to compare neurons from one brain to another was to spend hours and hours staring into a microscope and drawing the cells by hand, which I did. I looked at two parts of the pigs' cortex: the visual cortex, which was where Bill's enriched rats had

extra dendritic growth, and the somatosensory cortex, which receives information from the pig's snout.

When I finally got done, I realized the Disneyland pigs didn't have any greater dendritic growth at all. I was even more surprised to find out that my barren-environment pigs did have greater growth. Also, my barren-environment pigs had their extra growth in the somatosensory cortex, not the visual cortex where Bill's rats had shown extra growth. [19] My experiment totally contradicted Bill's. My enriched pigs didn't have greater brain growth, and the part of the brain where my underestimated pigs did have greater growth was different from the part where Bill's enriched rats had theirs.

When I told Bill about my results he said, "Oh, s***."

He thought I must have made a mistake, so I had to do the whole experiment over again. This time I installed a battery of security cameras trained on the pigs so I could see what they were doing when I wasn't around.

I already knew my barren-environment pigs had to be different from my Disneyland pigs, because they were so hyper. I'd go to clean the pens and they'd bite the hose over and over again and get in the way; they wouldn't stay away from me. That was from the environmental deprivation, which makes animals hyperactive. When the pigs saw the water hose, their SEEKING system went into overdrive.

I found out from watching the videotapes that they were hyper at night, too. All night long they were rubbing their noses into each other and into the floor, and they were going crazy manipulating the nipple waterer, which is a water pipe with a nipple on the end. All this activity was going on while the Disneyland pigs were sleeping.

When I looked at the brains under the microscope, I found the same thing I found the first time. The barren-environment pigs had greater dendritic growth than the Disneyland pigs, and the greater dendritic growth was in the somatosensory cortex, not the visual cortex.

Bill wasn't happy about my second experiment, either.

Trying to figure it out, I got to thinking that maybe what makes dendrites grow isn't the environment. What makes dendrites grow are the animal's behaviors and actions in its environment. Bill Greenough created a visually complex environment for his rats. There was a lot to look at. But my barrenenvironment piglets had been doing a lot, not seeing a lot. They'd been constantly using their noses to prod and poke each other and the waterer. Greater use of a body part led to greater dendritic growth in the part of the brain that received input from that body part. I think the lack of stimulation revved up their SEEKING system, because when I cleaned their feeders the pigs were so starved for stimulation that they intensely rooted and chewed at my hands. My Disneyland pigs were much less interested in feeder cleaning because they had plenty of fresh straw and toys to occupy their SEEKING system.

Everyone who read Bill Greenough's studies, including me, automatically assumed that increased dendritic growth was a good thing. But after I saw how my pigs were acting at night when they should have been sleeping, I started to think there can be increased dendritic growth that was abnormal and bad.

Bill didn't agree, but that's what neuroscientists believe today. You can have too little brain growth and you can have too much growth. Both things can be pathological. My barren-environment pigs probably had abnormal overgrowth of the dendrites in the somatosensory cortex. This is where my belief came that it is so important to satisfy the SEEKING system to prevent abnormal brain development.

What Makes an Environment Stimulating?

I didn't come out of graduate school with a biological test for animal welfare, and we still don't have one today. The only guide people have to judge whether an environment is good for an animal is the animal's behavior, which gives us insight into its emotion. But that raises quite a few questions. For one, we don't necessarily know how a captive or domestic animal with good mental welfare should behave, and some animals even hide the fact that their welfare is very poor. Prey species animals such as cattle and sheep hide their pain when they know they are being watched so that predators cannot detect their weakness. When nobody is around they may be lying down and moaning. Another problem with using the animal's behavior to judge its mental welfare is that captive and domestic animals aren't free to act the way they would act in the wild. For example, a normal, healthy animal can mate successfully, so if you have an animal that can't or won't mate, that's a red flag. But if a captive animal never has an opportunity to mate, there's no way to tell whether it would if it had the chance.

Probably for reasons like these, animal welfare researchers have ended up focusing on abnormal repetitive behaviors—stereotypies—to judge animal well-being. Stereotypies are extremely common, easy to see, and definitely abnormal in humans, although both people and animals in certain high-tension moments do have normal stereotypies. If you watch a tennis match, you'll see lots of them. Roger Federer has a racket-twirling stereotypy, and Maria Sharapova has a little repetitive dance she does while she's waiting for her opponent to serve. I call these "burst" stereotypies, because they don't last long. Animals do lots of burst stereotypies. Pigs go crazy bar chewing and bar biting at feeding time. Animals living in the wild also have some burst stereotypies. Polar bears are notorious pacers and figure-eight swimmers in captivity, and they've been observed doing "transient pacing" in the wild.

Burst stereotypies are probably always normal, so I don't worry about them. The stereotypies I worry about are the continuous stereotypies, the ones that go on for hours. Really intense stereotypies—stereotypies an animal spends hours a day doing—almost never occur in the wild, and they almost always do occur in humans with disorders such as schizophrenia and autism. Normal children raised in isolation also

have stereotypies. One study of adopted Romanian orphans in Canada found that 84 percent of them had stereotypies. A lot of them rocked back and forth on their hands and knees inside their cribs; other babies stood up, held on to the sides of the cribs, and shifted back and forth from one foot to the other.

One-fourth of the children had self-injurious behavior, or SIB, as well. Self-injurious behavior means the children deliberately injured themselves the way some autistic children do: biting their hands, banging their heads against the wall, or slapping themselves in the face and head. Captive animals can have SIBs, especially primates. Ten to 15 percent of rhesus monkeys living alone in a cage develop self-biting, head banging, and self-slapping.

You never see ARBs or SIBs that severe in the wild. So, when you see them in captivity, that means something is wrong.

85 Million Animals

Georgia Mason and Jeffrey Rushen at the University of Guelph and Agri-Food Canada estimate that over 85 million farm, laboratory, and zoo animals and pets worldwide have stereotypies, including 91.5 percent of all pigs, 82.6 percent of poultry, 50 percent of lab mice, 80 percent of American minks living on fur farms (these are breeding females), and 18.4 percent of horses.[20]

That's a lot of stereotypies, and researchers are still trying to come up with the best way to classify the different types of stereotypy. Georgia Mason groups the most common kinds of ARBs this way:

- Pacing-type ARBs—pacing and other similar actions, such as circuit swimming, where a bear or a seal swims the same circuit around its pool over and over again. Over 80 percent of stereotyping carnivores pace, either back and forth or in a figure-eight pattern.

- Oral ARBs—bar and fence chewing, obsessive object licking, tongue rolling, and so on. Oral stereotypies are common in all grazing animals, because that's what they do all day. They graze.

- Other ARBs—rocking, repetitive jumping, and so on, or "non-locomotory body movements."

The zoo animals I call the "big pretty animals"—the big predators such as the lions, tigers, and bears—pace. Ungulates, which are the hoofed animals—horses, cows, rhinoceroses, pigs, zebras, llamas—do stereotypies with their mouths. Most of the other animals, including primates and lab rats, develop movement stereotypies in the third category. In human disorders such as autism, the abnormal behavior is usually

in the first or third category.

One of the most extreme cases of stereotypy I've ever seen was in a female wolf I saw at a wolf shelter. The wolf's name was Luna. Some crazy lady had been raising wolves in her yard, where she kept them all tied up to trees. No social roaming animal can be tied up all the time; keeping wolves or dogs tied up like that is cruel. They need to travel around and have lots of free social contact with other wolves and dogs. What that lady did was terrible.

The shelter people had rescued all the wolves and built really nice enclosures for them, one hundred feet long, thirty feet wide, and full of trees. They built six pens and put two wolves to a pen, which is fine. Wolf families are generally pretty small, maybe around seven or eight animals, so two wolves to a pen gave each wolf another wolf to socialize with, without the shelter risking putting together a lot of incompatible individuals that might get into fights.

Probably about half of all the wolves were pacers when they first got to the pens, but some of them were in worse shape than others. Luna and her pen mate were both pacing. The pen mate, though, would respond to changes in the environment. When you walked into the pen she'd look up and see you, or if a truck drove by she'd stop and look at it. If you stood in front of her while she was pacing, she'd notice you were there and take another path.

Luna was completely out of it. She was a beautiful wolf, with a gorgeous coat, and her mouth was in the relaxed "smile" position. But she acted the way some young autistic children do; she was in her own little world. You'd walk into the pen and she wouldn't be aware that you were there, and she didn't react to trucks driving by. She had paced so much she'd worn a path into the ground.

There was a log by Luna's path, so I sat down on it with my student Lily and we put our toes on the edge of Luna's path in the ground. Luna just paced by our toes like they weren't even there.

Then I stretched my leg out across her path. Luna jumped over my leg, but not in a normal way. She dropped her toes the way I've seen autistic kids do and scuffed them on my leg as she went over.

I don't know why toe dropping happens, but my own shoes were always scuffed on the top of the toe when I was a child. No other children had scuffs on top of their shoes, just me. Being autistic, I had a lot of stereotypies, too.

Next I put my other leg out, and she did the same thing. She put her toes down and scuffed them on my legs when she jumped over.

Then Lily put one leg out and the same thing happened. Luna jumped over all three of our legs without acting like they were there, and she scuffed her toes. Lily put her other leg out, so now there were four legs in the path. Luna jumped and scuffed

again.

I wanted to see if there was any way to get Luna to notice that there were two human beings blocking her path, so I put my hand out about eight inches above my leg, like a low wall. Luna jumped the "wall" very badly, bashed her foot on my hand, and kept on going as if Lily and I weren't there. I raised my hand to eighteen inches above my leg, and this time Luna smashed into my hand with her chest and scuffed all four of our legs with her toes. The shelter lady told me that another woman who worked there had stood in front of Luna once, blocking her path, and Luna knocked her over. Ran right over her. Luna was like a robot, or a wolf zombie. She just kept pacing back and forth, back and forth, and nothing could catch her attention or change her path.

A Shock

When I first started writing this book, I thought that you could use stereotypies as a test of animal welfare. If a captive animal is stereotyping, that means it is suffering. The reason I thought this is that I've spent a lot of time around high-strung, nervous horses that have more stereotypies than calm horses. Also, I had stereotypies myself when I was little, and I had a lot of problems then. Repetitive behavior calmed me down when my overly sensitive nervous system was bombarded by sounds that hurt my ears.

But just a few weeks after I started to read the most recent research on stereotypies and barren environments, I found a group of studies on mink stereotypies that blew my mind. Farmed minks are high-activity animals that live in horrible, small cages. Anyone would expect them to have a lot of stereotypies, living in that tiny space, but 25 percent of the minks in the study—all breeding females—didn't have any stereotypies at all. They were not living in a good environment, but they didn't have stereotypies and they were breeding well.

That part didn't surprise me because there is a huge variability in stereotypies between different individual animals. I saw that with my pigs. The shock came when I read the results for the 75 percent of minks that *were* stereotyping. It was the opposite of everything I had always believed. The 75 percent of minks that had stereotypies were calmer and less fearful than the 25 percent that didn't.[21] They weren't out of it like Luna, either. When the experimenters pushed a stick a little way inside their cage, the stereotyping minks explored it, but the rest of the minks either attacked the stick violently or ran away. An animal that explores a novel object put inside its cage has better welfare than an animal that is terrified or enraged. The stereotyping minks had better welfare than the minks that didn't have stereotypies.

When I first read this, I was like Bill Greenough with the pig results—"Oh, s***! Oh, s***!" All I could keep thinking about was, "How do I reconcile these minks with everything else I know?" I was also freaked out because I knew there would be some

people who would use the studies to say it's acceptable to keep minks in these horrible cages because the stereotyping minks are calm.

Then I went through all the new research on stereotypies and realized my mistake. I was used to seeing stereotypies in high-fear Arab horses and autistic children. So I associated all stereo-typies with fear and anxiety. But the most recent research on stereotypies showed me that wasn't the whole story. Yes, stereo-typies are abnormal, but you can't automatically assume that an animal that is stereotyping has poor welfare right at that moment or that an animal that is not stereotyping has good welfare. An animal that is stereotyping might have better welfare than an animal that isn't. Abnormal repetitive behavior means one of three things:

- The animal is suffering now.

- The animal was suffering sometime in the past but isn't suffering now. A barren environment caused my pigs to start doing stereotypies. I think this caused extra, abnormal dendrites to grow. Even when the pigs were moved to a better environment, stereotypies tended to persist thanks to those extra dendrites.

- The animal's current welfare may not be great, but the animal is in better shape than other animals in the same barren facility that aren't stereotyping. A stereotyping animal in a bad environment may be soothing or stimulating itself, whereas the nonstereotyping animal may have just given up and become totally withdrawn and depressed. In a bad environment, the pacing animals have better welfare.

I would put Luna the wolf in the second category. Luna had good living conditions at the shelter, but she still had some of the worst stereotypies I've ever seen in a canine. I think stereo-typies can have different motivators that are based on the core emotions. Fear may be the driver in some cases, but the minks were probably motivated by the SEEKING system. Since there is nothing to seek in a barren cage, they paced. When I replayed the memories of my childhood stereotypies, I realized that they were initially motivated by fear so I could escape from sounds that hurt my ears. I studied all the reflections on grains of sand that I dribbled through my hand, and I shut out the world around me. My SEEKING system had now kicked in, and I studied details that most people would ignore.

The reason Luna's pacing was so extreme is probably that she was born and raised in captivity. That's one of the most interesting findings from the research on animal stereotypies: wild-caught adult animals—animals that were born and grew up in the wild before being captured—have fewer stereotypies than animals raised in captivity.[22] Most people would think that animals captured in the wild and put in a zoo would be pacing or bar biting like crazy because it's horribly stressful to remove wild

animals from their natural habitat and transport them to zoos, and it should never be done. But it's the other way around. Animals born in captivity have more stereotypies than animals born in the wild.

The reason wild-caught animals stereotype less than animals born and raised in captivity is probably that wild-caught animals were living in a rich, natural environment when they were young and their brains were developing. Many animals born in captivity were raised in barren environments like the Romanian orphans. Luna was probably a deprived animal with a scar on her brain that caused her pacing to be worse.

That explains the pet tiger I saw in Texas. The big predators living in zoos are known for doing a huge amount of pacing, and almost all of these animals were born in captivity. It's good that they were born inside zoos because it's horribly stressful for a wild animal to be captured and put in a zoo. But lions and tigers that grow up inside zoos often pace their enclosures for hours and hours.

The tiger I saw was born in captivity, but he didn't have any stereotypies at all. That's probably because his captive environment was highly stimulating. The tiger was raised by two ranchers who found him at an emu auction when he was a baby. The wife saw the tiger and said, "I'm taking him home." This was an eight-week-old male tiger cub.

They took the tiger cub home, and he lived in their house with them like a pet, becoming house-trained just like a dog. He would stand at the door to go out to go to the bathroom. The couple also owned a mature Labrador retriever who was immediately dominant over the baby tiger. After the tiger had lived with them and the Labrador for a while, they got a St. Bernard who was also dominant over the tiger. A house with two humans and two dominant dogs isn't a natural environment for a tiger cub, but it's not a deprived, barren environment, either. In the wild, tiger cubs live with their mamas and their brothers and sisters for a year while they learn how to hunt. The two dogs were the pet tiger's brothers and the ranchers were probably his parents. The tiger baby was growing up in an enriched social and physical environment.

When he reached the age of one and a half, the ranchers moved him out of the house and into a cage outside, about sixteen feet wide by fifty feet long, and he's been there ever since. They never let him roam outside the cage, but there's a little door big enough for his head to come out and they pet him and feed him. They don't have the dogs anymore, so he's pretty much alone.

That tiger has no stereotypies: no fur pulling, no paw biting, and no pacing. The only thing wrong with him is that he's a little paunchy because when he was young they overfed him, so now that he's lost weight his skin hangs down. But that's all.

The tiger has tons of cattle to look at in the pasture across the way from his enclosure, and he looks at them constantly. He gets really excited when the cattle are rotated to different pastures. If little kids visit the ranch, he also likes to look at them.

He looks at small children in a really scary way—he looks at the kids the same way he looks at the cattle. That's because he wasn't raised with kids, just with grownup people and dogs. So, to him, the little person and the big person are not the same thing.

I've been doing a lot of consulting work with zoos since *Animals in Translation* came out, so I've seen a lot of big cats in captivity. This tiger looks fine to me, and if you took his cortisol levels I bet they'd be normal. (Cortisol is a stress hormone.) His current environment seems to be OK for him, but the most important thing is that he had an enriched social and physical environment when he was a cub. There is something neuroprotective—protective of the brain—about early stimulation.

To improve welfare in captive-born animals, people need to give them enriched environments both as babies and throughout adult life. It's much better to prevent stereotypies from developing in the first place, instead of trying to treat them once they've started. Once stereotypies do develop, you should try to reduce them, even in the case of scar-on-the-brain-type stereo-typies. An animal like Luna may not be suffering, but the constant stereotyping itself interferes with an animal's quality of life and her nervous system is operating in a totally abnormal manner. If I had been allowed to do stereotypies all day, I would have never become a professor and I would have missed many wonderful experiences. The people who ran Luna's shelter did manage to get her stereotypies down somewhat by moving her to a different pen away from the food preparation area. The sight of food was probably making her stereotypies worse because it constantly stimulated her SEEKING system.

Everyone who is responsible for animals—farmers, ranchers, zookeepers, and pet owners—needs a set of simple, reliable guidelines for creating good mental welfare that can be applied to any animal in any situation, and the best guidelines we have are the core emotion systems in the brain. The rule is simple: Don't stimulate RAGE, FEAR, and PANIC if you can help it, and do stimulate SEEKING and also PLAY.[23] Provide environments that will keep the animal occupied and prevent the development of stereotypies.

In the rest of the book I'm going to tell you what I know about how you can do that.

2: A Dog's Life

DOGS ARE VERY DIFFERENT from a lot of other animals we work with because they are hyper-social and hypersensitive to everything we do. Dogs are so tuned in to people that they are the only animals that can follow a person's gaze or pointing finger to figure out where a piece of food is hidden. Wolves can't do it,[1] and neither can chimpanzees.[2]

Dogs are genetic wolves that evolved to live and communicate with humans. That's why dogs are so easy to train compared to other animals. Anyone can teach a dog to sit and shake hands, and most dogs do a lot of self-training as they get older. I know a dog who, every time his owner puts her shoes on to take him for a walk, runs up to her side, sits, and waits quietly for her to put on his collar. When his owner picks up the collar he bows his head. No one trained him to do any of those things. He trained himself.

The reason dogs can train themselves to perform a lot of behaviors is that our social reactions are reinforcing to dogs.[3] To train a cat, you have to give it food treats, but a dog is happy when you're happy. Over time that dog noticed that his owner acted happy when he waited quietly for his collar, so he learned to wait quietly to make her act happy.

Of course, some trainers would say that the dog trained *her* to act happy when he did his collar thing and they'd probably be right. People and dogs unconsciously train each other all the time. The natural state of life for dogs is to live with people.

Researchers have known about dogs being genetic wolves for only about ten years now.[4,5] That discovery has probably increased people's interest in the similarities between dog behavior and wolf behavior. The problem is that people have a lot of misconceptions about wolves. One of my biggest surprises doing the research for this book was reading L. David Mech's thirteen-year study of the wolves on Ellesmere Island in the Northwest Territories (now part of Nunavut) of Canada.[6] Mech's findings turn practically everything we thought we knew about wolves upside down. Since dogs are genetic wolves, that means we need to think about dogs in some new ways, too, which is what I'm going to talk about.

Dr. Mech's most important finding for people thinking about wolves and dogs: *In the wild, wolves don't live in wolf packs, and they don't have an alpha male who fights the other wolves to maintain his dominance.* Our whole image of wolf packs and alphas is completely wrong. Instead, wolves live the way people do:[7] in families made up of a mom, a dad, and their children. Sometimes an unrelated wolf can be adopted into a pack, or one of the mom's or dad's relatives is part of the pack (the "maiden aunt"), or a mom or dad who has died could be replaced by a new wolf. But mostly wolf packs are just a mom, a dad, and their pups.