

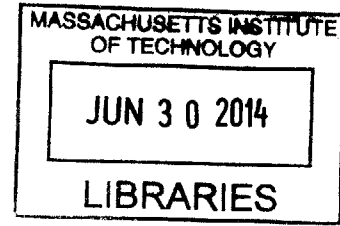
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The Beast Within:  
Measuring the Minds of Zoo Animals

by

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B.A. History of Science  
Harvard University, 2011



SUBMITTED TO THE PROGRAM IN COMPARATIVE MEDIA STUDIES/WRITING  
ON JUNE 11, 2014 IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR  
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**ABSTRACT**

Though zoos have come far from their early days of concrete boxes in caring for their residents' physical health, zoo animals' mental health—the feelings and thoughts beneath the furry and scaly exteriors—has only recently become a serious field of research. The fear of anthropomorphism, or the furnishing of non-human entities with human characteristics such as “happy” or “depressed,” has discouraged scientists for decades from approaching this seemingly unscientific and unknowable topic. But as the concept of welfare becomes increasingly lauded as the main focus of zoos, crucial to zoos' attendance, their respect by society, and their future existence, zoo keepers, curators, and researchers are beginning to seek out new ways to discover and understand their animals' true feelings—broadening ‘animal welfare’ to include minds as well as bodies.

This thesis explores new studies, technologies, and ways of thinking about animal mental welfare among zoo researchers. Specifically, the thesis focuses on researchers at Brookfield Zoo in Chicago, who have developed a unique tool for studying welfare based on the idea that animals have emotions that can and should be ascertained—and that keepers, those who spend long periods of time with the animals, have the ability to tell how their animals are feeling.

**Thesis Supervisor: Marcia Bartusiak**

**Title: Professor of the Practice**

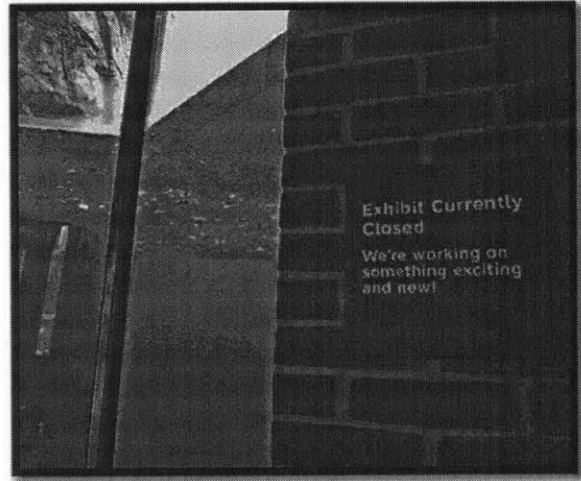
# THE BEAST WITHIN:

## Measuring the Minds of Zoo Animals

**F**or a below-freezing, cloudy day, spotted with snow showers, there is a surprising turnout. Wrapped in fluffy coats, armed with mittens and snow boots, and hauling covered strollers, January visitors to New York City's Central Park Zoo go to great lengths to trek the small, 6.5-acre animal park. The sea lions are out, catching fish and waving flippers, and lemurs frolic, shielded from the cold in the humid Tropic Zone building.

Caked with a fresh batch of snow, rolling rocks nearby look primed for the steps of an arctic native. But in this exhibit, in between the snow leopards and the penguins, no feet or fur grace the snow. In the exhibit's underwater viewing area, a dark tunnel lit largely by sunlight shining through blue-brown water, visitors stop for a moment, staring at floating leaves and twigs in the cloudy water. Only a small black sign by each window indicates that there's nothing to see. "Exhibit Currently Closed: We're working on something exciting and new!" they read. The muddy pool has no reason to be cleaned out. The last polar bear to tread the water in Central Park Zoo passed away in August 2013. His name was Gus.

Weighing about 1,000 pounds, Gus was known for his obsessive swimming routine. He would drift smoothly through the water, slowly pushing off of one side of the exhibit with his hefty white haunches. Gliding into a slow backstroke, he would float backwards toward one of the viewing windows with his nose and stomach in the air, then gracefully dive to the bottom and twist around to swim forward, back to the other side. Then he would do it all over



A sign at Gus's empty exhibit

again. And again. And again, sometimes up to twelve hours in a day, etching a figure-eight in the water. Gus's repetitive laps earned him the titles of "neurotic Gus,"<sup>i</sup> "the lonely polar bear,"<sup>ii</sup> and the "bi-polar bear."<sup>iii</sup>

Gus's habitual swimming is a type of behavior that all zoo keepers watch out for. It is known as stereotypy, a recurring routine of action that is considered an indicator of stress or discontent. Polar bears are the largest land carnivore—their range in the wild can reach 31,000 square miles. By contrast, the entire Central Park Zoo is just one hundredth of a square mile, or less than one millionth the size of a polar bear's natural territory. While watching the routine unfold, New Yorkers questioned whether Gus, like themselves in their tiny New York apartments, felt cramped in an absurdly small living space. Or was it the maddening clamor of the city? The noxious smells of car exhaust and garbage? The keepers and vets focused on his physical health, examining his food and housing.

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Without the ability to ask Gus himself to disclose his deepest feelings, observers could only speculate.

To get to the bottom of the problem, in 1994 the zoo hired Tim Desmond, an animal behaviorist and the trainer of the whale in the movie “Free Willy,” to treat him. Print and television media were quickly filled with news of a depressed New York Zoo polar bear in therapy. The number of visitors to Gus’s home skyrocketed, as people came to view and cheer up the pacing swimmer. “This is a bear New Yorkers can relate to,” a *New York Times* article said, “anybody who is anybody in Manhattan has a therapist.”<sup>iv</sup> Some articles claimed he was also put on Prozac.<sup>v</sup>

“Bored” was Desmond’s \$25,000 diagnosis. His prescribed treatment involved adding new physical and mental challenges, such as putting his food at the bottom of the pool, burying it in gravel, or providing live trout to catch.<sup>vi</sup> Working for food is one thing bears have in the wild that they don’t in captivity, Desmond reasoned, and perhaps it offers an engaging activity to keep them occupied and healthy. With meals and toys handed to him regularly, maybe Gus had become like a spoiled rich kid, discontented and lazy.

With the help of these novel programs, Gus did appear better for a while. But then, eight years later, he had a relapse. In 2002, another \$25,000 was spent on a new pool that created a constant current for the bear to swim in, in hopes of discouraging a new bout of repetitive swimming.<sup>vii</sup> They also added a log for Gus to roll on and even a private air-conditioned room for him to sleep in. The keepers spent their lunchtimes discussing different ways to keep Gus healthy and engaged. “I’m going out on a limb as an animal behaviorist saying he is happy,” said

Don Moore, the zoo’s senior curator at the time.<sup>viii</sup>

And then, after losing his female companion of twenty-four years, Ida, in 2011, all of Gus’s symptoms returned in full force. The media once again contemplated the bear’s feelings. “Is Gus the Widowed Central Park Polar Bear Sad?” inquired the New York-based blog *Gothamist*.<sup>ix</sup> In 2013, Gus lost his appetite and had difficulty chewing and swallowing food. The keepers wondered if the symptoms indicated a deeper dive into depression, but veterinarians soon discovered a large, inoperable tumor. At the age of twenty-seven, Gus was euthanized.

After his death, sympathy for the sad bear only heightened. A swarm of articles and eulogies connected Gus’s life to that of all New Yorkers. “We are all Gus the depressed polar bear,” read one article in *New York Magazine*.<sup>x</sup>



**A polar bear swimming in a zoo exhibit**

The case of Gus is an extreme example of a common yet controversial human practice; we readily see human-like emotions in animals. Scientists call this anthropomorphism. It is difficult to view a

large, furry mammal playing with a red ball, slouching with its head on its paws, or staring straight at you, without musing on the being's inner state. When a dog pursues its own tail for hours, or a zebra bounds excitedly around its exhibit, we can't help but wonder; what *are* they thinking? The connection felt between New Yorkers and Gus, the care and consideration afforded an *Ursus maritimus*, illustrates a common concern we have with the mental experiences of animals.

While watching Gus pace back and forth across his pool, lingering by the viewing window, or peering back at the humans peering in, people at the exhibit pondered Gus's deepest emotions, ailments, and desires. Though Gus spent his entire life in captivity, both zoo keepers and visitors likely wondered, did Gus yearn for thousands of acres of ice and snow? Did he dream of snagging a fresh seal dinner as it popped out of the open water? Was he as tormented by his manmade confinement in the center of New York City as his perpetual pacing seemed to suggest?

Zoos—the good ones at least—have always taken care of their charges' physical health: providing food, shelter, and medicine for their illnesses. These physical provisions are the parameters by which good welfare has traditionally been defined. Keepers and vets keep checklists and routines to ensure animals' bodies are in good condition, that fur is shiny, eyes are clear, appetite is healthy, and excrement looks normal. But if an animal has all of its physical needs seemingly taken care of, yet still shows signs of discontent, how do you fix a problem that you can't be sure is there? Zoo goers don't hesitate to declare an animal "unhappy," but zoo keepers and researchers shy from such words. It is not professional or scientific to be anthropomorphic; the animals may be expressing poor welfare, but "unhappy"?

That's not a word they are comfortable with.

A growing frustration with this quandary is rising within the zoo world. Popular, expressive individuals like Gus prompt public awareness and media attention. Sad animals do not make for happy zoo goers — and through their visits, donations, memberships, and media attention, visitors put pressure on zoos to make changes. As zoos are confronted by their investors' concern for their animals' mental health, there is a growing willingness to tackle the unknown: the inner feelings, emotions, and even thoughts of the furry, scaled, and winged creatures in their care. While visitors watch seals clap and gibbons swing from branch to branch, speculating on which ones look happy, sad, pensive, or grumpy, zoos are taking steps to perform objective scientific tests that can confirm those impressions.

The question is: How do you set up a rigorous, controlled experiment to enter an animal's mind? And how do you ensure that, in the process of probing parrot, penguin, and puma feelings, that you do more than just bestow them with your own emotions?

## A History of Animal Thoughts

Anthropomorphism is ingrained in us. We call hurricanes Carmen, Ivan and Wilma, we suspect our laptops of conspiring against us when they freeze up, and we think diamonds can be our friend. With moving, breathing characters, it's even easier—and possibly for as long as *Homo sapiens* has existed, hunting, evading, and coexisting with animals, humans have pondered the thoughts of other species, as they anticipated the movements of their prey or calculated the intentions of newly encountered creatures.

In the fourth century B.C., Aristotle believed animals could experience certain sensations such as pain and anger, but

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maintained that only people have souls.<sup>xi</sup> The school of Greek philosophers called Stoics in the third century B.C. held that animals have no sensations or emotions of any kind, thus requiring no moral consideration. This philosophy was picked up by early Christian thinkers and stuck, shaping early Western views of animal mind.<sup>xii</sup>

One notable philosopher influenced by Aristotelian and Stoic ideas was seventeenth-century philosopher Rene Descartes, who proposed a dualist philosophy of mind and body. The mind is not anchored in the body, Descartes believed; in humans it is a separate entity, the soul, an immaterial link to the mind of God. Animals do not have this link to God, and thus they are no more than reflex-driven machines, covered in flesh and fur. For many, the mental line between humans and animals was drawn.

But then, in the nineteenth century, naturalist Charles Darwin strayed from Descartes' dualistic views. Darwin saw a cohesive relationship between the bodies and minds of both humans and animals—emotions and all. In *Descent of Man*, Darwin noted, “It is a significant fact, that the more habits of any particular animal are studied by a naturalist, the more he attributes to reason, and the less to unlearned instinct.”<sup>xiii</sup> Through evolution, he concluded, we share with animals a mixture of the same neurological parts—making it only natural to draw parallels between the minds of humans and the animal kingdom.

In light of this inherent cognitive connection, animal thoughts became a genuine research topic for Darwin. He filled his notebooks and publications with animal anecdotes attesting to their inner experiences. As he wrote in *Descent of Man*, “The love of a dog for his master is notorious; in the agony of death he has been known to caress his master,

and every one has heard of the dog suffering under vivisection, who licked the hand of the operator.”<sup>xiv</sup>

At the London Zoological Garden, which was founded during Darwin's time for the purpose of scientific observation,<sup>xv</sup> Darwin saw cleverness in elephants as they maneuvered their trunks to blow objects outside of their exhibit closer to them.<sup>xvi</sup> He scoured the zoo for evidence of emotional tears for his book *The Expression of the Emotions in Man and Animals*.<sup>xvii</sup> He contemplated the inner goings-on of Jenny the orangutan, who “kicked & cried, precisely like a naughty child” when the keeper offered and then retracted an apple.<sup>xviii</sup> Such instances convinced Darwin that all “higher” animals “have the same senses, intuitions, and sensations—even the more complex ones, such as jealousy, suspicion, emulation, gratitude, and magnanimity.” “They even have a sense of humor,” he wrote, “they feel wonder and curiosity.”<sup>xix</sup>

But near the end of his life, Darwin came under fire for his overly anthropomorphic tales of animal mind.<sup>xx</sup> Though he was a revered and distinguished scientist, his writings on bestial mental faculties earned him little academic praise. At this time, a new branch of cognitive science was rising to the fore, and Darwin's beliefs on the minds of animals quickly became obsolete.

These newcomers rejected the very idea of animal feelings. Called behaviorists, they believed only objective, observable actions could constitute scientific data. In his 1913 manifesto, American psychologist John B. Watson called for a psychology that leads “practically to the ignoring of consciousness.”<sup>xxi</sup> The mind should not be studied, he said, as it is too much the subject of conjecture. Harkening back to the ideas of the Stoics, behaviorists asserted that animals don't feel; they just act. In 1927, Russian

physiologist Ivan Pavlov, whose work and writings had a large influence on behaviorism, wrote that animals should be examined “without any need to resort to fantastic speculations as to the existence of any possible subjective states.”<sup>xxii</sup> We can learn all we need to know about psychology by watching behaviors, he asserted. Behaviorists doubted whether even humans could think for themselves, much less animals.

In the early twentieth century, behaviorism reigned. The new intellectual leadership relocated the proper place for conducting animal science. Zoos, homes, and backyards, where Darwin and others had conducted animal observations, were replaced by laboratories—a more “scientific” setting.<sup>xxiii</sup> To investigate the feeling of fear, Watson viewed the reactions of a boy named “Little Albert,” who, when repeatedly presented with a white rat accompanied by a loud clanging sound in his lab, soon became fearful of any furry object. B.F. Skinner watched rats learn behaviors as they pressed levers for either rewards or punishment in his engineered “Skinner Box.” Emotions in both humans and animals, they decided, were just conditioned responses.

While behaviorism changed the face of psychological science, the character of zoos changed, too. Instead of places of scientific study as they were used by Darwin, zoos became almost entirely recreational. A visitor to the New York Zoological Park in 1904 noted that “[l]earning natural history...is not the greatest good this zoo does for the multitude.” What matters most, he wrote, is that people get “out into the fresh air and sunshine for one mighty good day in which they have forgotten themselves and their perhaps stuffy city rooms.”<sup>xxiv</sup> With this role, zoos proliferated in the beginning of the twentieth century. By 1900, there were about

thirty zoos and aquariums in the U.S., and by 1950, seventy-seven more zoos had emerged.

At first, there was no governing body to oversee animal care and no legislation in place to ensure proper animal welfare. Animal exhibits were initially of the “concrete box” variety—simple, easy to clean spaces. Due to a lack of data on wild animals’ physical needs, habits, and preferences, early zoo builders often had no idea how to house wild species. In 1879, bears roamed Chicago’s Lincoln Park at night after escaping from the zoo’s first bear enclosure. The sea lion pool, built in 1889, also could not contain its residents, and the sea lions sauntered into a nearby restaurant one night. All were later captured except for one, which was last seen diving into Lake Michigan.<sup>xxv</sup>

But with increased knowledge of animals’ natural history in the later twentieth century, zoos began featuring fewer bars and more naturalistic, immersion exhibits that fit the physical and behavioral needs of each species. Instead of in empty, white boxes, unrepresentative of a species’ natural habitat, animals and the guests who came to view them were soon brought into the species’ native lands—into the Serengeti, the Arctic Circle, and the deep ocean. With improvements in exhibits, technology, and methods for delivering veterinary care, zoos made massive strides in caring for the physical welfare of their animals in the 1970s and ‘80s. Around the same time, the first animal welfare laws were enacted in the U.S., regulating the sale and handling of animals used in research.

Extending these welfare concerns one step further—to an animal’s *mental* condition—is largely due to Donald Griffin, a former professor of zoology and animal behavior who taught at Cornell, Harvard, and Rockefeller universities. His work identifying echolocation—the use of sonar to navigate

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and hunt—in bats, revived the idea of animal sentience. From the 1970s to the early 2000s, with the respect he earned as a rigorous scientist from this work, Griffin set out to bring the investigation of mental experiences in animals back from the times of Darwin. He called this new field of study “cognitive ethology,” and young scientists flocked to the field to begin searching for the evolutionary origin of the cognitive mind, how human minds are connected to those of animals, and what this means for the mental experiences of animals today. Previously shunned as a subject unfit for scientific research, animal cognition crossed again into the realm of scientific analysis. When Griffin passed away in 2003, his *New York Times* obituary described him as “the only reason that animal thinking was given consideration at all.”<sup>xvii</sup> While the field of cognitive ethology is still young and not without critics, Griffin and his followers have tenaciously pushed animal studies beyond the physical body and its actions.

Today, chihuahuas strut streets in sweaters and shoes, the ill-tempered internet sensation Grumpy Cat loathes everything, and books, television and movies adorn animals with voices, feelings and friends. In the 2003 movie *Finding Nemo*, a young clownfish named Nemo is caught by fisherman in the Great Barrier Reef and finds himself in a dentist’s fish tank, where he and his new pals devise a return to the sea. In the 2005 cartoon *Madagascar*, Marty the zebra, Alex the lion and other creatures plot their escape from Central Park Zoo. Much of society has long thought like Darwin—seeing thoughts and feelings in the actions of animals. And now, Griffin has opened the door for conjecturing this way in science, as well.

As institutions for the public and increasingly for the growth of animal science

as well, zoos today find themselves in the midst of this burgeoning field of emotion studies, facing a rising flood of questions: If animals feel, do *all* animals feel? How can you tell what a python feels, or a butterfly, a fish, or an ant? And most crucially—when exploring the minds of others, how do we distinguish their feelings from ours? When a bird loses its mate, does it feel a crushing weight of grief like we do? A less acute agony? Or something else entirely? Does a lion relish the warming welcome of a morning sun?

Zoo keepers know animals have feelings—they see it every day. By caring for thousands of different kinds of animals from all over the world, zoos are in a unique position to find some answers, across species and across lands. Yet zoo staff remain distrustful of anthropomorphism. The fear of committing the scientific sin of ascribing human qualities to critters lingers menacingly in the back of keeper minds. Zoo researchers study “affective states,” and keepers are sometimes hesitant to disclose animal names, for fear of encouraging the public to view animals and their actions with human-like characteristics.

What zoos desire—and are now beginning to search for—is a scientific basis for animal emotion, to distance themselves from the clinging stigmatization of “unscientific” anthropomorphism. Zoos hope to evaluate well-being with tests and experiments, to procure hard scientific data in order to build confidence that they know how their animals feel. To ensure that they are helping rather than hurting their charges, zoos aim to link behaviors and emotions to a data point.



## **A New Track**

Brookfield Zoo, a large, 216-acre zoo just outside of Chicago, hosts around 450 species of animals. The zoo has been the place of many firsts since its opening in 1934; indoor multi-species exhibits and successful gorilla brain surgery both debuted at Brookfield. It was one of the first zoos to use moats and ditches rather than cages to separate animals from zoo visitors.<sup>xxvii</sup> And in recent years, it experienced yet another first.

In 2006, Nadja Wielebnowski, then the Vice President of Conservation Science at Brookfield, noticed a curious connection. She paid close attention to the many aspects of animal care and met regularly with keepers, managers, curators, and veterinarians about animal updates and changes. Conversations with keepers of okapis, an endangered animal that appears half deer, half zebra, stuck out in her mind. She heard the okapi keepers often express feelings of “just knowing” when something was wrong with an okapi. Its ears would droop, its gait would slow, or food was not quite as enticing; subtle differences in behavior raised a tiny red flag in the keepers’ minds.

But the keepers often didn’t write it in their daily log book or mention it to their managers, having no real proof to substantiate their intuition. It was an indefinable sense that something was “off”—one of those times when you can’t put your finger on it, but something tells you that things are not right. It could easily be nothing more than keepers extending their own feelings to the okapi; perhaps they’d just had a fight with their girlfriend, or they missed breakfast that morning. Or, the okapi could just be having a bad day and would be better tomorrow. It’s an okapi, anyway—how can a person possibly read into its feelings? Yet often, days or weeks later, the animal’s health began to show

visible deterioration, requiring the veterinarians to step in and figure out what was wrong.

Okapis are not like gorillas or tigers, who have expressive faces and gestures that more outwardly scream for help when they’re in pain. Okapis are prey animals, stoic in their behavior; in their native home in the rain forests of Central Africa, they have learned that assuming a tired posture only shows weakness, inviting leopards to pounce. This adaptation makes ascertaining the animals’ levels of discomfort or discontent all the more problematic.

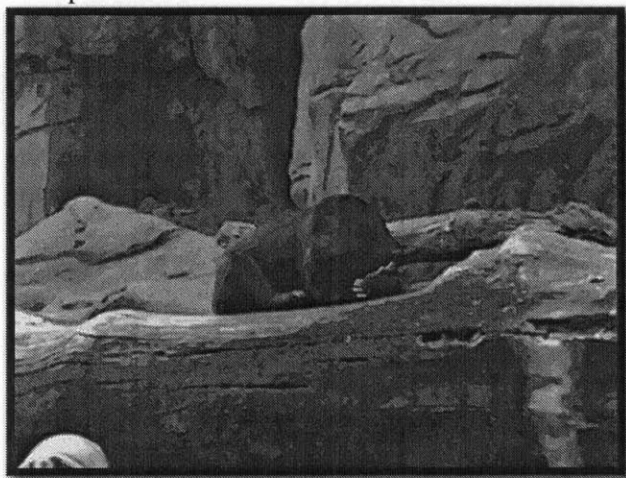
Nonetheless, the correlation of keeper hunches with okapi vet visits seemed to Wielebnowski too much of a coincidence. The keeper inklings came even before any traditional physical warnings appeared. If taken seriously, she thought, a keeper’s hunch could save an animal’s life. But a hunch is still a hunch. So, Wielebnowski wondered whether keeper observations could be experimentally validated. She decided to investigate the parallels between keepers’ red flags and physiological changes in the animal’s body.

There are multiple ways to deduce animal well-being; keepers can look for changes in an animal’s behavior, how shiny its coat is, or whether it has lost weight. These are all physical, outwardly visible changes; these are the notes keepers take in their daily logs. Like the behaviorists’ canon states, the physical is the only kind of observations we humans can be sure of without the ability to ask the animal to describe its inner sensations.

But in humans, we know that well-being goes far beyond the physical. A friend’s sudden slumped posture and shuffling walk raise concern for more than their physical health—and a quick “are you okay?” could confirm our suspicions. Herein lies the major difference in diagnosing humans versus

animals; in humans, diagnosis of depression has emotion-related check marks. Doctors ask about feelings of sadness, loss of enjoyment in once pleasurable activities, and difficulties making decisions.

Studies have shown links between depression and physical symptoms such as aches and pains, digestive problems, sleep patterns, and appetite. The chemicals in the brain that affect one's mood are also involved with feelings of pain. Distinguishing between pain caused by depression and pain caused by other means is an important distinction to make for treatment and for better understanding how to interact with and care for a person—but what about animals?



**A sun bear curls up at Lincoln Park Zoo**

There are ways to assess an animal's inner welfare. It's not always something a keeper's daily routine can catch. One of the most popular and scientifically accepted means of analyzing an animal's mental condition requires a trained eye and a laboratory: the study of hormones.

Wielebnowski, a driven animal researcher and Austrian-born biologist, is especially attuned to the connection between chemicals and behavior. At the Smithsonian

National Zoo before moving to Brookfield, Wielebnowski spent three postdoctoral years studying the behavior and stress of cheetahs and clouded leopards. She examined both their behavior and hormones, focusing on finding ways to study hormones in the least intrusive manner. During her PhD research, Wielebnowski also developed an interest in animal personalities—especially how different personalities may result in differing reactions to stressful events. In 2001, she began at Brookfield as curator and behavioral endocrinologist, continuing her analysis of animal hormones focused on stress. When she moved up to vice president in 2006, she widened her gaze to encompass animal welfare science in general, and she still kept a watchful eye on the endocrinology lab.

“They call it ‘stress studies,’” said Jocelyn Bryant, manager of the lab. “Though some people don’t like to use the word ‘stress.’” The zoo’s endocrinology lab is made up of two rooms filled with large freezers, chemicals, scales and test tubes in a building situated between the reptiles and the primates. Bryant is currently the only endocrinologist on staff, in charge of all hormone analysis for the zoo’s 2,300 animals. After Wielebnowski switched roles, “I had an assistant, but now it’s just me. It’s pretty wild,” she laughed. Bryant, a bubbly, blonde-haired woman, occupies an office near the lab with three desks all to herself. She fills the empty space with images of her German shepherd and the sound of alt-rock radio.

Her work used to primarily involve reproductive tests, to find out when animals were pregnant. Now, she says, stress studies are more common. Fecal hormone analysis, studying the hormones discharged in waste, emerged just over the last few decades. The

rise in popularity of this science within the zoo world suggests an excitement over the use of a chemical—a modicum of science—to investigate the feelings of animals.

Chronic stress in animals, like in humans, is considered an undeniable agent of poor health. We all know stress can do bad things to us; it can tense your shoulders, mangle your digestive system, and make you want to hurl expletives at inanimate objects. When we experience stress in some way, it causes a rise in certain hormones. Sometimes, with adrenaline, it keeps us alert and focused. By increasing the amount of these hormones in our system, our bodies can send energy sources to the places of need, shipping our inner energy troops away from digesting breakfast to assisting the areas in most need of defense.

A little bit of stress is a good thing that keeps us alive in times of danger. When a stressful event happens, hormonal glands release molecules called corticosteroids, on cue. The primary chemical, cortisol, increases the amounts of sugars available for use in the bloodstream. But sometimes, when these chemicals have loitered around too long, things start going downhill. Studies have shown that long-term stress in humans can lead to issues such as obesity, sleeping problems, anxiety—and depression. Knowing the effects these chemicals have on human well-being, scientists began analyzing levels of these hormones in animals, as well.

The association of too much stress with overall negative health effects is known; the critical level of stress, however, and the exact effects caused by prolonged stress in animals, are unknown. But as much in animal mind studies lies on the side of unknown, for animal researchers, the study of stress seems a more concrete method of determining an animal's feelings than many other means.

Bryant specifically measures cortisol

levels. Hormone levels were traditionally measured by sedating animals, bringing them into the lab, and taking blood. More recently, to study stress without stressing out the animals in the process, zoo scientists filch their feces. “I still wish I knew who came up with this,” Bryant sighed. In the “poop lab,” hormones are extracted from the animal waste. They are then taken to the “assay lab,” where the results are analyzed.

Not every zoo, though, has the capability to run these studies, as not every zoo has an endocrinology lab onsite. And the analyses do not always produce useful results. Fecal hormone analysis in particular does not work for every species; the consistency of bird waste, for example, does not lend itself well to hormone studies. But for okapis, it works.

Wielebnowski requested keepers collect okapi waste and bring it to the lab. There, Bryant mashed the waste and placed small samples of it in test tubes in solution. The contents were then thoroughly mixed to shake out the desired chemicals from the other waste ingredients. Bryant's lab freezer was quickly filled with cold okapi poop awaiting analysis.

Once Bryant extracted and analyzed fecal hormones of interest, she generated graphs displaying the various levels of stress hormones in different okapis. Comparing multiple samples over time can reveal ‘peaks’ in hormone levels – times when the animal experienced heightened stress. These could be the times when okapi well-being started plummeting.

With a list of dates of keepers' red flags, Wielebnowski sat down with the hormone results to compare the timing of the observational and physiological events. If the keeper notes didn't match up with the hormones, the keepers' suspicions could not be verified, and would remain just that:

suspicions. If they did match, keeper impressions could be treated as more than that – they could be used as meaningful data. A scientific finding to accompany an inkling.

Staring at graphs of hormones alongside lists of keeper thoughts, Wielebnowski confirmed her own suspicions. They matched, peak for peak.

To initiate deeper analysis of these connections, Wielebnowski applied for grants to bring a postdoctoral researcher on board. “If we can find a way based on science that integrates this information in an easy form, with graphs and printouts available, we would have a good communication tool,” she thought. In early 2007, Jessica Whitham, a recent graduate of a Ph.D. program in biopsychology at the University of Chicago, joined the zoo as a postdoc in behavioral endocrinology. Wielebnowski immediately put her to work on the new finding.

“She brought me in, sat me down and told me that when she would have [the endocrinology lab run samples, the fecal corticoids, that they found that the keepers had said that the animals are off. Even though they couldn’t pinpoint exactly what was wrong, they noticed peaks in those weeks,” said Whitham. Wielebnowski and Whitham began brainstorming ways to turn the keepers’ subjective analyses into objective, qualitative assessments that could provide insight into animal welfare.

But first, they needed to define welfare.

### **What is welfare?**

Welfare is a hot-button word, associated with bloody chickens stuffed in tiny cages, like the images that splatter brochures disseminated by animal rights

organizations. The word suggests the need to correct horrid conditions, rather than the daily care of animals. Zoos have not wanted to be linked to that picture, so the term faded from zoo lingo.

Terry Maple, the former director of Zoo Atlanta and former professor of both biology and psychology at Georgia Tech, noticed the avoidance of the term. A friendly but somewhat gruff man with a palpable pride in his work, Maple recently co-wrote a book entitled *Zoo Animal Welfare*, detailing his ideas for best practices and future changes, drawing from his thirty years’ experience working with zoos. To bring the concept of welfare back into the zoo, he decided to implement a new term for it. When he started working as a consultant to the San Francisco Zoo, he began using the term “wellness,” in reference to the modern concept of overall well-being in humans. “I determined that welfare was a somewhat misunderstood term. Zoos weren’t as warmed up to it as they should’ve been...so I tried to link it to humanity in some way,” said Maple. The “wellness initiative” at San Francisco Zoo began in 2012, hiring a Curator of Animal Behavior and Wellness.

While the term “wellness” so far has stuck in San Francisco among the health-conscious hipsters, the word welfare actually began making a comeback in the zoo world in the 2000s. In 2000, the Association of Zoos & Aquariums (AZA), the organization that inspects and accredits zoos in the U.S., formed its first Animal Welfare Committee (AWC). Every year, zoo professionals from accredited institutions convene at an AZA conference to present new developments and research. Between the years 2004 and 2007, there was no mention of the word “welfare” in any of the presentation titles or categories at the AZA conferences. In 2008, Jessica Whitham and Nadja Wielebnowski

made the first mention of the word in their presentation, introducing their work on creating a new strategy for understanding welfare at Brookfield.

By then, Brookfield Zoo had embraced the word. Influenced by Wielebnowski's emphasis on animal welfare as vice president of conservation science, in May of 2008, Brookfield Zoo hosted its first zoo animal welfare conference, one of the first international zoo conferences specifically focused on welfare. At the same time, the zoo announced the opening of a new center, the Center for the Science of Animal Welfare (CSAW), the first zoo center with a title denoting the study of animal welfare.

In 2009, there were three different AZA presentations on "welfare," including one by Whitham and Wielebnowski entitled "Hunches, Intuitions, and Score Sheets: How to Employ Them to Improve Animal Welfare at Zoos and Aquariums." By 2012, the word 'welfare' was mentioned ten times in the list of conference presentations. And in 2013, the word warranted its own category. "Obviously keepers think of welfare on a daily basis, but more researchers are putting that term to use—the science of animal welfare is definitely what's picked up," said Whitham.

Other zoos have opened up their own welfare centers, as well, and have added the word welfare into their missions, such as Oregon Zoo's pronounced dedication to "advancing the highest level of animal welfare." AZA's Animal Welfare Committee has been compiling knowledge and guidelines on different species' well-being ever since its formation. "There is quite a focus on, and increasing momentum, focused on animal welfare within AZA," wrote Sharon Dewar, public relations advisor for the Animal Welfare Committee.

Whether or not more work on animal welfare is being done now than in the past, the

term has securely entered the zoo lexicon. But what does the word mean to those who use it today?

Asking a zoo professional to define good welfare is like asking a vineyard owner to define a good wine; it is a complex concept to pin down, a set of mostly indefinable qualities. The wine grower or sommelier may spout out common knowledge and expectations, the popular descriptions of wine such as pleasing to the palate, with complexity, earthiness, and a balance of sweetness—but, they would point out, the successful combination of these characteristics vary for every type of wine and for every tongue tasting it. Some wines may win awards or have higher price tags, but in the end, it is subjective. A bad wine is generally more easily agreed upon than a good wine. Defining welfare by the manifestly negative signs, like those seen in inadequate chicken farms, is similarly more easily interpreted.

Whitham sees a new movement in welfare studies: a switch of focus from identifying negative welfare to achieving positive welfare. "That's what we're trying to do here—not just correctly identify poor welfare, but figure out how to go from good to great welfare: how to know if an individual is thriving," she said passionately, with an emphatic *thriving*. "Good," "great," and "thriving" are the sexy new welfare words, and Whitham repeated them multiple times in each conversation on the topic. To Whitham, good welfare can only be discovered if you "start asking the animals," and go beyond the physical questions.

Though the word has come into wider usage, welfare is still a loaded word. When asked how she defines welfare, Megan Ross, vice president of animal care and education at Lincoln Park Zoo in Chicago, just a few miles

from Brookfield Zoo, was at first unsure how to answer. “How do I define welfare...” she said. “that is a hard word to define.”

Then she went on; “I would say that welfare is that an animal has the psychological, physical, physiological, and social needs that they require, so in some ways we are meeting all of the different needs that that animal has. If they have good welfare, you’re meeting those things. If they have poor welfare, then some of those needs are not being met.” Ross included psychological and social needs on the list, as part of understanding the whole of an animal. She believes not just one indicator, but all, must be considered.

Those outside of zoos have their own ideas of what welfare should constitute. “Animal welfare isn’t an absolute; it’s the state of the animal. It’s not what you’re offering it—you could in theory give an animal everything it needs for its life, but the animal could still be very poor,” said Chris Draper of the animal welfare organization Born Free, which aims to “end the suffering of wild animals in captivity.”<sup>xxviii</sup> This idea of welfare extends more deeply into the animal—an animal can be perfectly physically healthy, with shiny fur, glossy eyes and a fine appetite, and still not have good welfare, an idea easily understood by any who have watched the discontented animals in the movie *Madagascar*.

Zoo professionals seem to increasingly agree. But scientists still have difficulty explaining this concept. “I’m a scientist, so whatever the outcome is, I just say what the results are,” said Bryant in her zoo office. Her hormone graphs show peaks that can indicate stress, or they don’t—in which case the animal is, according to her measures, fine. “There are different ways that people view welfare here,” reflected Bryant. “Some people

believe that you have to be sick or dying before it’s an actual issue, while others like to nip it early...but definitely keepers seem to feel most strongly,” she said.

Events that especially affect Brookfield’s animals, according to Bryant, are the zoo’s booming summer concerts, when 30,000 children and adults descend on the premises. These concerts inevitably cause hormone-level jumps in her graphs. Many keepers would like these events to stop, as they always notice odd behaviors during and after. Bryant herself focuses on what the hormones say, which agree with the keepers. “Part of me wants to say, well this is how it is, and maybe we shouldn’t do that anymore because it stressed them out.” She initially believed her science separate from the concept of animal welfare. “At first I thought I had to spin everything to fit under this animal welfare umbrella,” she recalled. But now, she sees her work’s connection to animal welfare.

To some, welfare is simply a new label being slapped onto things zoos have always done, a newly popularized term, like “YOLO” or “swag,” that is not an especially new idea. “Welfare is the hot topic now in zoos,” said Craig Demitros, Assistant Curator of Primates at Brookfield. An energetic, dark-haired man with a friendly face and work-worn skin, Demitros had been at the zoo for thirty years. While he recognized the new emphasis on the word, he asserted that what appears to be a growing focus on “welfare” is actually nothing new. To Demitros, it’s just a different way of framing the animal care practices that keepers have always done. “I think it’s a part of the evolution of zoos, that welfare is all over everything. It’s everything we do,” he said, with a dramatic wave of his hands.

But to others, like Whitham, it is a new and growing scientific concern—something more than zoos have done in the past: a redefinition of “welfare,” leading animal

science and care into unfamiliar territory that takes more than just physical health into account.

### Weaving a Welfare Tool

Faced with the seemingly daunting task of defining animal welfare for a zoo full of myriad species, Whitham and Wielebnowski pushed forward. In 2008, they decided to survey the zoo keepers, managers, and curators who, like the okapi keepers who sensed inconspicuous changes, had worked closely with a species for many years. They expected a great array of responses, and no easy answer.

They first chose twelve species, ranging from gecko to hawk to elephant, for which to create welfare surveys. They developed a questionnaire for the experts asking, in various ways and words, “How do you tell how an animal is feeling?” The questionnaire inquired how long the survey taker had worked as a keeper, how long they had worked with the species in question, and how many hours per week they spend with the animals. Other questions included: How do you determine if an individual is doing well? How do you determine if an individual is doing poorly? Do you feel that you can tell whether an individual is in good health? Healthy? Comfortable? “Off”? “Happy”? “Depressed”? The more emotional words such as “happy” and “depressed” were always in quotation marks. “We knew that people might feel uncomfortable using those terms, so for those folks we used quotation marks,” explained Whitham.

The survey also provided a long list of terms, including “jittery,” “impulsive,” “feels good,” “careless,” “shy,” “insecure,” “sad,” “apathetic,” and “cool,” asking the responders to rate them on a scale of usefulness in determining animal welfare. Finally, the

survey included two pages for open-ended responses, one for listing criteria used in assessing poor well-being, the other for “good or even great well-being.” The survey also asked directly whether it is worthwhile to use gut-feelings, “the subjective, qualitative assessments of keepers” when looking at welfare.

Whitham and Wielebnowski were unsure what to expect—their shameless use of anthropomorphic terms and direct inquiries on the inner state of animals could easily garner scoffs and ridicule. But the replies surprised them.

After about six months of data collection, the results were in. Though they had anticipated weeks to months of back-and-forth about what constitutes welfare, Whitham and Wielebnowski instead found substantial agreement. About 95 percent of the responses showed no hesitation in assessing whether their animals are “happy” or “depressed.” For some species, such as gecko, people were more hesitant to bestow the animals with emotions. But most responders gave serious, thought-out answers to questions involving what are generally considered anthropomorphic terms. “Keepers use the words freely in the lunchroom, anyway...unless a researcher walks in,” reflected Whitham.

Craig Demitros filled out the questionnaire for gorillas. “When we get into terms like ‘off’ and the following ‘happy’ and ‘depressed’ used to describe gorillas, we are approaching for better or worse becoming anthropomorphic,” wrote Demitros in his response. Fully aware that he was answering questions involving potentially unscientific words, he justified his reason for responding; for apes at least, their close relations with humans make anthropomorphism easier and more acceptable, and is even becoming more



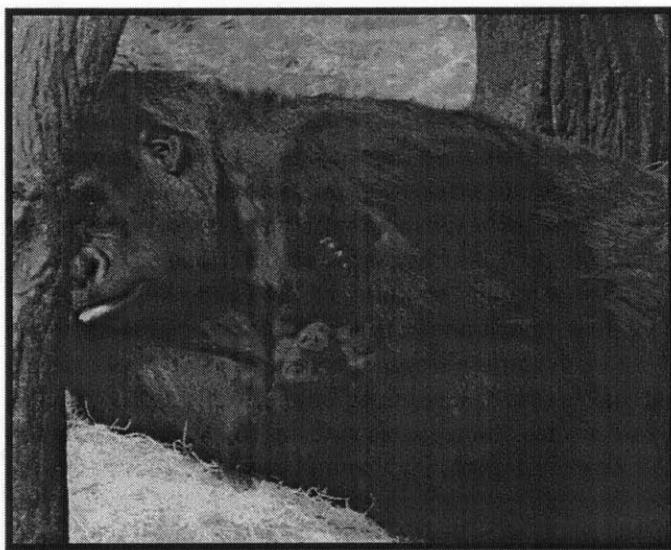
accepted in the world of primatology, he wrote.

He also further endorsed the usefulness of keepers. “Keepers can tell an animal is off through a ‘gut feeling,’” he wrote. ‘It can’t always be pinpointed but you know something is not right with the individual. They are just ‘not themselves.’” Demitros mostly avoided emotive words in his discussion of animal welfare. When he did use words associated with feelings, they were each time chaperoned by finger-quotation marks and a marked intonation.

“Some of it just comes with experience – you know the animals more,” he said, and “not just species in general but individuals as well – there’s a lot of variation between gorilla *‘personalities,’* if you will.” A keeper’s background with the animal is key, he explained. Happy gorillas, he said, “act silly” and make what experienced gorilla observers know as “content grumbles.” Perhaps indicative of his experience and relationships with animals as a long-time zoo veteran, Demitros’s wariness of anthropomorphic words did not deter him from using them.

Besides the open willingness to consider emotions in animals, the biggest surprise for Whitham and Wielebnowski was the quick agreement on what welfare means. Once the surveys were returned, Whitham summarized and compressed the findings into one list of items, a “definition” of welfare for the species in question. When put together and sent out for final confirmation, people were largely satisfied. The experts concurred on how to spot a happy or unhappy animal, even among leopard geckos.

After collecting the experts’ thoughts, Whitham and Wielebnowski further whittled them down to ten to fifteen indicators of welfare, a list of one- to three-word rating scales to be used in analysis. For gorillas, the final list of welfare checkmarks included appetite, locomotion, attitude, feces, posture, calm-relaxed, performs self-mutilating behaviors, and produces content grumbles. These categories were then rated by keepers on a five-point scale from poor to excellent.



A gorilla and baby at Brookfield Zoo

As every species of animal has its own likes, dislikes, and preferences, every species acquired its own survey with its own criteria. Many of the indicators overlap across species, such as appetite, activity levels, and pacing behaviors like those exhibited by Gus the polar bear. But others are more specific, requiring intimate knowledge of a species, such as whether gorillas produce “content grumbles,” whether red-tailed hawks spend an uncommonly long time staring off into the distance, or whether geckos have “onion-like” skin.



With the surveys formed, they were ready to be tested and used by keepers.

They decided to call this new welfare-monitoring tool “WelfareTrak.” The keepers go about their normal routine during the week, cleaning, feeding, observing, and filling out their daily logs. At the end of the week, once their shift is done, the keepers pull out the surveys for each individual animal they worked with that week. Looking back on their week, they rank the attitudes, activity levels, and other markers of well-being. The idea is to fill the questionnaire out as quickly as possible, spending about two to three minutes per animal. “We don’t want them to over-think their responses,” Whitham said, “just a gut reaction, a quick glance at the week.” The WelfareTrak data can then be compared with information from physical exams, hormone analyses, and other behavioral observations.

A crucial final step in the use of WelfareTrak is having regular meetings to discuss results. Once a month, the keepers and curators meet to go over the graphs and scores

caretakers. After a few years of preliminary testing and tweaking at Brookfield, in 2011 the tool began a yearlong pilot at five different AZA institutions. With a grant, Whitham and Wielebnowski also developed a website for the tool, which went live in the summer of 2013.

“WelfareTrak allows caretakers to be the ‘voices’ for the animals under their care,” the WelfareTrak website declares. To Wielebnowski and Whitham, it makes perfect sense; keepers and animal caretakers have an exceptional responsibility over and relationship with their animals, and their closeness naturally fosters insight beyond the physical realm. “Sometimes keepers spend more time with the animals than with their own spouses,” Whitham joked. Just as you might take your grandmother to the doctor to discuss her medicine, speaking on behalf of both her emotional and physical needs, they feel the keepers fill the same role for their furry and feathered wards.

**“ WelfareTrak® allows caretakers to be the ‘voices’ for the animals under their care. ”**  
—WelfareTrak website

of each animal in their area. Demitros and his team of primate keepers helped test the gorilla surveys once the final list was constructed. He felt that even though it was only a few moments per week, the keepers’ responses picked up on things – on trends and behavior that brought up productive discussion. “It really showed that casual keeper observations that might be considered subjective are really objective,” said Demitros.

Although initially created just for Brookfield, they eventually decided to make WelfareTrak available to any animal

### Back on Track?

As Whitham and Wielebnowski had hoped, keepers who tested the tool reported an ability to catch welfare issues early on. In one case, a keeper gave one rhinoceros consistently low scores on “showing interest in the environment” and “playing.” To improve those behaviors, the rhino team decided to alter their management style, giving the rhino new treats and toys to peak his interest—and the rhino’s scores improved. In another case, the tool picked up on a gorilla’s penchant for log-shaped feeders,

which resulted in “content grumbles” heard for the first time by visitors peering from the walkway. WelfareTrak also saved a gecko from unpleasant circumstances; after noticing an overall decrease in welfare scores after the gecko began being frequently handled and moved around for an educational program, they retired her from the program, and her scores got better.

Today, WelfareTrak is used regularly in at least six different wildlife institutions. The team at Brookfield is working on developing surveys for more species, and they have over forty requests from different institutions for demos and more information about the tool. Wielebnowski recently moved from Brookfield to Oregon Zoo, and she is currently applying WelfareTrak to assess polar bear well-being there. She plans to extend the tool to black bears and otters, then to elephants, chimps, orangutan, and others in the future. Wielebnowski’s former Brookfield position has been filled by an experimental psychologist, Lance Miller. He and Whitham plan to continue expanding and marketing WelfareTrak—with the possibility of implementing WelfareTrak across an entire country for monitoring a species.

WelfareTrak also had an unexpected side effect. According to keeper surveys, the tool revealed more than glimpses into animals’ inner sensations—it provided insight into the minds of other humans, as well. One lead keeper of twenty-seven years told Whitham and Wielebnowski, “The best part of it was the insight into how my coworkers think.”<sup>xxix</sup> Multiple keepers expressed a similar sentiment. As various individuals delve into the mind of another species, the similarities and differences in their interpretations—and thus their ways of thinking about others and the world—become clear. Moreover, besides giving animals a “voice,” the keepers felt they gained more of a

“voice” themselves. With data points to support their instincts, they have proof of a deep knowledge of their animals—and that they know what they’re doing.

Yet while Griffin’s followers, zoo keepers, and researchers like Whitham and Wielebnowski have embraced the concept and study of beastly feelings, the behaviorists’ dogma persists, and the animal-mind debate rages on. In February 2014, just a few months after the WelfareTrak website was rolled out, a story swept across news sites and stations. “Behaviorists: Dogs Feel No Shame Despite the Look,” read the title on the *Associated Press* website. The article explained the behaviorist notion that dogs feel nothing. Pet owners may be convinced of their pups’ remorse by those droopy eyes, ears, and tails. This feeling is encapsulated in the popular trend of online “dog shaming,” putting pictures online of dogs looking guilty for apparent crimes they committed, such as shredding a twelve-pack of toilet paper rolls all over the living room or eating an entire wheel of cheese.

None of these canines, the articles said, know what they did wrong, or even what shame is. The articles referenced a study by Alexandra Horowitz, an associate professor of psychology at Barnard College. In a test of fourteen dogs, Horowitz noted the dogs’ reactions to their owners when they left and returned after ordering the dogs not to eat a treat. She found that “guilty” looks appeared only after dogs were scolded by their owners, whether or not they committed the crime. The AP article concluded with a quote from a professor at Texas A&M University’s College of Veterinary Medicine, Dr. Bonnie Beaver. Beaver recapitulated the behaviorist belief that nothing more than body language and physiological responses can provide evidence—and that “we will never truly know because we cannot ask them.”<sup>xxx</sup>

## A Choir of Voices: Other Perspectives

Despite the ongoing dispute and uncertainty, Brookfield Zoo is not alone in its quest to expand and conquer welfare beyond the physical. In 2009, the Detroit Zoo was the second zoo to found a center with welfare in its title. Detroit's Center for Zoo Animal Welfare (CZAW) focuses on collecting and disseminating animal welfare-related information and fostering discussions. Stephanie Allard, who comes from a psychology background, was appointed Director of Animal Welfare and leader of CZAW in 2013. She helps host workshops that encourage people to put themselves in the hooves and paws of zoo animals; in the four-day experience, "the whole idea is to really get into the nitty gritty of what it's like to be an animal in a zoo," said Allard. By imagining themselves in the position of an animal, perhaps they gain a better sense of their mindset, to dig deeper into the brains of beasts. Regarding the welfare of zoo animals, "as an industry we are starting to want to have the answers...to embrace what we might find out," she said. In describing Detroit's methods, she used the same key words as Whitham: zoos are striving to have animals that are "thriving."

Detroit is also working on new, noninvasive technologies, like fecal hormone studies, to study welfare. Recently, they have

**“As an industry we are starting to want to have the answers...to embrace what we might find out.”**  
-Stephanie Allard,  
Director of Animal Welfare, Detroit Zoo

**“ We will never truly know because we cannot ask them.”**

**-Dr. Bonnie Beaver,  
Professor, Texas A&M University's  
College of Veterinary Medicine**

been looking into infrared thermography, a medical science that uses infrared cameras to find areas of stress and irregular blood flow. By detecting elevated body temperatures, it can show spots of infections or physical strain on animal bodies with just the glance of a camera. Such a system could help detect welfare problems early on, with less disturbance of the actual animal. But the technology is expensive.

Allard conveyed a sense of frustration at the difficult, multi-faceted nature of understanding true animal welfare. "None of that is easy, and none of that is quick; I keep having to remind myself, this isn't something we can find out overnight on any animal," she said.

Perhaps reflecting the influence of behaviorism, strictly behavior-based observation is still the most popular form of research. This is also the type of study that was used on Gus the polar bear.

Lincoln Park Zoo, also in Chicago, is in the process of building its own behavior-based welfare monitoring tool called ZooMonitor. "When people talk about animal welfare, it's really not an easy thing to get at," said Megan Ross, "These animals can't tell us that they're having a great day; they can't tell us that they feel happy; but sometimes animals can kind of indicate to you that they don't like something," she said. To attain welfare information, ZooMonitor uses behavioral monitoring—the scientific collection

of animal actions as data for discovering what an animal likes or doesn't like.

While WelfareTrak surveys are completed on paper and then entered into the website once a week, ZooMonitor is an iPad app. Observers watch the animal for ten minutes, entering the animal's behavior at each one-minute interval directly into the app, multiple times per week. Unlike WelfareTrak, which is made for keeper use, ZooMonitor observations are generally conducted by researchers. Rather than capturing a keeper's weekly gut feelings about an animal's various states of wellness, ZooMonitor instead collects snapshots of an animal's behavior. The basic method is similar to that of behaviorism, except that animal mentality is allowed. Even though we can't directly ask an animal how it's feeling, Ross believes psychological states must still be sought.

Ross explained the tradition of trusting gut instinct in zoo keeping. "It used to be that people relied exclusively on gut instinct...it was your experience working with animals that really dictated how you took care of them," she said. While she believes WelfareTrak is a valid tool, she pointed out that gut instincts can often be misleading. Keepers are extremely busy, she said, and they spend time with lots of individual animals.

"Keepers are what I call our first line of defense – they're the first people that might notice something changing. But sometimes, if you work with something every day, you might miss something because you're close to it," said Ross. Also, modern developments in science and technology provide us with an expanding set of tools to study welfare, she said. Like Whitham views WelfareTrak, Ross views ZooMonitor as a means of giving the animals a voice. "We're really allowing them to tell us what they like," she explained.

For Ross, the collection of objective data is paramount in getting to the root of

welfare, but she sees the value in other modes of research. "I think that WelfareTrak and ZooMonitor are actually very complementary of each other, because WelfareTrak gets that subjective nature of things and is quantifying it in a way to give you some data, and then ZooMonitor is really based on this behavioral, objective viewing." Ross is a behavioral researcher, so she is naturally inclined toward the study of behavior. Wielebnowski had a background in hormonal studies, and Whitham in anthropology. The variety of modalities provides different perspectives, ideas, and methods. "I think a lot of people are really trying to figure out what's going on with welfare, across the board," said Ross, "I think there's lots of different scientists approaching it in lots of different ways."

Jason Watters is the current vice president of wellness and animal behavior at San Francisco Zoo and a former research scientist at Brookfield. While at Brookfield, he led the development and implementation of EthoTrak, an application similar to that of ZooMonitor. Whereas EthoTrak and ZooMonitor are behavior-monitoring programs, he called WelfareTrak an "opinion-monitoring program." With a doctoral degree in animal behavior, he directs San Francisco's wellness initiative. There is a slightly different approach than other zoos are taking, he said; it's a more comprehensive, broad view of overall well-being in the zoo. "We get wrapped up in thinking about health and body condition," said Watters. Believing all animals need basically the same things, he focuses on whether animals' actions show they are doing well—or "thriving"—and by doing so, promote positive experiences for those who visit as well. "We're trying to make sure that everybody feels okay," he said.

Before moving to Brookfield in March 2014, Lance Miller worked as a scientist in

behavioral ecology at San Diego Zoo. According to Miller, San Diego is “one of the few institutions that is actually trying to look at the entire collection” of animals. Concentrating on behaviors, San Diego’s researchers seek a method of study that incorporates every species and individual and their specific needs. Miller reported that they were in the process of developing an application like ZooMonitor as well, harnessing new technologies to assemble the deluge of animal data. Miller praised the level of collaboration between zoos, but pointed out that they “wouldn’t be moving the field forward as quickly as they are” without the diversity of approaches zoos are taking to tackle the subject of animal welfare.

Besides implementing WelfareTrak on the resident polar bears at Oregon Zoo, Wielebnowski also leads AZA’s Animal Welfare Committee. And in the past few years, she spearheaded a massive study on zoo elephant welfare. The study analyzed 255 elephants at 70 different institutions—about 95 percent of zoos with elephants. This study “provides a sound, science-based platform for future discussions of elephant welfare,” by inspecting as many angles of welfare as possible, said one team member of the study. The researchers, from institutions all over, looked at body condition, repetitive actions, foot and joint health, reproductive cycles, and more. “We have asked the elephants how they perceive their welfare and they have answered,” the researcher said.<sup>xxxii</sup>

The results were unveiled at the 2013 AZA Annual Conference in Kansas City, in a presentation entitled simply, “Using Science to Understand Zoo Elephant Welfare.” “This study represents a milestone in the understanding of the factors that contribute to zoo elephant welfare,” the summary of the presentation began.<sup>xxxii</sup> Zoo professionals

widely consider this a groundbreaking study, a testament to the importance of animal welfare science.

Don Moore, Associate Director of Animal Care Sciences at the National Zoo, called the study “the biggest thing that the zoo association has done” in the past few years. Among many findings, the study provided firm evidence that concrete floors are not good for elephants’ feet, something that keepers had long suspected but had no real proof. “That was huge,” he said. The study also found that female elephants were more likely to have successful births with increased social experiences and a larger variety of enrichment items. Like neurotic Gus, elephants can also pace routinely—and this decreased when elephants had more space to roam and more positive relationships with other elephants and keepers. In the future, Moore predicts a boost in grant money to zoos to fund similar studies, for the purpose of getting to the bottom of what animals need.

It’s not all about science, though, said Moore. “It may start with the rise of a new science, and then the public gets interested. This drives more media attention, which drives more studies, which drives more education on the topic, which drives pressure on governing authorities...and all that circular stuff has led to today, and modern zoos with naturalistic exhibits,” he concluded.

**T**his circular process certainly seems true in the case of Gus, whose cycle of media coverage, public outcries, and scientific analysis repeated multiple times. If the zoo will not say how an animal feels, the public will. The sequence of media attention, public demand, and zoo response begins. The loss of Gus has been followed by a cry for a replacement, a

new Gus to swim the pool, as well as a plea to never subject a polar bear to Gus's situation again. As there are few polar bears to go around, Central Park Zoo is currently unsure of its plans for its empty exhibit. Like elephants, polar bears are a large, charismatic mammal that many believe shouldn't even be in a zoo. But for the individuals that are in captivity, zoos are gathering together, pooling resources, and struggling to get into their heads, in order to give the animals a "voice."

Some believe the new developments in animal welfare research are simply a matter of relabeling old practices. Others see a genuine movement in thought, practice, and science. But there is no doubt that, almost like the days of Darwin, zoo animals today are ever more the subjects of science. Keepers, researchers, and students eye them from behind exhibit barriers, behind notebooks and iPads. The methods of pinning down their thoughts and feelings may differ, but zoos are realizing that without the mental aspect of welfare, the picture is not complete. With developing technologies, strategies, and new ways of thinking about animal minds, they may gain more insight into animal welfare—and how animals truly feel, inside and out.

By attempting to enter an animal's separate, different mind, zoos are embarking on the journey that Darwin and billions of others have joined, free from the bounds of "anthropomorphism" or what constitutes "science": the everlasting effort to understand and connect with other life on this planet.

**Source Notes**

- <sup>i</sup> Daly, "Neurotic Gus Bears Loss of Gal Pal, Ida, in His Own New York Way."  
<sup>ii</sup> Ackerman, "Gus, the Lonely Polar Bear."  
<sup>iii</sup> "Gus the Bi-Polar Bear and the Pain of Existence."  
<sup>iv</sup> Kifner, "ABOUT NEW YORK; Stay-at-Home SWB, 8, Into Fitness, Seeks Thrills."  
<sup>v</sup> Zuckerman, "Gus, Central Park's Famously Depressive Polar Bear, Has Died."  
<sup>vi</sup> Daly, "Neurotic Gus Bears Loss of Gal Pal, Ida, in His Own New York Way."  
<sup>vii</sup> Cosgrove, "SPA THERAPY FOR BIPOLAR BEAR."  
<sup>viii</sup> Ibid.  
<sup>ix</sup> Carlson, "Is Gus The Widowed Central Park Polar Bear Sad?".  
<sup>x</sup> Dolnick, "We Are All Gus the Depressed Polar Bear."  
<sup>xi</sup> Allen, "Animal Consciousness."  
<sup>xii</sup> Sorabji, *Animal Minds and Human Morals*. 2.  
<sup>xiii</sup> Darwin, *The Descent of Man*. 67.  
<sup>xiv</sup> Darwin, *The Descent of Man*. 39.  
<sup>xv</sup> Kisling, *Zoo and Aquarium History*. 37.  
<sup>xvi</sup> Darwin, *Selections from "The Origin of Species", "The Descent of Man", "The Espressions of the Emotions in Man and Animals", "Animals and Plants", "Insectivorous Plants" and "The Formation of Vegetable Mould."* 84.  
<sup>xvii</sup> Masson, *When Elephants Weep*. 106.  
<sup>xviii</sup> Darwin, *Selections*. 84.  
<sup>xix</sup> Ibid. 85.  
<sup>xx</sup> Baratay and Hardouin-Fugier, *Zoo*. 182.  
<sup>xxi</sup> Hauser, "Behaviorism."  
<sup>xxii</sup> Pavlov, *Conditioned Reflexes*. 16.  
<sup>xxiii</sup> Baratay and Hardouin-Fugier, *Zoo*. 132.  
<sup>xxiv</sup> Ibid. 169.  
<sup>xxv</sup> "Lincoln Park Zoo Timeline."  
<sup>xxvi</sup> Yoon, "Donald R. Griffin, 88, Dies; Argued Animals Can Think."  
<sup>xxvii</sup> Chicago Zoological Society, "About CZS."  
<sup>xxviii</sup> Born Free USA. "About Us - Keep Wildlife in the Wild."  
<sup>xxix</sup> User Testimonials, Welfaretrak.org.  
<sup>xxx</sup> Manning, "Behaviorists."  
<sup>xxxi</sup> Baker, "Executive Summaries, Using Science to Understand Zoo Elephant Welfare."  
<sup>xxxii</sup> Ibid.

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### **About the Author**

Julie Duke is a native of Saint Louis, Missouri and a lifelong animal lover. She graduated from Harvard University with a degree in History of Science in 2011. While working in the Conservation & Science office of Chicago's Lincoln Park Zoo for two years post-Harvard, she discovered an increasing desire to express her passion for wildlife and science through words and articles. She left to earn her Master's at M.I.T.'s Graduate Program in Science Writing, and will spend the summer of 2014 writing about her favorite topic for The Wildlife Society.