

Inside the Frozen Zoo That Could Bring Extinct Animals Back to Life

9 hours ago



All around us, every day, things are disappearing—birds, butterflies, coral reefs, islands. Places we used to live. Things we used to eat. But what if there was a way to bring some of it back? Well, it turns out there is. A few miles north of San Diego, scientists are gathering up specimens of every living thing they can get their hands on in a last-ditch effort to save the planet from an unstoppable predator: us

I. Nobody Say “Jurassic Park”

A few weeks ago, a humpback whale arrived in a FedEx box. Dr. Oliver Ryder removed the vial containing the whale from the package. He used its cells to grow more cells. Then he froze it. “And you know how hard it is to get a sample of a whale, legally?” It’s hard. There are rules about this sort of thing, shipping whales across national borders. Nevertheless, more boxes—full of deer, ibis, flamingos, desert tortoises, rhinos—arrive every day. They are unboxed, grown anew. Then they go into the Frozen Zoo to be saved.

It’s unassuming, the Frozen Zoo—just north of San Diego, deep in California inland nothingness, where it is housed at the San Diego Zoo

Institute for Conservation Research. The institute is like any other academic building: low-slung, quiet, smells of cleaning supplies. The Frozen Zoo itself is even less glamorous. A room full of big frozen steel tanks fed by vacuum jacketed pipes pumping liquid nitrogen. Every time you open one of the freezers you get a witchy puff of smoke. Inside the tanks are the animals.

Ryder points at a tank, which he says contains nearly all of the Frozen Zoo’s individuals. Almost 10,000 of them. “They compress to a pretty small space,” he says. Each individual has its cells split up, placed into multiple tubes. “Half of the vials of an individual are in that freezer. Half of the vials are in a freezer in another place, so even if this building is destroyed we

won't lose the collection.” Ryder will not disclose the whereabouts of this other place. An undisclosed location.

Ten thousand individuals. Representing about a thousand species and sub-species. In this regular-looking steel tank. “And it's the size of a refrigerator?” Ryder asks rhetorically. “That's the densest vertebrate biological diversity on the planet.”

It's an ark, in other words: Ryder's building an ark. An ark in a freezer! The mission of the Frozen Zoo, Ryder says, is to preserve “a legacy of life on Earth” at the precise moment that life, in all its glamorous and tedious and ungainly forms, is disappearing from our orb at an alarming rate. We're losing big charismatic mega-fauna like elephants. Also vital little soldiers like bees. And, increasingly, actual people. We're running out of water, out of food, out of bees. We're running out of the life that makes other life. It's going away. Maybe *we're* going away. So Ryder is building an ark.

Some of the animals whose genetic material is stored in the ark are still here on Earth, alive, walking around. Many are long dead. Some represent species that are endangered—the ancient Przewalski's horse, which looks, with its long block head and placid eyes, like a living cave painting. One species in the Frozen Zoo, the po'ouli, a portly Hawaiian bird, is extinct. The only place it lives on—“lives” is probably not the right word, or at least not yet—is here, in the Frozen Zoo.

What is the ark for? That depends on how you look at it. From one angle, it's a museum: a catalog of what we have, or—increasingly—what we had, here on Earth. With a microscope, it's the Met. From another angle, it's a research resource. This is its primary use. “We've sent thousands of samples to hundreds of investigators,” says Ryder, with his cheerful beard and his fleece vest and plaid shirt and baggy pants. “It's not a time capsule. It is *used*.” But the Frozen Zoo also has a third purpose. For a while Ryder didn't like to talk about this fact. Visitors would come to the zoo and throw around words like “Jurassic Park.” They'd ask the obvious questions about bringing animals back to life, dead but for the cells and DNA that live on in the Frozen Zoo. Is that possible? Or will it be, someday?





A zoo in a box: 100 tubes—one with a northern white rhino inside—and several thousand more just like them stored in freezers outside San Diego.

San Diego Zoo Global © 2016

“People would ask us about that,” Ryder says. “I avoided that question because I considered it spurious and I didn't want to deal with sensationalism. I wanted to acquaint people with the real problems of trying to save species today, not like fantasy solutions for the future.”

A long pause. “But there's been kind of a convergence, and the technology has developed.”

TRENDING THIS VERY SECOND

So, yes, the third purpose of the Frozen Zoo is this: Resurrection. Reanimation. Whatever you want to call it. (Nobody at the Frozen Zoo, nobody anywhere with any kind of serious scientific background, calls it any of those things. If they have to say something, they say *de-extinction*.) The technology exists. To create clones, basically—to take the still-living cells of a dead animal from a dead species and reprogram those cells into sperm or eggs. To combine sperm and egg. To put that fertilized egg into a surrogate host, which will then give birth. To take what was dead and gone and give it life again. Scientists have done it with a mouse already—siphoned off blood from a mouse's tail, extracted white blood cells, turned them back into stem cells, built a whole new mouse. “It's been the realm of science fiction, but here we have it, here it's going to be used and we're deciding now what we do next,” Ryder admits grudgingly. “Each current generation understands they can't bring back what was lost, you know? Then they go through their own sense of loss. We can mitigate some of that.”

Imagine: through history, things just vanishing around us. The common estimate is that 99 percent of what has ever lived on this Earth has since vanished. Over 5 billion species, gone forever. That process now accelerating to a frightening speed, on account of us. So much loss that it outpaces our capacity for grief, if that makes sense. But for how long? The world is shrinking, closing in on us. Life is fading away.

Nobody's ever systematically gathered the material you could use to recreate that life, Ryder says, swiveling in his office chair one warm March day. “This is the first time. Move forward a thousand years or ten thousand years: What's that going to mean for the structure of life on our planet? I don't think it will be an incidental footnote. I think it's going to have huge utility.” The return of lost ecosystems. Abundance prevailing, against the odds, over scarcity. Mankind not dying en masse, even.

The reality, our reality, is simple: Keep on going as we have and soon there will be no more us. But what if we could reverse the tide? Get back what we've lost, before we lose ourselves?

II. A Brief History of Lost Things

Extinction is old but it's also new. (Don't worry, we can do all this in a paragraph.) Throughout the 1700s, gentleman scientists were finding bits of fossilized skeleton in the ground that made no sense, had no corollary on the planet that they could find. Thomas Jefferson, for one, was obsessed with the mastodon. He kept trying to get his hands on some bones. But he also assumed the creature was still alive, somewhere in the American interior. He hoped Lewis and Clark might find one. The idea that things like mastodons and mammoths could wink into and then out of existence went against God, as far as he and pretty much everyone else were concerned. Even Charles Darwin didn't believe things just up and disappeared; he figured they evolved, improved, natural-selected themselves into their next form. It took a skeptical Parisian, Georges Cuvier, to posit the existence of *espèces perdues*: lost species. That was right around 1800. (Like I said: one paragraph.)

So it's only been 200 years, really, that anybody on this planet has had to walk around with the poison knowledge that a thing they love, or fear, or take for granted, or hunt for food may one day get swept away in the breeze, never to return. And for most of those 200 years, mankind has been on a pretty chill clock. Yes, species may go extinct, but in the droplet of geologic time that is a human lifetime? What are the odds? For a while, not very high. But now? After cars and airplanes and air conditioners and the vast depredation of our rain forests? After Amazon and SUVs and your 6-year-old kid developing a taste for raw bluefin tuna? Pretty damn high.

Things are gloomy out there. Right now Australia's koalas, whose numbers are already declining, are suffering from a debilitating chlamydia epidemic that may do in the remnant. In the last 30 years we've lost about half of the coral in the Great Barrier Reef. The tiny armored truck that is the Chinese pangolin—whose keratin scales are rumored to help women lactate—is being driven to extinction by poaching. We're losing our butterflies. Only an estimated 40 Amur leopards are left in Russia. Maybe 40 Asiatic cheetahs in Iran. Four hundred Iberian lynxes. The bullet that took the life of Internet meme Harambe also took one of our remaining western lowland gorillas. The spoon-billed sandpiper, the saola, royal turtles, certain lemurs—they're not going to make it. All around us, on our dinner plates and in our backyards and on our ecotourist vacations to Antarctica, it's all vanishing. We're not quite the first generation to grow up with this knowledge, but we might be the first to really see it in action.

But...that's just a list of animals! you say. *Chlamydia*, LOL! You may not

care, as is your right. Most of us don't. (Though let's pause to just notice that: your inevitable reaction, not to care. The same way that when you're drowning, after a certain point, you no longer think of air.) But consider for a second: A place you loved and can never go again. A particular taste, some smoky sense memory from a faraway coast. The infinite possibilities the world has to offer becoming finite. Because of us.

Take the northern white rhinoceros. A classic study in the many ways humans can make something disappear. Once, northern whites—dim-sighted, clumsy, peaceable, one of two subspecies of white rhinoceros, along with southern whites—roamed over much of East and Central Africa. But they were poached. The rhino's horn has been used in traditional Chinese medicine for centuries, as a cure for fever, gout, snakebites, food poisoning, demonic possession. They grind it or shave it into a powder, drink it with boiling water. In Vietnam they use it to cure hangovers. More recently the horn has become a status symbol, an ostentatious way of possessing what the rest of us could not or would not dare to possess. By the end of the 1970s, some estimates had the northern white population in the wild as low as 15 animals, all clustered in Garamba National Park, in what is now the Democratic Republic of Congo. Anti-poaching initiatives brought them back, briefly, before they unraveled due to corrupt government officials, militia groups out of Darfur, and rebel organizations like Joseph Kony's Lord's Resistance Army. The rhinos were trapped there, in the Congo, as humans fought it out. Sometimes their horns helped fund the fighting. By the early 2000s there were only a handful left. The last northern white was sighted in Garamba in 2006. They've now vanished from the wild, and nearly from this planet.

Only three remain. Three. The fourth, Nola, used to live here, right next door to the Frozen Zoo, in the San Diego Zoo Safari Park. She died last November, at the advanced age of 41. Four or five decades is about as long as any white rhino lives. The trio are kept in a wildlife preserve in Kenya called Ol Pejeta: Najin, Fatu, and the last male northern white rhino on the face of this Earth, Sudan. The three have failed to reproduce. (They are also, it should be said, related: Najin is Sudan's daughter, Fatu his granddaughter. Incest is their best defense against extinction. Make of that what you will.) Sudan is 43; his sperm count is perilously low. In 2015, doctors determined that neither of the two females was capable of breeding. Maybe the concrete floor of the zoo where they lived before coming to Ol Pejeta wrecked their hips.

Dr. Barbara Durrant, San Diego Zoo Global's director of reproductive physiology, who also works on the Frozen Zoo with Ryder, is attempting an in vitro workaround—northern white sperm and northern white ovarian tissue harvested from the live northern whites, combined into a fertilized embryo, and then re-implanted back into one of the two females. They're practicing on southern whites now. But there is still much that is

mysterious about the reproductive cycles of rhinos. “No embryo transfer has ever been attempted in any rhino species,” says Durrant. And time is running out.

They are ghosts. Even now they're disappearing into what's known as the extinction vortex: “the notion,” Ryder explains, “that we have that a population can be doomed but there's still numbers of them around. The numbers get smaller and it becomes a feedback loop. Like water going down a drain: It's deterministic. Or a mass entering a black hole. Once you hit the event horizon, you're out of here.”

The northern whites are out of here.

III. How to Bring Them Back

Let's say in vitro fails. Let's say northern whites have hit the event horizon. This is where the Frozen Zoo really comes in. It begins with cells. You gotta collect them. So, first clean the site: Shave one tiny part of the animal, ideally while it's alive and anesthetized. Next, as Ryder explains, “take sterile tweezers and a sterile scalpel and you take a little piece. It doesn't have to be any bigger than a grain of rice. Then you take that material and you make a cell suspension out of it”—meaning, basically, that you put those cells in flasks, in a broth that's designed to encourage them to multiply. You fill up a flask. And then you divide the suspension in half and put it into two flasks. “One becomes two, two becomes four,” Ryder says. Soon, “we've got enough to freeze eight vials.”

The multiplied cells in the vials are called fibroblasts—the common, connective tissue that makes up all animals, including us. Now, reprogram those cells into what are known as induced pluripotent stem cells. “That means you have taken that cell and kind of turned back time to when it was a stem cell,” Durrant says. “So it can't make everything in the body, but it can make all three of the germ layers that you would see in an early embryo. It can make any of those.”

One of those germ layers is what eventually becomes sperm or eggs. “It's very complicated, every step of the way, and there are many steps,” Durrant says gently, reading the look of total incomprehension on my face. But the gist is: Collect the cell, turn it back into a stem cell, tell that stem cell how and what to become anew. Namely: sperm and eggs.

Finally, the easy part of this whole terribly difficult exercise in playing God: You take those sperm and eggs, combine them, then fertilize and implant the egg into a surrogate—something close to the original, such as a southern white. The southern white gives birth to a northern white. From cells, life. From life, more life. The rhinos wink out. They wink back on.

IV. Life and Death in the Extinction Vortex

The frozen zoo is both a monument to and a counterforce against the extinction vortex. The zoo and its staff are poised at the edge of existence, that shadowy plane where things are sort of alive and sort of dead, where the arrow could point both ways. All the doctors at the zoo have stories about what it's like to labor in this sad zone. What it was like to be there when Nola died, for instance. The northern whites are of particular interest to the Frozen Zoo's researchers. Durrant routinely works with species right on the brink. She is freckled, kind-faced, forthright. "There was a lot of grief" when Nola died, she says.

Her other passion is the Yangtze River giant softshell turtle. *Rafetus swinhoei*. Only two are known to remain, both at the Suzhou Zoo, both over 100 years old. Durrant is working on getting them to reproduce. "There was an additional male in Vietnam—he just died in the last few months. Unfortunately, no one was allowed to collect sperm from him, so nothing was saved. There was a lot of superstition. As long as that animal was alive, then everything was good in the country. When it died, politically and socially and spiritually things changed. No one there was allowed to actually cut into that animal. No one outside was allowed to do it, and they were not willing to do it themselves because there was a lot of superstition about that. One veterinarian had done something with one of those animals in the past, and within 24 hours he was in a motorcycle accident and lost his hand."

The turtle lived in a lake. "He was alone, he was revered. He was sacred. It was just out of the question that we would do anything with him. No one was allowed to touch him. Even in death we were not allowed to touch him."

Durrant knows not everyone shares her love for our animal brethren. "I think people talk about it abstractly, but they're not connected to those animals. They don't feel it the way we do." But their decline, she says, is "a sign of what's happening. It's going to happen more and more and more." Species dwindling from 1,000 to 500 to 100 to 10 to 5, circling the beveled edge of the extinction vortex like the northern whites already are. Take a slightly longer view and we might all be poised there. Right on the edge.

I wanted to see what that in-between state looked like: here but already gone. And I wanted to understand the incredible—and incredibly expensive, and debatably worthwhile—human effort to save the rhinos and their endangered peers. Ryder and Durrant's work is controversial. "The Frozen Zoo is basically re-arranging the deck chairs on the *Titanic*," the eminent Stanford scientist Paul Ehrlich told *The Washington Post* last year. Ehrlich's argument—and he is far from alone—is that this is all a waste: all that money and energy and time, to *maybe* save a handful of animals. Why not redirect those resources to lobbying Congress, or preserving rapidly shrinking habitats?

“I don't see Sudan enjoying life anymore,” James says. “The fact that he's the only one, it's not a lovely life. Knowing you're the last male standing—it's really sad.”

There's a psychological undercurrent to the skepticism, too: If you tell lazy humans that we can just bring these animals back, will anybody work to save them in the first place? No. We'll eat them at twice the rate, grind their bodies into jet fuel so that we might run up a few more frequent-flier miles, and count on science to save us when they're gone. Science is like: *Nah, fuck that.*

Plus, anyone who studies this stuff seriously knows the godlike feat of de-extinction is only the first step of many. Bring back the dodo and here's what will almost certainly happen next: A human will club that animal right back into extinction. Then build an oil rig on top of its habitat. To truly rescue species from extinction, we need to save not just them but also the conditions that allowed them to live in the first place. We need to give them back the world we're destroying. From this perspective, mankind—greedy, violent, wasteful—needs a reboot just as badly as the northern whites do. More so, even. This is the crux of the anti-Frozen Zoo argument: Shouldn't we fix ourselves before we fix anything else?

I bought a plane ticket, Los Angeles to Amsterdam to Kenya. I wanted to see the rhinos before they went. For what they represented, sure. But also just to see them. To look upon something that will vanish before I will. Tens of thousands of gallons of planet-wrecking, habitat-destroying jet fuel for no better reason than the one I just gave.

Like I said: Mankind. Something broken there.

V. The Last Male Standing

Morning coming on amid the sleepy terminals at Wilson Airport, the equatorial heat drifting in on the breeze. Last night, I came in through Nairobi's other airport, Jomo Kenyatta International, a low-lit smear in the dark. We'd driven through the city, every traffic light switched off. Now in daylight the sky is a marble-like blue-gray. The runway at Wilson is just a few linear rectangles of asphalt, dirt, and grass, swiftly growing faint below the tires of a wobbly twin-prop airplane. Ol Pejeta is north of here, in Nanyuki, up past Nairobi National Park, over the rusted roofs and mud paths of Kenya's most infamous slum, Kibera, and then onward, past where the city gives way to estates with pools and tennis courts, and then to flower farms. Straight toward Mount Kenya, buried beneath an eruption of clouds. The land below green, yellow, and red like a child's place mat.

The northern whites in Ol Pejeta are not native to Kenya. They were brought here from the Dvůr Králové Zoo in the Czech Republic—four of them, in 2009—in an effort to get them to reproduce in an environment that resembles the one, evolutionarily speaking, where they're from. This did not happen. One of the four rhinos, Suni, died in 2014, two years after once valiantly managing to mate (alas, to no avail) with Najin, the elder female in the group. His death left Sudan, now 43, as the last male of his kind. Nabire, a female white rhino who remained at Dvůr Králové, died in July 2015. A few months later, in San Diego, Nola followed Nabire into the afterlife. Earth's remaining three northern whites are all at Ol Pejeta,

waiting to be saved, or to vanish, or both.

The equator bisects the town of Nanyuki. Ol Pejeta is just beyond it, down a rocky, muddy road, past bars and pubs, ice cream shops, cafés, salons, all in the same low shacks. Tim, the chill naturalist and guide who met me at the airport in a battered green jeep, and I bump along, dodging goats and cows, winding among the farms outside the town, the road lined with euphorbia trees and rangy green plants, hedges of low trees bearing orange fruit. At the entrance to Ol Pejeta is a picture of an armed ranger and a sign, now depressingly out-of-date: “Could you be a rhino bodyguard? See what it takes to protect three of the world's last remaining four northern white rhinos....”

Ol Pejeta is a safari park—wild but also not wild, unless you count Chinese tourists unloading double-barreled Nikons at every passing elephant from the relative safety of a neon green Range Rover. It is startling, frankly, the sheer abundance of animals here: orange antelopes and buffalo gang-tackling one another in patches of water, their horns like hats pushed Leonardo DiCaprio-low on their foreheads. Skinny elephants with manta-ray ears, their hides like topographic maps. Impalas decked out in violet eye shadow. Scruffy, mangy-looking warthogs. Goth ibis. Everything is so green it vibrates. I sort of bliss out for a second, surrounded by that many different living things, then feel guilty, weak, unprofessional for doing so. I'd imagined the northern whites somewhere isolated, remote. Somewhere sacred. Not here, in this stocked pond of semi-artificial abundance, on display for tour groups trying to knock out a complete set of what people kept calling the Big Five—lion, elephant, buffalo, leopard, rhinoceros—before lunch.

The rhinos lie beyond a steel fence at the east end of the park, next to quasi-military barracks where their caretakers and security live. One of their keepers, James Mwenda, is waiting for us at the gate. James is young and smiley in the green fatigues of the preserve. He used to be a porter on Mount Kenya, where he discovered that he loved animals. He wanted to help protect them. Now he's here. During the day he looks after the rhinos,

and at night he goes out with a rifle on patrol. It's unclear exactly when he sleeps.

The rhinos at Ol Pejeta have armed guards that watch over them 24 hours a day, seven days a week. This is a matter of real, bloody necessity. Everywhere at Wilson Airport signs are posted: no ivory on board. hands off our elephants. Poaching—elephant, rhino, anything with ivory or a keratin horn attached—is a scourge in Kenya, even as the animals are respected, revered. They have them on their currency. But they also have a massive organized-crime problem: When the poachers come now, they come armed with helicopters, night-vision goggles, and frighteningly advanced weaponry, largely funded by criminal syndicates. About 30 percent of Africa's elephants were killed between 2007 and 2014 alone.

So James and his co-workers shoot back. “If a poacher comes with an AK-47,” he says in his matter-of-fact way, “let's hope the patroller has a G3 or a machine gun.” A G3, he explains, is the next rifle up, firepower-wise, from the AK-47. Wildlife rangers are not cops; they're not looking to make arrests. Poachers get bailed out; then they jump bail. “If you look at how horrible they kill these animals to get the horn, you have no sympathy,” James says. So wildlife rangers do what they have to do to protect what they're charged with protecting. “If I was given a chance to make a verdict, I would say these people are merciless. They don't deserve any mercy.” That's at night. During the day, around the rhinos, James has a lot of time to think. He has a bond in particular with Sudan. The work is invigorating but also depressing. “I don't see Sudan enjoying life anymore,” he says. “The fact that he's the only one, it's not a lovely life. Knowing you're the last male standing—it's really sad.”

Tim and I stand there at the gate, nodding.

“Want to see him?” James asks.

VI. About the Size of a Volkswagen

The northern whites have 700 acres of their own here. They're fenced in, not just for their own protection but also because they're zoo animals—they would die in the relative wild of Ol Pejeta, with or without human assistance. Sudan, old and decrepit, is separated further: He lives by himself, on 15 acres, so he doesn't get bullied by the other two, or have to walk too far at any given time.

I'm stalling here. How to describe a ghost?

Okay, fine: I will not tell you he was beautiful. The first impression was of a shadow-colored bulldozer, a motorcycle-sized blur looming underneath a tall, long-limbed whistling-thorn acacia tree. Comically attentive Bugs Bunny ears fringed by a light halo of fur. A bump on his neck not unlike the

phallic bulge on the cover of *Sticky Fingers*. Weirdly delicate 1940s starlet eyelashes. He lay with his chin on the ground, staring sadly forward, snot gently pooling out of his nostrils. The overall semblance was of those rocks you encounter in national parks, the ones that some ancient person has carved something into, and now that thing has faded. A message you can't read.

James was motioning Tim and me over to the animal. I was totally unprepared for this. You can actually touch him. He's old, and mostly domesticated. He's indifferent. Blind in one eye. You need to approach from the side on which he can see you, or else risk what's left of his wrath. One at a time, we lay hands on him. Tim and I took turns, and we couldn't stop. He was warm. Huffing and rasping. His skin like bark or Braille. Like mud that'd cracked in the sun. Expanding and contracting.

He struggled and then stood, as Tim and I backed away. Eyed his little corner of habitat: partial roof above, some straw in the corner, a rectangle of muddy water. Then he set out through some acacia trees, walking gingerly. You could hear his old back crack when he leaned down to pull up grass. The sky had turned off-white; we were out among the trees when it began to rain. Sudan turned back toward his home, making his way through the silvery drops. Tim and James and I sprinted back toward the jeep. A bunch of animals all running for shelter.

VII. A Rhino Addresses the Delegates

What gets saved? What *deserves* to get saved? Even on an ark, the room isn't infinite. "Like, who are we to decide?" Ryder asks one day, back at the Frozen Zoo. "What's the right choice?"

Technology in human hands is the story of unintended consequences. "Do you know this gene-editing technology?" he asks me. You can tweak genes, make them express what you want them to express. "I knew that the Chinese had made many pigs, because pigs are used in a lot of human medical research. If you had a small one, it would save a huge amount of money and make a lot more studies more feasible, basically. So the Chinese developed that. But they found out that there's a market for them in medical research, but there's also a market in them as pets. So they're selling these mini pigs as pets. They say in the future you'll be able to choose their appearance." For instance: "I imagine in the future it will be possible to have one of these mini pigs that's got a coat color pattern like a cheetah."

A mini pig dressed as a cheetah! Humans have always done this. Behaved this way. Made nature reflect our needs, our wants, our desires. "There's our dilemma," says Ryder. "You look at Przewalski's horses, the wild horses, and they're all basically phenotypically uniformed. You look at domestic horses and you've got all these variants—that's because people

selected them. People preferred them. People were interested in them. That's what our species does, is experiment.”

Now that we're on the verge of deextinction...what will we do with that power?

“It's about our values, because if we have the capability of being designers, what are the rules? My priority as a conservationist may be one direction, but human society is going to have the potential to do these kinds of things. And will people prefer having a world where they have mini pigs that look like cheetahs to all of the hassles involved in saving these animals?” Ryder genuinely wonders. And our history is not super promising on this score.

At Ol Pejeta, it costs around \$10,000 a month to protect the northern whites. Not all the other animals on the preserve. Just the northern whites. Rangers like James going out in the dark every night, risking their lives to defend these animals. Poachers risking their lives, too, for the horns. And for what? A northern white is nearly identical to a southern white. “All the money we spent on protecting the northern white rhino, millions and millions of dollars, and at the end of the day, 20 years from now, you could put southern white rhinos in there and you would never notice the difference,” John Lukas, the president of the International Rhino Foundation, told author Irus Braverman in 2013. Now, standing in the shadow of their own demise, the three remaining northern whites mill about Ol Pejeta as the preserve plays host to scientists who show up and disagree about who will do what—will it be scientists from the Czech Republic or Africa or Germany or California who attempt the cloning or in vitro fertilization that might save them? Where will that attempt even take place?

The arguments go on. The rhinos go deeper into the veil. And the world they might someday re-occupy closes in on them: habitat gone, horns trafficked, fellow animals—Asian elephants and Indochinese leopards, eastern monarch butterflies and Panamanian golden frogs—following right behind them into the extinction vortex. The best-case scenario for the northern whites: survival as a living museum piece. The worst: survival as a museum piece that might someday live again. The gap between those outcomes is barely even a gap.

Most of us are ruthlessly indifferent. Some of us are ugly and blind in one eye. We live, all of us, decimated by loss. And all of us deserve to survive.

And yet they're still here, the rhinos. They're alive. I resolved not to be sentimental. The last thing the world needs is another magazine journalist parachuting in, spending two days on a game preserve, and coming back

waxing emotional about what is basically three tons of mobile Silly Putty. But without getting too anthropomorphic with it: *They are blameless*. To be a human in front of a northern white is to be a representative of the force that is now ushering them out of existence. You just want to disembowel yourself in their presence. Sudan, Najin, Fatu: They're here and already gone. Shadows on a plain. I said I wouldn't say it, but: They were beautiful. They *are* beautiful.

And we can bring them back. If we want to, if it makes sense, with just another handful of scientific breakthroughs, they will live again. Resurrection! It's unreal but it's about to be real. What a degenerate, terrible species we are. But also: Look at what we're capable of! The same brutal, merciless ingenuity that we bring to ruining the world is the exact same ingenuity applied by the scientists working at the Frozen Zoo and elsewhere, poised at the horizon of existence, willfully pulling our animal brethren back from the edge. And maybe pushing us back from the brink, too. Playing with cellular matter so that it might again become life. Building an ark to save what we can't or won't. Most of us are ruthlessly indifferent. Some of us are ugly and blind in one eye. We live, all of us, decimated by loss. And all of us deserve to survive.

Well, most of us, anyway. Maybe. I get sentimental. A funny thing that happens around the folks at the Frozen Zoo—they make you feel optimistic just by the fact of their existence. So optimistic that sometimes you fail to listen. Talk to them about magic and they'll talk to you about reality. One animal rescued does not add up to a species saved. An ark is useless until it has a place to make landfall. "Saving cells isn't saving species," Ryder tells me. "Saving DNA isn't saving species. Nobody said it was."

The irony is not lost on them—that their great effort to conserve these animals and their DNA is insignificant next to our greater, albeit unintentional, effort to destroy them. Science is hard; people make it harder. "Unfortunately, people are always going to take precedence and people are going to protect themselves and their livelihoods," Durrant says. Even in her own profession, "there are some people in the game who are doing this out of pure scientific curiosity and the intellectual challenge. There are some people who are doing it because they think if they can make one of these extinct animals they'll be famous and rich. Some people who, once they made one, they'd be done and move on to something else. And then what? What happens to that animal?"

The answer to that question can be found, for better or for worse, at Ol Pejeta. Twice during my visit there, James, the northern white rhino keeper, described the same scenario to me, something he's begun to imagine: What would happen if Sudan, the mournful last male of his kind, were somehow able to talk. If he were given a podium—at the U.N., say. All the delegates from all the various corrupt populations of man gathered

around. “What's the best stadium?” James asked me.

“Okay, Madison Square Garden.” Sudan steps to the microphone. “And the audio is so good. I've always tried to write down what the speech would be. At times he would sob, cry, break down, knowing he's going to die. How would you be behaving knowing you're going die? Knowing you're the last one? Maybe you'd drown yourself in wine, in woman—Sudan can't speak, he's an animal, but it's so sad. His cousins, brothers, and sisters have been killed in this search for rhino horn.”

James said he figures if Sudan were actually given that podium, and the means to speak, it's pretty obvious what he would do: “He would curse the human generation.”

Zach Baron is GQ's staff writer.

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