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# SEEING THE FUTURE

## IN THE WEST, RESEARCHERS AND PHOTOGRAPHERS SEE THE LAND AS A LIVING TIME CAPSULE

BY JOHN D. SUTTER

The artist Jonathon Keats is standing on a bluff overlooking a remote valley in the Arizona desert, about 40 miles from the United States-Mexico border. In his hands, and aiming toward the mountainous horizon, is a camera-esque contraption that looks like something out of "Poor Things" or maybe that weird neighbor's bedroom in "Toy Story" — a hybrid of the familiar and the slightly grotesque. It's part Nikon camera body, complete with a digital screen and a travel-dad neck strap, but where a lens would normally be, there's a copper cylinder that looks like a soup can.

It's entirely unclear how this "camera" might create an image.

Yet Keats keeps adjusting the frame and looking into the distance.

In front of us is an expanse of the Sonoran Desert, painted in the shadow-erasing light of a spring afternoon. Part of the University of Arizona's Santa Rita Experimental Range, a dusty expanse of land set aside for research for more than 100 years, this is among the most photographed (or certainly most photographed in the name of research) landscapes in North America.

Since 1902, photographers have been coming to this very location — labeled site #222 in a file cabinet in Tucson — to capture the view of a valley filled with mesquite trees giving way to a horizon blocked by the towering, sandy mountains. Right at the edge of the bluff where Keats is adjusting and readjusting his contraption's view is a metal fence post staked into the dirt. It's a reference point for photographers who, year after year, and decade after decade, have been making images of this exact location — or "re-photographing" it, in the parlance of the trade.

**THIS DUSTY EXPANSE OF LAND IS AMONG THE MOST PHOTOGRAPHED LANDSCAPES IN NORTH AMERICA.**

The goal is to observe change over time. Not to see the future, exactly, but to chart the ways in which the future might be emerging.

All of those photographers used glass lenses on their cameras, though.

Not, you know, soup canisters.

"Is the moon going to be in the image?" I ask Keats, ribbing him a bit.

A daytime moon is floating high above the mountains — faded white against piercing blue.

"Not in this exact moment," Keats replies, his gaze still fixed on the digital screen. A safari hat shades his head and neck. The moon "will be in frame sometime in the next 1,000 years," he says.



IN THE SONORAN DESERT, ARTISTS AND RESEARCHERS ARE FINDING WAYS TO DOCUMENT CHANGES TO THE LAND THROUGH PHOTOGRAPHY.



THE AIM OF THE PROJECT IS, THAT AS THE LANDSCAPE OF THE WEST CHANGES, THOSE CHANGES WILL BE CAPTURED FOR FUTURE GENERATIONS.



ARTIST JONATHON KEATS HAS INVENTED A CAMERA EQUIPPED TO TAKE A 1,000-YEAR EXPOSURE.

PHOTOGRAPHY BY JOHN D. SUTTER

He looks up, as if to consider what 1,000 years looks like in a single image.

He smiles.

"It'll make a cameo appearance."

**ONE THOUSAND YEARS.**

I'm terrified by that figure.

It's the reason I've traveled to Arizona to meet with Keats.

Specifically, I am overwhelmed by the fact that some of the excess carbon dioxide pollution we create by burning fossil fuels lingers in the atmosphere and oceans, contributing to warming, for something on the order of millennia — supercharging storms and heatwaves, and flooding coastlines for dozens of generations. That excess carbon dioxide makes its way slowly through the atmosphere, land and ocean before eventually being reabsorbed into dense rock where it originated, David Archer, a geophysical sciences professor at the University of Chicago, writes in "The Long Thaw," perhaps the most authoritative book on the long-lasting nature of fossil fuel pollution. That process of reabsorption can take thousands of years. For all practical purposes, Archer tells me, carbon dioxide pollution might as well last almost indefinitely. "It's fair to say that most of (the carbon dioxide pollution) goes away in a few hundred years," he says, "but some of it sticks around essentially forever. … It's just immense what we're playing with. It's so huge."

And carbon emissions from burning fossil fuels keep going up.

You could be forgiven for being paralyzed by facts like these. The Turkish writer Ece Temelkuran put it aptly when she said that now we are "mourning in future tense" — fearful of a range of crises that feel almost too big to tackle, and assuming, in a sense, that we will fail to solve them. Our economies and politics are built on tidy time horizons of years or decades. How could we even begin to tackle a 1,000-year challenge? The dauntingness of it all — and our, so far, inability to solve existential challenges like the climate crisis — can lead to a kind of future-avoidance, where people stop thinking about or planning for impending events or problems in order to avoid discomfort. These weighty and pessimistic views about the future can show up in polling, too. Nearly 60 percent of adults in the United States say the country's best years are behind us, according to a December 2025 Pew Research survey.

Keats, meanwhile, implores us to keep looking ahead.

That's why he developed this camera using Renaissance-era painting techniques and long-established pinhole camera technology. He claims it will be able to generate a 1,000-year exposure of the landscape, showing not only the recontouring of the land from wind, rain and heat, but also the steady march of species across it. He's so sure that this "Millennium Camera" will help reshape the way humanity interacts with the natural world, and our role in its future, that he's been building and installing these metal-canister devices at iconic locations across North America and Europe. There's one at Lake Tahoe; another up high in the Austrian Alps, overlooking a melting glacier; one at the top of Tumamoc Hill, in Tucson; one at Amherst College and at Arizona State University; and there's a 10,000-year version gazing across the Hollywood hills from the Los Angeles County Museum of Art. Each camera invites an onlooker to imagine the landscape of the future. And each promises to create images that can be viewed by future people alive in the 3020s and beyond.

**YEAR AFTER YEAR, AND DECADE AFTER DECADE, PHOTOGRAPHERS HAVE BEEN MAKING IMAGES OF THIS EXACT LOCATION. THE GOAL IS TO OBSERVE CHANGE OVER TIME. NOT TO SEE THE FUTURE, EXACTLY, BUT TO CHART THE WAYS IN WHICH THE FUTURE MIGHT BE EMERGING.**

But can he really create an exposure that lasts 1,000 years? And even if he can, what does it mean for us today?

**THERE'S A HUGE** map on the wall behind Mitch McClaran's desk at the University of Arizona. It's colored in faded pastels to demarcate "Biotic Communities of the Southwest." It looks to me like we're in "Mojave Desert Scrub," which is yellow, or the "Arizona Upland Subdivision," which is a desert-y pink. It's hard to tell because cities and borders aren't clearly marked. When I ask McClaran for insight, he tells me he loves this particular map, but it's been updated anyway.

Ecosystems shift through time.

McClaran is a professor of range management and the sixth person — the others are all dead — to oversee the repeat photography program at the Santa Rita Experimental Range. Every summer, he drives with a colleague, Alessandra Gorlier, out to search for several of the 119 active stations where researchers like them have been taking the photos for decades.

He thinks of it as "time travel." It's something he's been obsessed with since he was an undergraduate at the University of California, Berkeley. He remembers a professor pulling out a book showing images of how much landscapes had changed from 1890 to 1960.

"When I saw that as a 20-year-old, it changed my worldview," he says.

As if to replicate the demo, he pulls images for me from the Millennium Camera site #222. The first image is from 1902. The man who took it, David Griffiths, traveled by buggy and had to carry around a huge box camera with delicate glass — all without breaking it, McClaran says. The image shows the same canyon — labeled "Proctor Canon" — with the camera pointed to the east. Vegetation is fairly thin. There's a large mesquite tree in the foreground, just at the point where the bluff meets the valley. Next photo: 1941. "Mesquite has increased greatly in numbers as well as size," the caption says. "Burroweed has come in in spots in the canyon bottom where there was none originally." It's starting to look like a different landscape.

McClaran's name appears in that photo series in 2000. "Grasses on side slopes are tanglehead, slender grama, sideoats," he writes. "Mesquite tree at bottom of picture is dead."

McClaran is beaming showing me this. "I'm entertained by the ability to see time!" he says. "I'm serious when I say that. The repeat photography is capturing light to see time. Being able to see time is way different than reading about time unfolding on a chart or a graphic."

We look at the changes we can see.

The mesquite trees at that spot are disappearing, he says, but they have been spreading wildly at many of the other research sites. Grasslands are changing, shifting toward a species native to South Africa instead of those that evolved in Arizona. And of course it's getting hotter and drier, which you can see in climate data as well as the photos. But McClaran also revels in details that are the same. "That plant!" he says. "It was there 120 years ago!"

"Some things are inevitable," he says of watching changes unfold at a landscape scale. These mountains have been forming for 35 million years, he says, and now the population of Tucson is booming. "When you bring a million people within an hour's drive of the Santa Rita Range, all manner of things happen, and all manner of changes follow," he says. "Some things you can manage. Some things you can't. But if you keep a record, then you know what's changed."

All over the office are images of him in various hats, peering over digital cameras, recreating the photographs of colleagues who came before him. It's a task that could seem like drudgery if it weren't imbued with such a sense of purpose for him — the gift of witnessing.

"What I like about seeing time is it isn't abstract," he says. "You don't have to imagine change. You see dramatic changes already. I think about 'big time' changes all the time, but I also have a foundation in the changes that have happened already."

**THE REASON KEATS** is being coy about whether the moon might make an appearance in his image is that it's difficult to know what the future, much less a 1,000-year exposure of it, might look like.

The copper canister — the little soup can — is part of a rugged pinhole camera, meant to withstand a thousand years of wear. Keats attaches it to the digital camera so he can approximate the frame of an exposure that will be captured between now and 3026.

I look over his shoulder at a digital screen to see the pinhole view.

**"WHAT I LIKE ABOUT SEEING TIME IS IT ISN'T ABSTRACT. YOU DON'T HAVE TO IMAGINE CHANGE. YOU SEE IT."**

The landscape looks like a Rothko painting — a dimly lit and smudged reality.

He's still adjusting.

"I'd come back more from the repeat photo site," Brett Blum, a collaborator and interim director of the Santa Rita Experimental Range, calls from below. Keats is standing at the edge of a bluff. "That seems a little risky," Blum adds.

This bluff might not be here in 100 years, much less 1,000.

Keats steps back a bit and marks the precise location. Blum plans to come back later in the week with workers to hike to this location again, past the prickly pear and cholla cacti and up to this ledge overlooking an area that's called a "wash" because when it rains — and it can rain hard in the desert — it floods in three or four feet of water. They'll pour several bags of cement into the ground to hold a metal post in place, and then weld the metal-canister camera on top of that post.

The inside of the camera canister is painted with a pigment that bleaches extremely slowly in the presence of light. Keats estimates a viewable image — a sort of time-lapse in a single frame — will appear in some centuries. On that timescale, "it will have a liquid look to it," Keats tells me. Mountains may shift. Trees may migrate or disappear. Buildings may emerge. "You have enough time there for the landscape itself to change appreciably," he says.

Walking back from the site with Keats, Blum points to a small item in the dust. It's a single, pillowy sneaker, the whites and pastels popping against the sand — as if frozen in time. The apparent remnants of a dangerous journey from Mexico to the United States. I wonder if the border will still be there in 1,000 years.

**THE MORE TIME** I spend with Keats, the more I realize his primary interest is not the image the Millennium Camera will produce — or even whether the camera survives.

"The problem with the tripod is the ground, and the ground is not stable," he tells me, referring to the shifting nature of the physical landscape. "But I take that to be part of the picture."

He's designed it in hopes it can survive, of course.

But who knows what the Earth will do with it.

The actual point, perhaps, is to force us to imagine it in the future, and to contemplate the ways we all are shaping it.

Before I leave the research site, Blum, Keats' collaborator, offers a confession: His seven-year-old son stepped in front of one of the Millennium Cameras to snap a silly selfie.

He asks if that selfie would make it into the 1,000-year exposure.

It won't, Keats assures him.

Not literally. But, in a sense, we're all part of the image.