The Improbability of Fossils

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I'm beginning to suspect that most of the world's leading dinosaur experts are under the age of seven.

I was one of them, once. My preschool class excavated an enormous dinosaur egg from the playground during recess. I can still remember the thrill of our discovery, the heft of the gray egg in our chubby hands, our excited speculations about which species it belonged to. We had unearthed a tangible link to prehistory, equal parts mystery and science.

Years later I found out the so-called dinosaur egg was actually a cantaloupe our teacher had buried earlier in the day. The illusion shattered; so too did any fascination I'd harbored for these long-dead creatures.

Until I became a mother.

As a toddler, my oldest son cycled through all the usual obsessions: fire engines, construction vehicles, outer space. But now, on the cusp of entering preschool, he has discovered dinosaurs—the more obscure, the better.

He rarely picks fiction for his bedtime stories, instead preferring dense, encyclopedic books that catalog every known prehistoric species. Stumbling through words like "*Pachycephalosaurus*" and "ornithischian," I wonder if scientists chose these names specifically to torture weary parents. But after hundreds of nights and thousands of pages, my son's curiosity starts to rub off on me. Just a little.

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Back in the 1800s, the entire Western world went through its own phase of dino-obsession. Fossil-hunting was a largely unregulated pastime, offering adventure and glory to professionals and amateurs alike. A twelve-year-old girl dug up a 17-foot-long ichthyosaur and sold it to a local nobleman. A country doctor and his wife happened upon the fossilized teeth of an unknown gigantic reptile, which they named *Iguanodon*. But it was Sir Richard Owen, a British scientist with a flair for the dramatic, who cemented the position of these "terrible lizards" within the public imagination. He commissioned life-sized sculptures of more than 30 prehistoric animals and co-hosted an eight-course dinner party inside the *Iguanodon*.

The early fossil-hunters made a few notable blunders along the way. Without the benefit of a complete skeleton to guide them, they overestimated the size of the *Megalosaurus* by nearly 40 feet. They mistakenly placed the *Iguanodon's* thumb bone on top of its nose, like a rhinoceros horn. More egregiously, an eminent American paleontologist mixed up the skull and tail of his *Elasmosaurus* specimen, a humiliation from which he never quite recovered.

My son's bedtime books recount these bloopers with a certain air of amusement, as moments of comic relief within the history of paleontology. "Look how silly these scientists were," the authors seem to say. "See how far we've come since then."

But there's something endearing about these stories. I feel a rush of admiration for these scientific pioneers, who stumbled upon a world bigger than they ever could have imagined. Somehow, they possessed enough boldness to keep moving forward, taking their best guesses at the mysteries they encountered and trusting the truth would sort itself out later.

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One evening I open our bedtime book to a page about mass extinctions. I try to read the words as matter-of-factly as possible, even when it says we're currently living through the sixth mass extinction in the history of the planet. Even when it proclaims that the "losers" of this extinction will be amphibians, birds, and mammals.[1] Even when my son scrunches up his nose and remarks, "but…*we're* mammals."

It's not news, exactly. I know about the warming climate and the rising seas, the wildfires and the floods, the plastic-saturated oceans, and the smog-filled skies. I've read apocalyptic headlines about record-breaking temperatures and entire schools of fish that wash ashore, dead.

But as I sit snuggled up with my wide-eyed child, the weight of it all breaks my heart anew.

The next time he chooses this book, I try to skip that particular page. He finds it anyway.

"Look," he says, pointing to the timeline. "Here's the one where we're all going to die."

"Oh, honey," I say automatically. "We're not –"

What was I planning to say? *We're not going to die?* Even under the best of circumstances, that would be a lie.

I try again. "We don't know what the future holds," I tell him. "But we're going to face it together. One day at a time."

He gives me a long look—of skepticism or pity, I'm not sure which—and I wonder what burdens my generation will bequeath to his. Then he nods, slowly, and envelops me in a hug.

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The fifth mass extinction—the one that killed the dinosaurs—was likely accelerated by a series of massive volcanic eruptions. So when our family takes a vacation to the Pacific Northwest, my son unsurprisingly fixates on the towering giants of the Cascade Range. "Don't worry," he tells a pair of hikers at the base of Mount Rainier. "That volcano is not going to interrupt."

Inside the Mount Rainier Visitor Center, we grab a junior ranger booklet, which serves as our travel guide for the next few days. I help my son identify native plants, pick up litter, and draw pictures of his favorite hike. Finally, on our way out of the park, he turns in his completed booklet, repeats the official pledge, and proceeds to wear his badge with pride.

At home, he takes his vow seriously. He posts signs around the house with rules like "Don't hurt nature." He becomes conscientious about conserving electricity and learns to ride his bike so he can reduce his carbon footprint.

Inspired by his earnestness, I plant a vegetable garden and order a worm-composting kit. Hundreds of worms arrive in the mail, and I dump them into their new home. It takes our new pets a few days to acclimate to their surroundings. In the meantime, they wriggle onto the hallway floor every chance they get; only when I (counterintuitively) remove the lid from the top of the bin do the worms burrow deep into the layers of compost like they're supposed to, escaping the glare of the overhead light.

Over time, my initial enthusiasm wears off. Weeds overtake the garden plot, and caterpillars feast, unabated, on the spinach leaves. The scorching sun roasts my worms inside the compost bin-turned-oven, which I accidentally left outside a few days earlier. With a grim sort of guilt, I spread the worm carcasses over the ground like fertilizer. If I can't even change the momentum of my own backyard, what hope can I offer the rest of the planet?

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Speaking of momentum:

Once a week, when I can't wait any longer, I fill my car with gasoline. Between my daily commute to the office and my endless parental chauffeur duties—to school, church, piano lessons, and t-ball practices—I burn through fossil fuels at an alarming rate. We try to walk wherever we can, mostly to the park and the library, but it doesn't make much difference.

Every Monday morning, I haul several bags of garbage to the curb. We keep a separate can for recycling, too, until our city discontinues the program—although we hear rumors that most of the supposed "recycling" ended up in a landfill anyway.

And so it goes. Every action I take feels fraught with existential ramifications, but I don't know how to escape the ocean of consumerism in which I am swimming. I consider installing solar panels on our roof but become overwhelmed by the logistics and give up. I invest in reusable grocery bags, but as often as not, I forget to bring them inside the store. I pack my son's lunch in silicone bags, which works well until he refuses to eat anything but prepackaged cracker sandwiches.

In the midst of it all, I write: poems, paragraphs, and stories, in short, scattered bursts on the Notes app of my phone. If humanity is indeed hurtling toward extinction, I wonder why I bother with these words I know will never last. But the alternative—to quit writing altogether—feels unfathomable.

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I find myself bookmarking articles about the latest fossil finds under the pretense of sharing them with my son later. Each article is invariably accompanied by an illustration of the new discovery, some computer-generated rendering of the prehistoric world. When I read the captions closely, I notice similar refrains: "T. rex *may have had* lips,"[2] "Spinosaurus *may have had* paddle-like webbed feet,"[3] "Pterosaurs *may have had* brightly colored feathers."[4]

In other words, it's all guesswork. Highly educated guesswork, aided by high-tech modeling software and artificial intelligence—but guesswork nonetheless. I appreciate the honesty of these captions and their obvious awareness that today's best theories could be dethroned tomorrow.

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All my comfortable routines collapse in a single afternoon. The governor announces a month-long closure of public schools, and my boss orders me to take my laptop home over the weekend. Dumbfounded, I drive into the kindergarten carpool lane, where my son climbs in, all smiles. "Guess what!" he announces. "I have lots of work to do, and we're going to play school until April!"

At first, I am optimistic. I rise an hour early to answer emails and analyze data before guiding my son through circle time, handwriting lessons, and math facts. While I eat lunch, I check the latest statistics from the state's public health department. I keep a daily pandemic journal, as if by recording the weirdness, I can harness it somehow. Amid the rising death tolls and growing panic, I read news articles about how the stay-at-home orders have led to an immediate, drastic reduction in air pollution in cities like Bangkok, Beijing, and Bogota.

"Is it too much to hope for," I write in my journal, "that we will all birth something new during this time? That we will learn how to prioritize each other, to take on sacrifices for the global good? That we will collectively learn the skills we need to tackle climate change?"

In the months that follow, the answer becomes clear. Squabbles about facemasks devolve into a toxic, partisan gridlock. Public health guidelines change constantly—at best, leaving people

confused; at worst, sparking dark conspiracy theories. I watch my friends and neighbors retreat into isolated bubbles, their opinions ossifying at record speed.

Perhaps it's because of all the dinosaur books I've been reading, but I think to myself: maybe this is what science looks like in real time. Maybe the reliability of the scientific method comes not in spite, but because, of its imperfections.

Maybe it was never supposed to be about certainty.

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Each of my son's dinosaur books devotes a page or two to the process of fossilization, explaining how a skeleton, footprint, or piece of poop can harden into stone over millions of years. The authors make it look easy, with the steps laid out like a DIY Pinterest project.

But most dinosaurs did not turn into fossils. The vast majority died, decomposed, and were no more. No fanfare, no ceremony, no trace left behind. Only a lucky few managed to die in the right place at the right time, and instead of being consumed by scavengers, got themselves buried beneath mud or volcanic ash.

According to scientists, just one in every billion bones becomes a fossil. By that estimate, the entire population of the United States (333 million, at last count) can expect to fossilize approximately 70 bones. One-third of a complete human skeleton.

I could weep at the thought of so much beauty being lost. The entire world as we know it, reduced to a few rocks? What about the hallmarks of modern civilization: the plays of Shakespeare, the symphonies of Shostakovich, the poems of Maya Angelou? The internet? Airplanes? Indoor plumbing?

No one knows how plastic will fare in the millennia to come; our trash could easily outlive our bodies. I can only hope the next species will recognize the value once contained within the casing of a lone hard drive or cell phone.

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Late in the summer, something catches my eye, half-buried in the tangle of weeds that used to be my vegetable garden. I kneel on the ground and brush away the dirt with my fingers, revealing a smooth, greenish-yellow ball, slightly smaller than the cantaloupe I excavated as a preschooler three decades ago. It's not a fossil. It smells alive, and coming from this failed garden plot, that feels like a small miracle.

I cradle the miracle-ball in my arms and carry it inside, where I slice it open atop a wooden cutting board. The inside of the ball is, startlingly, orange. In the moment, I do the only thing that makes

sense, something I probably wouldn't do if I stopped to think about it: I take a bite. The fleshy middle tastes familiar, tart, and refreshing. *A cucumber?!?* Yes, now I notice the seeds at the center, same as the ones I planted in the spring.

It turns out extreme heat and drought can turn a cucumber orange. Overripe cucumbers are still edible (thankfully) but tend to have fewer nutrients and a more bitter taste —which means, despite its unusual shape and size, this vegetable is nothing to boast about.

Nevertheless, my discovery thrills me in some deliriously delightful way, and I call my family into the kitchen to share the bounty of my harvest. What are the odds that this one cucumber would persist among the weeds? It is random and unexplainable and, in its own way, beautiful.

We don't know what the future holds. The truth of the words I spoke to my son comes flooding back to me. *But we'll face it together. One day at a time.*

I do not know what will persist in the world: which seeds will sprout, which bones will fossilize, which species will survive the latest mass extinction. Which words, ideas, and theories will dissolve into nothing and which ones will take root.

I'd prefer certainty. Instead, I must muddle through with something far messier: hope. It's the reason I keep writing my snippets of poetry. It's why I snuggle with my son every evening, soaking up his earnestness and desperately trying to impart a bit of wisdom in return. And when next spring rolls around, it is why, once again, I'll plant something new.

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[1] Jenkins, Steve (2016). *Animals by the Numbers: A Book of Infographics.* New York, NY: Houghton Mifflin Harcourt.

[2] Black, Riley (2023). "The Top Ten Dinosaur *Discoveries of 2023." Smithsonian Magazine,* https://www.smithsonianmag.com/science-nature/the-top-ten-dinosaur-discoveries-of-2023-180983403/. Accessed 7 March 2024.

[3] Freund, Alexander (2022). "Discovered: Rare Spinosaurus fossils." *DW,* https://www.dw.com/en/rare-spinosaurus-dinosaur-fossils-found-on-isle-of-wight/a-62091791. Accessed 7 March 2024.

[4] Black, Riley (2022). "Pterosaurs May Have Had Feathers, Exquisite Fossil Reveals. *Scientific American,* https://www.scientificamerican.com/article/pterosaurs-may-have-had-brightly-colored-feathers-exquisite-fossil-reveals/#:~:text=Now%20experts%20are%20beginning%20to,colored%20as%20that%20of%20any. Accessed 7 March 2024.