JOHN

ESSAYS ON A HUMAN-CENTERED PLANET

Signed Edition

GREEN

#1 BESTSELLING AUTHOR OF TURTLES ALL THE WAY DOWN AND THE FAULT IN OUR STARS

THE ANTHROPOCENE REVIEWED

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Essays on a Human-Centered Planet

by John Green

DUTTON

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I have to confess I'm not a huge fan of copyright pages in general with their small type, obtuse verbiage, and morally charged legalese. I do appreciate, though, that copyright pages identify the book's font, as above. Designer Anna Booth set this book in Bembo MT Pro. Bembo was released in 1929 by the Monotype Corporation, but it is based on a design first cut in 1495 by Francesco Griffo, who worked for the famed Venetian printer Aldus Manutius. The first printing press arrived in Venice in 1469; within thirty years, there were more than four hundred presses, printing everything from Greek classics to travelogues. The typeface Bembo is based on was first used to print Pietro Bembo's short memoir of visiting Mt. Etna. Robert Slimbach has called Griffo's font design an "ideal balance of beauty and functionality," and although I'm no font designer, I agree. I give Bembo MT Pro four and a half stars.

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THE ANTHROPOCENE REVIEWED

This page is known to publishers and bookbinders as the "half-title page," because it lists the title but not the author name or subtitle. The half title once served a real function in the printing and bookbinding process, but these days it is mostly ornamental. I've never been a huge fan of half-title pages. By the time I've arrived here as a reader, I already know the title of the book, and if I need to be reminded, it's perpetually available to me on the book's front cover. But, then again, in an age of screen reading, I suppose every facet of bookmaking is anachronistic, and I do deeply love the feel of paper, and the sight of print, so I'll give half-title pages two and a half stars.

INTRODUCTION

MY NOVEL *TURTLES ALL THE WAY DOWN* was published in October of 2017, and after spending that month on tour for the book, I came home to Indianapolis and blazed a trail between my children's tree house and the little room where my wife and I often work, a room that depending on your worldview is either an office or a shed.

This was not a metaphorical trail. It was an actual trail in the woods, and to make it I cleared dozens of the prolific and invasive honeysuckle trees that choke much of Central Indiana, and I dug up the English ivy that had taken over, and then I covered the path in wood chips and lined it with bricks. I worked on the path ten or twelve hours a day, five or six days a week, for a month. When I finally finished, I timed myself walking along the path from our office to the tree house. Fifty-eight seconds. It took me a month to build a fifty-eight-second walk in the woods.

A week after finishing the path, I was searching through a drawer for some ChapStick when all at once and without any warning, my balance failed. The world began to roll and spin. I was suddenly a very small boat in very high seas. My eyes shivered in their sockets, and I began vomiting. I was rushed to the hospital, and for weeks afterward, the world spun and spun. Eventually I was diagnosed with labyrinthitis, a disease

of the inner ear with a wonderfully resonant name that is nonetheless an unambiguously one-star experience.

Recovery from labyrinthitis meant weeks in bed, unable to read or watch TV or play with my kids. I had only my thoughts—at times drifting through a drowsy sky, at other times panicking me with their insistence and omnipresence. During these long, still days, my mind traveled all over, roaming through the past.

The writer Allegra Goodman was once asked, "Whom would you like to write your life story?" She answered, "I seem to be writing it myself, but since I'm a novelist, it's all in code." For me, it had started to feel like some people thought they knew the code. They would assume I shared the worldviews of a book's protagonists, or they'd ask me questions as if I *were* the protagonist. One famous interviewer asked me if I also, like the narrator of *Turtles All the Way Down*, experience panic attacks while kissing.

I had invited such questions by having a public life as a mentally ill person, but still, talking so much about myself in the context of fiction became exhausting for me, and a little destabilizing. I told the interviewer that no, I do not have anxiety around kissing, but I do experience panic attacks, and they are intensely frightening. As I talked, I felt distant from myself—like my self wasn't really mine, but instead something I was selling or at the very least renting out in exchange for good press.

As I recovered from labyrinthitis, I realized I didn't want to write in code anymore.

In 2000, I worked for a few months as a student chaplain at a children's hospital. I was enrolled in divinity school and planning to become an Episcopal minister, but my time at the hospital disavowed me of those plans. I couldn't handle the devastation I saw there. I still can't handle it. Instead of going to divinity school, I moved to Chicago and worked as

a typist for temp agencies until eventually landing a job doing data entry for *Booklist* magazine, a biweekly book review journal.

A few months later, I got my first chance to review a book after an editor asked me if I liked romance novels. I told her I loved them, and she gave me a novel set in seventeenth-century London. Over the next five years, I reviewed hundreds of books for *Booklist*—from picture books about the Buddha to poetry collections—and in the process, I became fascinated by the format of the review. *Booklist* reviews were limited to 175 words, which meant each sentence must work multiple jobs. Every review had to introduce a book while also analyzing it. Your compliments needed to live right alongside your concerns.

At *Booklist*, reviews do not include ratings on a five-star scale. Why would they? In 175 words, one can communicate far more to potential readers than any single data point ever could. The five-star scale has only been used in critical analysis for the past few decades. While it was occasionally applied to film criticism as early as the 1950s, the five-star scale wasn't used to rate hotels until 1979, and it wasn't widely used to rate books until Amazon introduced user reviews.

The five-star scale doesn't really exist for humans; it exists for data aggregation systems, which is why it did not become standard until the internet era. Making conclusions about a book's quality from a 175-word review is hard work for artificial intelligences, whereas star ratings are ideal for them.

It's tempting to make labyrinthitis a metaphor: My life lacked balance and so I was devastated by a balance disorder. I spent a month drawing a straight line of a trail only to be told that life is never simple paths—only dizzying labyrinths folding in on themselves. Even now I'm structuring this introduction like a maze, coming back to places I thought I'd left.

But this symbolization of disease is exactly what I've tried to write

against in my novels *Turtles All the Way Down* and *The Fault in Our Stars*, where I hope at least OCD and cancer are portrayed not as battles to be won or as symbolic manifestations of character flaws or whatever, but as illnesses to be lived with as well as one can. I did not get labyrinthitis because the universe wanted to teach me a lesson about balance. So I tried to live with it as well as I could. Within six weeks, I was mostly better, but I still experience bouts of vertigo, and they are terrifying. I know now with a viscerality I didn't before that consciousness is temporary and precarious. It's not a metaphor to say that human life is a balancing act.

As I got better, I wondered what I would do with the rest of my life. I went back to making a video every Tuesday and a weekly podcast with my brother, but I wasn't writing. That fall and winter was the longest I'd gone without trying to write for an audience since I was fourteen years old. I suppose I missed writing, but in the way you miss someone you used to love.

I left *Booklist* and Chicago in 2005, because my wife, Sarah, got into graduate school in New York. When she finished her degree, we moved to Indianapolis, where Sarah worked for the Indianapolis Museum of Art as a curator of contemporary art. We have lived here ever since.

I read so much at *Booklist* that I can't remember when I first came across the word *Anthropocene*, but it must have been around 2002. The Anthropocene is a proposed term for the current geologic age, in which humans have profoundly reshaped the planet and its biodiversity. Nothing is more human than aggrandizing humans, but we are a hugely powerful force on Earth in the twenty-first century.

My brother, Hank, who started out his professional life as a biochemist, once explained it to me like this: As a person, he told me, your biggest problem is other people. You are vulnerable to people,

and reliant upon them. But imagine instead that you are a twenty-first-century river, or desert, or polar bear. Your biggest problem *is still people*. You are still vulnerable to them, and reliant upon them.

Hank had been with me on the book tour that fall of 2017, and to pass the time on long drives between cities, we'd try to one-up each other with absurd Google user reviews for the places we drove past. A user named Lucas, for example, gave Badlands National Park one star. "Not enough mountain," he reported.

In the years since I'd been a book reviewer, everyone had become a reviewer, and everything had become a subject for reviews. The five-star scale was applied not just to books and films but to public restrooms and wedding photographers. The medication I take to treat my obsessive-compulsive disorder has more than 1,100 ratings at Drugs.com, with an average score of 3.8. A scene in the movie adaptation of my book *The Fault in Our Stars* was filmed on a bench in Amsterdam; that bench now has hundreds of Google reviews. (My favorite, a three-star review, reads in its entirety: "It is a bench.")

As Hank and I marveled at the sudden everywhereness of reviewing on a five-star scale, I told him that years earlier, I'd had an idea to write a review of Canada geese.

Hank said, "The Anthropocene . . . REVIEWED."

I'd actually written a few of the reviews back in 2014—the one about Canada geese, and also one on Diet Dr Pepper. In early 2018, I sent those reviews to Sarah and asked for her thoughts.

When I reviewed books, "I" was never in the review. I imagined myself as a disinterested observer writing from outside. My early reviews of Diet Dr Pepper and Canada geese were similarly written in the nonfictional version of third-person omniscient narration. After Sarah read them, she pointed out that in the Anthropocene, there are no disinterested observers; there are only participants. She explained that

when people write reviews, they are really writing a kind of memoir—here's what *my* experience was eating at this restaurant or getting *my* hair cut at this barbershop. I'd written 1,500 words about Diet Dr Pepper without once mentioning my abiding and deeply personal love of Diet Dr Pepper.

Around the same time, as I began to regain my sense of balance, I reread the work of my friend and mentor Amy Krouse Rosenthal, who'd died a few months earlier. She'd once written, "For anyone trying to discern what to do w/ their life: PAY ATTENTION TO WHAT YOU PAY ATTENTION TO. That's pretty much all the info u need." My attention had become so fractured, and my world had become so loud, that I wasn't paying attention to what I was paying attention to. But when I put myself into the reviews as Sarah suggested, I felt like for the first time in years, I was at least trying to pay attention to what I pay attention to.

This book started out as a podcast, where I tried to chart some of the contradictions of human life as I experience it—how we can be so compassionate and so cruel, so persistent and so quick to despair. Above all, I wanted to understand the contradiction of human power: We are at once far too powerful and not nearly powerful enough. We are powerful enough to radically reshape Earth's climate and biodiversity, but not powerful enough to choose *how* we reshape them. We are so powerful that we have escaped our planet's atmosphere. But we are not powerful enough to save those we love from suffering.

I also wanted to write about some of the places where my small life runs into the large forces of the Anthropocene. In early 2020, after two years of writing the podcast, an exceptionally large force appeared in the form of a novel coronavirus. I began then to write about the only thing I could write about. Amid the crisis—and writing to you from April of

2021, I am still amid it—I find much to fear and lament. But I also see humans working together to share and distribute what we collectively learn, and I see people working together to care for the sick and vulnerable. Even separated, we are bound up in each other. As Sarah told me, there are no observers; only participants.

At the end of his life, the great picture book author and illustrator Maurice Sendak said on the NPR show *Fresh Air*, "I cry a lot because I miss people. I cry a lot because they die, and I can't stop them. They leave me, and I love them more."

He said, "I'm finding out as I'm aging that I'm in love with the world."

It has taken me all my life up to now to fall in love with the world, but I've started to feel it the last couple of years. To fall in love with the world isn't to ignore or overlook suffering, both human and otherwise. For me anyway, to fall in love with the world is to look up at the night sky and feel your mind swim before the beauty and the distance of the stars. It is to hold your children while they cry, to watch as the sycamore trees leaf out in June. When my breastbone starts to hurt, and my throat tightens, and tears well in my eyes, I want to look away from feeling. I want to deflect with irony, or anything else that will keep me from feeling directly. We all know how loving ends. But I want to fall in love with the world anyway, to let it crack me open. I want to feel what there is to feel while I am here.

Sendak ended that interview with the last words he ever said in public: "Live your life. Live your life. Live your life."

Here is my attempt to do so.

"YOU'LL NEVER WALK ALONE"

IT IS MAY OF 2020, and I do not have a brain well suited to this.

I find more and more that I refer to it as "it" and "this" without naming or needing to name, because we are sharing the rare human experience so ubiquitous that the pronouns require no antecedent. Horror and suffering abound in every direction, and I want writing to be a break from it. Still, it makes its way in—like light through window blinds, like floodwater through shut doors.

I suppose you are reading this in my future. Maybe you are reading in a future so distant from my present that "this" is over. I know it will never fully end—the next normal will be different from the last one. But there will be a next normal, and I hope you are living in it, and I hope I am living in it with you.

In the meantime, I have to live in this, and find comfort where I can. For me, lately, comfort has meant a show tune.

In 1909, the Hungarian writer Ferenc Molnár debuted his new play, *Liliom*, in Budapest. In the play, Liliom, a troubled and periodically violent young carousel barker, falls in love with a woman named Julie. When Julie becomes pregnant, Liliom attempts a robbery to support his

burgeoning family, but the robbery is a disaster, and Liliom dies. He ends up in purgatory for sixteen years, after which he is allowed a single day to visit his now-teenaged daughter, Louise.

Liliom flopped in Budapest, but Molnár was not a playwright who suffered from a shortage of self-belief. He continued mounting productions around Europe and then eventually in the U.S., where a 1921 translation of the play attracted good reviews and moderate box office success.

The composer Giacomo Puccini tried to adapt *Liliom* into an opera, but Molnár refused to sell him the rights, because he wanted "*Liliom* to be remembered as a play by Molnár, not as an opera by Puccini." Instead, Molnár sold the rights to Richard Rodgers and Oscar Hammerstein, the musical theater duo who were fresh off the success of *Oklahoma!* In doing so, Molnár ensured that *Liliom* would be remembered almost entirely as a musical by Rodgers and Hammerstein, retitled *Carousel*, which premiered in 1945.

In the musical, Rodgers and Hammerstein's song "You'll Never Walk Alone" is sung twice—first to encourage the newly widowed Julie after her husband's death, and then by Louise's classmates years later, at a graduation ceremony. Louise doesn't want to join in the song—she's too upset—but even though her father is now invisible to her, Louise can feel his presence and encouragement, and so eventually she starts to sing.

The lyrics of "You'll Never Walk Alone" contain only the most obvious imagery: The song tells us to "walk on through the wind and through the rain," which is not a particularly clever evocation of a storm. We are also told to "walk on with hope in your heart," which feels aggressively trite. And it reports that "at the end of the storm, there's a golden sky and the sweet silver song of a lark." But in reality, at the end of the storm, there are tree branches strewn everywhere, and downed power lines, and flooded rivers.

And yet, the song works for me. Maybe it's the repetition of the words "walk on." I think two of the fundamental facts of being a person are 1. We must go on, and 2. None of us ever walks alone. We may *feel* alone (in fact, we *will* feel alone), but even in the crushing grind of isolation, we aren't alone. Like Louise at her graduation, those who are distant or even gone are still with us, still encouraging us to walk on.

The song has been covered by everyone from Frank Sinatra to Johnny Cash to Aretha Franklin. But the most famous cover came in 1963 from Gerry and the Pacemakers, a band that, like the Beatles, was from Liverpool, managed by Brian Epstein, and recorded by George Martin. In keeping with their band name, the Pacemakers changed the meter of the song, increasing the tempo, giving the dirge a bit of pep, and their version became a #1 hit in the UK.

Fans of Liverpool Football Club almost immediately began to sing the song together during games. That summer, Liverpool's legendary manager Bill Shankly told the Pacemakers' lead singer, Gerry Marsden, "Gerry, my son, I have given you a football team, and you have given us a song."

Today, "You'll Never Walk Alone" is etched in wrought iron above the gates of Anfield, Liverpool's stadium. Liverpool's famous Danish defender Daniel Agger has YNWA tattooed on the knuckles of his right hand. I've been a Liverpool fan for decades,[1] and for me the song is so linked to the club that when I hear the opening notes, I think of all the times I've sung it with other fans—sometimes in exaltation, often in lamentation.

When Bill Shankly died in 1981, Gerry Marsden sang "You'll Never Walk Alone" at the memorial service—as it has been sung at many funerals for many Liverpool supporters. The miracle of "You'll Never Walk Alone" for me is how well it works as a funeral song, and as a high school

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1. Why? When I was twelve, I was on my middle school soccer team. I was awful, of course, and rarely played. We had one good player on our team, a guy named James. James was from England, and he told us that in England, there were professional soccer teams, and thousands of fans would stand together, shoulder to shoulder, and sing all through the games. He told us that the best team in England was Liverpool. And I believed him.

graduation song, and as a we-just-beat-Barcelona-in-the-Champions-League song. As former Liverpool player and manager Kenny Dalglish said, "It covers adversity and sadness and it covers the success." It's a song about sticking together even when your dreams are tossed and blown. It's a song about both the storm and the golden sky.

At first blush, it may seem odd that the world's most popular football song comes from musical theater. But football *is* theater, and fans make it musical theater. The anthem of West Ham United is called "I'm Forever Blowing Bubbles," and at the start of each game, you'll see thousands of grown adults blowing bubbles from the stands as they sing, "I'm forever blowing bubbles, pretty bubbles in the air / They fly so high, nearly reach the sky / Then like my dreams, they fade and die." Manchester United fans refashioned Julia Ward Howe's U.S. Civil War anthem "Battle Hymn of the Republic" into the song "Glory, Glory Man United." Manchester City fans sing "Blue Moon," a 1934 Rodgers and Hart number.

All these songs are made great by the communities singing them. They are assertions of unity in sorrow and unity in triumph: Whether the bubble is flying or bursting, we sing together.

"You'll Never Walk Alone" is cheesy, but it's not wrong. The song doesn't claim the world is a just or happy place. It just asks us to walk on with hope in our hearts. And like Louise at the end of *Carousel*, even if you don't really believe in the golden sky or the sweet silver song of the lark when you start singing, you believe it a little more when you finish.

In March 2020, a video made the rounds online in which a group of British paramedics sang "You'll Never Walk Alone" through a glass wall to coworkers on the other side, who were in an intensive care unit. The paramedics were trying to encourage their colleagues. What a word that is, *en-courage*. Though our dreams be tossed and blown, still we sing ourselves and one another into courage.

I give "You'll Never Walk Alone" four and a half stars.

HUMANITY'S TEMPORAL RANGE

WHEN I WAS NINE OR TEN, I saw a planetarium show at the Orlando Science Center in which the host, with no apparent emotion in his voice, explained that in about a billion years, the sun will be 10 percent more luminescent than it is now, likely resulting in the runaway evaporation of Earth's oceans. In about four billion years, Earth's surface will become so hot that it will melt. In seven or eight billion years, the sun will be a red giant star, and it will expand until eventually our planet will be sucked into it, and any remaining Earthly evidence of what we thought or said or did will be absorbed into a burning sphere of plasma.

Thanks for visiting the Orlando Science Center. The exit is to your left.

It has taken me most of the last thirty-five years to recover from that presentation. I would later learn that many of the stars we see in the night sky are red giants, including Arcturus. Red giants are common. It is common for stars to grow larger and engulf their once-habitable solar systems. It's no wonder we worry about the end of the world. Worlds end all the time.

A 2012 survey conducted across twenty countries found wide variance in the percentage of people who believe humanity will end within their lifetimes. In France, 6 percent of those polled did; in the United States, 22 percent. This makes a kind of sense: France has been home to apocalyptic preachers—the bishop Martin of Tours, for instance, wrote "There is no doubt that the Antichrist has already been born." But that was back in the fourth century. American apocalypticism has a much more recent history, from Shaker predictions the world would end in 1794 to famed radio evangelist Harold Camping's calculations that the apocalypse was coming in 1994—and then, when that didn't happen, in 1995. Camping went on to announce that the end times would commence on May 21, 2011, after which would come "five months of fire, brimstone and plagues on Earth, with millions of people dying each day, culminating on October 21st, 2011 with the final destruction of the world." When none of this came to pass, Camping said, "We humbly acknowledge we were wrong about the timing," although for the record no individual ever humbly acknowledged anything while referring to themselves as "we." I'm reminded of something my religion professor Donald Rogan told me once: "Never predict the end of the world. You're almost certain to be wrong, and if you're right, no one will be around to congratulate you."

Camping's personal apocalypse arrived in 2013, when he died at the age of ninety-two. Part of our fears about *the* world ending must stem from the strange reality that for each of us *our* world will end, and soon. In that sense, maybe apocalyptic anxieties are a by-product of humanity's astonishing capacity for narcissism. How could the world possibly survive the death of its single most important inhabitant—me? But I think something else is at work. We know we will end in part because we know other species have ended.

"Modern humans," as we are called by paleontologists, have been around for about 250,000 years. This is our so-called "temporal range,"

the length of time we've been a species. Contemporary elephants are at least ten times older than us—their temporal range extends back to the Pliocene Epoch, which ended more than 2.5 million years ago. Alpacas have been around for something like 10 million years—forty times longer than us. The tuatara, a species of reptile that lives in New Zealand, first emerged around 240 million years ago. They've been here a thousand times longer than we have, since before Earth's supercontinent of Pangaea began to break apart.

We are younger than polar bears and coyotes and blue whales and camels. We are also far younger than many animals we drove to extinction, from the dodo to the giant sloth.

In the spring of 2020, a few weeks after the emergence of a novel coronavirus began to shut schools and clear out grocery stores in the U.S., someone sent me a collection they'd made of times I'd publicly mentioned my fear of an infectious disease pandemic. On the podcast *10 Things That Scare Me*, I'd listed near the top, "a global disease pandemic that will result in the breakdown of human norms." Years earlier, in a video about world history, I'd speculated about what might happen "if some superbug shows up tomorrow and it travels all these global trade routes." In 2019, I'd said on a podcast, "We all must prepare ourselves for the global pandemic we all know is coming." And yet, I did nothing to prepare. The future, even in its inevitabilities, always feels vague and nebulous to me—until it doesn't.

After my kids' school closed, and after I'd found a mask that I'd bought years earlier to minimize sawdust inhalation while building their tree house, but long before I understood the scope of the pandemic, I called my brother, Hank, and told him I was feeling frightened. Hank is the levelheaded one, the sane one, the calm one. He always has been. We have never let the fact of my being older get in the way of Hank

being the wise older brother. Ever since we were little, one of the ways I've managed my anxiety is by looking to him. My brain cannot reliably report to me whether a perceived threat is really real, and so I look at Hank, and I see that he's not panicked, and I tell myself that I'm okay. If anything were *truly* wrong, Hank wouldn't be able to portray such calm confidence.

So I told Hank I was scared.

"The species will survive this," he answered, a little hitch in his voice.

"*The species will survive this?* That's all you've got for me???"

He paused. I could hear the tremble in his breath, the tremble he's been hearing in my breath our whole lives. "That's what I've got for you," he said after a moment.

I told Hank I'd bought sixty cans of Diet Dr Pepper, so that I could drink two for each day of the lockdown.

And only then could I hear the old smile, the my-older-brother-really-is-a-piece-of-work smile. "For someone who has spent four decades worrying about disease pandemics," he said, "you sure don't know how disease pandemics work."

One rule of retail marketing maintains that to maximize sales, businesses need to create a sense of urgency. *Mega-sale ends soon! Only a few tickets still available!* These commercial threats, especially in the age of e-commerce, are almost always a fiction. But they're effective, an echo of our apocalyptic visions: If we feel a sense of urgency about the human experiment, maybe we'll actually get to work, whether that's rushing to save souls before the Rapture or rushing to address climate change.

I try to remind myself that back in the fourth century, Martin of Tours's eschatological anxiety must have felt as real to him as my current anxiety feels to me. A thousand years ago, floods and plagues were seen as apocalyptic portents, because they were glimpses of a power far

beyond our understanding. By the time I was growing up, amid the rise of computers and hydrogen bombs, Y2K and nuclear winter made for better apocalyptic worries. Today, these worries sometimes focus on artificial intelligence run amok, or on a species-crushing pandemic that we have proven ourselves thoroughly unprepared for, but most commonly my worry takes the form of climate anxiety, or eco-anxiety—terms that did not exist a few decades ago but are now widespread phenomena.

Humans are already an ecological catastrophe. In just 250,000 years, our behavior has led to the extinction of many species, and driven many more into steep decline. This is lamentable, and it is also increasingly needless. We probably didn't know what we were doing thousands of years ago as we hunted some large mammals to extinction. But we know what we're doing now. We know how to tread more lightly upon the earth. We could choose to use less energy, eat less meat, clear fewer forests. And we choose not to. As a result, for many forms of life, humanity *is* the apocalypse.

There are worldviews that embrace cyclic cosmologies—Hindu eschatology, for instance, lays out a series of multibillion-year periods called kalpas during which the world goes through a cycle of formation, maintenance, and then decline. But in linear eschatologies, the end times for humanity are often referred to as "the end of the world," even though our departure from Earth will very probably not be the end of the world, nor will it be the end of life in the world.

Humans are a threat to our own species and to many others, but the planet will survive us. In fact, it may only take life on Earth a few million years to recover from us. Life has bounced back from far more serious shocks. Two hundred and fifty million years ago, during the Permian extinction, ocean surface waters likely reached 104 degrees Fahrenheit, or 40 degrees Celsius. Ninety-five percent of Earth's species went extinct,

and for five million years afterward, Earth was a "dead zone" with little expansion of life.

Sixty-six million years ago, an asteroid impact caused a dust cloud so huge that darkness may have pervaded Earth for *two years*, virtually stopping photosynthesis and leading to the extinction of 75 percent of land animals. Measured against these disasters, we're just not that important. When Earth is done with us, it'll be like, "Well, that Human Pox wasn't great, but at least I didn't get Large Asteroid Syndrome."

The hard part, evolutionarily, was getting from prokaryotic cells to eukaryotic ones, and then getting from single-celled organisms to multicellular ones. Earth is around 4.5 billion years old, a timescale I simply cannot get my head around. Instead, let's imagine Earth's history as a calendar year, with the formation of Earth being January 1, and today being December 31 at 11:59 PM. The first life on Earth emerges around February 25. Photosynthetic organisms first appear in late March. Multicellular life doesn't appear until August or September. The first dinosaurs like eoraptor show up about 230 million years ago, or December 13 in our calendar year. The meteor impact that heralds the end of the dinosaurs happens around December 26. *Homo sapiens* aren't part of the story until December 31 at 11:48 PM.[2]

Put another way: It took Earth about three billion years to go from single-celled life to multicellular life. It took less than seventy million years to go from *Tyrannosaurus rex* to humans who can read and write and dig up fossils and approximate the timeline of life and worry about its ending. Unless we somehow manage to eliminate all multicellular life from the planet, Earth won't have to start all the way over, and it will be okay—at least until the oceans evaporate and the planet gets consumed by the sun.

But we'll be gone by then, as will our collective and collected

2. Agriculture and large human communities and the building of monolithic structures all occur within the last minute of this calendar year. The Industrial Revolution, two world wars, the invention of basketball, recorded music, the electric dishwasher, and vehicles that travel faster than horses all happen in the last couple of seconds.

memory. I think part of what scares me about the end of humanity is the end of those memories. I believe that if a tree falls in the woods and no one is there to hear it, it does make a sound. But if no one is around to play Billie Holiday records, those songs really won't make a sound anymore. We've caused a lot of suffering, but we've also caused much else.

I know the world will survive us—and in some ways it will be *more* alive. More birdsong. More creatures roaming around. More plants cracking through our pavement, rewilding the planet we terraformed. I imagine coyotes sleeping in the ruins of the homes we built. I imagine our plastic still washing up on beaches hundreds of years after the last of us is gone. I imagine moths, having no artificial lights toward which to fly, turning back to the moon.

There is some comfort for me in knowing that life will go on even when we don't. But I would argue that when our light goes out, it will be Earth's greatest tragedy, because while I know humans are prone to grandiosity, I also think we are by far the most interesting thing that ever happened on Earth.

It's easy to forget how wondrous humans are, how strange and lovely. Through photography and art, each of us has seen things we'll never see—the surface of Mars, the bioluminescent fish of the deep ocean, a seventeenth-century girl with a pearl earring. Through empathy, we've felt things we might never have otherwise felt. Through the rich world of imagination, we've seen apocalypses large and small.

We're the only part of the known universe that knows it's in a universe. We know we are circling a star that will one day engulf us. We're the only species that knows it has a temporal range.

Complex organisms tend to have shorter temporal ranges than simple ones, and humanity faces tremendous challenges. We need to find a way to survive ourselves—to go on in a world where we are powerful enough

to warm the entire planet but not powerful enough to stop warming it. We may even have to survive our own obsolescence as technology learns to do more of what we do better than we can do it. But we are better positioned to solve our biggest problems than we were one hundred or one thousand years ago. Humans have more collective brainpower than we've ever had, and more resources, and more knowledge collected by our ancestors.

We are also shockingly, stupidly persistent. Early humans probably used many strategies for hunting and fishing, but a common one was persistence hunting. In a persistence hunt, the predator relies on tracking prowess and sheer perseverance. We would follow prey for hours, and each time it would run away from us, we'd follow, and it would run away again, and we'd follow, and it would run away again, until finally the quarry became too exhausted to continue. That's how for tens of thousands of years we've been eating creatures faster and stronger than us.

We. Just. Keep. Going. We spread across seven continents, including one that is entirely too cold for us. We sailed across oceans toward land we couldn't see and couldn't have known we would find. One of my favorite words is *dogged*. I love dogged pursuits, and dogged efforts, and dogged determination. Don't get me wrong—dogs are indeed very dogged. But they ought to call it *humaned*. Humaned determination.

For most of my life, I've believed we're in the fourth quarter of human history, and perhaps even the last days of it. But lately, I've come to believe that such despair only worsens our already slim chance at long-term survival. We must fight like there is something to fight for, like we are something worth fighting for, because we are. And so I choose to believe that we are not approaching the apocalypse, that the end is not coming, and that we will find a way to survive the coming changes.

"Change," Octavia Butler wrote, "is the one unavoidable, irresistible, ongoing reality of the universe." And who am I to say we are done

changing? Who am I to say that Butler was wrong when she wrote "The Destiny of Earthseed is to take root among the stars"? These days, I choose to believe that our persistence and our adaptability will allow us to keep changing with the universe for a very, very long time.

So far, at a paltry 250,000 years, it's hard to give humanity's temporal range more than one star. But while I initially found my brother's words distressing, these days I find myself repeating them, and believing them. He was right. He always is. The species will survive this, and much more to come.

And so in hope, and in expectation, I give our temporal range four stars.

1986. I was eight. This apparition of the comet was, to quote Wikipedia, "the least favorable on record," with the comet much farther from Earth than usual. The comet's distance, combined with the tremendous growth of artificial light, meant that in many places Halley was invisible to the naked eye.

I was living in Orlando, Florida, a town that throws a lot of light up at the night sky, but on Halley's brightest weekend, my dad and I drove up to the Ocala National Forest, where our family owned a little cabin. At the tail end of what I still consider to be one of the best days of my life, I saw the comet through my dad's birding binoculars.

Humanity may have known that Halley was a repeating comet thousands of years ago. There is a reference in the Talmud to "a star that appears once in seventy years and makes the captains of ships err." But back then it was common for humans to forget over time what they had already learned. Maybe not only back then, come to think of it.

At any rate, Edmond[3] Halley noticed that the 1682 comet he observed seemed to have a similar orbit to comets that had been reported in 1607 and 1531. Fourteen years later, Halley was still thinking about the comet, writing to Isaac Newton, "I am more and more confirmed that we have seen that comett now three times since ye year 1531." Halley then predicted the comet would return in 1758. It did, and it has been named for him ever since.

Because we so often center history on the exploits and discoveries of individuals, it's easy to forget that broad systems and historical forces drive shifts in human understanding. While it is true, for example, that Halley correctly predicted the comet's return, his colleague and contemporary Robert Hooke had already expressed "a very new opinion" that some comets might be recurring. Even putting aside the Talmud's

3. Or possibly Edmund.

possible awareness of periodic comets, other sky gazers were beginning to have similar ideas around the same time. Seventeenth-century Europe—with not just Newton and Hooke, but also Boyle and Galileo and Gascoigne and Pascal—saw so many important scientific and mathematical breakthroughs not because the people born in that time and place happened to be unusually smart, but because the analytic system of the scientific revolution was emerging, and because institutions like the Royal Society allowed well-educated elites to learn from one another more efficiently, and also because Europe was suddenly and unprecedentedly rich. It's no coincidence that the scientific revolution in Britain coincided with the rise of British participation in the Atlantic slave trade and the growing wealth being extracted from colonies and enslaved labor.

We must, then, try to remember Halley in context—not as a singular genius who emerged from a family of soap-boilers to discover a comet, but as a searching and broadly curious person who was also, like the rest of us, "a bubble on the tide of empire," as Robert Penn Warren memorably put it.

That noted, Halley was brilliant. Here's just one example of his use of lateral thinking, as discussed in John and Mary Gribbin's book *Out of the Shadow of a Giant*: When asked to work out the acreage of land in every English county, Halley "took a large map of England, and cut out the largest complete circle he could from the map." That circle equated to 69.33 miles in diameter. He then weighed both the circle and the complete map, concluding that since the map weighed four times more than the circle, the area of England was four times the area of the circle. His result was only 1 percent off from contemporary calculations.

Halley's polymathic curiosity makes his list of accomplishments read like they're out of a Jules Verne novel. He invented a kind of diving bell to go hunting for treasure in a sunken ship. He developed an early magnetic compass and made many important insights about Earth's magnetic

field. His writing on Earth's hydrological cycle was tremendously influential. He translated the Arab astronomer al-Battānī's tenth-century observations about eclipses, using al-Battānī's work to establish that the moon's orbit was speeding up. And he developed the first actuarial table, paving the way for the emergence of life insurance.

Halley also personally funded the publication of Newton's three-volume *Principia* because England's leading scientific institution, the Royal Society, "rashly spent all its publishing budget on a history of fish," according to historian Julie Wakefield. Halley immediately understood the significance of the *Principia*, which is considered among the most important books in the history of science.[4] "Now we are truly admitted as table-guests of the Gods," Halley said of the book. "No longer does error oppress doubtful mankind with its darkness."

Of course, Halley's ideas didn't always hold up. Error still oppressed doubtful humankind (and still does). For example, partly based on Newton's incorrect calculations of the moon's density, Halley argued there was a second Earth inside of our Earth, with its own atmosphere and possibly its own inhabitants.

By the time Halley's comet showed up in 1986, the scientific revolution's approach to knowledge-building had proven so successful that even third graders like me knew about the layers of the earth. That day in the Ocala National Forest, my dad and I made a bench by nailing two-by-fours to sections of tree trunk. It wasn't particularly challenging carpentry, but in my memory, at least, it took us most of the day. Then we started a fire,

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4. In *Out of the Shadow of a Giant*, Mary Gribbin and John Gribbin argue that while the *Principia* is of course important, it also relied upon—and at times outright stole—research from others, especially Robert Hooke. They write, "The famous story of the falling apple seen during the plague year of 1665 is a myth, invented by Newton to bolster his (false) claim that he had the idea for a universal theory of gravity before Hooke." It's sort of comforting to know that even Isaac Newton exaggerated what he got done during his plague year.

cooked some hot dogs, and waited for it to get properly dark—or as dark as Central Florida got in 1986.

I don't know how to explain to you how important that bench was to me, how much it mattered that my dad and I had made something together. But that night, we sat next to each other on our bench, which just barely fit the two of us, and we passed the binoculars back and forth, looking at Halley's comet, a white smudge in the blue-black sky.

My parents sold the cabin almost twenty years ago, but not long before they did, I spent a weekend there with Sarah. We'd just started dating. I walked her down to the bench, which was still there. Its fat legs were termite-ridden, and the two-by-fours were warped, but it still held our weight.

Halley's comet is not a monolithic spherical miniplanet flying through space, as I imagined it to be. Instead, it is many rocks that have coalesced into a peanut-shaped mass—a "dirty snowball," as the astronomer Fred Whipple put it. In total, Halley's dirty snowball of a nucleus is nine miles long and five miles wide, but its tail of ionized gas and dust particles can extend more than sixty million miles through space. In 837 CE, when the comet was much closer to Earth than usual, its tail stretched across more than half of our sky. In 1910, as Mark Twain lay dying, Earth actually passed through the comet's tail. People bought gas masks and anti-comet umbrellas to protect against the comet's gases.

In fact, though, Halley poses no threat to us. It's approximately the same size as the object that struck Earth sixty-six million years ago leading to the extinction of dinosaurs and many other species, but it's not on a collision course with Earth. That noted, Halley's comet will be more than five times closer to Earth in 2061 than it was in 1986. It'll be brighter in the night sky than Jupiter, or any star. I'll be eighty-three—if I'm lucky.

When you measure time in Halleys rather than years, history starts to look different. As the comet visited us in 1986, my dad brought home a personal computer—the first in our neighborhood. One Halley earlier, the first movie adaptation of *Frankenstein* was released. The Halley before that, Charles Darwin was aboard the HMS *Beagle*. The Halley before that, the United States wasn't a country. The Halley before that, Louis XIV ruled France.

Put another way: In 2021, we are five human lifetimes removed from the building of the Taj Mahal, and two lifetimes removed from the abolition of slavery in the United States. History, like human life, is at once incredibly fast and agonizingly slow.

Very little of the future is predictable. That uncertainty terrifies me, just as it terrified those before me. As John Gribbin and Mary Gribbin write, "Comets were the archetypal unpredictable phenomenon, appearing entirely without warning, rousing superstitious awe in the eighteenth century to an even greater extent than eclipses."

Of course, we still know almost nothing about what's coming—neither for us as individuals nor for us as a species. Perhaps that's why I find it so comforting that we do know when Halley will return, and that it will return, whether we are here to see it or not.

I give Halley's comet four and a half stars.

It's short, reasonably accessible, and rather than being a book for "the season only," it has proven to be a book for all seasons.

Gatsby is a critique of the American Dream. The only people who end up rich or successful in the novel are the ones who start out that way. Almost everyone else ends up dead or destitute. And it's a critique of the kind of vapid capitalism that can't find anything more interesting to do with money than try to make more of it. The book lays bare the carelessness of the entitled rich—the kind of people who buy puppies but won't take care of dogs, or who purchase vast libraries of books but never read any of them.

And yet *Gatsby* is often read as a *celebration* of the horrifying excess of the Anthropocene's richer realms. Shortly after the book came out, Fitzgerald wrote to a friend, "Of all the reviews, even the most enthusiastic, not one had the slightest idea what the book was about."

Sometimes, that still feels true. To tell a story of my own horrifying excess, I once stayed at the famous Plaza Hotel in New York City and received a "free upgrade" to the Great Gatsby suite. The room was a study in visual overstimulation—sparkling silver wallpaper, ornate furniture, fake trophies and autographed footballs lining the mantel. The room seemed utterly unaware that, in the novel, Daisy and Tom Buchanan are the bad guys.

Eventually, in what may have been the most entitled moment of my life, I called and requested a room change because the ceaseless tinkling of the Gatsby Suite's massive crystal chandelier was disturbing my sleep. As I made that call, I could feel the eyes of Fitzgerald staring down at me.

But *Gatsby* lends itself to the confusion that Fitzgerald lamented. Yes, it is unwavering in its condemnation of American excess, but even so, the whole novel pulses with an intoxicatingly rhythmic prose. Just read the first sentence aloud: "In my younger and more vulnerable years, my father gave me some advice that I've been turning over in my mind ever since." You can damn near tap your foot to it. Or take this one:

"Gatsby turned out all right in the end; it is what preyed on Gatsby, what foul dust floated in the wake of his dreams that temporarily closed out my interest in the abortive sorrows and short-winded elations of men."

When words roll like that, it's hard not to enjoy the party, and for me that's the real genius of *Gatsby*. The book makes you feel for the entitled spoiled disgusting rich *and* the poor people living in the valley of ashes, and everyone in between. You know the parties are vapid and maybe even evil, but you still want to be invited. And so in bad times, *Gatsby* feels like a condemnation of the American idea, and in good times it feels like a celebration of that same idea. David Denby has written that the book has "become a kind of national scripture, recited happily or mournfully, as the occasion requires."

So it has become for that sentence near the book's end. "For a transitory enchanted moment, man must have held his breath in the presence of this continent, compelled into an aesthetic contemplation he neither understood nor desired, face to face for the last time in history with something commensurate to his capacity for wonder."

There's just the one problem with that line, which is that it's not true. It's not true that "man" held his breath in the presence of this continent, because if we are imagining "man" as all of humanity, then "man" had known about, and indeed lived in, the area for tens of thousands of years. In fact, the use of "man" in the sentence ends up telling us a lot about whom, precisely, the narrator thinks of as a person, and where the narrator centers their story.

That "last time in history" also proved wrong, of course. Within a few decades of *Gatsby*'s publication, human beings stepped foot on the moon. Not long after that, we sent a telescope into space that allowed us to glimpse what the universe looked like just after the Big Bang.

Maybe the novel knows this. It is, after all, a book about hearkening back to a past that never existed, trying to fix some single moment from the past into permanence, when the past is neither fixed nor fixable.

And so maybe the novel knows that hearkening back to these transitory enchanted moments is a doomed enterprise. Maybe the Plaza knew they were making a room about (and for) the baddies.

But I will confess this endless parsing of ambivalences and ironies exhausts me. Here's the plain truth, at least as it has been shown to me: We are never far from wonders. I remember when my son was about two, we were walking in the woods one November morning. We were along a ridge, looking down at a forest in the valley below, where a cold haze seemed to hug the forest floor. I kept trying to get my oblivious two-year-old to appreciate the landscape. At one point, I picked him up and pointed out toward the horizon and said, "Look at that, Henry, just look at it!" And he said, "Weaf!" I said, "What?" And again he said, "Weaf," and then reached out and grabbed a single brown oak leaf from the little tree next to us.

I wanted to explain to him that you can see a brown oak leaf anywhere in the eastern United States in November, that nothing in the forest was less interesting. But after watching him look at it, I began to look as well, and I soon realized it wasn't just a brown leaf. Its veins spidered out red and orange and yellow in a pattern too complex for my brain to synthesize, and the more I looked at that leaf with Henry, the more I was compelled into an aesthetic contemplation I neither understood nor desired, face-to-face with something commensurate to my capacity for wonder.

Marveling at the perfection of that leaf, I was reminded that aesthetic beauty is as much about how and whether you look as what you see. From the quark to the supernova, the wonders do not cease. It is our attentiveness that is in short supply, our ability and willingness to do the work that awe requires.

Still, I'm fond of our capacity for wonder. I give it three and a half stars.

LASCAUX CAVE PAINTINGS

IF YOU'VE EVER HAD OR BEEN A CHILD, you are probably already familiar with hand stencils. They were the first figurative art made by both my kids—somewhere between the ages of two and three, my children spread the fingers of one hand out across a piece of paper, and then with the help of a parent traced their five fingers. I remember my son's face as he lifted his hand and looked absolutely shocked to see the shape of his splayed fingers still on the paper, a semipermanent record of himself.

I am extremely happy that my children are no longer three, and yet to look at their little hands from those early artworks is to be inundated with a strange, soul-splitting joy. Those pictures remind me that my kids are not just growing up but also growing away from me, running toward their own lives. But *I* am applying that meaning to *their* hand stencils, and the complicated relationship between art and its viewers is never more fraught than when we look deeply into the past.

In September of 1940, an eighteen-year-old mechanic named Marcel Ravidat was walking in the southwestern French countryside, when