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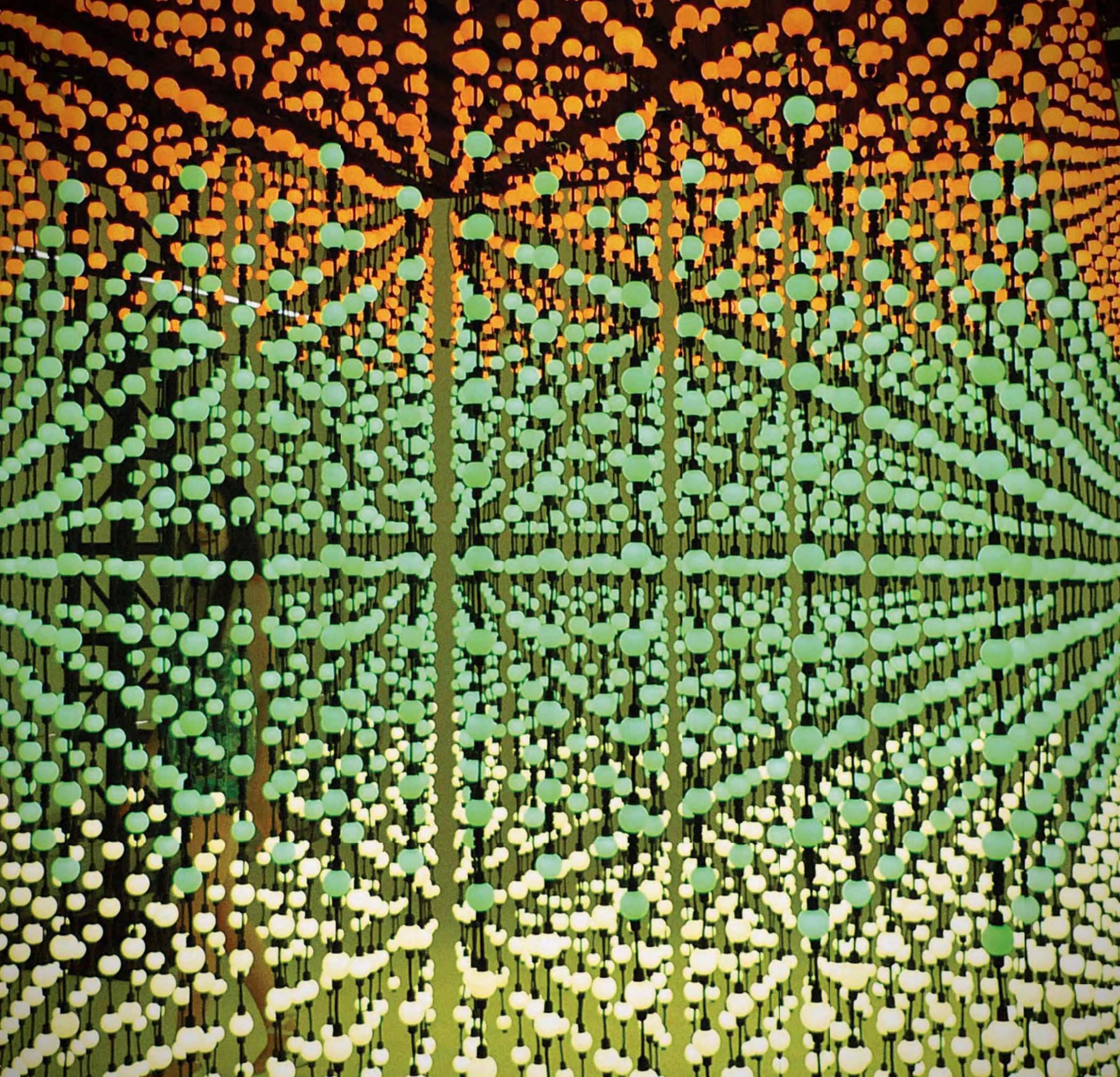


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Muti Randolph, "Deep Screen" | photo by Adam Mignarelli

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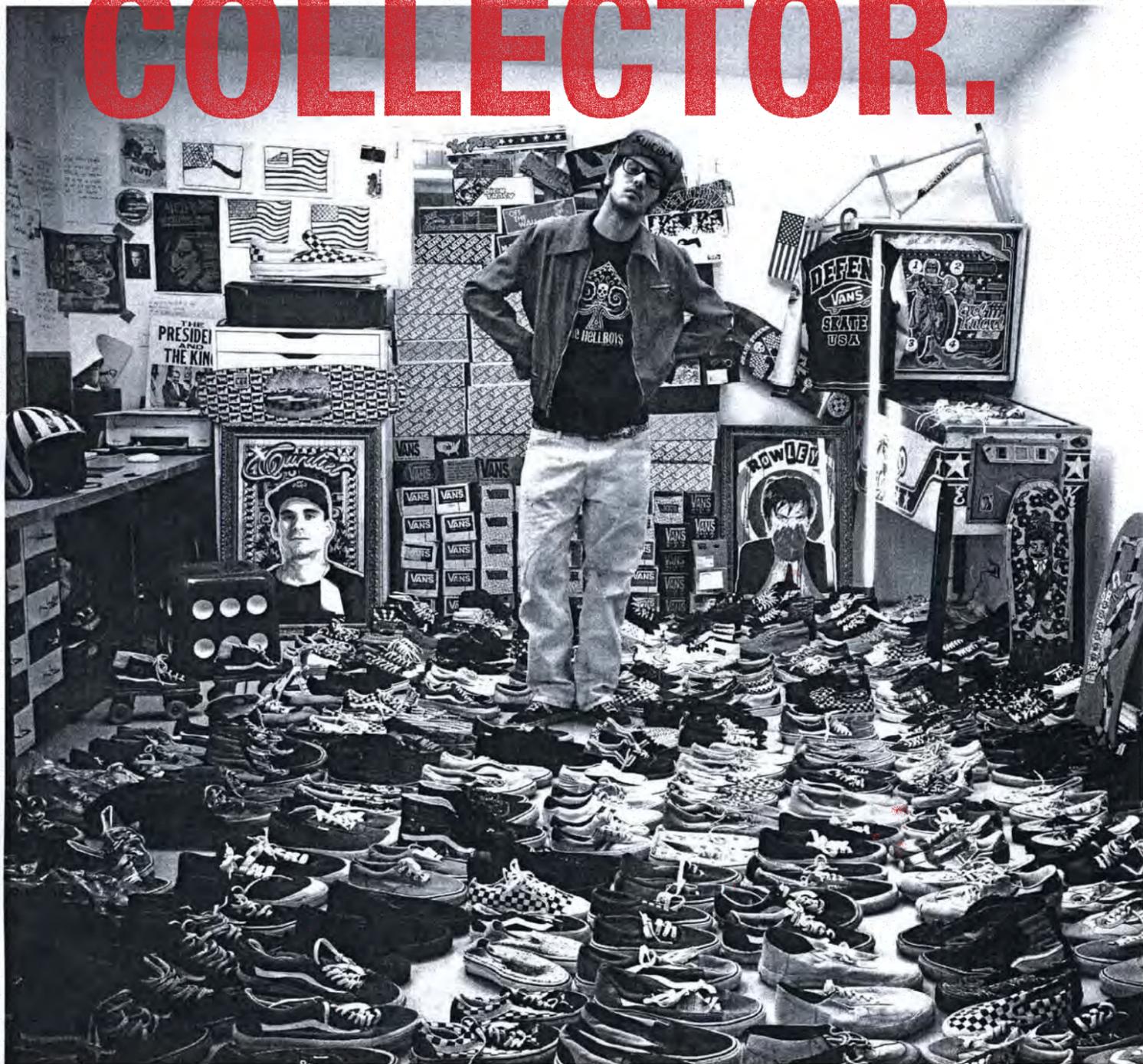
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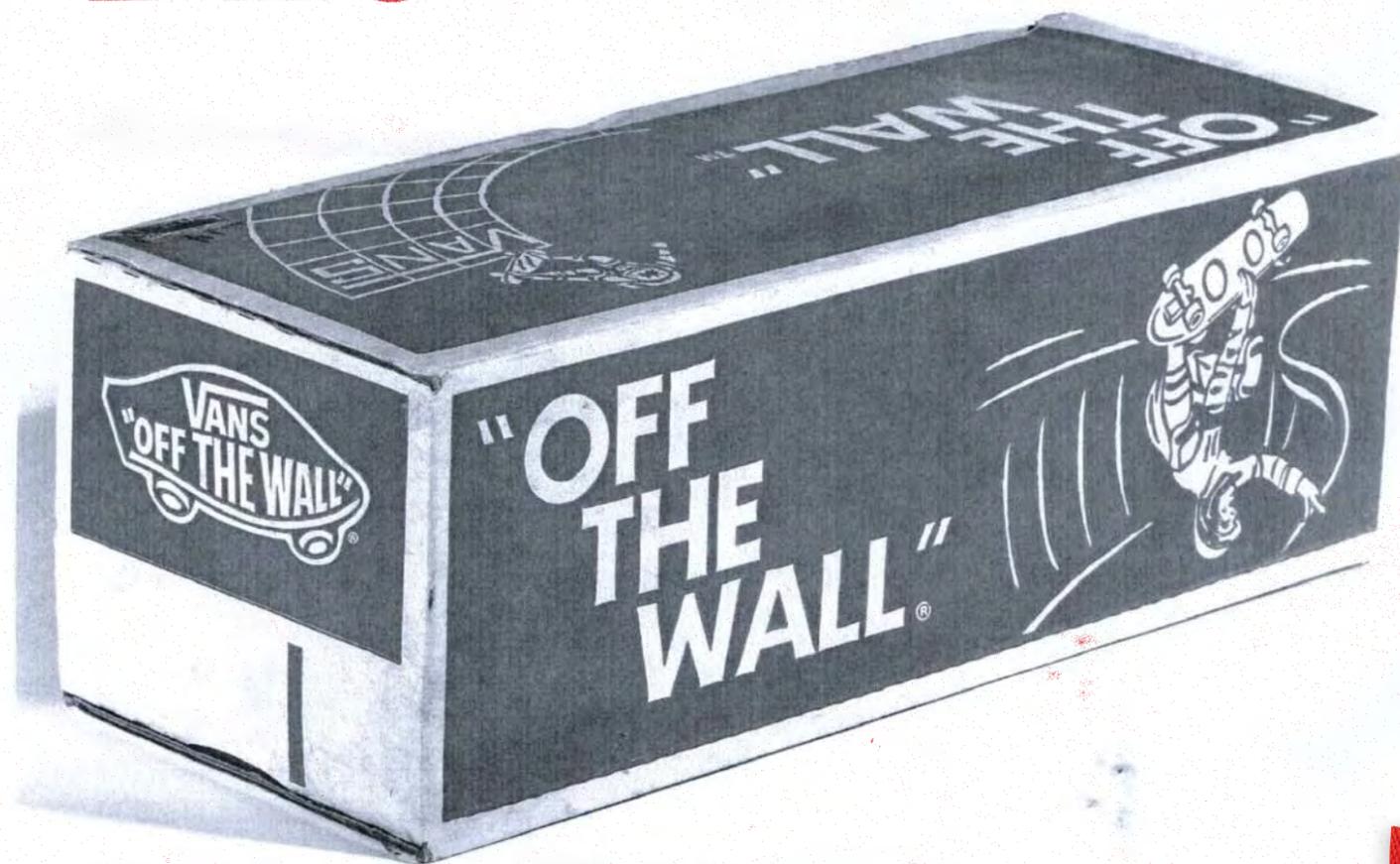
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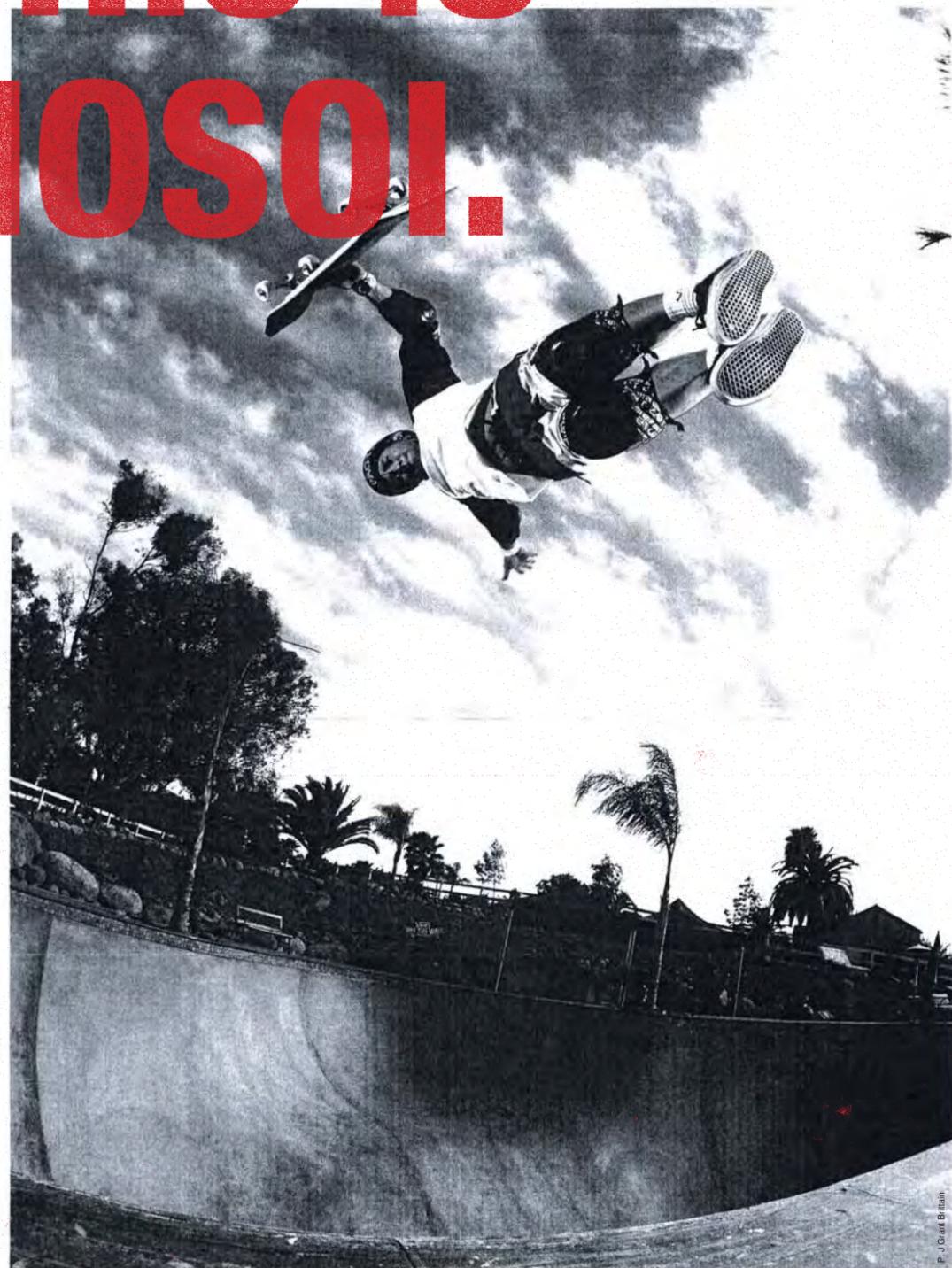
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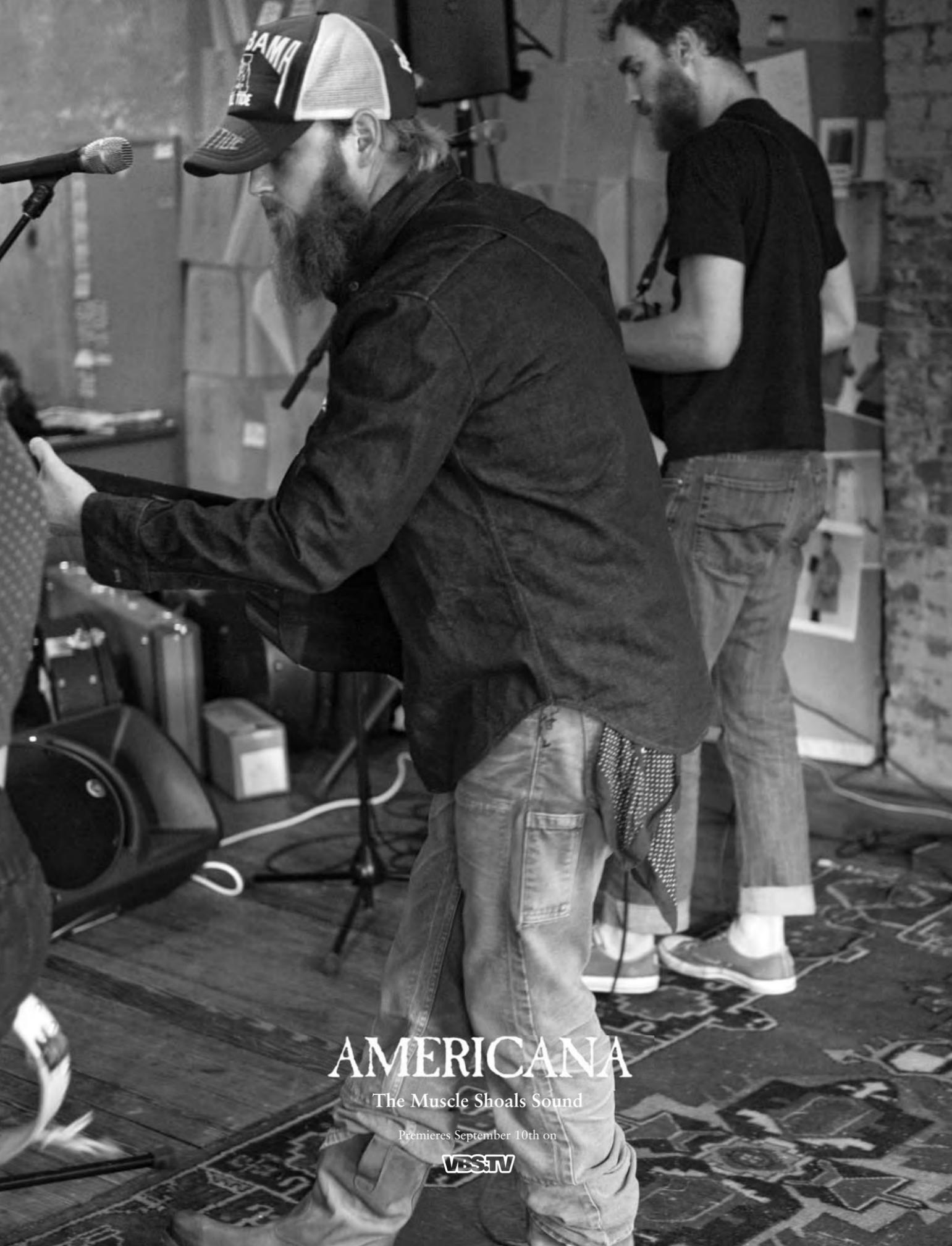


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Santa Barbara

Saint Barbara is the patron of stonecutters, miners, military engineers, artillerymen, mathematicians, masons, those who fear fireworks and lightning storms, and anyone with the risk of sudden death while at work. She is also the patron saint of Italy's largest petrol company, Ente Nazionale Idrocarburi.

History tells us that she was the daughter of a possessive pagan father who kept her locked in a tower, away from suitors and temptations. Despite the isolation, Barbara discovered God. Her father denounced her to the authorities, who decreed that Barbara must be decapitated, but only after having been tortured for two days by, guess who, Dad. It is believed that her father was struck by lightning, aka killed by God, the day after her martyrdom. Barbara is therefore invoked against sudden deaths.



Santa Clara

Saint Clara of Assisi is the patron of gilders, telephones, eye diseases, goldsmiths, embroiderers, laundry, telegraphs, good weather, and television. Clara was chosen for these things because she spent a long part of her life bedridden by illness. To save her from boredom, God granted her visions of liturgical functions that were taking place in church. In Italy you can even buy stickers that say, "Saint Clara, protect my television." Generally, the elderly buy them and stick them on their TV sets in the hope that they will never break down. Clara, however, is effective not only for technical faults but also for the quality of TV shows. On August 11, her feast day, nuns come together in collective prayers calling on her to purify television of sexual imagery, non-educational rubbish, and Satan.

VOLUME 17 NUMBER 9

Cover by Robert Longo

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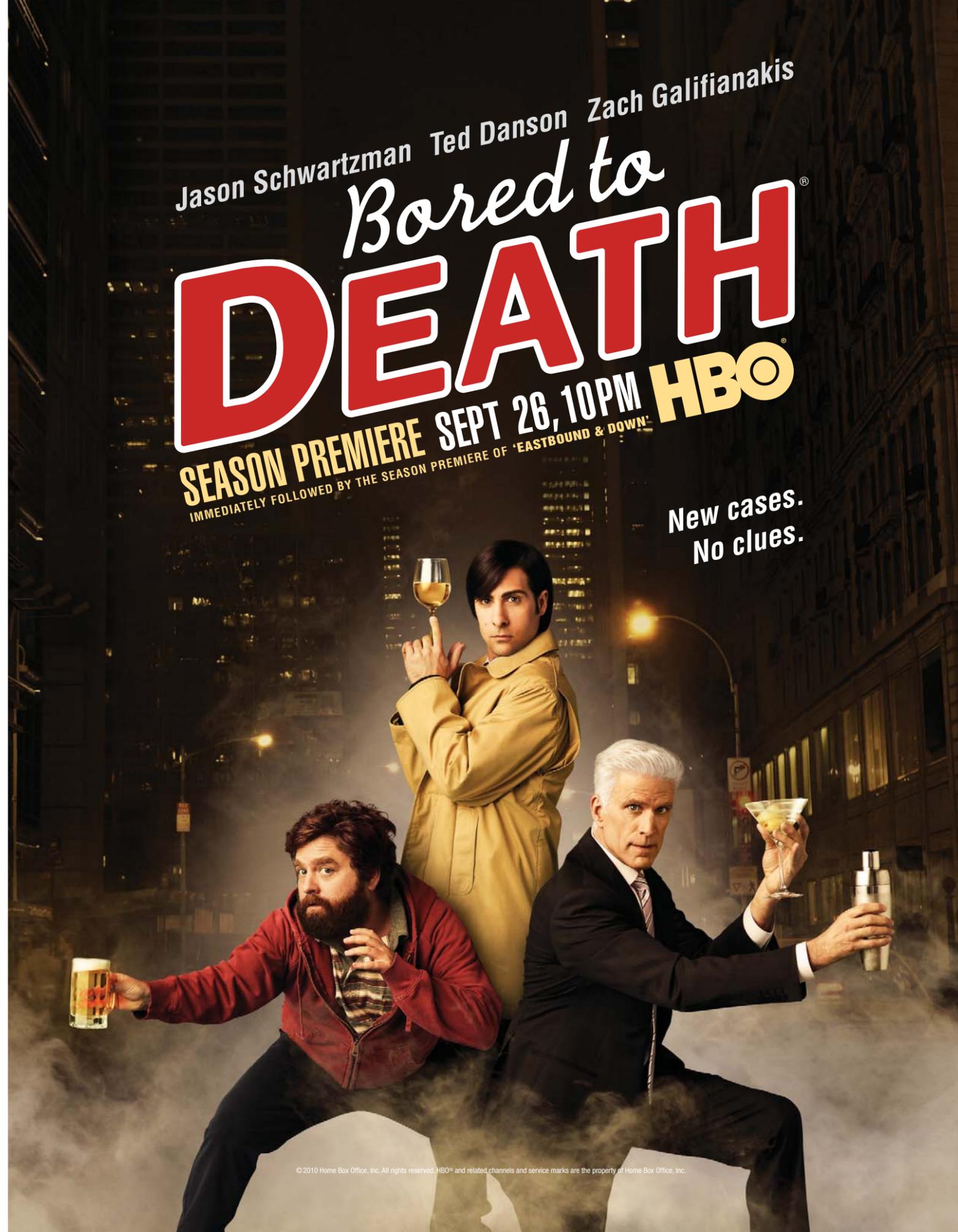
Saint John of Nepomuk is the patron of floods, drowning, and Bohemia. In 1393, he was appointed the vicar general to the Archbishop of Prague, a position that led to his death on March 20 that same year. At the time, a new abbot was to be appointed to Benedictine Abbey of Kladbury, whose resources were highly sought after by Wenceslaus, the king of the Romans and of Bohemia. Wenceslaus backed the Avignon Papacy. And John, wanting to uphold the laws of the Catholic Church, sided with his archbishop's candidate, who followed the pope at Rome, Avignon's rival. This move supremely pissed off Wenceslaus, and at the king's request, John was drowned in the Vltava River in Prague. An alternative version of the story suggests that John was drowned because he refused to tell the king what his wife, the queen of Bohemia, would divulge during confession. Saint John is venerated throughout central and eastern Europe, and he protects against drowning and floods due to his manner of death.



Saint Erasmus of Formiae, aka Saint Elmo, is the patron of colic, intestinal ailments, sailors, cramps and the pain of women in labor, cattle pests, and storms—both celestial and intestinal. Erasmus was a bishop and a hermit, and his martyrdom was especially gruesome. The Roman emperor Diocletian, no friend to Christians, had Elmo bludgeoned with an iron mallet until all his veins burst, dropped in a pit filled with worms and snakes, burned with boiling oil, and forced to drink a soup made of sulfur, resin, tar, and more oil. Then he had his teeth removed with pliers and was stuck in a barrel full of spiders. The story goes that Erasmus was so strong in his faith that he still managed to escape after all of that, hide in a cave, get captured again, and eventually be disemboweled with an anchor—hence his dual protection over sailors and people who suffer from aching stomachs. St. Elmo's fire, once considered to be a warning to sailors of coming storms, is named for him.

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FOUNDERS Suroosh Alvi, Shane Smith

GUEST EDITOR Jim Shepard

EDITOR IN CHIEF Jesse Pearson (jessep@viceland.com)

EXECUTIVE EDITOR Chris Cechin (chrisc@viceland.com)

MANAGING EDITOR Amy Kellner (amy@viceland.com)

ASSOCIATE EDITORS

Rocco Castoro (rocco@viceland.com)

Santiago Fernandez-Stelley (santiago@vbs.tv)

Ellis Jones (ellis@viceland.com)

FASHION EDITOR

Annette Lamothe-Ramos (annette@viceland.com)

ONLINE EDITOR Thomas Morton (thomasm@viceland.com)

ASSISTANT ONLINE EDITOR Jonathan Smith (jonathans@viceland.com)

UK EDITOR Andy Capper (andy@viceuk.com)

LAYOUT inkubator.ca

WEB DESIGN Solid Sender

DESIGN ASSOCIATE Matt Schoen (matt@viceland.com)

WORDS

Caroline Dumoucel, Rivka Galchen, John Kleiner, Elizabeth Kolbert, Tom Littlewood, Clancy Martin, Rich Remsberg, Ariel Rubin, Jim Shepard

PHOTOS

Caroline Dumoucel, Martin Fengel, Quico Garcia, Richard Kern

ILLUSTRATIONS

Robert Longo

COPY EDITORS Sam Frank, Nicole Rudick

INTERNS

Harry Cheadle, Patty Delgado, Ivan Forde, Leslie Kinsman, Laura McMullen, Liam O'Keefe, Alexandra Sears, Emily Thomas, Becky Washington, James Williams

PUBLISHER Erik Lavoie (erik@viceland.com)

ASSOCIATE PUBLISHER John Martin (johnm@viceland.com)

BUSINESS DEVELOPMENT Ben Dietz (ben@viceland.com)

ADVERTISING DIRECTOR Shanon Kelley (shanon@viceland.com)

ONLINE ADVERTISING DIRECTOR Ryan Duffy (ryand@viceland.com)

ACCOUNT MANAGERS

Thobey Campion (thobey@viceland.com)

Stewart Stone (stewart@viceland.com)

Sarah Rubinstein (sarah@viceland.com)

ONLINE OPERATIONS

Michael Tennant (michael@viceland.com)

Jonathan Hunt (jonathan@viceland.com)

Jonathan Montaos (jonathanm@viceland.com)

Cynthia Goldman (cynthia@viceland.com)

PRODUCTION MANAGER Julia Alvidrez (julia@viceland.com)

CIRCULATION MANAGER Lauren Dzura (lauren@viceland.com)

COMMUNICATIONS DIRECTOR Alex Detrick (alex@viceland.com)

COMMUNICATIONS MANAGER Rory Ahearn (rory@viceland.com)

COMPROLLER Richard Bisson

OFFICE MANAGER Meg Goetsch (meg@viceland.com)

ACCOUNTS RECEIVABLE MANAGER Ron Hemphill (ron@viceland.com)

ACCOUNTANTS Richard Ouellette, Bianca Belley

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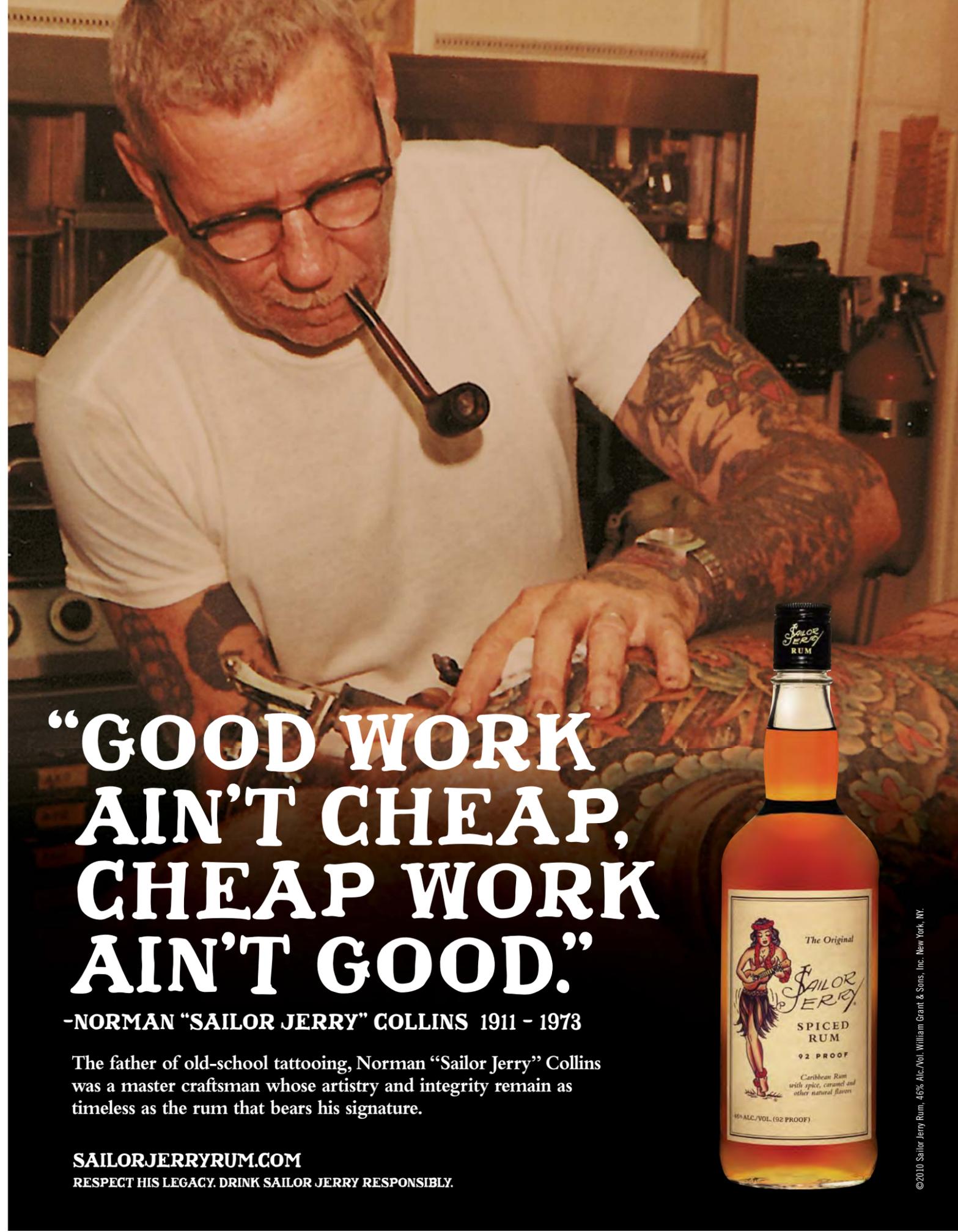
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VICE POLAND

ul. Czarnieckiego 64/2, 01-548 Warszawa
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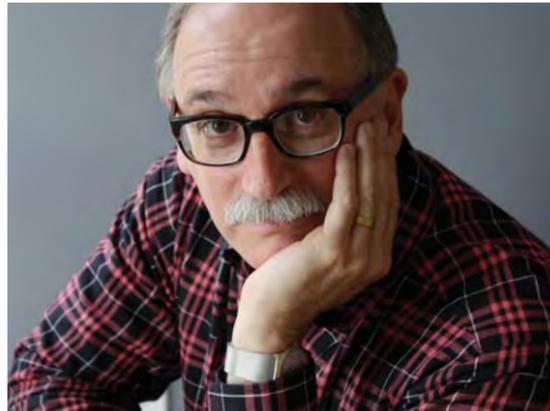
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JIM SHEPARD

Jim Shepard is to blame for six novels and four story collections, including *You Think That's Bad*, coming out in March 2011 from Knopf.

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ELIZABETH KOLBERT

Elizabeth Kolbert is a staff writer for the *New Yorker* and the author of *Field Notes From a Catastrophe: Man, Nature, and Climate Change*. She is a two-time National Magazine Award winner and a recipient of the National Academy of Sciences' Communications Award. Kolbert lives with her husband and three sons in Williamstown, Massachusetts.

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RICH REMSBERG

Rich Remsberg is an archival-image researcher, working mostly on PBS documentaries and independent films. He received an Emmy for Outstanding Research in 2008 and is the author of *Hard Luck Blues: Roots Music Photographs From the Great Depression*.

See ARCHIVAL CATASTROPHES, page 68



Photo by David Fox

CLANCY MARTIN

Clancy Martin's writing has appeared in *Harper's*, the *New York Times*, *Esquire*, the *London Review of Books*, *McSweeney's*, and elsewhere. His first novel, *How to Sell*, was chosen by the *Times Literary Supplement* and many other publications as a "Best Book of 2009." His writing has been translated into Russian, Czech, and Portuguese, among other languages.

See LISA (FROM A MEMOIR IN PROGRESS), page 38

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WELCOME TO THE CATASTROPHES ISSUE

You can make a pretty good argument that if you're an apocalyptic you're both fucked up and plugged into the zeitgeist. I was an apocalyptic kind of guy before I even understood what the word meant—some of my earliest obsessive interests involved books like *All About Volcanoes* and *All About Earthquakes* and movies like *A Night to Remember*—but that was in the early 60s, and as we all know from our radically abridged cultural histories, the shit didn't hit the fan, in American terms, until the late 60s. So when I'm feeling good about myself, I can pretend I saw it all coming—I still take secret pride in the precocity of my childhood conviction, in the face of everything I read, that a catastrophic event of some sort had ended the Cretaceous—but when I'm being more honest, I have to ask myself some version of the question my long-suffering wife once asked me: What kind of person takes a history of the guillotine to the beach?

Well, the good news for people like me and the bad news for the rest of the world is that things are getting *so* fucked up that a worldview that sees disaster around every corner is starting to look a lot like a measured and sober understanding of the facts. Pick your poison—land, sea, or air—and try to think of an arena in which we don't seem to be accelerating toward some pretty bad news. Accelerating because of our nature as human beings, which is to say in individual terms, the bad decisions we make each and every day, and in collective terms, our decision to have handed over our fate to global capital.

What to do about climate change? The toxification of our food? The death of our oceans? These are all decisions we've turned over to ExxonMobil, Monsanto, and BP. And those companies have become as powerful as they are by having figured out how to game the system. Regulatory agencies, national and international, are now controlled by the very companies they're supposed to be scrutinizing. And each industry, in pursuit of ever-greater profits, has installed as its primary value its definition of greater efficiency, which means ever-narrowing options and greater precariousness. So that now instead of thousands of local slaughterhouses, America has 13 megaplants, the perfect recipe for collecting lethal pathogens and spreading them far and wide. Now instead of shallow offshore drilling, our oil companies are drilling six miles down in water two miles deep, which means the chances of anything going wrong, then going catastrophically wrong, increase geometrically.

And the one agenda on which all of these corporations agree is that of doing away with what used to be known, quaintly, as the public's right to know: They've come to understand that the kind of master-of-the-universe success they're envisioning is as much about the control of information as it is control of the market. And that's a nonpartisan agenda, worldwide. In the US, the progressive Obama administration—and you can supply your own air quotes around *progressive*—has been timid and tentative about everything *but* going after whistleblowers.

As more and more is systematically hidden from us, there's less and less chance that we—or anyone—will be able to intervene in time to prevent disasters. If a crucial step involved in growing older is understood to be the recognition that loss is the seminar in which we're all going to be enrolled, the collective version of that understanding in the 21st century might be that catastrophe is the seminar in which we're all going to be enrolled. We have a lot of *Deepwater Horizons* ahead of us.

JIM SHEPARD, Guest Editor



End Permian Extinction

BY ELIZABETH KOLBERT

Charles Darwin didn't believe in catastrophe. The whole idea struck him as implausible, a product of the sort of antiquated thinking that mixed science and religion, Noah's flood and the ice ages. In *On the Origin of Species*, published in 1859, he heaped scorn on the "catastrophist" approach: "So profound is our ignorance, and so high our presumption, that we marvel when we hear of the extinction of an organic being; and as we do not see the cause, we invoke cataclysms to desolate the world."

If the fossil record seemed to show that whole groups of organisms had suddenly vanished from the face of the earth all at one time, then that must mean the record was imperfect. At one point in *On the Origin of Species*, he compares the fossil record to a multivolume world-history set no one has bothered to look after. Of the many original books in the set, he writes, "We possess the last volume alone, relating only to two or three countries"; of this volume, "only here and there a short chapter has been preserved."

By the start of the 20th century, Darwin's view had become so dominant that to be a scientist meant to see extinction as he did. All the way into 1970s, paleontologists were delivering lectures on "the incompleteness of the fossil record." But Darwin, it turns out, was wrong.

Over the past half-billion years, there have been at least 20 mass extinctions. Five of these—the so-called Big Five—were so devastating they are usually put in their own category. The first took place during the late Ordovician period, nearly 450 million years ago, when life was still largely confined to the water. Geologic records indicate that more than 80 percent of marine species died out. The fifth occurred at the end of the Cretaceous period, 65 million years ago. The end-Cretaceous event exterminated not only the dinosaurs but 75 percent of all species on earth.

It's now generally believed that the end-Cretaceous extinction was caused by an asteroid that struck the Yucatán Peninsula. The asteroid, which was about six miles wide, was traveling at a speed of 45,000 miles per hour, and its impact released a billion times more energy than the detonation of the bomb that destroyed Hiroshima. The discovery of the asteroid impact in the early 1980s blasted away, in a manner of speaking, Darwinian skepticism about mass extinction. It also challenged some fundamental notions about the nature of the world. No organism, no matter how well adapted to its environment, can prepare for a catastrophe that occurs only once every 25 million years or so. So is it the fit that survive, or just the lucky?

The biggest of the Big Five extinctions is what is known as the end-Permian. It took place some 250 million years ago and is named after the geologic period—the Permian—that it brought to a disastrous conclusion.

At the time of the end-Permian catastrophe, geologic records indicate that almost all of what we would now call the seven continents were part of one huge landmass, which goes by the name Pangaea. The oceans—or, really, ocean, since all the seas were also smushed together in one super-sea, known as Panthalassa—were filled with reefs, which, while very different from today's, were home to a wildly diverse cast of corals, sponges, mollusks, brachiopods, and fish. (One place you can see the remains of these reefs is in West Texas; the Guadalupe Mountains are the remnants of an enormous underwater ecosystem.)

Then, all of a sudden, those crowded seas became a lot less crowded. The reefs, everywhere, died out. Rugose corals, which built skeletons that looked like horns, and tabulate corals, which built skeletons

that looked like honeycombs, vanished completely, never to reappear. All in all, something like 90 percent of species in the oceans disappeared, and recent research suggests that the devastation was roughly the same on land. It took ten million years for reefs to reappear, and when they did, they were patchy affairs, nowhere near as rich or diverse as those that they replaced. It took tens of millions of years more for life in general to rebound.

The end-Permian has been called the "the great dying," the "mother of mass extinctions," and the "greatest unsolved murder mystery of all time." The mystery is not only why life should have been nearly obliterated but also why, having got so close to the brink, it wasn't done in entirety. (In that case, of course, we wouldn't be here now to wonder about the event.)

Following the discovery of the asteroid impact that ended the Cretaceous, many scientists expected to find evidence of similar impacts coinciding with other mass extinctions. But this hasn't happened. There are impact craters all over the planet, but the timing just doesn't jibe with the chronology of the extinctions. In recent years, scientists studying the end-Permian have focused on a series of gigantic volcanic eruptions that occurred in what is now Siberia. The eruptions created a formation known as the Siberian Traps—essentially a million cubic miles' worth of lava. The process threw into the air huge amounts of carbon dioxide and also may have released large amounts of chlorine, fluorine, and sulfur dioxide.

How the eruptions would have produced a mass extinction is not known exactly, but there are some plausible theories. Then, as now, the added CO₂ in the air would have led to significant warming. Meanwhile, the chlorine and fluorine would have damaged the ozone layer, and the sulfur dioxide would have produced acid rain. It is disconcerting to realize that all of the proposed triggers for the event—the release of large amounts of CO₂, chlorine, fluorine, and sulfur dioxide—are things that are occurring today.

One of the few clear and unambiguous facts about the end-Permian is that the oceans became anoxic, or devoid of oxygen. (This signal can be found in rocks from the period.) Most organisms obviously can't survive such conditions, but some forms of bacteria, which, in effect, "breathe" sulfur, can. These bacteria, which nowadays tend to be found tucked away in the bottom of lakes, seem to have thrived at the time of the extinction; if they had released large amounts of hydrogen sulfide into the water, they could potentially have poisoned most organisms in the sea and also on land.

What about the organisms that made it through? Were they special in any way? Among the relatively few land animals to survive was a reptile known as *Lystrosaurus*. *Lystrosaurus*—the name means "shovel lizard"—had a flat face, a waddling gait, and two pointy teeth and was about the size of a pig. It went on to dominate the wasted landscape—for a time, it was the largest creature on Earth—and in some areas makes up 95 percent of the animal fossils from the period right after the extinction. Various explanations have been offered to account for *Lystrosaurus*'s good fortune, none of which has proved convincing. As Michael Benton, a paleontologist at Britain's University of Bristol, has put it, the survivors of mass extinctions appear to be "more lucky than specially adapted."

Right now, as it happens, another mass extinction is taking place—this one entirely of our making. It is sometimes referred to, for dramatic effect, as the Sixth Extinction, though it is still unclear whether things will get bad enough to justify that title.

Currently, a third of all amphibian species, nearly a third of reef-building corals, a quarter of all mammals, and an eighth of all birds are classified as "threatened with extinction." These estimates do not include the species that humans have already wiped out—a list that starts with the mastodon and extends beyond the passenger pigeon—or the species for which there are insufficient data. If you go to the Hall of Biodiversity at the American Museum of Natural History and look down, you will see a tiny exhibit set into the floor. The exhibit shows the fossils of various lineages that died out in each of the previous mass extinctions. "We are in the midst of the Sixth Extinction," it says, "this time caused solely by mankind's transformation of the ecological landscape." Visitors can walk right over the exhibit, and when I visited the museum a few months ago, that's exactly what they were doing. I didn't see anyone in the hall pause long enough to figure out what they were stepping on. ■

LISA

(from a memoir in progress)

BY CLANCY MARTIN

“Come on,” Teryn whispered. She had opened my window from the outside, and was on her hands and knees. I had fallen asleep with a book on my chest. “Hurry. If Mom and Dad catch you we’re both dead.” My bedroom was in the basement and it was a small casement window. I put on the black leather jacket Lisa had given me four years ago—it finally fit me—and climbed up on my chair, and Teryn helped drag me through the window onto the gravel. We took the back streets up the hill behind the Glencoe Club in case my stepfather (her father) was out driving: It was late but often he had to go to the halfway house he ran, 1835 House, at unpredictable hours. We smoked Teryn’s Du Maurier cigarettes and she had a warm bottle of beer that we split, sitting in the grass and the cold—it was May and almost midnight, Calgary, Alberta, 40 degrees—looking at the lights of the houses below us and the black uncoiling streak of the Elbow River. Then I took a vial of hash oil from my pocket, a pin, tinfoil, a Bic pen, and a lighter. I wouldn’t normally share my hash oil with Teryn, but it was our night. I scraped the thick black chocolate paste onto the foil and held the flame underneath, and we each took a few lungfuls with the Bic pen (you take the writing part out, naturally). It was good Afghan hash oil, 30 bucks a vial, and I knew (though Teryn didn’t) that we were going to be very stoned. Then we finished the beer, coughing, and headed through Mount Royal down to 17th Avenue where Lisa was playing in the finals of the foosball tournament. I hadn’t seen Lisa in six months or so, but Teryn told me she had run away from her last foster home—she’d been in five or six of them and had lost her spleen trying to escape from the Foothills Hospital psychiatric ward—and was living in a house near Western with her boyfriend and their roommates. Supposedly they had a marijuana farm in the basement. Lisa was 17, Teryn was 13, and I was 11.

In Henry’s it was crowded and filled with adults. We looked for Lisa. A bartender spotted us, and they were taking us out the door when Teryn shouted, “Lisa!” and I saw her, wearing a baseball cap, even skinnier, in an AC/DC t-shirt (she shouldn’t listen to that crappy music, I thought), with her boyfriend’s arm around her. He was an Indian with strong features, straight glossy black hair that hung to his shoulders, and a generous, powerful smile. I had met him once before. Eight years from this time, my mother would call me in my dorm room at Stetson University in DeLand, Florida, and tell me that my sister was dead. Teryn had returned from getting ice for a party that she and Lisa were throwing and found the apartment empty, blood in the bathroom and on the steps outside, and after calling the police they’d discovered Lisa’s body in a dumpster, beaten to death by a baseball bat swung by this same boyfriend (over

some money she owed him on a pot deal), and he would serve seven years in prison. Lisa caught my eye and smiled and then saw we were being kicked out and hurried through the crowd—both her arms in the air, a beer in each hand—to catch us and explain to the bouncer that we were her kid sister and brother, we were here to watch the match. “Keep an eye on them, Lisa,” he said. “If I catch them drinking it’s your ass.”

Lisa won that night. She beat a man with a broken nose—he was wearing a baseball cap, too, and kept a cigarette in his mouth the whole time he played—five to one in a best of nine games. They cheered, shook beer bottles, and sprayed her with beer. “Watch the pool tables!” the bartender shouted. She gave me a shot of rye whiskey and said leaning close, “You know, I love you, Clancy.” The big gold wood-and-plastic trophy was on the bar. I wished she would kiss me. Just a kiss from my big sister, nothing weird.

The light was clean through her bedroom window, and she had a record playing on her bright orange plastic record player. It was that high, long mountainborn light of the summer in Calgary. She was playing a John Denver album. I watched her brush her hair. I sat on the end of her bed with my feet dangling. She and Teryn shared this room, and there was a balcony outside with a door that came off my and my little brother’s room (he was a real brother, not a stepbrother) so we could walk down and climb through their window if we didn’t want to use the doors that went into the hallway. Lisa was taking us to Stanley Park that morning—it was about a three-mile walk—to catch grasshoppers. She sang along to the music and I would have liked to sing as well (I knew the words), but I have no singing voice. In her tight striped knit shirt I could see the sharp wings of her shoulder blades.

She turned to me and said, still brushing her hair, “You know, when my mom died and Mom moved in, I hated her. But I love her now.”

I didn’t understand.

Later that day, after we brought the grasshoppers back and closed them up in shoe boxes with grass to eat, Teryn and my little brother stayed home and Lisa and I went to Elbow Park, a few blocks from our house. We sat in the middle of a clump of bushes and she taught me how to smoke a cigarette. I tried to inhale but couldn’t (to this day I can inhale almost anything but cigarette smoke). She explained how to hold your tongue against the roof of your mouth, swallow, and exhale through your nose. That was the one way I could manage it.

When we came back, just in time for dinner, Mom smelled smoke on us. My stepfather got the plunger from the downstairs bathroom and knocked Lisa to the floor with a slap on her ear. He took her hair in his fist and pulled her up the stairs to her bedroom while she fought him, bumping up the stairs on her back, screaming. He had the plunger in his other hand. He slammed her bedroom door. Then we listened to them—six of the nine of us kids were home then—while he beat her with the wooden handle of the plunger. My mother frowned at me the whole time: I had been smoking too, and I was in first grade, which exacerbated the injury I had done her. The fact was, I understand in retrospect, he wanted me to hear her take the punishment that, because of my mother, he could not inflict upon me.

They let me go to her when he came back down, after he made sure that I ate my dinner (I didn’t like to eat, as a kid), and she cried with her head in my lap. I did

not know what to do as she cried. Two more times, over the next seven years—before I would stop speaking to her altogether—both times in a hospital room in the psych ward, she would cry into my lap, and I had no better idea how to help then, either.

We were in the parking lot outside Shopper's Drug Mart on 14th Street. The poplar leaves were red, and the air was rich with that smoky smell of autumn that you only get in the mountains. When I think about growing up in Calgary, now, the thing that makes me feel most forlorn is the memory of that smell. A proof of the value of suffering: It's much easier to be an adult, but childhood was better.

"OK, this isn't some Paki's candy store, Clancy. They have cameras in here and mirrors. First you walk the aisles and spot what you want. If it looks like it's going to be hard to grab don't move it off the shelf but pretend like you're shopping and make it easy to get to. Then go look at a few other things. Comic books or whatever. When you come back make sure the guy at the register isn't watching you and do it behind your back, right into your underwear." She checked to see my shirt was untucked and my pants weren't tight. She was wearing the black leather jacket that she would give me, two years later, when she moved to her first foster home. "You ready?"

I nodded. I had been shoplifting since I was five so I had several seasons under my belt but I stuck to the small stores and Eaton's downtown like Lisa had made me promise.

We went in. The store was busy and that was good. I went to the toy aisle and spotted the Green Lantern spy binoculars I was after. They hung on a hook, but were a bit high to grab from behind, so I had to move them down a shelf. Then I walked to the other side of the store where the candy was and shuffled the Coffee Crisps. I looked for Lisa but didn't see her among the aisles. I knew she was stealing makeup, but using her purse, which was trickier. Then I wandered back by way of the vitamins and cold remedies to the plastic toys. The pharmacist was watching me, I could see. There were round mirrors in all four corners and one camera, as far as I could tell, but the toys were in the middle of the aisle in the middle of the store, there couldn't have been a more hidden location. I inspected the girls' toys with embarrassment while I waited for the pharmacist to look away. Then I backed up, lifted my jacket and my shirt, and slipped the binoculars into my pants. I missed my underwear and they fell into the pant seat. Ugh. I forgot to check the cashier. He was watching me. The binoculars were balanced between my legs. If I walked they were going to drop out of my pant leg. But I couldn't reach between my legs and put my hand there, or stick my hand back down my pants now. Rule number one was keep your hands out of your pockets. The cashier still had his eyes on me. I walked as carefully as I could toward the front door, trying to keep the binoculars in place. If I took very small steps and kept my legs and back straight I could hold the crinkly plastic-and-cardboard bag in place. It must have looked like I had shit my pants. I waited for a hand to fall on my shoulder. "Excuse me, son, stop right where you are." Calling my mom on the phone. The police frowning and shaking their heads. The cashier watched me all the way out the door.

Her boyfriend the Indian was there. She said, "I hear you've been telling Mom that I shouldn't smoke pot."

Outside I grabbed the binoculars with my hand in my pocket and ran around back to our meeting place behind the dumpster. I took the binoculars out of my pants and their wrapper to admire them. They did not work very well but they were collapsible. I was thirsty with the great thrill of a successful theft. (In more than 25 years of thievery, from age five to 30 or so, when I retired, I was only caught once, stealing an INXS tape in a mall store for my little brother's birthday. I had the 20 bucks I had planned to use to buy the tape in my pocket, which made the judge go easy on me—along with my good grades—because it was clearly "a onetime thing.") I sat on the curb and waited for Lisa. She didn't come.

When I got home two hours later—I waited and waited—my mom said, "Where have you been?" and I knew she'd already talked to the drugstore. "At Tom Davis's," I said. She went to call the Davises, but Tom's parents were never home.

I didn't see Lisa again for a month. She had a record, and she often went to juvenile detention. She told me good stories of how they smuggled in hash and beer and went on a day trip to the bowling alley on the weekend.

The last time I spoke to Lisa I saw her on the other side of the swinging wood bridge that crossed Elbow River on the way to Rideau Junior High. The river was iced over and there was snow piled in tall, precise narrow lines along the ropes of the bridge. I was in seventh grade. Her boyfriend the Indian was there. She said, "I hear you've been telling Mom that I shouldn't smoke pot." There was more to the story than that. It was one of those lies moms make you tell, by asking questions you can't answer truthfully. "I ought to beat you up," she said.

"He's your kid brother," the Indian said. "Give him a break, Lisa." He was wearing a yellow cowboy hat and a blue down vest. Under his vest he wore one of those checkered lumberjack shirts. Lisa was wearing a brown toque and gloves with the fingers cut off. They were sharing a cigarette.

I walked past her, trying not to cry. I hadn't seen her in over a year, and I had expected her to hug me and tell me how tall I'd grown (I'd had a growth spurt over the summer and fall and was probably taller than she was, I thought). She called a week or so later to apologize, and I wouldn't take the call. After that she called five or six times a year, and always called on my birthday, and sometimes—if my mom made me—I would listen to her voice on the phone before I hung up. "Please talk to me, Clancy," she'd say. But my father had left when my parents divorced, and my older brother had left (my other real brother) when he was sent to reformatory school (that's when Lisa became his stand-in, I realized many years later), and I decided, that winter morning on the way to school, from then on I was doing the leaving. Of course I was wrong about that. ■



Karen Russell Interviewed by Rivka Galchen

PHOTOS BY RICHARD KERN

Karen Russell was born and raised in a state with sinkholes, where the ground can give way unannounced for a mile on account of something that has something or other to do with water tables, or God. Her empathy extends to crocodiles and the cruel, and if ever there was someone whom I'd be happy to see at my own funeral—meaning I guess that I wouldn't really mind that it was my funeral—it would be Karen, or Karen's prose. Her prose, which is disciplined in the way that the wild particles in an accelerator are disciplined.

Karen is the author of a book of stories—*St. Lucy's Home for Girls Raised by Wolves*—and a novel—*Swamplandia!*—forthcoming next March. I thought she'd be the perfect person with whom to talk over catastrophes, maybe because for months we've been discussing minor-league catastrophes nearly every day.

Rivka Galchen: Karen, one of the things we learned about each other this year was that as kids we both liked to sit in an empty bathtub—the quietest place in the house, and a storm shelter to boot—and we both turned away from reading books about girls and their horses in order to read tales of alien invasions or battles with evil. What might have been the draw, do you think, of, say, *Day of the Triffids*, which I know was an early find for you?

Karen Russell: The novel's narrator, Bill Masen, is a botanist who survives the end of the civilized world. Anarchy is first loosed by a comet that blinds 99.9 percent of the globe's population, leaving our species vulnerable to attack by the Triffids—fearsome carnivorous plants who can move.

It's a classic of British science fiction, but I didn't know that at the time. What I knew was that I must never, ever let my sixth-grade peers catch me reading this book. John Wyndham's tale forced me to reckon with certain uncomfortable truths about myself: I was a weird kid with no interest in sanitized tales of blond sisters and babysitters; I was excited by the spill of evil through the dying world. I wanted apocalypse, now!

In reality, I was just a very awkward sixth-grader, and each day of middle school felt like treading a dark suck of water. After enduring my first boy-girl dance, the apocalypse didn't seem half bad. In the post-apocalypse, who cared what jeans you were wearing? Triffids were attacking (thank God!). And there is no guiltier pleasure for a reader, I don't think, than the dark, vertiginous thrill of a title like chapter 1's: "The End Begins."

“After enduring my first boy-girl dance, the apocalypse didn’t seem half bad.”

Yeah, the fear of end times is somehow always also a titillation, right? It seems evil to want to be present at the suffering from which we’ve been spared—seems wrong to think of other peoples’ suffering like it was Mr. Toad’s Wild Ride at Disneyland—but all that said, are there catastrophes you wish you’d been present for? And why?

Missed Tragedy 1: Well, assuming the friendly Disney ride operator is going to let me survive the blast, I would have loved to see the sky over Pompeii and Herculaneum on the day of the Mount Vesuvius explosion. Like you, I’m a little weather-obsessed, and I would love to see whatever the sky became over the village in the hours before the thing blew. (The event itself I think I could pretty easily skip—charring, screaming: for these, why not go to the beach?)

A few years ago I went to Pompeii with my tiny family, and we were all really moved by the faces of the plaster casts in the Garden of the Fugitives. Remember that old TV show, *Candid Camera*? In Pompeii you get the sense that Catastrophe herself took a candid photograph of these poor villagers’ terror. On the one hand, it’s pretty stiff and formal—everyone ossified in ash. But if you stare at their faces, I swear there’s something uncanny and moving in there still, like a liquid. All the tiny muscles are doing familiar, terrible things. You start to feel like the range of expressions that we’ve inherited from our monkey forebears is too limited for our experience: Why should the Pompeians get stuck with the same goggle-eyed look as some Alabama dude riding Space Mountain?

What my family agreed felt genuinely haunting about the plaster casts of the victims and also somehow wonderful was the way they worked, collectively, as a museum of a sky. The paste-colored faces preserved a feeling of radiant, immense magma reds—so you could work backward from the horror on a baker’s face frozen in AD 79 to the live coal of that day. Age had fallen away from him. Many of the faces in the Garden of the Fugitives looked like that to me: wonderstruck, childlike in surprise.

And the faces aren’t statues, either, that was so hard for me to remember! They’re the real living dead. I got scared imagining this blind photographer—the volcano—pouring its polishing red gaze over everyone. J.M.W. Turner has a painting that I think my own imagination is plagiarizing called *Vesuvius in Eruption*. His sky is oily orange and scar-tissue red, just spectacularly hellish. Many painters have tried to reweather that sky over erupting Vesuvius, which seems to me like a weird and glorious effort, like paleontologists imagining the feathers on a dinosaur’s bones. It’s exciting to me that the mountain is still erupting daily on Turner’s canvas and in so many tourists’ minds and on the faces in the Garden of the Fugitives.

Though I don’t think the animals of Pompeii and Herculaneum were so razzle-dazzled by it all. One of the dogs that’s preserved is frozen with this sort of jaded-Denny’s-waitress snarl, like, “Oh, crap, here we go again, just what we needed, freaking lava...”

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Missed Tragedy 2: The *Titanic*, maybe? I know—I don't want to give James Cameron that satisfaction, either. But I'd like to hear Wallace Hartley's quintet. I really loved that scene where this tiny, tuxedo-tailed band plays a final concert as the world's largest ocean liner slowly cracks in two and sinks. The scene has a mythic feel to it: the violinist rowing his bow on deck, a sort of dreamy, boatless oaring. And meanwhile all of the life rafts are getting lowered. And everybody is ant-scrambling around the rising water, and the whole ship is sliding up. And then, in the middle of the nightmare, a mournful, self-aware song starts threading around the deck...

Nobody can agree on the title of the last song that Wallace Hartley's quintet played; survivors reported that the concert included "Alexander's Ragtime Band" and "In the Shadows."

In the house of a childhood friend there was this amazing painting of the moment of rapture; it was sort of a Hieronymus Bosch's latter-day and left-handed country cousin in acrylics—and you just thought, seeing these car crashes and stricken dinner parties—that the rapture did at least look interesting. Any hopes for future catastrophes? What about something clean in which no one really gets hurt, just everything ceases to exist? Like all those articles they were running a while back about the possible universe-ending black hole to be caused by the Large Hadron Collider?

I don't know enough or really anything about physics, but I just read this on the Hadron Collider's Wikipedia entry: "This synchrotron is designed to collide opposing particle beams of either protons at an energy of 7 teraelectronvolts (1.12 microjoules) per particle."

PERRY BOYS

1979: THE PERRY BOYS WERE A UNIQUE UNDERGROUND FASHION SUBCULTURE. EMANATING FROM INNER CITY MANCHESTER AND SALFORD TO BECOME TRENDSETTERS ON THE TERRACES AND NIGHT CLUBS OF THE CITY. REBELLING AGAINST EVERYTHING AROUND THEM WEDGE HAIR CUTS, FRED PERRY'S AND NORTHERN CONFIDENCE BECAME THE NEW ORDER OF THE DAY. SPAWNING THE CASUAL AND RAVE SCENES THAT FOLLOWED.

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“Microjoules” makes me picture a bunch of microscopic Frenchmen in berets! Smug little Frenchmen who are bloodstream-small. At least one is a furrier. The synchrotron I imagine as a Casio keyboard set to “Bossa Nova.”

Sometimes I think that my secret yearnings for an epic, movie-huge omega of an ending must be directly connected to how boring it can feel to ride the elevator down to my basement laundry room with a dryer sheet and a bunch of boatneck sweaters from the Gap. Like: Swallow us, Hadron! Save us from the hideous exigencies of “Tuesday”!

But it sounds maybe a little *too* neat? Like the ultimate anticlimax? Like the universe gets drawn into a syringe by a competent male nurse named Dennis.

We’d be skipping all the chaos and the fires, the gushing seas, the opportunities for old-fashioned human goodness to grow stem-green out of the rubble and/or to defend our family members and downstairs neighbors with an ax from zombie attacks...

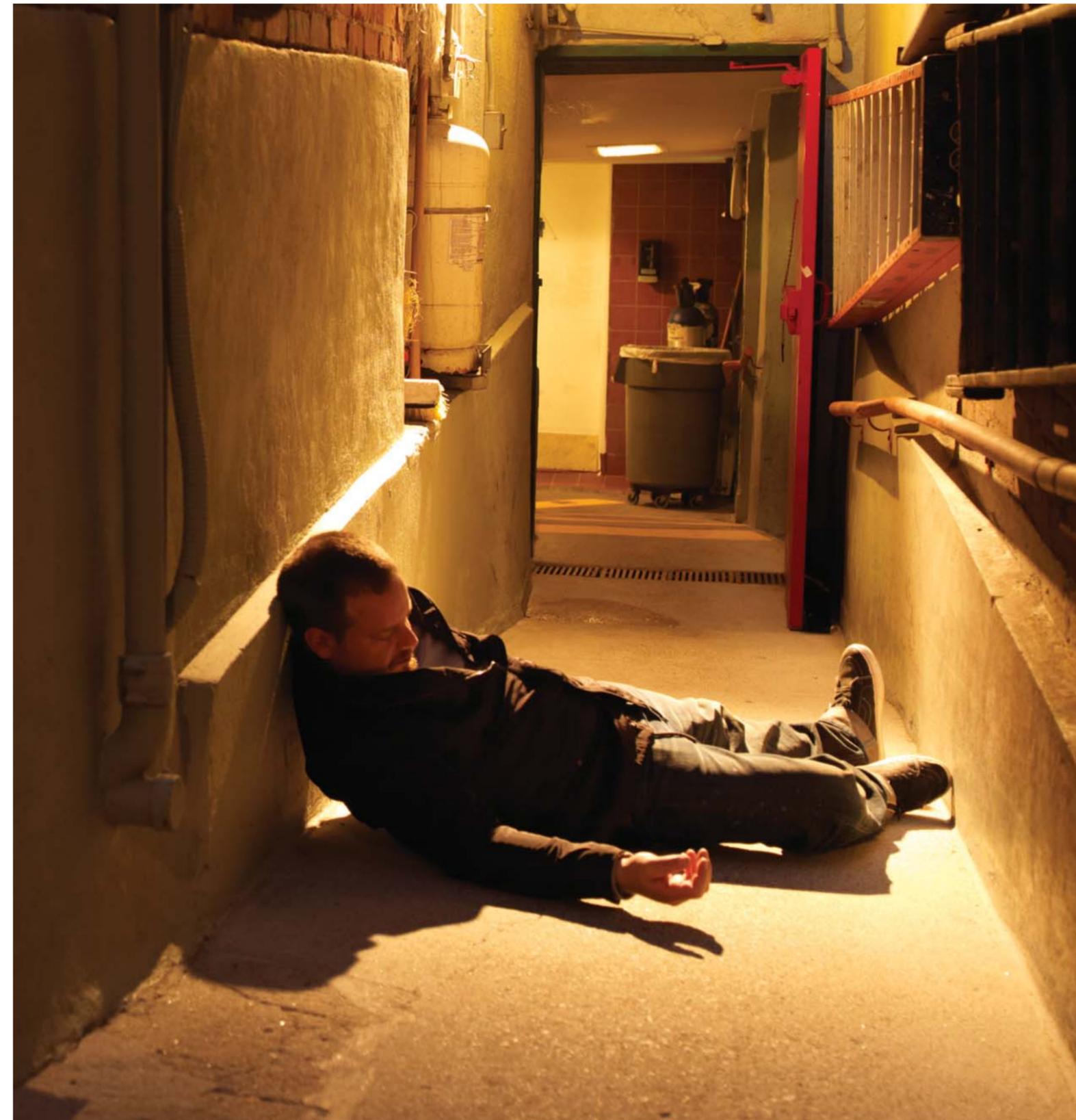
That’s true, it seems like the lure of catastrophe is its promise of revelation—like finally the world might need my special skills with paper folding. Or my inappropriate rage has found an objective correlative in the onslaught of an army of androids. That feeling of dread and terror is a complicated one, all stitched through with fluorescent joy, right? Like all those strange and new feelings we’ve been cataloguing this year?

I think the Old and New Disaster Feelings are especially hard to write about. When I was a kid in Miami, my friends and I had no language for the huge and contradictory emotions with which our city “celebrated” hurricane season. Hurricane season was better—or scarier, or more exciting—than the Christmas season. August in particular I remember as a month of terror and gleeful sky-vigilance and anticipated loss and real loss and adrenaline and release and relief and, sometimes, a secret inadmissible disappointment if a storm passed over us, or, often, a surprising “fluorescent joy” in a storm’s wake.

Rebecca Solnit has this excellent book out now, *A Paradise Built in Hell*, where she argues that we need a new emotional vocabulary to talk about the joy as well as the despair generated by large-scale catastrophes. She interviews many people who cite a disaster, natural or personal, as one of the great moments of their lives. She says, which I love, that everyday life is “already a disaster of sorts, from which actual disaster liberates us.”

Here are a few Old Feelings Related to Disaster. Dry bathtubs are involved again, I’m afraid.

Old Feeling 346: Sitting in a dry tub with your entire family, happy. Seven of my blood relations had piled into my grandparents’ bathroom to ride out Hurricane Andrew together. (Part of Old Feeling 346 is connected to the even more ancient and uncanny emotions provoked by a visit to a grandparent’s house—the way your grandparents’ world is both alien and familiar. Well, this is awesome but pretty weird, I used to think—it smells like cinnamon toast and papery age, we play a Depression-era game with colorful pegs that Grandma kicks my butt at, my mom is a child here, a smiling brunette in all the picture frames...)



“Sometimes I think that my secret yearnings for an epic, movie-huge omega of an ending must be directly connected to how boring it can feel to ride the elevator down to my basement laundry room with a dryer sheet and a bunch of boatneck sweaters from the Gap.”

Hours earlier, it had been suggested to us by the big TV face of Rick Sanchez that we move into a room without windows: hence the hide-and-go-seek feel of everybody barricaded in one dark bathroom. I was ten and we weren't even in that bathroom for very long, maybe 40 minutes during the worst part of the storm, but I remember that little bubble as one of my most keenly happy moments.

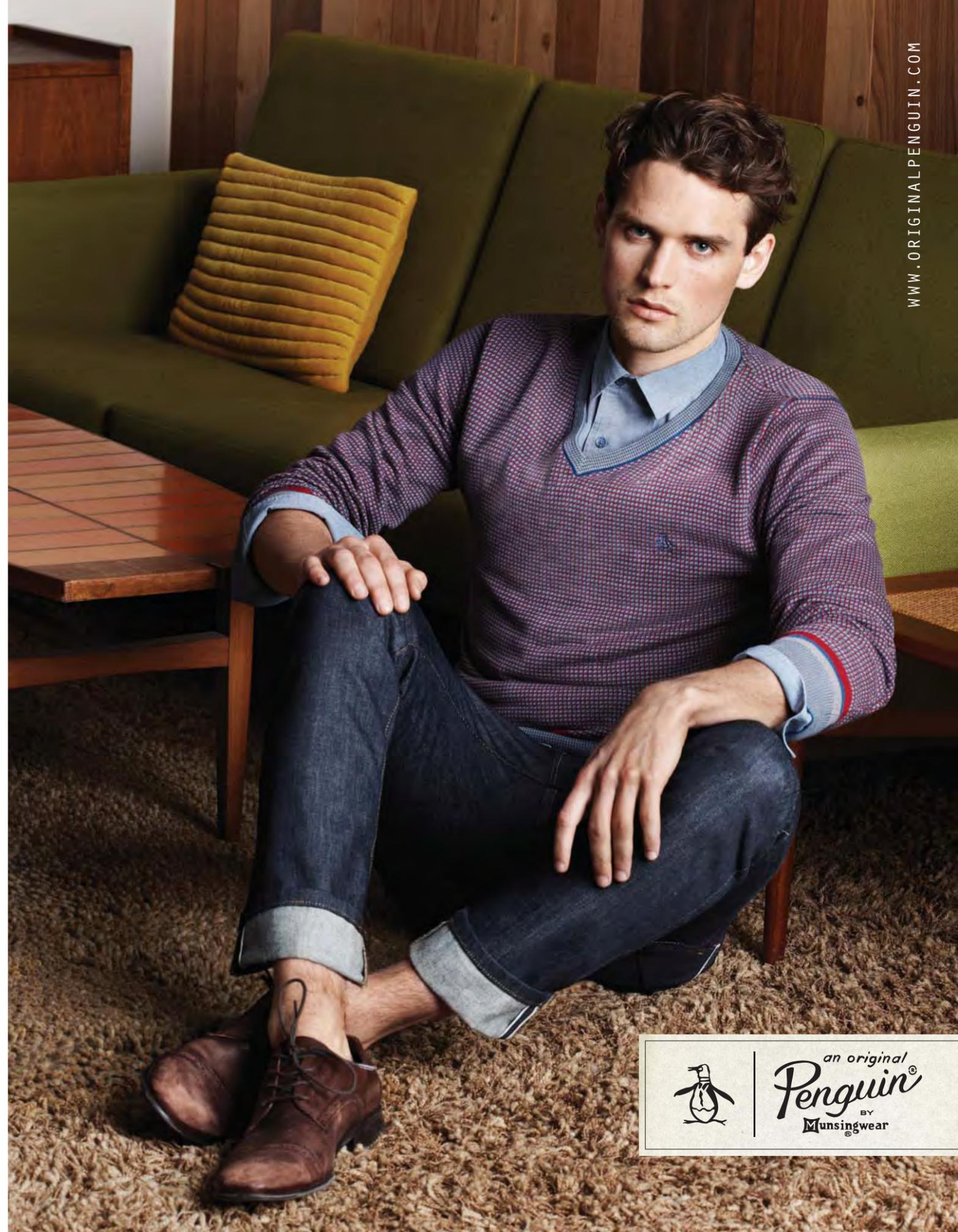
Old Feeling 347: Listening to the adults confessing their bright fears to us kids in the family syntax: “Don't worry because *this* is not going to happen, and neither is *this*: We are not going to drown inside our houses! Haha! We are not going to wake up tomorrow *homeless*. That would be unspeakably bad, so do not worry, instead your dad is going to don a floral shower cap and tell some jokes and we are definitely not going to speak about anything like *that...*”

Old Feeling 348: Seeing Father in floral shower cap, and hearing your mom's laughter inside the storm, and very dimly understanding that this goofiness you are witnessing is real courage, and real love.

Old Feeling 349: The wind rising. Somebody standing up to go check on the doors. Somebody else making noise about “going outside.” The sound of a tremendous cracking behind the wall. A kid's submerged and hiccupy understanding, beneath layers and layers of a laughter, of: EMERGENCY.

In New York, the Old Disaster Feelings get reactivated and updated all the time—most recently when the MTA conductor informed us in her Monday voice, “We are being delayed. Fire on the tracks,” when our subway car was, alarmingly and confusingly, on those same tracks.

Or remember last January, when that big blizzard was predicted to hit New York City and we all gleefully canceled our plans and prepared to miss work and revealed some bizarre preconceptions about what a “whiteout” might require—I bought that weird Jekyll-and-Hyde-looking Smucker's product, Goober, the



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“While firemen discover their inner nobility, my experience with disaster has taught me how much I crave a reason to hide out in bathrooms.”

peanut butter and jam that comes in the same jar, and also candles and toilet paper—and then nothing changed. The power stayed on, there were no service interruptions, we got to watch reality TV and take the subways to our friends’ baby showers and our jobs. And like that Smucker’s product, Goober, I bet many people in New York had a 50/50 ratio of relief/disappointment. Mine was more like 20/80, I think. Disappointment always teaches me what I am actually, subliminally hoping for—the dream of mass cancellations. The dream of a blanketing blackout, and many visible stars, and mysterious service interruptions. Also the dream of eating weird and expensive peanut butter by candlelight, without the shame of “choosing” to do this. While firemen discover their inner nobility, my experience with disaster has taught me how much I crave a reason to hide out in bathrooms or my dark apartment.

Absolutely. It’s such a persistent, and persistently embarrassing, realization: that there might be a heaven that looked like ramen noodles and the downing of all radio, internet, and phone communications. I guess it’s the underneath-it-all-shy person’s dream. I remember there being a related happiness I used to get when I was working in a hospital, especially at night, especially in the ER, when, say, there was a car-accident victim to attend to, this alongside some drunk who keeps getting up from his gurney and wandering around naked, dragging an IV fluid machine along behind him... I used to love that feeling of everyone basically in pajamas, doctors and patients alike, padding around, and knowing what their job was: look up lab results, report pain symptoms, whatever.

So what would belong on the playlist for the apocalypse?

Well, I think almost anything recorded by Johnny Cash would work, but maybe the apocalypse anthem could be “When the Man Comes Around.” He should man the last radio station in the world, the one that plays only his songs. When Johnny informs everybody that “the whirlwind is in the thorn tree”—I mean, who’s going to argue with *that* traffic alert, on the AM radio station for the end of time? I felt vindicated when it was used in the remake of *Dawn of the Dead*.

I tried to learn more about it and found out: It was probably the last song Cash ever recorded, the lyrics are from Revelations, and Cash died just before the album that included it was released. Maybe we should also add “Folsom Prison”—because it’s unclear whether that’s where we’re coming from or going to—either way is arguably the preferred.

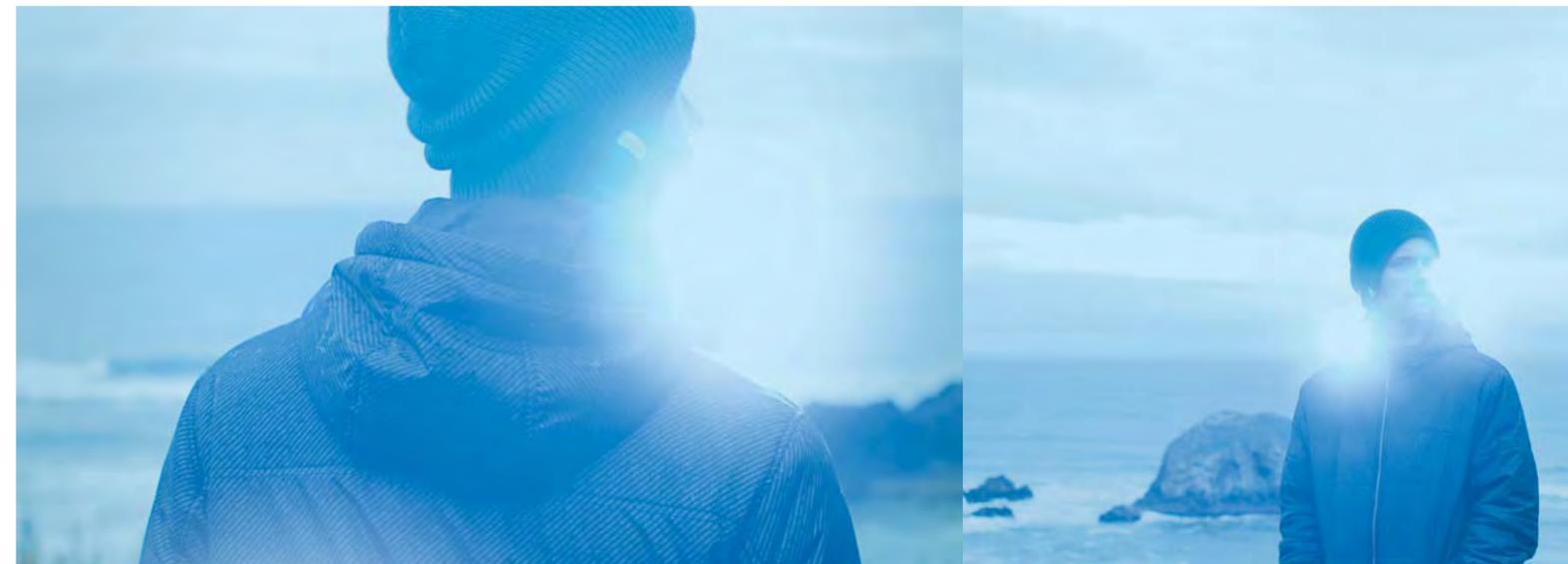
Yes! Both ways have their own special terrifying appeal! Do you know that song “Made” by Greg Weeks? I think that’s an appropriately chilling pick, too. I could



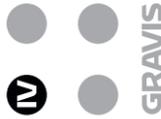
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Phil in the Frena Solid

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by Gravis Footwear.
To see the film, log onto
gravisskateboarding.com/dylan

be mishearing these lyrics, but I think he's saying "So much for today/So much for the days of men." Also: "They made us this way/For what they can never say." Then he summons this flautist straight out of whatever Julliard exists in Dante's *Inferno*, and winter coasts out of this one organ chord, and all the leaves fall off the trees. Don't invite Greg Weeks to any spring weddings in a botanical garden or children's birthday parties.

Hey, speaking of children, I know we both devoted a fair amount of adolescent time to Stephen King. I remember loving how in *The Shining*, when the caretaker looks into his handkerchief to see his own snot, it was sort of as scary as any of the other scenes. All this horror and disgust in the ordinary setting of, you know, a young lovely family, a romantic old hotel, the miracle of snow!

Oh my gosh, that snot moment stuck with me, too! There's a scene in *It* where one of the boys turns the faucet on and I remember wanting to crawl out of my skin—Stephen King can make a kid's interactions with indoor plumbing terrifying. I think one thing that really appealed to me about his stuff was the way his characters, far from being stereotypes, feel like far-too-real ventriloquies of actual parts of ourselves, you know? The heroes and the villains always read like excised and exaggerated parts of our basic nature, the cutout parts of our hearts. The lost kid, the failure, the wife-mourning dude, the father, and everybody in the valley of the shadow trying to sort things out and rebuild a coherent moral world (i.e., defeat a child-eating clown named Pennywise). On a much smaller, hidden, mental scale, which of us does not have to battle that evil clown sometimes? What I like about his style of humongous, Manichaeic epics is that they resize you—King writes an evil so cosmically huge and inhuman that it redeems us, shrinks us back into innocents. We get to magnetically inhabit our best selves. Just a bunch of fools and dorks, pitting our meagerness against the Darkness.

Maybe we can end on a more straightforwardly happy note? The catastrophes that prove not to be? Maybe like those animals you used to tell me about from your time working in the vet hospital? The ones dropped off early in the AM for their surgical procedures?

Yeah. When I worked at the vet, dogs would get dropped off in the morning unfed and unwatered and totally groggy and pissed. Then their owners, the humans charged with their care, abandoned them in a place that smelled like death and Lysol. They underwent terrible operations, woke up in a fog of puppy anesthesia, in a cage, next to an incontinent cat we called Stinky. Surely this seemed like hell. But! Actually, Dr. Campbell had fixed something crucial within them, some organ or unpronounceable leaky-valve thing, and now their life spans were doubled, and, hey, the fog of the amnesia juice was wearing off, and at 7:00—this was the BEST part—all of the owners came back and there were the most raucous and joyful and straight LOUD reunions ever witnessed in a paisley, paw-print-themed waiting room. ■





Paul Virilio

INTERVIEW AND PHOTO BY CAROLINE DUMOUCEL
TRANSLATED BY PAULINE EIFERMAN

Cultural theorist Paul Virilio has been repeating essentially the same thing, packed inside different specifics at different times, over and over for the past 30 years. Maybe it's time for everybody—not just French people and college students—to start listening to him.

Virilio is into revelations. He's like some kind of prophet of the apocalypse. There are no moral judgments in his work, even though he is a devout Catholic. He deals more in the observation and analysis of banalities, or "evidences," as he calls them. His best-known statement is "The invention of the ship was also the invention of the shipwreck." It's probably the most concise and eloquent explanation of causality we've ever read, and it can be applied to almost anything. Virilio expands this into what might be his main message, which is, to paraphrase, that every technological invention bears its specific defect in its DNA and that the cult of speed and acceleration that technology has engendered will be the death of us all.

Virilio worked, after World War II, as a stained-glass artist along with Matisse and Braque; in the 60s, with partner Claude Parent, his concept of oblique architecture revolutionized the field; and in the 70s, he came to know the then-bosses of French theory: Gilles Deleuze, Félix Guattari, and Michel Foucault. Virilio's book *Speed and Politics*, published in 1977, marked the birth of his concept of dromology, or the logic of speed. He's been the publisher of Georges Perec and Jean Baudrillard, he's friends with Chris Marker and Peter Sloterdijk... and now he's friends with us.

Virilio recently picked us up at the train station in La Rochelle, France, and brought us to the local aquarium, where we talked. Or rather, where he gave us the tools to understand the modern world and explained why, although utter doom is inevitable, he's still an optimist.

Vice: People know you as the theorist of disaster. Do you think you might be obsessed with it?

Paul Virilio: Not at all. Look at it this way: I used to be friends with Georges Perec, a child of the Holocaust. His parents died in a concentration camp. Once, when I was with him, I told myself: "I'm not a child of the Holocaust. My parents aren't dead. I'm not Jewish. But I am a child of total war." It lives in me in the same way that he can't forget the Holocaust. We are children of the same war. We can't be racist and say that he's allowed to be haunted and I'm not.

You witnessed aerial bombings in Nantes...

The bombings were a very complex and perverted phenomenon. You can't understand the French collaboration and resistance movements if you don't understand the occupation period. Being occupied is being in a situation of absolute perversity. You live next to your enemy, and your allies kill you. I was ten years old in 1942. I had to understand that the people who lived close by were my enemies, and the ones bombing me were my friends. I was a child of total warfare, of the lightning war, of the quick war: the blitzkrieg.

“Today’s events, like the stock-market crash, are speed accidents. I call these ‘integral accidents’ because they trigger other accidents. There is an amplification of pure events in history. Today, history is entirely accidental.”

Did you hide in basements during the bombings?

On the contrary, we used to go to the fields. We were scared of being buried alive in basements. We used to hear people screaming from the cellars, drowning because the water pipes had exploded. So my dad told us that we wouldn’t do that. We went to the fields and lay on the ground.

And yet you suffer from claustrophobia, right?

Oh yes. Maybe it started back then, I don’t know. The bombs would fall close by and cover us in sand and dust, but we’d rather die in the sun than croak in a basement. Bombings are a cosmic phenomenon. You don’t feel like a concrete person is doing this to you, it’s more like the apocalypse or a huge storm or the eruption of Vesuvius. When I was young, I witnessed collective fear. Individual fear is easy to deal with as a young boy. Either you hit back or you run away. It just requires individual courage. But when your parents are terrified and grandmothers are crying and the people around you are screaming then, wow, you can’t be brave.

A lot of people see only the negative side of your theories. But I see much of it as positive, such as the fact that you are interested in accidents because they are the epitome of complete surprise.

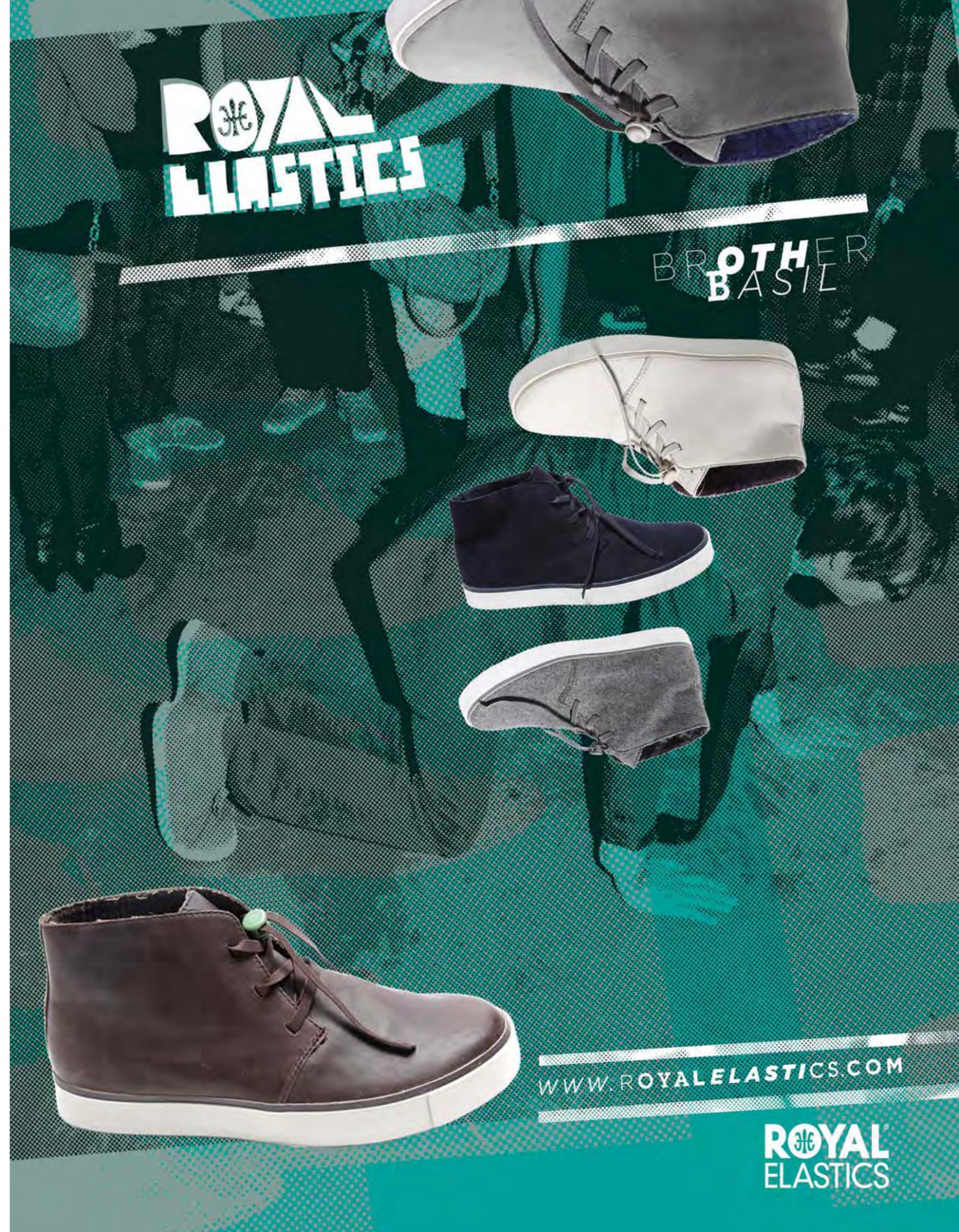
Of course. There are happy accidents: love at first sight, winning the lottery... Aristotle said, “Time is the accident of accidents.” Time is what exists, and the accident is what happens. You have a substance that exists, like a mountain. And then you have the event: the earthquake. I didn’t study disasters, but accidents—rupture. Substance is necessary and absolute, accidents are relative and contingent. How could we manage to analyze today’s technical progress if we don’t analyze its accidents?

Do you mean “accident” in the same way that some say “event” in modern-day philosophy?

Yes, except that for me, an accident is the event of speed. Our accidents are linked to the acceleration of history and of reality. The French were occupied by the Nazis by surprise. They didn’t react well because they didn’t understand the speed of it all. They were taken by speed. Today’s events, like the stock-market crash, are speed accidents. I call these “integral accidents” because they trigger other accidents. There is an amplification of pure events in history. Today, history is entirely accidental. Look at 9/11. It’s not an event, it’s an accident. But we consider it to be as important as yesterday’s events. It’s like a declaration of war without a war.

Are you against progress?

No. I’ve never thought we should go back to the past. But why did the positive aspect of progress get replaced by its propaganda? Propaganda was a tool used by



Nazis but also by the Futurists. Look at the Italian Futurists. They were allies with the Fascists. Even Marinetti. I fight against the propaganda of progress, and this propaganda bears the name of never-ending acceleration.

I was kind of hoping you'd talk about your metaphor of the shipwreck...

Oh yes, of course. It's just that I've been repeating it forever.

It's fairly simple, but so universal.

Inventing a plane is not only inventing the crash but also inventing the breakdown. A jet engine is an amazing thing, but it's also sensitive to birds, to volcanic ash... So you go from the plane that can go really fast to the plane that can't fly at all. Whether it's because of terrorism and being scared, or because of the volcano and it being too risky, or something new tomorrow, you can't innovate without creating some damage. It's so obvious that being obliged to repeat it shows the extent to which we are alienated by the propaganda of progress.

I'm guessing that you always hear, "Regardless, Mr. Virilio, progress is a good thing." Does that annoy you?

Yes, it's very irritating. These people are victims of propaganda. Progress has replaced God. Nietzsche talked about the death of God—I think God was replaced by progress. I believe that you must appreciate technology just like art. You wouldn't tell an art connoisseur that he can't prefer abstractionism to expressionism. To love is to choose. And today, we're losing this. Love has become an obligation. Progress has all the defects of totalitarianism.

Do you own many technological items?

I don't have a car or a TV anymore. I contributed to launching the internet, back during those heroic times. But today, I don't have a computer and I don't have a cell phone. I have a perfectly normal house phone, water, gas, and electricity. Sometimes I listen to the radio.

Let's talk more about the danger that's inherent in speed.

"The faster the better" is completely false. The faster you go, the more risks you take. I used to have a Jaguar. I drove it at more than 200 kilometers per hour once with Claude Parent. He owned an E-Type, I had the S-Type. Physical speed freezes you. And the faster you go, the farther you have to look, and you lose lateral vision. You are fascinated.

You just made a gesture as if you were wearing blinders.

Why do animals have eyes on the side? There are very few that have eyes in the front like us. It's because real danger comes from the side or from behind. Speed flattens the vision, like a screen.

You said once that "choosing resistance is not opposing yourself to new technologies, but refusing to collaborate."

Yes, that's obvious.

You also say that human nature is to resist. So what should I do? Throw my MacBook out the window?

This isn't a question for individuals, but for political, economic, environmental development. Churchill said, "An optimist is a man who sees a chance behind every calamity."

What do you think of Karlheinz Stockhausen's comments about 9/11 being "the greatest work of art that exists for the whole cosmos"?

Peter Sloterdijk told me that Stockhausen had rejected that comment after he made it. Maybe he was misinterpreted. I don't know. I don't consider catastrophes to be art. Technique is art.



F ⚡ U R E Y E D F R E A K S

“Being a Christian, I have to say that I participate in what Saint Paul called ‘a hope against all hope.’ It means that in a way, I see hope behind the threat of the apocalypse. It doesn’t put an end to humanity.”

Yes, *ars* in Latin is equivalent to *technê* in Greek.

So we agree. There are weapons that exist through their destination. For example, if I take this bottle and kill you with it, it’s a weapon by destination. If I have a gun and I kill you, it’s a weapon by function. During 9/11, they hijacked technological progress by using a civilian plane to make a bomb, killing themselves in the process. It’s a weapon by destination. That’s total perversity. If you go back to the bottle, it’s less perverted, but it’s still a crime. The bottle will stay a bottle, even if it’s killed you. And the plane will stay a plane, even if it’s killed more than 3,000 people. So Stockhausen is a great musician, but I just don’t think he’s philosophical enough in his statement, if it’s what he meant.

What could be done to prevent such perversions?

Well, I don’t denounce the fact that technology is used to do evil. I guess maybe we could ban planes, because they can be used as weapons. And bottles, too. And high heels like yours, too.

Today, man is capable of destroying humanity. Hans Jonas, in *The Imperative of Responsibility*, calls for a radical change in ethics. I suppose you agree with him.

Yes, I do. But I don’t agree with the precautionary principle. The precautionary principle is the *cache-sexe* of the responsibility imperative. It’s a mask that helps the propaganda of progress. “We are going to take extra measures of caution.” This isn’t where the problem lies. It lies in the responsibility, at the highest level. It’s so huge. There are no “measures of caution” to take at that level.

It’s already hard for man to consider his own death. Do you really think he’s capable of considering the death of humanity—outside of Hollywood representations? Being a Christian, I have to say that I participate in what Saint Paul called “a hope against all hope.” It means that in a way, I see hope behind the threat of the apocalypse. It doesn’t put an end to humanity. It’s possible, but not certain. And at the bottom of the pit, there is only hope. We are approaching the pit of ignorance.

Please explain.

I fear another accident, the accident of knowledge. Number one, of substances, the environment. Number two, of distances, the world is too small. And number three, the huge risk, is the one of nihilism, of losing knowledge, the coma of sciences because we hit the wall of time.

Is that what you mean by the “accident of thought”?

Yes, the ubiquity, the instantaneity. The president of Goldman Sachs said: “I do the work of God.” That’s worse than nihilism.

THE DUB PATIO
HOLLYWOOD, CA
2:23AM



PHOTOGRAPHY BY FREEMAN@ATRUSTEDFEW.COM

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“America isn’t the New World anymore. With globalization, it will never be the New World again. The world has become a planet that everyone can discover instantly. America is only a part of it, that’s all.”

In American movies of the 70s, there were tons of catastrophes. Today, we’re more into apocalypse movies.

Yes, it’s gothic. It goes back to medieval times, or to the Great Fear at the start of the French Revolution.

In the 70s, people were more into local catastrophes.

The Poseidon Adventure, *The Towering Inferno*, even *Titanic*, I’ve seen them all. They all introduce the anxiety of progress. *Titanic* has become the perfect example, but *The Poseidon Adventure* was first. *The Poseidon* is a huge ship that capsizes. The boat is reversed and becomes a kind of upside-down landscape where the survivors have to find ways to move inside the boat. When they arrive at the top, they hit the “ceiling” and make a hole in the hull to get out. It’s an interesting film because the vehicle is held responsible. There is also *Airport*. Basically, you have ships, towers, helicopters, planes...

Massive things.

Those objects have long since been surpassed by virtualization. The threat, in these movies of the 70s, comes from old technical objects. But as for virtual space, we don’t fear anything—except maybe becoming addicted.

And what about all these more recent apocalyptic blockbusters, like *The Day After Tomorrow* or *2012*?

America isn’t the New World anymore. With globalization, it will never be the New World again. The world has become a planet that everyone can discover instantly. America is only a part of it, that’s all. Hence Obama’s timidity concerning foreign affairs. American imperialism is changing, even militarily. You can see that through the cutting down of nuclear warheads and the fact that he’s stopping the space race. America has lost the “Go West” mentality of its frontier days. And I think that those films have been announcing that. At least, that’s how I see them.

There’s also an obsession with catastrophe in the news media. We’re always waiting for the next one to arrive.

We are going into another age of great terror. We are afraid of things that we can’t understand, and we can’t be brave in front of collective fear, in front of panic.

What do you think of the media craze about the Large Hadron Collider?

Two charges have been brought against them, by American physicists and by professor Otto RöSSLer, the theorist of chaos. They asked the people at the Large Hadron Collider: What gives you the right to risk a black hole? And the debate poses an important question. Where are the limits of experimenting? Sciences aren’t magic, they are experimental by nature. Back in the 19th century, if you messed up an experiment, your laboratory would explode and you’d come out of it all black. Your wife would say,



Archival Catastrophes

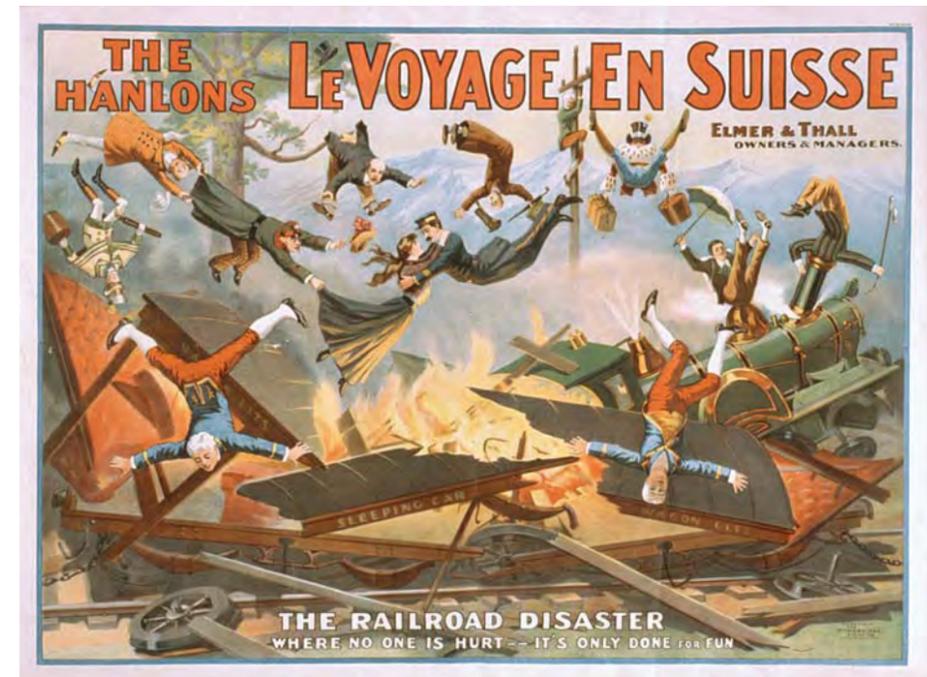
BY RICH REMSBERG

In my day job, I work as an archival-image researcher, mostly on PBS documentaries. I look through hundreds of old photographs every day—in archives, private collections, flea markets, people’s basements—and I always keep an eye out for a few things that I think typify the American experience, like banjo players, crazy preachers, hobos, and disasters.

There’s a messy geometry to the following images. They’re not tragedies, despite whatever newscasters or onlookers might say. These pictures all share a cool neutrality, and they don’t assign responsibility. They’re about physical, not moral, failings. In those failings we see the objects held still for our examination. When they functioned normally, we tended to take them for granted. Once they fail, we see their insides laid bare, and we stand in awe of the power they had, right in front of us, moments ago.

And we all like to experience that kind of awe. It allows us a sense of humility and grandeur simultaneously.

Here are some of my favorite images from various archives that, for different reasons in each case, came to mind while thinking about catastrophes.



Poster for the Hanlons' *Le Voyage en Suisse*, c. 1900. Artist unknown. Archive: Library of Congress.

THE HANLON BROTHERS

It's not often that pantomime and train wrecks overlap, but the Hanlon Brothers were from an era when mimes were made of tougher stuff.

Their shows were dark and elaborate combinations of acrobatics, music, and illusion based on both clever mechanical devices and sleight of hand. They held patents on theatrical beheading devices, and they had a lot of bits that revolved around floods, broken glass, fighting skeletons, and hooded executions. Human heads figured into their shows prominently and frequently, always being lopped off or appearing in unexpected places. Many of their characters were drunks who did something careless or malevolent with fire. One historian referred to their style as “violent clowning,” a phrase you don’t hear much.

Le Voyage en Suisse (*The Trip to Switzerland*) is a play about an attempt to break up a marriage. It is mostly set on a train between Paris and Switzerland, where said marriage is to take place. Loaded with complicated components and rigging, the train blows up at the end of act 2, with terrified passengers landing in trees. In act 3, a hotel is destroyed with dynamite.

The Hanlons were a major influence on Buster Keaton, George Méliès, the Marx Brothers, and the Three Stooges, not only for the craftsmanship of their physical comedy but also for their appetite for the chaotic disruption of polite society. *Le Voyage en Suisse* was their most popular production, touring throughout the US after runs in Paris and London. It ran for 82 weeks, performed every single night except the day President Garfield was assassinated.



Results of hurricane, Miami, September 18, 1926. Photographer: R. S. Clements. Archive: Library of Congress.



Burned-out shell of Eastern Airlines plane that crashed in a field in North Salem after a mid-air collision with a TWA 707 jet, which then landed safely at Kennedy Airport, December 4, 1965. More than 100 got out alive. Photographer: Syd Greenberg. Archive: Author's collection (from New York City flea market).

NEWS PHOTOS

In a news photo, it's the invasion of the abnormal into the mundane that fractures the architecture of our assumptions. A ship on the sidewalk? With news photos, there is no pregnant tension, no chronic lack of ease. It's all blown open. The ship is on the sidewalk. The plane—or what's left of it—is on the ground. The tension in the inherent conflicts with which we live every day has been released, and we stare at the naked consequences.

CHARLES CUSHMAN

Charles Cushman was an amateur photographer who began shooting with Kodachrome film in 1938, so he shows us in color an era we tend to see mostly in black and white, which means there's a lack of the sort of abstraction to which we're accustomed, and a greater sense of immediacy. Color photography, like Cushman's, is, as critic A. D. Coleman says, "more tactile, more sensory, more persuasive; less like reports about reality and more like actual slices of the real."

With a reliable gut instinct and a cultured sense of refinement, Cushman spent quite a bit of his time traveling abroad and walking the streets of the cities where he lived, photographically documenting the 20th century. It's not entirely clear why.

What is clear is that he had a taste for a few things in particular, including slums, street vendors, fires, floods, and accidents. The photos he captured, like the one's featured below, are the only visual records of historically significant events such as the Naperville train wreck—considered the worst in Chicago-area history—which led to an overhaul of railroad safety regulations.

But Cushman was no journalist. Like the best street photographers, he recognized public space as theater and seemed drawn to the extreme results of ordinary conflict and the drama of sorrow.



The Naperville train wreck at the Chicago, Burlington, and Quincy Railroad station, April 26, 1946. Many of the people on the trains were servicemen returning from WWII.



Ruins of fire-swept building at 4600 S. Paulina Street, Chicago, January 16, 1949.



Shoulder of Hwy 4/24. Truck wreck, Contra Costa County, California, May 31, 1957.



The Naperville train wreck, 15 minutes after the No. 39 train plowed into the rear of No. 11. Forty-seven dead—all in last coach of No. 11.

All photos this page: Charles Cushman. Archive: Indiana University Archives.



Members of the Buffalo Historical Marionettes with the set of *Death Takes the Wheel*. Photographer unknown. Archive: Library of Congress.



Scene from *Death Takes the Wheel*. Photographer unknown. Archive: Library of Congress.

THE BUFFALO HISTORICAL MARIONETTES

Before there were driver-ed films like *Blood on the Highway* and *The Bottle and the Throttle*, before there was a Highway Safety Foundation, there were the Buffalo Historical Marionettes.

During the Depression, the Federal Theatre Project employed about 200 people in Buffalo, New York, to create and stage puppet shows. The program was under the direction of Esther Wilhelm, who considered herself, in the words of Buffalo Historical Marionette historian Peter Rachleff, “Buffalo’s own Eleanor Roosevelt.” Because of Wilhelm’s vision, the performances had sets, costumes, live orchestras, and subject matter that doesn’t often come up in puppet shows. Judging from the photographs, one of the best was the driver-safety marionette performance *Death Takes the Wheel*.

TRAIN WRECKS

In the early days of the railroad, there was a lot of room for things to go wrong. Boilers exploded; locomotives collided. Pretty quickly they improved the engines and put more planning into schedules, and railroading became a much safer affair. But people kind of missed the old days. Maybe not the carnage, but the spectacle.

There developed a tradition of staged train wrecks for entertainment’s sake, a sort of large-scale, old-timey demolition derby. The most famous of these took place in 1896 near Waco, Texas. Promoted by a man named Bill Crush, the retired locomotives faced each other on a single piece of track, each with seven cars in tow and packed with explosives.

When Crush, mounted on a white horse, gave the signal by dropping his hat to the ground, the two locomotives started toward each other, building speed. In the last seconds, the engineers and firemen jumped to safety and, traveling at more than 100 miles an hour, the two trains collided.

The collision gave the spectators a little more than they had come for. The boilers exploded on impact, sending pieces of twisted metal into the crowd and the surrounding cotton fields. One photographer had a bolt and washer embedded in his head. Three people were killed, many more injured and scalded, and souvenir hunters, forgetting that the metal was still hot, burned their hands. ■



Staged train collision near Waco, Texas, September 15, 1896. Photographer: J. C. Deane. Archive: Texas Collection, Baylor University.



The Woman Who Fell to Earth

INTERVIEW BY TOM LITTLEWOOD
PORTRAIT BY MARTIN FENGEL

Juliane Koepecke was born a German national in Lima, Peru, in 1954, the daughter of a world-renowned zoologist (Hans-Wilhelm) and an equally revered ornithologist (Maria). As a teenager, Juliane was enrolled at a Peruvian high school. Her parents were stationed several hundred miles away, manning a remote research outpost in the heart of the Amazon. Juliane herself was no stranger to the swelteringly harsh Amazonian environment and was well versed in the inner workings of its volatile ecosystem. It was this knowledge that would later save her life.

On Christmas Eve 1971, only hours after her high school graduation ceremony, 17-year-old Juliane and her mother boarded a plane that was to cross the Peruvian rain forest. They were heading home to celebrate Christmas with her father. The plane flew into a volatile thunderstorm and was obliterated in seconds—killing all 92 passengers except for Juliane. After being thought dead for 11 days, she emerged from the jungle and was reunited with her father.

The details of this remarkable escape were revisited in *Wings of Hope*, a little-known documentary that was made for German television by Werner Herzog in 2000. Not enough people have seen this film or heard Juliane's story, so *Vice* recently spoke with her and asked her to tell it to us all over again.

Vice: Can you describe the atmosphere in the airport when you arrived there to take that doomed flight? Did anything seem amiss?

Juliane Koepecke: It was completely normal. The flight was delayed, but they have delays in Peru all the time, so no one thought anything of it. I remember it was very crowded in the airport and all the people wanted to go home to spend Christmas with their families. We saw the machine outside, a turboprop Electra. It looked really neat. Of course you can't tell when you're not a technician, but to me it seemed perfect. Then we boarded the plane and for the first 30 minutes everything was fine.

Did you choose to sit by the window yourself?

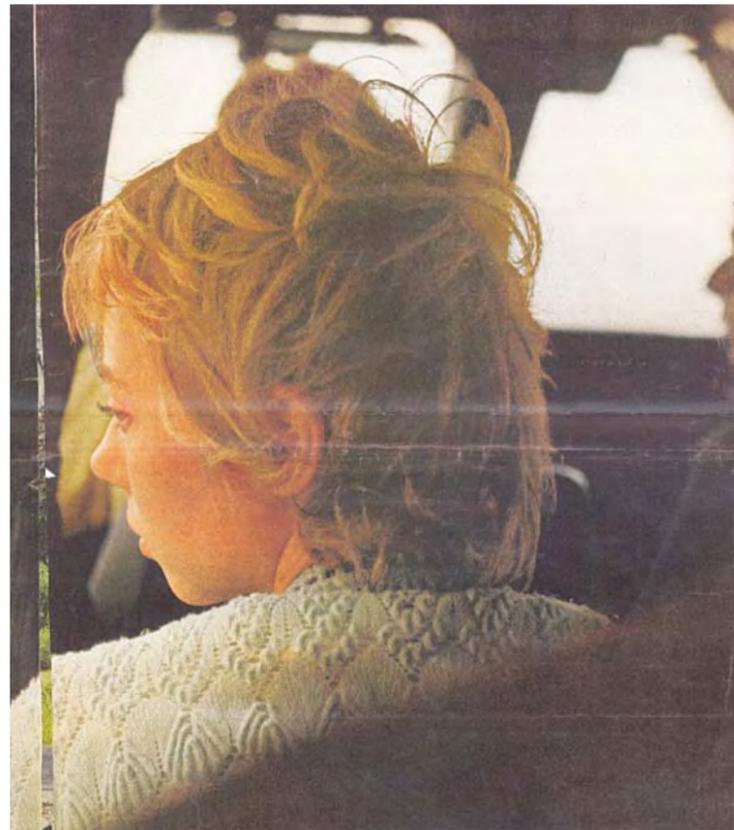
Yes, because I used to love sitting next to the window and looking outside. My mother didn't care so much. We sat in the very back. That was by chance, of course. We sat in the second-to-last row.

When did you notice for the first time that something wasn't quite right?

Only once we flew into the thunderstorm. They served sandwiches about half an hour after takeoff, and we were supposed to land 20 minutes later. It's a total flight time of 50 to 60 minutes to where we going, a place called Pucallpa.

How did the trouble begin?

The clouds became thicker. I used to love flying, so I didn't really pay that much attention to the weather. Then my mother started getting nervous and said, "I don't like this." The clouds became darker and darker and the flight became more turbulent. Then we were in the midst of pitch-black clouds and a proper storm with thunder and lightning.



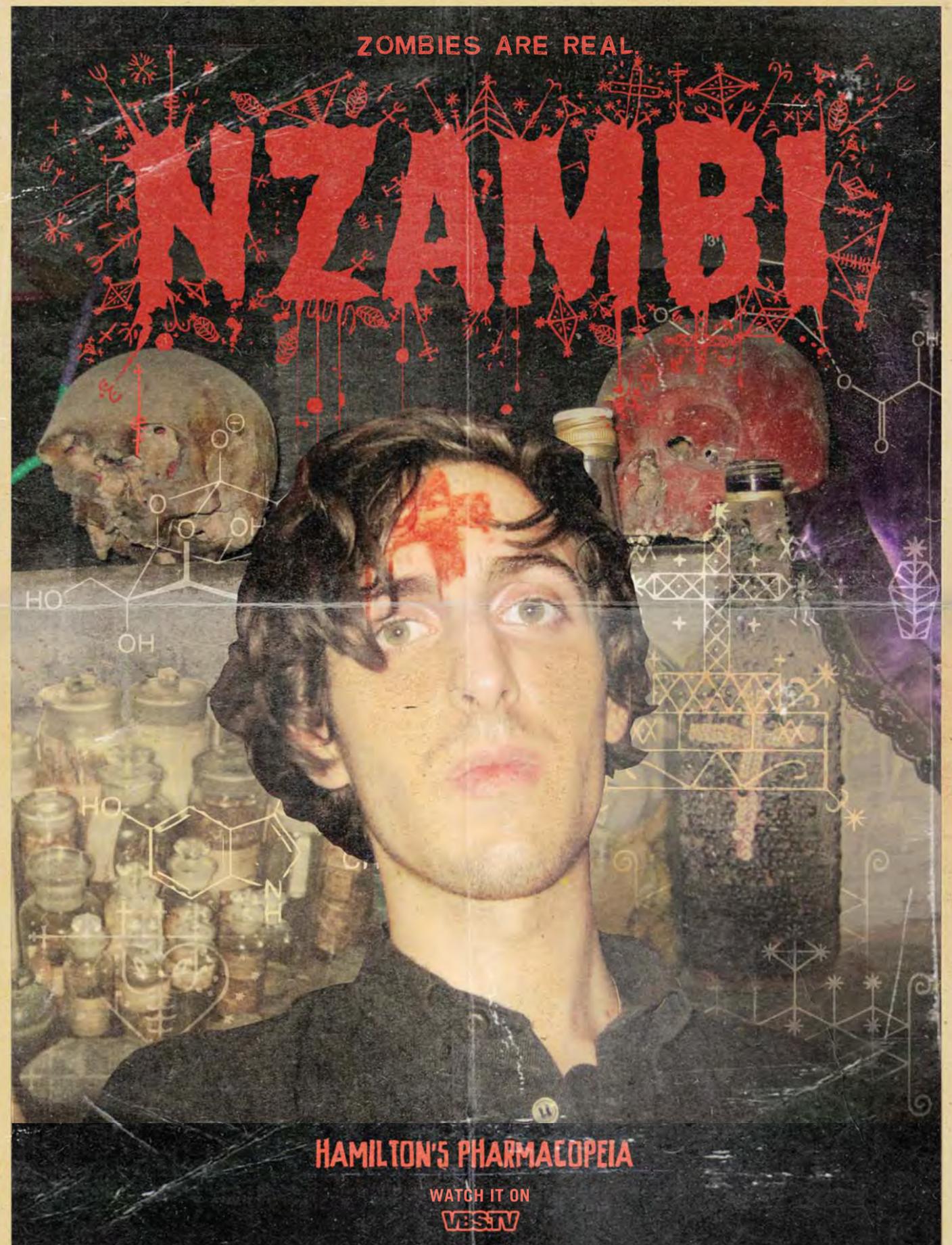
Juliane Koepcke on January 4, 1972, on the plane to Pucallpa just after she was found in the jungle. Photo by Harold Sells Jr., courtesy of Juliane Koepcke.

Were the other passengers as nervous as your mother?

My mother wasn't exactly nervous. She was merely concerned, but you couldn't really tell from the outside. The other passengers were still calm. They weren't happy about it, but you couldn't really feel that. It was pitch-black all around us and there was constant lightning. Then I saw a glistening light on the right wing and my mother said: "Now it's over." The motor was hit by lightning. This machine had turbines with propellers. After that, everything went super-fast. What really happened is something you can only try to reconstruct in your mind. We only found out later that turboprop Electra machines weren't designed for this kind of heavy turbulence. Their wings are too stiff. The bolt that hit the plane probably caused it to break up in midair, because it definitely didn't explode.

When your mother said, "Now it's over," did that comment mean anything to you at all?

No, I didn't really have the chance to think about it. I registered it and then I had a blackout. There's one thing I remember: I heard the incredibly loud motor and



“I was in a tailspin. I saw the forest beneath me—like ‘green cauliflower, like broccoli,’ is how I described it later on.”

people screaming and then the plane fell extremely steeply. And then it was calm—
incredibly calm compared with the noise before that. I could only hear the wind in
my ears. I was still attached to my seat. My mother and the man sitting by the aisle
had both been propelled out of their seats. I was free-falling, that’s what I registered
for sure. I was in a tailspin. I saw the forest beneath me—like “green cauliflower,
like broccoli,” is how I described it later on. Then I lost consciousness and regained
it only way later, the next day.

What did you feel while all of this happened? Was it terror, or were you in shock?
I wasn’t scared; I didn’t have time for that. Even while I was falling I wasn’t afraid.
I just realized that the seatbelt was putting pressure on my stomach and my head
was upside down. But that’s about it—it was probably only fractions of a second.
Or maybe I blocked it out. Either way, I don’t remember it.

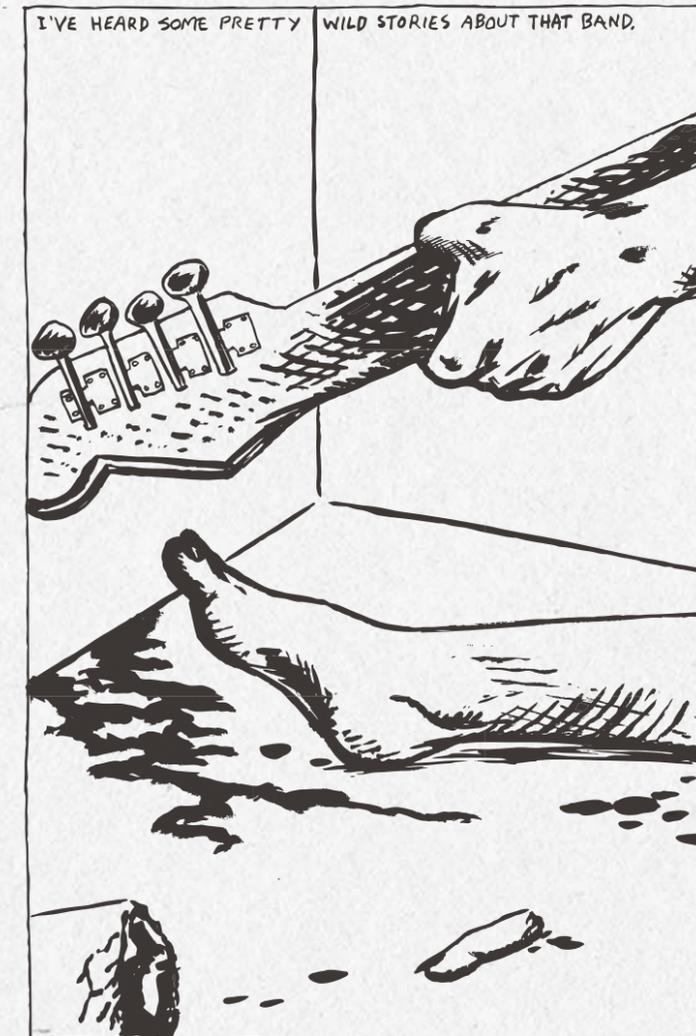
OK, and then you woke up the next day on the jungle floor?

The next morning, actually. The crash was around 1:30 PM, and the next morning
around nine I looked at my wristwatch. It was still intact and only stopped working
later on. Then I realized I was on the ground and I knew right away what had hap-
pened. I had a serious concussion, so I couldn’t sit up. My eye was swollen. My
glasses—which I’d had since I was 14 because I’m nearsighted—were gone. I was
lying underneath my seat and I wasn’t strapped in anymore. I could see a bit of the for-
est but also a bit of the sky. I knew that I had survived a plane crash. The concussion
and the shock only let me realize basic facts. I didn’t really think about myself. I was
more concerned about where my mother was. That’s the first thing I remember. I had
probably woken up and lost consciousness again a couple of times before that, due to
the heavy concussion. I must have released myself from the seat because I was defi-
nitely strapped in when I fell. That’s what Werner Herzog reconstructed later on, too.
We know I was attached to the seat, which must have turned and buffered the crash.
Otherwise I wouldn’t have survived. I also know that I had crawled under the seat
because it was raining. I used to dream about this. I dreamed that I was dirty and
soaked and would only have to get up to take a shower. Then I have a tiny fragment
of a memory, of pulling myself under that seat to protect myself from the rain. Then I
thought, “I just have to get up,” and when I made up my mind to do that, I woke up.

Can you remember how it felt to be under this concussion?

I couldn’t really feel anything; it was like being wrapped in cotton balls. With a lot
of effort I could only get up on my knees, then everything turned black again. I
couldn’t see very well with one eye and I only found out later that the crash and the
difference in pressure inside and outside of the plane made the capillaries in my eyes
pop. That’s why the whites of my eyes were blood red. I probably looked like a
zombie from a movie. I couldn’t feel it, though. I wasn’t in any pain and my head
didn’t hurt either. I was just dizzy and every once in a while everything turned
black. In the beginning I lost consciousness all the time. It took half a day until I
could get up and walk.

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“I came around a crook of the stream and found this row of seats. I couldn’t really see that much, only people’s feet pointing up. I poked their feet with a stick.”

And naturally, your first thought was to find your mother.

I searched for a full day and then I realized there was no one there. I crawled around all over the place and called out, but I couldn’t hear anything. In the afternoon on that same day, I found a little well and I remembered what my father had once told me: If you get lost in the jungle and you find water, you should follow it.

Why?

A small stream will flow into a bigger one and then into a bigger one and an even bigger one, and finally you’ll run into help. When I found that water, I had a goal and I knew what I had to do to attain it. Of course it was easy for me to leave because I didn’t find any survivors at the crash site. If I had found someone who was injured, then I probably would have stayed and that would have meant death for both of us.

Did you come across dead bodies?

Yes, once. It was the fourth day after the crash. I found a row of seats, drilled into the ground. The impact must have been so hard that it drilled itself three feet deep into the ground. The three people strapped into these seats must have been killed right away. That was an ugly moment. It was the second time I had ever seen a dead body. The first time had been a little child. I had seen a child that I didn’t really know, lying in state at a funeral.

How did you handle seeing these crash victims?

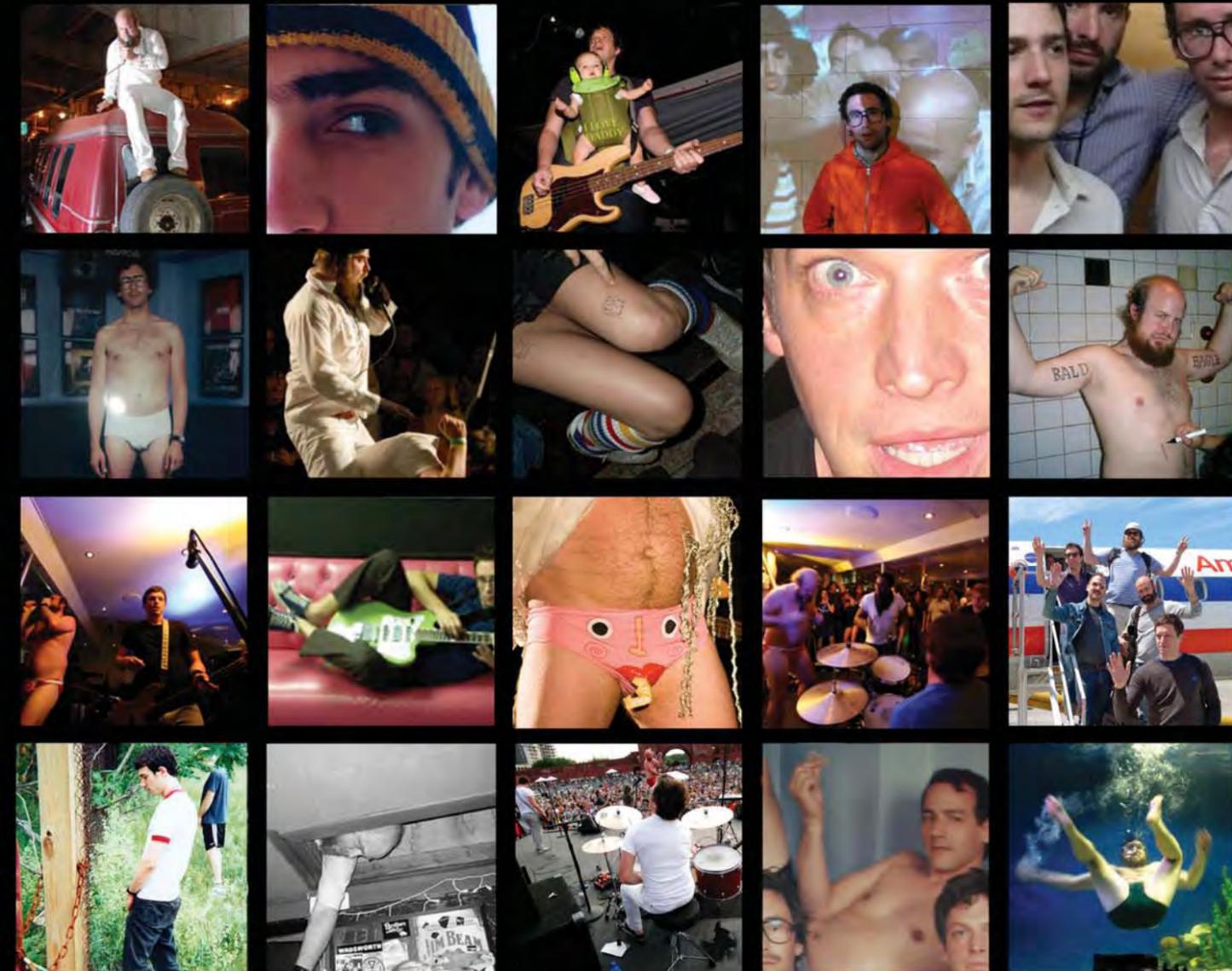
I had already sensed that I’d come across dead bodies because I had heard this noise, the sound that king vultures make when they land. King vultures are big condors, the biggest new-world vultures in South America, and I knew this sound because I had lived at my parents’ station for one and a half years prior to the crash. When I heard that sound, I knew there must have been a big dead animal or human somewhere nearby. And that’s exactly how it was. I came around a crook of the stream and found this row of seats. I couldn’t really see that much, only people’s feet pointing up. I poked their feet with a stick. I couldn’t touch the dead bodies. I couldn’t smell anything and they hadn’t been eaten yet or started to decay. I mean, sure, decay must have started, but I couldn’t notice it. I could tell it was a woman because she had polished toenails and the others must have been two men, judging by their pants and shoes. I moved on after a while, but in the first moment after finding them, it was like I was paralyzed.

From fear?

I don’t know exactly. Maybe it was respect for death and the thought that they hadn’t made it...

Soon after this, you started to hear and see rescue planes far above.

Yes, but I couldn’t draw their attention to me, and after a while, I didn’t see them above me anymore, and that’s when I knew they had stopped searching. Of course my thinking went into different directions: They have found the machine or they



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Juliane Koepcke in Lima, just before prom on December 22, 1971 (the night before the crash).
Photo courtesy of Juliane Koepcke.



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have given up. Either way I knew that I was truly on my own and they wouldn't continue looking for me.

How did that feel?

It was a feeling of hopelessness. I wasn't in pain or panic, but I knew that I had to rely on my own strength to get out of there. I didn't know that the river that I'd found was uninhabited and I was still hoping to find help soon because it was such a wide river. But then as the day moved along I felt that it was strange that the wild animals were so tame: monkeys, martens, brocket deer—you wouldn't normally see them. Plus, there were lots of fallen trees in the water, which is an indicator that a river isn't traveled. That made me think, but then I blocked those thoughts out—of there possibly not being any help out there.

Also, you weren't entirely uninjured in the crash.

I had a deep cut on my left calf, but it didn't bleed a lot. That's a common thing when people are in shock—the bleeding isn't very strong even though the cut is deep. I ended up with a lot of scar tissue in that place after being in the water all the time, floating down the river and swimming. Also, my right collarbone was broken. I could feel that the bone was broken and overlapping. Nothing came through the skin, though. It wasn't an open wound.

You only broke one bone after falling from the sky?

Well, other things were found later when I saw a doctor. I had strained the vertebrae in my neck and I had a partially fractured shin, but that was a fissure only, not too bad. And I tore my ACL—which was the worst of all the injuries, actually, but I didn't know about that until I was in a hospital bed. That's when the swelling and the 104-degree fever set in.

So, in the jungle, you didn't just block things out mentally but also physically.

The only thing that made me nervous, or let's say concerned me, was this little patch on my upper arm. It wasn't any tragic wound or anything, but it was small and open and flies had laid their eggs in it. The maggots hatched underneath my skin and ate a hole into my arm.

Oh my God.

I was afraid they might have to amputate my arm. After our dog had a similar thing—I think it was the same kind of fly too—it got infected. I was concerned and I thought, "I have to do something about this. I have to get these maggots out of my arm." But that wasn't exactly easy. I had this ring that was open on one side that you could squeeze together, and I tried with that. It didn't work because the hole was so deep. So I tried with a stick, but that didn't work either. Only after ten days, when I found a boat with a motor and a barrel of diesel fuel, was I able to do the same thing we had done to our dog—pour petroleum into the wound. That brought the maggots to the surface. Not all of them, but the majority. The people who found me and the doctor who treated me extracted the rest.

Let's focus on the boat for a moment. Ten days in the jungle, and you just came across it?

It was weird. At first I couldn't believe it. I was very weak. It was early afternoon on the tenth day. I couldn't go on, so I let myself sink into this riverbank and doze off. I thought to myself that I had to find a place to sleep now that the sunlight was slanted. My watch had stopped working and I had to pay attention to the sun. I always looked for a place that was even ground, a little bluff or slope or possibly a thick tree, so nothing could come up to me from the back. But then I sat up and I saw this boat just sitting there. I thought that I was hallucinating at first, that I was



“The thought—why was I the only survivor?—haunts me. It always will.”

in a little village near Pucallpa. She brought me there in her tiny plane, a two-prop airliner. Even though it was a really short flight, that didn't feel great. But it was only 15 minutes until we arrived at the home of these missionaries, where they cared for me until I was OK again.

What was it like when you saw your father again?

We didn't exchange a lot of words, but we had each other again. Of course there was this thought of what had happened to my mother. They found the plane with the help of my directions, but it took a couple more days to find and identify the dead bodies. When they identified my mother, we... then it was real that I was the only survivor and that I had lost her. The real mourning set in way later, because after the crash I was constantly being interviewed and interrogated by the air force and police. My father quickly sold the exclusive rights to the story to the German magazine *Stern*. They came out right away and I had to give interviews to them. That was a massive distraction. I couldn't take the sudden fame very well. I was famous overnight. Everybody knew about me. I received letters from all over the world, which was very touching. I couldn't understand at first why people would write to me.

What did it feel like to go back to the crash site with Werner Herzog?

It was very weird. They had to search for the site of the crash. Everything was overgrown with plants, it was thick rain forest. They had to build paths to the individual pieces of the wreck, which were still lying around in the exact same places where they'd fallen. They cleared a landing space for a helicopter. Once we got there, I was pretty detached. Well, not detached—but I wasn't upset.

Do you think that you benefited from that experience?

I learned a lot of new things, things that completed my memories and experience. It was almost therapeutic. It helped me psychologically. That's where I told the whole story to Herzog. I really focused on it, on doing it well, so I didn't really have the time to become upset. What stunned me the most was when we came to the wheels of the plane—one part of it was lying upside down with the wheels facing up. That was such a finite impression. It was like a dead animal. It symbolized this finality—that it's really over.

You're speaking directly to the camera in the movie. That's pretty impressive and brave.

That was his idea. He was very gentle in directing me. He wanted me to tell things like I was telling them to myself, introspectively, without a lot of emotion or fidgeting. He didn't want it to be very bubbly, but rather deliberate. You can see that in the movie.

It's incredible how you managed to deal with this trauma, this horrific thing that happened to you.

Yes, and you have to consider that I didn't have any psychological help either. Nowadays one would get that sort of help right away, but in the early 70s things were different and that wasn't even on people's minds. If I hadn't managed to deal with it, that would have been my problem. Of course I had nightmares for a long time, for years, and of course the grief about my mother's death and that of the other people came back again and again. The thought—why was I the only survivor?—haunts me. It always will. ■

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The Children of Kampiringisa

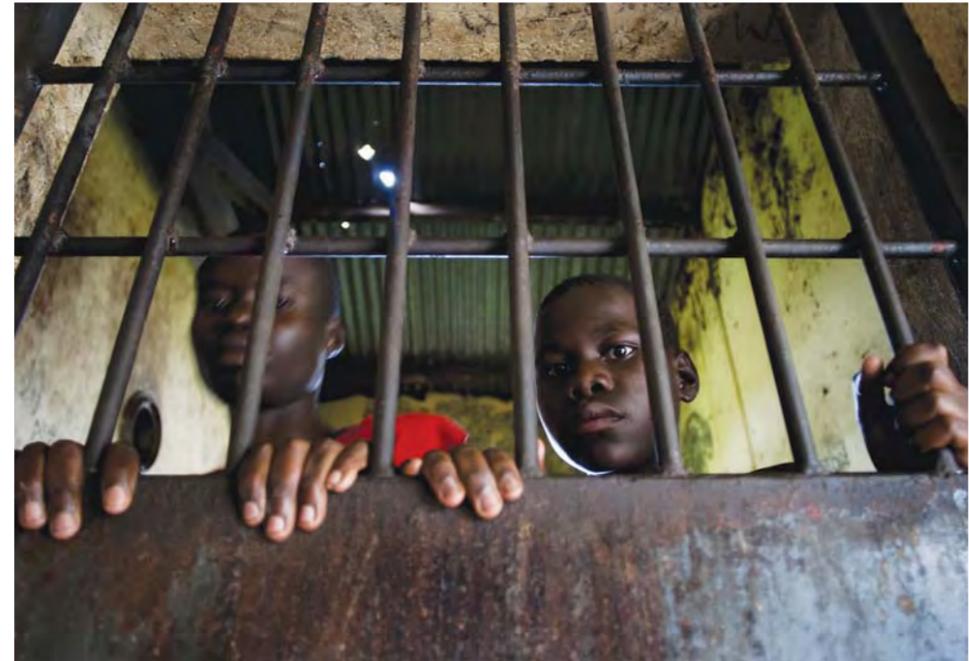
BY ARIEL RUBIN, PHOTOS BY QUICO GARCIA

Katende Patrick sits with a friend on the floor, absentmindedly rotating a few tiny rocks in his hand. They are pieces in a makeshift game of Parcheesi that the two have made out of a scrap of paper. Both of the boys are in the throes of malaria, so they speak slowly, but Patrick talks with an eloquence and calm that belie his 13 years of age.

This is the Kampiringisa Rehabilitation Centre, Uganda's only juvenile-detention facility. Unlike remand homes, which house minors awaiting their court dates, Kampiringisa is a prison where the convicted serve out sentences ranging from three months to three years. The ramshackle dormitories, cafeteria, and gymnasium look like they ought to be condemned. And in spite of a gleaming sign out front declaring First Lady "Mama" Janet Museveni's 2003 renovation of the center, most of the window panes have been shattered, the walls are peeling, and the floors are caked in mud.

Patrick has just begun to serve a six-month sentence for allegedly stealing a battery from his father. He doesn't wear a shirt because, as with all other new convicts, the authorities have taken it from him. He will receive one at the end of the month, when he, alongside the 25 other newly admitted, will be allowed to leave the "black house"—a barred room where the children sleep on the floor, scrambling for space and lucky to procure a filthy blanket—and be assigned a bed of his own.

According to a recent report by the Foundation for Human Rights Initiative, there are 224 children incarcerated in Kampiringisa. This number changes frequently since the center houses—against both international





Since the formal admissions procedure is rarely followed, parents can simply drop truculent children off at will. One young girl was sent here by her parents for “being stubborn.”



and national law—child offenders alongside street children. Kampiringisa is not only a prison; it also doubles as temporary housing for Uganda’s hundreds of homeless minors. Whenever the government or the Kampala City Council decides to round up street children, they are brought here to be counted and subsequently resettled. “This additional mandate began in 2002,” Alule Michael, principal of the center, explained to me, “as a way of trying to reduce the stress on the streets.”

Since the formal admissions procedure is rarely followed, parents can simply drop truculent children off at will. One young girl was sent here by her parents for “being stubborn.” Another’s crime was “refusing to do what my parents told me.” These two are serving five and 12 months, respectively. When queried, their social worker says, with a trace of laughter, “Well, even babies are brought here!” And as if to bolster his claim, he points to two-year-old Museveni, a street child who has been sentenced to stay here indefinitely. He sits on the floor and doesn’t bother to swat the flies away from his urine-soaked clothes. He’s already been here for a year.

According to the Ministry of Gender, Labour and Social Development’s report “Removal of Street Children in Uganda Strategy 2008,” plans were enacted to build a separate rehabilitation center to house street children and provide vocational skills and recreational activities. Acknowledging that “it is against national and international laws to accommodate vulnerable children with those child offenders on detention at the same centre,” the document goes on to state that a 1.1-billion-shilling “funding gap” remained. Allocations included 40 balls (8 million shillings, or \$400), two 27-inch televisions with DVD players (3 million shillings, or \$150), assorted welding materials (30 million shillings, or \$15,000), and 30 assorted indoor games (750,000 shillings, or \$325).

A recent visit revealed just how few of the removal strategy’s aims have been achieved. Instead of participating in any visible recreational activities, most of the boys ambled about on a derelict field, kicking up dust or making their way to the canteen for their meager daily meal of ground maize and beans. Their distended bellies read more



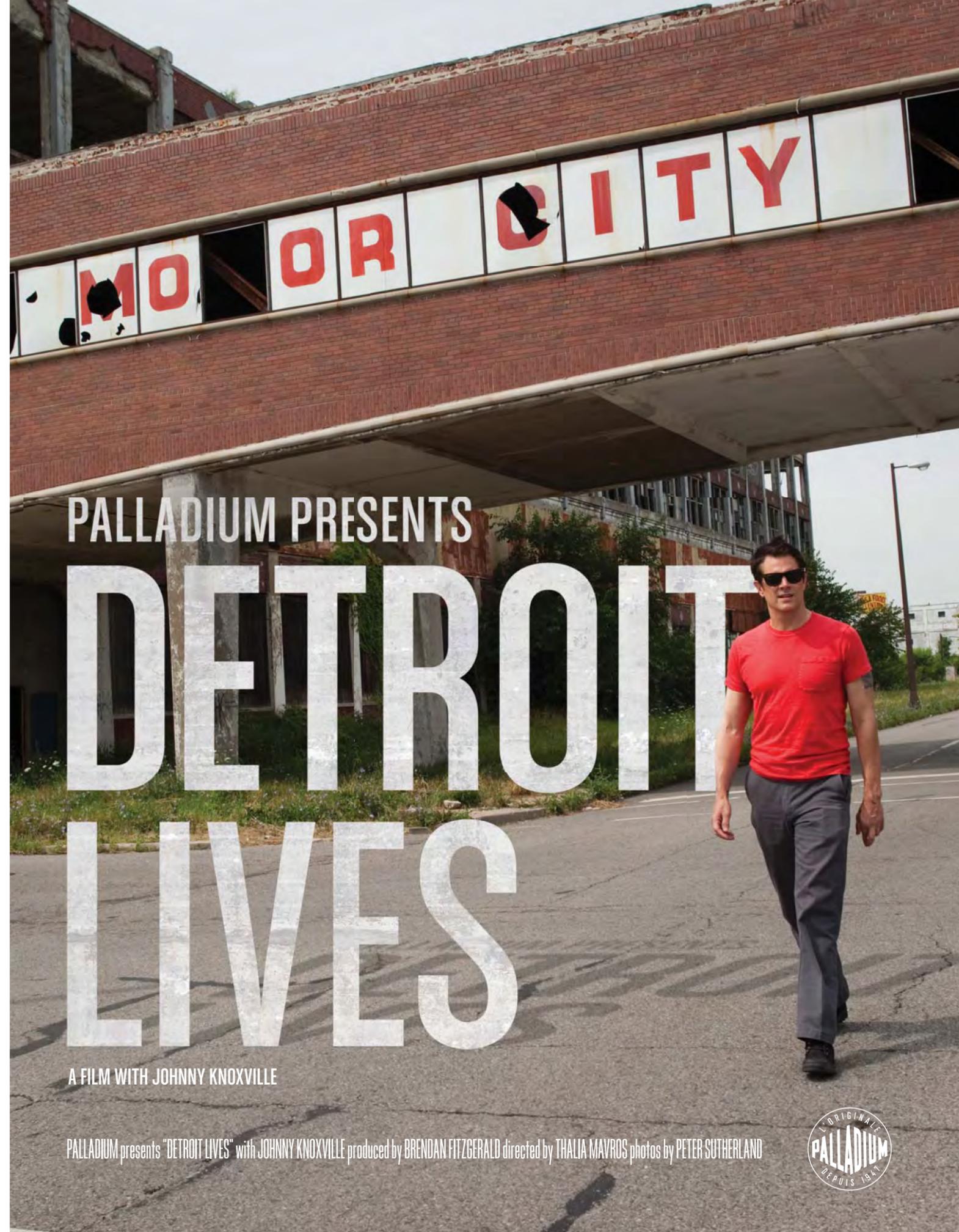


The smell of the room is fetid and nauseating; the boys take turns hoisting themselves up to the small, barred opening in the door to get a breath of fresh air.

“refugee camp” than “rehabilitation center.” Since malaria is commonplace and medicine scant, inmates like Patrick will have to simply wait out their diseases. According to one of three social workers on duty on the day of my visit, medication is always running out because the dispensary also serves the local community.

The boys who come here after being arrested on alcohol- or drug-related charges must spend their first few weeks in a place called “the cell.” Here, in a room no bigger than a broom closet, five to seven half-clothed and wild-eyed kids are forced “to sober up,” as the attending social worker notes approvingly. This is where the rehabilitation process begins for those children convicted of smoking marijuana, or *bangi* as it is known locally, which according to Michael makes one “go mentally mad.” The smell of the room is fetid and nauseating; the boys take turns hoisting themselves up to the small, barred opening in the door to get a breath of fresh air. It seems that they should be angry. Perhaps they are. But they hardly say a word. One boy serving time in the cell is clearly mentally disturbed. The social worker says that he was sent there for shattering a window with his bare hands. Since there are no mental-health workers on site, disturbances like this are dealt with through isolation. He is placid and his eyes are red. He looks ill. Like the rest, he is mostly silent, but he suddenly speaks up: “I want to leave. Today!” The social worker quickly and jovially says that it is time to watch the preparations for a Christmas dance.

For Alule Michael, Kampiringisa is a point of pride, a “success” that is “nationally known” for its ability to retain both child convicts and unwanted street children. Meanwhile, Patrick still nurses hopes of returning home even though his father doesn’t respond to his letters. Though his father used to beat him regularly, Patrick recalls fond memories of him and of his own life before being sent to the center. He tells his story with hardly a trace of anger or sadness. He says, “The last thing my father said to me was ‘I don’t know you and I don’t want to know you.’” ■



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Critics have called Detroit the death of the American dream. Once the fourth-largest city in America, the Motor City these days is more like the Wild West cast in concrete—a place where rules are secondary to willpower, despite very real adversity. The abandoned towers and factories left behind have been well-covered, thanks to the roving gangs of photojournalists in recent years, prowling the empty city and feasting on its highly photogenic carcass. There's no doubt that there's plenty wrong with these pictures.

But our experiences can't help but lead us to a less bleak conclusion. Lead by Johnny Knoxville, Palladium traveled to "The D" to see what lies gasping beneath the rubble and decades' worth of social and economic imbalance. What we found is a burgeoning class of creative young people inspiring each other by using their city's "disadvantages" as opportunities.

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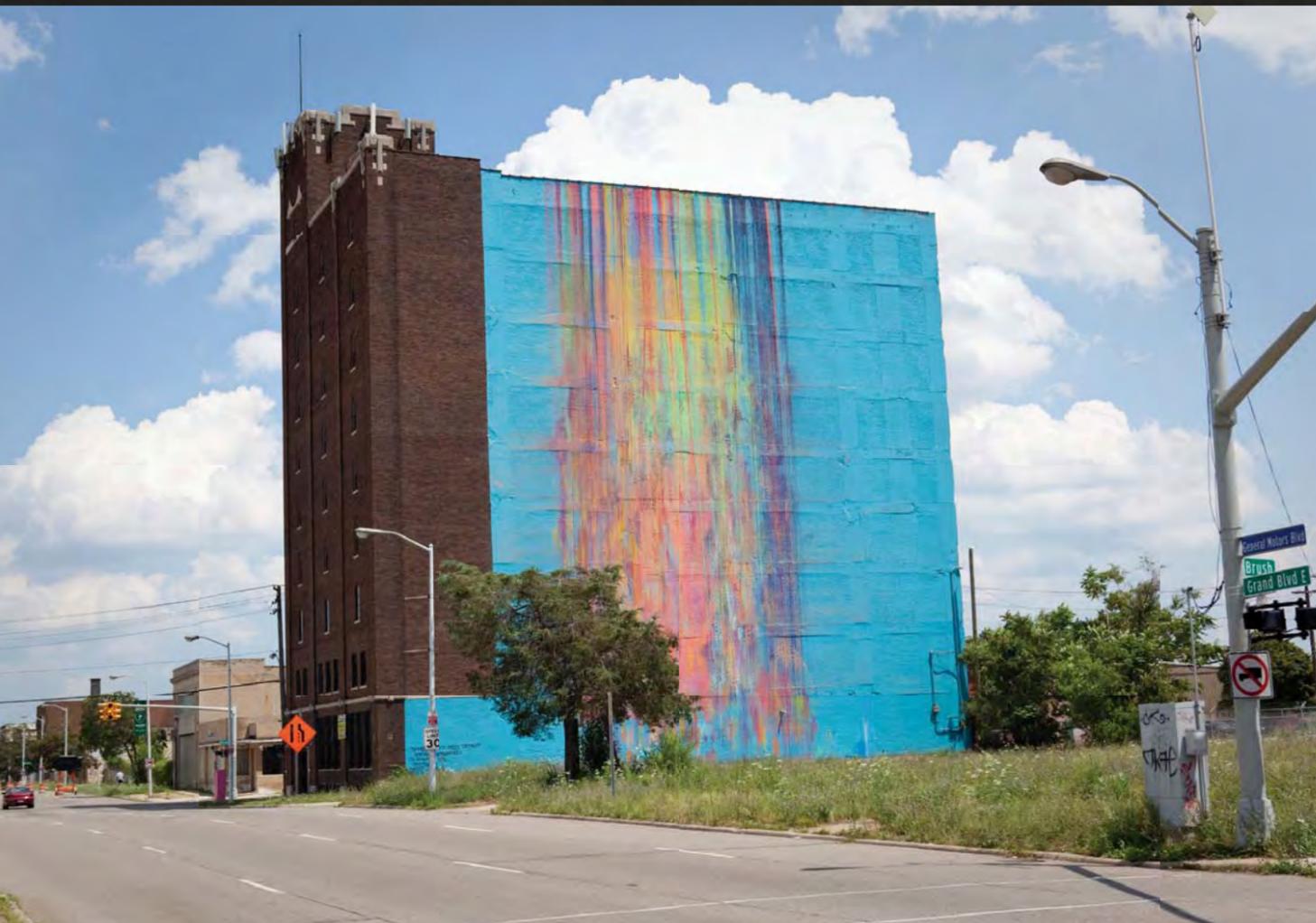


Built in 1926, the Michigan Theater is an icon of both Detroit's gilded age and of its current condition. It once sat over 4000 movie goers. Today it's used as a parking garage.



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Doomsday Scenarios, Considered

INTERVIEWS BY JESSE PEARSON
PHOTOGRAPHS COURTESY OF NASA AND THE US GEOLOGICAL SURVEY

BLACK HOLES

Mark Reid is senior radio astronomer at the Smithsonian Astrophysical Observatory at the Harvard-Smithsonian Center for Astrophysics. He specializes in what many consider to be the alpha of astrophysical doomsday bogeymen—the black hole.

Vice: I've always wanted to ask somebody who is an astrophysicist to explain black holes to me as if they were explaining it to a ten-year-old. Use the simplest terms possible.

Mark Reid: It's something that's got so much mass in such small volume, such a high density—but I don't know if that's a good word for ten-year-olds—that nothing can escape its gravitational grasp. Light doesn't come out of it. Objects falling into it don't come out.

And how are black holes created?

There are two types in the universe as far as we know. One type we call stellar-mass black holes, meaning they came from an exploding

star, like a supernova. When a star explodes, a lot of stuff goes out, but the stuff on the inside implodes—it gets so dense that it becomes a black hole. These are presumably all around the galaxy. There are probably tens of thousands of them.

The other type of black hole is what we call a supermassive. Those are always at the centers of galaxies—the Milky Way has one.

It's called Sagittarius A*, right?

Yes. And these are usually between about 1 million and 1 billion times the mass of a star like our sun. We don't really know the details of how they form. Presumably there would have been a very massive early star that exploded, and then it accreted matter.

How can a black hole gather matter?

Dust and gas can fall into it. If a star gets too close, it can be stretched by the black hole, and then shredded by it, and the gas that remains will fall in. And the other possibility for the growth of black holes has its



roots in the early universe. It's thought that galaxies like the Milky Way grow by taking little subgalaxies, little groups of stars, and merging them together. You'd have two groups of stars and gas that might have a million solar masses in it and those two might collide, merge, and become a 2-million-solar-mass cloud. If you do a lot of that, especially hierarchically, like you get two 2 millions and you get a 4, it goes pretty quickly.

It's an exponential-growth kind of a thing.

Yeah. So that's sort of how people think galaxies grow. And you might merge black holes in the centers of other subgalaxies as they're merging. So you'd get 2-, 5-, or 10-million-solar-mass black holes in two different subgalaxies and as they merge, you'd double the mass of the black hole.

OK. And the location of our own supermassive black hole, Sagittarius A*, is determined by the behavior of things around it, right? There seems to be a gravitational force that stars around the constellation of Sagittarius are sort of circling?

Yeah, but there are sort of two ways of locating Sagittarius A*. If you're a radio astronomer, like me, it's actually a very strong radio

source that you look for. There's this source of radio waves that we can easily detect, and we can tell that it's sitting exactly at the center of the Milky Way, and it's not moving. So that's pretty clear evidence that it's a supermassive black hole. If it weren't massive, it'd be moving around very quickly.

If you're an infrared astronomer, you can see that some stars are orbiting something that isn't really visible, and you can figure out the center of the orbit, and then the center of the orbit gives the position of Sagittarius A*. And then if you compare the radio and the infrared, you can tell that the two positions are the same.

So if there are these stars orbiting something that isn't visible, it's a good guess that there's a black hole there.

Right. At infrared it's mostly invisible. They can sometimes see something at that location. But basically the infrared observations, which give you the orbits of stars, tell you that there's something about 4 million times the mass of the sun at the center of these orbits.

There's a pop-culture and pop-science obsession with black holes as terrifying things.

Yeah, I have to explain to my mother all the time that we're not going to fall into one. She's really worried about that. Every time I mention black holes, she grimaces and worries.

Where do you think that reputation originates?

I think it's the name, you know? Like the Black Hole of Calcutta. It sounds pretty scary, right?

It does. Can you tell me the potential catastrophic scenarios that surround supermassive black holes? Are there any really realistic ones?

Well, I don't know about supermassive. I would say the scenario that would be scarier—and more realistic, even if the odds are astronomically low—is that we'd run into a black hole that's moving around the Milky Way. There are a large number of them, we don't know the exact number, floating around the Milky Way unseen. You could think of them as giant asteroids, only much more massive. If we were to get very unlucky and have a collision with one, then yeah, that would destroy Earth [laughs].

What would the nature of the destruction be? How would it function?

If it were a direct hit—which is almost impossible—Earth would be stretched and shredded, and then all the materiality would fall into the black hole and never be seen again.

And is there any sort of quantification of the likelihood of this ever happening?

Oh, I've never calculated it. I'd hate to put a number on it without calculating. My guess is it might happen once in the universe. Or, no, maybe more than that. But there is another scenario. If we got close enough to one, even without a direct collision, if one came into the solar system, it could be like having another star here, and that would probably eject most of the planets in the solar system out into space and then we wouldn't have a star at all anymore.

At which point we would become a frozen rock.

Exactly. And it's also possible that the planets could exchange orbits—instead of orbiting the sun, we would start orbiting the black hole as a star, and the black hole isn't going to do you any good because there's no light coming off of it.

Are there other astrological doomsday scenarios that are more likely than those concerning black holes?

The only super-real one would be a big asteroid hitting us.

But we can rest easy in terms of black holes?

Yeah. The odds of a meteorite problem are infinite times more likely than those of a black hole.

What are some of the current specific topics that are being discussed among people who specialize in black holes?

Well, Sagittarius A* is as well established as a supermassive black hole, I'd say, in terms of astrophysicists, as anything. Physicists who don't look at all the information might be a little more skeptical, but it's pretty certain. And if Sagittarius A* is not a supermassive black hole, it's something even more interesting. It would have to be some material we don't know about, some type of matter that acts like a black hole, but isn't. That would be almost weirder. There's one group in South Africa that was suggesting that it might be what's called a fermion ball, like a big cloud of electrons or something like that. Then there are even more exotic things called boson stars. Bosons can be as compact as a black hole, basically. From a physical point of view, if you took all these elementary particles called bosons and crammed them into a very small space, you could get something that would have about the right mass, if you could get it into that volume.

Astrophysics is an interesting science because so much of it has to be hypothesis and theory.

Yeah, we can't do experiments. Basically, we do observations.

Do black holes have sort of a life span? I mean, are there ends to black holes?

The types of black holes we've been talking about should keep growing. They'll run into material, either as they orbit the Milky Way or at the center of a galaxy, and they will accrete matter and grow.

So if that's the case, then in billions of years do black holes consume the universe?

It would be more than billions of years.

The sun will die way before that, then.

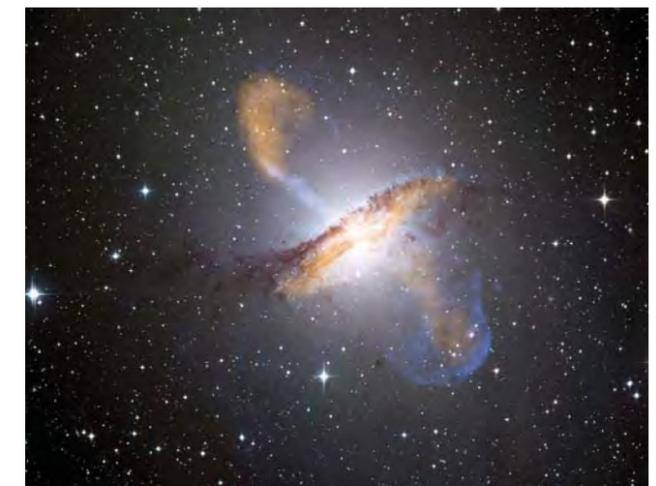
Oh yes, absolutely. We know that within about 4 or 5 billion years the sun will become a red giant and we will be very close to being inside it.

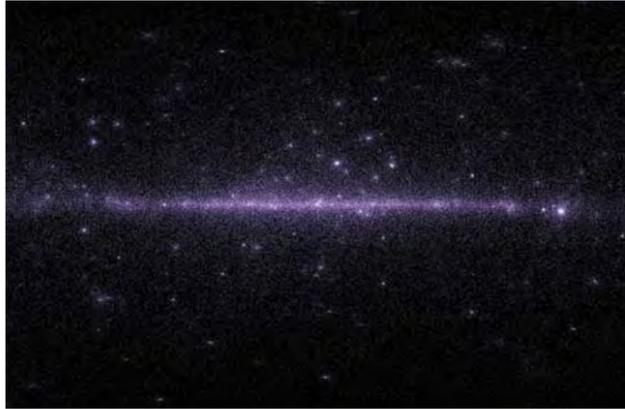
I wish I could be around for that.

It's kind of sobering. There's an episode of *Dr. Who*, the newest version, where he takes his girlfriend to see the end of Earth, the day the sun becomes a red giant.

Romantic.

Yeah. But anyway, that's a sure thing. There's an old joke about this. An astronomer is giving a talk to a community group and he says that in 4 or 5 billion years the sun will expand and engulf Earth. This woman in the back faints. They revive her and he says, "Well, gee, it's a long way off. Don't worry." And she says, "Well, what did you say?" And he says, "4 or 5 billion years." And she says, "Oh! I thought you said *million*."





GAMMA-RAY BURSTS

Jonathan Katz is a professor of astrophysics at Washington University in St. Louis and the author of the book *The Biggest Bangs*, which concerns gamma-ray bursts.

Vice: Please tell me just what a gamma-ray burst is.

Jonathan Katz: They were discovered almost 40 years ago, and they are brief bursts—“brief” means anything from a few tenths of a second to several minutes—of what we call gamma rays, which we can think of as basically somewhat higher-energy versions of what comes out of your dentist’s X-ray machine, coming from distant astronomical sources. For several decades, these sources were unidentified. Now we know that they come from very distant galaxies, or from components of very distant galaxies, usually from 90 percent of the way across the universe.

When they’re going off, gamma-ray bursts are more powerful than the whole regular light of a galaxy. Of course, they’re only going off for, typically, tens of seconds. About a dozen years ago it was discovered that they are followed by an emission of visible light, which fades over some hours or days. But for a period of hours or a day or two, the visible light is about as bright as a whole galaxy.

How could these possibly be a threat to us?

The question that people ask is what would happen if one went off in our own galaxy. Well, the first thing to remember is that it doesn’t happen very often. In a good-size galaxy like the one we’re in, there’s roughly one of these every million years. On the one hand, that means they hardly ever happen; on the other hand, our galaxy is about 10 billion years old, so it means there’s been about 10,000 of them in the age of the galaxy. The age of our solar system is about half that, so there have been about 5,000 of these in its life span. Really, the numbers are really very poorly known, but we can say it’s in the thousands. These of course are closer to home, and so one might ask if they are going to have any effect on us.

Are they?

The galaxy is like a disc. A lot of them are across on the other side, and some of them are on our side. Out of these 10,000 or so, there will of course be a few that are comparatively close. But “comparatively close” in this case means the closest ever was, probably, a few hundred light-years away. To set the scale of things, the closest star—other than the sun—is about four light-years away. So what would it have been like when that went off? Well, it would have been the brightest thing in the sky. It would have been brighter than Venus, but it wouldn’t have been as bright as the moon. It’s something you sure would have noticed, but it’s not something that was going to dazzle you.

How long would it last in the sky?

It would fade in a couple of days. There are things called supernovas, which are exploding stars that also can be brighter than Venus. There were two of them about 500 years ago, visible in the daytime, and at night visible for months to the naked eye. This was all before telescopes.

In fact, there have been none of them in our galaxy since the invention of the telescope, which is a bit of a pity. It gives you an idea of how often they go off nearby, too.

OK.

So, suppose we have one of these gamma-ray bursts as close as it’s ever been in the history of our galaxy. We’d probably see it in the daytime. It wouldn’t be as bright as the moon but it’d be pretty bright. Now, what about the gamma rays? Well, Earth’s atmosphere absorbs them, mostly in the top 1 percent of the atmosphere. People who study gamma rays have to put their instruments up on satellites. In the early days they put them up on balloons that floated very near the top of the atmosphere. Anyway, in the event of a gamma-ray burst we wouldn’t be irradiated to the ground. If it were really close, it would make some extra ozone in our upper atmosphere. But that also happens when the sun erupts in solar flares.

Right. Those are also something that people fear as potential bringers of doom.

It’s an ordinary thing, nothing terribly extraordinary. The other things people sometimes worry about are very energetic particles, which we call cosmic rays. It is possible that some of these are produced in gamma-ray bursts. Nobody really knows. These can be very penetrating—we get cosmic rays that hit the ground—and in fact much of the regular radiation dose that people get comes from cosmic rays. The rest of it, almost all of it, comes from natural radioactivity in rocks.

Oh, that’s interesting.

Yeah. And if you take a long high-altitude airplane flight you get a measurable extra dose of cosmic rays. If you live in Colorado you get a measurable extra dose.

So pilots and air stewards are getting constant doses of cosmic rays?

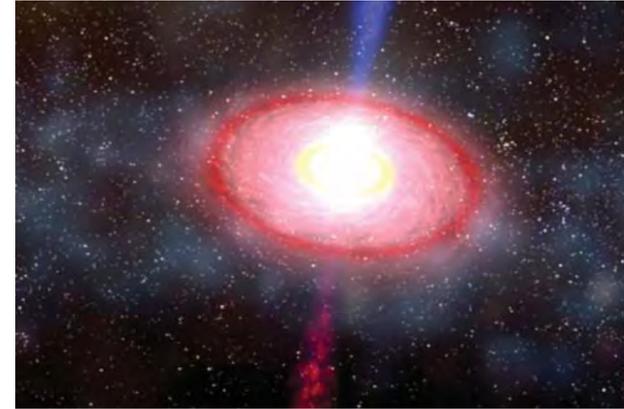
Oh yeah, they are. They have a total radiation exposure that’s quite a bit bigger than that of those of us who live on the ground and only go up in the air a few times a year. It doesn’t seem to hurt them, but it’s certainly measurable.

There’s a hypothesis that one of Earth’s minor extinctions—the Silurian Ireviken—could have been the result of a gamma-ray burst.

Yeah, people have said that, but it’s hard to see how it could have killed things off. And let me point out something: Supposedly, the rays from a gamma-ray burst all come at once, and they’re all coming in one direction. So the other side of Earth, so to speak, the side that’s pointing away from such a burst, is completely shielded. It isn’t affected at all. If you want my favorite cosmic catastrophe, it’s the comet, asteroid, or meteorite.

That’s what our black-hole expert told us as well.

It’s what killed off the dinosaurs 65 million years ago. Sooner or later, something will hit Earth. It’s like blindfolding yourself and throwing darts at a dartboard. Every now and again you’re going to hit it.



Right.

The real cosmic catastrophe I’d worry about is the comet, more than the asteroid, for the following reason: You can track asteroids a long way in advance. But comets don’t become detectable until a few months before they’re in the inner solar system. Asteroids are on orbits that go out to Mars and maybe partway to Jupiter and so on, so they’re never that far from the sun, and so they’re never incredibly dim, and so you can observe them using modern telescopes. Gradually you make a more and more complete catalogue of smaller and smaller ones and measure the orbits more and more accurately, and eventually—we’re not there yet—but eventually we’ll have all the ones that are big enough to really endanger us catalogued and we’ll know in advance which ones might be a danger and we’ll track those more carefully.

But comets don’t have such small orbits.

Comets come from way, way out in the solar system, far beyond the orbit of Pluto, and in a completely unpredictable way. At this distance they’re so dark they’re completely unobservable, because there’s not much sunlight out there. And so we don’t discover them, and they can come from any direction.

So with a comet, it enters our inner solar system and we say, “Oh, we’ve got about two months”?

Something like that, right. And if it happens to be on a collision course with us, that’s probably not enough time. Even if we’re prepared, even if we have a rocket somewhere with a nuclear explosive on it and we’re all ready for this, it’s probably not going to give it a big enough push. Remember, the closer it is when you detect it, the bigger push you’ve got to give it.

OK, so just to confirm: As someone who knows a lot about gamma-ray bursts, you’re telling me that near-Earth objects are a much more viable doomsday scenario.

They’re a much more serious problem, yes. Comets in particular. It’s probably about one chance in 100 million in a year.

Was there an epiphanic moment when you decided you were going to become an astrophysicist?

I was an undergraduate at Cornell when these things called pulsars were discovered. They’re stars that are about the same mass as the sun, but only about ten kilometers across. So they’re very dense, very small, and they rotate very fast. They give out regular pulses of radio radiation. The analogy people always use, and it’s a good one, is it’s like a light on a lighthouse, a beam, going round and round.

So like a lighthouse, it’s rhythmic and measurable—

Yeah, very periodic. This was discovered my first year in college, and it turned out that a number of the people who were doing theoretical astronomy were there at Cornell. I was actually interested mostly in physics at the time, but this was really exciting. Pulsars weren’t discovered at Cornell, they were discovered in England, but they were

immediately studied with the world’s biggest radio telescope, which Cornell ran. It became a center for the theoretical study, as well as the experimental-operational study of these things. Being at the center of interpreting a major discovery was really exciting.

So you weren’t majoring in astrophysics at first?

I was majoring in physics. But with physics and astronomy, there’s a big overlap. It was mostly physicists who were working on this. I got drawn into it and then ended up making my career in it. Now, I’m working on quite different applied-physics problems today.

What’s your daily focus now?

At the moment I’m involved in a collaboration that’s doing an experiment on the flow of drilling mud through oil wells.

Oh, speaking of catastrophes and doomsday.

Yeah, it is rather topical. We were able to predict that when they first attempted to do what they called a top kill on the BP well, it wasn’t going to work because the stuff they injected would get spat out. And that’s precisely what happened. Now that they have the well capped, nothing can get spat out. It’s going to work, and it’s all under control.

When I was looking into you before we spoke, I read this article that you wrote 11 years ago called “Don’t Become a Scientist.” It talks about a different kind of catastrophe, which is the shrinking of the scientific community in terms of jobs.

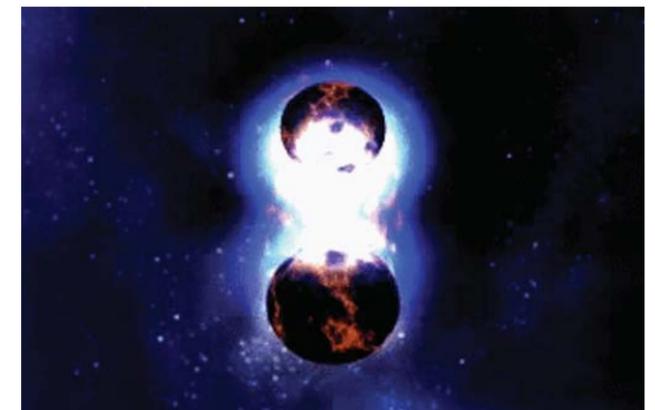
We suffer from the fact that there’s a concerted effort on the part of all sorts of leaders of communities to try to get young people into science. You never hear the end of it: “We need more people studying science!” Blah blah blah. And now too many people want to become scientists, but it makes no sense to train people for whom there are no jobs. It’s like training doctors if there aren’t going to be patients. It makes no sense. We’ve created a situation where there’s a permanent oversupply because, let’s face it, society doesn’t need that many scientists. We need a certain number, but more beyond that isn’t better, it’s worse, because it creates this awful scramble for jobs, and it means that the very best and most ambitious people don’t go into science because the job prospects are so dubious.

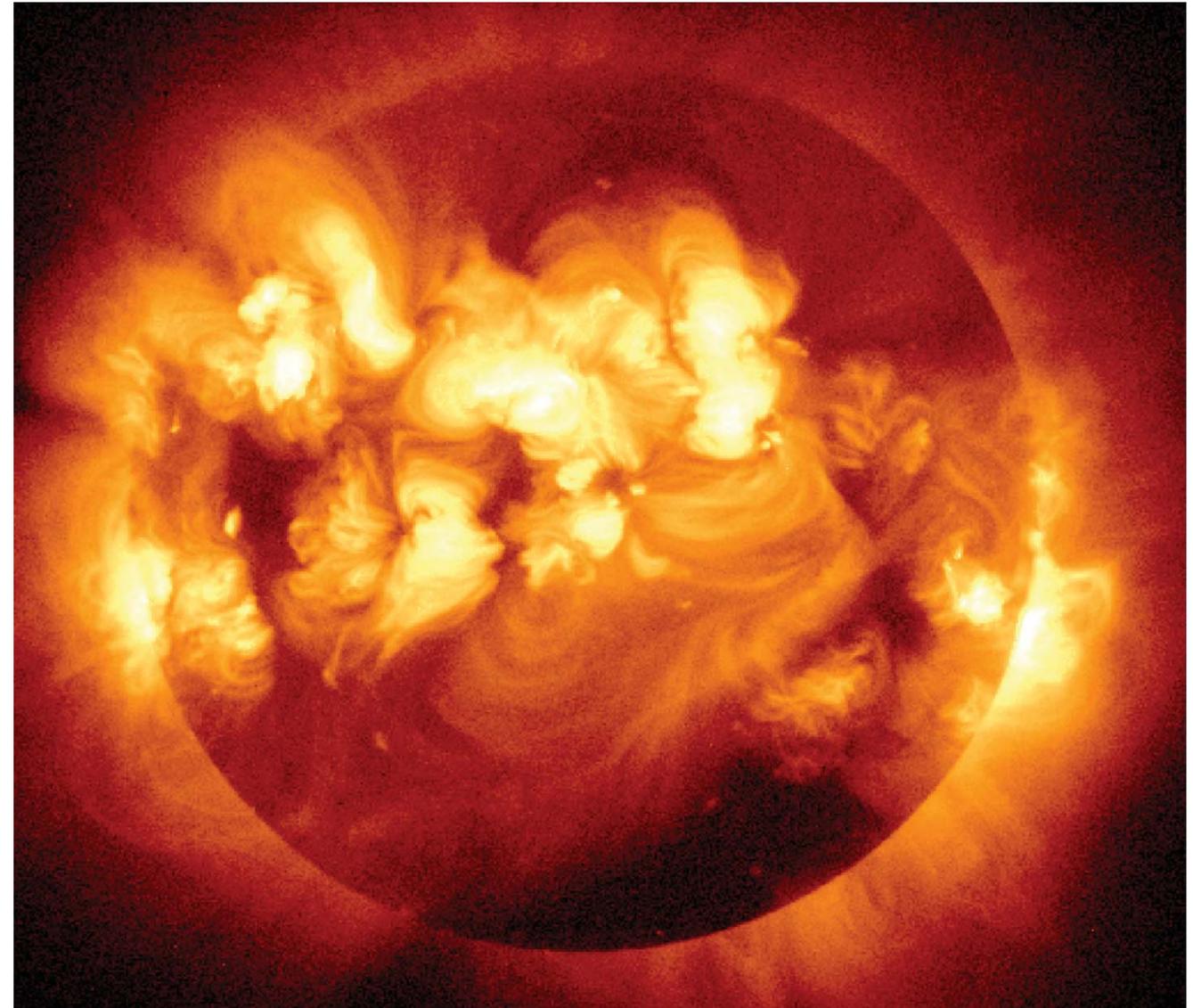
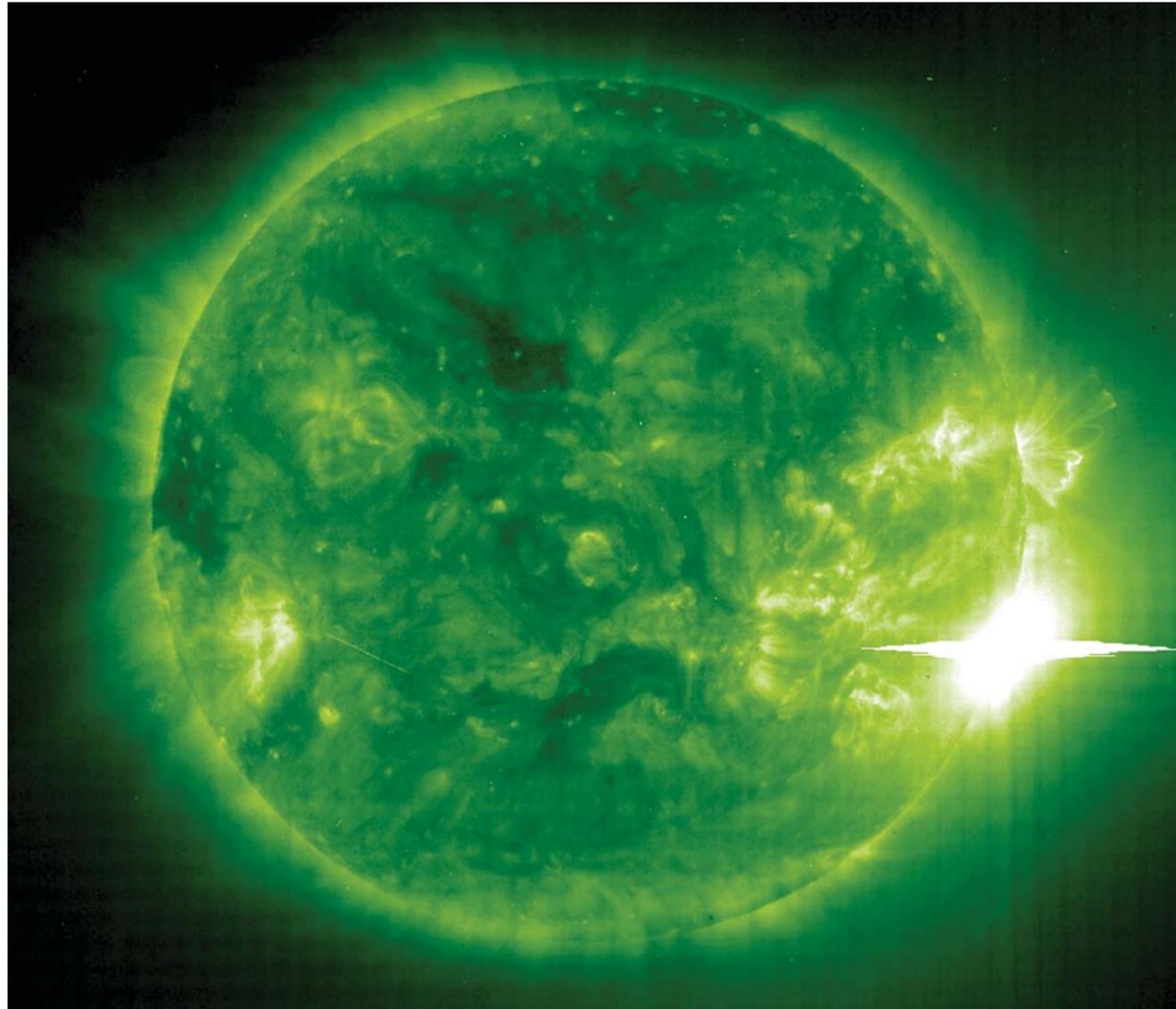
So you stand by that article 11 years later?

Absolutely! It’s still valid, and one of the worst consequences of training too many scientists is that we don’t turn the few people who really ought to become scientists into scientists. I get emails once or twice a week from somebody who’s read that article. “Is it really this bad?” they ask. I say, “Yes, it is.” The saddest ones are the people who say, “You’ve ruined my dream.” Well, I’m sorry. Better it’s ruined by spending ten minutes reading my essays rather than by spending ten years of your life trying to get a permanent job.

You’re a realist.

I think I should be. That’s what science is supposed to be about. The world.





SOLAR FLARES

Markus Aschwanden is the author of *Physics of the Solar Corona*. He is an adjunct professor of physics and astronomy at Rice University. From 2004 to 2005, he was a member of NASA's Sun-Earth Connection Roadmap team.

Vice: Can you give me a quick Solar Flares 101?

Markus Aschwanden: The sun doesn't have a solid surface. It rotates at different speeds at different latitudes. That is one reason why it has much stronger magnetic fields than Earth, and why such violent processes happen when the magnetic field gets crazy out there. Inside the sun, there is a dynamo that constantly creates new magnetic fields—very strong fields, which bubble to the surface and create these dipolar magnetic fields that pop up and look like beautiful loops. They then get constantly twisted and sheared, and once they get too twisted they break, at which point they create huge amounts of magnetic and electric energy. This is the reason for solar flares. The fields they create are so strong that particles get accelerated to really high energies, and some of them escape the sun and travel to Earth. Astronauts are not supposed to get high doses of these high-energy particles. They can knock out satellites or GPS.

How frequently do they happen?

Well, they come in bunches. We're just ramping up to the solar maximum, which comes around every 11 years. That's how frequently the magnetic field reverses within the sun. It's fascinating—the solar dynamo creates magnetic fields like crazy, and the field just kind of breaks apart and the south and north poles switch.

So once that polar shift happens on the sun, the cycle begins again and it rebuilds to the solar maximum?

Right. Also, the rotations inside the sun are so complex. Different layers rotate at different speeds. That gives it a lot of friction and that produces the electric field, so that's the solar dynamo.

Is the dynamo sort of the battery of the sun?

Yeah, exactly, and it constantly charges itself as the different layers rotate at different speeds.

What do you think of the doomsday scenarios that have arisen around solar flares? Is it just sensationalism, or is there anything to it?

Sometimes there are really huge events. The worst that can happen is that maybe the power grid here on Earth would get disrupted or

communications could break down for a couple hours. They've also knocked out satellites.

Is it sort of like an EMP?

Yeah, because the particles enter these currents in the ionosphere and these currents charge up satellites.

You know, a lot of the more extreme survivalist types believe in the possibility of a solar flare shutting down the power grid of the Western world and society being thrown into chaos as a result of that.

There are a lot of security systems that rely on our power grid. And it is rare that a ripple will shut something down, but it happens occasionally. Five years ago there was a ripple on the East Coast and it wiped out a third of the electric grids. But that was not caused by a solar flare.

I live in Manhattan and was here for that blackout. People simply dealt with it. Society did not collapse. Looking back, it was all drum circles. The city devolved into Burning Man for a night.

Certainly it's not life-threatening. It's more an annoyance. But the point is that we are vulnerable because we have so many electronics that are controlled from spacecraft. Twenty years ago we

were not so dependent. There was hardly a telecommunications satellite up there. But now GPS, cell phones... everything depends on satellites.

I'm getting the sense from talking to various astrophysicists about their areas of expertise that we don't have much to fear from these astrophysical phenomena.

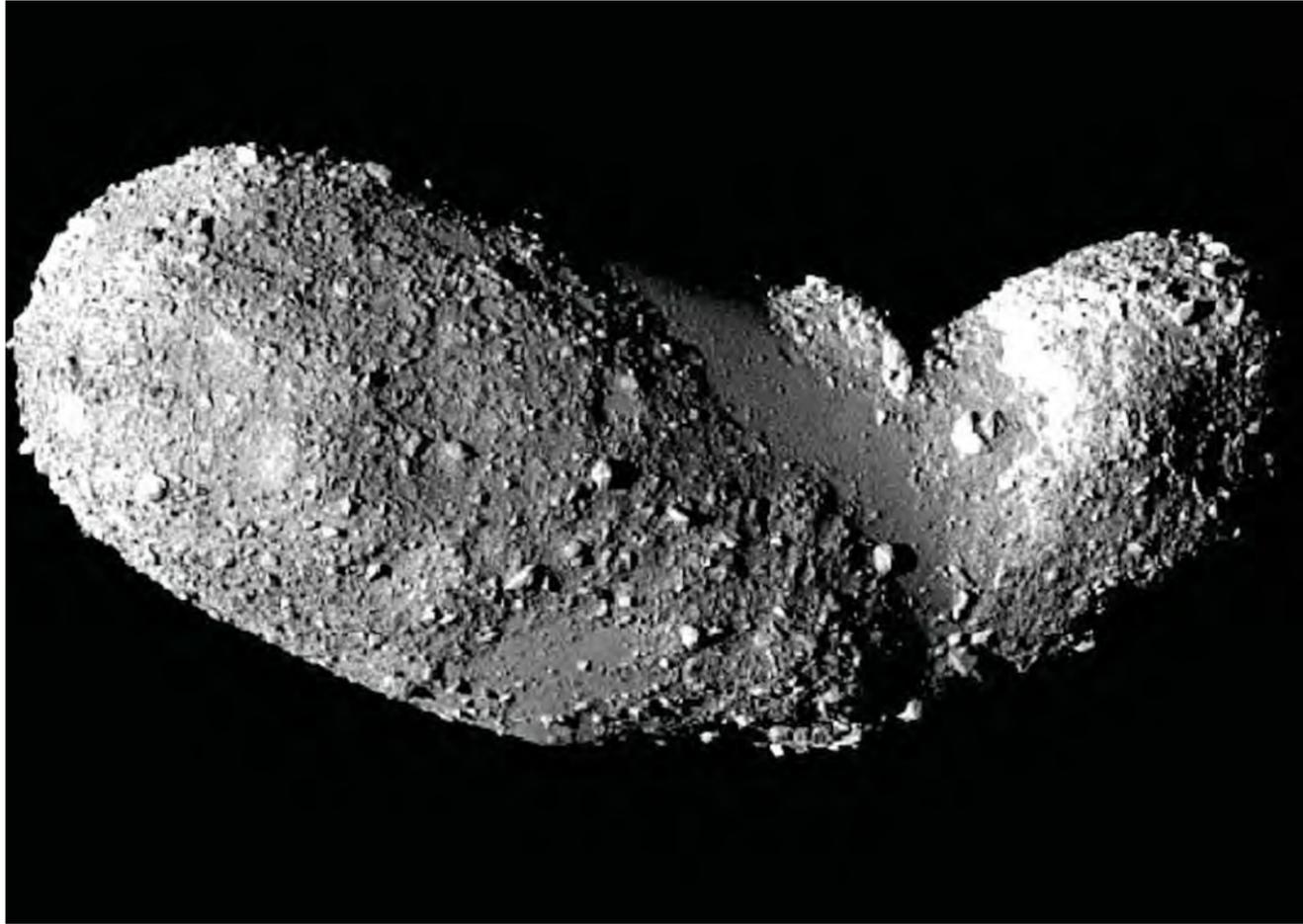
No, they are all so far away.

Do you know when you decided to become an astrophysicist?

When I was a teenager, a friend and I would build telescopes together. We were curious to see what was out there. It was fascinating, how a poor man with \$100 could build a telescope and see the moon 100 times bigger, could see every crater.

What's your relationship with science fiction like?

When I was a teenager, I was reading all of it that I could get. It was very inspiring. But then later, when I became a scientist, I also became more interested in the real thing. Though my children still favor fiction over real astronomy. I tell them, "I could show you footage of a real solar flare," and they say, "Oh no, we prefer *Star Trek*."



NEAR-EARTH OBJECTS

Dave Williams works at NASA's Goddard Space Flight Center in Maryland. He is a part of the National Space Science Data Center, which is NASA's deep archive for spacecraft data. Dave is in charge of planetary and lunar data.

Vice: I'm starting to get the sense that asteroids and comets are the most feasible space-generated doom bringers.

Dave Williams: Yeah, asteroids seem to be the one doomsday scenario that's at least on the radar. Some of these other things are sort of pie-in-the-sky. The difference between all those things and asteroids is that asteroids have hit Earth in the past—and they're all around us today.

Isn't the Chesapeake Bay partially an asteroid crater?

There is a large asteroid crater in the Chesapeake Bay. It didn't form it, but it did probably influence its shape and size.

And of course, one of the most accepted theories for the extinction of the dinosaurs is an asteroid strike.

Exactly right. It's definitely something that has happened in the past and will happen in the future. There are asteroid strikes every day, but asteroids can be anything down to the size of a piece of dust, technically. There's no real cutoff. And anytime you see a meteor or a meteor shower, you're basically seeing material coming into Earth's atmosphere. Luckily, most of that stuff is tiny.

And then, once in a great while, something significant hits.

Sure. For example, there is a roughly 30-mile-diameter crater in Tajikistan. It's called Kara-kul. The estimated age is roughly 5 million years. Now, that's a long, long time when imagined by humans, but in

geologic time, it's nothing. It's yesterday. In fact, the impact that caused the Chesapeake Bay crater was about 36 million years ago and it's about 90 kilometers in diameter. That's relatively ancient, at least.

When we talk about the catastrophic effects of something like this, we're talking mostly about the debris it sends into the atmosphere. Those effects are more lethal in the long-term than the impact.

Yes, definitely. Whether it hits on land or in the ocean—because it's more likely to hit in the ocean just because more of Earth is ocean—it will throw up a tremendous amount of material. Also, when you think of the size of some of these large asteroids like the dinosaur-extinction-type, if it hits in the ocean, it can plow right through to the bottom. In that case, it sends debris way up into the stratosphere, and it stays there for a really long time. Every ecosystem on Earth would be dramatically affected.

I've been told that comets are scarier than asteroids as near-Earth objects because they're unpredictable.

Asteroids are mostly concentrated in the main belt between Mars and Jupiter. That's pretty close. Every once in a while, usually when Jupiter perturbs an asteroid, it will change its orbit. But they basically keep an elliptical orbit that's not really eccentric. In other words, it's an oval but not too squashed. So you can count them and you can keep track of them. Comets come from way out beyond Neptune, and they can come in at any angle. That's why every once in a while there's all this excitement because you discover a comet like Hale-Bopp. No one knew it existed. It was way out there and then all of a sudden it comes in. We're not going to find a huge asteroid, all of a sudden, out of nowhere. In fact, we're putting a lot of effort into cataloguing the orbits for all of the asteroids that are any threat to Earth. There's no chance that we

could catalogue every comet. One could appear at anytime from somewhere way out in the solar system. There could be something with a 10,000-year orbit or a 100,000-year orbit.

And it's heading back our way.

Or it's been out there in the Kuiper belt or the Oort cloud and it got perturbed and it's on its way in right now.

The major asteroid that's being tracked right now, the one that's known as Apophis, is supposed to come very close to us in 2029 and then possibly impact us in 2036. Is that right?

That's right. It is within statistical probability that it could hit Earth, although the probability is really small. We'll know a lot better in ten years or so. The thing about tracking asteroids and comets is, the more time that goes by and the longer of a baseline track you have, the better able you are to determine where it's going to go next. It's just like any equation: The more information you have, the closer you can get to solving it. It's almost certain that as time goes on, this asteroid's probability to impact Earth will diminish.

But however farfetched, that is threat number one right now—ruling out some comet that could get blasted out of the Oort cloud at us.

Yeah, I guess that is a fair statement. As far as we know, Apophis is the one to watch.

Can you tell me a little about what your daily work is like?

In our archives, we've got data from back in the Apollo, Mariner, and Viking days up to the Mars Rovers and the Messenger and everything that's going on now. The nice thing about it for me is that I get to be a little bit involved in every planetary and lunar mission that comes along. We also put up information about these missions to aid in the study of asteroids and comets. Over the years, people have seen my name on these various webpages and sent me questions, and so I started doing these fact sheets just to say, "Take a look here, it's all the information you need."

How much energy and time do you think NASA spends on keeping up with potential near-Earth objects that could be catastrophic in nature? That's a good question.

A lot of people think that worrying about asteroids is sheer alarmist paranoia.

It is a very hard question to answer because the odds of an asteroid large enough to do some damage hitting Earth are really, really tiny. But then again, the consequences are so incredible that if the odds are not zero then we really should be paying attention. Right now, the most important thing to do—and the most cost-effective thing—is to try to find everything. In other words, try to track every large asteroid that is anywhere near Earth's orbit, and figure out what its orbit is, to be able to cross it off the list. "OK, this one's not a threat. Oh, we found another one... and now this one's not a threat." The nice thing about that, too, is that it's very scientifically useful because the distribution and size of asteroids can tell us a lot about how the solar system formed and how its dynamics work. Now, the idea of mitigation, and I get asked this a lot, like what is NASA going to do if they find an asteroid heading toward Earth and it's definitely going to hit Earth? We have nothing in place right now. Maybe that makes sense. We may not need it for 10 million years.

It would be hard to justify to taxpayers, I'm sure.

Right, exactly.

How far back does your interest in these things go?

When I was a kid I had a big poster of the solar system on my wall and I was always collecting rocks. I loved science. When I was an undergraduate I started doing physics and kind of decided that physics is really neat but after a while everything was just frictionless this and massless that—all these perfect systems. I really like to apply things. My college had a geophysics program, so I switched over to that and I've sort of done that ever since—applying geophysics to other planets.

That's interesting. It's sort of theoretical and not theoretical.

Exactly. When you're dealing with rocks and the crust and the mantle and gravity and things, all of a sudden everything gets a little messy, which to me is a lot more interesting and fun.

Since you know geophysics I may as well bring this up with you. After researching all of these potential astrophysical doomsday scenarios, it seems that a more valid scenario for catastrophe is actually a terrestrial thing—the Yellowstone Caldera.

Yeah, that's true. We know with plate tectonics that something like Krakatoa, for example, simply has to happen. There's no way around it. And these things have to happen on the timescale of at least tens or hundreds of thousands of years. Yellowstone, at some point, is going to do something. No one knows the timescale, but that is a definite thing. And Yellowstone is just one. There are other possibilities. There could be a massive landslide on the slope of the Big Island of Hawaii. This would cause a tsunami to dwarf all tsunamis that we have any experience with.

Something has to come due, basically, whether it's earthbound or from space.

Yeah, statistically, it's going to happen. But we're probably not going to be surprised. The odds of something hitting Earth in the next 20 years are very, very close to zero. The odds of something hitting Earth, something large enough to really get our attention, in the next 100 million years is almost 100 percent. But whether that's 200 years from now or 20 million years from now, there's no telling.

A cynic would say that we're a lot more likely to destroy each other before something else destroys us.

I would have to agree with that. The average person is more likely to die in a car crash or falling off a ladder. If you're going to worry about things, you should eat better and get more exercise.

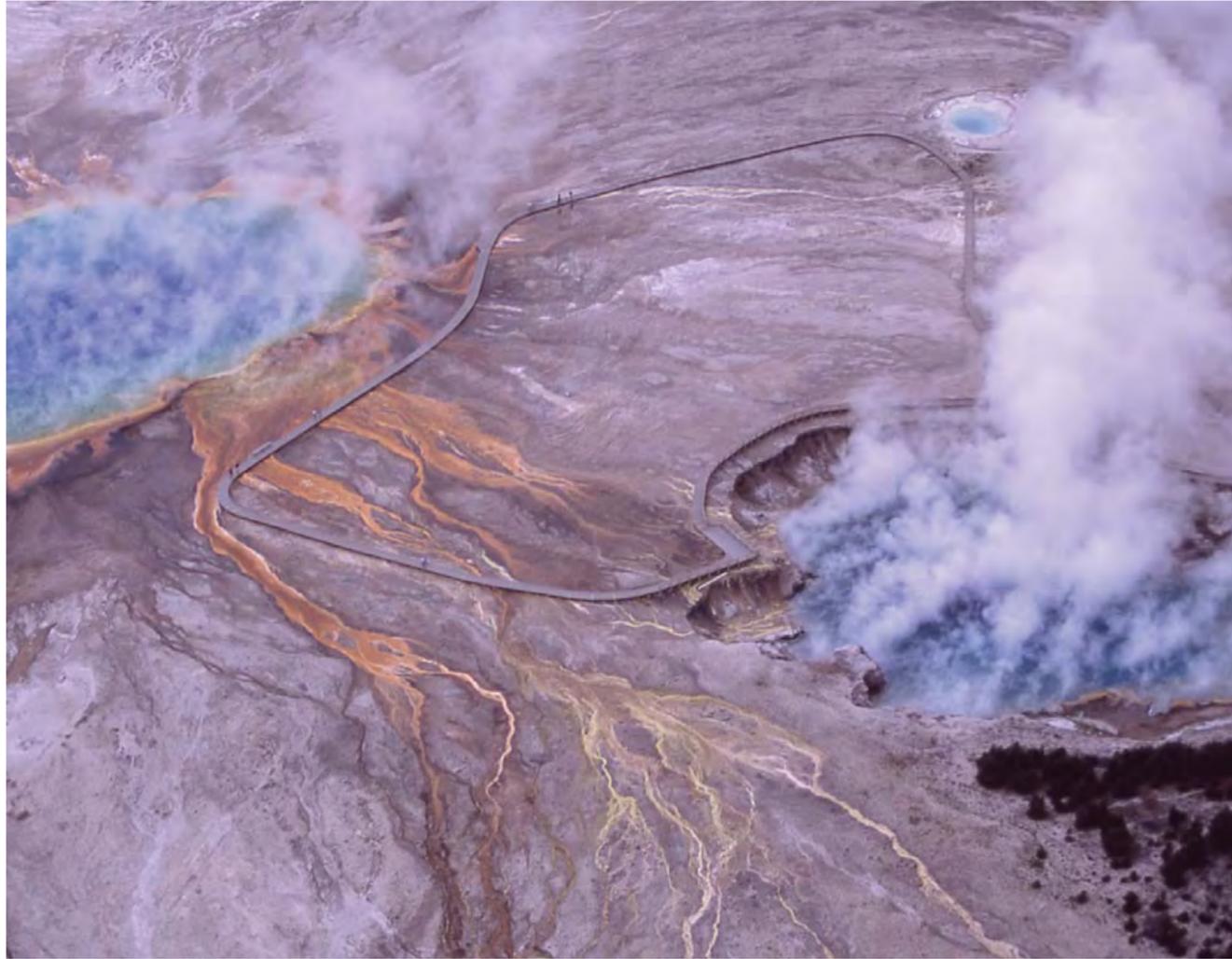
It's interesting that often when science enters popular culture in terms of entertainment, it's about Earth being laid to waste.

It's too bad. And you know, there is actually a fairly new idea—meaning it was conceived within the last 20 or 30 years—that large impacts play a real role in Earth. The idea before was basically that the planet evolved tectonically and geologically and also that life on Earth evolved in this certain way but now we're really thinking that there is this random component, that these asteroids—*boom!*—come in and all of a sudden there's a mass extinction and all these niches are changed and all these new life-forms come in and take over. To me, it's absolutely a fascinating thing.

So the idea is to look at asteroids as a contributing factor to evolution. Like, maybe we wouldn't be here without them.

Without asteroids, who knows? Maybe we'd have smart dinosaurs. We would have a very different world.





YELLOWSTONE CALDERA

Paul Doss is a scientist at the Yellowstone Volcano Observatory and a professor of geology and physics at the University of Southern Indiana.

Vice: I guess what I'd like to know first is the distinction between a caldera and a volcano.

Paul Doss: "Volcano" would be the very general term to describe any surface landform where magma from Earth's crust or deeper can get out onto Earth's surface. A caldera is basically one type of volcanic landform, just like shield volcanoes or strata volcanoes are other types of volcanic landforms.

And what is distinctive about calderas?

Most of the time when people conjure up an image of a volcano, they see an image of a high-peaked mountain, which is built up from the discharge of magma or lava. A caldera is where the eruptions tend to be large enough and significant enough that the chamber that was holding all of the magma underneath Earth's surface kind of empties out and all of the support for the crust is gone, so it collapses.

How rare are calderas?

On the scale of Yellowstone, very. But simply as landforms, they're not very rare. A number of the volcanoes in the Aleutian Islands have caldera landforms. Crater Lake, another national park in Oregon, is actually a caldera. A lot of the volcanoes in Indonesia and other areas of the South Pacific have caldera forms. But a caldera of the scale of Yellowstone is essentially unheard of.

Please tell me a little bit about the scale of the Yellowstone caldera.

Uh... [laughs] It's remarkable! It's unique, it's unparalleled, it's breathtaking.

There is nothing like it on Earth.

That's right. When you stand next to it or on it, it doesn't have as striking an appearance as, say, Crater Lake does. That's because it is such a big volcano. After its last catastrophic eruption, the caldera got filled up by lava flows that followed. So the very dramatic basin or collapse crater that you might see in a normal caldera, you don't see that out there because it's so big that you simply can't capture it all in your field of view and also because large parts of it have been filled up in the ensuing time.

Did that lack of a classic caldera shape make it hard to discover?

It did hamper its understanding, make it a bit more of a detective story. Some geologists in the first half of the 1900s hypothesized that there was a big volcano there. But the true scale of the beast, if you will, was figured out by an outstanding geologist named Bob Christiansen, who recently retired from the US Geological Survey. He's the one who, back in the 1960s, did most of the geologic mapping in Yellowstone. He found that it was the rocks that told the story, and he's the one who weaved that story together.

Can you give me some sort of idea of the dimensions of the caldera?

It's not circular, so you can't give one dimension that precisely describes it. But it is 30 miles across, kind of, from north to south, and 40 to 45 miles across, northeast to southwest. It's got kind of an

ovoid shape. In areas where there are segments of the caldera wall that are still exposed, you know you're on the scale of a thousand to a couple thousand of feet vertically that represent the collapse.

And is there any kind of way to measure or even hypothesize the volume of the caldera's last eruption?

What has been done is the quantifying of the material that was ejected from the volcano in its last eruption. It's painstakingly difficult to do. You look at the rocks that were produced, and you measure how thick and widespread they are, and then you calculate volume.

But didn't the surface area covered in Yellowstone's last catastrophic eruption stretch all the way down to the southern states?

Yes. "Tuff" is the name that geologists give to rocks that are produced from volcanic ash. Some of the recent tuffs from Yellowstone have been found in the Gulf of Mexico, Missouri, Iowa, and Louisiana.

When was Yellowstone's last catastrophic eruption?

It's called the Lava Creek eruption, and it was about 600,000 years ago. You've probably seen pictures of the Mount St. Helens eruption that happened in 1980? That eruption ejected 0.3 cubic meters. Yellowstone's Lava Creek eruption was 1,000 cubic meters.

Wow. So I guess that brings us nicely to the next topic, which is, what sort of a time line is at play here?

There isn't any evidence right now that one of these catastrophic caldera eruptions is imminent. In fact, most of the data suggests the opposite. We have evidence that the kind of magma in the subsurface that would create these very explosive eruptions is actually solidifying and crystallizing.

OK... I don't know why, but I almost feel disappointed.

Now, there is data that suggests a different kind of magma is actively being injected into the magma chamber. It's called basaltic magma. The Yellowstone caldera system has a history of having these big, wild-factor, catastrophic eruptions, and these are followed by a whole bunch of basalt. So for example, Idaho, which used to be on top of where Yellowstone is now, is covered with basalt. That's why it grows good potatoes. I don't know that it would be a surprise to anybody if there were basaltic lava flows erupting in Yellowstone in the short term.

How serious can those be?

They're not going to be explosive. They're going to be more along the lines of what we see in Hawai'i Volcanoes National Park. But there are a couple of greater risks in Yellowstone. One of them is catastrophic earthquakes and one is steam-type explosions.

Let's start with the earthquakes.

The Yellowstone area is the second-most seismically active in the lower 48 states, after California. Yellowstone has, on average, a couple of thousand earthquakes every year. Most of them are pretty small and not really felt, but in 1959, there was a massive earthquake right next to Yellowstone that had a number of human tragedies associated with it. It generated significant landslides and landslides. Nobody in the scientific community has the ability to predict earthquakes, but that I think most everybody recognizes the potential for large, significant earthquakes in Yellowstone.

And it's much more of an imminent possibility than the caldera going off?

Absolutely.

And what can you tell me about steam explosions? I haven't really read much about those.

In the field, there's been a relatively recent recognition of the hazard associated with those. The whole idea is that the geyser systems and the hot-spring systems in Yellowstone deposit this stuff called sinter on the surface. It's sinter that builds the cones around the geysers and hot springs. Sometimes it can form a seal over the hot water, and it becomes like a pressure cooker. The water can be superheated to the point where it can blow its top. Now, we know they have them, we know they exist, and we see them all over the park. Some little ones have happened in the last decade or so. There is even evidence that some of them are on the floor of Yellowstone Lake. That's where some

of the attention is focused now, because in the park the lakes can be 100 feet deep and that water already applies a big pressure to the bottom. If something were to happen, like an earthquake, that reduced the level of Yellowstone Lake instantaneously, it would be like taking the lid off the pressure cooker. The water could flash to steam and cause a significant explosion. In fact, there is some evidence around Yellowstone Lake of tsunami deposits—tsunamis that could have formed as a result of these lake-bottom hydrothermal explosions.

Are Yellowstone's geysers sort of symptomatic of the caldera beneath the surface?

That's exactly right. They are how we know Yellowstone to be an active volcano. There are gases that are emanating from the magma that are being discharged in Yellowstone.

Even though it is not a possibility for a very long time, could you humor me and tell me what the potential doomsday scenario would be if the caldera were to go?

Life as we know it would cease. Food would be in short supply because agriculture would fundamentally change in the United States. Any large-scale agriculture would cease at least temporarily, throughout the midcontinent. There would be a period of climatic cooling because the particulate material ejected into the upper levels of the atmosphere would induce incoming solar radiation. Even the Mount Pinatubo eruption in 1991 generated measurable global cooling. Are you familiar with that one?

Only a bit.

It was relatively large eruption at the Clark Air Base in the Philippines, and it only generated seven cubic meters of erupted material.

Compared with a potential 1,000 from Yellowstone.

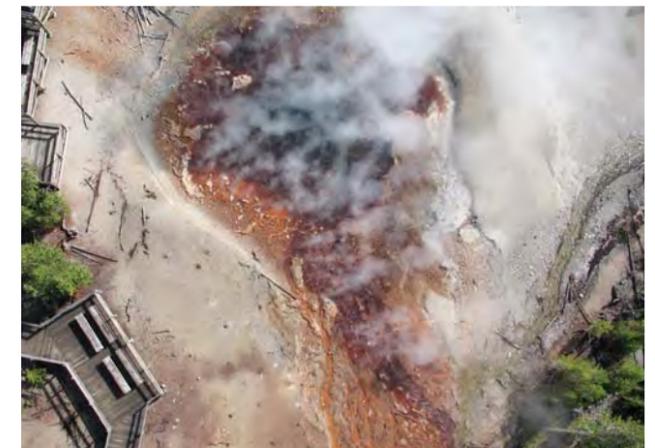
I remember once Yellowstone Park received a letter from a senator from Illinois. This was after a couple of big doomsday films came out in the late 1990s. They generated a lot of fear, and federal representatives were being contacted by their constituents who were saying, "We are going to lose our farm if this thing erupts!" So a senator mailed a letter to the superintendent of Yellowstone.

Saying what? "You guys need to handle this shit?"

Basically, yeah. They'd say that their constituents were concerned and ask what they could tell them and what we were doing. The superintendent turned to the park geologist and said, "Write me a letter in response." But you can't do anything. There's nothing that could stop the caldera. In fact, yeah, agriculture in Illinois probably would not happen if the caldera were to erupt on the scale it has in the past.

Yellowstone is incredibly volatile in so many ways.

It's wild, man! It's wild! It is the epitome of wildness, with all of its beauty as well as all of its risks. ■



Powers of Ten

BY JOHN KLEINER

10⁰—9:45 AM, August 28, 2007, 11th hole of Odana Hills Golf Course, Madison, Wisconsin. Lightning strikes Francis Adams, killing him instantly. “It’s maybe a wake-up call, a sad reminder that lightning really is something you don’t want to goof around with,” notes Ray Shane of the Madison Parks Department.

10¹—12:30 PM, January 15, 1919, 529 Commercial Street, Boston. A 58-foot cast-iron tank at the Purity Distilling Company bursts open, releasing 2.3 million gallons of molasses. A wave of syrupy goo, estimated at between eight and 40 feet tall, sweeps an elevated train from its tracks, demolishes several buildings, and tosses a truck into Boston Harbor. Twenty-one people drown.

10²—April 22, 1848, Victoria Strait near King William Island in the Canadian Arctic. The crews of the HMS *Terror* and the HMS *Erebus* abandon their ships, which have been frozen into the ice pack for nearly two years. The men have been searching, fruitlessly, for a Northwest Passage since 1845. All 128 perish somewhere out on the ice. There are rumors, gathered from Inuits who claim to have encountered the survivors, that the group resorted to cannibalism.

10³—August 21, 1986, Lake Nyos, Cameroon. 1.8 million tons of dissolved carbon dioxide is suddenly released from the lake in one gigantic burp. The gas, which is 1.5 times heavier than air, pours into neighboring valleys, where it suffocates livestock and people, many of them in their sleep. Joseph Nkwain, a survivor from the village of Subum, recalls his awakening: “I was surprised to see that my trousers were red, had some stains like honey. I saw some starchy mess on my body. My arms had some wounds. I didn’t really know how I got these wounds. I opened the door. I wanted to speak, my breath would not come out.” The death toll reaches 1,700.

10⁴—September 19, 1788, Careensebeș, Romania. Austrian hussars preparing to fight the Ottomans cross the Timis bridge, where they encounter Wallachian peasants selling schnapps. Some hours later the infantry arrive, also wanting liquor, only to be repulsed by the inebriated hussars. In the confusion, cries of “Halt! Halt!” are misinterpreted as “Allah! Allah!” leading to a generalized impression that the Ottomans are attacking. By daybreak, 10,000 Austrian troops have killed one another. Emperor Joseph II is dispirited. He writes to his brother, “I know not how to continue. I have lost my sleep and spend the night with dark thoughts.”

10⁵—10:24, November 1, 1755, Lisbon. An earthquake estimated at nine on the Richter scale shakes the city for six minutes, toppling most of it. Fifteen-foot fissures run through the center of town. Crowds gather at the harbor, where the water level has mysteriously receded. When, subsequently, a tsunami strikes, most of the bystanders are swept out to sea. Fire follows. Up to 100,000 people die in Lisbon and coastal areas of Morocco.

10⁶—1845-48, Ireland. The Irish Potato Famine, sometimes referred as the Great Famine, the Great Hunger, or the Bad Life, follows the arrival in Connemara of *Phytophthora infestans*, commonly known as late blight, in October 1845. The fungus, imported to Europe from the United States in a shipment of seed potatoes bound for Belgium, wipes out the crop on which a third of the population depends. Around a million Irish starve to death. In his book *The Irish Crisis*, published in 1848, Charles Trevelyan, the treasury secretary who directed the English relief effort, describes the famine as “a direct stroke of an all-wise and all-merciful Providence.”

10⁷—1959, People’s Republic of China. Chairman Mao Zedong announces the Great Leap Forward or, in Chinese, 大躍進. He proclaims that China will overtake Britain in production of steel and other products within 15 years. A year later, Mao radically revises the time line—now, what was to be accomplished in 15 years is to be accomplished in just one. In the great rush of enthusiasm—or fear—agricultural workers devote themselves to building backyard furnaces. In many parts of the country, grain rots in the field. Fictional surpluses are sold abroad. By the spring of 1959, the Chinese are starving. Some 30 million die of famine; another 500,000 are executed.

10⁸—2 AM, October 12, 1492, the New World. Seeing the Taíno for the first time, Christopher Columbus is struck by their good looks. Writing in his log, he notes, “All of those whom I saw were young men—for I saw no one of an age greater than 30 years—very well made, with very handsome and beautiful bodies and very pleasant features... They do not bear arms, nor do they know them, for I showed them swords, and out of ignorance, they took them by the edge and cut themselves.” In the course of European colonization, some 100 million natives perish, and the population of the Americas falls by as much as 98 percent. It is mainly the new diseases, small pox and measles, that make the genocide possible. ■

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