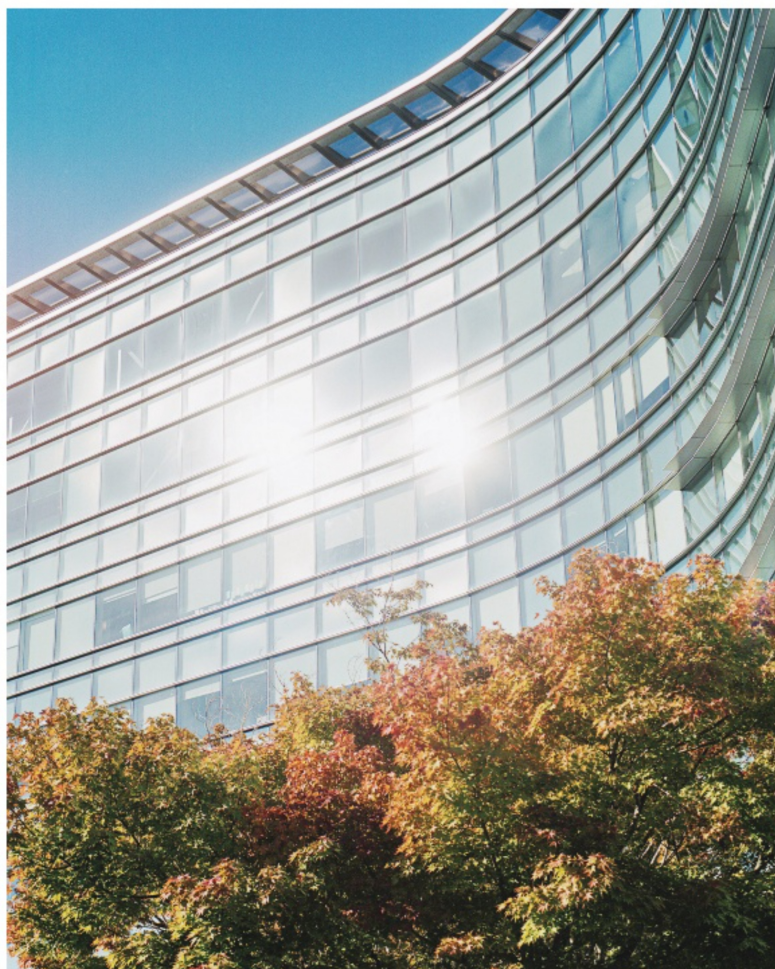


UNDER THE DOME

A chronicle of a climate disaster in slow motion.

BY JAMES ROSS GARDNER



The high winds that make up the polar jet stream encircle the Northern Hemisphere like a loosely draped rope. There are typically four or six curves in the rope, the result of the temperature differences between the equator and the North Pole. The pattern of these curves is usually predictable, the weather associated with them—warm or cold spells, rain or snow—sticking around for a week or two, unless a significant event disrupts it. On June 20th, a tropical depression that appeared in the western Pacific, near Micronesia, may have been the beginning of such a disruption. The next day, as the tropical depression moved northwest, past

Guam, it gathered enough force—sustained winds of forty miles per hour—to qualify as a tropical storm. It turned north on June 22nd, and as the storm, called Champi, neared Japan it became a typhoon, with winds as strong as ninety-two miles per hour. As the typhoon moved farther north, though, it weakened and then disappeared altogether on its way toward Alaska.

Typhoon Champi caused no serious damage and no loss of human life. But a number of atmospheric scientists believe that it may be what gave the jet stream a snap. After the storm diminished, its force continued on, crimping the jet stream into a sharply curved band,

or what meteorologists refer to as an omega block, because it resembles the Greek letter. This led to what's called, colloquially, a heat dome, a high-pressure system in which hot air is trapped over a single geographic area. It stalled over British Columbia, Washington, and Oregon, sealing in the heat.

On June 23rd, in Portland, inside a labyrinthine government building across the Willamette River from downtown, Chris Voss, the emergency-management director for Multnomah County, joined a teleconference call. He marvelled at the number of people on the monitor in front of him: dozens of administrators from all over the region, including crisis managers from neighboring cities and unincorporated areas and officials from health, human-services, and transportation departments and from the National Weather Service.

The hottest temperatures ever recorded in Oregon were imminent. The heat dome appeared on weather models as a bloody thumbprint pressed into the Pacific Northwest, and would likely produce what one meteorologist characterized as “obscene temperatures.” A hundred and three degrees, a hundred and four, maybe even a hundred and seven were forecast. “This is not just uncomfortable heat,” Jennifer Vines, the lead health officer for three counties, including Multnomah, advised Voss and the others. “This is life-threatening heat.” Twenty-one per cent of households in the metropolitan area do not have air-conditioning. Deaths were likely throughout the county, home to more than eight hundred thousand residents, including around six hundred and fifty thousand in Portland.

A representative from the National Weather Service told the participants on the call that the nighttime lows could be as high as eighty degrees, with no breeze; there would be no reprieve after the sun went down. Emergency officials decided to open three cooling shelters and to keep them running around the clock. The largest would be at the Oregon Convention Center, capable of housing hundreds of people. Voss would help lead the teams working at the shelters and sort out the logistics of securing beds, food, water, and other supplies.

Vines, the health officer, had studied deadly heat waves. She knew the

Ninety-six people perished in one of Oregon's deadliest calamities.

severity of the physiological stress: how the heart works harder to move blood around so that a person can dissipate heat through the skin, the face going red because the blood vessels are open, trying to radiate that heat; how overnight cooling is needed to give the vascular system a break. She warned her colleagues, “People can literally bake in their homes.”

By 10 A.M. on Saturday, June 26th, thermometers already read eighty-two degrees. At 10:14, a barefoot man wearing a T-shirt and blue sweatpants was found lying in the grass; a caller to 911 said that the man was coherent but in need of help, likely because of the heat. A little more than an hour later, in the Hazelwood neighborhood, a resident found a man unconscious in a doorway; that caller, too, thought the emergency was heat-related. Calls to E.M.S. climbed to double the normal volume. At 1:37 P.M., when the temperature was nearing ninety-six degrees, a man was found at a bus stop in Mill Park, passed out on the sidewalk. Around 2:34, two callers reported seeing a man with a cane stumble and collapse on East Burnside Street, evidently toppled by the heat.

In Northeast Portland, a thirty-five-year-old Amazon distribution employee named Shane Brown drove to a Walmart, where he picked up groceries curbside, and headed to the neighborhood of Rockwood, where his sixty-seven-year-old mother, Jollene Brown, lived in an apartment complex. Junked cars lined the street—abandoned automobiles that had been gutted or filled with trash. He stepped out of the car and onto the scorching asphalt of the parking lot; it was before noon, and already into the nineties. He pulled out two bags of groceries for his mother. In her studio apartment, sunlight passed through a pair of sliding glass doors and crept across the hardwood floors. The entire space comprised a small kitchen, a bathroom, and a room crammed with a television, a bed, and an orthopedic recliner.

Shane greeted his mom. Jollene, who had gone by Jolly since childhood, propped her legs up on the recliner’s footrest. A tube trailed from her nostrils to an oxygen tank next to the chair. Twenty years ago, doctors discovered

blood clots in her lungs and diagnosed a pulmonary embolism; she’d needed supplementary oxygen ever since. Shane set his mother’s groceries on the counter, then returned to the car to retrieve a package that Jolly had arranged to have delivered to Shane’s apartment, because, at fifteen pounds, it was too heavy for her to carry. It was a swamp cooler, which runs fans over water to cool the air a few degrees. It stood about two and a half feet tall and had wheels, enabling Shane to roll it as close to his mother as possible.

He sat down on the bed and cued up “The Masked Singer” on Hulu, which they watched together every Saturday. Jolly and Shane’s father had separated when Shane was three, and she had raised him alone, moving around the West—Colorado, Washington, Oregon—as she followed work in the telecom industry. In recent years, cirrhosis and her reliance on oxygen tanks often kept her homebound. So Shane picked up her groceries, chauffeured her to medical appointments, and stopped by on his days off, every Saturday and Wednesday.

By the end of “The Masked Singer,” the swamp cooler had helped a little, but it left the room muggy and uncomfortable. Back at his apartment, Shane crouched near a small portable air-conditioner, which cooled him only if he sat directly in front of it. At 5:04 P.M., the temperature in Portland hit a hundred and eight degrees—four degrees higher than had been predicted and one degree higher than the city’s all-time record.

After the teleconference call earlier in the week, Chris Voss and other county leaders and their staffs worked around the clock, preparing and maintaining the cooling shelters. Inside the Oregon Convention Center, the staff kept the temperature in the ninety-thousand-square-foot space at around seventy degrees. There were food-serving stations, a medical station, and cots. In addition to people experiencing homelessness, the guests included those who did not have air-conditioning in their homes and students in un-air-conditioned dorms.

One young man arrived unconscious in the back of a car. He was revived by the time an ambulance showed up, but

he refused to go with the E.M.T.s, because, he said, he couldn’t afford it. Alix Sanchez, a county employee, explained that nonprofits could help him with the bills, and that emergency rooms can’t turn anyone away. He wouldn’t budge.

At times, the noise inside the convention center was deafening, the din of a village square reverberating throughout. Sometimes a fight broke out, and the staff would guide those in the squabble to separate ends of the shelter. When more people arrived, the staff would take down another set of the convention center’s modular walls to make more space available.

In the course of the heat wave, the cooling shelters hosted fourteen hundred people overnight. At its peak, the convention center housed three hundred and eighty-five in a single night, not to mention dozens of dogs and cats, and a few rabbits—a temperature-controlled ark riding out the wave in a city blistering under the deadly reckoning of climate change.

On Sunday, June 27th, Shane Brown took a personal day off from work and joined friends at Rooster Rock State Park, along a tranquil stretch of the Columbia River, about twenty-five miles east of Portland. The heat was awful, yet Shane and his friends stayed from 11 A.M. until 5 or 6 P.M., attracted by the relative coolness of the river. The sun turned Shane’s shoulders a searing pink.

Back at his apartment, he called Jolly, and they decided, with the weather report forecasting another triple-digit day, that he should not go to work the next morning. There was no way he could handle a ten-hour shift at the Amazon warehouse. Jolly told him that she couldn’t get the swamp cooler to work properly. She and Shane discussed buying her an actual air-conditioning unit soon.

Outside, asphalt buckled. Cables on the Portland Streetcar melted. At 3:23 P.M., in the Piedmont neighborhood, a lifeguard exhibited signs of heatstroke. At 4:33, the temperature hit a hundred and twelve—breaking the previous day’s record by four degrees. An hour later, in Powellhurst-Gilbert, a ninety-three-year-old woman became confused and feverish. Her skin was hot to the touch. At 7:42, a thirty-one-year-old man at

the entrance of a grocery store was vomiting and unable to hold down water.

The city's first responders had implemented a divert-and-zone protocol reserved for mass-casualty events: ambulance crews would take one patient to Oregon Health and Science University, home to the state's largest hospital, and the next patient to Portland's other major trauma facility, Legacy Emanuel Medical Center. Many exhibited signs of heat illness: nausea, vomiting, difficulty breathing. Some were confused or irritable. Medical staff referred to some of the patients as "obtunded," meaning they were unable to respond at all.

At the convention center, late in the afternoon, a man collapsed at the entrance. A nurse from the Medical Reserve Corps and Jenny Carver, an emergency manager for the county, rushed to his aid. They placed cooling towels around his neck, helped him to stand up, sat him back down, and gave him water. "I'm glad the convention center wasn't a hundred yards farther away," someone on the emergency team said.

Staffers opened up yet another section of the floor; the number of guests had continued to grow. At a nearby hotel, Voss loaded his car with garbage bags full of ice; the hotel's management had donated the ice to help the cooling shelter's guests make it through the night. As Sunday came to an end, the city braced for its hottest day yet.

Vivek Shandas, a professor and researcher at Portland State University, woke up on Monday in the relative cool of his bedroom, next to his partner, Kathleen, their eleven-year-old son, and the family's two dogs. A portable A.C. unit blew cold air across the bed. About a week earlier, Kathleen, having heard about the coming high temperatures, had bought the unit—their first. The family spent most of the weekend huddled in the bedroom, working, watching movies, playing video games.

Shandas measures and studies ambient heat, particularly in urban areas, often to demonstrate disparities between affluent neighborhoods and poor ones and communities of color. He's written multiple studies on the phenomena known as urban heat islands: pockets with scant tree cover, a preponderance of asphalt, and, in many cases, close proximity to

freeways and parking lots. The asphalt retains heat and hinders nighttime cooling; the lack of trees means there is little shade to cool the ground. In recent years, Shandas had presented his findings to Portland city planners, warning of the threats that climate change poses to urban environments and advising on the design of future housing developments, distinguishing between heat-mitigating features (vegetation, light-colored concrete) and heat intensifiers (barren landscapes, black asphalt).

Now Shandas saw a research opportunity. He pulled his son, Suhail, away from Minecraft to help him with "a little experiment." In response to the boy's protests, Shandas told him, "It's not going to happen again, hopefully, but it may actually happen again in the future. This is our one chance to go out and collect some really interesting data."

At around two in the afternoon, father and son climbed into the family's Toyota Prius, bringing with them an infrared camera and a handheld temperature sensor, and set off for the neighborhoods that Shandas had identified, in 2014, as the city's hottest. Their first stop was a former industrial district in Southeast Portland, where turn-of-the-century brick warehouses had been converted into storefronts and multifamily housing. Shandas stuck the sensor out the car window: a hundred and nineteen degrees. Using the infrared camera, he measured the surface temperature of the asphalt: a hundred and thirty-five degrees.

They headed east, first along Hawthorne Boulevard. Every ten or fifteen blocks or so, Shandas took a temperature reading. It was Monday afternoon, nearing rush hour, but there were few cars on the road. Occasionally, they'd pass a homeless encampment and see people stirring inside their tents. Otherwise, they saw almost no human activity. There were no birds, either. An avid birder, Shandas noted that even Portland's ever-present crows had retreated from the heat.

They drove to Lents, one of the city's poorest communities. Near the intersection of S.E. Ninety-second Avenue and Foster Road, Shandas lowered his window. The air felt like a hot iron on his skin. At 3:03 P.M., he took the highest measurement he'd seen in

fifteen years of chronicling temperatures, not just in Portland but anywhere. The ambient temperature was a hundred and twenty-four degrees; the infrared camera registered the surface of the asphalt at a hundred and eighty degrees. He braved a few blocks on foot and observed that the neighborhood had many of the elements he'd warned city leaders about for years: sparse vegetation, asphalt parking lots, residential high-rises crowded together and near an interstate, all absorbing and retaining heat.

He made his way northwest. In Nob Hill, one of Portland's wealthiest neighborhoods, he recorded an ambient temperature of a hundred and eleven, thirteen degrees cooler than in Lents. In leafy Willamette Heights, Shandas's sensor logged just ninety-nine degrees. After driving in a near-circle around the city for three hours, Shandas and Suhail headed home, where a bedroom cooled by the brand-new A.C. unit awaited. Shandas thought about the people without air-conditioning in trailer parks, in exposed single-family homes, and in multifamily developments, and he wondered how they were going to survive.

That day, Shane Brown texted his mother at around 7 A.M. and sent her a picture of his sunburned shoulders. By 10 A.M., she hadn't replied, so he tried calling, twice on his cell phone and then through Facebook Messenger. No answer. During the eight-minute drive to her apartment, he called eighteen more times.

When he opened the apartment door, Jolly was sitting in her recliner. She looked asleep, her head lolled to one side. But she also appeared to be in the middle of getting out of the chair, with the motorized lift stopped halfway in the up position and one of her feet raised a few inches off the floor. She had removed the oxygen tubes; they rested on her cheek. He touched her to try to wake her up. She felt stiff and she wasn't breathing.

Jollene Brown was one of eleven people confirmed to have died from the heat that Monday in Portland, including a seventy-eight-year-old retired mathematics professor and an eighty-three-year-old former airline mechanic.

One woman died in an ambulance on the way to the hospital. Late in the night, a fifty-seven-year-old woman went downstairs to the bathroom, and was discovered by her spouse early Tuesday morning, unresponsive, near the foot of the steps.

Many victims were not found for days. Downtown, someone called 911 to report a strong smell coming from the apartment of a man who was not answering his door. In Richmond, neighbors watched medics carry a seventy-three-year-old man out of an apartment complex in a body bag forty-eight hours after the extreme weather passed. At a mobile-home community, a body wasn't discovered until more than a week after the heat wave.

By the time temperatures cooled, at least ninety-six people would be confirmed by the state medical examiner to have died of heat-related causes, making this one of the deadliest natural disasters in Oregon's history. In neighboring Washington, officials reported ninety-five dead. An analysis of C.D.C. data by the *Times* suggests that the real number of fatalities in the Pacific Northwest may be three times those official counts.

For the majority of those who died, the heat was experienced privately, for hours upon hours, and then for days. And when temperatures took their final toll, the victims dehydrated and in a hyperthermic state, that was private, too. This was a climate catastrophe unlike any the public is used to seeing play out on TV. We've grown accustomed to the dramatic images of human-caused climate change, via increasingly frequent hurricanes and wildfires, but the element at the center of it all, the heat, has been more abstract, not as directly connected to Americans' lives. The evidence indicates that that's likely to change.

In early July, an international team, part of the World Weather Attribution group, concluded that the intensity of the heat wave would have been "virtually impossible without human-caused climate change." The scientists, including researchers at Princeton, Cornell, Columbia, Oxford, and the Sorbonne, argued in their report that "our rapidly warming climate is bringing us into uncharted territory that has signif-



"Sorry—our counter is reserved for lone dudes staring at their phones in silence."

icant consequences." In their analysis, which has not yet been peer-reviewed, the researchers posited that temperatures within the heat dome were 3.6 degrees hotter than they would have been at the beginning of the Industrial Revolution. Furthermore, they concluded that the heat wave was most likely a once-in-a-millennium event, and that, in thirty years, with rising temperatures, similar heat waves could be once-in-a-decade events, or even once-every-five-years events.

"What happened this June was startling," Oregon's state climatologist, Larry O'Neill, told me. "We're setting more records all the time, and seeing things that we usually don't see in places we don't see them. It makes me very concerned that the climate projections are underestimating the degree of climate change." Climatologists weren't expecting to see events on this scale for another twenty or thirty years, O'Neill said. Joe Boomgard-Zagrodnik, an atmospheric scientist at Washington State University, said, "People died from this. That's a threshold event."

In August, Multnomah County released a report assessing its handling of the disaster. Nowhere else in the state had seen as many heat-related deaths—sixty-two people by the latest official count. The county admitted that its call line, 211info, a source of critical information for people looking for cooling shelters and other emergency services, inadvertently dropped

more than seven hundred and fifty calls, and that when callers got through they were sometimes given inaccurate information. The county vowed to improve that system, and to make sure that cooling shelters were more equitably situated—closer to the homes of the Portlanders who needed them most—and to make transportation to the shelters easier to obtain.

Ten days after the end of the heat wave, when temperatures were in the sixties and seventies, I sat with Chris Voss in an empty conference room in the county headquarters. He described the days and nights in the convention center, the ice runs and the momentary elation at finding new ways to feed hundreds of people under the same roof. When I asked about the more than sixty county residents who had died in the heat, he grew emotional and his glasses steamed up. "That number's not palatable for us," he said. "It's not palatable for anybody."

In late July, Shane Brown held a memorial service for his mother in White Salmon, Washington, along the Columbia River, where Jolly's mother is buried. Shane invited a few friends and family members for the informal gathering, which is how his mother would have wanted it. "She had paid for everything in advance—her urn, her cremation, where she was going to be buried," Shane told me. Jolly was a planner. She knew she would die. She just didn't know the time or the place. ♦