
NINE DAYS INSIDE
HURRICANE SANDY
SUPER
STORM
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Published by the Penguin Group
Penguin Group (USA) LLC
375 Hudson Street
New York, New York 10014

USA | Canada | UK | Ireland | Australia | New Zealand | India | South Africa | China
penguin.com
A Penguin Random House Company

LIBRARY OF CONGRESS CATALOGING-IN-PUBLICATION DATA
Miles, Kathryn, 1974– author.
Superstorm : nine days inside Hurricane Sandy / Kathryn Miles.
pages cm
ISBN 978-0-698-18622-4
1. Hurricane Sandy, 2012. 2. Hurricanes—United States—History—21st century. 3. Weather broadcasting—United States. I. Title
QC945.M46 2014
551.55'2—dc23 2014031087

Version_1

For Hayden,
who helped write the first word

In the eye of a hurricane, you learn things other than of a scientific nature. You feel the puniness of man and his works. If a true definition of humility is ever written, it might well be written in the eye of the hurricane.

—Edward R. Murrow

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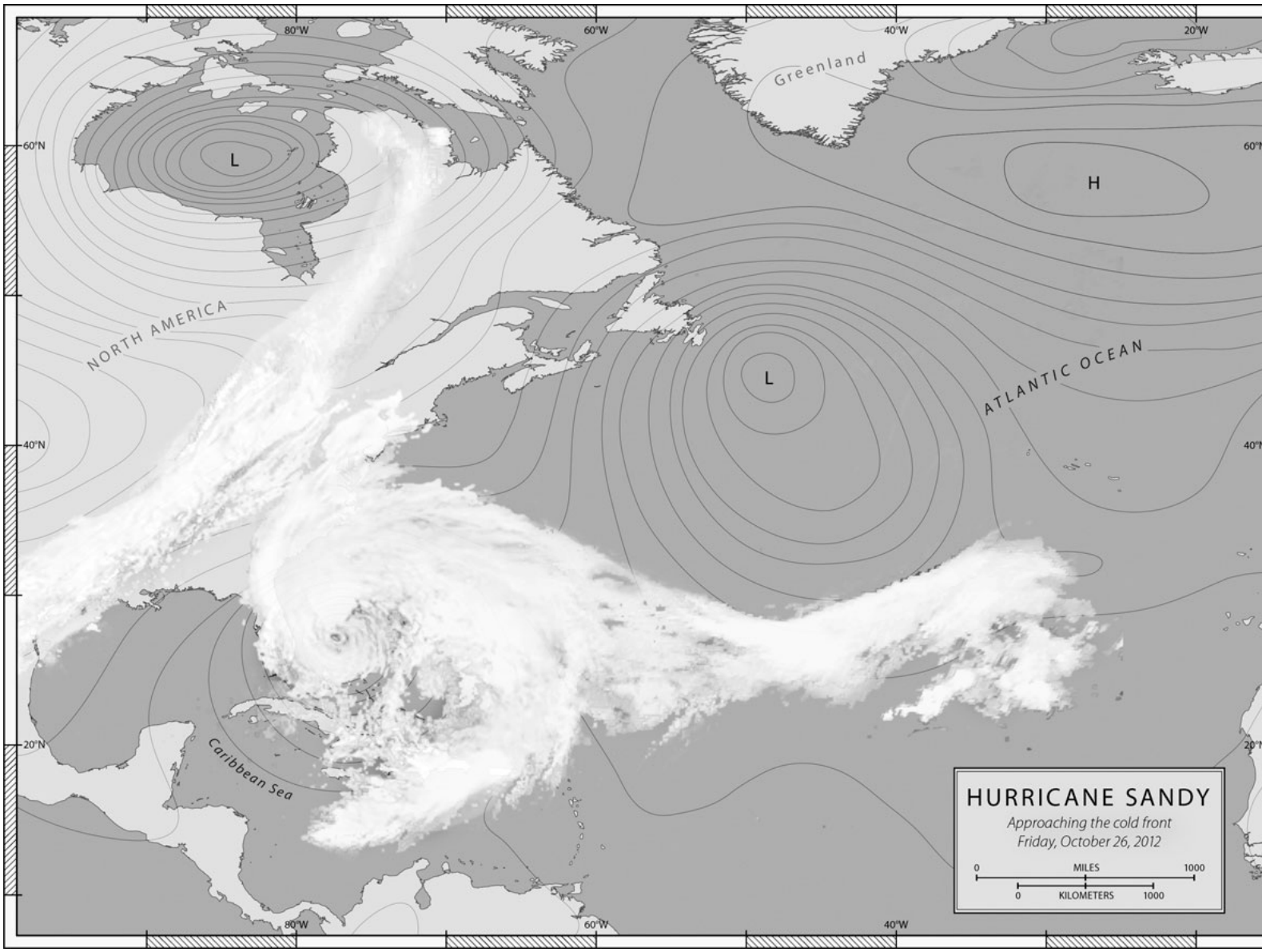
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ATLANTIC OCEAN
Caribbean Sea
HURRICANE SANDY
Approaching the cold front
Friday, October 26, 2012
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LANDFALL

THE SKY WAS lit by a full moon that night, but no one could see it. Everything—the enormous harvest moon, the stars, the horizon—had been consumed by cloud. The storm was so immense it caught the attention of scientists on the International Space Station, who stopped what they were doing and peered out their windows. From there, the cloud cover seemed almost limitless: 1.8 million square feet of tightly coiled bands so huge they filled the windows of the station, so thick they showed only the briefest insinuation of an eye. It was the largest storm the planet had ever seen—a storm big enough to consume the entire Eastern Seaboard and beyond.

It had already wreaked devastation in the Caribbean, taking lives and destroying families. Now th storm was marching up the Atlantic, turning the ocean into unimaginable chaos. Waves the size of a two-story house collided against one another, exploding in foam and fury and blocking everything els from view as millions of pounds of water rose and crashed and fell, only to rise again. Those same waves fueled the machine that created them, sending more and more moisture into the storm's core, where energy exploded with the force of a nuclear bomb. Gale-force winds rose and then spread out for 870 nautical miles, threatening everything in their path. The system was growing.

Nightfall came by imperceptible degrees. The wind and rain did not. They were soon punctuated by an omnipresent moaning: a kind of dark, low hum that made it seem as if the entire world was haunted. Within minutes, that moan became a constant, pervasive shriek as gusts of 90 miles per hou were recorded everywhere from Washington, D.C., to New York City. Barometers plummeted to unseen lows, heralding the force of the storm. So, too, did the apocalyptic precipitation that began to follow: almost thirteen inches of rain in Bellevue, Maryland; nearly six in Cleveland, Ohio. Twenty inches of snow fell in places like Kentucky and Newfound Gap, a low pass in the Great Smoky Mountains that divides North Carolina and Tennessee. In West Virginia, more than three feet of snow fell near the town of Richwood, collapsing roofs and collecting into barricade-like drifts six feet tall.

At the National Zoo in Washington, D.C., keepers scrambled to corral their charges inside, wrangling elephants and clouded leopards, the facility's iconic pandas, and even a spindly, two-week-old dama gazelle. As they did, the storm turned inland, fixing a bead on the mid-Atlantic coast. Heralded by hurricane-force winds, the storm announced its arrival long before it made landfall, knocking down power lines and exploding transformers. A woman in Toronto was killed when a large illuminated sign pulled from its supports, then plummeted thirty feet to the ground. An eight-year-old Pennsylvania boy died when a tree fell in his Franklin Township yard. Not long after, an enormous oa fell through a home in North Salem, New York, crushing two best friends, ages eleven and thirteen, but leaving the rest of the home's occupants unharmed.

And still the storm continued its relentless beat to shore, charging across three hundred miles of open ocean, picking up strength with every step. Meteorologists and scientists, officials and emergency managers stood baffled: What *was* this thing? By the time many of them decided, it was too late to issue warnings, too late to persuade millions of people their lives were in danger.

Gusts rose to 83 knots, building the waves higher, blowing off their tops and sending cataracts of salt water through the air for miles. Across Manhattan, those residents who resisted the call to

evacuate struggled to walk down rain-swept streets, where litter tornadoed around telephone poles an newspaper kiosks. Awnings sheared off of storefronts and took flight. Flags stood straight and solid; trees rippled as if suddenly liquefied. Nearly a thousand miles away, spray from twenty-foot surf on Lake Michigan crashed onto Chicago museum-goers and commuters. At the international airport in Gary, Indiana, 50-mile-per-hour winds grounded planes. Hundreds of stranded passengers sat packed in terminals from Baltimore to Oklahoma City—and beyond.

By 6:00 P.M. that evening, three million people were without power, most of them in Manhattan and the surrounding boroughs. The lights went out on Broadway. Wall Street ground to a standstill ar would remain closed for two days—the first time weather had shut down stock markets for consecutive days since the Great Blizzard of 1888. Out on Ellis Island, the Statue of Liberty—whose newly renovated crown had reopened to visitors just one day before—lost her torchlight and went dark.

At New York University's Langone Medical Center, hospital officials were certain their patients would be safe, despite the deteriorating conditions outside. But the facility's backup power system soon failed, shrouding the eighteen-story complex in blackness and requiring the evacuation of three hundred patients into a caravan of ambulances that extended blocks down rain-torn streets. The first t emerge from the darkened hospital were twenty infants from the neonatal intensive care unit, each or cocooned in blankets and heating pads and carried down nine flights of stairs by nurses, administrators, and maintenance workers. They worked by flashlight and feel, delivering first the babies and then the most critical patients, some of whom weighed well over two hundred pounds. They moved silently, synchronized, and often arm in arm, working together in teams of five or ten ar stopping frequently to check breathing tubes and vitals. The only audible sound, some would report later, was that of the growing wind and surf. Waves so big they hardly seemed real rolled through streets. It was like being in a movie, said the staff, only much, much scarier.

That same surge swamped beaches and shoreline from Florida to Nova Scotia. It sank boats in Ba Harbor, Maine, and swept as far inland as Albany, New York—nearly 150 miles from the coast.

And then the storm itself arrived.

It hit land like . . . what? Like a freight train or an atomic explosion or an alien invasion? People tried to find a comparison, but everything fell short. It was a hurricane that wasn't a hurricane. A superstorm. And as it hit like whatever it was, the storm sheared away sections of Atlantic City's iconic boardwalk before inundating the streets with a wall of wave eight feet high. Within minutes, more than 75 percent of the city was underwater. Sixty miles away, in Seaside Heights, the storm ripped the Jet Star Roller Coaster—a massive structure with seventeen hundred feet of steel track and fifty-foot drops—from its pier and relocated it in the ocean shallows. It swept entire houses from the foundations and pulled cars into the surf. In Fall River, Massachusetts, the storm peeled away roofs and flooded Battleship Cove. In New London, Connecticut, it pulled the town's iconic bathhouse fron its pilings and left in its place a household stove, along with cords of splintered timber. The weather station atop New Hampshire's Mount Washington registered gusts of 139 miles per hour.

Back in Manhattan, seawater poured down stairs and vents into subway stations, filling tunnels from track to ceiling. At the NYU medical center, the most critical patients had been safely evacuate but thousands of animals used for medical testing had not. More than ten thousand mice and rats, many of which had been genetically altered for cancer and mental illness research, drowned in their basement cages. Seven thousand trees fell in New York City parks. More than sixty-five thousand boats were destroyed in New York alone. The city, one meteorologist said, was living its own worst-case scenario.

The force of the wind and sea exploded electrical transformers and caused massive fires that destroyed both fin de siècle mansions in Old Greenwich, Connecticut, and more than one hundred

working-class homes in Queens. Other damage created a kind of cruel *carnivàle*: As the storm marched across the region, it neatly piled sailboats at the end of a dry pier and left floating taxicabs i their slips. It relocated a fishing vessel onto railroad tracks and pushed pickup trucks into backyard pools. Dining rooms filled with sand. Floodwaters plucked the New York Aquarium's resident three-foot American eel from its tank and deposited it, unharmed, in a staff shower stall.

But those were the easy stories. Most were far more grim.

More than ten feet of salt water flooded the low-lying areas of Staten Island. There, neighbors banded together and decided to make a last-minute run for it. They set out down their street, but were soon stopped by a wave of dark water bearing down on them. They turned and raced the opposite way only to stop dead in their tracks. An angry wall of water was coming from that direction, too. It snaked, leapt, spun, and crashed, picking up bits and pieces of people's lives: toilets and kitchen sink pianos and sewing machines, lawn mowers and bicycles, porches and chimneys. Jack-o'-lanterns bobbed their way through the storm-churned water by the hundreds, a parade of ghoulish faces amid the chaos.

There was no escape.

The waves continued to grow, cannoning through windows and doors and deluging homes. Within minutes, that water was lapping at attic floors.

In the Oakwood neighborhood, two men sought shelter on the second story of a home after their car stalled on the street below. Within minutes, floodwater was above their chests. They jimmied ope the attic window and looked into the surge of water, now at eye level. A car floated by, then a Dumpster. And then—what was that? The roof of an entire house. Still attached to the house. The whole damn thing was floating on the angry tide. They agreed to take a chance. On three, they leapt out the window and onto the floating roof. There, they dug their nails into the shingles, trying not to get dizzy as the building spun its way through the crashing water.

Not everyone was so lucky.

The same rising sea caught several elderly people unawares and trapped them in their homes. The residents screamed for help, but neighbors couldn't reach them: The waters were just too high, too fast. The bodies of the trapped would be found floating in living rooms and bedrooms days later. So, too, would the body of an off-duty police officer who relocated his family, including his fifteen-month-old son, to their attic before retreating back downstairs to secure the rest of the house. The family waited for hours, but he never returned. Another father and son were found in their basement, their bodies locked in a tight embrace, the dead father's arms still shielding his son's head.

In Tottenville, Staten Island, a family of three who had been robbed during Hurricane Irene also chose to remain in their home, despite the evacuation orders. As they finished dinner, the waters bega flooding their house, lifting the dining room from its foundation and eventually shearing it away. The ran to their second-story master bedroom, but within minutes the water began pouring in through the windows and doors there as well. They retreated to the bathroom, where the mother and her thirteen-year-old daughter clung to the sink faucet as storm water lapped at their chins. And then the entire wall of their house gave way, pouring them out into the churning surge. Waves tore them from each other. The mother called—no, shrieked—her daughter's name, but the plea evaporated in the roar of water. She kept calling, clinging to the sink, flinching each time another house slid into the waves. Hours later, she was deposited on a pile of debris. She was severely hypothermic but otherwise unharmed. It would be days before the bodies of the father and daughter were found.

As news of the rising water began to intensify, another mother bundled her two boys, ages two an four, and tucked them into their car seats, then set out for a family member's house in Brooklyn. She thought she was doing the right thing—keeping her boys safe. But their SUV was soon overtaken by swell. The car stalled. Water began to pour in. She struggled with her seat belt, slipped into the back

and wrestled both boys out of their car seats, took a deep breath, and crashed into the surge. The wave were unrelenting. They crashed upon her, pulling the mother and boys down. She clung more tightly. The waves kept coming. And then the biggest one of all struck. It tore the boys from her arms before sweeping her away, too. She clung, first to a tree, and then to the hope that someone would help. But no one would answer their door—no one would take that risk, no matter how much she begged and cried. Exhausted, she collapsed on a stranger's porch and waited until daybreak, then walked the flooded streets until she found a police officer. Days later, the bodies of the boys were found less than twenty feet from each other, tangled in reeds and debris in a marsh at the end of a dead-end street.

ON AVERAGE, ABOUT six hurricanes develop each year. Fewer than two of them strike the United States. Major storms—storms with winds greater than 110 miles per hour—occur even less frequently: one every eighteen months, give or take. The chance that one of those storms will strike New York City is 3.2 percent. None of these statistics mattered at all with Superstorm Sandy. There was no precedent, no authoritative model or soothing data to help make sense of what was happening. The world had simply never witnessed a storm like this one.

Barometric pressures that day, October 29, 2012, were the lowest ever recorded north of the Carolinas. Surge levels were their highest. And the damage wrought by this storm was immense. Sandy damaged or destroyed a million homes. More than half of those were in the United States, located in a damage area roughly the size of all of Europe. Nearly nine million households were without power from South Carolina to Maine. Rain from the storm reached as far west as the Dakotas and as far south as Texas. Thousands of acres of shoreline were severely eroded. By the time Sandy dissipated somewhere over western Pennsylvania, at least 147 people had lost their lives in places as far-ranging as Jamaica and Canada.

This storm—this superstorm—wasn't supposed to be that deadly. And it certainly wasn't supposed to make landfall in the most populated region of North America. Nor was it supposed to morph into a monstrous hybrid the likes of which our oceans had never born. And that's what was so terrifying about this storm. Hurricane Sandy broke all the rules.

Its story began just more than a week before it made landfall.

SUNDAY

3:00 A.M.
National Weather Service Forecast Office
Mt. Holly, New Jersey
45°F
Barometer: 29.93 inches (rising)
Winds: 4 mph (WNW)
Skies: Clear

THE ABSENCE OF any windows and a constant, humming fluorescence give the forecasting floor of the Mt. Holly National Weather Service bureau a timeless quality not unlike that of an Atlantic City casino, where day and night are marked by the same pulsing light. Thirty computer monitors and four sixty-inch flat-screen TVs flank the walls, filling the room with cool blue light. There's a vibration there, too. The combined workings of dozens of strong hard drives and the equally strong fans required to keep them from overheating give off a kind of alien-spaceship buzz. The entire effect can feel like one of inhuman sensory deprivation—or at least sensory reassignment, dialing you in to the constant flash of radar and innumerable, incomparable graphs. A special way of looking at our planet's nature.

Watching this data shift and stream were two young forecasters, dressed in the requisite National Weather Service uniform: faded jeans, a T-shirt, and a fleece pullover. She wore pink socks and a ponytail. He had wire-rimmed glasses and running sneakers. They sat, as they did most midnight shifts, with their backs to each other. She was working the short-term forecasting desk, crunching line after line of data to generate the forecasts that would keep the Philadelphia International Airport and the ports of New Jersey running for the next twenty-four hours. He was working the long-term desk: generating a far more general forecast that would keep the mid-Atlantic thinking about the next five days. Their shift had been quiet. Uneventful. Outside the cavernous brick building, another perfect autumn day would soon be dawning—warm, sunny, with barely a ripple of wind. Perfect autumn days tend to bore forecasters. Especially at 3:00 A.M. It can be a struggle not to get a little sleepy on a shift like that.

He rubbed his eyes, pushed back his chair. There wouldn't be much happening for the next half hour—not until the European Centre for Medium-Range Weather Forecasts Integrated Forecast System (or ECMWF) sent out its forecast. Based in Reading, England, this European forecasting system boasts one of the largest supercomputers in the world (#41, to be precise: behind NASA, several Chinese supercomputer centers, and the University of Edinburgh, but ahead of the US Army Research Laboratory and the French Alternative Energies and Atomic Energy Commission). Twice a day, the ECMWF supercomputer generates one of the planet's most dependable weather forecasts. That information comes by way of a series of spatial maps, and forecasters on both sides of the Atlantic know to wait for them. On a quiet graveyard shift, it's the highlight of the night—particularly during hurricane season. The forecaster toggled over to the ECMWF display, then got up and went to the vending machine to get himself a snack.

At precisely 3:30 A.M., the maps began to stream in. He sat at attention. She wheeled her chair over

to the computer so they could watch together. The forecasters glanced. Then glanced again. And then they laughed. It just seemed so absurd. A system had begun building deep in the southern Caribbean. That was a little unusual, given how late it was in the hurricane season. But what really seemed ludicrous was what ECMWF said the system would do next: grow. And not just grow, but become enormous. So enormous, in fact, that it would become unstoppable, even after it left the warm waters of the Caribbean. So enormous that it would keep marching up into the colder waters of the Atlantic, eventually turning not out to sea, like practically every other storm in recorded history, but inland instead. According to the ECMWF, this storm was going to do the almost unthinkable: It was going t slam directly into the mid-Atlantic seaboard. Preposterous. No storm had done anything like this sinc 1903, when a hurricane named the Vagabond assaulted New York and New Jersey, killing dozens and endangering the life of President Theodore Roosevelt, who had the misfortune to be aboard his yacht in Long Island Sound. That hurricane was the first to make landfall in New Jersey in recorded history and everyone agreed it was a freak occurrence. The chances of such a thing happening again were minuscule. This forecast must be a giant mistake. A wonky anomaly—a reminder about just how fallible even the best prediction can be. The two forecasters at Mt. Holly felt certain of this.

"Well, at least we know what's *not* going to happen next week," he said.

"I know," she agreed. "That's totally off the wall. Absurd."

They laughed a little more, and then they put it out of mind. *The model will resolve itself tomorrow*, they said. *I mean, how could it possibly be accurate*?

5:00 A.M.
Boothbay, Maine
Barometer: 29.74 (rising)
Winds: 6 mph (WNW)
Skies: Clear
Seas: Calm

IN THE SUMMERTIME, the coastal town of Boothbay bustles with tourists and nautical groupies making their way down the commercial district's narrow streets and into gift shops with names like Two Salt Dogs, Joy to the Wind, and Sweet Bay. Down near the wharves, taffy and ice cream shops vie for a tourist's attention alongside attractive girls hawking whale and puffin tours. But the real attraction here is not so much the town itself as it is the harbor, a narrow and deeply set port well protected by rocky crags and spruce-swept islands. When the days are long, the harbor positively hums with controlled chaos, as yachts and day cruisers zip between lobster boats and the iconic schooners that have made the region famous.

By Columbus Day, though, much of this seaside town slips into hibernation. The fried-clam stand are stowed away in inland barns; stores hang cheerful signs promising they'll reopen in the spring; schooners sleep quietly at the dock, swaddled in white plastic. Even the Boothbay Harbor Shipyard stood all but vacant that early Sunday morning in late October. The predawn air was thick with chill, and remnants of the previous day's fog still pushed against the harbor's floating docks, making everything feel low and close and damp.

Just after 5:00 A.M., alarm clocks and cell phones began ringing on board the *Bounty*. A few lights began to shine out of the portholes and the windows of the great cabin. Several minutes later, groggy bodies spilled out onto the deck, dressed in Carhartts and sweatshirts, with hoods and stocking caps pulled low to cover dreadlocks and piercings. They wore headlamps and gloves. They fired up the ship's two aging engines; they fiddled with lines for the ship's enormous square sails; they hauled of the last of the trash and anything else they couldn't take with them.

Standing near the rear of the ship, their captain looked on. His hair was thinning, but he wore it in a wisp of a ponytail anyway. He also wore thick glasses, attached to a heavy cord so he wouldn't lose them, and beat-up Teva sandals with wool socks, even though his wife told him they looked silly. He didn't care about that, he said. And he liked having warm feet. It never occurred to him to try closed shoes. His jeans were dirty, his canvas jacket a little worn. But he didn't care about that, either. He was quiet. Almost shy. And his two hearing aids could make it seem like he was ignoring you. Sometimes, he actually was. But he knew his ship better than anything, and his crew knew that, too. They loved him. Worshipped him, almost.

His name was Robin Walbridge. He'd been master of the *Bounty* for almost twenty years. She wa he was fond of saying, his greatest love. His wife, Claudia, didn't mind being runner-up. Robin, she says, always had plenty of love to spread around. There was a charisma to him—an energy. It drew you in. Made you want to stay. Crew members thought of him as the dad they'd always hoped to have They depended upon his calm good nature. It takes that and something more to work on a tall ship. Certainly it's not the paycheck—about $100 a week for a deckhand. But tall-ship sailors aren't the kind of people who worry about money. They're environmental studies majors taking a semester off from school and tattooed wanderers who never really fit in (at least, not until they found their ship). They spend their winters running day trips out of the Florida Keys or couch surfing in Puerto Rico or skiing Jackson Hole on their last twenty bucks. They eat ramen and hot sauce and drink cheap beer ou of tall cans. Those things are all good. But nothing makes them nearly as happy as being under way.

Their captain knew that. He banked on it. *Shore spoils a crew*, he always said. The prospect of heading back to sea made him almost giddy that morning. The crew was stumbling a little—it'd been six weeks since they'd sailed their ship. Robin teased them when they tangled a line. He spoke to them in rhyme when they had a hard time shaking off too little sleep and one too many beers at the House Pizza: "Wakey, wakey, little snakies," he said. "Wakey, wakey, eggs and bacy." They laughed. Even with the fatigue and the little hangovers, they were excited. They were itching to be back on the water It was where they belonged. It was home.

At that time in the morning, just about everyone on the working waterfront blended in. The blond woman who tumbled onto the *Bounty*'s deck wearing an oversize green stocking cap and humming th Rolling Stones did not. She had the body and the kind of charisma that stopped traffic, whether she was in a Miami club or on an L.A. beach. In a Maine sailing town, a jut of her pinup-girl hip was enough to silence an entire boatyard.

Her name was Claudene Christian. She'd come to the *Bounty* because she was lost. Because she was looking for something tangible—structure and truth. And yes, okay, she wanted a little adventure too. That morning in Boothbay, she was more certain than ever that she had found all of those things. And she was nothing if not utterly enamored with her shipmates.

That stocking cap she wore—the one embroidered with the word *Bounty* in big gold letters—had been given to her by her watch supervisor, Doug Faunt. He'd bought hats for all of them after their first night sleeping in the New England chill. That's just the kind of thing he did. At sixty-six, Faunt was the oldest member of the crew, and a successful career in computers had allowed him to join the ship as a volunteer rather than as a paid employee. It also made him a wiz at wiring and electrical systems and entitled him to play the role of curmudgeon when needed. But that was really just skin deep. Faunt adored both his ship and his fellow crew members: He'd often put electrical parts for the former on his own credit card; he'd take the latter out for donuts, give them his frequent-flyer miles, or buy big wheels of expensive cheese for them all to share.

For the first time all year, there was time for that. The season was over. No more dockside tours, no more pirate-themed festivals or answering tourists' questions. The ship had just one more stop to make before it returned to its onetime home in St. Petersburg, Florida. Claudia would be waiting. So,

too, was a possible benefactor. The captain's best friend, Ralph McCutcheon, a longtime fixture on th ship, was planning a massive party for them. After that, a couple of them would stay on the ship at its winter home in Texas. The rest would disperse to those day sailers and couches and chairlifts. Until then, they had nothing to worry about.

The crew's numbers had dwindled to seventeen: Several of the younger sailors were heading back to school; others were returning to jobs or beginning winter work. Faunt asked Walbridge if that mad them shorthanded (the ship's manual said it did), but the captain assured him he'd sailed with fewer. To replace the departing crew, Jess Hewitt, a twenty-five-year-old graduate of the Maine Maritime Academy with the soul of a rock star, had joined the ship just two weeks before it began its month-long dry dock at the Boothbay Harbor Shipyard. Already she was known for her fabulous flair: big sunglasses, slim jeans, braided captain's caps, and bikini tops on workdays. Chris Barksdale, a fifty-six-year-old handyman with a background in horticulture, arrived a few weeks later to replace the ship's engineer. The crew loved his decorum and southern drawl: the soft consonants of a Vah-ginian gentleman, the way he put "Miss" before women's names.

Barksdale had arrived while the *Bounty* was in dry dock. He wasn't sure what to make of the ship—it seemed worn to him. But the rest of the crew agreed it was in the best shape ever. Most of them had worked together on the ship during the previous season. They were tight. Walbridge told them they were the best crew he'd ever had, and they believed him. Throughout that whole summer, they had moved up the Eastern Seaboard, stopping in places like Savannah and New York and Boston and Philadelphia. They scraped and painted historic buildings in exchange for free dock space. They hung hand-painted advertisements, gave endless tours, and entertained streams of tourists, answering the same questions every day with a smile. During their downtime, they played Twister and grilled hamburgers on deck; they had movie nights and slumber parties down below. They took cities by storm and drank rum. Most of the time, they moved as a single unit, playing around wherever they went, whether it was jumping in bouncy houses or staging impromptu jam sessions on deserted street late at night.

The sheer energy of it all both surprised and delighted Claudene Christian, who called the scene "Booty on the *Bounty*." It was exactly her cup of tea. She was a former beauty queen. A cheerleader. A sorority girl. The kind of woman men adore and women love to hate. Except, of course, for the fact that it was nearly impossible to hate Claudene. She was outgoing and unassuming and funny. She never had a bad word to say about anyone, and always made you feel like you were her best friend—even if she had just met you.

The *Bounty*, Claudene was certain, would be the greatest adventure of her life. She talked on and on about how capable her fellow crew members were—that they could literally build, fix, or engineer anything. She said that they were super cool and super intelligent, which, she admitted, kind of surprised her. Her family and friends were skeptical. It had been a rough several years for Christian. She had been diagnosed with bipolar disorder. She was drinking too much. She suffered a nasty lawsuit with Mattel and an even worse relationship with a boyfriend named Sasha.

Christian had always been obsessed with sailing and the Knights Templar. Her family claimed direct descent from Fletcher Christian, the famous mutineer on the original *Bounty*. Her father encouraged her to try life on a tall ship. With his help, she signed on as cook of the *Niña*, a re-creation of Christopher Columbus's famed ship. But Claudene did not fit into the regimented culture of the *Niña*: Policies on board prohibit tattoos and piercings, and "extreme hair"—including dreadlocks and colors other than those naturally endowed at birth—was not permitted. The ship's captain adhered to age-old nautical hierarchy, forbidding people to sit at his table unless expressly invited or to speak to him unless he spoke to them first. When Claudene appeared to work her way into his little world, jealousies erupted. By the time the ship reached Florida, Claudene was miserable and soon called her

new boyfriend, Brad Leggett, to help her escape.

It wasn't long after that she found the *Bounty* on the Internet. Claudene felt certain she would be bringing history full circle if she could manage to join that organization: *Imagine! A descendant of Fletcher Christian willingly stepping aboard the ship!* And she'd be smarter this time—of that she fe certain. The *Niña* had enlightened her about the realities of life at sea—enough for her to know that that kind of life wouldn't be sustainable for someone like her. Instead, she said she had bigger aspirations: to find a way to market the ship and, eventually, to become its owner. But to do that, she first have to get aboard. She wrote to the organization, playing up her marketing experience. They agreed to accept her as a volunteer.

Her father drove Claudene from Oklahoma to North Carolina that May, where they rendezvoused with the *Bounty* in Wilmington. He was a little apprehensive when they arrived. The ship needed a major overhaul, he told Brad, and would certainly never pass an inspection.

Rex Christian wasn't the only one who was concerned. Coast Guard Sector Commander Anthony Popiel was on the ship that day, too. Popiel's job is a heavy one: He's captain of a major port, and ha the authority to close it when serious weather—like a hurricane—bears down on the region. It's a serious decision, and one that can cost hundreds of millions of dollars in lost trade, fuel, and sailor wages. But Popiel is also in charge of monitoring the safety of the waters beyond that port, and his team at sector must oversee all search-and-rescue or recovery operations that happen therein. Risk is his life, and he's seen a lot of it—enough to know it should be avoided at every opportunity.

Popiel and his son spent that May day aboard the *Bounty*. John Svendsen, the ship's first mate, gave them a tour, showing them all the nooks and crannies of the ship. Svendsen is a soft-spoken guy who, with his long blond hair and trim beard, looks a little like he stepped out of a nineteenth-century novel. Like his captain, he tends to stand in the shadows when faced with a crowd. But he and Popiel hit it off at once and spent the day sharing stories about their experiences at sea. Popiel was impresse by Svendsen's experience and expertise: The first mate really seemed to know his stuff. So did the other five or six crew members Popiel met on board. Still, the ship had limitations. Unlike sailing school vessels, the *Bounty* had only a dockside coast guard inspection, which meant it wasn't certifie to take passengers to sea. Popiel could tell it had been built as a movie prop instead of as a seagoing ship. There wasn't a lot of organization concerning where things ought to go, and space was tight—especially in the crew quarters.

That alone, he says, wasn't really cause for serious concern. But Popiel says he was also "fresh of Irene," the hurricane that hammered North Carolina the previous year. It had been a big storm and ha taken a lot out of the coast guard—not to mention the people and the vessels in his coastal state. The day Popiel visited the *Bounty*, he checked the marine forecast (he *always* checks the marine forecast) and he didn't like what he saw: An early-season tropical storm was heading their way. He tried, gently, to persuade the crew of the *Bounty* to stay. "Hey," he remembers saying, "don't you want to hang out here for a while?" Popiel added he was even sure he could find dockage for them as long as they needed. But John Svendsen declined, saying the storm would be good for the ship. Popiel remembers that the first mate told him the ship "likes wind," that she "moves well" in a big storm. That, the sector commander says, was what got him worried. "The takeaway from a storm, when you've had that experience, should be to heed warnings and seek safe shelter," says Popiel.

Svendsen told Popiel he felt confident his ship could beat Mother Nature. And if his newest deckhand knew about the storm or worried about it, she didn't say so. Instead, Claudene pulled out he guitar and sang songs. She flirted. She was enthralled. Her spark had returned.

The *Bounty* crew took a little time warming up to their new shipmate. But once they did, they fell head over heels. They called her their spy, because she could find out anything about anyone. She'd talk up visitors and crews from other vessels and invariably find out where the best party was that

night. During the yard period, she wiggled into tight spaces with a Shop-Vac, and led the crew in gymnastics sessions. At the House of Pizza, she'd buy everyone's rounds. When her credit card was declined, Barksdale happily lent her fifty bucks. She promised she'd repay him—and promised, and promised. He said he didn't care either way. How could you? She was just so happy.

That particular October morning, Claudene was one of the first on deck. She sang a couple of Juic Newton songs and tried to look busy. She winked at fellow crew members as they walked by. She texted her mom to say she was doing great.

Walbridge was happy, too. He was on his way home to Claudia. He hadn't seen her in weeks. He made a show of tucking away the jewelry he had purchased for her the day before at Patty Stone's gif shop, just half a block up from the shipyard. He told everyone the ship looked great. They'd worked really hard in the yard. He was proud of them.

The sun wouldn't rise for over an hour. But by 5:45 A.M., they were making their way out of the deserted harbor, past Mouse Island and the Burnt Island Lighthouse, motoring on the strong outgoing tide—there wasn't enough wind to sail. Everything was calm. Flat calm, Walbridge said. He seemed little disappointed. So did the crew. The trip to New London, Connecticut, would be boring. Mundane At least there was work to do. Temporary lights still hung below deck, and Doug Faunt was still working on much of the wiring. The crew quarters were in shambles. But no one looked worried. Aft all, they trusted one another—and their captain. He had the traditional maritime knowledge and personal experience to deal with whatever the sea threw at them. And they were a family.

> **11:00 A.M.**
> **Miami, Florida**
> **Barometer: 30.00 inches (falling)**
> **Winds: 7 mph (NNE)**
> **Skies: Mostly cloudy**
> **Seas: 2–4 feet**

BY ALL METEOROLOGICAL accounts, the 2012 hurricane season was not going to be throwing much at anyone. Chris Landsea, the Science and Operations Officer at the National Hurricane Center, was inclined to agree.

Outside his office window at the NHC headquarters, cars streamed by on the Florida Turnpike, casting blinding reflections of light off their bumpers and windows. Even convertibles were rolled up tight—it was too hot for anything other than maxed-out air-conditioning. Twenty miles to the east, South Beach's perennial parade of bikers and Rollerbladers had already stripped down to the barest o tropical essentials: thongs and short shorts, bare chests, visors, and lots of oversize sunglasses. Families crowded onto towels and into the lapping waves. West of the city, out among the cream-and pink-colored buildings of Florida International University, the heat was a different story altogether. I pressed down, made everything come to a standstill. By noon, the temperature had reached 90 degree Fahrenheit, and the dew point was almost as high. Even the super-industrial air conditioners at the National Hurricane Center were having a hard time keeping apace.

The NHC is a relatively new organization by US governmental standards—and one that often operates with more questions than answers. The Hurricane Center is the storm trooper of the Nationa Oceanic and Atmospheric Administration (NOAA), an organization not much older than its youngest meteorologists. NOAA was formed by President Nixon in October 1970, with the goal of streamlinin the country's major scientific branches: the Coast and Geodetic Survey, the Weather Bureau, and the Bureau of Commercial Fisheries, each of which had profound impact on environmental policy, and each of which was seen as crucial in our understanding of how we move through the world. The idea

of uniting these disparate branches was based in the realization not only that the oceans and atmosphere are inextricably linked, but that we are utterly dependent upon both. Nixon summed it up this way in his 1970 proposal to create a new organization: "We face immediate and compelling need for better protection of life and property from natural hazards, and for a better understanding of the total environment—an understanding which will enable us more effectively to monitor and predict its actions, and ultimately, perhaps to exercise some degree of control over them."

Control appealed to just about everyone that year. It was already a calendar marked by uncontrollable disasters: That spring, a freak avalanche killed 39 tourists in the French Alps; a month later, another killed 74 boys at a French sanitarium. An F5 tornado struck Lubbock, Texas, killing 28. Landslides killed 200 in Colombia and a staggering 47,000 people in Peru. More than 500,000 people died after a late-season cyclone struck East Pakistan. An unusually wet monsoon season in Vietnam left 200,000 people homeless and did what no treaty had been able to accomplish: It forced a temporary end to the Vietnam War. Cholera was sweeping across Eastern Europe. Revolutionary groups with names like the Weather Underground were surfacing to protest governmental policy.

Still, those in power did their damnedest to eke out a sense of autonomy. England announced plans to build a revolutionary flood barrier on the Thames. Not to be outdone, the United States decided to build the scientific organization to end all organizations—one that would acknowledge, at long last, that our fate is tied to both the weather and the sea. At the center of it all would be the National Weather Service. Nixon placed the new organization, known as NOAA, within the Department of Commerce: a decision, as it is apocryphally recorded, that was based more on spite than a sense of organization. As the story goes, the Republican president was so incensed by the antiwar sentiment expressed by his secretary of the interior that he made a point of denying that office the opportunity to house NOAA. Instead, the agency was bestowed upon the Department of Commerce. Whether or not that story is true has been lost to history, but it has enough traction that President Obama trucked it out in a 2012 State of the Union address, when announcing that he intended to restore NOAA to its rightful place in the Department of the Interior.

Meanwhile, the Hurricane Center continues to define itself in reaction to storms that got the better of us all. It's a process of fits and starts, says Chris Landsea: Each storm shows them another place where they need to improve. After FEMA, the Federal Emergency Management Agency, underwent harsh criticism for its slow response to Hurricane Katrina in 2005, the federal government decided to locate a FEMA office at the NHC so that relief efforts could be coordinated more quickly and efficiently: Instead of having to call the NHC to find out about a storm, FEMA managers would have their own on-site representative with the most advanced teleconferencing equipment available. In 1992, when Hurricane Andrew sent satellite dishes careering off the NHC roof, disabling meteorologists' ability to communicate, they decided they needed new digs. And so they traded their original building—a commercial site in the southern part of Miami—for a plot of land offered to them by Florida International University. The new headquarters they built there is nothing short of a bunker and it stands out like a weird braces-wearing kid among the genteel architecture of the rest of the campus, what with its collection of satellites and communication towers perched atop the concrete structure.

But the NHC building isn't intended to look pretty, says Landsea. It was built to withstand major hurricanes. That's why its foundation is four feet higher than any other building on the campus—computers don't tend to work well when they're wet. That's why imposing metal shutters can be dropped over the building's few doors and windows at a moment's notice. And why, inside those doors and windows, there's a kind of inner sanctum, a building inside a building as it were, built out still more concrete and rebar. There, two enormous generators can keep the whole operation running for days. When a major storm is approaching, they'll actually switch off from the public grid so that

no operations are interrupted by service blips. Fiber optics laid well below its foundation allow forecasters to tap into different information lines, even when hurricane winds are upon them. A secondary roof made of poured concrete and reinforced with steel bars keeps forecasters safe. They also have independent sewer and water systems, and the two generators make sure at least a few creature comforts are met during a cataclysmic storm—like the vending machines in the lounge. In fact, this inner sanctum is so regulated, so removed from anything approaching the natural elements, that the meteorologists working there regularly have to consult sources like the Weather Channel to know what's happening right outside their door. There are no seasons, no dips in temperature or darkening storms at the NHC—just fluorescent light and 72-degree canned air. They may as well be miles underground.

And that, says Landsea, is precisely how you want to feel when a hurricane is barreling down on you. He's seen the building put through its paces—enough to know that all the concrete in the world isn't enough when a major storm comes knocking. In 2005, Hurricane Wilma thrashed Florida, killin twenty-two people and leaving millions without power. The National Hurricane Center would have gone dark, too, had they not disconnected from the grid and switched over to generator power. Not certain that would be enough, they also dispatched a team of forecasters to Washington, D.C.—just i case the hurricane proved too much for their new headquarters.

It remained standing. Their generators continued to power their computers and radios, but both were drowned out by the ferocity of the winds, which blew through the satellite guy wires so hard tha the whole building was screaming. "It was like being on a battleship," says Landsea. "A battleship during a really, really ugly storm. It's not a pleasant feeling." And it's made all the more intense by a architect's whimsy: At NHC headquarters, large metal doors with portholes mark egresses, and ship' lanterns illuminate hallways outside the restrooms. A ship, says Landsea, is the last place you want t be in a hurricane. The second-to-last, he says, is on the lawn outside the National Hurricane Center. Their satellite dishes can really only withstand winds under 100 miles per hour. Any higher, says Landsea, and "those things are going to go sailing like giant Frisbees."

The question for Landsea is not so much whether that will happen as it is when. "Florida sticks ou like a sore thumb. We know we're going to get hit again."

That's one reason the NHC is deadly serious about storm protection. It's equally serious about security, but there are surprising moments of whimsy there as well. The guard's station is militaristic in its configuration, but also includes a wholesale club–size tub of cat food. They leave a few scoops out each morning for a cat who skulks around in the bushes just outside the front door. The staff has named the cat Pit because, explains the guard, the long-haired tabby is clearly tougher than all of the other feral cats in the area. Beyond the guard's station, and at moments when you least expect it, ABBA's "Dancing Queen" will come blaring out of the marine forecasting room. Over and over agai In their spare time, forecasters send around hilarious cartoons that only a meteorologist would get. They daydream about sharknados.

Marine forecasters, say the hurricane specialists, are like that. They move at a pace not unlike what you'd see at a bank or an insurance office. On particularly routine days, one of the large TV monitors will be tuned to ESPN or CNN. The hurricane forecasting side of the building is more feast- or-famine. The forecasting desk there stands largely empty for six months of the year, as the forecasters travel throughout the hurricane region educating families about storms or while they conduct training workshops on everything from new satellite technology to emergency management. Both, they say, are efforts to mitigate the stress felt during an actual storm. Stress they want the rest us to understand—especially if you work in the realm of disaster response. "If you really want to frea out a first responder guy," says Landsea, "put them in the forecast seat with some real-time hurricane data and tell them to predict the track of a storm."

Frankly, he says, that freaks out the hurricane specialists sometimes, too.

On that particular Sunday, Chris Landsea wasn't freaked out yet, but he was really interested. An hot. That the heat was enough to try Landsea's patience says quite a lot about the National Hurricane Center's most cheerful employee, who is—not coincidentally—also the agency's most charismatic star. At academic and press conferences alike, Landsea prefers bright Hawaiian shirts to suit jackets NOAA's traditional uniform of a navy-blue golf shirt (though he does pair even his brightest prints with creased slacks and European dress shoes). He's famous for taking basketball breaks at lunch and is an unabashed Jimmy Buffett groupie (hence the Hawaiian shirts). He refers to politicians and high level administrators as "critters." He plays water polo in his spare time. He's also hurricane *obsessed* his three kids are all named after major storms; his idea of a great vacation is a cyclone conference in Key West, where he'll walk from session to session like the celebrity he is, often talking to admiring grad students while simultaneously holding a cell phone with a reporter or a science writer conducting an interview on the other end. If someone is sitting at a computer station and sees Landsea, they get up and offer him the seat.

That afternoon, Landsea was thinking less about conferences and more about water polo and time with his kids. The hurricane season seemed all but over, and no one at the National Hurricane Center minded at all. It had been a weird year—tied for the third most active in history, but without a major storm. Months had passed without a single system threatening land—not even hurricane-prone Florida. And then there was all this lingering, record-breaking heat.

Sitting at his computer station, Landsea was trying hard not to sweat through his thinnest Hawaiian shirt as he watched the satellite data streaming in. Something had caught his interest. Ten days earlier, an easterly wave had formed off the coast of the Western Sahara and was now being buffeted by the trade winds. On a fair day, those winds funnel toward the equator, then coalesce into a steady conveyor belt, pushing air (and everything in it) across the Atlantic. They are relentless in their singular pursuit, moving westward—always westward—making them the most consistently powerful force on the planet. But every once in a while, there is a hiccup—a kind of ripple—in their movement. In meteorological parlance, it is a "migratory disturbance," which is to say that some of the winds zig while the rest of the trades zag. That's when real weather begins to form.

The hiccup's gap creates an easterly wave—a pocket in which unstable air can form. And that unstable air can create anything from a brief rain shower to a catastrophic hurricane. On average, about sixty easterly waves form each year. Most of them (90 percent, in fact), dissipate with a few thunderclaps somewhere over the Atlantic Ocean. A small handful of them grow into a system of clouds with organized movement (what meteorologists call a "tropical disturbance"). An even smaller handful of these disturbances continue to grow, eventually coalescing into a swirling circle of thunderstorms capable of feeding themselves (a "tropical depression"). Every once in a while, that depression continues to intensify, eventually becoming a tropical storm or, in the rarest of cases, a full-fledged hurricane. But going from a wave to a hurricane is about as likely as making it from Little League to the majors. If you've been in the tropical weather business for a while, that means you tend not to get too excited when you see a wave forming out there.

The process by which a wave develops into a tropical storm or hurricane is called "tropical cyclone genesis," and it requires a very particular set of complex meteorological circumstances. Most of our weather occurs between sea level and about forty thousand feet up—a region of the atmosphere known as the troposphere. For a tropical wave to become a hurricane, it must build itself up into a giant, menacing tower of swirling thunderstorms that brush the tropopause, or uppermost ceiling of the troposphere. For that to happen, the hurricane—perhaps paradoxically—needs calm, fair weather wherever one of its many thunderstorms is developing, and that requires a kind of synchronicity not often found in our atmosphere. The troposphere is really just a giant layer cake of different wind fields

(which is why airplanes often change altitude during a flight—they're always on the lookout for the most favorable wind conditions). Some of these tropospheric winds can be severe: It's not at all uncommon for even private pilots of single-engine planes to encounter 100-mile-per-hour winds as low as ten thousand feet. Those sorts of winds are more than enough to disrupt cloud formation or to prevent a system from developing. In fact, winds as high as 25 miles per hour will easily shear off a developing thunderstorm as it begins to form. Sometimes, even 10 or 15 miles per hour of wind is enough to stunt a developing storm, particularly if the air is cool and dry. Hurricanes thrive on warm moist air; once that air cools or begins to dry, the storm wilts.

Initially, Landsea's wave had been encountering plenty of wind and low-pressure air as it bounce across the Atlantic. And Hurricane Rafael, which was churning east of the Bahamas, was throwing in its own complications, too. Both sets of factors had been preventing the wave from growing into muc of anything. And for all Landsea knew, this new wave would fizzle out completely. Still, he couldn't help but look at the data streaming in. Two days earlier, that wave had split into two systems—one was now meandering around the Azores, while the other was on a more deliberate path toward the Caribbean. As it moved westward, the wave encountered the second in the series of specific circumstances required for a tropical system to grow: deep, warm ocean waters—at least 80 degrees Fahrenheit and of a "sufficient depth," though just how deep no one knows. That warm water is the lifeblood of a storm—it's what allows it to build, to move, and, ultimately, to unleash its fury.

As a developing system passes over warm water, it sucks up the moist air around it, creating a vacuum that is quickly filled by more warm, moist air: food for the growing storm. This air pushes upward and is cooled by the surrounding atmosphere. As it does, two things happen: First, the water vapor it contains condenses—releasing latent heat to fuel the storm and causing massive rain shower second, low pressure forms at the surface, creating a vacuum that the surrounding air rushes in to fill The Coriolis effect forces that air to swirl—counterclockwise in the northern hemisphere; clockwise in the southern—so as it rises, it begins to circulate around a developing eye, looping its way up to th tropopause. As long as the air is warmer than its surroundings, it will continue to rise. If it meets a high-pressure system sitting atop the growing storm, its winds will continue to intensify. (Pressure differentials create wind. The greater the pressure difference between two areas, the stiffer the wind.) A high-pressure system can also help prevent wind shear from lopping off the growing clouds and pushing them away, where they will quickly dissipate. Instead, these clouds continue to expand, heaping upon one another and defined by the winds within, which mold the clouds into organized, swirling bands. Once they have a full circular rotation, the system is considered "closed." And that's when it really begins to grow.

The system Landsea was watching hadn't become a tropical depression yet. But there was always the chance it could. That chance was increasing by the moment, thanks to a developing high-pressure system in the Caribbean. What had been a 10 percent likelihood was now up to 60 percent. Those are the sorts of odds that get Landsea excited.

Forecasters are gamblers. They live in the realm of probability. Sixty percent is like a strong deal at a blackjack table. Every so often, Landsea would get up from his seat at the marine forecasting station and wander over to see his colleague Lixion Avila, who was nursing a cup of coffee at the ma hurricane forecasting desk. The senior hurricane specialist loves ritual and says he never peeks at weather data overnight. Instead, Avila says he likes the drama and surprise of letting the past twelve hours unfold in brilliant color. There's a romance to it, he says, and that appeals to him a great deal.

"Hey, Lixion."

Avila was so absorbed by the satellite images that it took him a while to process that Landsea wa standing beside him.

"Christopher," said Avila, rolling out the *R*s with an exaggerated Cuban accent.

Avila was in his first hour of what was supposed to be an eight-hour shift, though he says they always have a way of going longer. He doesn't mind. And he was enjoying his morning routine. There was data to gather and numbers to crunch and, eventually, a forecast to write that would be read by millions. That's where Avila has earned his stardom. Weather advisories can seem almost robotic in their construction. But Avila bucks that trend, and he loves to quote musical lyrics or make wry comments. When announcing the development of 2002's fourth tropical storm, he wrote: "The bell just rang in the Atlantic. Hello Dolly!" Weather junkies everywhere went crazy. In 2007, he wrote, "I some of the dynamical models have their way . . . Juliette could meet her less-than-Shakespearean demise sooner than indicated." Those same junkies swooned. In early December 2005, when Hurricane Epsilon, a relentless storm that had been building and then weakening for days, finally showed signs of dying out, Avila quipped in his forecast, "I've heard that before about epsilon . . . haven't you?"

Most of the time, Avila's levity comes from self-deprecating jokes about the frustrating unknowability of storms. "I hope there will be no more surprises," he wrote when Hurricane Kyle teased the Carolinas in 2002. "Famous last words," he rued after calling for Hurricane Bertha to diminish. "Neither I nor the models are good enough to precisely know if Ernesto will have an intensity of 64 knots at landfall," he admitted.

That kind of honesty is one reason why Avila is the only NHC forecaster to have his own Wikipedia page. At sixty-one, he is also the senior-most forecaster at the National Hurricane Center. He jokes that that honor entitles him, like Landsea, to one of the few offices with a view of the Florid Turnpike. From his desk in the NHC bunker, if you tilt your head and lean a little, you can see palm trees and cloud formation in addition to the flow of traffic out there in the natural Florida light. Frankly, says Avila, he'd set up shop in the basement if he had to (even though the building doesn't have a basement). As far as Avila is concerned, working at the NHC is a dream come true for someon who grew up watching the storm-churned sea off Cuba's northeastern coast. Storms are his greatest obsession.

His second is dance. And if he was thinking about anything that afternoon, it was his upcoming trip to the International Ballet Festival in Cuba. His colleagues had agreed to cover him. An easy trade, he says, since he's the only one who never wants to take time off for Dolphins or University of Miami football games.

As the morning progressed, however, Avila was beginning to have second thoughts about heading off on a vacation. The heat wave was continuing to push across the region, and that was making the atmosphere south of Florida unstable. Out over Grenada, one of the disturbances began to throw thunderheads high into the air. The enormous clouds broke upon themselves, unleashing a shower of heavy warm rain on the Spice Island Resort that flattened palms and sent vacationers scurrying away from the pool. At the Hewanorra International Airport on the southern tip of St. Lucia, that rain was joined by lightning and thunder—enough to delay a few flights, but hardly unusual in this sultry climate, where humid air regularly makes for afternoon showers. What was unusual was the fact that this system was clearly growing. And it was on the move. Once past the Windward Islands, it continued its messy slog—an amorphous system with sloppy edges and no real sense of direction.

Avila squinted at the radar. He was playing a guessing game now, hoping these clouds might drop some clues about just how menacing it, whatever it was, intended to become. But the images gave away nothing. He needed to know what was going on closer to the surface—what the winds were doing. And that presented a challenge. Meteorologists have very few tools that can provide that kind of information. For years, the forecasters at the National Hurricane Center relied upon a tool called th quick scatterometer (or Quick-Scat, for short), which used microwave sensors to gauge wind speeds near the ocean surface. Attached to an orbiting satellite, it could give meteorologists a sense of winds

across the globe, but it broke in 2009. Ask forecasters at the NHC how or why and they'll shrug. *It ju broke*, they'll say. *That's all we know*.

Their boss, James Franklin, says it's more like the Quick-Scat died of old age. He's heard rumors that there is another one lying around somewhere that might get fixed to the exterior of the International Space Station at some point, but he's not holding his breath. For a while, he and his staf relied upon a Canadian scatterometer, but it failed recently, too. And so now the forecasters content themselves with a European version, called the A-scat, which they all agree is far inferior to the previous two. The A-scat takes pictures much like an old 35-millimeter camera does, which is to say that it takes fractions of a second for its shutter to open and close. Given how fast the satellite moves (about 15,000 miles per hour), that means forecasters end up with ribbons of data separated by large swaths of empty space—some as wide as three hundred miles.

It's frustrating, says Franklin. But not nearly so much as the data that does come in. The images forecasters get aren't very precise: They'll show you the presence of wind, but don't expect the images to distinguish between 60 and 100 miles per hour. And forget about reading gusts over 100 miles per hour—that's just too sophisticated for the European scatterometer's technology. There's also the problem of time: The scat's images take an eternity to load. But the most infuriating aspect o the A-scat is that, for each point the scatterometer reads, it offers three or four potential wind directions, called ambiguities. Franklin says you have to be a real masochist to enjoy figuring out which direction represents what is actually happening. But if you get good at it, you can learn a lot about whether or not a system has become organized enough to become a tropical depression. And if you know whether or not that system has become a tropical storm, you can get a decent sense of intensity sometimes, too. The technology exists for a more sophisticated scatterometer to be launche and the forecasters get a hopeful look in their eyes when they talk about the possibility of having access to a tool like that. Franklin says he's asked—repeatedly—but the budget just never seems to b there. Without it, the only way they can really know if a tropical depression is forming is to send an aircrew into the storm. And that comes with obvious negative side effects, too, so NHC officials tend to wait until they're pretty sure about a storm before dispatching crews.

That meant that, for the time being at least, Lixion Avila really had only one tool available to hin And if he wanted to know anything at all about this new system, he also knew he'd have to wait. Avila's a pretty patient guy. He sat at the desk, tapping his fingers. Landsea returned.

"I think there's something out there," said Avila.

Landsea looked over his shoulder. The data was still loading. Landsea sighed.

Avila lobbed a few jokes about how even old guys are faster than their technology.

Landsea laughed. Still no data. He wandered back to the marine forecasting desk. Avila thought about ballet.

And then, one strand at a time, the scatterometer began to reveal the winds of the Caribbean. Avi was really paying attention now. In between gaps of missing information, the forecaster could see the thunderstorms heaping on top of one another, releasing more moisture as they coalesced and began wrapping their winds around one another.

A cyclone was building. Or so it seemed. He called Landsea back over. They both leaned close to the screen. Neither of them said anything for a while. Then Avila pointed to the center of the storm. There, bands of clouds appeared to be orbiting around one another. Circulating. The system was organizing itself into a tropical depression. Landsea sighed. Clearly, the season wasn't over yet. And was time to get somebody inside this storm. Avila picked up the phone. In an instant, he was patched through to Lieutenant Colonel Jon Talbot, Chief Meteorologist for the 53rd Weather Reconnaissance Squadron.

"Hey," asked Avila, "do you guys see what we see?"

“Yep,” said Talbot. “I think we do.”