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SPRING 2024 | VOL 65 NO 1

# WINDswept

The Bulletin of the Nonprofit Mount Washington Observatory

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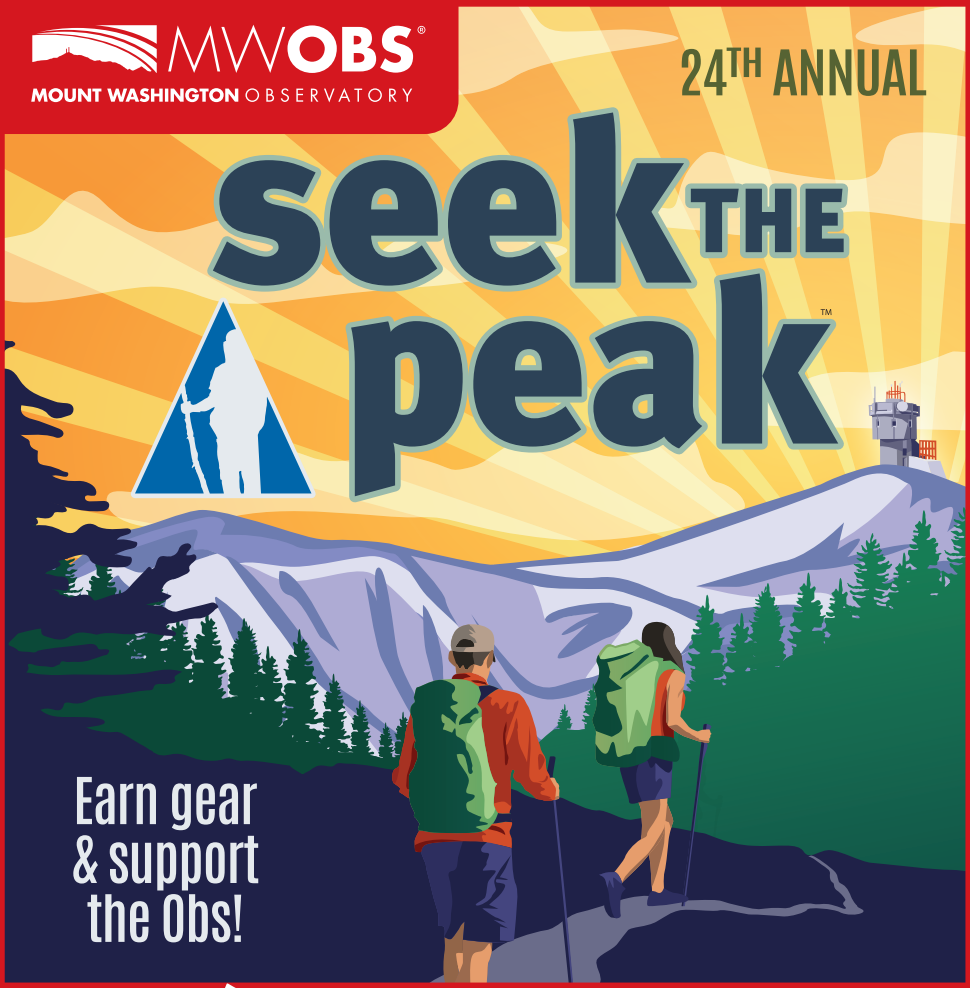


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# WINDswept

SPRING 2024 | VOL 64 NO 4

## FEATURES



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Mount Washington Observatory® is a private, nonprofit, member-supported institution with a mission to advance understanding of the natural systems that create Earth's weather and climate. It serves this mission by maintaining a weather station on the summit of Mount Washington, performing weather and climate research, conducting innovative science education programs, and interpreting the heritage of the Mount Washington region.

Membership in the Observatory is open to all. Members who donate at least $60/year or $5/month receive: Tours of our famous mountaintop weather station (generally mid-May through mid-October); a one-year subscription to *Windswept™: The Bulletin of the Mount Washington Observatory*; meteorology and climate research news from the summit of Mount Washington, straight to your inbox; free admission to *Extreme Mount Washington*™ museum; advanced notice of special events; a 15% discount on all purchases in our museum and online shop; and free admission to more than 300 science centers through the ASTC Passport Program (restrictions apply, please see the ASTC website for details).

Members will receive the three issues of *Windswept* for the year following the quarter in which they join. Please make checks payable to the Mount Washington Observatory and send to: Mount Washington Observatory, PO Box 2310, North Conway, NH 03860-2310, or join at mountwashington.org.

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IN MY VIEW

# Honoring Our Past, Pursuing Our Purpose

Ellen Estabrook

BY **ELLEN ESTABROOK,** WINDSWEPT EDITOR

This spring edition brings celebration of many things, past and present. First, because of the incredible Observatory community, another successful Year-End Campaign is in the books. The fundraising goal was not only met, but exceeded by $50,000. The team is incredibly grateful and greatly motivated to meet what 2024 has in store.

The past is ever-present in Observatory endeavors, and will be even more so in the coming weeks. In this issue, we reach far back into the over 90-year old archives to our founding years, which are rooted in the organization's still-symbiotic relationship with the Appalachian Mountain Club (AMC). AMC's Matt Morris writes a beautiful tribute to the intertwining history of the two entities (p.12), with huts manager and Observatory co-founder, Joe Dodge, whose name is omnipresent on the trails still, as the cornerstone of the important work to follow.

Peter Crane, co-collaborator of the aforementioned article and curator of the Gladys Brooks Memorial Library, also reflects on our archival collection as a whole (p. 18), highlighting an exciting and important opportunity to protect the historical documents dating back to the institution's forebears.

Finally, the Observatory's legacy comes full circle in April for the 90th Anniversary of Big Wind Day, a landmark weather event of 231mph World Record Wind. Every year, we are reminded of what inspired the "Home of the World's Worst Weather" motto, and this year we'll be celebrating in a big way (p. 30) to commemorate the connection of human, technology, and mother nature. You'll also hear firsthand from an observer what 2023 was like on the summit, marked by "a rollercoaster of meteorological phenomena" of its own. Suffice to say, much is underway to preserve, celebrate, and honor the Observatory's work in weather and climate science, and we look forward to bringing our community together for these opportunities to share what connects us all to this shared mission.

Lastly, if we have not yet met, my name is Ellen and I am excited to serve the organization as a new communications team member. I've already learned so much about what makes this organization so special, and hope to see you—in the valley, on the summit, or perhaps somewhere on trail in between. Thank you for the warm welcome, and I look forward to continuing to serve the Observatory's mission alongside all of you.

# From Past to Present, The Importance of Mount Washington Observatory

Drew Bush

BY **DREW BUSH,** EXECUTIVE DIRECTOR

Over the past few months, we have marked two seminal events in the history of the Observatory. The first came on January 29th, 1934, in just the second year of our existence, when our team on the summit of Mount Washington recorded the coldest ambient air temperature ever to that point.

Let me take you back, for a moment, to that cold winter day 90 years ago. At that time, our existence was made possible by our partners at the Mount Washington Auto Road. Our crew was housed in the summit stage office of what was then known as the Mount Washington Summit Road Company, with sleeping quarters in the attic. On the mountain that fateful day were Ralph Batchelder, Wendell Stephenson, Sal Pagliuca, and Alex McKenzie. Pagliuca wrote in the Observatory's logbook:

"A record-breaking morning. The temperature oscillating about 46 degrees below zero reached a minimum of 46.5 below zero at 10 a.m. The pressure reached the lowest since the establishment of the present observatory with 22.187 inches at 7:45 by mercurial barometer, and 22.15 by barograph between 7 a.m. and 7:45 a.m. A 95-mph wind was blowing from Northwest. The summit was in clouds, a very light, almost negligible deposit, presumably rime, was forming but not accumulating. Low heat only was required on the anemometer for true readings. I believe that all the causes of slowing down removed, the instrument would have not been affected by the small deposition of rime. But we wanted to play safe and heat was continuously applied."

One can only imagine the fortitude of our forebearers who braved this historic day without the conveniences of our modern life. Yet imagining does not take much work for three of our current summit staff. Just over one year ago, on February 4, 2023, our current observation team of Francis Tarasiewicz, Karl Philippoff, and Alexis George braved the elements to record an ambient air temperature of minus 46.7 degrees Fahrenheit.

The Observatory, and the meteorological community, was fortunate to have had such a diligent team on the summit for that very notable weather. Starting after 10:00 p.m. on February 3, 2023, Philippoff and George began taking measurements every half hour as opposed to the Observatory's normal hourly routine. By 12:15 a.m., the observers knew something

special was happening and began taking readings every 15-20 minutes, totaling 22 measurements during the next seven hours until 5:15 a.m. Philippoff later memorialized the moment the record was tied, and then broken, on our blog on Mountwashington.org, writing:

"I looked at the temperatures at some of the stations upwind of Mount Washington to the north and west and noticed that after similarly long periods of stasis, their temperatures had started dropping ever so slightly by early Saturday morning. Shortly thereafter, the Foxboro digital thermometer — located on the observation deck — and our sling psychrometer measurements also seemed to show a small, but at this point record-tying dip. After having held steady between -45 °F to -46 °F for six hours, we were consistently getting measurements below -46 °F. At 3:40 a.m., we measured a -46.6 °F reading, and the Foxboro was indicating that temperatures were still dropping. I slung again at 4:10 a.m., and Alexis came out to assist me in reading while I slung. I stepped out from the sheltered location in the lee of the tower into the brute force of the 90+ mph winds to get the best exposure to the coldest air flow."

"One of the reasons that I had asked Alexis to assist me in reading the thermometer was that, due to how I was bundled up against the cold, my breath would become trapped within my layers and freeze on the inside of my goggles, making it near impossible to read the temperature through them. In order to read the thermometer accurately, I had had to take my goggles off in the lee of the building. In this instance, I dashed over to Alexis so she could read the alcohol at its lowest point and confirm my previous reading. It read -46.7 °F!"

While current meteorological practice rounds readings in such contexts and thus equates this low temperature with the minus 46.5 Fahrenheit recorded on the summit on January 29, 1934, those who know remember that this reading was two-tenths of a degree lower than the 1934 reading—making the 2023 reading the record low for the station. Both events distill our purpose into its truest form. The Observatory exists to provide a home for scientific endeavor that enables us not only to measure the Earth's most extreme conditions but also to keep track of how our planet may one day change.

This purpose has led to an incredible busy winter, with our staff re-establishing long-standing research relationships with the United States Air Force, the United States Army Corps of Engineer's Cold Regions Research and Engineering Laboratory, Blue Hill Observatory, and the Appalachian Mountain Club. We've also launched new partnerships with Eversource Energy and the United States Forest Service's Mount Washington Avalanche Center to share expertise and build new meaning for our student interns. We're even looking to expand our work with the National Weather Service to make Mount Washington a training ground for the improvement of numerical weather models and their ability make forecasts that keep humans and our infrastructure safe. At the same time, our programs with area schools continue to grow with our first winter trips on the mountain contributing to the National Aeronautics and Space Administration's (NASA) Community Snow Observation citizen science campaign.

In coming days, you will have the chance to mark another 90th anniversary with us. We invite you to North Conway, New Hampshire where everyone will be welcomed to celebrate Big Wind Day (a historic day you can read about in this edition of *Windswept*) on April 12, 2024 with fun for families and a party with some of our founding staff members' descendants. Just before it, we'll mark the 2024 Total Solar Eclipse with a variety of events and, just after, we'll begin the march to our 24th Annual Seek the Peak. I hope you will get involved, join us for any or all of these exciting times, and consider making a generous gift to sustain our mission into the future.

**NEWS FROM NIMBUS**

# Just Another Day in Purr-adise!

TRANSLATED BY **TRICIA HUTTON**

Hi fur-iends! Let's paws and catch up on all my latest adventures in life. I have some purr-sonal milestones and cat-tactic stories to share.

I believe my napping skills have reached an all time high. My cat-naps really help me recharge my purr-battery.

My purr-sonal growth includes expanding my fur-mily up here; we have interns! I love our interns on the meow-tain because now there are more laps to sit on! I tried to convince them to feed me extra treats, and even told them I am on a strict treat-based diet…but I don't think they believed me. I litter-ally tried every day—they are too smart and won't listen. These observers have been purr-forming exceptionally well, and I'm not kitten around! My favorite fur-niture is found up in the weather room, but sometimes

Nimbus working on his higher summits fur-cast

the humans are busy working and take the chairs from me. I love going to the weather room, their windows have paw-some views.
After being up here fur quite some time, I have decided to help with the fur-casts and I think I'm getting purr-ty good at it. I remind myself that nobody is purr-fect. Maybe one day my fur-cast will be published… keep a close eye out in case my purr-suasion works!

I hope my updates have left you feline happy. I look forward to updating you soon on my claw-some life. Enough from me fur now, I hope your lives are filled with warm laps and endless treats. Sending purrs your way!

# Erica Broman Begins Leadership Role as Board of Trustees Chair

During their February 13 meeting, Mount Washington Observatory's Board of Trustees unanimously approved the nomination of Erica Broman to serve as Board Chair.

Broman first joined the Board of Trustees in 2013 and has been leading the Observatory's Development Committee since 2016. She recently retired as Senior Advisor at Westfield State University (MA) after a successful tenure as Vice President of Institutional Advancement and Executive Director of their Foundation. Previously, she oversaw the marketing, resource development, institutional research, and advancement efforts at Holyoke Community College (MA), where she helped grow their foundation four-fold.

Broman received her BA from Miami University, her MBA from the University of Massachusetts, and her doctorate in higher education management from Northeastern University.

"I am honored and excited to be stepping into the role of Chair of the Observatory," Broman says. "It holds a unique place in alpine weather research and education and I hope to build on the great work already being done by Drew Bush and our staff. We, as a board, are committed to increasing the impact of the organization and furthering our efforts to expand weather knowledge and the weather history of Mount Washington."

Erica Broman

The February 13 meeting also included unanimous approval for Ty Gagne to serve as Board Vice Chair. Learn more about Broman, Gagne, and our full Board of Trustees at mountwashington.org.

## Lourdes Avilés Named AMS Fellow

Please join us in congratulating Observatory Trustee Lourdes Avilés for being named a Fellow of the American Meteorological Society at their 2024 Annual Meeting.

New fellows are elected annually to recognize individuals who have made "outstanding contributions to the atmospheric or related oceanic or hydrologic sciences or their applications during a substantial period of years."

Before becoming Associate Provost at Plymouth State University, Lourdes was a professor of meteorology for two decades, during which she taught a large number of courses, wrote books on atmospheric phenomena, and conducted extensive research in meteorology, air quality, and interdisciplinary science. She was also department chair and director of the Computational, Applied, Mathematical, and Physical Sciences (CAMPS) Academic Unit.


Lourdes Avilés, right.

Lourdes holds Ph.D. and M.S. degrees in Atmospheric Sciences and Physics from the University of Illinois at Urbana-Champaign, and the University of Puerto Rico, Mayagüez Campus, respectively.

## Amy Cotter Joins Observatory as School Programs Educator

Amy Cotter, previously a summit intern, has recently joined the Observatory's Education team as School Programs Educator. Working closely with the School Programs Coordinator and Director of Education, Amy has been instrumental in both school and after-school programs, as well as field trips to the summit. Welcome, Amy!


Amy Cotter

# Remembering Marty

BY **KEN RANCOURT,**
MOUNT WASHINGTON OBSERVATORY TRUSTEE

Known throughout New England as "Marty on the Mountain," Marty Engstrom passed away on Jan. 4 at his home in Fryeburg, ME, according to his family. He was 86 years old. Engstrom worked for 38 years on Mount Washington as an engineer at the WMTW transmission station; he wrote about his experiences in his 2003 book titled "Marty on the Mountain: 38 Years on Mount Washington."

Marty was already on the Mountain for over ten years when I met him in the fall of 1979. Guy Gosselin (Obs Director)'s assistant, Rob Kirsch, took me over to the TV station to introduce me to their staff, our nearest (and only) neighbors. At that time The Old Obs and the TV station where Marty and Willie (fellow Mt. Washington Channel 8 engineer) lived and worked was only separated by a 20 foot long 'breezeway'. Over those years I was fortunate enough to witness Marty presenting his evening weather report in person! He approached that task with dedication and at times asked Observers for their opinion of existing conditions. For a long time we were the only 4 people on the mountain in winter.

The Obs and TV staff shared Sunday night 'TV-dinners' in those days (we shared over 20 years of Sunday dinners together), and Marty was the designated cook on their shift. Every meal there began by Marty saying grace, and following dinner Marty would call his wife at the precise agreed upon time. Many people would call Marty's home trying to impersonate him, but this technique foiled their efforts.

Marty giving a tour in April 2001.

Beyond cooking Marty had a wicked sense of humor—even in stressful situations. On Shift Change Wednesdays in winter sometimes Phil Labbe, the TV tractor operator, would allow us Obs folks to ride 'on' (not in!) their tractor. On one particular occasion the weather was extreme, and much snow had fallen with an east wind—totally blocking the 5-mile section of the Auto Road. Phil and Marty discussed it and I was allowed to ride in-

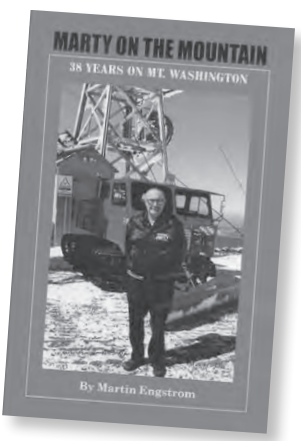
side this time. Phil decided to ascend via the Winter Cut-Off, a steep and tortuous trail that avoided the 5-mile grade but traversed both the Sugar Bowl and the Snow Bowl. Marty, riding in the Co-Pilot seat, frequently gave Phil reports of what he saw out the right window while Phil focused on the limited view out the left window. Willie and a radio technician and I sat very quietly in the back seat hoping they knew what they were doing. We bounced around, hitting a few rocks, and tipping precariously numerous times. We stopped many times due to zero visibility and Phil finally decided to admit defeat and return to base (that in itself was a difficult portion of the trip too— we had to turn around!). Recall that we were the only tractor on the mountain at that time so we were totally alone. When we finally reached the intersection with the Auto Road, Phil looked left and Marty, looking right, reported "Cleeaahh Right" in his inimitable accent. We all laughed at the


Marty in 1999. Photo by Wex

release of the accumulated tension.

Marty was also a technological resource. He was truly a self-taught engineer. During many of those TV-dinners our discussions sometimes turned to very esoteric topics. At some point during the talk Marty would raise his eyebrows, place his fingers on his chin, and exclaim 'wait just a minute'. He would return to the table with just the right book to resolve the issue at hand. Marty was also very helpful when it came to wiring issues on the summit as grounding was always a questionable affair. Working with Cold Region Research and Engineering Laboratory technicians we had great difficulty getting good data from some of their very sensitive sensors. One problem we saw frequently was that when Channel 8 went from a normal television show to commercial, or went from a white scene to a dark one, we would get a significant 'blip' in the data stream. Not surprisingly, Marty came up with the solution we needed. Because you couldn't properly 'ground' the data cables, he suggested we use tin foil! The TV staff would frequently use wrappings of tin foil around some of their cables to stop the interference from getting into the cables in the first place. It worked on CRREL's data lines too.

Marty was a pleasure to work with and will be remembered fondly by his mountain friends.




Marty's book, "Marty on the Mountain: 38 Years on Mt. Washington."

FEATURE

# The Shared History of AMC and the Mount Washington Observatory

BY **MATT MORRIS,**
APPALACHIAN MOUNTAIN CLUB

**April 11, 1934:** It was relatively warm on the summit of Mount Washington. Below freezing, but not by much. But more comfortable temperatures were not a reason for relief for the staff of the Mount Washington Observatory. Two walls of the Observatory building were caked in ice nearly a foot deep and the wind was picking up. The observers decided to stay up in shifts that night, taking measurements with a radio to an anemometer (a special device for measuring wind speed) and a stopwatch.

"There was big weather out there, and the instruments would need tending," wrote William Lowell Putnam in his history of the Observatory, The Worst Weather on Earth.

The wind picked up all night. By midday on April 12, Observatory staff were recording gusts of more than 200 miles–per hour. Then it happened. 231 miles–per hour. A world record for the highest wind speed ever recorded to date. Still the highest wind speed ever witnessed in person.

Capturing the measurement was a major scientific achievement for the fledging Mount Washington Observatory, then just eighteen months old. But it was also a victory for the Appalachian Mountain Club and its Huts Manager, Joe Dodge. Dodge was a life-long advocate for scientific research on New England's highest peak and a co-founder of the Observatory. All the men on the summit that day had been AMC employees at one time.


Today the Appalachian Mountain Club and the Mount Washington Observatory's work and missions remain entwined. AMC's backcountry huts in the White Mountains depend on forecasts from the Observatory to prepare staff and guests for the day's adventures. Scientists from the two organizations frequently collaborate to study the impacts of climate change on our region.

**The Beginnings**

As long as people have been living near Mount Washington, they've been in awe of its wild, unpredictable weather.

The Abenaki name for the mountain is Agiocochook, which can be translated as "Mother Goddess of the Storm." In the winter of 1870-1871, Dartmouth College professor Charles H. Hitchcock and a small team built a temporary weather station in a railroad building, sharing reports via telegraph. The next year the U.S. Army Signal Service established a full-time weather station on the summit of Mount Washington. But when the government closed the project in 1892, the high peaks of the White Mountains were without consistent meteorological data for almost 40 years.

Until AMC Huts Manager Joe Dodge came along.

"Often, folks that have some knowledge of Joe think of him as just a long-time AMC huts manager. But he also had a very strong technical streak and scientific streak," said Dr. Peter Crane, Mount Washington Observatory Curator.

Crane's workplace, the Mount Washington Observatory's Gladys Brooks Memorial Library in North Conway, New Hampshire, is filled with reminders of Dodge's legacy: letters from Dodge to friends and donors, made out on both AMC and Observatory letterhead. Studious notes on the newest innovations in radio, a lifelong passion of his that would play a role in his co-founding a weather observatory.

Joe Dodge was enamored with radio as a teen, even building his own amateur setup. When the U.S. entered World War I, he dropped out of high school and worked as a radio operator on a naval submarine. A few years after returning home, he moved to New Hampshire's North Country and found work as the hutmaster at AMC Pinkham Notch Lodge. Today it's called Joe Dodge Lodge.

Dodge soon saw the impact of the White Mountains' volatile weather – and what it could mean to understand and predict it. In 1927, after historic flooding in New England, he worked with a Dartmouth College professor to set up precipitation recording at AMC's backcountry huts. He then became a U.S. Weather Bureau official observer for the area.

Dodge made another Dartmouth connection around this time, future Observatory co-founder Bob Monahan. Monahan was just a college sophomore when he organized a Christmas break trip to take weather data on the summit of Mount Washington. He met Dodge passing through Pinkham Notch, and the two bonded over a shared desire to rebuild a year-round weather station on the mountain.

"[They] decided that the example given by the 19th century weather observers was too good to pass up. They talked about reinstalling or reoccupying Mount Washington," said Crane.

Scientific funding during the Great Depression was hard to come by, but the pair found a way. In 1932 Dodge gave a presentation on the potential of an observatory at a meeting of the New Hampshire Academy of Science. His talk impressed Academy President James W. Goldthwait so much that the organization decided to make a major donation.

"[The Academy of Science] figured out how much they would need for their basic operations for another year. They set that money aside and everything else in the treasury was given to Joe Dodge for starting up the observatory," said Crane. Just like that, the Mount Washington Observatory was on its way to becoming a reality.

**The Early Observatory**

With funding secured, Dodge and Monahan set to work turning a seasonal office building on the summit (courtesy of the Mount Washington Summit Road Company) into a modern scientific station that could withstand inhospitable conditions. In written reflection on this time, Observatory mainstay Alex McKenzie remembered days of hard work, surrounded by friends from across the AMC hut system:

"After the storm windows had been placed, the chains over the roof tightened, and all the work of making the place livable had been finished, we were free to start making our Observatory, installing instruments, wiring the house for electricity, building and setting up radio equipment. Joe had enlisted Itchy Mills… Ralph Batchelder, mule skinner and hutmaster par excellence, and Wen Stephenson, prospective hermit of Carter Notch, to help the Observatory crew at the start."

When construction was completed, a small crew hunkered down for the Mount Washington Observatory's inaugural winter. Each had previously worked for the Appalachian Mountain Club. Monahan stayed on the summit full-time while Dodge split his duties between the Observatory and Pinkham Notch. Joining them was Galehead Hutmaster Salvatore Pagliuca and backcountry skiing pioneer Albert Fleetford Sise. McKenzie replaced Sise later that year.

Winter on the mountain was challenging. Trips halfway down the mountain for supplies could involve high winds and limited visibility. Most observatory staff only took five days off a month, and contact with the outside world was limited to the radio and occasional visitors.

"At the moment our last remaining friend had disappeared into the fog, we became men rather than boys," recalled McKenzie.

But there were moments of joy. In *"The Worst Weather on Earth"*, Putnam recounts a visit from Joe Dodge's wife, Cherstine, carrying a batch of oatmeal cookies that "disappeared like magic." The crew were kept company by a "monumentally unhousebroken" dog and a cat. While, supposedly, no one was excited to have the cat there, the tradition of the observatory cat continues to this day. By 1934 eight cats were living on the summit.

What attracted those early crews to the summit of Mount Washington? Conditions were tough and isolation near constant. Observers served on a volunteer basis, only receiving room and board. While the pay is much improved, the draw of working on New England's highest peaks, whether as a meteorologist or AMC Hut Croo, remains the same for many: adventure and the comradery that comes with living in an environment unlike any other.

**Keeping the Backcountry Safe**

With the tradition established by its

founding staff and worldwide publicity after measuring a world record wind, the Mount Washington Observatory continued to grow. Staff moved from their borrowed office to a new facility and began a partnership with the U.S. Weather Bureau. They also integrated Joe Dodge's first love, the radio, into their work. The results were pivotal not just for science, but for the outdoor recreation culture Dodge and the AMC were creating in the White Mountains.

"Reports about ski conditions and the weather forecasts were in part for safety reasons and part to encourage tourism… From a commercial angle for Joe [Dodge], he wanted to have a successful winter. He wanted skiers who came all the way up from Boston," said Crane.

From the start Dodge and Alex McKenzie, a skilled radio technician in his own right, intended for the Observatory to share their weather reporting with the world. They began broadcasting their forecasts to the Blue Hill Observatory down in Milton, Massachusetts. From there, reports were shared with the U.S. Weather Bureau's Boston Office and sent to a broadcast in Washington D.C., according to an article by McKenzie in the Bulletin of the American Meteorological Society. The pair also found an important use for the radio closer to home.

In 1933 a young hiker named Simon Joseph went missing in cloudy conditions on his way to AMC Lakes of the Clouds Hut. To aid the search, Observatory staff sent the hut's Croo a newfangled device they'd built over the winter – a twenty-pound portable radio system. While Joseph's body was unfortunately found too late, the impact of using radio to coordinate a search did not go unnoticed. According to author Nicholas Howe in his book Not Without Peril, the effort had global implications for how rescues are carried out.

"The AMC was so impressed by reports of the Joseph episode that their high-elevation huts – Lakes, Madison, and Greenleaf – were equipped with portable two-way radios… Word spread, and by 1938 the Swiss were equipping their mountain refuges with thirty-pound portables."

Perhaps more important than the searches the radio system aided are all the missions that never happened because radio communication between huts and the Observatory kept hikers informed about

changing weather patterns.

Aside from improvements, it's generally the same system both organizations use today.

Each morning at 7am sharp, hut Croos tune their radios to the Observatory's daily forecast. Croos share these reports with their guests at breakfast and write them down for passing hikers to see. In a place where phones quickly lose battery and cell service is limited, radio reports give hikers the information they need to make smart decisions.

**Understanding Climate Change**

The Mount Washington Observatory doesn't just collect its data for the daily weather forecast. Reports are stored for posterity, creating a reliable, consistent scientific record almost a century-long. Data sets like these are rare, especially in the backcountry. Between the Observatory and AMC's 90 years of weather reporting at nearby Pinkham Notch, the Mount Washington area is fortunate to have two such records. By sharing their resources, scientists from the two organizations have taken advantage of a unique opportunity to understand the fragile environments they steward.

In 2021 AMC Staff Scientist Georgia Murray published a study utilizing Observatory and Pinkham Notch data focused on temperatures and snowfall on Mount Washington from 1917 to the present. Murray found that New England's highest peak, once relatively insulated from the impacts of climate change, is now warming at a statistically significant rate. Since 1917 the mountain has seen 20 fewer "frost days," or days where the temperature is below freezing. Snowpack is declining, and the growing season for plants is getting longer.

Much of that change has been in the last 20 years.

"Our paper found that for the first time, the summit is tipping to what we call significantly warming," said Murray, speaking to WMUR.

The founders of the Mount Washington Observatory may not have had climate change on their minds, but their measurements have proved instrumental to our understanding of its effects in the Northeast.

"Since 1932, Mount Washington Observatory has built one of only a few high-altitude, long-term records of weather and climate worldwide. This record provides huge benefits to scientific research, including our own climate studies, grant-funded projects, partnerships with universities, and product testing," says Observatory Executive Director Drew Bush.

Research like Murray's informs policymakers and the public about the real, immediate, and close-to-home impact of climate change. Without the longstanding scientific relationship between AMC and the Mount Washington Observatory, a big piece of the report would have been missing.

"Our missions are different, but the passion is the same… We couldn't do this climate work without what they're doing up there," says Murray.

**Staying in Touch**

From shared staff and research grants to radio calls and rescues, it's impossible to tell the history of AMC without

the Mount Washington Observatory, and vice versa. Peter Crane, the Mount Washington Observatory Curator, doesn't just record this history. He's lived it. Before working at the Observatory, he was a ten-year AMC veteran, starting as a caretaker in Carter Notch Hut in 1978. In a 2006 article from the Hut Croo's alumni association, the OHA, Crane says the skills he learned in his decade with AMC, from understanding the alpine environment to living in isolation, prepared him for his new job on the summit. In many ways, it's a metaphor for the relationship between the two organizations.

"The trend is toward working more closely with some of the things that both organizations have been involved in for many, many decades. Hiker safety and hiker awareness. Protection of the environment. Climate awareness… It's a big mountain, and there's plenty of room for many organizations that are working for better experiences for the public and for the environment."

Nothing is safe from the passage of time, even in the seemingly constant mountains. Observatory staff (and beloved "Obs" cats) come and go. The Pinkham Notch outpost that Joe Dodge helped turn into the center of White Mountain recreation is now named in his memory. Weather patterns shift and temperatures rise. But the partnership between AMC and the Mount Washington Observatory remains strong.

"It's great that we've stayed in touch for 90 years," says Crane.

FEATURE

# Collections Stewardship at the Observatory: MAPping the Past for the Future

BY **PETER CRANE**

2023 was the 50th anniversary year of the Mount Washington Observatory's museum on Mount Washington – now known as "Extreme Mount Washington Museum." This made it a very appropriate time to take a closer look at one critical element of our educational activities, our museum collections, and to consider ways we might improve the stewardship of the many important materials which constitute our collections.

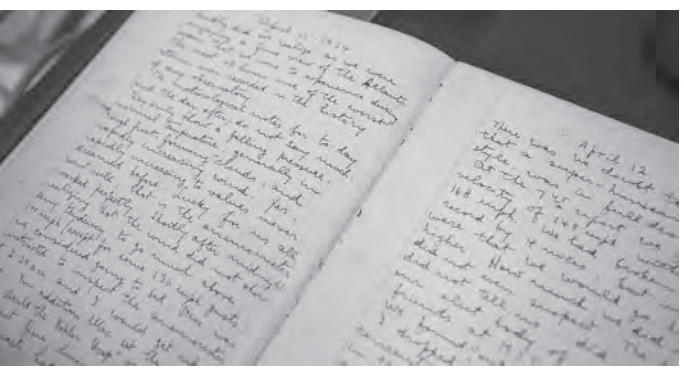
With this goal in mind, the Observatory applied for participation in the American Alliance of Museums' (AAM) Museum Assessment Program (MAP). The AAM is the nation's principal professional museum organization. Through the MAP program, museums use AAM-provided materials to scrutinize their operations and to self-evaluate their performance. Participating museums also benefit from a visit from an experienced museum professional to assess operations and to suggest ways for improvement. Given our focus on many technical scientific activities, the Observatory is not a typical museum institution. However, our educational activities were recognized as consistent with the AAM interests, and we were welcomed into the program. In this MAP project, we focused on collections stewardship.

First, a few words about the evolution of the Observatory's museum endeavors. The Observatory was founded in 1932. Since that time, we have been involved in weather and climate activities and also in many educational endeavors. That educational work took a leap forward 50 years ago with the establishment of the Observatory's seasonal museum on the summit of Mount Washington, sharing information about the mountain, its weather, its environment, and its human history with hundreds of thousands of visitors over the years since.

The museum's founding resulted in the accumulation of historical materials that could be used as resources for developing new exhibits. Collections include books, stereoviews, postcards, maps, artifacts, and Mount Washington and White Mountains memorabilia. Over the years this collection has grown considerably, providing a resource not just for exhibits, but for educational programs for schools, libraries, and other locations, and serving as a source of information for those doing historical research in the area as well as for individuals seeking more information about the region for personal enrichment. Among the materials in the collection now are more than 2,000

stereoviews, more than 1,200 postcards, more than 6,000 slides, about 75,000 feet of motion picture film, many maps, photos, newspaper clippings, and White Mountains ephemera, and more.

With this background, and with this history of the Observatory's museum collections in mind, we participated in the MAP program to assess and to improve our performance in taking care of our collections. We realized that items could be better organized, which would facilitate access for Observatory staff and for other researchers as well. We knew, too, that the physical preservation of some materials in the collection needed some attention. We also wanted to use these significant materials more in our many educational programs, whether on the mountain, or in schools, libraries, or virtual venues. Finally, we wanted to explore possibilities for making collections materials more accessible to the public, including through digitization and web access.



Observer logbook account of 1934 Big Wind.

A major component of the collection is related to Guy Shorey, a prominent photographer who was active in the area in the first half of the 20th century; the Shorey collection includes more than 9000 negatives, plus photos, personal papers, cameras, and other materials. Materials from the early history of the Crawford House, aerial photos and other items from Brad Washburn's cartographic survey of the Presidential Range, photos and films from White Mountain photographer Winston Pote, and atmospheric icing reports from research during the mid-20th century, are also in the collection. The personal White Mountain collection of Walter Wright, a longtime special collections librarian at Dartmouth College, is an essential part of the Observatory's holdings. The collection includes the Observatory archives, which also feature material from the institution's forbears, the U.S. Army Signal Service, which maintained a summit weather station in the late 19th century. There are also personal papers from some of the Observatory's founders, such as Joe Dodge and Alex McKenzie.

From time to time, some of these materials have been borrowed by other institutions, such as the Currier Museum of Art in Manchester, and the Museum of the White Mountains in Plymouth, for incorporation in their own exhibits.

An integral part of the museum collection is the Observatory's resource library, the Gladys Brooks Memorial Library, which comprises about 3700 books, with a principal focus on the human history of the White Mountains and the sciences pertinent to the area. Patrons of more than 70 librar-

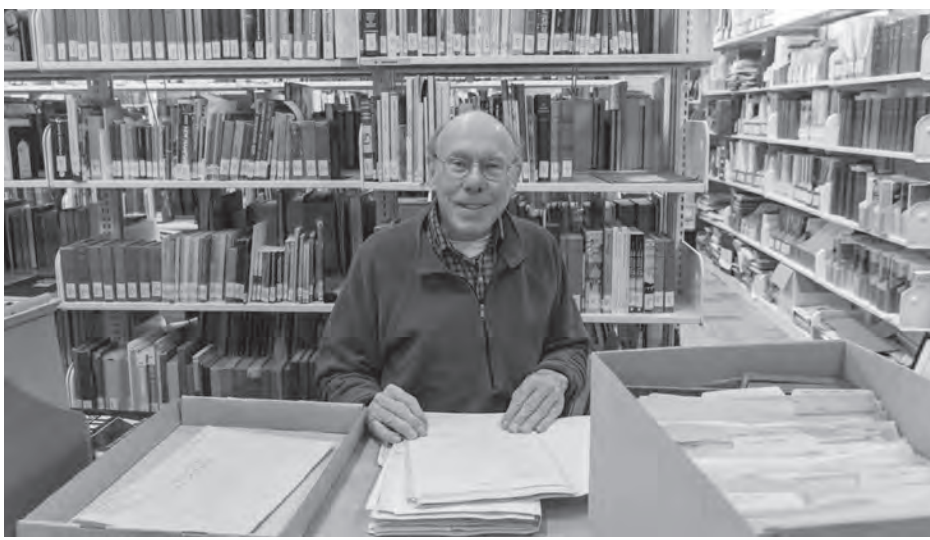
ies throughout the state have borrowed these books though the New Hampshire interlibrary loan system. The library also remains open for walk-in use by appointment with our curator.

The Observatory's museum collections, archives, and library are housed at its valley office location in North Conway village. The collections are an important resource to assist the Observatory in addressing one of the items singled out in our mission statement, "interpreting the heritage of the Mount Washington region."

Our MAP team consisted of Executive Director Drew Bush, Director of Education Brian Fitzgerald, Curator Peter Crane, Trustee Gary MacDonald, and Volunteer Librarian Karen MacDonald. The team met regularly through much of the year, reviewing AAM materials which guided the group in becoming more aware of professional museum standards. There were many earnest discussions regarding our current practices and how to improve them.

A special feature of the AAM MAP program is the visit of a museum professional to assess and comment on observed practices. Our Peer Evaluator was Sue Taylor, Curator Supervisor of the New Mexico Museum of Space History. Sue visited in September, touring our North Conway facility, including the library and collections storage areas, and also visited the summit museum. So that Sue could understand the Mount Washington experience, including exposure to the summit environment, we welcomed her for an overnight atop the mountain.

Sue's final report had few surprises but was nonetheless somewhat sobering. The bottom line: we have a lot of work to do! Readers of *Windswept* know that the Observatory has always been very frugal in its expenditures, but it has become evident that we have been a bit too frugal in our investments in our collections



Peter Crane in the Gladys Brooks Memorial Library. Photo by Matt Morris, AMC

and their keeping, and it is time to take remedial steps to provide more suitable care for the important materials entrusted to us. We will be converting underutilized space in the North Conway building to use for collections storage, moving materials from current secondary and less-than-ideal storage rooms in the building. We will do this both to better preserve collections items and to make them more accessible for use. We will take extra steps to monitor the environment of our collections storage areas and to make sure that temperature and humidity are kept within appropriate limits to ensure the physical preservation of materials, including paper documents, photographs, photographic negatives, and motion picture films.

Additionally, we will be investing in up-to-date collections management software to better organize and keep track of the approximately 30,000 items for which we are responsible. We also will be purchasing archival-quality folders, boxes, and related materials, since some items in the collection have not yet received this preferred housing. We are also looking at increasing staff and volunteer time to devote to collections cataloging and related care. Plus, we will be updating our Collections Management Policy, to help guide us in expanding our collections to meet the needs of our educational and interpretive activities.

One example of our stepped-up efforts is the creation of a committee under the Observatory Board of Trustees Education Committee to oversee our collections stewardship. Such a committee is a typical component of institutional structure for non-profit organizations that include museum work and collections management in their activities. Our goal is to have the collection in very good shape for the upcoming 100th anniversary of the Observatory in 2032. Even with eight years to do that work, we will have to remain determined and diligent to accomplish that goal, along with our regular, ongoing library and museum work.

The Observatory will be seeking financial support for this work, since the materials needed, and the labor involved in the stewardship work, will be significant. We have already applied to the National Endowment for the Humanities for support, and to a local foundation which supports such cultural endeavors. We will be applying to other potential funding organizations as well. We would welcome donations from private individuals interested in this work that will be essential to complete the significant body of work that will be needed to bring our collections care to the point where we know it should be. We would also welcome those wishing to volunteer in this important effort to get contact us to take part. If interested, please email *membership@mountwashington.org* with "Collections Volunteering" in the subject line.

Thanks to the generosity of many donors over the years, the Observatory's collection is a very significant resource for better appreciation for and understanding of the cultural and scientific heritage of Mount Washington and the White Mountains region. Guided by the recommendations of the Museum Assessment program, we are working to ensure that the important materials in our collections will be preserved and available to researchers for many decades to come.

FEATURE

# An Observer Reflects on 2023

BY **FRANCIS TARASIEWICZ**

2023 will undoubtedly go down in history as a year marked by extraordinary occurrences. From prolonged periods of intense warmth pushing the planet beyond the critical 1.5°C threshold to instances of flooding, wildfires, and unexpected polar vortex intrusions, the past year was a roller-coaster of meteorological phenomena for Earth's inhabitants.

At the Home of the World's Worst Weather, where resilience in the face of extremes is a way of life, we embrace weather that tests our limits. For more than 90 years, the summit has attracted scientists positioned between thrill-seekers and geeks on the Venn diagram. Interestingly, 2023 marked my first full year on the summit, offering me the opportunity to witness numerous unprecedented and record-breaking events. These extremes appeared to shadow my colleague Karl and me, as we found ourselves on the front lines of several historic events, ranging from months of haze and poor air quality to a close brush with a hurricane, making 2023 a year defined by chaos.

In this blog, I aim to reflect on the tumultuous weather of the past year. Below, I'll delve into my top five personal favorite weather events from this extreme year, which not only impacted my own experiences but potentially had implications for global climate as well. Without further ado, let's rewind and revisit the unforgettable moments of the past year.

**5.) Haze from Wildfires**

A record warm and dry spring served as the prelude to a profound transformation of the expansive boreal forests in northern Canada. Once lush green sanctuaries, these forests became ripe for large and unprecedented wildfires. As the summer season unfolded, dry thunderstorms gradually advanced northward, igniting more fires each passing day. Ordinarily, the smoke from such wildfires would be whisked eastward by the robust winds of the jet stream. However, 2023 presented a different scenario.

Unlike the typical strong jet stream, this year's jet stream was weaker, allowing it to meander southward. This peculiar pattern rolled out the metaphorical red (or rather, acrid gray) carpet, allowing the smoke to spill into the lower 48 states. Apocalyptic scenes of smoke-blocked sunshine and horrific Air Quality Index (AQI) values took over the headlines as the fires persisted well into the fall. This particular event secures the fifth spot on my list, not due to any fondness for particulate matter but because of its prolonged and intense nature.

While summertime air typically carries its share of pollutants and tree pollen, low visibility during this season is not entirely unprecedented. However, the past summer was exceptional. Days with

visibility exceeding 50 miles were a rarity, leading to our observations frequently being accompanied by the remark "HZ DSNT ALQDS." This notation, typically reserved for instances when haze from smoke or pollutants limits visibility to less than 50 miles but more than 10 miles, became a near-constant addition to our records. On multiple occasions, visibility dipped low enough to classify haze as the prevailing weather phenomena, indicating that it was restricting visibility to less than 7 miles.

Presenting the weekend's Higher Summits Forecast on Facebook Live in November.

The impacts of wildfire smoke reached far beyond visibility concerns. With hundreds of thousands of summer visitors flocking to the White Mountains annually, it became apparent that the dense layer of suspended ash presented an enormous public health risk. For us forecasters, 2023 unfolded as a year marked by steep learning curves and a need to quickly learn how to convey previously unheard-of hazards. In this case, the hazard was particulate matter pollution.

On the east coast, we are accustomed to witnessing distressing scenes of wildfires and poor air quality in the western regions, often taking generally good air quality for granted. However, the sheer volume and frequency of smoky episodes forced me to learn the language of smoke-related hazards. While I am well-versed in describing the health impacts of cold weather, writing about the impacts of smoke and haze presented an entirely new challenge. It was during these moments that the realization dawned—2023 was shaping up to be a year of forecasting unlike any other. As I wrap up reflecting on my #5 weather event, I hope to never again have to incorporate warnings about pulmonary issues from smoke into a Higher Summits Forecast.

**4.) Apr-May Rain to Heavy Snow**

My number 4 event of 2023 was a good old-fashioned New England storm that turned our weekly shift change on its head with the power of inches of rain and feet of snow. This storm stood out to me because of how difficult it was to forecast. On the summit, the team and I expected a swift transition from periods of freezing rain and glaze ice to plain rain. What we got instead was a brutal 23-hour stretch of freezing rain. I struggled to keep up with the accumulation of glaze ice, which accumulated on every surface at a rate of nearly 6 inches per

hour. While this may sound horrible, it's what we observers live for and far better than what could have happened. Prior to the freezing rain, model guidance was suggesting that the summits were going to see anywhere from 7 to 10 inches of rainfall! Having some of that total fall as freezing rain helped reduce the worst impacts from flooding in the valleys.

The glaze ice was a double-edged sword, however, as the ice that coated the ground set the stage for significant runoff. While over half of the precipitation from the storm fell as freezing rain, temperatures eventually rose above freezing. The result was an impressive 3.1 inches of rain in a 24-hour period. The deluge resulted in significant runoff that managed to wash out over a quarter mile of the auto road. As if this wasn't enough, the storm system eventually became strong enough to create its own supply of cold air. A lull in rainfall gave way to sleet, which gave way to heavy snowfall—this was the storm's second act. High above the summits, a pocket of sub-zero air created the instability necessary to bury the summits in snow. Closer to the surface, an easterly flow helped funnel in moisture off the Atlantic. In the span of just a couple of days, the team and I measured an impressive 20.2 inches of new snow, sleet, and graupel. Ironically enough, this still is my highest storm total snowfall on the summit. The road washout combined with the heavy snow royally snarled up our standard shift change. Thankfully, the hard-working team at the Cog Railway came to our rescue, and we were able to ride down in style. I will never forget watching their massive snow blower cut through the 5-7 ft drifts like confectioner's sugar. This storm brought about many core memories for me as an observer and forecaster and, quite honestly, humbled me. I also got to see firsthand how far our partners are willing to go to help us fulfill our mission and will be forever grateful for their hospitality and efforts.

**3.) July/Summer Extreme Rainfall**

The first half of 2023 came and went with snowfall, precipitation, and temperature records in ruin and just as Karl and I were catching our breath the atmosphere concocted another historic event. July 9th through 11th will be remembered for the incredible amounts of rainfall that fell over a wide swath of New England. Vermont, a flood-weary state that was really only just beginning to fully recover from the impacts of Tropical Storm Irene in 2011, was the epicenter of this epic rainfall event. After an exceptionally wet May and June (150-250% of average), the stage was set for flooding, and the question became when, not if, flooding would occur.

The summit team got its first answer to the question of when around a week before the storm. I recall looking out into the longer-range computer model guidance (a strange hobby, I know) and feeling a pit in my stomach. The models were showing an exceptionally warm and humid airmass interacting with an area of low pressure that was going to track somewhere in New England. The feature may have been a week out, but alarm bells were already ringing.

Fast forward a couple of days, and our concerns greatly increased as the meteorologists at the Weather Prediction Center (WPC) highlighted much of the northeast in a moderate risk for exces-

sive rainfall. These types of outlooks are reserved for more significant flooding events, and the WPC describes moderate risk days as days with "Numerous flash flooding events with significant events possible. Many streams may flood, potentially affecting larger rivers." Even several days out, the WPC was expecting a significant event. Meteorologists' fears came to a head at 5 pm on the 9th when the WPC issued an exceedingly rare High Risk outlook for central and northern Vermont. Like with high-risk outlooks for severe thunderstorms, this category is reserved for the very worst of events. This was also the first time a high-risk outlook was issued outside of a tropical cyclone. Unfortunately, the high risk verified as much of Vermont experienced the consequences of flash and river flooding. This event ranks in the top three for me because of my connections to Vermont. Having attended college at Northern Vermont University (now Vermont State College at Lyndon), I am very aware of how vulnerable Vermont is to flooding. Seeing the devastation in Montpelier was heart-wrenching, but equally important was the successful forecast and communication of risk from meteorologists and emergency managers. The forecast verified despite numerous sources of uncertainty, and improved forecasting methods no doubt saved numerous lives.

**2.) Dec 18th**

After a year of consistent above-average temperatures and record warmth, I was pleasantly surprised when November ended up four degrees below average. This was the coldest temperature anomaly in 2023, as most months ended up well above average, with temperature anomalies between 2 and 10 degrees above normal. Even better, this cold start was accompanied with actual bona fide snowstorms! One such storm dumped 15 inches of snow, 3 of which fell in the span of an hour! After such cold and snow, memories of previously warm and rainy winters began to slip into the back of my mind, that was until December 18th.

In New England, we are accustomed to large winter storms, more specifically storms that pass to the south of the region. These storms, called Nor'Easters, have the perfect track to deliver our big winter snows. By passing to the south of the area, the warmer marine air is kept out of the picture, but the moisture that results from it moves around the low pressure into colder air giving us our noteworthy snowfall totals. On December 18th, low pressure tracked to the west of the region. As a result, warm air flooded north, and even the summit saw temperatures well above freezing. Unfortunately, on this day I had the displeasure of measuring yet another record warm temperature of 41 degrees. This storm completely wiped out the snowpack for all of New England all the way up to its highest peaks. The story didn't stop there. Due to warmth prior to the storm, the snowpack in the Whites and across New England's summits was already near 32 degrees. Warm fog and heavy rains allowed the snow to melt almost instantly as the event got underway. The results in the surrounding valleys were catastrophic. The snowmelt and inches of rain brought local rivers to crests unseen since Irene. The Saco River in North Conway reached an all-time high crest of 17.71 feet, bridges washed out, and area roads became rivers. The summit saw 4.1 inches of rain and a wind gust of 132 mph, but

extremes like that are to be expected. This system makes the list as my #2 most memorable weather moment because of how widespread and far-reaching its impacts were. Power outages across New England numbered in the low millions as a freakishly strong low-level jet of 80-110 mph was able to mix close to the surface. This storm humbled many and unfortunately resulted in a handful of fatalities. I won't soon forget having to pump out inches of water from the tower, or seeing most of our parking lot eroded from record high river levels. I will forever hate this storm as it showed me that a single rain event can, in the new climate, erase a season's worth of snowfall.

**1.) Cold Snap**

The most memorable weather event of 2023 as a weather observer put myself and my hardworking team in the history books. It originated high in the Canadian Arctic and tied a 90-year record; it is something that I will never forget. I am, of course, talking about the short-lived but brutal cold snap of February 3rd and 4th. The story of this began a week and a half before the event. January 2023 was a whopping 10.3 degrees above normal. To say that I was eager to experience the true cold of a Mt. Washington winter was an understatement. I distinctly remember jokingly glancing at forecast depictions beyond 300 hours on the 25th of January as I was gearing up to head back home for shift change. In the world of forecasting, taking anything a model puts out after 7 days seriously is almost sacrilege. So when I saw the Global Forecast System (GFS) model output an arctic blast of -40 degrees extending from the high Arctic coming to New England around 10 days out I brought my coworker Karl over to the computer and jokingly said "wouldn't that be nice". He chuckled in agreement and after our weekly shift change meeting we headed home. Being the always-on weather geek I am I resolve to check the models a few times during my off week. On the day before shift change I loaded up the GFS and to my great surprise it still had that arctic blast except this time it was only 90 hours away. I excitedly texted my shift mates playfully and half-jokingly asking them if they were ready for -80 degree wind chills, little did I know how much colder it was actually going to be. Shift change on the 1st was the most somber shift change I can recall. Veteran observer Ryan Knapp warned us about everything that could go wrong with the expected cold. From gelled fuels to instrument failures, we were told to pay extra attention to safety as temperatures were forecast to fall to levels not seen since 1934.

Thursday came and the models put out increasingly bold predictions. By Thursday, models converged around a piece of the polar vortex rotating down from far northern Canada and delivering extreme cold to the entire region. Models converged around a solution of -47F as the coldest temp, our station's record. That afternoon I issued my most intense Higher Summits Forecast ever. Given the gravity of the impending historic and perilous event, I did not mince words.

"Remember that even a minor error in these conditions could prove fatal. A simple slip, fogged goggles, or other small mishaps might swiftly escalate into a life-threatening situation. Also, keep in mind that none of the buildings on the

higher summits will be accessible to the public. Finally, responding to emergencies in a timely manner will be extremely challenging for rescue services."

Yes, it was that serious.

After releasing this forecast, we began receiving media calls. It started as a trickle – a local TV station here, an area newspaper there. Then, a bit later, the summit went viral. Twitter was flooded with images of my forecast, and media interest soared. Names like Anderson Cooper, Good Morning America, and NBC Nightly News began filling our inboxes. It was showtime.

All the while, the temperature outside continued to drop. Thursday night featured a brief line of snow showers and squalls that signaled the onset of the temperature plunge. When I awoke for Friday's first observation, the thermometer already read 25 degrees below zero. The rest of the day was a blur. I did no less than 20 media interviews, maintained instrumentation struggling under the burden of the cold, all while training an intern and keeping the facility safe. I don't say this to brag; rather, it demonstrates the passion observers have for the summit and our data. In reality, I was merely in the right place at the right time.

During the afternoon, as I geared up for a routine observation, I heard a loud thud and the sound of wind. To my dismay, the lower tower door had flung open. The culprit was extreme cold, metal, and a rogue gust into the 120s. It took Karl, myself, and our two volunteers, Pat and Steve, to hold the door closed in hurricane-force winds while Nate from the State Park literally screwed the door shut. This moment takes the cake as the most memorable not only of 2023 but of my life so far.

Friday night came, and as I prepared for some restless sleep, our thermometer was dipping into the -40s, and the wind chill read a mind-numbing 107 below. When this happened, our website crashed as we had over 2 million unique viewers.

For more on the specific story of the cold wave, I strongly encourage you to read Karl's blog. If you don't, here are some notable events from that day:

• Temperatures at or below -45 °F for 13 straight hours

• The -47 °F reading (rounded) is the coldest in 89 years, tying our record low.

• Our lowest recorded temperature of -46.7 °F may be the lowest temperature ever measured in Mount Washington Observatory records, to the tenth of a degree, as the lowest temperature recorded by the weather observers in January 1934 was -46.5 °F, as reported in their journals and a brief article published in the Monthly Weather Review in February 1934.

• Wind chills below -100 °F for 15.5 straight hours

• -109 °F was the lowest wind chill noted on our current conditions page, on at least three occasions

• Sustained winds greater than 82 mph for 28 straight hours, with a top gust of 127 mph

There are moments when we must rise to the occasion in the face of extremes,

ensuring that the challenges they bring do not defeat us. I will forever be proud of the summit team that, when faced with the coldest air since the original four observers, rose to the occasion. For instance, Karl stayed up for over 30 hours, aiding me in measuring our temperature by hand (he was bundled up, of course). Alexis, the night observer and introvert, went above and beyond, excelling with several media interviews. I will always be thankful for her help and cool-headedness as she took on the brutally cold night, mostly by herself.

In conclusion, 2023 has etched its place in history as a year of meteorological extremes that tested the resilience of us observers and many around the world. From the unprecedented haze caused by wildfires to a New England storm that defied forecasting expectations, and from extreme rainfall events to a humbling cold snap that tied a 90-year record, the year showcased the unpredictable nature of weather. As a weather observer, my experiences on the summit of Mount Washington provided front-row seats to these historic events. Each weather event presented unique learning opportunities. Looking back on my top five memorable weather moments, I am reminded of the importance of accurate forecasting, effective communication, and the unwavering dedication of the summit team in the face of adversity. As we reflect on the tumultuous weather of 2023, it serves as a stark reminder of the need for continued vigilance and preparedness in the face of an increasingly extreme climate.

FEATURE

# Record Gust, Human Grit: 90 Years of Big Wind

BY **ELLEN ESTABROOK**

"'Will they believe it?' Was our first thought. I felt then the full responsibility of that startling measurement…"

Salvatore Pagliuca, Weather Observer and electrical engineer, wrote those words in the observer logbook on April 12, 1934, upon noting a record wind velocity on the summit of Mount Washington of 231 miles per hour. This record, confirmed by the National Weather Bureau, still stands as the fastest speed ever recorded at a staffed, non-automated station. It is here that we turn our attention to the great human effort behind this endeavor, as Peter Crane, Curator of the Observatory's collections, so poignantly puts:

> "The fact that the 1934 Observatory crew could accurately measure a wind of world record magnitude, during a period of very heavy icing, is a tribute to their planning and engineering acumen, as well as their commitment to establishing and maintaining this remote scientific outpost. Sometimes science advances by sparks of genius, but often it depends as much on dogged determination…"

In many ways, this phenomenon, and the successful recording of it, solidified two of the then two-year-old institution's reasons for being—one, that Mount Washington's summit was at the confluence of extreme weather discovery, and two, this necessitated both a research institution and continual human engagement with it. In celebration of the 90th year of the Big Wind, we're going to meet the team that was on the mountain that momentous day, and get a snapshot of what the experience was like from their perspective.

April 1934's record wind was observed and recorded by Salvatore (Sal) Pagliuca, Alex McKenzie, and Wendell Stephenson. The fourth observer, Robert Stone, was transported down the mountain due to a skiing injury a few days before the record wind was observed. Also joining the crew were two guests, Arthur Griffin and George Leslie, two close friends of Pagliuca. Of course, the crew was also accompanied by several feline friends. Much of the accounts below are taken from Alexander A. McKenzie's 1984 publication "World Record Wind: Measuring Gusts of 231 Miles an Hour," in dedication to:

*"the joint memory of Salvatore Pagliuca and Joseph Brooks Dodge whose sober industry and joyous humor created an institution from a winter's adventure."*

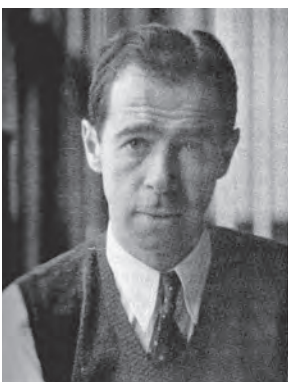
**Arthur (Art) Griffin** was a renowned artist and photographer (who created the photographs and portraits below the night before the Big Wind). Known as one of New England's earliest photojournalists, he shot for The Boston Globe, LIFE, Time, and other major publications, and was a pioneer in color film.

A Massachusetts native, Griffin traveled the northeast and beyond extensively, taking photographs that created a legacy that lives on today at the Griffin Museum of Photography. One can only imagine the artistic opportunities Mount Washington presented, as well as logistical challenges in taking photographs in the extreme weather. To pass the time and for entertainment, Art drew portraits of the crew and took photographs on the eve of the big wind, which perhaps serve as the sole visual documentation of that timeframe.

Photo by Arthur Griffin, © Griffin Museum of Photography.

During research, there was not much background information found on **George Leslie**, aside from being the second guest of Pagliuca, with a described "cheery presence" that undoubtedly helped throughout the extreme weather event:

"Despite the buffeting of the wind," Alexander McKenzie recounts in *World Record Wind*, "Art and George made several trips outside to take photographs. Their cheery presence helped relieve the increasing tensions that seemed to build during any severe storm. He continues by noting their sense of humor, as well as their helpful demeanor when it came to chores and duties.



Arthur L. Griffin (top), and George Leslie (below) in Alexander A. McKenzie's publication, "World Record Wind: Measuring Gusts of 231 Miles an Hour."

**Alexander McKenzie** , also known as "Mac," was an observer and radioman from 1932 to 1937, notably part of the Observatory's founding team. In "Mount Washington Reoccupied" by Robert S. Monahan (also a founding member), Alex is described as "a Dartmouth '32 graduate of considerable experience in radio and telephony." He had instrumentally helped Joe Dodge develop a system of radio communication between AMC huts. As noted above, he authored "World Record Wind", a 30-page publication with an aim to "assemble in one place a multifaceted story of the measurement of a world record wind across the summit of Mount Washington." In it, McKenzie includes anemometer diagrams, barographs, and wind records alongside personal accounts to create a comprehensive report of that fateful day.

Drawing of Alexander A. McKenzie by Arthur Griffin dated April 11, 1934 in "World Record Wind: Measuring Gusts of 231 Miles an Hour."

**Wendell Stephenson (Steve)** was a "1930 graduate of the University of Chicago who could not stand being away from mountains," according to William Lowell Putnam, author of "The Worst Weather on Earth: A History of the Mount Washington Observatory." Stephenson was well-known in the outdoor community from walking across New Hampshire from Mount Monadnock and for volunteering his time at the summit and Pinkham notch—he and his wife started Cardigan Lodge for the AMC later in 1934. He quoted, "I was willing to do anything…and this was a helluva lot better than the squirrel stew where I'd been living at Carter Notch."

Employed at the Observatory at 26 years old in early May 1933 by Joe Dodge, Steve stayed on for over a year. "Mostly I was the cook, except that we all took our duty turns as observer, reading instruments regularly and noting anything unusual." (Putnam, 1991). On the afternoon of April 12th, Stephenson reported an average wind speed of 173 mph with gusts of 220+ mph. As Weather Observer Alexandra Branton wrote in her April 2023 blog post, Remembering the Big Wind:

"His fellow observers could not believe this, insisting that they time the gusts themselves. When Pagliuca began measuring with the stopwatch, the telegraph clicks suddenly increased in frequency. Timing the next three clicks only took 1.17 seconds. Although the calculation to translate this into a wind speed had not been done yet, Pagliuca recalls knowing immediately that it was a record."

Wendell F. Stephenson (left) and Alexander A.McKenzie (right), photographed by Arthur Griffin in "World Record Wind: Measuring Gusts of 231 Miles an Hour."

**Sal Pagliuca**, Chief Observer at the time and for another year following, wrote the logbook entries during the big wind. Sal was one of the four original weather observers who founded the Observatory, and according to William L. Putnam in "The Worst Weather on Earth," he was "well on the way of becoming a professional meteorologist but had been working most recently as hutmaster at the AMC's newly opened Galehead Hut." Originally from Aversa, Italy, Sal had extensive training and experience in electrical engineering and a strong interest in science and mountain weather. He had spent 10 months "snapping stop watches" in a laboratory which provided sound practice for the techniques needed that day.

"We had measured by means of an anemometer the highest natural wind velocity ever recorded officially anywhere in the world," he wrote in his logbook.

Hopefully, through a snapshot of the individuals present during the record wind event, we can begin to understand and better appreciate both the grit and ingenuity present on the mountain that day, as well as celebrate the crews, then and now, who continue to uphold the tradition of human triumph in the name of weather discovery.

Drawing of Salvatore Pagliuca by Arthur Griffin.

This April, we celebrate the dedicated and diligent individuals at the Observatory during this world record event, as well as the crew, past and present, who continue to uphold the tradition of human triumph in the name of weather discovery.

Join us in celebrating the 90th Big Wind in a big way in just a few weeks—we'll be offering an array of engaging events to learn, celebrate, and explore this landmark event. Alongside a public celebration in North Conway the weekend of the 12th, we'll also be featuring digital and print accounts from our archives as well as virtual education programs. Learn more at mountwashington.org/events.

## SUMMER/FALL 2023 WEATHER DATA

| | AUG | SEPT | OCT | NOV |
|---|---|---|---|---|
| **Temperature (°F)** | | | | |
| Average | 46.1 | 47.4 | 35.2 | 16.8 |
| Departure | -2.6 | +4.3 | +3.9 | -4.0 |
| Maximum | 58 | 65 | 61 | 39 |
| Date(s) | 8th | 5th/7th | 4th | 17th |
| Minimum | 30 | 30 | 8 | -7 |
| Date(s) | 31st | 26th | 31st | 25th |
| **Precipitation (inches)** | | | | |
| Monthly | 14.01 | 9.00 | 10.36 | 5.59 |
| Departure | +6.29 | +1.34 | +0.37 | -2.50 |
| 24-hour Maximum | 2.47 | 3.57 | 3.26 | 1.93 |
| Date(s) | 10th/11th | 18th/19th | 21st/22nd | 26th/27th |
| **Snowfall (inches)** | | | | |
| Monthly | T | 0.0 | 13.6 | 34.1 |
| Departure | -0.1 | -1.2 | -5.4 | -1.5 |
| 24-hour Maximum | T | 0.0 | 5.1 | 8.4 |
| Date(s) | 31st | N/A | 22nd | 26th/27th |
| Season Total | T | T | 13.6 | 47.7 |
| Departure | -0.1 | -1.3 | -6.7 | -8.2 |
| **Wind (mph)** | | | | |
| Average | 29.2 | 22.2 | 31.9 | 42.4 |
| Departure | +4.7 | -5.4 | -3.6 | +3.0 |
| Peak Gust/Direction | 94 W | 101 W | 95 W | 108 W |
| Date(s) | 19th | 19th | 31st | 7th |
| Days 73+ | 7 | 5 | 6 | 19 |
| Days 100+ | 0 | 1 | 0 | 4 |
| **Other** | | | | |
| % Sunshine | 23 | 44 | 23 | 38 |
| Clear Days | 0 | 0 | 2 | 2 |
| Partly Cloudy Days | 3 | 6 | 4 | 4 |
| Cloudy Days | 28 | 24 | 25 | 24 |
| Days with Fog | 30 | 24 | 28 | 29 |
| Days with Rain | 24 | 16 | 17 | 5 |
| Days with Snow | 1 | 0 | 15 | 25 |

# A Closer Look at Summer/Fall 2023

BY **RYAN KNAPP**

**As with much of summer 2023, August and September mainly consisted of rain with brief clearing limited by Canadian wildfire smoke. October, rain transitioned to snow, with winter weather continuing into November.**

## August 2023

High pressure provided clearing and cooling conditions on the 1st, then slid offshore on the 2nd as a low crossed southern Quebec. A warm front on the 3rd provided light rain. A trailing cold front on the 4th provided rain and thunderstorms. High pressure provided clearing on the 5th, with fair weather lingering into the 6th. An upper-level trough steered a low up the Ohio River Valley, resulting in drizzle, rain, and thunderstorms on the 7th/8th. Intermittent fog early on the 9th gave way to fog and upslope rain showers. A northern low provided rain and thunderstorms on the 10th, with a trailing cold front providing rain showers for the 11th. A weak ridge provided daytime clearing on the 12th; then a warm front returned fog, rain, and thunderstorms overnight. A trailing cold front on the 13th provided continued fog, rain, and thunderstorms. High pressure on the 14th allowed rain to taper, but fog remained through the day. A warm front on the 15th provided rain and drizzle early, then high pressure provided clearing overnight.

An upper-level trough returned fog and drizzle on the 16th/17th. A northern low dragged a cold front through on the 18th, providing drizzle/rain and cooler temperatures overnight into the 19th. A secondary cold front provided drizzle/rain for the 20th/21st. A broad area of high pressure provided clearing late on the 21st. Fair weather conditions remained until the afternoon of the 24th when a low moved in from the west. Rain started overnight, then rain and thunderstorms continued for the 25th/26th as the low passed. Brief clearing overnight gave way to fog and light rain as a low passed on the 27th. A trough provided intermittent clearing and scattered rain showers for the 28th/29th. A cold front on the 30th provided rain. As it slid offshore on the 31st, a light dusting of snow coated the summits before sunrise, then melted as high pressure built, providing mostly clear skies.

## September 2023

High pressure started the month with

fair skies and low winds. Clouds returned on the 2nd, with fog returning on the 3rd. High pressure provided clearing on the 4th, but Canadian wildfire smoke limited our visibility. Fog returned on the 5th as a low retrograded. The moist flow lingered for the 6th, with intermittent fog and clouds limiting visibility through the day. The 7th saw brief clearing, and temperatures soared to 65F, setting a new daily record high for the date. A warm front provided rain and thunderstorms overnight. A cold front on the 8th provided additional rain showers and thunderstorms. Fog/drizzle lingered until the morning on the 9th, and then summits cleared briefly before a low to the south returned fog overnight. A coastal low on the 10th/11th provided showers and periods of heavy rain. Another coastal low provided light rain showers and drizzle for the 12th. A western low on the 13th provided additional drizzle/rain. High pressure provided brief drying/clearing on the 14th, with fair conditions lingering into the 15th.

Hurricane Lee passed offshore on the 16th, providing summits with fog and light rain showers. High pressure on the 17th provided fair weather skies. A low from the SW returned fog on the 18th, with 4.71" of rain falling on the 18th/19th. Drizzle lingered for early on the 20th, then tapered as high pressure started to build. The ridge settled overhead for the 21st-23rd. The remnants of Tropical Storm Ophelia provided light rain showers on the 24th. High pressure returned on the 25th and lingered through the 28th. Summits remained dry, but the haze from wildfire smoke made for increasingly poor air quality and significantly reduced visibility. A low to our south provided light rain for the 29th, but summits remained fog-free but hazy. High pressure returned on the 30th with fair skies overhead as haze limited visibility.

## October 2023

A broad area of high pressure was in place from the 1st to the 5th, providing primarily clear, albeit windy conditions and temperatures well above normal. Temperatures peaked on the 4th with a high of 61F, which set a new daily record high for the date. The ridge departed on the 6th, and an upper-level low approached from the west, returning clouds, fog, and rain showers. The remnants of Tropical Storm Philippe moved into the Gulf of Maine on the 7th and provided widespread rain. A cold front passed on the 8th, dropping temperatures below freezing and transitioning rain to snow. The low stalled and kept light snow showers for the 9th/10th. Another low from the west on the 11th/12th provided additional snow and freezing temperatures. As it slid offshore, it stalled for the 13th-16th, providing slightly warmer temperatures and resulting in a wintry mix.

High pressure built on the 17th, but ample moisture provided continued fog and upslope snow/sleet that lingered into the 18th. The 19th finally saw a break in precipitation; however, fog persisted through the day. A western low on the 20th resulted in rain, and as another

low moved up from the SW on the 21st, rain picked up in intensity, delivering close to 3 inches of rain for the day. As the low shifted offshore, an inverted trough swung overhead on the 22nd, and rain transitioned to snow. Flurries and fog lingered early on the 23rd but tapered and cleared as high pressure built over the mid-Atlantic. The high kept summits fog-free on the 24th, but a few rain showers passed late from a low to our north. A series of lows passed to the north for the 25th-27th, providing mostly foggy conditions mixed with rain showers. A cold front on the 28th provided rain, followed by freezing temperatures. A wintry mix lingered for the 29th, and a pair of lows on the 30th continued the wintry mix. The 31st saw high pressure, providing clear, cold, and windy conditions.

## November 2023

A northern low on the 1st provided light snow. Clearing returned on the 2nd with high pressure. A cold front passed early on the 3rd, and then high pressure cleared summits for the day. A cold front on the 4th/5th returned fog, flurries, and winds. High pressure briefly passed on the 6th, then a Clipper on the 7th/8th provided a wintry mix and peak winds of 108 mph. A warm front from a western low on the 9th resulted in snow transitioning to a freezing mix as temperatures rose. The low passed on the 10th, and an upper-level trough settled overhead, returning snow that lingered into the 11th before tapering as high pressure built. The high remained for the 12th, then exited on the 13th as a low approached from the west, providing fog/snow for the 13th/14th. High pressure cleared summits on the 15th, with fair weather lingering until the morning of the 17th.

A cold front approached late on the 17th, providing rain, which transitioned to snow with its passage on the 18th. A trough and associated cold front provided just over 6 inches of snow on the 19th/20th. A high cleared summits late on the 20th and early on the 21st, then a coastal low returned fog/snow/freezing rain overnight and through the 22nd. Brief clearing on the 23rd gave way to a cold front that provided snow overnight into the 24th. High pressure provided clearing on the 25th, with fair skies lingering for the day on the 26th. Overnight into the 27th, a coastal low provided 8.6 inches of snow on the summit. A cold front on the 28th delivered an additional 4 inches of snow. A secondary cold front and upper-level trough continued snow on the 29th. Upslope snow showers lingered early on the 30th, then tapered, and clearing returned late as high pressure built in.

## SAWDUST FROM THE BLOG

*A contemporary homage to Sawdust from the Log, a section featured in this publication since 1973. The below excerpts have been compiled from the current weather observers' blog posts published on mountwashington.org.*

COMPILED BY **ALEXIS GEORGE**

### 4:47 p.m., Fri., Oct. 6

Hello! My name is Charlie Peachey, and I am a new weather observer at Mount Washington Observatory. Overall, I loved everything about my internship at the Observatory. Especially the opportunity it gave me to witness the day-to-day life of a professional meteorologist and how professional-level research was conducted. It was a truly transformative experience. Going into the summer, I wasn't sure if I wanted to be a broadcast meteorologist or focus more on meteorological research after I graduated. And by the end of the summer, I realized that research was the career path I wanted to pursue. So, my experience as an Observatory intern was the primary reason I decided to return to Plymouth State and obtain my master's degree in applied meteorology.

**Charlie Peachey, Weather Observer/ Research & IT Specialist**

### 3:36 p.m., Thurs., Oct. 26

Hi all! I'm Amy Cotter, one of the fall summit interns, and I am thrilled to be working at Mount Washington Observatory. I began taking atmospheric science courses my junior year, and this immediately sparked my interest in meteorology and the atmosphere. Then, after having the opportunity to do field work at the high-elevation Storm Peak Laboratory in Steamboat Springs, Colorado during an Atmospheric Chemistry course, I set my mind upon Mount Washington Observatory's fall internship following my college graduation. At Storm Peak Laboratory, I had the opportunity to study the effect of local and regional wildfire conditions on aerosol properties and persistence. This experience helped me fully recognize the vital scientific and social importance of the research that mountaintop observatories like Storm Peak Laboratory and the Mount Washington Observatory conduct. Additionally, it helped me realize just how much there was to learn about meteorology and that my experience at Storm Peak Laboratory was just the beginning!

**Amy Cotter, Summit Intern**

### 6:50 p.m., Fri., Oct. 27

Once again, my day started at 5:45am so that I could prepare for my 6:30am shift. I was on morning observations today,

meaning for the first six hours of the day I went outside every hour to record the weather. Periodically throughout the morning, I shoveled snow and deiced various instruments, objects, and structures outside. Also in the morning, it was my turn to do daily chart checks. This consists of checking every form and digital database from the day prior to make sure that everything is correct and consistent. This usually takes a couple of hours and, combined with observations and deicing, takes up the whole morning.

**Alexandra Branton, Weather Observer & Education Specialist**

### 4:07 p.m., Wed., Nov.1

Now that my time as the 2023 fall intern for the Mount Washington Observatory is coming to an end, I would argue that my abilities as a forecast meteorologist and research scientist have vastly improved. Coming from Maui, Hawaii, Mount Washington has provided me with many first experiences. Mount Washington has given me my first experiences with: wind chills below 0 degrees Fahrenheit, hurricane force winds, a blizzard, or even shoveling snow. Throughout my internship I have witnessed the breaking of various records. I was on shift when we shattered the record for the wettest summer season and I was also present for when record daily temperature maximums were exceeded. In short, I quickly discovered why Mount Washington has earned its title "Home of The World's Worst Weather."

**Jordan Frate, Summit Intern**

### 6:22 p.m., Tue., Nov. 7

METAR observations are submitted every hour of every day at Mount Washington Observatory. METAR is a format for reporting weather information that gets disseminated through the Aviation Weather Center. While METARs are primarily used by aircraft pilots, you can actually view METAR data for any station across the country. It might seem difficult to decipher these weather reports at first, but I'll dive into reading the basics of METAR to help readers learn something new!

**Alexis George, Weather Observer & Meteorologist**

### 3:02 p.m., Wed., Nov. 15

After 17 months of working at New England's highest peak, it finally happened. On the night of November 12th, 2023, I was lucky enough to view the famous and ever-elusive Aurora Borealis, or northern lights. This blog will chronicle my experience of the night, including the dazzling details of pillars, excited oxygen molecules, and curtains of plasma. Before I can share the exciting details of the night, I feel it necessary to talk a bit about the science behind this awe-inspiring phenomenon, starting from the sun and ending around 60 miles above our heads in our planet's ionosphere.

**Francis Tarasiewicz, Weather Observer & Education Specialist**

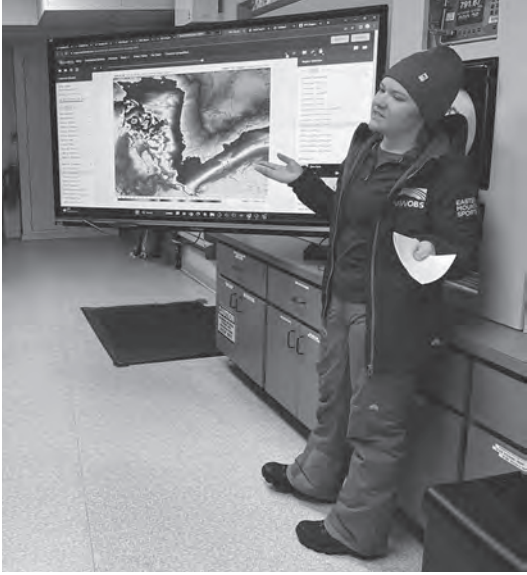
### 5:47 p.m., Wed., Nov. 22

Working on the summit of Mount Washington is not your average job. There aren't too many other places where the employees work and live together for eight days in a row and then get six days to rest. So, as you might imagine, it takes a little while to adjust to life on the summit, and I have experienced that through my first three months working at the Observatory. I went from finishing research for my master's degree in early August this past summer to working my first shift at the Observatory less than two weeks later. It made navigating the transition from college to professional life even more chaotic. It also presented many new scenarios I've had to learn to adjust to daily. But, most of the new scenarios have been unique and exciting, like getting used to what we like to say is the "best office view in New England" (which tends to make it much easier to procrastinate).

**Charlie Peachey, Weather Observer/ Research & IT Specialist**

### 4:19 p.m., Tue., Dec. 12

As my fall internship at Mount Washington Observatory comes to a close, I find my last week as a summit intern to be both bittersweet and fulfilling. I've been on the summit every other week for the past 4 months, and as I reflect on my time here, I recall many memories, both good and challenging. I've had the unique opportunity to grow here both professionally and personally, from my forecasting skills to my research to recreating with my summit team to



Intern Amy Cotter Gives Weather Report at Shift Change Meeting.

fixing malfunctioning instruments and shoveling in miserable conditions.

**Amy Cotter, Summit Intern**

### 6:19 p.m., Wed., Dec. 27

The December 18-19 storm that produced unprecedented flooding across most of New England will be remembered by most as one of the most impactful storms in recorded history. Most stream gauges along rivers in and around the White Mountains measured their highest or second-highest flood totals. The last time that flooding of this magnitude was observed was during Hurricane Irene. Even days after the rain stopped, many rivers in the area were still considered to be at a moderate flood stage. Significant damage was also done to local infrastructure like roads and bridges, resulting in the National Guard assisting with local rescues of people trapped by the floods.

**Charlie Peachey, Weather Observer/ Research & IT Specialist**

# 2023 By the Numbers

BY **RYAN KNAPP**

Looking back at weather stats, I would summarize 2023 weather conditions on the summit as warm, wet (but not snowy), and foggy. To find out why these words were chosen, let's look back at some of the stats from last year:

Our average temperature for 2023 was 30.4°F (-0.9°C), which is 2.4°F above the 1991-2020 30-year normal for our station. This would make the annual average temperature of 2023 tied with 2012 for the highest average annual temperature in our dataset (1932-present). Our warmest temperature recorded in 2023 was 66°F (18.9°C), which occurred on July 6th. Our coldest temperature recorded in 2023 was 47°F below (-47°F/-43.9°C), which occurred on February 4th.

In terms of total liquid precipitation, from January to December of 2023, the summit of Mt Washington received 113.76 inches, which was 22.53 inches above the 1991-2020 30-year normal for our location. The 113.76 inches of precipitation makes it the 12th wettest year (January to December) in our dataset (1932-present). From January to December of 2023, the summit received 266.1 inches of snow, which was 15.7 inches below the 1991-2020 30-year normal for our location.

In terms of winds, for 2023 our average was 33.9 mph, which was 1.0 mph below the 1991-2020 30-year normal average for our location. Our highest gust recorded for 2023 was 132 mph, which occurred on December 18th. From January to December, we had 145 days which had gusts of 73 mph or greater and of those days, 33 days had gusts that were 100 mph or greater.

As for our weather during 2023, we averaged 35% of the possible sunshine. The summit had 11 days that were noted as clear or mostly clear, and there were 59 partly sunny days, with the remaining 295 days being filed under mostly cloudy, cloudy, or obscured (fog). We had 328 days with at least some amount of fog recorded during a 24-hour period. We had 146 days with rain and 173 days with snow.

Other notable stats that landed in the top 3 for any given month/season/year from 2023 are as follows:

- January 2023 had an average temperature of 16.1°F making it the warmest January average in our

Night of Dec 31, 2023 as the moon was rising on undercast skies looking north.

dataset (1932-present) (previous record was 16.0°F originally set in January 2006)

- The 47°F below (-47°F/-43.9°C) recorded on February 4th
- Equaled (tied) our locations all time record low (1932-present) (record originally set on 29 January 1934)
- Set a new monthly record low for the month of February (1932-present) (previous record of 46°F below (-46°F/-43.3°C) originally set on 15 February 1943 and equaled on 3 February 2023)
- Set a new daily record low for February 4th (1932-present) (previous daily record low of 35 below (-35°F/-37.2°C) recorded on 4 February 1963)

- June 2023 monthly snowfall of 8.4 inches set a new monthly snowfall record for the month of June (1932-present) (previous record of 8.1" set in June 1959)
- June 2023 monthly precipitation total of 17.30" was the second largest precipitation total for the month of June (greatest June precipitation total of 19.96" measured in June 1998)
- July monthly precipitation of 17.08" set a new monthly precipitation record for the month of July (1932-present) (previous record of 16.85" set in July 1996)
- August 2023 monthly precipitation total of 14.01" was the second largest precipitation total for the month of August (greatest August precipitation total of 20.69" measured in August 1991)

- Meteorological summer (June 1 to August 31) 2023 received 48.39 inches of precipitation setting a new meteorological summer precipitation record (previous record of 37.80 inches originally set in summer 1998)
    - Meteorological summer (June 1 to August 31) 2023 was the second greatest precipitation season in our dataset (1932-present) (Meteorological Win ter (December 1 to February 28/29) 1969 remains the greatest precipitation season with 50.26 inches recorded)
- September 2023 was only the 13th time in our dataset (1932-present) that September had 0.0" snowfall recorded (we typically see our first flakes of the season in Sept)
- December 2023 had an average temperature of 20.7°F making it the second warmest December average in our dataset (1932-present) (warmest record is 24.4°F originally set in December 2015)

If interested in additional weather data, please check out our F-6 page which is updated nightly (*https://mountwashington.org/weather/mount-washington-weather-archives/monthly-f6/*), our Mount Washington Weather Archives page (*https://mountwashington.org/weather/mount-washington-weather-archives/*), our Current Conditions Page (*https://mountwashington.org/weather/current-summit-conditions/*), our 48-Hour and Higher Summits Forecast (*https://mountwashington.org/weather/higher-summits-forecast/*). If you need data for research purposes, you can submit a request at *https://mountwashington.org/research/data-request/*. If interested in supporting the work we do at our weather station, please consider donating at *https://mountwashington.org/donate/*.

Weather Observer Alex Branton changing out the precipitation can.

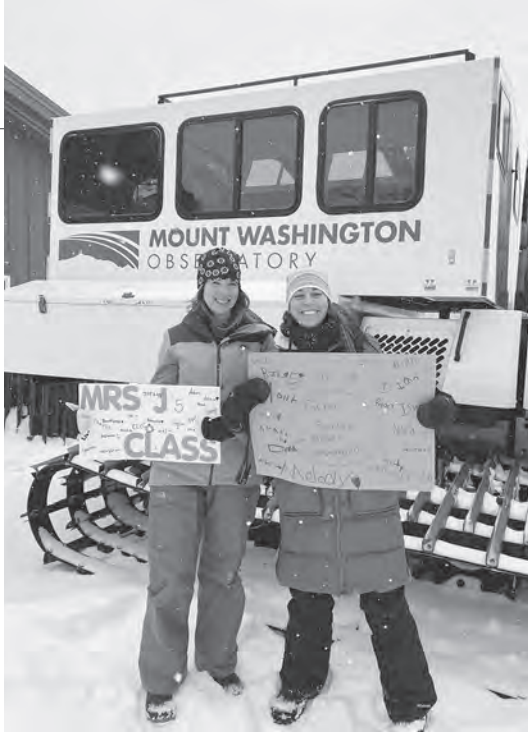
EDUCATION

# Springing Into School Programs & Citizen CATE

BY **BRIAN FITZGERALD**

Spring has sprung, and students and teachers are eyeing the end of the school year, rife with school projects, report cards, and dreams of summer. But don't forget about those end-of-year field trips! For nearly a dozen schools (and counting), students are looking forward to an unforgettable visit to the summit of Mount Washington.

Building on the success of the field trip pilot program begun in spring of 2023, the education team at Mount Washington Observatory (MWOBS) is responding to significant interest from educators across the region for local, relevant STEM-learning opportunities. New for the 2023-2024 school year, MWOBS began a school membership program that provides a menu of educational programs, curricula, and other resources for K-12 schools at discounted program fees. Seven schools, totaling over 125 hours of programming and serving over 200 K-12 students in western Maine and northern New Hampshire, are included as school members in this past academic year.




Teachers Michelle Jenkinson and Beth Bukala in front of the MWOBS snow tractor showing off their class's Mount Washington-bound posters.

School memberships allow teachers to pick from a menu of in-person programs with MWOBS educators, virtual programs given live from the summit weather station, and for nearly all members, culminate in setting up a field trip to the top of the Rock Pile. In partnership with the Mount Washington Cog Railway, the Mount Washington Auto Road, and Mount Washington State Park, students learn to take weather observations to study the nature of the atmosphere as you gain elevation, observe the climate zones from mountaintop to bottom, and/or participate in engineer design challenges.

Many of these school membership and other school field trips are supported by all-important grant and sponsorship

funding. The New Hampshire Charitable Foundation's Tillotson Fund helped get the pilot field trip program off the ground, followed by grants both large and small from sources such as NASA Space Grant, New Hampshire Environmental Educators Get Outside Grant, and Berlin City Auto's Keep Driving Foundation just to name a few sources. Finally, a significant bequest left to MWOBS has allowed us to create a scholarship and financial aid policy for schools in need.

Another highlight from this past school year has been the seventh year of the Arctic Wednesdays professional development program which saw a record 90 K-12 teachers apply for 12 program spots and a chance to visit the summit weather station on a winter shift change day and work with the MWOBS education team. Teachers from across the region, grades, and subject areas participated in this year's program that featured highlights such as a middle school art education teacher using White Mountain art as a source of interdisciplinary learning illustrating the distinct ecozones on Mount Washington, a Nashua High School teacher building resources for a brand new meteorology course, and a Kindergarten teacher (and summit volunteer!) connecting live with her students from the summit of Mount Washington to share about the weather and the adventure of a lifetime. If you know a teacher who might benefit from a professional development program with MWOBS, let us know!

Beyond the K-12 sphere, learners of all ages continue to engage with the Observatory through various program offerings. Six overnight winter Edutrips brought visitors to the summit weather station to learn about themes such as "The Science of Winter Storms" or the behind-the-scenes world of broadcast meteorology. Additionally, seven partner-led overnight climbing trips offered through International Mountain Climbing School (IMCS), Eastern Mountains Sports (EMS) Outdoor School, Redline Guides, and Synnott Mountain Guides brought climbers to MWOBS for a hearty meal, an in-depth tour of the weather station, and opportunities to learn about mountain weather from our summit team that knows it best.

In the virtual space, the Science in the Mountains lecture series continues to highlight experts conducting weather and climate-related work including researchers at MWOBS. If you haven't joined us before, we highly encourage you to join us for a future program or check out past program recordings available on the Observatory's YouTube channel. Highlights from the past quarter include extreme meteorologist and renowned storm chaser Reed Timmer, the Observatory's own Drew Bush sharing out collaborative research with McGill University researchers looking at social media communication and extreme weather, and the New Hampshire Healthcare Workers for Climate Action discussing the health impacts of climate change.

Finally, we hope you are getting as excited about the total solar eclipse as we are! On April 8th the moon passes between the Sun and the Earth and will completely block out the sun in portions of the United States, including


Students at Jackson Grammar School in Jackson, New Hampshire pose with their new Cotopaxi backpacks stuffed with weather and climate-themed resources alongside MWOBS School Programs Coordinator Jackie Bellefontaine.

northern New England creating a rare spectacle that won't be seen again in our region until 2079. While the summit of Mount Washington won't be in the path of totality, we are excited to have our School Programs Coordinator Jackie Bellefontaine serve as a regional coordinator for the NASA-sponsored Citizen Continental-America Telescope Eclipse (CATE) experiment that brings together 24 teams of local community or "citizen scientists" that provides next-generation polarized observers during the eclipse. Jackie will help support a team on the ground at Coleman State Park in Stewartstown, New Hampshire, with the public encouraged to join in the inquiry.

In addition to Citizen CATE, MWOBS is working with schools and groups around the region to share out other learning opportunities related to the eclipse, including sharing your own cloud, temperature and sound observations before, during, and after the eclipse through NASA's GLOBE Observer app. Be sure to visit observer.globe.gov to learn more or better yet, join MWOBS for one of our upcoming programs and learn how you can contribute to advancing our understanding of Earth's weather and climate. Never stop learning!


CLIMBING TO THE
TOP OF NEW ENGLAND
SINCE 1869
THE MOUNT
WASHINGTON
COG RAILWAY
THE ROUTE OF INNOVATION

# Overcoming Challenges to Continue Innovation

BY **JAY BROCCOLO**

Over the past four months, the Mount Washington Observatory has been at the forefront of advancing understanding of the natural systems that create Earth's weather and climate, despite facing several challenges. The Observatory has undertaken significant steps towards updating its database to current standards and creating an updated metadata database, which you can learn more about in our Research & Technology updates. This initiative is crucial for maintaining accurate records of calibrations as well as station and instrument metadata, ensuring the reliability of climatological records.

The observatory faced several issues with its wind vanes providing false readings, a result of numerous harsh and damaging weather events. However, the summit and technical staff demonstrated remarkable resourcefulness in mitigating these issues, swiftly restoring accurate wind direction measurements each time. Currently, the observatory is innovating in response to these challenges by working on a new design for its main wind vane instrument, which will incorporate heating to prevent future malfunctions caused by ice accumulation and other weather-related interferences.

Additionally, the summit staff have played a crucial role in program development, particularly in enhancing the efficiency and effectiveness of weather station tours. Their efforts aim to provide a better experience for participants while maximizing summit resources. This initiative reflects the observatory's commitment to public engagement and education, offering visitors an insightful glimpse into the world of atmospheric science.

The launch of new research programs, such as Undergraduate and Graduate Adventures in Atmospheric Sciences, marks a significant milestone for the observatory. These collaborations with universities and other organizations demand a high level of communication and teamwork to seamlessly integrate different operations. The summit staff's involvement is instrumental in ensur-


Jay Broccolo (far right) on a recent weather station tour with Congressman Chris Pappas (far left) and New Hampshire State Parks.

ing the organization's efficiency and capacity management, supporting its growth and expansion into new areas of research and education.

The observatory has also continued to highlight personal stories and the impact of its work through blog posts and educational initiatives. These reflections include a closer look at December's unprecedented flooding through rain-on-snow research and a glimpse at the first-of-its-kind internship program in partnership with the Mount Washington Avalanche Center. This summer, you will see updates to these research projects as well as product testing on our website, with each initiative underlining the importance of teamwork, innovation, and community engagement in advancing meteorological science and education.

# Information Integrity and the Importance of Metadata

BY **MWOBS STAFF**

Climatology, or climate science, is the study of Earth's climate by "recording and analyzing weather patterns throughout the world and understanding the atmospheric conditions that cause them" (National Geographic Society, 2023). Climatological records typically refer to periods of 30 years; new climate averages are calculated every three decades based on these records. It is here that the accurate documentation and dissemination of data is an integral piece of not only maintaining a clear picture of the past, but also better understanding implications for the future (for instance, when looking at mitigating climate change risk).

Mount Washington Observatory (MWOBS) maintains a 90+ year dataset, accounting for three 30-year climatological cycles of weather patterns in high altitude, complex terrain. As the only active meteorological station above 2,300 feet in mountainous New England, this means many entities, both regionally and nationally, rely on this data, including local businesses, outdoor recreation enthusiasts, mountain rescue teams, climatologists, data scientists, and the National Weather Service, to name a few.

In a 2021 study measuring climate trends in the White Mountains, climate scientists from the Appalachian Mountain Club refer to MWOBS' dataset as "one of the longest high-quality sets in the world" (Murray et.al, 2021).

To maintain this data is no easy feat. Since its 1932 founding, MWOBS is home to weather observers year-round who track the weather every hour to ensure consistency, accuracy, and precision. This data goes through a comprehensive process: as Weather Observer Alex Branton describes, "We're always doing routine instrument checks to make sure they're operating correctly, and then looking at the previous day's data, checking every form and digital database, to make sure everything is consistent."

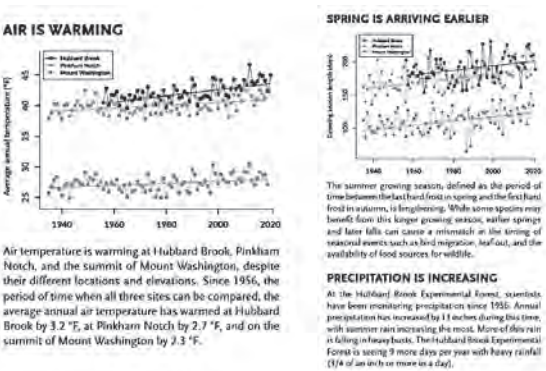
Specifically, some of this monitoring process is automated, but for the most part, it is a key part of the weather observer's role on a nightly, weekly and monthly basis.

Jay Broccolo, Director of Weather Operations, has been with the Observatory for over five years and has a keen understanding of the importance of day-to-day recordkeeping and the implications it has for larger datasets, or metadata, in

determining weather and climatological trends in complex terrain:

"The Mount Washington Observatory hosts a treasure trove of information that plays a pivotal role in understanding the intricacies of climate dynamics in the White Mountains and similar high-terrain regions," Broccolo says. "It's a vital tool for researchers, policymakers, and anyone interested in the health and future of our planet's mountainous areas." This information is applied in a number of ways, as Broccolo outlines:

Long-Term Climate Trends: Our dataset, which spans nine decades, provides invaluable insights into long-term climate trends. This is particularly important in high-terrain areas like the White Mountains, where changes in climate patterns can have profound impacts on ecosystems, weather patterns, and even local economies. Below, climate charts found in the Observatory's Extreme Mount Washington Museum, which were created in collaboration with the Appalachian Mountain Club and Hubbard Brook Research Foundation, highlight some of these trends.




Climate charts created in collaboration with the Appalachian Mountain Club and Hubbard Brook Research Foundation.

Extreme Weather Monitoring: Mount Washington is renowned for its extreme weather conditions. By continuously monitoring and recording these conditions, we can better understand the dynamics of mountain weather systems. This knowledge is essential not just for local forecasting but also for improving broader meteorological models.

**Ecosystem Health:** High-terrain areas are home to unique ecosystems. Our data helps in understanding how changing climate conditions affect flora and fauna, especially those species that are adapted to specific mountain environments.

**Climate Change Impact Analysis:** Mountains are among the first places where the impacts of climate change become evident. By analyzing our dataset, researchers can detect early signs of climate change, such as shifting temperature patterns, changes in snowfall and melting rates, and altered wind patterns.

**Educational and Research Value:** Our dataset serves as a resource for educators and researchers. It provides real-world data for studying meteorology, climatology, environmental science, and related fields.

**Guidance for Policy and Conservation Efforts:** The insights derived from our dataset can inform policy decisions and conservation efforts. Understanding how climate is changing in high-terrain areas is critical for developing strategies to protect these sensitive environments.

The long-term dataset is crucial for these efforts and is made

possible by its dissemination of metadata, or more plainly, data about data, making it easier to understand, manage, and use the information effectively, allowing for accessibility and versatility across many use cases.

From a digital perspective, it allows for the use of vast amounts of data stored in various fields. In research and big data, this is indispensable for data discovery, linking different datasets, and ensuring that data can be reused and understood by other researchers and organizations.

Areas where metadata is applied include organization/accessibility (data retrieval), interpretation/understanding of content, management (ensuring consistency in complex systems), archiving/preservation, and perhaps most importantly, resource integration and sharing.

The aggregation of observations recorded hourly on the summit create this vast network of accessible data, and one could not exist without the other. By better understanding this relationship, we can better appreciate the importance of the hourly observations and daily checks that form an integral resource for understanding weather and create opportunities to build on datasets for the future.

For Broccolo and his research team, that means upgrading and expanding the database to best meet modern standards and ensure data integrity. "Our Director of Technology, Keith Garrett, is diligently working to upgrade and update our servers and databases to meet current standards as we expand our mesonet," Broccolo explains.

The expansion, referring to MWOBS' network of remote stations in the White

Director of Weather Operations Jay Broccolo with RM Young anemometer.

Mountains, "will include 17 new strategically placed remote stations that will include the full suite of weather instruments plus some ecological monitoring instruments. We will also be adding weather instruments to our current weather stations that will enable our organization to capture more atmospheric variables at our automated weather stations, which will increase the resolution of our data."

During these upgrades, metadata and data governance methods and protocols are being adjusted to utilize current best practices recommended by the American Association of State Climatologists Mesonet Steering committee.

Ultimately, these upgrades will allow for higher quality outputs and ensure best practices in meteorological research, climate science, atmospheric science, and environmental monitoring, as well as ensure long-term compatibility going forward.

With data quality and information sharing at the forefront of operational goals, the team aims to not only maintain MWOBS' position as a highly trusted source of meteorological mountain data, but to also continue the expansion of that data in the name of collaboration and weather discovery to better understand our planet.

# System Upgrades & New Cannon Mountain Camera

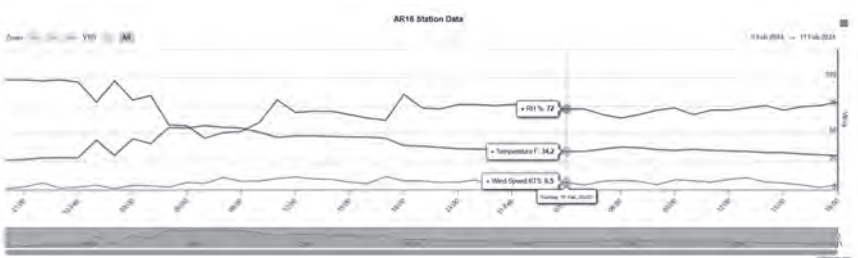
BY **KEITH GARRETT**

I hope everyone is enjoying the new website. Feel free to send an email with suggestions to make it better— Feedback can be sent to *info@mountwashington.org*. IT/Tech has quite a few projects currently ongoing:

The primary task as of now is migrating all of our internal servers to MySQL version 8 running on Ubuntu 22, a change from MySQL 5.7 on CentOS. Much of the underlying codebase needed significant work, and we are in the final testing phase of significant system-wide updates to underlying data ingest, processing, and dissemination systems necessitated by major version changes to our underlying code-base. During these upgrades, metadata and data governance methods and protocols are being adjusted to utilize current best practices recommended by the American Association of State Climatologists Mesonet Steering committee.

A new webcam was recently installed at Cannon Mountain, thanks to support from Scarsdale Security. The live feed can be found on both the Cannon Mountain website, as well as Mountwashington.org. The new camera is heated, and has significant pan and zoom capabilities. While it is currently mounted on top of a small building attached to the upper most lift, we hope to move it to the top of the lift structure in the future. A second camera is planned for Hermit Lake. This camera will provide views from the Hermit Lake Shelter in Tuckerman Ravine of the entirety of the Ravine and Headwall. Unfortunately it is not planned to be a live video feed due to power constraints, however it will update an image online at a to be determined interval when the camera is powered up.

A third camera is planned to replace the old North View camera from the Sherman Adams Building. This camera will




Example of new mesonet data display

Director of Technology Keith Garrett installs a live-streaming weather camera at Cannon Mountain.

be installed once the window where it is located is replaced, as you cannot currently see out the window due to age and wear. We may add a second camera to this location capable of imaging the Aurora Borealis- current thoughts are a ZWO ASI astrophotography camera with a wide angle c-mount lens, controlled by a Raspberry Pi. If anyone would like to help support any of these cameras, let us know!

On the mesonet side of things, we have been in a holding pattern as we wait to hear back from several entities regarding environmental permitting for our Northern Borders Regional Commission mesonet grant. This grant is specifically for upgrading several mesonet stations in Coos County, and adding an additional 17 new mesonet stations, which will cover areas of interest from Mount Washington all the way to the Canadian border. Additional sensors will be added to existing stations, such as soil moisture, soil temperature, and solar radiation.

The build-out of these additional stations is expected to begin in June, starting with another vertical profile following the entirety of the Cog Railway tracks. We expect these new stations to greatly enhance our understanding of mountain weather.

Simultaneously with these new station deployments, a new mesonet map with enhanced visualization of real time and historic data will be launched. We hope that recreationalists and weather enthusiasts alike will be better able to utilize real time data more specific to their location. Another related product will be a data portal, where historical data can be either viewed, downloaded, or requested.

# The Cog Railway

July 3, 2024 marks the 155th anniversary of the first passenger train to arrive at the summit of Mount Washington. The creation of the World's First Mountain-Climbing Cog Railway was a seemingly impossible feat celebrated far and wide, one that continues to fascinate folks from all over the world more than a century and a half later.

This year, visitors to the mountain via the Railway will once again experience what P.T. Barnum called "the second greatest show on Earth!" And with the success of our new Waumbek Station at 4000' and newly-expanded summit service from early May until late October, you can now enjoy a Mount Washington adventure on the Cog Railway 7 days a week, all year long!

Our 155th anniversary celebration begins with a special new section on our website (thecog.com/project155) profiling the visionaries who imagined, built, and continue to maintain and grow this remarkable example of American ingenuity. It all culminates on September 14, 2024 with a very special commemorative event open to the public, with steam train rides, shop tours, food and drink, guest speakers, and fireworks! We'll be announcing details shortly, so stay tuned to the website or follow our Facebook page.

All of this will expand the story of a modern operation rooted deeply in the past, but always with a keen eye focused on the future.

The Mount Washington Cog Railway– since 1869, truly THE ROUTE OF INNOVATION.

# Mount Washington Auto Road

The Mt.Washington Auto Road is heading into a busy summer season with many exciting infrastructure improvement and environmental initiative projects. Our major infrastructure projects include the construction of a new access road, bridge, and tollhouse. Summer 2024 operations will remain the same with the existing bridge and tollhouse. The new bridge will have three lanes to increase capacity and allow cars to be off the highway. There will also be a pedestrian sidewalk to increase safety. Additionally, a solar array will be installed in the Glen by the Peabody River. After completion, this array will bring our sister company, The Glen House, to net-neutral status. This past year we installed solar panels on the garage roof, adding 37kw of energy to our operations.

A new company vehicle—an all-electric 2022 Rivian R1T truck has been added to the fleet thanks to our partnership with Berlin City car dealership. As of 2024, there are four electric vehicle charging stations on the property as well as two more at the Glen House hotel. Visit www.mt-washington.com/environmental-initiatives/ for more information on all of our eco-initiatives.


Meghan Moody Schwartz, Marketing & Events Director at Mt.Washington Auto Road and Great Glen Trails Outdoor Center, on the Observation deck.

In programmatic news, we are excited to host our 24th Moat Mountain 24 Hours of Great Glen in 2024! This most beloved and iconic mountain bike race in New England, returns again August 3-4, 2024. For the theme this year, we plan to travel to outer space for the race, camping, parties, kids events, live music and bash celebrating the most delicious suds around made by Moat Mountain Smokehouse & Brewery. Registration for 24 and 12-hour solos and teams is open now! Learn more about this epic weekend at https://greatglen-trails.com/24-hours/.

Looking forward to a great season ahead—we expect to open Auto Road operations in May!

# New Year, New Volunteer Opportunities

BY **LINDA AND HANK DRESCH**

Winter conditions in the Mount Washington Valley have arrived, but not in the traditional way. However, with climate changing worldwide, there is nothing anyone can count on weatherwise with certainty. Now it is time to focus on Spring.

Our volunteers have been busy with the usual membership mailings, and the fall cleanup around the Observatory's North Conway office was led by Barbara Althen, Bill Ofsiany, and staff member Greg Fitch.

A very special event occurred in September when we recognized two of our nonagenarian volunteers, Bill Housum and Floyd Corson, who celebrated their birthdays almost on the same day. Congratulations are in order for both of these volunteers. And we were very sad to learn that Bill passed away on Feb. 11, 2024 after a brief illness, with family by his side. Bill was a dearly loved member of our community. He will be missed, and we will be sure to carry on in his memory.

New volunteer options have been made available by Drew Bush, Executive Director, Charlie Buterbaugh, Director of External Affairs, and Hannah Babineau, Membership & Events Coordinator. The possible work areas already identified are: Education, Retail and Facilities, Summit Operations and Research, Library and Archives, and Development. If you are interested in more information about these opportunities, contact Charlie directly at: *cbuterbaugh@mountwashington.org*. He will provide you with the details of whom to contact depending on your interest as well as your schedule.

Some of the volunteer options can be done at the Observatory's office or in your home; for example, making personal phone calls or writing personal thank-you

Volunteers Floyd Corson, left, Linda Dresch, Hank Dresch, and Bill Housum support our monthly stewardship work.

letters to the Observatory's supporting members. Scripts have been suggested to make it easier for the volunteers. Several people who have time available at home or on another day than Thursday morning mailings, have enjoyed the new opportunities. Also, those with talents for working on other projects at the office, for example in the library with Peter Crane, have already begun accumulating hours. Karen MacDonald and Joan Kurtz are two of these volunteers. Other opportunities include joining the education staff on school visits, as well as supporting the summit staff.

One of the additional projects we've been involved with on mailing days was stuffing backpacks donated by Eastern Mountain Sports with weather related educational materials, including home weather stations. These backpacks were given to students by Brian Fitzgerald and the education team when they visited local schools for presentations on weather and climate science. We also prepared packages of socks for mailing to the first supporters who donated funds to the Observatory's Year-End Campaign.

Seek the Peak planning has also been underway for some time. Specific plans haven't been confirmed yet but be sure to keep the weekend of July 20 available to volunteer! Register now for the event at seekthepeak.org and add the weekend date to your calendar!

Over the past few months our Volunteers have included:

Barbara Althen
Floyd Corson
Peter Crane
Marietta Deegan
Linda Denis
Linda & Hank Dresch
Peter Fisk
Karen Franke
Donna Gray
Kim Henry
Ava Honan
Bill Housum
Marie Kaspar
Joan & Sandy Kurtz
Karen & Gary MacDonald
Judy Meagher
Bill Ofsiany
Jane & Ken Rancourt
Jean Sweeney

Clockwise around the table: Linda Denis, Linda Dresch, Hank Dresch, Karen Franke, Donna Dunn, Kim Henry, Jackie Bellefontaine, Emily Veh, Brian Fitzgerald, Gary MacDonald, Peter Fisk, Karen MacDonald

# A quarter of a century... That is how long you have supported MWOBS.

BY **HANNAH BABINEAU**

To all of the members listed below, we are thrilled to extend our heartfelt appreciation for reaching this important milestone. Your dedication is an inspiration to all of us, and it is an honor to recognize your contributions to our organization.

Your commitment to our mission has been unwavering, and it has been incredible to witness your involvement and get to know you more with each passing year. Your efforts have made a significant impact on the lives of those who staff the summit 24 hours a day, 7 days a week, 365 days a year, and for that, we are truly grateful.

As we celebrate this milestone, we want to express our deepest gratitude for your tireless efforts and unrelenting dedication. Your passion, energy, and enthusiasm are truly remarkable, and it is because of you that our organization continues to thrive and make a difference in the field of weather observation, research, and education.

Once again, congratulations on reaching this important milestone, and thank you for being an inspiration to us all.

## 25 YEARS

Bryan Kielbania
Michael Judy
Paul Gaitanis
Robert Ledger
Dan M. McKivergan
Jean Chambers
Susan C. Stepp
John B. Redman Jr.
Scott A. Meiklejohn
Virginia Wiswell
Michael Capuano
Christopher Henchey
Sharon Wroblewski
McBrien A. Dunbar
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Fred M Weiss
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Stephen Zimmer
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Andrew Baker
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Duane K. Card
Peter H. Balbert
Bill Keegan
Terence J. Saunders
Lawrence R. Hertz
Bruce C Soper
John Macomber
Mark A. Allen
Lori Cooke-Marra
Robert E Monahan
Kenneth N White
Kenneth Raynor
Arthur O. Poltrack
Christopher Osgood
Harvey J Flanders Sr.
Gail F Paine
Daniel A. Julius

## TRIBUTES & MEMORIAL GIFTS

| | |
|---|---|
| The Edmund & Betsy Cabot Charitable Foundation | In Memory of Brad and Barbara Washburn |
| Erica Broman and Christopher Millette | In Honor of Bruce Soper |
| Kim and Lowell Putnam | In Honor of Bruce Soper |
| Mary Matlak | In Memory of Charles Matlak |
| Mark Michaud | In Honor of Cindy Campbell Michaud |
| Cynthia J Boyle | In Memory of Douglas A. Boyle |
| William deCamp Jr. Fund | In Honor of Edwin O'Malley |
| Souther Sisters Solar Farm, LLC | In Honor of Harold Souther |
| Julie Margolis | In Memory of Jay Margolis Jr. |
| Vanguard Charitable | In Memory of Jim Hoburg |
| Peggy Hoburg | In Memory of Jim Hoburg |
| Harvey Greenberg | In Memory of John Gibson Pounds |
| Josephine D. Stewart | In Memory of John Gibson Pounds |
| Bradley Carroll | In Honor of Katherine Carroll |
| Dawn P. Ridley | In Honor of Kent Ridley |
| Allmuth Perzel | In Memory of Kristen Riley |
| Don Spring | In Memory of Martin Engstrom |
| Robert A Pederson | In Honor of Nimbus |
| Leah Gawel | In Honor of Norman Silverman |
| Henrike Frowein | In Memory of Sam Gawel |
| Jess, Ramon, and Ooma Gawel | In Memory of Sam Gawel |
| Leah Gawel | In Memory of Sam Gawel |
| Norman Silverman | In Memory of Sam Gawel |
| Tor Clark | In Memory of Victor F. Clark |
| Burt Blackburn | In Honor of Zachary Blackburn |
| Deborah Kendall | In Memory of Clark Kendall |
| Tim Johnson | In Honor of Matt Johnson |

## IN-KIND DONORS

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Righteous Vices Coffee Roasters

## 2024 Total Solar Eclipse

On April 8, 2024, the U.S. will experience a total solar eclipse, and certain parts of New Hampshire will be in the path of totality. There are numerous ways to experience this epic phenomenon with Mount Washington Observatory, leading up to and on eclipse day, including the following:

- **April 4** from 7:00-8:00 p.m.: Join us virtually for a very special Science in the Mountains on Forecasting the 2024 Total Solar Eclipse. Register at mountwashington.org.
- **April 4 through April 8**: Tune into our Higher Summits Forecast for forecasting of the 2024 Total Solar Eclipse.
- **April 6 from 4:30-6:00 p.m.**: Photography exhibition and reception featuring MWOBS Weather Observer and Meteorologist Ryan Knapp's astrophotography. Location: Omni Mount Washington Resort Conservatory.
- **April 7 from 11:00 a.m. to 12:00 p.m.**: Understanding Weather and Climate of the 2024 Total Solar Eclipse (And Viewing Tips) educational program with MWOBS educators. Location: Omni Mount Washington Resort.
- **April 7 from 3:00-4:00 p.m.**: Eclipse Science and Surprising Misconceptions about Our Solar System with Dr. Neil F. Comins, Professor of Physics at the University of Maine. Location: Omni Mount Washington Resort.
- **April 8 from 12:00-5:00 p.m.**: 2024 Total Solar Eclipse family friendly viewing party with MWOBS educators. Location: Coleman State Park in Stewartstown, NH.
- **April 8**: 2024 Total Solar Eclipse Citizen CATE. Location: TBA in Pittsburg, NH.

## Big Wind Day 90th Anniversary

April 12, 2024 marks the 90th anniversary of Big Wind Day, when a world record wind gust of 231mph was measured by Alex McKenzie, Sal Pagliuca, and Wendell Stephenson on the summit of Mount Washington. Join us in celebrating in a big way this year with an array of engaging events to learn, celebrate, and explore this landmark event, outlined below. Alongside a public celebration in North Conway, we'll also be featuring digital and print accounts from our archives in addition to in-person and virtual education programs. Stay tuned for more details on our events page online!

- **Saturday, March 23**: In 2023, MWOBS hosted acclaimed author Rachel Slade at our summit weather station on Mount Washington. Stay tuned for a special investigative report on Big Wind Day and the science of wind. We'll publish a sneak peak ahead of the day itself in MWOBS Windswept Online, with the full story slated to run in a future issue of Yankee Magazine.

- **Thursday, April 11 1:00-4:00 PM**: Open House with Big Wind Day archival materials in MWOBS's Gladys Brooks Memorial Library. Come explore the amazing history of this day with our curator Dr. Peter Crane. Location: MWOBS Administrative Office, 2779 White Mountain Highway, North Conway, NH 03860.

- **Friday, April 12 3:00-6:00 PM**: 90th Anniversary Big Wind Day Celebration. Fun for families with a weather balloon launch, kites and anemometers (wind sensors) for kids, MWOBS educational programs, food, drinks, and a ceremony with the families of Alex, Sal, and Wendell. Location: Tuckerman Brewing Company in Conway, NH.

## SEEK THE PEAK

Seek the Peak, Mount Washington Observatory's largest annual fundraiser, will take place Sat., July 20. All outdoor and observatory enthusiasts are invited to raise funds, set goals, and earn gear – all in support of the Observatory's work.

This year, big plans for a dynamic event are focused around a hike up Mount Washington and a reinvigorated Aprés Hike Expo, including a climbing wall staffed by Mount Washington Valley climbing schools, more than 500 outdoor enthusiasts hiking and raising funds, LIVE music, a speaker, and competitions for school children and business teams. The Hike and Make Friends option pairs solo hikers with others in our awesome outdoor community!

Our registration fee includes a food voucher and free Minus 33 Merino socks. Anyone who registers to hike gets to refuel at our Apres Hike Party on the 20th! Visit seekthepeak.org to find out more and register today.


Volunteer Adam Gill (former weather observer), Director of Technology Keith Garrett, and Executive Director Drew Bush chat with Mount Washington Valley Adaptive Sports during last year's Seek The Peak Apres party.

## CORPORATE SUPPORT

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Weather Observer Charlie Peachey on the summit with extreme meteorologist and storm chaser, Reed Timmer.

*Dear Members,*

*Thank you for reading our Spring 2024 edition of Windswept, which introduced some design updates that I hope you consider improvements.*

*The changes include a simpler front cover that emphasizes our featured mountain image, updated section headers and article headlines, new fonts, and a column grid layout for a clean, uniform look. All of these changes are intended to improve your reading experience.*

*I would also like to thank Ellen Estabrook, who joined the Observatory as Communications Manager last September. Ellen has enthusiastically (and capably) taken on the role as editor of this publication, allowing me to focus more time on my new role. I'm excited to see the editions that Ellen produces, the stories she includes, and the perspectives that come to life in these pages.*

*It has been a welcome and rewarding challenge to edit Windswept during the past two years. Thank you for that opportunity. As a member, your support makes all that we do possible.*

*As we move forward, we will continue striving to share meaningful updates about the Observatory, Mount Washington, and the work of our staff, focusing on topics that you find most interesting. Your feedback is always appreciated. Please always feel free to email me at cbuterbaugh@mountwashington.org or Ellen at eestabrook@mountwashington.org with your thoughts or questions.*

*— Charlie Buterbaugh*

MWOBS

MOUNT WASHINGTON OBSERVATORY

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# WINDswept

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