



ATMOSPHERIC SCIENCE

COLORADO STATE UNIVERSITY

2020 NEWSLETTER

An unprecedented year

On Feb. 17, the Department of Atmospheric Science celebrated its new community space with an open house and ice cream social. This central location provided opportunity for faculty, students, and staff to interact and strike up new collaborations. It quickly became a favorite gathering place.

One month later, social distancing became policy and the department started working remotely due to the pandemic that would continue to disrupt all aspects of daily life through the end of the year and beyond.

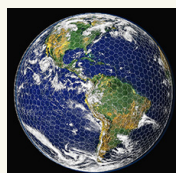
Only a few personnel conducting critical lab or field research and key staff were allowed on campus through the end of spring semester. Spring break was extended by a couple of days and, during that time, faculty Universitywide moved their classes online. This was a big challenge, especially for lab classes, such as Air Pollution Measurement, where videos of

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Faculty members
earn *Science News*,
AMS, AGU honors

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EarthWorks project to
bolster Earth system
modeling capabilities

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Department one of only
14 accepted into AGU
diversity program

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Donate

Please consider supporting the Department of Atmospheric Science. Your gift strengthens CSU through the recruitment and retention of world-class students and faculty. It also ensures that our department will continue to be a leader in weather, climate, and air quality research. Gifts are especially welcome this year to offset pandemic budget impacts.

To contribute, please visit: advancing.colostate.edu/ATMOS or email Beth.Hallmark@colostate.edu.

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Please send alumni news, comments, questions, corrections, and address updates to: info@atmos.colostate.edu, or call (970) 491-8682.

Much to celebrate despite challenges in 2020

Wow, what a year! Early 2020 looked so promising. At the AMS Meeting in Boston in January, we were able to catch up with so many of you, alumni and friends, at the CSU reception and in the delightful Wayne Schubert Symposium. Who knew that within a matter of weeks our lives would all be turned upside down?

It has been a challenging year here in ATS, as it has surely been for all of you. Our cover story talks about some of the challenges, from postponed field programs to bringing our primary workspaces home, to major University budget cuts. As I write this message in late November, we are finishing up in-person instruction for the fall semester with post-Thanksgiving classes all moving online.

Research has continued apace, albeit much of it from our home offices and kitchen tables. Too many Zoom meetings have had to fill in for the face-to-face conversations that are so key to kindling and nurturing collaboration. Throughout all of this, I have found the resilience and creativity of our faculty, staff, and students so remarkable, especially as many deal not only with work life and a pandemic, but also increased family responsibilities – not to mention weeks of heavy smoke from Colorado’s largest-ever wildfire in the mountains west of town.

In a crazy year like this, I am delighted that we can still report so many successes of our CSU ATS family. Included are successive wins of the AMS Meisinger award by Libby Barnes and Russ Schumacher; election of Sue van den Heever and alum Walt Peterson as AMS Fellows; Jim Hurrell’s receipt of the inaugural AMS Warren Washington Medal; receipt of the AMS Suomi Medal and AMS Brooks Service Award by alumni Eric Smith and Xubin Zeng; Emily Fischer’s naming to the *Science News*



Department Head
Jeff Collett

10 Scientists to Watch list; Bill Cotton’s election as an Honorary Member of the ICCP; Melissa Burt’s selection for the IAspire Leadership Academy; publication of a Joanne Simpson biography by alum Jim Fleming; alum Ken Harding’s promotion to regional director of the NWS Central Region in Kansas City; the many scholarships and awards received

by ATS students; and more.

I am also excited about our two 2020 recipients of the CSU ATS Outstanding Alum Award: Bob Rauber, director of the University of Illinois School of Earth, Society, and Environment, and NCAR scientist Julie Demuth. Congratulations to both! We have so many outstanding alumni who are deserving of recognition. Please consider who you might nominate next year.

You will note a significant emphasis in this newsletter on department efforts to promote diversity and inclusion in our field. This is a high priority for us. Efforts include elimination of the GRE admission requirement, the department’s participation in the new AGU Bridge Program, and the tremendous NSF-sponsored work on enhancing the retention of undergraduate women in the geosciences by Emily Fischer and Melissa Burt.

I hope that all of you are staying safe and sane in what seems somehow both the fastest and longest year ever. Thanks for all that you do to support the department. You are our ambassadors to the world. Here’s hoping for a better 2021. We look forward to seeing you in person, here in Fort Collins or elsewhere, when possible!

Sincerely,
Jeffrey L. Collett Jr.
collett@colostate.edu

FACULTY NEWS

Three professors earn AMS honors, including new award

The American Meteorological Society will recognize three CSU atmospheric science professors with prestigious honors at the 101st AMS Annual Meeting in January. Russ Schumacher will receive the Clarence Leroy Meisinger Award; Susan van den Heever will be inducted as a fellow; and James Hurrell will be the first recipient of the Warren Washington Research and Leadership Medal.

Hurrell, the Scott Presidential Chair in Environmental Science and Engineering, will receive the inaugural Warren Washington Research and Leadership Medal for his “highly influential climate system research, and a distinguished and impactful record of national and international leadership,” according to the AMS citation.

The award is especially meaningful for Hurrell because Washington was one of his mentors. “This particular award is special because Warren has been a very influential figure in not only my career, but also my life,” said Hurrell. “There are few people I respect and admire as much as Warren.”

Van den Heever has been elected a fellow for her extensive record of contributions to atmospheric science. No more than two-tenths of 1 percent of all AMS members are considered for the honor any given year. Van den Heever, a Monfort Professor, recently was named the 2021 MIT Houghton Lecturer and scientist-in-residence, as well as a visiting professor in the Department of Physics at Oxford University.

“It is a tremendous honor to have been made a fellow of the AMS. I feel most humbled to have been selected to join this group of top scientists and leaders of our field,” van den Heever said.



Schumacher, associate professor and Colorado state climatologist, will receive the Meisinger Award for his innovative analyses of observations and model simulations that improve our understanding of flash floods and other weather phenomena.

Professor Emeritus Richard Johnson and University of Georgia Professor John Knox co-lead Schumacher’s nomination.

“Russ is one of the top early-career scientists in our entire field, so it was a no-brainer to nominate him,” Knox said.

“The list of past winners of this award is a who’s who of great scientists in our field, including many who have been important influences on my career,” Schumacher said. “To be added to that list is an incredible honor.”

All three professors acknowledged the support of their mentors and research collaborators and said these awards reflect the work of many.

Schumacher is the second consecutive CSU atmospheric scientist to receive the Meisinger Award. Associate Professor Elizabeth Barnes earned last year’s distinction.

Ravishankara admitted to Indian National Science Academy

University Distinguished Professor A.R. Ravishankara, a professor in the Departments of Atmospheric Science and Chemistry, has been named a Foreign Fellow of the Indian National Science Academy, effective Jan. 1, 2021.



science in India, harnessing scientific knowledge for the cause of humanity and national welfare. The INSA is composed of scientists from all branches of science and technology. Currently, there are 930 fellows and 94 foreign fellows.

to India, Ravishankara has been able to identify the effect of pollution on the community’s health in India – where it comes from, how it is harming India, and how it can be reduced. He has brought these findings to the scientific community as well as to the public.

In India, **air pollution is the leading cause of death** and is responsible for 1.2 million premature deaths every year.

Established in 1935, the INSA promotes Through his recent research specific

FACULTY NEWS

Barnes receives AGU Turco Lectureship for climate science

Though it has been only eight years since Associate Professor Elizabeth Barnes earned her Ph.D., she already has significantly impacted her field and assembled a talented research group at the forefront of climate science. Recognizing her research and advances, the atmospheric sciences section of the American Geophysical Union has awarded Barnes the Future Horizons in Climate Science: Turco Lectureship.



Tim Woollings, an Oxford associate professor in physical climate science, cited the quality and quantity of her work. Her research already has achieved high impact, he noted, with 19 of her 79 peer-reviewed papers receiving more than 50 citations each.

“She has advanced the field of atmospheric science in these few years more than many of us do in our whole careers,” Woollings wrote in his nomination letter. “Her work is trustworthy, authoritative, and expertly targeted to make real, concrete advances in our understanding of the climate system.”

The Turco Lecture is intended to identify future areas of research for solving global warming and related issues. Barnes will present the lecture during the AGU Fall Meeting in December.

In nominating Barnes for the award,

Barnes looks forward to sharing her recent research focus in the lecture.

“I hope to discuss new tools for Earth system understanding and prediction, with a focus on machine learning techniques as an exciting frontier to advancing both how we do science/ explore data, and the science itself,” she said.

Barnes is a partner in a new \$20 million NSF-funded AI research center that will expand how artificial intelligence is used in environmental research. Her research group uses neural networks to study and predict climate.

Barnes credits her group and colleagues for the honor.

“I really see this award as recognition of the amazing group of people I have been fortunate enough to work with in recent years.”

Fischer named to *Science News* list of 10 scientists to watch

Associate Professor Emily Fischer has been selected by *Science News* as one of 10 scientists to watch – a distinction that recognizes early- and mid-career scientists age 40 and under who are significantly contributing to their fields.



WE-CAN. She combines analytical chemistry with high-flying techniques to understand where air pollution comes from and how it changes as it moves through the air,” *Science News* wrote in its spotlight on Fischer.

Fischer was honored in part for her wildfire smoke research. She was featured in the Oct. 10 issue of *Science News* and [on its website](#).

“Fischer, an atmospheric chemist, pulled together a diverse team of 10 lead scientists, and scores more graduate students and postdocs, to pull off the most comprehensive analysis of wildfire smoke ever attempted, a project dubbed

The honor took Fischer by surprise, and she acknowledged all the people she has worked with on WE-CAN and other projects.

“I really owe a lot of the journey over the last five or six years to some really wonderful teams that I’ve been on,” she said.

Fischer was nominated by a past SN 10 recipient, who lauded Fischer’s work

in the areas of air quality and diversity. “In addition to significant scientific advancements, she has substantially advanced research on how to increase diversity in geosciences,” said the nominator, who preferred to remain anonymous.

For anyone watching, Fischer will be studying what’s in the air we breathe and working toward the betterment of science and society.

“I am going to continue to work on opening up pathways into science. I’m also going to continue to think about ambitious and creative ways we can learn more about a variety of different air pollution issues, including those related to agriculture, energy production, and wildfires,” she said.

FACULTY NEWS

Department welcomes new Assistant Professor Rugenstein

Don't ask Maria Rugenstein about the weather. The new assistant professor in the Department of Atmospheric Science likely hasn't checked the forecast, and she's more concerned with how the climate will change in the coming decades to centuries.



influence clouds, and how do the clouds influence large-scale ocean circulation?"

In her climate dynamics research, Rugenstein primarily uses general circulation models, which simulate ocean and atmospheric flow.

One important focus of her work is to understand the trustworthiness of these models and their limitations.

"It's really just cool to think on large scales and amazing what we can know about this chaotic system," she said.

Rugenstein was drawn to the diverse day-to-day work that goes along with being a scientist, as well as the community.

"I like the solitariness of analyzing the data and thinking about a problem by myself, but then also the community aspect of science, explaining the problems, convincing and disagreeing with people – just the flow of ideas," Rugenstein said. "It is an absolute privilege to be working on the questions I choose together with people who also choose these questions solely based on

their interest."

Rugenstein joins CSU from the Max Planck Institute in Hamburg, Germany, where she was a postdoctoral fellow on a Humboldt Research Fellowship. Both her M.S. and Ph.D. in atmospheric and climate science are from the Swiss Federal Institute of Technology (ETH), in Zürich, Switzerland.

Colorado has made a good impression on the native German, and she looks forward to exploring more of the state.

"People are very friendly! They constantly wave at me for no obvious reasons – I love it!" she said. "We just started exploring but are very excited for the next few years because there are so many opportunities."

Colorado's weather probably will win her over too.

"I love listening to people geeking out about the weather, so I'm happy to be here at CSU and ATS!" she said. "My husband thinks it's a question of time and that Colorado weather will convert me into a weather geek."

"Whether or not it rains or snows today – so what, next week will be different," Rugenstein said. "I care about decadal and basin-wide averages, even though I'm aware that nobody experiences this in their backyard."

Rugenstein is interested in large-scale interactions of the atmosphere and ocean. How does the ocean influence the atmosphere, and how does it store and redistribute heat? Understanding these things will improve our ability to predict how the climate will change under certain conditions.

"The ocean can be a heat source or sink but also shapes sea surface temperatures, which modulate the atmospheric feedbacks," Rugenstein said. "For example, how does the ocean

Cotton chosen for elite honor by cloud physics organization

Professor Emeritus William Cotton was chosen for an honor given to only one member of the cloud physics community every four years. He was elected as an Honorary Member of the International Commission on Clouds and Precipitation, an organization based in the International Association of Meteorology and Atmospheric Sciences.



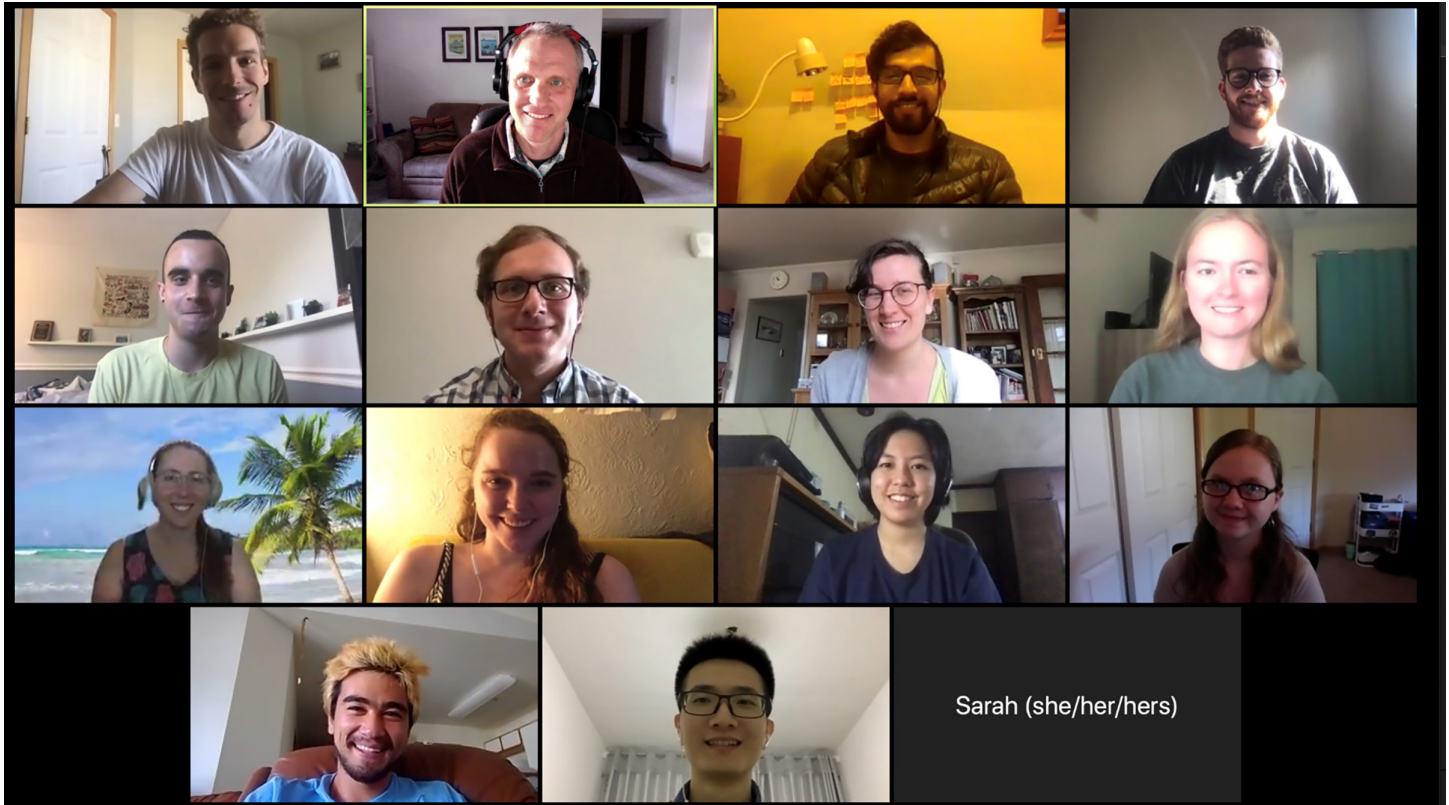
Every four years, the commission organizes the International Conference on Clouds and Precipitation, a top forum for atmospheric scientists to share their research on clouds and precipitation. Cotton has attended the conference

since the early 1970s. This year, he was to speak at the event scheduled for August in Pune, India, but it was postponed.

Last year, Cotton celebrated 45 years with the department. He is a fellow of the American Meteorological Society, the American Geophysical Union, and the Cooperative Institute for Research in the Atmosphere. He has published more than 190 papers in peer-reviewed journals and authored nine book chapters, one book, and a **memoir**, and co-authored two additional books. He considers advising students to be his most significant career achievement.

STUDENT AND STAFF NEWS

Welcome (virtually), new students!



Fall 2020 incoming students, from left to right, top to bottom row: Kyle Shackelford, Associate Department Head Eric Maloney, Daniel Veloso Águila, Ryan Patnaude, Marc Alessi, Daniel Hueholt, Kimberley Corwin, Nicole June, Emily Gordon, Ann-Casey Hughes, Gabrielle “Bee” Leung, Charlotte Connolly, Nick Leitmann-Niimi, and Weixin Zhang. Not pictured: Madison Shogrin.

Burt selected for two prestigious NSF-backed recognitions

Melissa Burt, assistant dean for diversity and inclusion in the Walter Scott, Jr. College of Engineering, was chosen for two unrelated National Science Foundation-backed honors. She was named an IAspire Leadership Academy Fellow and was appointed to a National Academies of Sciences, Engineering, and Medicine committee that will provide guidance to the NSF.



In serving the committee, Burt will draw upon both her atmospheric science research background and experience in incorporating diversity, equity, and inclusion into institutional systems.

“From my perspective, it’s really thinking about diversity and inclusion in the workforce, and how does that fit in to the ways we study the Earth,” she said.

The committee is tasked with advising the NSF on how to conduct Earth studies using an interdisciplinary approach.

Burt looks forward to the personal development she will gain from the IAspire Leadership Academy and

connecting with others across STEM disciplines who share her passion for diversity, equity, and inclusion. The IAspire leadership program aims to broaden diversity and increase inclusion in STEM fields and higher education leadership.

Burt’s position was created two years ago to help guide the college in its DEI goals, though her work on diversity and inclusion initiatives began a decade earlier in the department, where she leads successful NSF Research Experiences for Undergraduates programs.

STUDENT AND STAFF NEWS

Congratulations, Atmospheric Science graduates!



Spring and Summer 2020 graduates, from left to right, top to bottom row: Evie Bangs, Jared Brewer, Sam Childs (and his wife, Swae), Erin Dougherty, Aryeh Drager, Will Lassman, Jakob Lindaas, Peter Marinescu, Jon Martinez, Kathryn Moore, Yasutaka Murakami, Minnie Park, Jeremiah Piersante, Louis Rivoire, and Bryn Ronalds.

2020 Graduates

Student – degree – research group

Sam Atwood – Ph.D. – Kreidenweis

Evie Bangs – M.S. – Collett

Jared Brewer – Ph.D. – Fischer/Ravishankara

Sam Childs – Ph.D. – Schumacher

Alex DesRosiers – M.S. – Bell

Erin Dougherty – Ph.D. – Rasmussen

Aryeh Drager – Ph.D. – van den Heever

Anna Hodshire – Ph.D. – Pierce/Jathar

Andrea Jenney – Ph.D. – Randall

Julieta Juncosa Calahorrano – M.S. – Fischer

Nicholas Kedzuf – M.S. – Chiu

Will Lassman – Ph.D. – Pierce/Collett

Jingyuan Li – Ph.D. – Thompson

Jakob Lindaas – Ph.D. – Fischer

Peter Marinescu – Ph.D. – van den Heever/Kreidenweis

Jonathan Martinez – Ph.D. – Bell

Kathryn Moore – M.S. – Kreidenweis/DeMott

Yasutaka Murakami – M.S. – Kummerow/van den Heever

Jungmin (Minnie) Park – Ph.D. – van den Heever

Jeremiah Piersante – M.S. – Rasmussen/Schumacher

Louis Rivoire – Ph.D. – Birner/Knaff

Marqi Rocque – M.S. – Rutledge

Bryn Ronalds – Ph.D. – Barnes

Ben Toms – Ph.D. – Barnes

Ben Trabing – Ph.D. – Bell

STUDENT AND STAFF NEWS

Student and Postdoc Fellowships, Awards, and Recognition

2020-2021 American Geosciences Institute Fisher Congressional Fellowship	Jakob Lindaas
AGU Fall Meeting 2019 Outstanding Student Presentation Award	Andrea Jenney, Savini Samarasinghe
AGU Paros Scholarship in Geophysical Instrumentation	Julieta Juncosa Calahorrano
Alumni Award	Andrea Jenney
AMS Best Student Presentation	Chih-Chi Hu
AMS first-place Student Oral Presentation	Minnie Park
AMS second-place Student Oral Presentation	Sam Childs, Alex Sokolowsky, Ben Toms
AMS Outstanding Oral Presentation	Ben Toms
AMS Policy Colloquium	Michael Cheeseman, Kyle Chudler
AMS Poster Award	Ben Trabing
AMS Schubert Symposium second-place Student Poster Award	Jon Martinez
David L. Dietrich Award	Kate O'Dell
Fulbright Scholars	Emily Gordon, Daniel Veloso Águila
Herbert Riehl Memorial Award	Ben Toms
InTERFEWS Graduate Program	Kimberley Corwin
NCAR Advanced Study Program Postdoctoral Fellowship	Erin Dougherty, Jon Martinez
NOAA Climate and Global Change Postdoctoral Fellowship	Andrea Jenney
NSF Atmospheric Science Postdoctoral Research Fellowship	Zane Martin
Program of Research and Scholarly Excellence Scholarship	Nicole June, Nick Leitmann-Niimi, Ryan Patnaude
Program of Research and Scholarly Excellence Summer Fellowship	Michael DeCaria
Rocky Mountain States Section of the Air and Waste Management Association Scholarship	Kate O'Dell
Shrake-Culler Scholarship	Sean Freeman
SoGES Global Sustainability Leadership Fellows	Ali Akherati, Michael Cheeseman, Zack Labe, Zane Martin
Taiwan Ministry of Education Graduate Fellowship	Ting-Yu Cha
Vice President for Research Graduate Fellowship	Kevin Barry
Walter Scott, Jr. Fellowship (2021)	Daniel Veloso Águila, Weixin Zhang
Walter Scott, Jr. Fellowship plus Dean's GRA	Marc Alessi

Rauber and Demuth chosen as 2020 Outstanding Alums

Two exceptional alumni from the department will each receive an Outstanding Alum Award this year, Bob Rauber and Julie Demuth.

Rauber earned his M.S. (1981) and Ph.D. (1985) from the department, studying with Professor Lew Grant. His dissertation was “Physical Structure of Northern Colorado River Basin Cloud Systems.”

Rauber joined the faculty of the atmospheric sciences department at the University of Illinois in 1987, where he has been an award-winning teacher. He served as department head from 2008-2018 and led the development of the Illinois atmospheric sciences undergraduate degree program, now among the largest in the country. In 2018, Rauber was appointed director of the U of I School of Earth, Society, and Environment.

Rauber’s research spans many topics in physical meteorology, radar meteorology, and mesoscale meteorology, and he has led many major field programs. His research includes cloud and mesoscale modeling and extensive work with conventional, dual-Doppler, and airborne radars, radiometers, and other aircraft, ground-based, and satellite instruments.

Rauber is a prolific author and has published highly successful textbooks on radar meteorology, severe and hazardous weather, and Earth science. He is well known for his dedicated service to the atmospheric science community, including nine years as chief editor of the *Journal of Applied Meteorology and Climatology* and extensive service to AMS and UCAR. AMS recognized Rauber with the Charles Franklin Brooks Award for Outstanding Service to the Society in 2019. He has been an AMS Fellow since 2006.



Bob Rauber with his grandsons, Max and Henry, and Julie Demuth



Demuth received her M.S. from the department in 2001 and was advised by University Distinguished Professor Emeritus Tom Vonder Haar. Her M.S. thesis was “Objectively Estimating Tropical Cyclone Intensity and Wind Structure Using the Advanced Microwave Sounding Unit.”

After leaving CSU, Demuth worked for the National Research Council Board on Atmospheric Sciences and Climate before beginning a successful career at NCAR. While at NCAR, Demuth completed a CSU Ph.D. in public communication and technology. Her dissertation was “Developing a Valid Scale of Past Tornado Experiences.”

Demuth has pioneered a new and important research area that addresses pressing questions about how atmospheric science intersects with society. Her research and publications have broken new ground at the intersection of atmospheric science and risk communication.

Demuth’s work is highly cited, she is frequently invited to address high-profile conferences, and she has provided important feedback to the NWS concerning best practices and improved responses during major weather events.

Demuth co-founded the grassroots Weather and Society*Integrated Studies (WAS*IS) movement, dedicated to changing the weather enterprise by comprehensively and sustainably integrating social science into meteorological research and practice. Over the years, Demuth has been an outstanding mentor to many who have worked to integrate societal relevance into their research activities.

Rauber was nominated by Larry Di Girolamo, and Demuth was nominated by Andrea and Russ Schumacher. A virtual celebration is scheduled Dec. 10 to honor the winners and so they can share their work with the department. Please see **Page 11** for notes from the Outstanding Alums.

Updates from Alumni

Chris Collimore (M.S., '89) earned his Ph.D. from UCLA in 2018. After a stint as a visiting professor at Florida Tech, he is now a postdoctoral fellow at the NOAA Center for Earth System Sciences and Remote Sensing Technologies at City College of New York.

David Duncan (M.S., '13; Ph.D., '17) works at the European Centre for Medium-Range Weather Forecasts in the Earth System Assimilation section as a EUMETSAT research fellow, maintaining and improving the usage of microwave sounders in data assimilation.

Jim Fleming (M.S., '73) is a visiting scholar this year in the Department of the History of Science at Harvard University. He published a new book, *First Woman: Joanne Simpson and the Tropical Atmosphere* (Oxford University Press, 2020), available from www.oup.com using promo code ASPROMP8 at checkout for 30 percent off.

Eric Guillot (M.S., '10) began working at National Weather Service headquarters in January as a meteorologist in the Analysis and Nowcast Branch. He has been working with NWS field forecasters to create requirements regarding the upcoming 3-D Real-Time Mesoscale Analysis / Unrestricted Mesoscale Analysis system and the Rapid Refresh Forecast System.

Ken Harding (M.S., '91) recently was named the regional director of the National Weather Service Central Region in Kansas City. He is responsible for 45 weather forecast offices, river forecast centers, and center weather service units across 14 states with nearly 1,000 employees. Harding has been with the NWS since 1995, following nine years with the U.S. Air Force.

Stacey Hitchcock (Ph.D., '18) is a postdoctoral research fellow with the Australian Research Council's Centre of Excellence for Climate Extremes and the School of Earth Sciences at the University of Melbourne in Melbourne, Australia. Her research aims to improve understanding of the processes that support extreme rainfall in organized deep convection, with a specific emphasis on linear systems that frequently impact Melbourne and the surrounding region.

John Knaff (M.S., '92; Ph.D., '97), a CIRA colleague and NOAA scientist, received an AMS Editor's Award "for providing multiple rigorous, timely, and constructive reviews across three AMS journals, and also for contributing consistently excellent reviews over a period of many years."

Timothy Lang (M.S., '97; Ph.D., '00) recently was promoted to principal investigator for the Lightning Imaging Sensor on the International Space Station. Launched in 2017, ISS LIS is the former flight spare of the LIS instrument that flew on the Tropical Rainfall Measuring Mission (1997-2015). Among many other benefits to science and society, ISS LIS expands the long-term global lightning climatology provided by TRMM LIS to higher latitudes (+/- 55 degrees).

Walt Petersen (M.S., '92; Ph.D., '97), deputy manager of the Science Research and Projects Division at **NASA's Marshall Space Flight Center**, was elected an AMS Fellow. Those considered for fellowship "have made outstanding contributions to the atmospheric or related oceanic or hydrologic sciences or their applications during a substantial period of years."

Louis Rivoire (Ph.D., '20) is a postdoctoral fellow at Harvard University and works on convective processes in the upper troposphere and lower stratosphere, tropical cyclones, and the circulation of the stratosphere.

Chris Slocum (M.S., '13; Ph.D., '18) joined the NOAA Center for Satellite Applications and Research Regional and Mesoscale Meteorology Branch in Fort Collins as a physical scientist working to improve tropical cyclone forecasts through leveraging satellite data and artificial intelligence.

Eric A. Smith (M.S., '80; Ph.D., '84), a Florida State University professor, received the AMS Verner E. Suomi Technology Medal "for innovative technological achievements that fundamentally changed the use of satellite observations in meteorology and hydrometeorology."

Updates from Alumni

Samantha Wills (M.S., '15.; Ph.D., '19) is a postdoctoral researcher at the Cooperative Institute for Climate, Ocean, and Ecosystem Studies at the University of Washington and the NOAA Pacific Marine Environmental Laboratory. She works with autonomous surface observing platforms to collect high-quality in-situ measurements of oceanic and meteorological data and study air-sea interaction over remote regions of the central/eastern equatorial Pacific Ocean.

Xubin Zeng (Ph.D., '92), a University of Arizona professor, received the 2021 AMS Charles Franklin Brooks Award for Outstanding Service to the Society. He was honored for "skillful and effective service in senior leadership roles that has materially improved the Society's meetings and other activities."

Notes from 2020 Outstanding Alums, Rauber and Demuth

Note from Bob Rauber:

I want to sincerely thank everyone in the Department of Atmospheric Science for considering me for this honor. The department truly launched my career with opportunities I could get nowhere else.

I am particularly indebted to my adviser, Professor Lewis O. Grant, for opening my eyes to the excitement of field research. Lew gave me responsibilities for both managing field campaigns and developing novel analysis approaches to field data that I carry through to this day. I was so sad to learn of his passing some years ago, but happy that I was able to honor him before his passing when the department invited me back in 2012 to give a talk at the department anniversary celebration. Lew was in the audience and had no idea that the title of my talk would be "Career lessons I learned from Lew."

I am also deeply grateful for the advice and friendship of Professor Bill Cotton. I ran so many miles with Bill around the foothills that I'm sure the tracks are still there from our footprints. Our discussions on these runs were instrumental to completing my degree and in all future aspects of my career.

As my career as a professor at the University of Illinois developed, I have continually benefited from my experiences at CSU. Those who know me know that I love fieldwork — my experiences at the department helped me lead or participate in 23 field campaigns after graduating. What a trip! I also have had the wonderful experience of guiding my own students through their degrees and helping launch their careers.

Would I do it all over again? You bet! I tell our undergraduates here at the University of Illinois who are considering graduate school that they should have CSU on their radar screen. They can't go wrong if they choose to go to CSU, a department with a long history of excellence, and a great place to launch a career.

Note from Julie Demuth:

I'm incredibly humbled. It's such a tremendous honor to be chosen for this distinguished award and to be among so many accomplished, talented past honorees.

This award is especially meaningful in that I can trace my interest in studying the intersection of the atmospheric and social sciences back to when I was pursuing my M.S. at CSU. For one of my classes, I read a research paper (by a scholar who is now a dear friend and collaborator) about public perception of hazardous weather and climate change. I was fascinated, and I came to realize the research represented a nascent field of study.

I'm intrigued by how the atmosphere works and by the predictability — and predictability limitations — of hazardous weather. I'm also intrigued by how people perceive and respond to the risks posed by hazardous weather and its intrinsic uncertainty. Tying together these research threads has been challenging but incredibly rewarding. There are so many important, interesting, and complex science questions and pressing societal needs that fall at the interface of atmospheric science and risk communication (in addition to other social science disciplines)!

I'm so grateful for all the friends and colleagues I've learned from along the way and with whom I have the joy of collaborating to investigate these complex problems. I'm thankful that there is support for this kind of convergence science in the meteorological community, including in CSU's Department of Atmospheric Science. And, I'm especially appreciative of Andrea and Russ Schumacher for nominating me and of the selection committee for this honor.

Thank you kindly,
Julie

A year of extremes keeps Colorado Climate Center busy

Update from Colorado Climate Center Director Russ Schumacher.

Another year of extremes has kept the staff of the Colorado Climate Center busy once again. The rapid expansion of drought in the summer of 2020, an unprecedented wildfire season, and a wild temperature swing in September grabbed local and national interest.

CCC staff, including state climatologist Russ Schumacher, assistant state climatologist Becky Bolinger, and drought specialist Peter Goble, were widely quoted in the media in relation to the hot, dry conditions in Colorado this summer and how those conditions enabled the growth of the three largest wildfires in state history. The whiplash in September between temperatures above 100°F to snow two days later also garnered headlines across the country.

The CCC led the process to establish the

first NOAA-certified state record for low pressure: the pressure (adjusted to sea level) during the “bomb cyclone” in March 2019 reached 970.4 millibars in Lamar. After analysis of historical data, this record was established by NOAA’s State Climate Extremes Committee, the first time a pressure observation was certified by this committee.

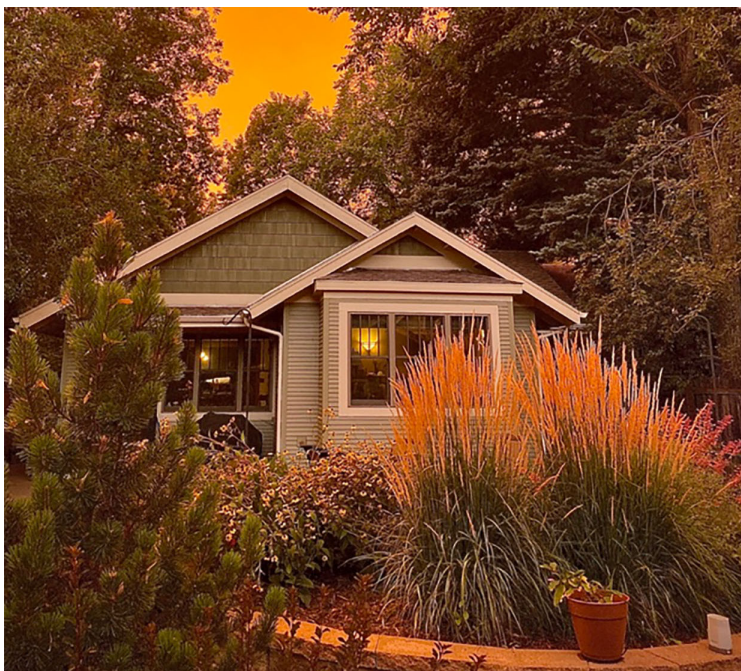
The pandemic caused big changes in many of our usual outreach and engagement activities, but one positive outcome of the pandemic was increased participation in the Community Collaborative Rain, Hail, and Snow Network. In April, CoCoRaHS achieved a major milestone by recording its **50 millionth daily precipitation observation**. That same month, it was honored with the CSU Community Engagement Scholarship award.

Several national publications highlighted CoCoRaHS as an activity people could

participate in while stuck at home, and records were broken yet again for the number of active observers in the network – currently reporting from 21,438 stations. CoCoRaHS staff published articles in the *Bulletin of the AMS* (on **daily precipitation extremes reported by volunteer observers**) and in *Weatherwise* (describing **a day in the life of the network**).

We have also continued to develop new ways to access and analyze the data from the Colorado Agricultural Meteorological (CoAgMET) network, also known as Colorado’s Mesonet. Furthermore, we have been conducting research on the droughts that have affected Colorado and the West in recent years and how to better anticipate them.

In all of these efforts, we look to continue fulfilling our threefold mission of climate monitoring, climate research, and climate services for Colorado.



“Fire and Ice”: Professor Scott Denning captured the smoky sky from the Cameron Peak Fire at 2:40 p.m. Sept. 7 (left), with a high of 77 degrees that day, and the extreme weather shift to snow at 8 a.m. Sept. 8 (right), in these photos of his Fort Collins home.

Faculty partner with NCAR on \$5M NSF EarthWorks project

Professors David Randall and James Hurrell will collaborate with the National Center for Atmospheric Research to create a high-resolution version of an Earth system model used by scientists around the world. The National Science Foundation will fund the nearly \$5 million, five-year EarthWorks project led by CSU.

The project will extensively modify a recent version of the Community Earth System Model, which is an open-source model used by many researchers to improve our understanding of the complex interplay of atmospheric, oceanic, land surface, and sea ice processes that comprise the Earth system.

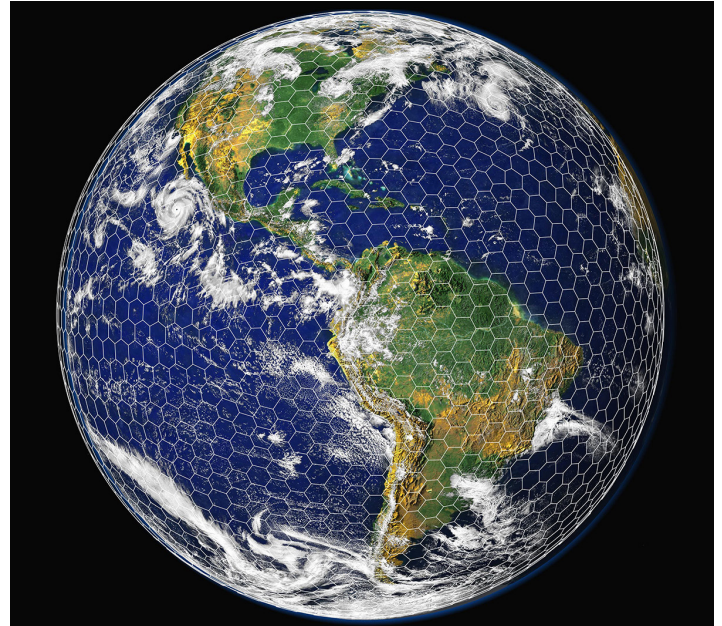
Though extremely useful and powerful for many science applications, the current model has limitations, including an inability to explicitly simulate thunderstorms and other relatively small-scale phenomena at its current low spatial resolution. Instead, storms, cloud formation, and other similar processes are parameterized, or represented statistically.

While some Earth system models have sufficient resolution to simulate thunderstorms – called global storm-resolving models – none of them are freely available to the research community. EarthWorks aims to bring this global storm-resolving capability to their version of the community model, so all researchers can utilize it.

“The fact that this is a community model that’s shared openly with everybody is unique and very valuable,” said Randall, EarthWorks’ principal investigator and a University Distinguished Professor. “Our intention is that everyone will be able to use what we’re building.”

EarthWorks’ goal is to develop a version of the model that can run with a grid spacing of just a few kilometers. That’s a significant advancement, considering the Community Earth System Model typically is used with a 25- to 100-kilometer grid spacing. The finer resolution will be able to render important geographical features, such as individual large mountains, that play an important role in weather and climate. Coastlines, lakes, and vegetation also will be better represented, and many complex chemical and physical processes will be simulated in a more natural way.

“It really opens the door to a much more realistic representation of what’s going on,” Randall said.



This graphic shows a coarse version of the EarthWorks grid superimposed on an image of the Earth. The actual EarthWorks grid will be much finer, with grid spacing about 100 times smaller than what is shown here. Credit: Bill Skamarock/NCAR

This level of detail is key to answering a lot of research questions, including many involving climate prediction.

For example, to fully explore how tropical cyclones might change with a changing climate, you need a model with high enough resolution to explicitly simulate the cyclones along with the full complexity of an Earth system model. You also need to be able to run the model for a long enough time period to detect how increasing greenhouse gases will affect cyclones in the future.

Atmospheric models for forecasting weather run at a resolution high enough to accurately capture the formation and evolution of individual cyclones, but they typically aren’t used with a complete representation of atmospheric, oceanic, and surface processes, and they are run for short periods of time.

“We want to run at weather-forecasting resolutions but for years to decades into the future,” said Hurrell, a co-principal investigator and the Scott Presidential Chair in Environmental Science and Engineering. “That will allow us to study a class of problems at the weather-climate interface that can’t be addressed with coarser resolution.”

RESEARCH

PROGRESS receives \$3.5M from NSF to build diversity

The geosciences don't look like they did several decades ago, and decades from now they'll look different from today. Scientific advances along with a greater diversity of scientists have strengthened the field, and improving the latter will lead to more of the former. That's the ultimate goal of a \$3.5 million National Science Foundation project led by Colorado State University researchers Emily Fischer and Melissa Burt.

Through their work on PROGRESS, a program for PROMoting Geoscience Research, Education, and Success, Fischer, Burt, and colleagues proved that mentoring is key to retaining undergraduate women in STEM fields. The mentoring program they created helped students by increasing their science identity and sense of belonging.

"Given that it works, we need to make a scalable version, so we can offer this kind of mentoring program to as many women as possible," said Fischer, an associate professor in the department.

Their most recent study, **published in *Nature Communications Earth & Environment***, identified three essential



Students complete a mentor map exercise during a PROGRESS workshop in 2019.

components for a successful mentoring program: inspiration through exposure to geoscience careers via women role models, inoculation through training on how to grow their mentor network and overcome obstacles, and an introduction to a local female geoscientist mentor. Distilling these three critical ingredients will allow PROGRESS coordinators to scale up the program to serve students across the U.S. The NSF grant will enable

Fischer and Burt to expand the program dramatically, while still testing some details.

The first iteration of PROGRESS served between 300 and 400 students along the Front Range and in North and South Carolina. The five-year NSF expansion will cover around 2,000 students and include minority-serving institutions in new regions, such as Georgia and Texas.

ATS gives perspective on record-breaking hurricane season

In August, the CSU Tropical Meteorology Project revised its forecast to predict the most named storms and hurricanes of any forecast it has ever issued, dating back 37 years. By September, the National Hurricane Center ran out of names and started using Greek letters. This has happened only once before, in 2005.

In early November, 2020 broke the record set in 2005 for most named storms in a single season, with 30 (and

counting, as of press time). Thirteen of those were hurricanes, including six major hurricanes.

Twelve named storms – six of them hurricanes – made landfall in the continental U.S., breaking the record of nine set in 1916. Six landfalling hurricanes in the continental U.S. ties the record set in 1886 and 1985.

Very warm sea surface temperatures and low wind shear in the tropical Atlantic,

as well as development of La Niña in the Pacific, contributed to the extremely active season, which claimed more than 400 lives and caused at least \$41 billion in damage.

Media outlets around the world called on the department's researchers for insight on the record-shattering season. Research scientist Phil Klotzbach, lead author of the forecast, has been quoted in news stories approximately 20,000 times since June 1.

DEPARTMENT NEWS

An unprecedented year, continued from cover

hands-on experiments had to be created for remote viewing.

Thanks to our dedicated faculty and teaching assistants and flexible students, the semester concluded successfully. Spring commencement, like so many events, was canceled. Instead, the department held its own online ceremony, with the added benefit of sharing interesting facts about each graduate.

Fall semester did not return us to normalcy. It brought viral testing, daily symptom checks, and remote or hybrid (remote and in-person) classes with reduced capacities and mandatory seating charts for potential contact tracing. Copious signs were placed around campus, covering everything from proper hand-washing technique to which doors should be used for entering and exiting. Most department personnel continued to work from home.

Three of our four new international students who had planned to start classes in Fort Collins in the fall were delayed by visa issues and had to take classes remotely from their home countries fall semester. Once here, our one international student who was able to obtain a visa and new Assistant Professor Maria Rugenstein were required to isolate for two weeks.

Our New Student Welcome Picnic was held virtually and without the picnic. No Professor of the Year was selected, but graduate representatives suggested all of our faculty should be awarded for their efforts to switch to virtual learning on such short notice. When asked for outstanding student nominations, faculty said the same about our students and their tenacity.



The department celebrated its new community space Feb. 17 with an open house.



Public health expectations now are posted at the entrance to the community space.

2020 has been a challenging year, to say the least, but in the department, education and research continue, though some projects have been delayed and some funding was lost. PRECIP, the Prediction of Rainfall Extremes Campaign In the Pacific, a major international field campaign led by Associate Professor Michael Bell and Assistant Professor Kristen Rasmussen, was postponed until summer of 2021.

Weekly seminars have continued virtually, which has enabled a larger number of international presenters. Attendance has thrived, growing beyond the physical capacity of our seminar room.

We look forward to a time when we can gather again in our communal spaces, hear esteemed speakers in person, sit next to one another in class, and celebrate achievements with food.

DEPARTMENT NEWS

Department accepted into AGU Bridge diversity program

The U.S. geosciences workforce does not reflect the diversity of the U.S. population, and the American Geophysical Union's Bridge program aims to fix that. AGU founded the new program to improve recruitment and retention of underrepresented minorities in science, technology, engineering, and mathematics graduate programs. CSU's Department of Atmospheric Science was one of 14 institutions chosen as a partner in the program's first round.

"The department applied because it strongly feels that diversity on our campus strengthens our entire scientific community," said Associate Department Head and Professor Eric Maloney. "We are continually seeking new partnerships



to increase diversity within our program."

Maloney led the department's application, along with Professors Emily Fischer, Jim Hurrell, Jeff Pierce, and Kristen Rasmussen, and Melissa Burt, assistant dean for diversity and inclusion in the Walter Scott, Jr. College of Engineering.

AGU received 52 applications from hopeful Bridge partners, representing 20 percent of the 250 active Earth and space science graduate programs in the United States. Through a rigorous

review process, AGU assessed each institution's ability to support and mentor underrepresented students.

"I think our department was chosen because it has a history of developing innovative programs to increase diversity," said Maloney. "We also presented novel ideas for improved mentoring strategies for future underrepresented minority students in our program."

Partners will have access to the Bridge program's student applicant database, so they can find and recruit qualified students from underrepresented groups who are interested in geoscience graduate studies.

GRE eliminated as admission requirement

The department will no longer consider Graduate Record Examinations scores for admission to the program. Faculty voted unanimously at their June meeting to remove the requirement based on their determination that the GRE is not an accurate measure of the skills needed to be a good scientist in the field.

"We anticipate this decision will lead to a higher number of strong applicants and a more diverse and representative applicant pool," said Professor and Associate Department Head Eric Maloney, who led the effort to remove the requirement.

Prior to the vote, faculty reviewed information on which measures determine graduate school success, including resources from the American Geophysical Union and American Geosciences Institute. They found the GRE is not a good predictor of Ph.D. completion or student publication rate. The GRE, a standardized test used for graduate admissions since the 1950s, also has proven to be biased against women and people of color.

"The GRE score is biased against under-

represented minority applicants and hurts our ability to recruit a diverse student body that is representative of the U.S. population," Maloney said. "The fact that the test is a financial and time burden on applicants also hinders the ability to create the strongest possible applicant pool."

Because it would be unfair to students who did not submit GRE scores for financial or other reasons, the department will not consider them as an optional qualification for admission. The department will approach admission decisions holistically, taking into account academic preparation – including grades and strength and rigor of the applicant's program, research experience, scholarly potential, alignment of research interests with its faculty and program, and the ability to clearly communicate long-term research goals.

"Since there is no evidence that the GRE is a good predictor of graduate school success in the geosciences, and some have even argued it has a negative correlation, it makes no sense to include it in a robust holistic review process for graduate admissions," Maloney said.

Faculty & Staff Milestones (Years of Service)

5 years

Michael Bell
Sam Childs
Dani Talmadge
Sarah Tisdale

15 years

Noah Newman

20 years

Wesley Berg
Chris Kummerow
Steve Saleeby
Dave Thompson

35 years

Paul DeMott

50 years

Tom Vonder Haar