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AMS Alumni Reception

Please join us for the
Atmospheric Science
Alumni Reception

6-8 p.m.

**Tuesday, Feb. 4,
2014**

during the

Annual AMS Meeting
at the

**Omni Hotel
at CNN Center,**
100 CNN Center,
International Ballroom E,
Atlanta, Ga.

Hope to see you there.

Greetings, Alumni and Friends!



Department Head
Jeff Collett

Welcome to our latest Colorado State University Atmospheric Science newsletter! Read about milestones and 2013 highlights, including the addition of two outstanding new faculty members: Assistant Professors Elizabeth Barnes and Emily Fischer. Both joined us midyear and are off

to a great start. This year we welcomed another outstanding class of students, including many fellowship recipients and two members of the armed forces. The many awards, scholarships, and prizes received by students, staff, and faculty are described later in this newsletter. I call your attention, in particular, to Sue van den Heever, selected by our students as Outstanding Professor of the Year (Sue is the first two-time winner of this award!); to Dave Randall, named the 2014 recipient of the AMS Jule G. Charney Award; to Wayne Schubert awarded

the College of Engineering's Abell Outstanding Research Faculty Award; and to Nolan Doesken and the CoCoRaHS team, slated to receive an AMS special achievement award. The AMS awards will be presented at the annual meeting in Atlanta in February. We hope you can join us there on the evening of Feb. 4 for the department's annual reception; it's a great opportunity to renew old acquaintances and make new friends! I also invite you to stop by the department anytime you are in the area to meet our new faculty and students and learn about the exciting work under way. In closing, I want to offer a special acknowledgment to one of our original faculty members, Lew Grant, who passed away this summer. A pioneer of the department's experimental cloud physics program, Lew continued to be an active participant in department activities through his 90th birthday earlier this year.

Sincerely,

Jeffrey L. Collett Jr.

In Memory of Professor Emeritus Lew Grant

The Department of Atmospheric Science sadly lost one of its founding members this year. Longtime faculty member, supporter, and friend of the department, Professor Emeritus Lewis ("Lew") O. Grant passed away July 29, 2013, at the age of 90.

Lew Grant's long and fruitful association with Colorado State University began in 1959 with his appointment as a faculty member in the Department of Civil Engineering. He was one in a small group of faculty forming a nucleus of atmospheric-related research that would later lead to the founding of the Department of Atmospheric Science in 1962. Lew

spent more than 40 years leading efforts to explore the potential for Western U.S. weather modification, first with cumulus cloud seeding in the late 1940s and early 1950s in Denver with Irving Crick Associates (1948-1958), and later from 1959 to his retirement from the University in 1993, where he and his research group led field experiments to explore the potential for Colorado wintertime high mountain silver iodide seeding to enhance Western winter snowpack.

Lew Grant was also one of our country's early and best-known explorers of weather modification,

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Department Welcomes New Professors

Assistant Professor Emily Fischer

Emily Fischer joined Colorado State University as an assistant professor in August 2013.

She received a B.S. in atmospheric science from the University of British Columbia in 2002 and her M.S. in earth sciences at the University of New Hampshire in 2005. She continued her graduate studies in atmospheric science at the University of Washington and received her Ph.D. in 2010. Emily then moved to Harvard University Center, where she was a joint NOAA Climate and Global Change Harvard University Center for Environment Fellow. While at Harvard, her research focused on understanding the factors controlling peroxyacetyl nitrate concentration in the atmosphere and the role of PAN in global oxidant chemistry.

Emily's research uses both field-based and applied modeling approaches to investigate the sources of atmospheric trace gases to remote environments. An underlying goal of her work is to improve our understanding of the role different processes play in determining the atmosphere's self-cleaning capacity. Her current work explores processes that redistribute anthropogenic reactive nitrogen to remote regions. Past research focused on the transpacific transport of Asian air pollutants.

Emily's teaching interests are in the fields of atmospheric chemistry, chemistry climate interactions, and reactive nitrogen in the earth system.

Emily taught Atmospheric Chemistry in Fall 2013.



Assistant Professor
Emily Fischer

Assistant Professor Elizabeth Barnes

Elizabeth Barnes joined Colorado State University as an assistant professor in August 2013. She received a B.S. in mathematics and a B.S. in physics from the University of Minnesota in 2007 and a Ph.D. in atmospheric science from the University of Washington in 2012. That same year, she was awarded a NOAA Climate and Global Change Postdoctoral Fellow and spent 2012-2013 at The Lamont Doherty Earth Observatory of Columbia University, where her research focused on the movement of global jet streams and how the relationship between the jets and weather patterns will respond to anthropogenic climate warming.

Elizabeth's primary research objective is to understand the mechanisms driving the variability of the atmosphere to better interpret and predict its behavior over a range of climates. Her research interests include large-scale atmospheric dynamics (e.g., annular modes, eddy-



Assistant Professor
Elizabeth Barnes

mean flow feedbacks), atmospheric mixing/transport, and the influence of atmospheric circulations on global and regional air quality.

Elizabeth will be teaching the data analysis and statistics course, titled Objective Analysis in the Atmospheric Sciences, in Spring 2014.

Faculty Members 2013



Front Row (left to right): Dave Thompson, Emily Fischer, Elizabeth Barnes, Chris O'Dell, Dave Randall, Sonia Kreidenweis

Middle Row: Scott Denning, Sue van den Heever, Thomas Birner, Wayne Schubert

Back Row: Russ Schumacher, Jeff Collett, Jeff Pierce, Chris Kummerow, Steve Rutledge, Eric Maloney, Dick Johnson

Not Pictured: Tom Vonder Haar

Faculty Announcements

The Department of Atmospheric Science is pleased to announce that Dr. A.R. Ravishankara (Ravi) will be joining our faculty as a professor in early 2014. Ravi is currently director of the Chemical Sciences Division of the NOAA Earth System Research Laboratory in Boulder. He will be retiring from this position and will begin his work at CSU, where he'll hold a primary appointment in the Department of Chemistry with a joint appointment in Atmospheric Science.

AMS Appointments

In appointment news, Professors Tom Vonder Haar and Wayne Schubert were honored with a formal appointment to the American Meteorological Society's History Committee. Tom will chair the committee, and Wayne will participate as a committee member, each serving a three-year term.

Outstanding Professor of the Year Sue van den Heever

Associate Professor Sue van den Heever received the 2013 Outstanding Professor of the Year award, which was presented at the annual New Student Picnic at Spring Canyon Park. Each year, a faculty member is chosen by Department of Atmospheric Science students for teaching excellence. Consideration points include innovative



Associate Professor Sue van den Heever speaking to new students, faculty, and staff at Spring Canyon Park.

use of classroom materials, enthusiasm for teaching, particularly instructive and innovative assignments, and willingness and availability to help outside of the classroom.

Student nominations noted Sue's "ability to communicate the essential details without clouding understanding with complexity is unique. She is the master of her lectures and actively engages even the students

who are most reluctant to provide an opinion. Her dedication to research, collaboration, and the science is admirable." Also, Sue "focuses her teaching on the latest research for a particular topic of study within the course. She facilitates critical thinking and discussion, teaching students to always question and to think like a researcher. This is a crucial, valuable skill that is not often taught in courses. Sue is a fantastic teacher not only in this aspect, but also in her ability to clearly explain concepts. She is very deserving of Professor of the Year."

Sue is the first Atmospheric Science faculty member to receive the award twice (she also won in 2009). In addition to this, Sue was also recently promoted to associate professor effective July 1, 2013. Her research focuses on dynamics and the microphysics of convective storm systems and the use of cloud resolving models. Information about Sue and her research group is available at <http://reef.atmos.colostate.edu/~sue>. Congratulations on all of your achievements, Sue!



Associate Professor Sue van den Heever and her research group.

AMS Jule G. Charney Award to Dave Randall

University Distinguished Professor Dave Randall, Atmospheric Science faculty member and director of the Center for Multiscale Modeling of Atmospheric Processes National Science Foundation Science and Technology Center, has been named as the 2014 recipient of the American Meteorological Society's Jule G. Charney award. This award, one of the highest honors bestowed by the AMS, is granted to individuals in recognition of highly significant research or development achievement in the atmospheric or hydrologic sciences.



Professor Dave Randall

Dave's selection was given in recognition of his transformative research into atmospheric convection and cloud processes and their improved representation in global weather and climate models. This award will be presented at the AMS Annual Meeting in early February 2014.

Follow Dave's research and group activities at <http://kiwi.atmos.colostate.edu/group/dave>.

Other Awards



Director Nolan Doesken

The Community Collaborative Rain, Hail and Snow Network was selected to receive an American Meteorological Society Special Award "for building a community of more than 15,000 volunteer observers dedicated to providing high-quality, reliable observations of daily precipitation across the United States." Special Awards are presented by AMS to individuals or groups that don't fit defined AMS award categories and who have made significant contributions to science.

Currently, Nolan and his team at the Colorado Climate Center are actively involved with analyzing the recent September storm.

A website containing facts, charts, maps, timelines, and pictures is available at <http://coflood2013.colostate.edu>. Furthermore, Nolan is partnering with the Cooperative Institute for Research in Environmental Sciences and Western Water Assessment to research the flood (<http://www.colorado.edu/resources/front-range-floods>).

Want to help CoCoRaHS with its research? Go to www.cocorahs.org and click on "Join CoCoRaHS" to sign up and learn more.

As this newsletter went to press, Professor Wayne Schubert was honored as the 2013 recipient of the College of Engineering's Abell Outstanding Research Faculty Award. The Abell Award recognizes high-quality, nationally acclaimed research productivity, with a particular focus on the preceding five-year time period. Learn more about Wayne's research at <http://schubert.atmos.colostate.edu>.



Professor Wayne Schubert



Welcome, New Graduate Students

Name (M.S./Ph.D.)	Adviser	Undergraduate/Graduate University
Jordan Allen	Denning	Savannah State University
Stephen D'Andrea	Pierce	Dalhousie University
Aryeh Drager	van den Heever	Dartmouth College
Caitlin Fine	Johnson	United States Naval Academy
Peter Goble	Schumacher/ Doesken	University of Northern Colorado
Alexander Goodman	Randall	University of Illinois-Urbana Champaign
Gregory Herman	Schumacher	University of Washington
Noel Hilliard	Collett	Mount St. Mary's University
Jack Kodros	Pierce	University of California-Berkeley
Leah Lindsey	Randall	New Mexico Institute of Mining and Technology
Chengji Liu	Barnes	Nanjing University
Landan MacDonald	Pierce/Collett	Dalhousie University
Andrew Manaster	O'Dell	University of Illinois-Urbana Champaign
Peter Marinescu	Kreidenweis/ van den Heever	Cornell University
Marie McGraw	Barnes	Massachusetts Institute of Technology
Alexandra Naegele	Randall	Ohio State University
Erik Nielsen	Schumacher	Texas A&M University
Kim Sakamoto	Pierce	Dalhousie University
Robert Tournay	Schumacher/ Vonder Haar	Air University
Jake Zaragoza	Fischer	Gonzaga University

Alumni and Herbert Riehl Awards



Alumni Award Winner James Ruppert and Adviser Professor Dick Johnson



Riehl Award Winners Adele Igel and Nick Davis

Student and Postdoctoral Awards

Colorado State University Global Sustainability Leadership Fellow	Matt Igel and Shunsuke Nakao
Teaching Recognition Certificate from the UADY Engineering Department, Yucatán, Mexico	Alex Gonzalez, Annareli Morales, and Gavin Roy
6th International Fog Conference Outstanding Student (Oral) Presentation Award	Ali Boris
12th ACCESS Invited Participant (Atmospheric Chemistry Colloquium for Emerging Senior Scientists)	Shunsuke Nakao
2013-AMS 19th Conference on Atmospheric and Ocean Fluid Dynamics Best Student Papers	Alex Gonzalez and Nick Davis
2013-AMS 93rd Annual Conference Student Poster Award	Noel Hilliard and Peter Marinescu
2012-AGU Fall Meeting Outstanding Student Paper Award	Bonne Ford and Aryeh Drager

Student and Postdoctoral Fellowships

AFIT (Air Force Institute of Technology)	Robert Tournay
AGEP (Alliance for Graduate Education and Professoriate)	Jordan Allen and Jake Zaragoza
AMS (American Meteorological Society)	Aryeh Drager, Caitlin Fine, Erik Nielsen, and Peter Marinescu
CIRA (Cooperative Institute for Research in the Atmosphere)	Leah Grant and Todd Jones
CMMAP Diversity (Center for Multiscale Atmosphere Processes)	Noel Hilliard
CONACYT (Mexican National Council for Science and Technology)	Zitely Tzompa
Dietrich Scholarship	Steve Brown and Bonne Ford
DOE (Department of Energy) Krell	Chris Eldred
GATES Millennium Scholars	Isaac Medina
I-WATER (Integrated Water, Atmosphere, Ecosystems Education, and Research)	Aaron Piña, Vanessa Vincente, and Isaac Medina
NASA	Matt Igel and Sara Ringerud
NASA DEVELOP	Renee Curry
NSF (National Science Foundation)	Shunsuke Nakao, Adele Igel, Leah Grant, Aryeh Drager, Nick Davis, Elizabeth Thompson, and Gavin Roy
NOAA Climate and Global Change Postdoctoral Fellowship	Nathan Arnold
NSERC (Natural Sciences and Engineering Research Council of Canada)	Kim Sakamoto and Landan MacDonald
PRSE (Programs for Research and Scholarly Excellence)	Greg Herman
Shrake Culler Scholarship	Isaac Medina, Stephanie Henderson, and James Ruppert
SOARS (Significant Opportunities in Atmospheric Research and Science)	Jake Zaragoza and Annareli Morales

Student Groups: Outreach Opportunities and Hands-On Experience

Extracurricular organizations in the Department of Atmospheric Science offer graduate students opportunities to explore science beyond conventional means. From networking events and tours of regional facilities, to outreach opportunities with local children, student groups have been strengthening within the department over the past several years. As of this fall, the Colorado State University student chapter of the American Association for Aerosol Research and the AMS FORT Collins' Atmospheric Scientists Chapter are two key groups through which students can find ways to reach out to the community and further their learning experientially. Each of these groups, although both atmospheric-science related, have their own individual focus areas.

The University student chapter of AAAR seeks to promote the mission of its parent association: the development of aerosol science and technology and its application to important societal issues. They do so through the exploration of current aerosol research topics (e.g., climate change, effects of air pollution on humans, etc.) within the University and the greater science community. AAAR also encourages public interest in these topics through education and planned community activities.

The Storm Peak Lab atop Steamboat Springs ski area, for example, has been a research field trip destination for AAAR in recent years. Nine students from AAAR and Jeff Collett's Air Pollution Measurement course spent an April evening studying the chemistry of the air and snow. The goals were to gain scientific insights and get hands-on experience with in-situ mountaintop and free tropospheric measurements.

In addition to research trips, AAAR also strives to connect with students in the Fort Collins community through activities such as maintaining adopted Forest Service trails. They also took part in their first Little Shop of Physics Open House in February, where they presented a 30-minute activity session titled "What's in the Air" to several groups of families. The session invited kids to do simple chromatography experiments, compete to form the greatest number of aerosol particles



Participants listen to one of the presentations at this year's Young Scientist Symposium on Atmospheric Research. (Photo courtesy of Elliott Foust)

using household items, and learn about the effects of particles on the colors and clouds in our atmosphere. AAAR also joined the Little Shop of Physics again in October at Super Science Saturday, in an effort to connect with kids and families about aerosol science.

FORTCAST, the department's other key group, created in May of this year, is a local chapter of the AMS that serves as an outlet for CSU students to interact with their peers, professors, and other members of academia interested in the study of the atmosphere, ocean, and other parts of the climate system.

FORTCAST's goal for the 2013-2014 year is to focus on education and outreach in Northern Colorado communities. In April, members of FORTCAST led hands-on experiments for 2- to 5-year-olds in University Children's Center at Colorado State (known as the Sunshine House). In addition to meetings with the public, FORTCAST also plans to hold a

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Congratulations, Atmospheric Science Graduates

Name	Adviser	Degree	Name	Adviser	Degree
Nick Beavis	Rutledge	M.S.	Clayton McGee	van den Heever	M.S.
James Carpenter	Kreidenweis	M.S.	Gabriela Mora-Rojas	Schubert	Ph.D.
Allyson Clark	Randall	M.S.	Biljana Orescanin	Denning	M.S.
Adam Davis	Johnson	M.S.	Matt Paulus	Johnson	M.S.
Nick Davis	Birner	M.S.	Lauren Potter	Kreidenweis	M.S.
David Duncan	Kummerow	M.S.	Morgan Phillips	Denning	M.S.
Kim Erickson	Kummerow/ Vonder Haar	M.S.	Aaron Piña	Denning	M.S.
Grant Firl	Randall	Ph.D.	Gavin Roy	Kummerow	M.S.
Daniel Jones	Ito	Ph.D.	Chris Slocum	Schubert	M.S.
Theodore Letcher	Cotton	M.S.	Katherine Thayer-Calder	Randall	Ph.D.
Ezra Levin	Kreidenweis	Ph.D.	Lance Vanden Boogart	Vonder Haar	M.S.
Christina McCluskey	Kreidenweis	M.S.	Jonathan Woodworth	Thompson	M.S.
Greg McGarragh	Stephens	Ph.D.	Charles Yost	Schumacher	M.S.

Atmospheric Science Field Studies

The department continues its long tradition of leading and participating in observational field studies, with a high level of activity in 2013.

In addition to the significant scientific achievements that result, fieldwork provides outstanding educational opportunities for our students to learn how data are obtained and the strengths and limitations of various instruments and observing systems. Activities over the past year include:

Bakken Air Quality Study: (Collett/Kreidenweis), February-April 2013 and November-December 2013. The study team set up five monitoring sites in the Bakken formation region and nearby in northwest North Dakota and northeast Montana,

including a core measurement site in Theodore Roosevelt National Park.

Measurements were made of various air quality parameters (fine particle mass, fine particle composition, ammonia, nitric acid, sulfur dioxide, ozone, methane, and volatile organic compounds) to study the impacts of extensive oil and

gas development and flaring on air quality. The largest impacts observed were periods of very high ammonium nitrate fine particle concentrations. Participants in field: Tony Prenni, Ashley Evanoski-Cole, Derek Day (CIRA), Arsineh Hecobian, Yi Li, Amy Sullivan, Misha Schurman, Yury Desyaterik. Sponsor: National Park Service.

Garfield County Gas Emissions Study: (Collett, Pierce, and Jay Ham-Soil and Crop Science), Summer/Fall 2013. The study seeks to obtain estimates of emissions of air toxics, ozone precursors, and methane from new well development activities on the Western Slope of Colorado. Measurements involve tracer release and the quantification of target species concentrations using mobile laboratories and canisters downwind of well drilling, fracking, and flowback stages of new well development. Participants in field: Arsineh Hecobian, Andrea Clements, Yury Desyaterik, Kira Shonkwiler, Brad Wells. Sponsors: Garfield County, Encana, WPX Energy, Bill Barrett Corp., and Ursa Energy.

NE Colorado Ammonia Study: (Collett), Summer 2013. The project involves time-resolved measurements of atmospheric ammonia concentrations at nine locations in northeast Colorado, part of an ongoing effort to determine the spatiotemporal variability of ammonia in this important agricultural source region. Participant: Yi Li. Sponsor: Agricultural Experiment Station.

Boulder, Wyoming Trace Gas and Fine Particle Study: (Collett), January-December 2013. Participants in this air quality study are making measurements of ammonia, nitric acid, and fine particle speciation in the active Jonah-Pinedale gas producing region of western Wyoming, part of a seven-year series of ongoing measurements in partnership with Air



Derek Day (from CIRA) and Ashley Evanoski-Cole at a Bakken Measuring site.

Resource Specialists. Participant: Yi Li. Sponsor: Shell Exploration and Development.

RailRoad Valley Field Campaign: (O'Dell), June 2013. The RailRoad Valley field campaigns are conducted for ongoing vicarious calibration of the GOSAT instrument. For a week in the Nevada desert every June, participants gather to measure surface reflectivity and clear-sky atmospheric conditions such as temperature and trace gas concentrations. These measurements are used to support vicarious calibration of the Greenhouse Gases Monitoring Satellite. Participants: Robert Nelson, Tommy Taylor. Sponsor: NASA.

MPEX: (Schumacher), Spring/Summer 2013. The Mesoscale Predictability Experiment is aimed at assessing whether additional atmospheric observations ingested into state-of-the-art numerical weather prediction models can provide improvements to forecasts of severe weather and heavy precipitation six to 24 hours in advance. Along with teams from the National Severe Storms Laboratory, Purdue University, and Texas A&M University, the CSU group launched numerous radiosondes surrounding a variety of storm types, including mesoscale convective systems and supercell thunderstorms. CSU collected key observations taken around the storms that produced deadly tornadoes in Moore and El Reno, Okla. in Spring 2013. Participants in field: Russ Schumacher, Matt Paulus, Vanessa Vicente. Sponsor: National Science Foundation.

IFLOODS: (Rutledge), May-June 2013. The Iowa Flood Studies involved deployment of several radars and extensive ground-based instrumentation to document heavy rainfall in Iowa as part of the NASA GPM Ground Validation program. A concurrent large groundwater hydrology program was carried out by the University of Iowa. Participants in field: Steven Rutledge, Brody Fuchs, Brenda Dolan, Weixin Xu. Sponsor: NASA.

MAGIC: (DeMott), June-September 2013. Marine ARM GPCI Investigation of Clouds field campaign involved shipboard measurements of aerosols, clouds, radiation, and meteorological data during round trips between Los Angeles and Honolulu to improve the representation of the stratocumulus-to-cumulus transition in climate models. CSU was funded for aerosol collections and ice nuclei measurements. Participants: Paul DeMott, Tom Hill. Sponsor: Department of Energy.

IDEAS-4: Aircraft Measurement of Biological Aerosols in Clouds – A Feasibility Study: (DeMott/Kreidenweis), September-October 2013. The NCAR IDEAS projects test new measurement ideas while supporting student training in airborne science. Scientists from CSU, Oregon State, University of Colorado, NCAR, and Droplet Measurement Technologies will obtain measurements of fluorescing biological particles in air and in cloud particle residuals from the NSF/NCAR G-V aircraft. CSU scientists will explore the contribution of biological particles to ice nucleation processes. Participants: Christina McCluskey, Paul DeMott, Tom Hill. Sponsor: National Science Foundation.

FROST: (Rutledge, Kennedy and Schumacher), February-April 2013. FROST is the Front Range Orography Storms project carried out by CSU and colleagues at NCAR (M. Kumjian and R. Rasmussen). CSU used the high-resolution X-band component of the CSU-CHILL radar to study kinematic and microphysical processes in Front Range snowstorms. Numerical simulations were done using the CSU-WRF model. Comparisons are being made between observations and simulations. Participants: Steve Rutledge, Pat Kennedy, Russ Schumacher. Sponsor: National Science Foundation.

Modeling

A wide range of numerical models are developed and/or utilized by the research groups within our department. The types, parameterizations and spatial and temporal characteristics of these models vary tremendously, being determined primarily by their research applications. Brief descriptions of the modeling work being conducted by some of our faculty are included below.

Cotton Group: Professor Emeritus Bill Cotton, together with Professor Emeritus Roger Pielke, oversaw the original development of the Regional Atmospheric Modeling System. RAMS is a cloud-resolving model that includes sophisticated microphysical and aerosol parameterizations, radiation, and land surface schemes. Bill's recent research has focused on the impacts of aerosols on stratocumulus clouds, mesoscale convective systems, tornadogenesis, hail formation, orographic precipitation, urban-induced precipitation, and hurricanes. A three-moment hail microphysical scheme has also been developed. The Cotton group is also using the Ocean-Land-Atmosphere-Model to investigate research areas of interest including the MJO. OLAM is a global version of RAMS developed by Dr. Bob Walko. Bob was one of the original developers of RAMS and a Cotton group member during the 1980s and 1990s.

Fischer Group: Assistant Professor Emily Fischer has recently made extensive use of a global suite of aircraft and surface observations, including her own, to overhaul the global GEOS-Chem peroxyacetyl nitrate simulation and conduct a global source attribution for this species. GEOS-Chem is a global chemical transport model driven by GEOS assimilated meteorological data that includes a state-of-the-science description of tropospheric oxidant chemistry. Based on our current understanding, PAN is the most important pathway by which anthropogenic reactive nitrogen emissions reach the remote troposphere and impact oxidant distributions. Emily currently serves as the co-chair of the GEOS-Chem Carbon Gases working group, and she is now working to incorporate her new model updates into the standard version of the model.

Pierce Group: The research group of Assistant Professor Jeff Pierce is working to improve global and regional predictions of aerosols in the GEOS-Chem chemical transport model. The group is using field measurements to improve the representation of particle production from power plants and secondary organic aerosols. Jeff's group is also using the System for Atmospheric Modeling Large-Eddy Simulation model, along with field measurements to (1) understand particle formation and growth in power-plant plumes, (2) explore gas dispersion from oil/gas fields, and (3) look at warm-rain microphysics in North Atlantic marine stratus clouds. Estimates of the effect of cookstoves on climate and population health in developing countries are also being obtained by Jeff's group through the use of the Goddard Institute for Space Studies model E general circulation model with online aerosol microphysics (TOMAS).

Randall Group: CMMAP, under the direction of Professor Dave Randall, has led the development and implementation of "super-parameterization," an approach in which a cloud resolving model is run in each grid cell of a climate scale atmospheric model, specifically the Community Earth System Model, in order to improve the inability of global climate models to resolve the much smaller-scale motions involved in atmospheric moist

convection and cloud formation. CMMAP scientists are examining the effect of using "super-parameterization" in response to an increase in CO₂. They have found that the improved convection representation leads to significant effects, including wintertime Arctic atmospheric convection, enhanced Arctic sea ice melting, and stronger increase of tropical intra-seasonal variability. The results reinforce the concern that convection representations in state-of-the-art climate models introduce significant uncertainties into their predictions. The Randall research group is also striving to improve our understanding of cloud parameterizations through the use of a cloud-resolving model with a domain about the size of one grid cell in a global model (200 km) and horizontal grid spacing of 100 m to simulate a field of thunderstorms and other large clouds, while resolving the large turbulent eddies that grow inside on the edges of the clouds. These Giga-Large-Eddy Simulations take 1 billion grid cells in the CRM to simulate the many scales involved, and a supercomputer is required to run the model and manipulate the large volume of data generated. They are currently simulating a deep convective event that was observed over the tropical Pacific Ocean. Analysis of the simulation will allow them to examine the assumptions used in global model parameterizations and improve them.

Schumacher Group: Assistant Professor Russ Schumacher's research group uses the Advanced Research version of the Weather Research and Forecasting model for several applications. The model is used for understanding mesoscale atmospheric processes in both case studies and in quasi-idealized frameworks. WRF-ARW is used in conjunction with ensemble data assimilation tools for diagnostic analysis of weather systems and predictability studies. Finally, Schumacher's group regularly runs a series of real-time experimental forecasts at relatively coarse resolution, and also has tested real-time configurations with explicit convection in support of the Mesoscale Predictability Experiment in 2013. Schumacher and his group also use the Cloud Model 1 to conduct idealized simulations of mesoscale processes for both research and educational purposes.

van den Heever Group: Associate Professor Sue van den Heever's group has taken over much of the development of the RAMS model. Recent enhancements to the RAMS model include the incorporation of nine prognostic aerosol species, tracking and budgeting of all the microphysical and aerosol processes within the model, the incorporation of a bin microphysics scheme, a complete restructuring of the code that allows for linear gains in parallel processing, a dust lofting surface scheme, and improvements to ice nucleation based on research conducted by Dr. Paul DeMott. Sue's group is utilizing RAMS to investigate the microphysical and aerosol processes within extratropical cyclones, hurricanes, mesoscale convective systems, and deep tropical and mid-latitude convection. Understanding the feedbacks between microphysical processes and storm dynamics is one of the core objectives of the van den Heever group. The scales at which convection organizes, the role of cold pools and latent heating in the organization of convection, and the transport and processing of water vapor, trace gases, and momentum are also all topics of interest to the van den Heever research group, and which are investigated through the use of RAMS and CloudSat data. Finally, the van den Heever group has also been evaluating the parameterization of various microphysical processes within RAMS, both in terms of computational efficiency and accuracy via comparisons with observational data.

Alumni Updates

Eric Guillot (M.S., '10) left his position with SSAI at NESDIS Satellite Analysis Branch to work for Integrity Applications Inc. on the GOES-R Data Operations Support Team at NASA Goddard.

Thomas A. Guinn (M.S., '89; Ph.D., '92) has been promoted to associate professor as well as program coordinator for the applied meteorology program at Embry-Riddle Aeronautical University.

John Henz (M.S., '74) was elected Fellow of the American Meteorological Society.

George Howard (M.S., '87) retired from his position of warning coordination meteorologist at the National Weather Service-Northern Arizona in October 2013.

Steve LaDochy (M.S., '69), currently a professor at California State University, Los Angeles geosciences and environment department, was recently awarded two grants: a NOAA-Crest Partnership Grant and the LaKretz Environmental Research Award to study coastal urban heating in Southern California. Steve also worked on climate change projects as a summer faculty Fellow at JPL, NASA.

Robert Levy (M.S., '96) received the International Radiation Commission Young Scientist Award at the 2012 International Radiation Symposium.

Jerry D. Mahlman (Ph.D., '67), retired director of the NOAA Geophysical Fluid Dynamics Laboratory in Princeton, N.J., passed away peacefully on Nov. 28, 2012.

Joel Martin (M.S., '88), retired Air Force colonel, departed his position as senior staff Fellow and associate vice president for commerce information and venture opportunities at the University of Oklahoma in 2012. Joel is now coordinating the growth of Jupiter Fuels, a natural gas-to-liquid fuel conversion company, building a prototype plant using hyperactive nanocatalyst, licensed from Louisiana Tech University.

Angela Rowe (M.S., '07; Ph.D., '11) is currently a postdoctoral researcher at the University of Washington, Seattle. She is using ground-based, dual-polarimetric radar data to study the cloud population in the Indian Ocean during the Madden-Julian Oscillation and in the mountainous regions of Taiwan. Angela, along with **Nick Guy** (Ph.D., '12), created a Facebook site in April 2013 called the Community Cloud Atlas (www.facebook.com/CommunityCloudAtlas) described as a "place to show off your pictures of the sky, identify clouds, and discuss how specific cloud types form and what they can tell you about current and future weather."

Aaron Schwartz (M.S., '08) formed a small natural-hazards/climate-risk assessment consulting company called Alpenhaus Consulting (www.alpenhausconsulting.com). The company is managed by Aaron and his wife, **Katherine S. Maclay Schwartz** (M.S., '06; Ph.D., '11).

Brent L. Shaw (M.S., '95) is currently the senior vice president, Expert Solutions for Weather Decision Technologies Inc. in Norman, Okla. Brent

leads a team of applied R&D meteorologists working on advanced radar applications, nowcasting, and numerical weather prediction solutions for domestic and international clients.

Vince Scheetz was elected Fellow of the American Meteorological Society.

Larry Vardiman (Ph.D., '74), senior research scientist, astro/geophysics, retired from the Institute for Creation Research in June 2012.

Young P. Yee (M.S., '78) co-authored a book recently published by Springer Publishing titled *Atmospheric Temperature Profiles of the Northern Hemisphere*.

Phillip L. Youngblood (M.S., '74) retired from Holly Corp. (now HollyFrontier Corp.) as vice president for environmental affairs.

In Memory

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Department Head Jeff Collett enjoys a moment with Professor Emeritus Lew Grant.

and served for many years as an adviser to various Western and local state governments and to many Western farm interests. As Lew pointed out in his ATS 50th Anniversary interview, available at http://www.atmos.colostate.edu/documents/Grant_audio_interview_2009.mp3, he was enthralled with water resource issues in general. He knew how to connect science to the practical matters of life on Earth, such as the feeding of expanding populations. Lew mentored a generation of scientists who are now in senior positions across all sub-disciplines of cloud-related studies at universities and in federal laboratories. He would be proud to know that they try always to retain his keen philosophical spirit on how to do scientific research and how to interact with and help young scientists to develop to their full potential.

For more information on Lew, see the department website at <http://www.atmos.colostate.edu/dept/lewGrant.php>.



CycloneCenter.org/CSU Alumni Participate in Hurricane Crowdsourcing

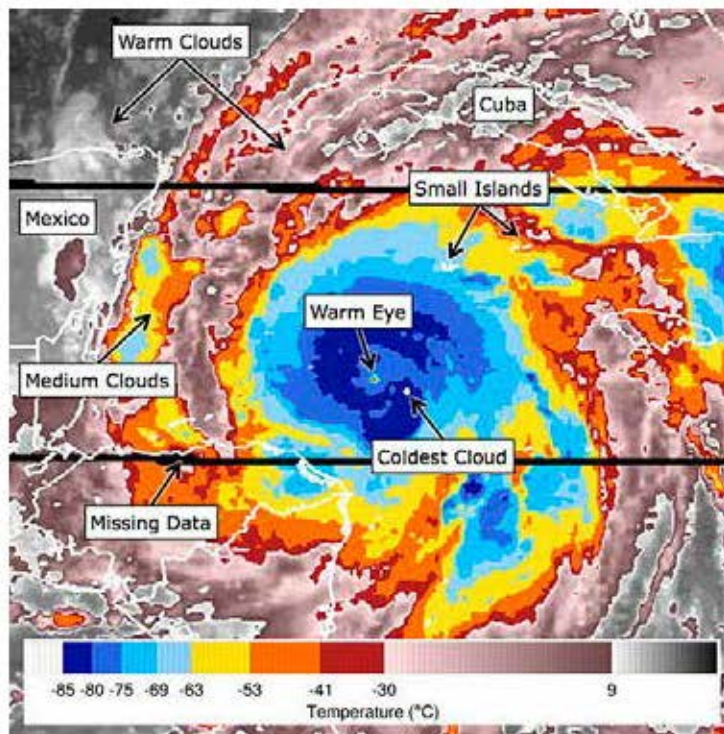
Hurricanes capture the imaginations of scientists and the general public alike. Scientists have spent countless hours analyzing hurricane data and, sometimes, find they need additional help with their analysis. This help may come from fellow scientists, or in the case of the **CycloneCenter.org**, citizen scientists from around the world.

CycloneCenter.org, a project launched in September 2012, is a hurricane analysis website jointly coordinated by the National Oceanic and Atmospheric Administration/National Climatic Data Center, the University of North Carolina-Asheville, the Cooperative Institute for Climate and Satellites-North Carolina and, in particular, the Citizen's Science Alliance, located at the Adler Planetarium. Colorado State University alumni Kenneth Knapp (2000), Scott Stevens (2009), and James Kossin (2000) were directly involved in this project's conceptualization and development.

The formation of the **CycloneCenter.org** took time. The need originally stemmed from the Dvorak method used for determining tropical cyclone strength over the years. Since it has been applied differently around the world and has changed through time, inconsistencies exist in the global historical record of tropical cyclone activity. It has been found that patterns in storm imagery are best recognized by the human eye, so crowdsourcing of citizen scientists has distinct advantages over more automated methods, hence the idea of employing citizen scientists in the data analysis project.

As Ken, developer of HURSAT-Hurricane Satellite (and co-PI along with Chris Hennon from UNC-A) stated, "This was an idea that we had bouncing around for a while. Hurricanes are fascinating phenomena, and the potential for citizen scientists to get hooked into analyzing imagery was great. It was something that the CSA wanted to support the development of, and our team (UNC-A, NCD, and CICS-NC) provided the science support to take a complex scientific algorithm (the Dvorak Technique) and make it palatable to anyone on the Internet." Hence, the **CycloneCenter.org** was born. One year into the project, 5,000-plus participants have made more than a quarter-million classifications.

Participants need no prior training. Instead, they are asked a series of questions about a given color-enhanced image of a tropical cyclone taken from HURSAT database (based on three decades of global satellite data). They are guided through an analysis process of a specific hurricane image and answer questions on that image using a simplified technique for estimating the maximum surface wind speed of tropical cyclones. Multiple people review the same image to get the best analysis. Scientists then



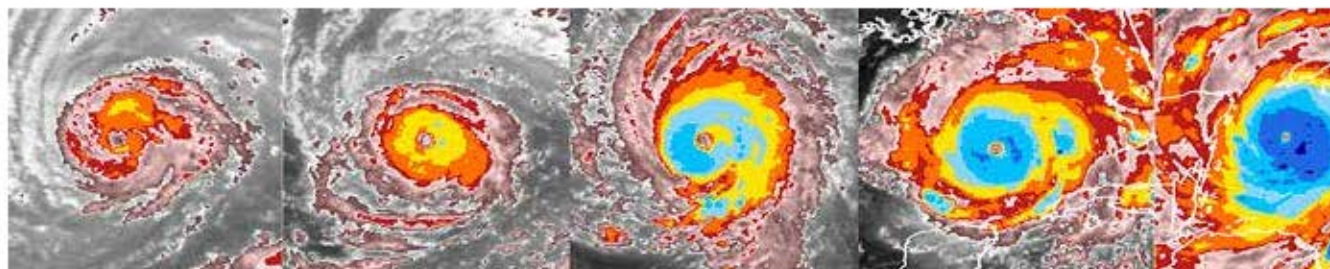
Sample tutorial image from the **CycloneCenter.org** website (note colors possibly corrupted during printing).

use the information provided by the public through the analysis process to determine the intensity of the storm.

The end product of this ongoing project will be a new global tropical cyclone data set that will provide three hourly tropical cyclone intensity estimates, confidence intervals, and a wealth of other metadata that could not be realistically obtained in any other fashion. Using citizen scientists will allow meteorologists to make more rapid progress on the analysis of historical tropical cyclone data. The new data set will then be used by NOAA climate scientists and other researchers to better understand and research global tropical cyclone activity.

"CycloneCenter is a unique website where anybody can be involved in improving our understanding of hurricanes and climate. The contributions so far have shown surprisingly good results in the ability to estimate hurricane intensity based on community analysis! Given enough participation, these classifications could complete our goal in months instead of decades," stated Ken.

For more information on the CycloneCenter, go to <http://www.cyclonecenter.org>.



Pictured at left are five canonical eye scene images used by citizen scientists to help identify storm scene types.

Teacher Professional Development Courses on Weather and Climate

The Center for Multiscale Modeling of Atmospheric Processes and the Little Shop of Physics hosted their seventh annual set of Teacher Professional Development Courses on Teaching Weather and Climate from July 8-12, 2013. This year, they taught two separate one-credit courses for the teacher-participants: one course emphasizing basic physical processes in weather and climate intended mostly for science teachers in elementary or middle schools, and a second course on global weather and climate intended for high school teachers. Assistant Professor Thomas Birner and Professor Scott Denning taught the two courses in collaboration



Teachers Jennifer Wagner (Lake County Christian Academy, Nashotah, Wis.) and Katherine Green (Timnath Elementary, Timnath, Colo.) learn about radiative transfer in layered media.



Teachers Christina Espericueta (Norma Linda Trevino Elementary, Edinburg, Texas), Michael Mosley (Cache La Poudre Elementary, Laporte, Colo.), and Tammy Wright (North Mor Elementary, Northglenn, Colo.) learn about infrared absorption by becoming a water vapor molecule.

with Brian Jones and his amazing staff from LSOP, and nine graduate students participated as teaching assistants. Since 2007, more than 300 teachers have taken these courses, including most science teachers from local school districts. Other teachers have traveled from La Junta, Pueblo, Cortez, the Pine Ridge Lakota Reservation, California, Illinois, Ohio, and New York to take the courses. As school districts across the U.S. prepare to implement the Next Generation Science Standards, we anticipate a huge need for teacher professional development on weather and climate. CMMAP, LSOP, and the Department of Atmospheric Science look forward to continuing to offer these courses, and hope to find new ways to support them as the CMMAP NSF Science and Technology Center approaches its 10-year sunset.



Weather and Science Day at Coors Field

On April 24, The Center for Multiscale Modeling of Atmospheric Processes and the Little Shop of Physics joined Denver meteorologist Kathy Sabine and the rest of the 9NEWS weather team to present Weather and Science Day at Coors Field. More than 10,000



Students participate in one of the Little Shop of Physics experiments at Coors Field.

students from area schools learned about the science of weather and climate before watching the Colorado Rockies play the Atlanta Braves. They explored buoyancy, the mass of air, radiation, and pressure, in a series of live experiments carried out at the scale of a major league baseball stadium. It turns out that kids love to learn about our science when

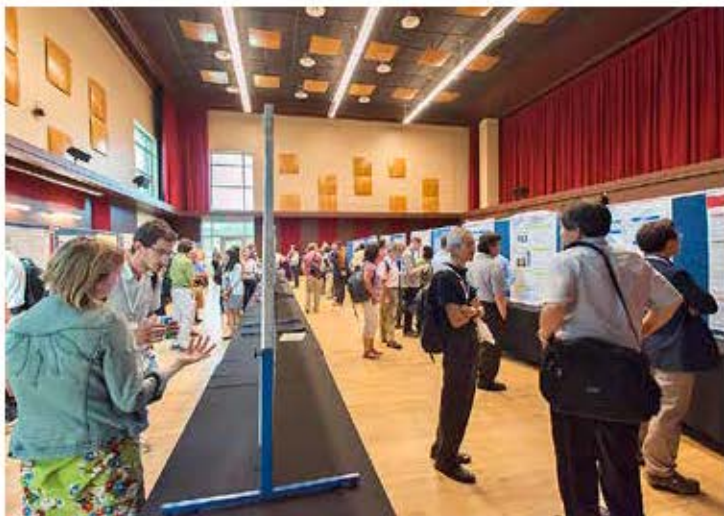
they can do so while watching Brian Jones blow things up! One of the highlights was a demonstration of the buoyancy force that involved the Rockies mascot, Dinger, being literally bowled over by a giant ball of air. CMMAP and LSOP look forward to developing more stadium-scale atmospheric experiments for this event in coming years, and welcome any help from atmospheric science students, researchers, faculty, and alumni.



Melissa Burt, CMMAP's education and diversity manager, (back row, third from left) was a participant at Weather and Science Day.

2013 Faculty and Staff CSU Milestones (Years of Service)

5 YEARS	Thomas Birner, Yuri Desyaterik, and Eric Maloney
10 YEARS	Celal Konor, Gregory Elsaesser, Joon-Hee Jung, Tony Prenni, Mark Ringerud, Wendy Ryan, Tommy Taylor, and Julian Turner
15 YEARS	Ian Baker, Scott Denning, and Connie Hale
25 YEARS	Charlotte DeMott, Donald Dazlick, Dave Randall, and Steve Rutledge
40 YEARS	Wayne Schubert



Participants browse an ICNAA poster session.

International Conference on Nucleation and Atmospheric Aerosols

Dr. Paul DeMott, senior research scientist in the Department of Atmospheric Science, chaired and hosted the 19th International Conference on Nucleation and Atmospheric Aerosols and Nucleation Symposium, held June 24-28. The Committee on Nucleation and Atmospheric Aerosols, part of International Association of Meteorology and Atmospheric

Sciences, conducts the ICNAA conferences at four-year intervals. The ICNAA series began in 1955, with a focus on measurements of condensation nuclei in the atmosphere, and it has expanded

to encompass topics from pre-nucleation clusters to global measurement and modeling of aerosols and their impacts on clouds and precipitation. Since 1988, this series of conferences has been held jointly with the Nucleation Symposium. This year's meeting was the first to be held in the U.S. since 2000, and only the third U.S.-based meeting in conference history.

The Colorado State University campus served as the venue for the 19th ICNAA, with approximately 250 attendees from 20 countries. In platform



Dr. Paul DeMott addresses the ICNAA.

and poster sessions throughout the week, participants learned about current research in tropospheric and stratospheric particles, new particle formation studies (theoretical, lab, and field observations), cloud drop and ice crystal formation, and aerosol-climate interactions. This year, there was also a special session organized on the CLOUD (Cosmics Leaving Outdoor Droplets) experiments conducted at the CERN particle accelerator facility in Switzerland, aimed at elucidating the role of cosmic rays in atmospheric nucleation. Two poster sessions provided opportunities for stimulating one-on-one discussions.

The ICNAA was sponsored by the Department of Atmospheric Science and by Droplet Measurement Technologies, Aerodyne Research Inc., and TSI Inc. The National Science Foundation provided travel support for U.S.-based students and early-career scientists, and the IUGG provided travel support for international students.

In a highlight of the week, Paul was elected to honorary member status of the CNAA and will serve as vice chair of the next ICNAA, to be held in Helsinki, Finland, in 2017.

Student Groups: Outreach Opportunities

Continued from Page 5

weather day in early 2014 in conjunction with the Fort Collins Museum of Discovery.

Throughout 2013, AAAR and FORTCAST teamed up to tackle tasks that required a large amount of student support. They jointly hosted a barbecue, raising \$256 for the School is Cool outreach effort to provide backpacks and school supplies to K-12 students in Fort Collins.

On Sept. 20, AAAR and FORTCAST once again came together and hosted a successful Young Scientist Symposium on Atmospheric Research. The goal of the 2013 YSSAR

was to provide all students and postdocs along the Front Range with an opportunity to present their atmospheric research and attend a one-day meeting for young scientists. AAAR, which focuses primarily on aerosol research, included FORTCAST to further the involvement of young atmospheric scientists from other research areas, such as atmospheric dynamics, cloud physics, tropical meteorology, and climate.

Students in both organizations look forward to an eventful and rewarding year of outreach and learning to come. Interested alumni and local atmospheric science enthusiasts are invited to take part in the fun with FORTCAST, and stay updated with both groups through the department website at <http://atmos.colostate.edu/current/studentOrgs.php>.



YSSAR participants watch a weather balloon launch. (Photo courtesy of Elliott Foust)



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