

Eight Years of Education and Diversity Achievements



Melissa Burt
Scott Denning
Brian Jones



**“Scientists are
necessary,
but not
sufficient to
solve the
climate
problem”**

**Dr. Ralph Cicerone,
President of the National Academy of Science,**

CMMAP E&D Activities

Researchers/
Professionals

Faculty

Broadcasters

Diversity
research

PostDocs

Grad

ATS

Ecology

Sociology

Psychology

ATS543

Poli Sci

Colorado
College

Undergrad

ATS150

REU

SOARS

LSOP interns

CC @ CSU

Public

Talks

Osher

CSU Online+

Extension

Teen Sci Cafes

Windows2Univ

K-12

Teacher PD

LSOP

CGCC

HESTEC

CMMAP E&D Activities

Researchers/
Professionals

Faculty

Broadcasters

**Diversity
research**

PostDocs

Psychology

Grad

ATS

Ecology

Sociology

Poli Sci

**Colorado
College**

ATS543

Undergrad

ATS150

REU

SOARS

LSOP interns

CC @ CSU

Public

Talks

Osher

CSU Online+

Extension

Teen Sci Cafes

Windows2Univ

K-12

Teacher PD

LSOP

CGCC

HESTEC



Little Shop of Physics

8 years

1,500 interns & volunteers

3,000 teachers

200,000 students

**Hand-Crank
Generator**

What to Do:

Turn the handle on the
light bulbs.
Is the crank easier to
turn when the energy

We've come a long way.

- Major funding from CMMAP has allowed the program to grow.
- Connections with CMMAP has allowed the program to develop.



Our Mission

- Find creative ways to share the wonder of science.
- Present a unique hands-on science experience to a diverse range of students.
- Involve undergraduates in significant and meaningful service.
- Share ideas and insights with current and future teachers.



Our Motto

Aligned with standards
Based on science
Connected to the classroom



What We Do

School Visits

- 40+ schools
- 10,000+ students
- 50 volunteers
- 12 interns
- Schools with diverse populations.
- Diverse group of interns.





Open House

- 7,000 visitors, 150 volunteers
- Science partners
- **Biggest event on CSU campus**

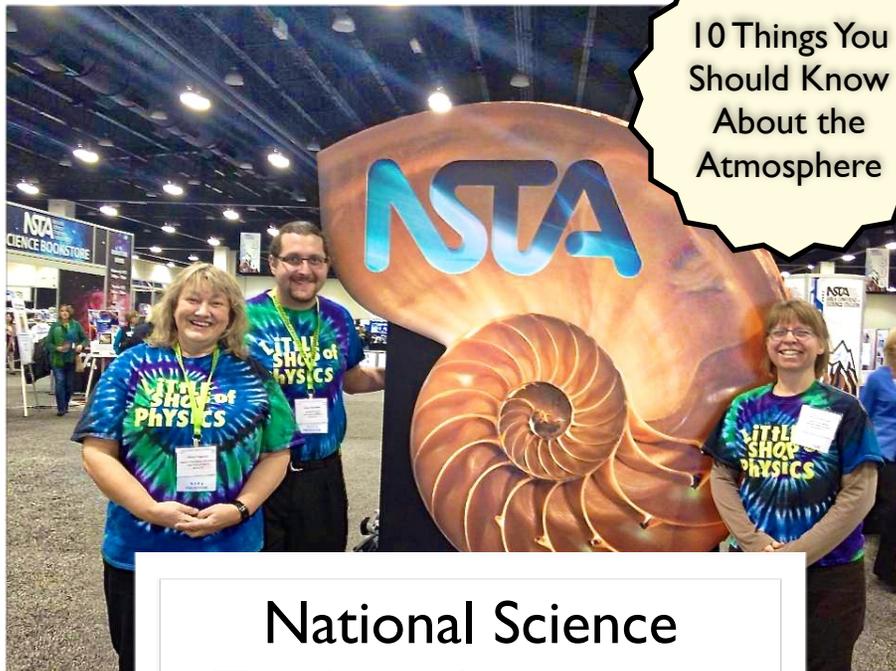
Teacher Workshops

- 500+ teachers
- Local
- Regional
- National



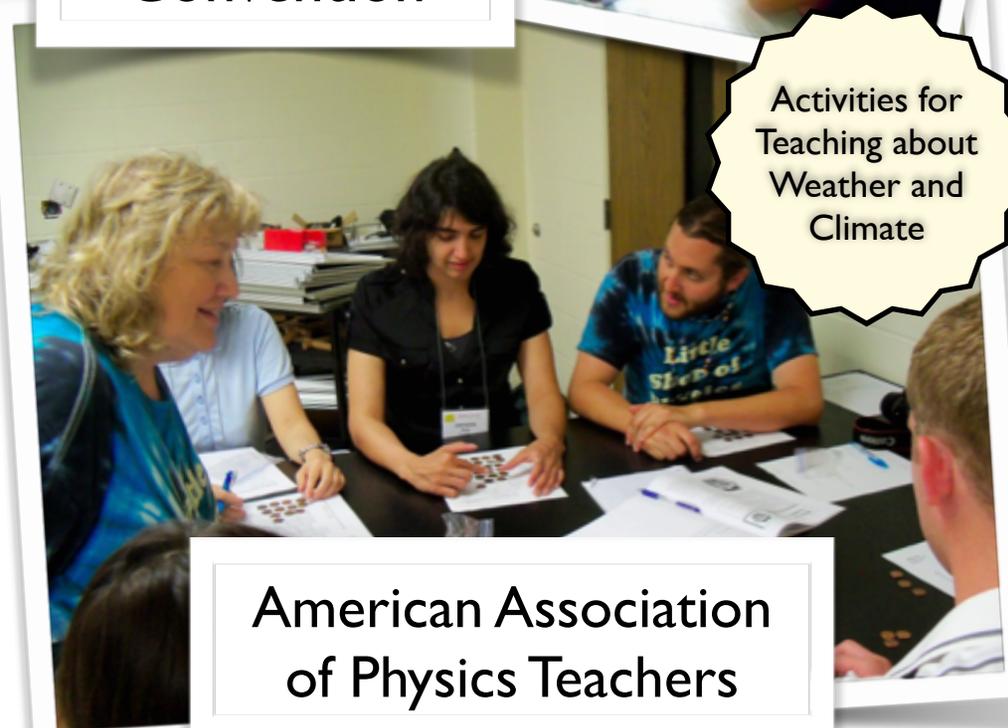
10 Things You Should Know About the Atmosphere

Colorado Science Convention



10 Things You Should Know About the Atmosphere

National Science Teachers Association



Activities for Teaching about Weather and Climate

American Association of Physics Teachers

Summer Teacher Course

- 40 teachers this year.
- Now 3 courses, more in future years. “Summer Teacher Institute”
- Evolving in response to feedback from teachers.
- Continued development of materials to share.
- Transitioning (successfully) to a pay model; teachers paid tuition this year.



Weather and Science Day

Coors Field
April 24, 2014

By the numbers

- CSU / Rockies / Channel 9
- 200+ CSU volunteers
- 12,000+ K-12 students
- **World Record for Largest Physics Lesson**



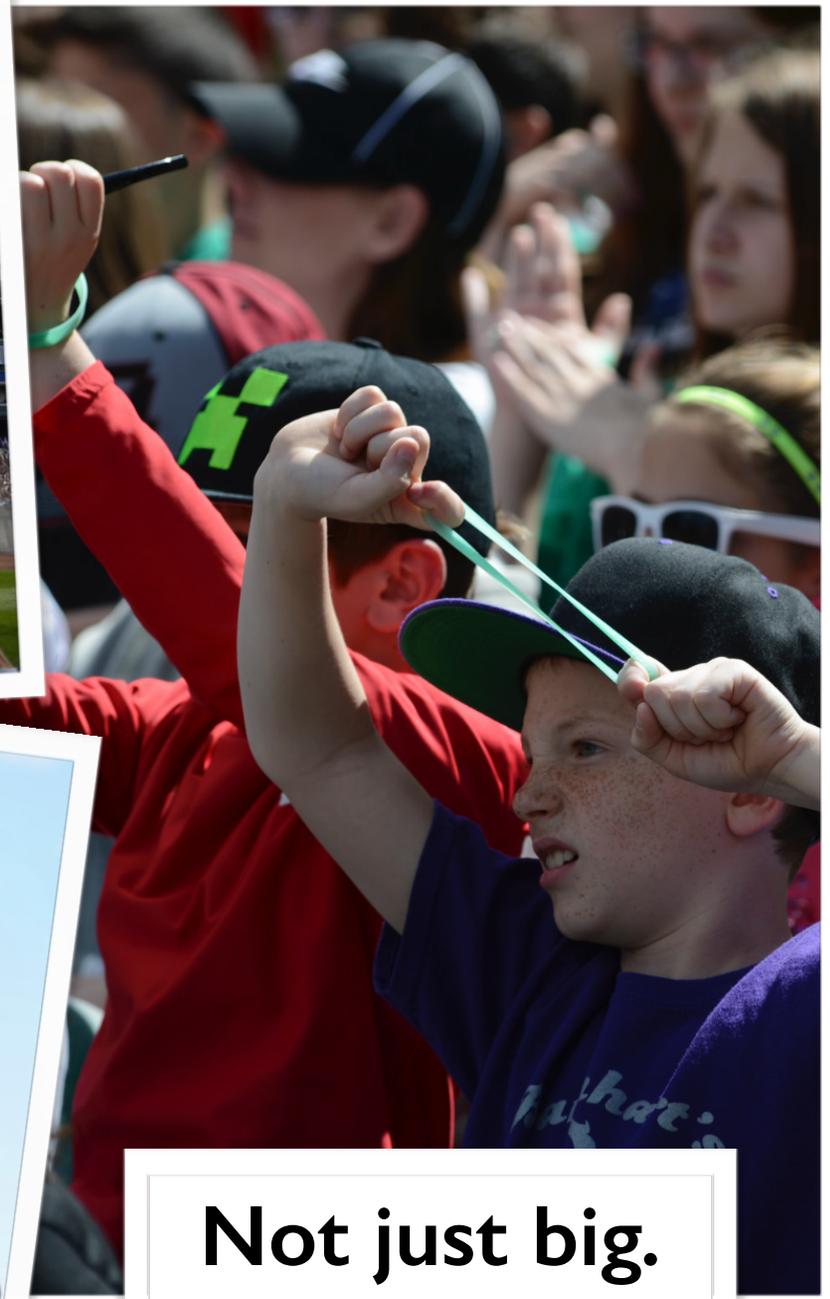
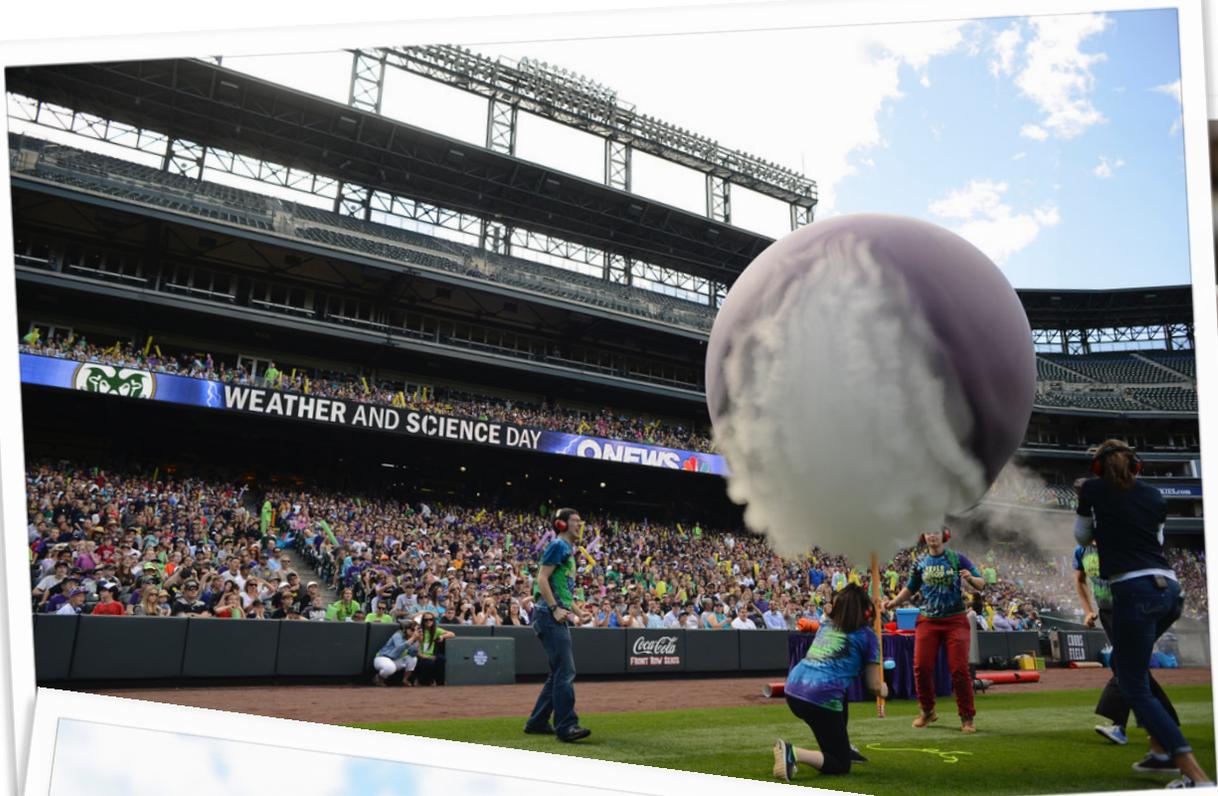
Each student
received 10
hands-on
science items.

WEATHER AND SCIENCE DAY

11:05:31

68°F





**Not just big.
Awesome.**

USA Science & Engineering Festival

Washington, DC

April, 2014

By the numbers

- Part of NSF Booth
- 10,000+ K-12 visitors





**The 2nd biggest
thing we've ever
done.**

Our Legacy



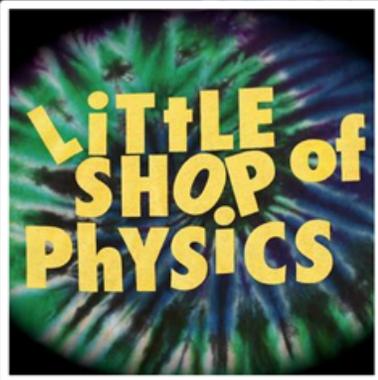
Heather Michalak



Adam Pearlstein

LSOP
The Next Generation

Our Legacy



The Little Shop of Physics

977 likes · 20 talking about this

Update Page Info 1

✓ Liked

✓ Following



College & University

*Facebook & Twitter
Behind the Scenes
Show Me Some Science
Try This At Home*



Photos

Our Legacy: Media

- Social media
- Traditional media
- Weekly podcasts
- Weekly blog posts

LITTLE SHOP of PHYSICS

Home Who We Are What We Do Resources for Teachers Photo

Our Legacy: Media
In two years, will be most popular way to interact with Little Shop of Physics.

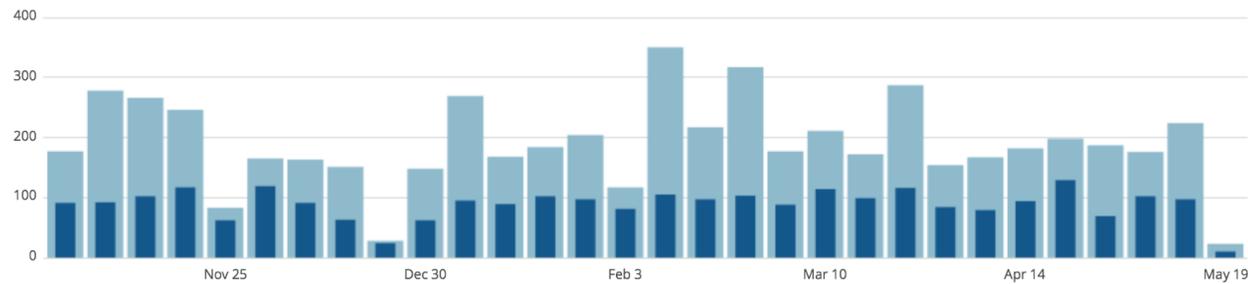


May 19, 2014, 6:58 pm

Little Shop of Physics (WP.com)

Days Weeks Months

Views Visitors Summaries



Today
10 Visitors
23 Views

Best ever
160 views

All time
34,871 views

48 comments

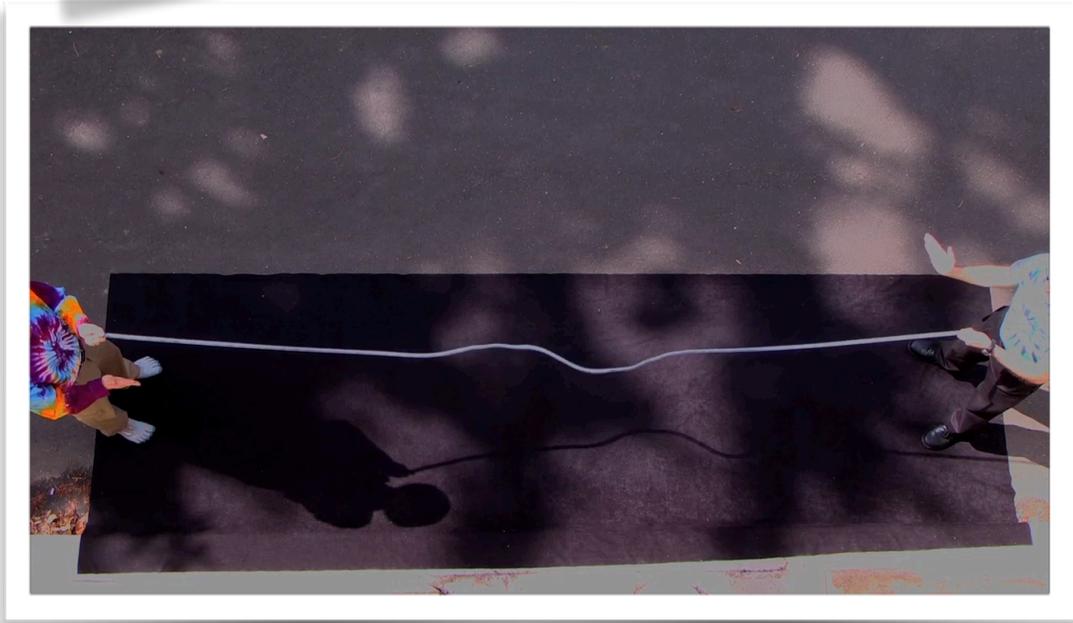
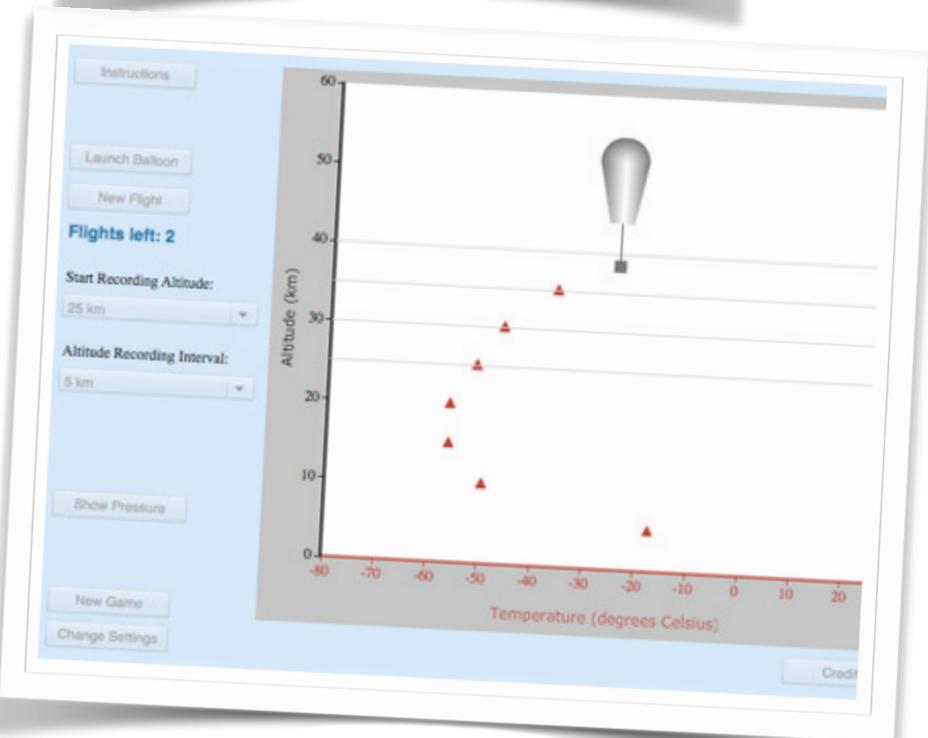


LiTTLE
SHOP of
PhYSICS

**From *Show Me Some Science*
Greenhouse Gases**

Our Legacy: “The Portal”

- Lessons
- Videos
- Sims & Apps
- Instruction
- Connection



Our Legacy: Studies of Informal Education

How Much Interaction?

A longer-term quasi-experimental study to examine the effect of the level of verbal interaction between students and interns on student engagement and perceptions of the exhibit.

Len Albright,
Education

Developing
tools and
techniques.



Our Legacy: Teachers

Effects of the Teacher Course

Len Albright,
Education

Table 2:
Since the workshop, I have...

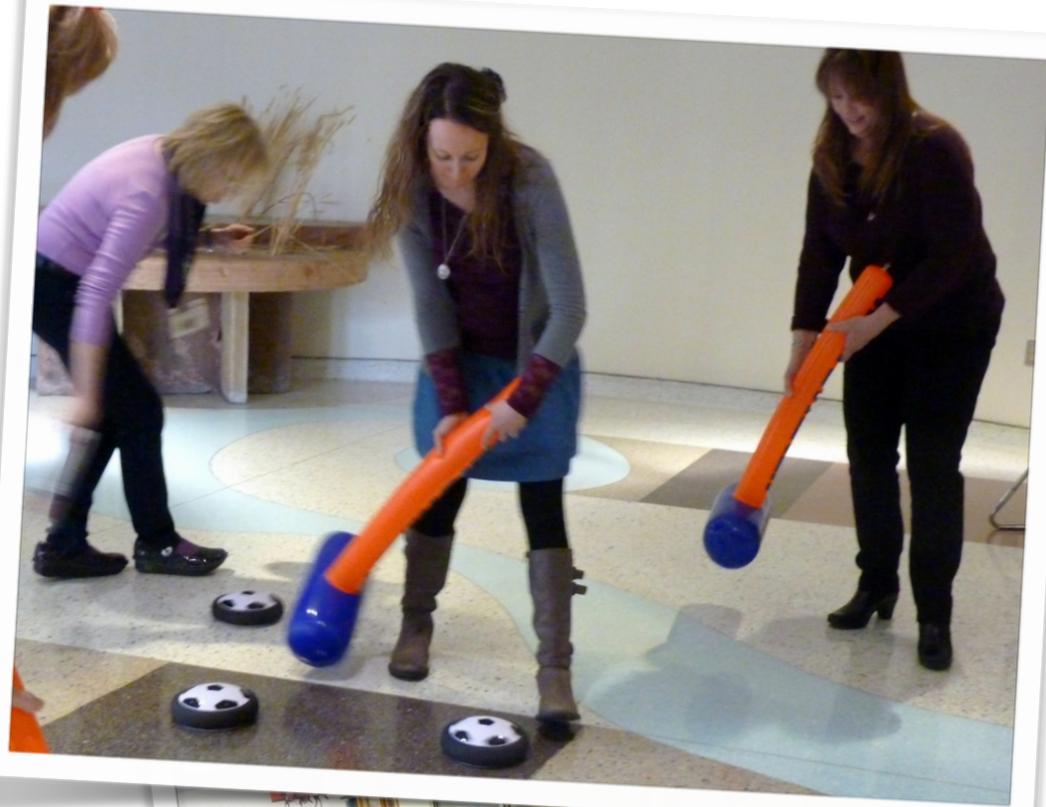
		#	%
Communicated about climate & weather to students		13	93%
Used hands-on activities presented in the workshop		13	93%
Shared what I learned with science teachers at my school		12	86%
Become more confident in my ability to communicate about weather and climate		11	79%
Incorporated the 5-e model of learning into my classroom		8	57%
Used the lesson plan I created		8	57%
Shared what I learned with non-science teachers at my school		8	57%
Communicated about climate & weather to adults		8	57%
Used the CMMAP lectures in my classroom		5	36%
Communicated with a teacher I met at the workshop		4	29%
Communicated with one of the instructors/presenters from the workshop		4	29%

Our Legacy:

Classroom Kits

- 4 kits for sale
- 4 to be sold
- PSD kits

- *Explicit match to science standards*
- *Developed in cooperation with teachers.*
- *Testing continuing*



Bohemian Foundation

*This year's focus:
Classroom teachers.
How are the kits being used?*



Our Legacy:

“Franchises”

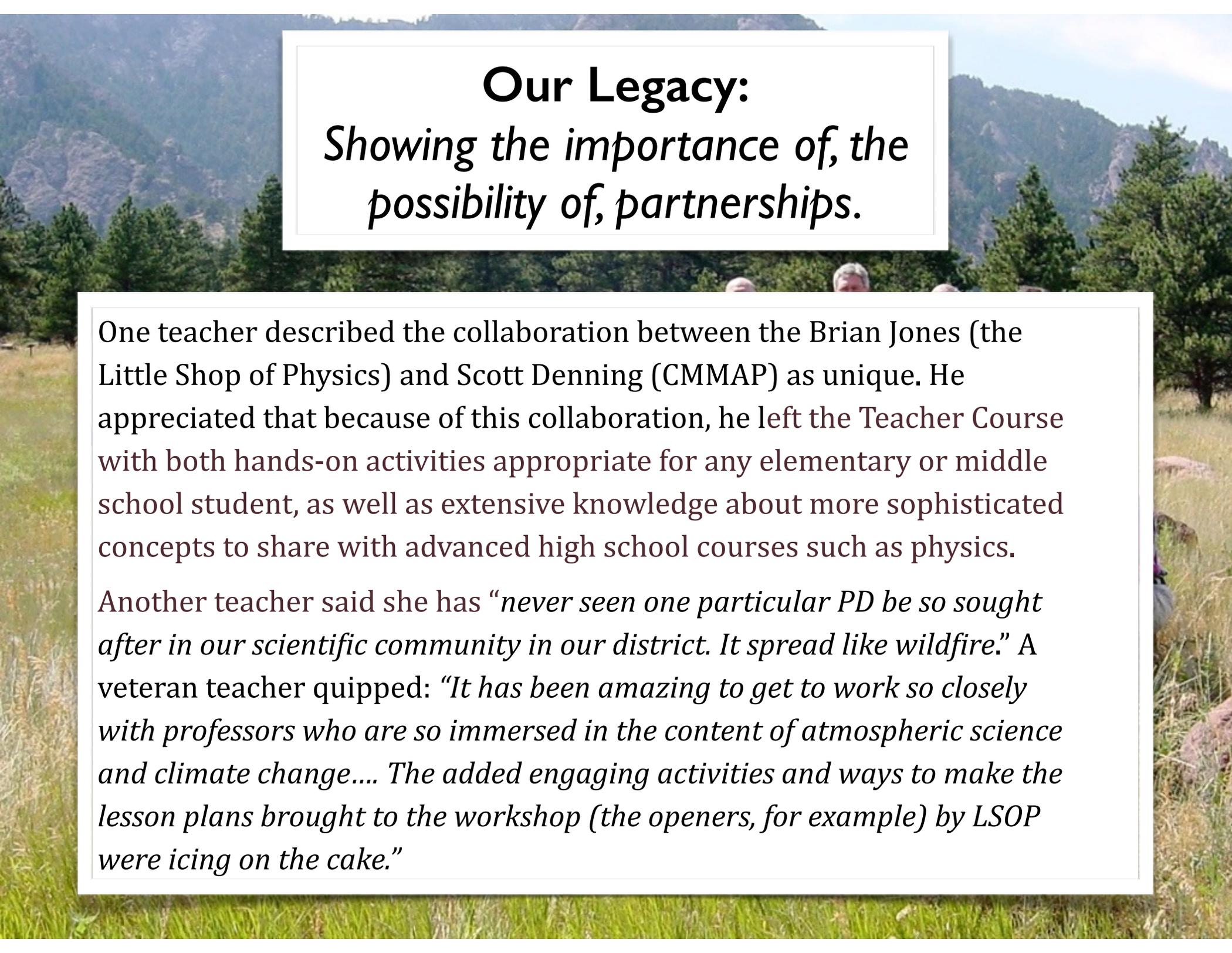
- Projects for outreach and formal instruction
- 7 sites

- *Oglala Lakota College*
- *Austin Community College*
- *University of Texas, Pan American*
- *Sterling High School*
- *Trinidad Middle School*
- *Cornell University*
- *Denver, “Little Shop of Science”*



“...Therefore be it resolved that the fourth week of the month of November be proclaimed as the official Oglala Lakota Nation Little Shop of Physics Week.”





Our Legacy:

Showing the importance of, the possibility of, partnerships.

One teacher described the collaboration between the Brian Jones (the Little Shop of Physics) and Scott Denning (CMMAP) as unique. He appreciated that because of this collaboration, he left the Teacher Course with both hands-on activities appropriate for any elementary or middle school student, as well as extensive knowledge about more sophisticated concepts to share with advanced high school courses such as physics.

Another teacher said she has *“never seen one particular PD be so sought after in our scientific community in our district. It spread like wildfire.”* A veteran teacher quipped: *“It has been amazing to get to work so closely with professors who are so immersed in the content of atmospheric science and climate change.... The added engaging activities and ways to make the lesson plans brought to the workshop (the openers, for example) by LSOP were icing on the cake.”*

Our Legacy

Using the Lessons of the Informal Science Experience to Improve Formal Science Instruction

- The world is comprehensible, and you can learn about it by exploring.
- Science is a social enterprise.
- We learn best when we are active.
- You can understand something better if you can touch it.
- To make it stick, make it real.
- It's easy to convince students that you are smart. It's harder to convince them that they are smart.
- Our job is to design an environment in which students can learn.
- If you want your students to be enthusiastic about learning, you need to be enthusiastic about teaching.



Our Legacy: Stability.

- Promise of stable, long-term support.
- Closer ties to other sciences, education, formal instruction.





Front Range Teen Science Cafe'

Teen Science Cafe' Network

scientists & teens exploring the world



2nd Wednesday of each month

Food, Music, Science!

Youth Leadership Committee

Higher Education & Diversity



Undergraduate teaching
Research Experiences for Undergraduates
Recruiting diverse students

Undergraduate Teaching

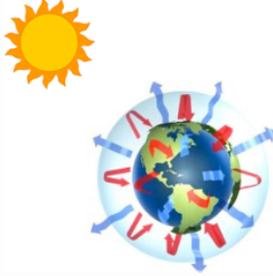
ATS
150

Global Climate Change



[Home](#)
[Schedule](#)
[Assignments](#)
[Calculators](#)
[Videos](#)
[Links](#)

Search ...



How climate change works

Understanding how the Earth's climate works, how and why it changes, and how it's likely to change over the coming years is not just a way to satisfy your curiosity. No matter what your field of study or what kind of work you do, the problem (and solutions!) of climate change will very likely be a major theme in your life. After taking this course, you will no longer be confused by conflicting media stories about climate.

It's not just for scientists anymore!

This course will provide a thorough grounding in the science of global climate change for undergraduates. It is intended to be accessible to nonscience majors, and uses minimal mathematics (familiarity with high-school algebra). We will cover the basic physics of radiation and energy as it applies to incoming solar and outgoing longwave radiation that determines the energy balance of the Earth and the forcing of climate change. Human perturbations to this balance will be considered, especially the emission of greenhouse gases by combustion of fossil fuels. The fate of anthropogenic emissions will be explored. Climate feedback processes and climate sensitivity to Radiative forcing will be explained. Numerical models will be explained qualitatively, and the projections of future global change will be put in the context of past climate change.

The course itself:

The class format consists of three formal lectures per week. Lecture notes will be downloadable from this web site. Readings will be assigned each week from the required textbook. In-class demonstrations of basic physical principles used to develop understanding. The semester grade will be determined by two exams (1/3 each), plus a few homework assignments (1/3 total).

Students are encouraged to download and print [lecture notes](#) to bring to class.

What's New

Download notes:

- Climate Solutions!
- Homework #4 Due Last day of class

Coming Attractions

[Review for Final Exam](#)

Contact

[Prof: Scott Denning](#)

[TA: Jordan Allen](#)

Context

- [100 Views](#)
- [BioCycle Group](#)
- [CMMAP](#)
- [CO Climate Center](#)
- [Atmos. Science](#)
- [CSU Home](#)

Dates	Notes	Readings
1/22	Simple, Serious, Solvable	
1/24	Earth System Overview	Chapter 1
1/29 - 2/3	Energy & Electromagnetic Radiation	Chapter 2
2/5 - 2/10	Layer Model of Greenhouse Effect	Chapter 3
2/12 - 2/14	Greenhouse Gases, Lapse Rate	Chapter 4
2/17 - 2/21	Energy Budget of the Earth	Chapter 5
2/24 - 2/28	Winds and Weather	Chapter 6
3/3 - 3/7	Oceans and Climate	Chapter 6
3/10	Review for Midterm	
3/12	MIDTERM EXAM (in class)	
3/24 - 3/28	Climate Sensitivity & Feedback	Chapter 7
3/31 - 4/4	Climates of the Past	Chapter 8
4/7 - 4/11	Fossil Fuel and Energy	Chapter 9
4/14 - 4/17	Future Climate Change	Chapter 11
4/21 - 4/25	Climate Change Impacts	Chapter 12
4/28 - 5/2	Climate Adaptation and Mitigation	Chapter 13
5/5 - 5/9	Renewable Energy	Chapter 14
5/15	FINAL EXAM (11:50 - 1:50)	

3 credits, 45 classes,
175 students so far

Changing Climates @ Colorado State

100 Views of Climate Change

a multidisciplinary education and outreach initiative

1 We organize talks on & off campus

Number of talks: 125 +

Number of speakers: 110 + (from 27 departments & many other entities)

Number of heads counted in audiences: ~ 6000

2 We run a multidisciplinary website for nonspecialists

Number of pages/topics: 23

Number of annotated entries: 450 +

3 We help (climate) scientists communicate

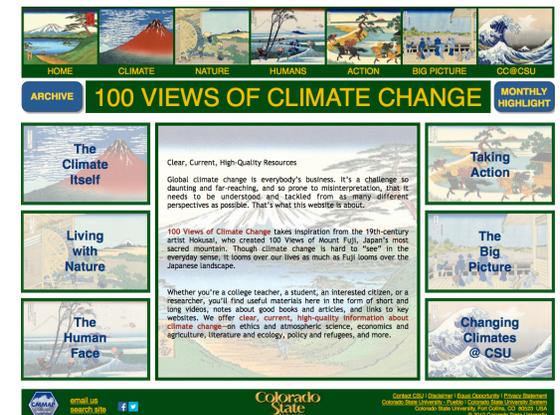
Number of groups: ~ 11

Duration: 20 minutes to 1 week

4 We write and speak about this work

Number of venues: ~ 20, with more to come

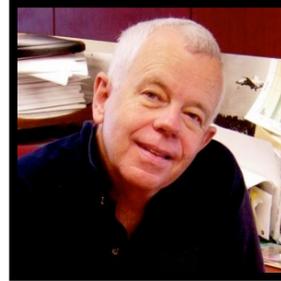
SueEllen Campbell & John Calderazzo
Department of English



Building relationships with MSIs



Dr. Ashanti Johnson
UT Arlington and IBP



Dr. Hugh Willoughby
Florida International University



Dr. Yvonne Coston
St. Augustine's University

- Special Seminars on CMMAP Program
- Past interns give presentations on summer experience
- Meet with Science and Engineering Faculty

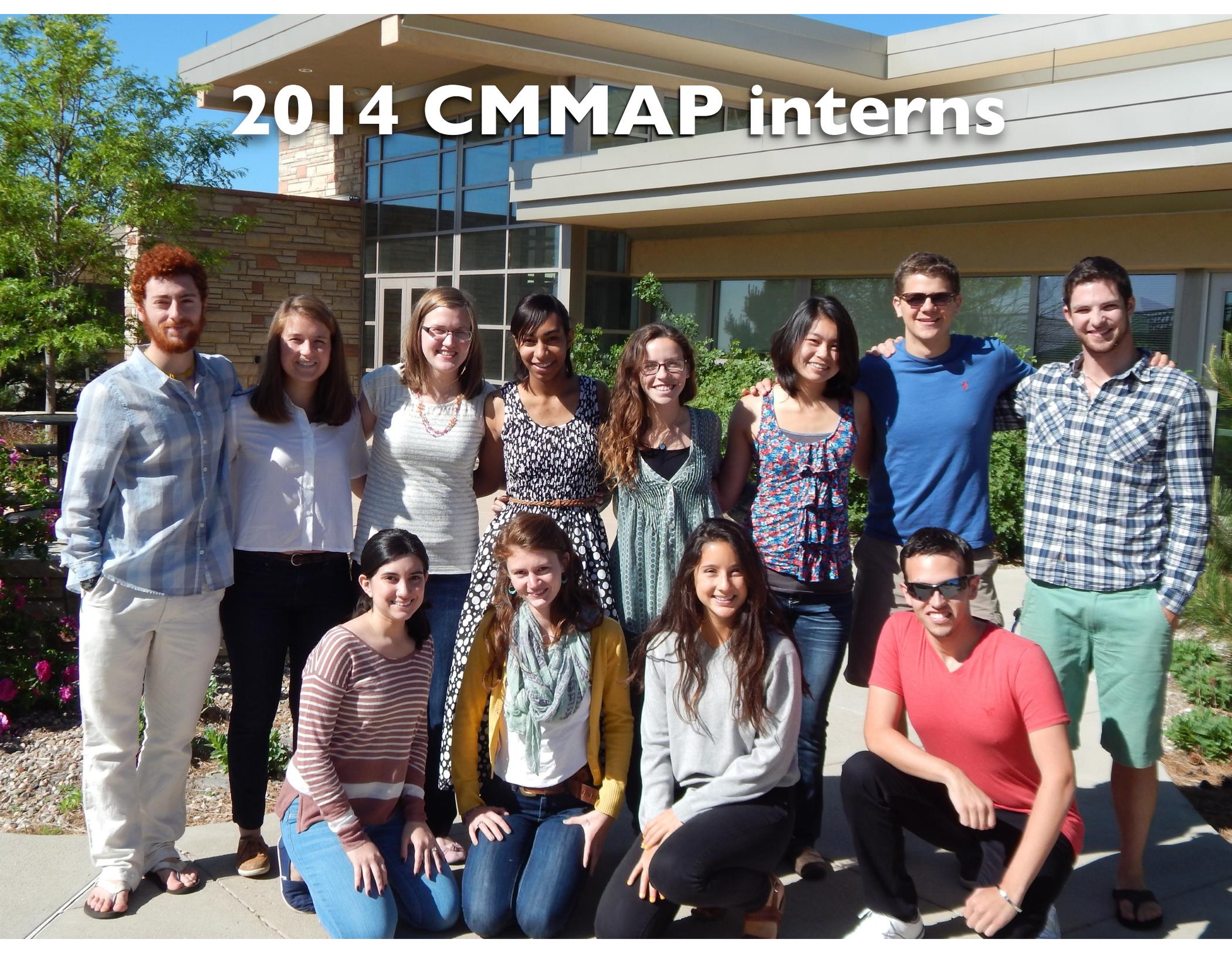


Dr. Solomon Biligin

North Carolina A&T State University

- 6 month grad student visit and/or co-advising of students
- Collaboration on NSF NRT Grant
- Virtually teach special topics lectures
- Pursue other research collaborations
- Partner with NCAT REU program

2014 CMMAP interns



CMMAP Summer Internship

- Research experience
- Multidimensional mentoring
- A supportive, inclusive community
- Professional development
- Travel to a professional society meeting
- Extensive financial support



Where do we come from?



Summer Internship Program

2009

Ten interns spent a summer at CMMAP in 2009. Laura Witte worked with the Ft Collins Sustainability Group estimating how much CO₂ would be conserved by implementation of policies.

Having a strong passion for disaster research, Heather Morgan tried to find a connection between the MJO and Atlantic hurricanes.

Terreka Hart focused her research on how concentric eyewalls and mesovortices influence the intensity of hurricanes in the Atlantic basin.

Lance Vanden Boogart worked with the land-surface modeling group comparing a chemistry transport model with observed CO₂ concentrations in the midwest.

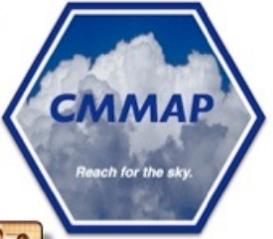
Samantha McGraw conducted interviews and researched New Jersey city climate action plans.

JOBeth Minniear came to CMMAP to research how water vapor, temperature, and vertical velocity relate to one another in a very high resolution simulation of a tropical convection.

Katie Riley researched and summarized trends in the carbon offset markets. She also created a hypothetical model of offset design.

Katherine Heal learned to use an aerosol mass spectrometer to analyze aerosol emissions from types of biodiesel and later, perform sampling in Rocky Mountain Nat'l Park.

Liz Huddle spent the summer determining parameters for a mist chamber to try to increase its efficiency.



2007

CMMAP welcomed three interns in our first year. Parker Kraus investigated land-atmosphere interactions in the West African country of Mali, looking at evaporation and photosynthesis rates.

Claudette Ojo worked on the Tropical Ozoneless Dataset for Satellite Validation Processing and Modeling looking at spatial and temporal relationships between ozone and temperature as a function of height.

One of our first summer interns, Beth Beckel explored cloud and precipitation chemistry. She learned the basics of gas-phase atmospheric chemical sampling techniques and spent most of the summer learning about the mist.

2008

CMMAP enjoyed six interns in 2008.

Claudette Ojo, a business major, interviewed companies for the organization Climate Wise to learn the progress they were making in reducing greenhouse gas emissions.

Tyler Ruggles, interested in environmental science and policy, helped a city become part of the Mayors for Climate Change organization.

Alice Duvivier and Jette Petersen worked together on a numerical approximation for mathematical operators used in climate modeling.

David Sullivan studied carbon pricing and taxation for the National Conference of State Legislators finding advantages and disadvantages of different methods and creating a booklet.

Zoe Keve has a strong interest in helping people and improving our world. She worked at the National Conference of State Legislators constructing a booklet on biofuels.

2010

We hosted 12 interns this year!

Idamis Del Valle came from Puerto Rico to study the effects of enhanced moisture triggers on precipitation and winds.

Kyle Hemes researched the spatiotemporal influence of vegetation on global surface-atmosphere exchange.

Erin Kashawik compared data assimilation schemes used by operational forecast centers.

Ariana Marrero, from Puerto Rico, studied the variability of the seasonal cycle in the Tropical Eastern Pacific and Caribbean.

2011

2011 brought us eleven summer interns.

The moisture cycle of the Madden-Julian Oscillation (MJO) was the focus of Jennifer's research this summer.

Jason looked at the seasonal variability of the width of the tropical belt from GPS radio occultations and reanalyses.

Moises performed studies of variability in fire count in Indonesia: Effects of ENSO and MJO phase.

Keri's research modeled the West African Monsoon and looked at the formation of African easterly waves.

Brittany compared and analyzed total precipitable water from ground-based GPS and SSM/I Satellite Remote Sensing.

Dustin performed an error analysis of SSM/I F08 antenna temperatures to produce an extended record of observations for climate applications.

David looked at the diurnal cycles characteristics of disturbed and undisturbed periods during TIMREX.

David looked at the diurnal cycles characteristics of disturbed and undisturbed periods during TIMREX.

Julie investigated approaches to local Climate Action Programs and model practices in Colorado.

Molly studied the sources and trends of free tropospheric aerosols measured at Mauna Loa.

Evaluating the response of the terrestrial biosphere to significant drought was the focus of Ian's summer research.

Jessica did a comparison model precipitation forecasts for hurricane Ida which occurred in 2009.

Jackie Gushue looked at electrical rate structures and their impact on demand response decision making with a company in Fort Collins.

Daniel Rothenberg got into the nuts and bolts of a climate model dynamical core.

Nick Geyer used the Vector Vorticity Model to simulate the Tropical Western Pacific/ICE case.

Tina Laboy spent her summer researching the propagation of the Madden-Julian Oscillation.

Christina McCluskey researched nitrogen samples collected from Rocky Mountain National Park.

Christina McCluskey researched nitrogen samples collected from Rocky Mountain National Park.

Christina McCluskey researched nitrogen samples collected from Rocky Mountain National Park.

Christina McCluskey researched nitrogen samples collected from Rocky Mountain National Park.

Christina McCluskey researched nitrogen samples collected from Rocky Mountain National Park.

Christina McCluskey researched nitrogen samples collected from Rocky Mountain National Park.

Find out more about us here: www.cmmap.org/scienceEd/internships.html

2012

We welcomed 12 interns in 2012!

Raymond Ruiz investigated the enhancing of the entrainment rate in the lower troposphere of a GCM and the effect on Kelvin waves.

Lindsay Hayden examined growing cumulus and cumulus congestus clouds sampled during the Ice in Clouds Experiment.

Anthony Cosio studied the balanced wind, mass and potential vorticity structure of warm-ringing tropical cyclones.

2013

A record 14 interns visited us in 2014.

Shannon Thomas & Emily Fish used the Life Cycle Assessment Tool to investigate four product groups.

Ernesto's research focused on the eastern Pacific and the formation of easterly waves.

Kate looked at how well a precipitation algorithm works over land.

Certain non-spherical kinds of cloud condensation nuclei were the focus of Madeline's summer research.

Noel Hilliard's research was based in Rocky Mountain National Park and looked at how nitrogen comes from the Front Range of Colorado up into the park.

Matt Muscato created a database and used GPROF to validate rainfall products from the recently launched Chinese FengYun-3B Microwave Radiometer Imager.

Aryeh Drager studied deep convection in tropical oceans: how sea-surface temperature affects cloud morphology, convective core vs anvil and what deep convective clouds look like.

Dakota Smith investigated using fluorescence as an indicator of vegetation productivity in West Africa.

Katerina studied ozone pollution at the surface for her CMMAP summer research project.

Justin used a Cloud Resolving Model (CRM) to evaluate a statistical model of thunderstorm behavior.

Using the CMIP5 climate model, Abby researched cloud feedbacks and arctic ice.

Catie DeMets investigated what barriers exist to restaurants locally sourcing food and solutions to those barriers.

Dan Miller looked at the ClimateWise program for Fort Collins, CO and what recommendations are implemented by businesses for lowering greenhouse gas emissions.

Matt Muscato created a database and used GPROF to validate rainfall products from the recently launched Chinese FengYun-3B Microwave Radiometer Imager.

Aryeh Drager studied deep convection in tropical oceans: how sea-surface temperature affects cloud morphology, convective core vs anvil and what deep convective clouds look like.

Dakota Smith investigated using fluorescence as an indicator of vegetation productivity in West Africa.

Katerina studied ozone pollution at the surface for her CMMAP summer research project.

Justin used a Cloud Resolving Model (CRM) to evaluate a statistical model of thunderstorm behavior.

Using the CMIP5 climate model, Abby researched cloud feedbacks and arctic ice.

Heather Vazquez studied the differences between Mesoscale Convective Vortices (MCV) that produce heavy precipitation and those that do not.

Climate Chaos: Josh Anderson created an Apple iOS / iPad application/game to enhance climate change education.

Steven Brey showed how distinguishing tropical and extratropical dynamical regimes can be done based on Rossby number statistics.

Leah Lindsey studied the effects of horizontal resolution on cumulus cloud simulations using the SAM model.

Alli looked at the effect the Balcones Escarpment in west central Texas has on flooding in that state.

Albert was in up to his ears in NVAP data and how tropical cyclones affect it.

Brandon looked at patterns in tropical cyclones to develop an algorithm to estimate tropical cyclone intensity.

Aaron researched what sudden stratospheric warmings are and the results of changing their definition.

8 summers - 80 interns

CMMAP supported SOARS Protégés

CMMAP-SOARS Protégés

Kimberly Trent (CMMAP-SOARS 2006-07)
 B.S. Yale University, 2007 (Applied Physics)
 PhD candidate in Applied Physics at the University of Michigan,
 NSF Graduate Research Fellow, Ford Fellow, & NASA JPPF
 Fellow



Zizi Serales (CMMAP-SOARS 2007)
 B.S. San Francisco State University, 2009 (Geology)
 Zizi is now an environmental remedial project manager with
 EPA R9 Superfund Division

Karen Diaz (CMMAP-SOARS 2008)
 B.S. Polytechnic University of Puerto Rico, 2007 (Environmental
 Engineering)
 PhD candidate at Colorado State University in Environmental
 and Radiological Health Sciences



**Alex Gonzalez (CMMAP-SOARS 2007-09, SOARS
 Fellow)**
 B.S. Pennsylvania State University, 2008 (Meteorology)
 M.S. Colorado State University, 2011 (Atmospheric Science)
 PhD candidate in Atmospheric Science at Colorado State
 University

Nicole Ngo (CMMAP-SOARS 2009)
 B.S. University of California, Irvine, 2006 (Earth &
 Environmental Science)
 PhD Columbia University, 2013 (Sustainable Development)
 Nicole is now an Assistant Professor in the Department of
 Planning, Public Policy & Management, University of Oregon



Maximo Menchaca (CMMAP-SOARS 2010)
 B.S. University of Illinois, Urbana-Champaign, 2011
 (Environmental Studies)
 PhD student in Atmospheric Science at the University of
 Washington, NSF Graduate Research Fellow

Diamilet Perez-Betancourt (CMMAP-SOARS 2010-11)
 B.S. University of Puerto Rico, 2012 (Physics)
 PhD student in Atmospheric Science at the Massachusetts
 Institute of Technology, NSF Graduate Research Fellow



Rosimar Rios-Berrios (CMMAP-SOARS 2011)
 B.S. University of Puerto Rico, 2012 (Physics).
 Graduate student in Atmospheric Science at the University of
 Albany, NSF Graduate Research Fellow

**Vanessa Vincente (CMMAP-SOARS 2011,
 SOARS Fellow)**
 B.S. Valparaíso University, 2012 (Meteorology)
 Graduate student in Atmospheric Science at Colorado
 State University.



9 summers - 14 proteges!

CMMAP-SOARS Protégés

Frances Roberts-Gregory (CMMAP-SOARS 2012)
 B.A. Spelman College, 2013 (Sociology and Anthropology)
 Graduate student in Environmental Science at the
 University of California, Berkeley



Ana Ortiz (CMMAP-SOARS 2012)
 B.S. University of Illinois at Urbana-Champaign, 2013
 (Atmospheric Sciences)
 M.S. student in Professional Science at the University of
 Miami

**Jake Zaragoza (CMMAP-SOARS 2012-13, SOARS
 Fellow)**
 B.S. Gonzaga University, 2012 (Chemistry)
 Graduate student in Atmospheric Science at Colorado State
 University

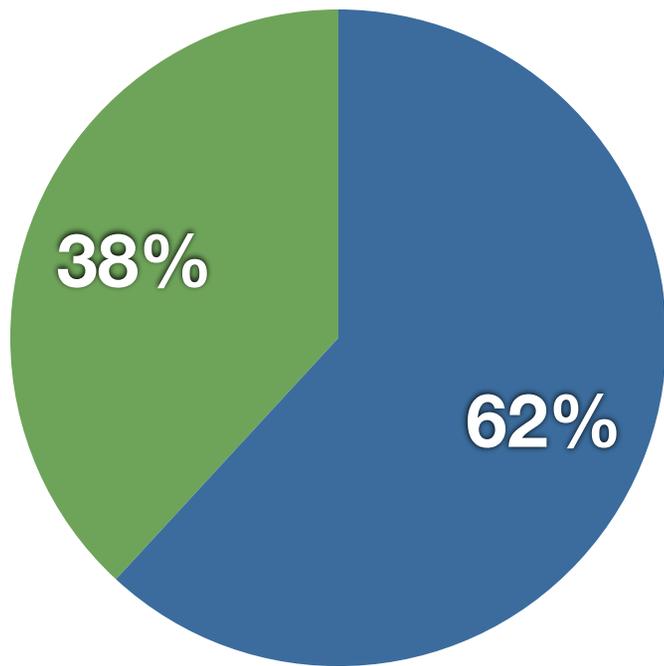


Jonathan Martinez (CMMAP-SOARS 2013)
 B.S. student in Meteorology at Florida State University

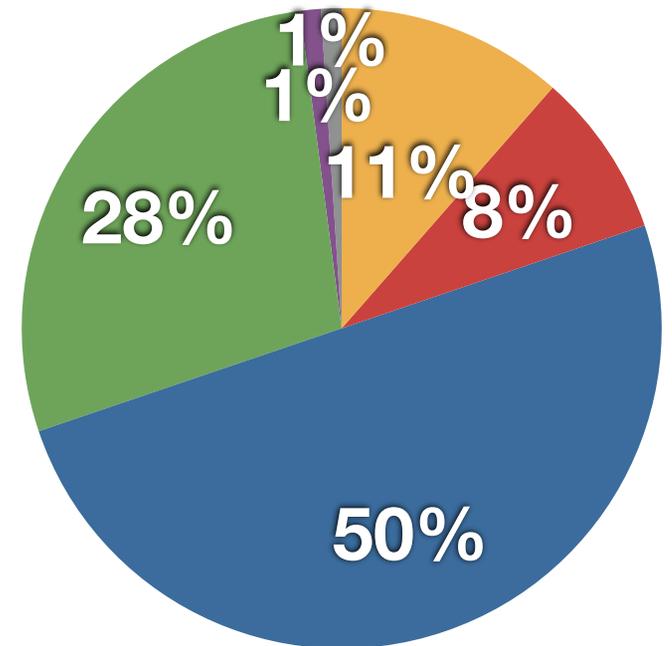


Demographics of CMMAP-supported interns

Includes CMMAP Interns at CSU, UC Irvine and CMMAP-SOARS protégés



- Female
- Male



- African American
- Asian
- Caucasian
- Latino
- Native American
- Other

N=96

Years: 2006-2014

42% underrepresented groups



After the internship... where do our interns go?

Undergraduate programs: 26

Graduate programs: 46

Scientific workforce: 25

Half are now graduate students.

**One third are graduate students
are at CMMAP!!**

CMMAP Graduate Students

Supported **67 graduate students** at 7 institutions!

- Atmospheric Science, Political Science, Psychology, Human Development, Sociology

Participate in **Center's research** --

- inventing innovative methods for climate modeling
- studying climate change impacts and policy
- uncovering reasons for the historical underrepresentation of diverse populations in climate science

CMMAP Graduate Students

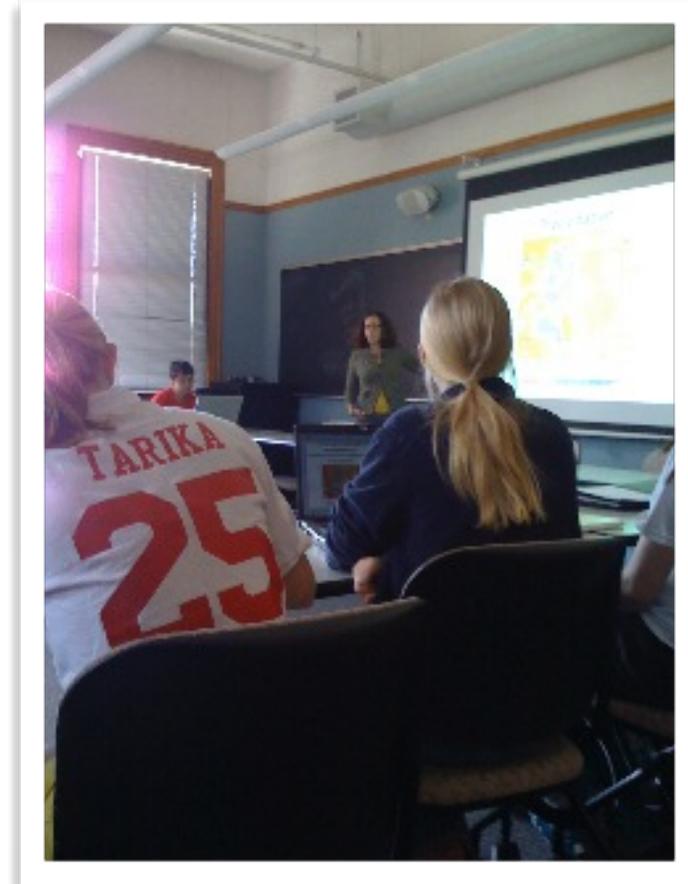
- Outreach at K-12 level with Little Shop of Physics
- Work with Teachers in Weather and Climate Course
- Mentor our undergraduate interns
- Opportunity to teach undergraduates at Colorado College



Valuable Teaching Experience

Colorado College Teaching Fellowship

- formal interview process
- develop lesson plans/labs/exams
- intensive 3.5 week course
- mentored by CC faculty



Valuable Teaching Experience

“Without an undergraduate program at CSU in which to get some teaching experience, I felt very fortunate to have the opportunity to get in the classroom with undergraduate students at CC.”

“... the class was instrumental in giving me the confidence that I can be an effective teacher and that I do know a lot about atmospheric science after studying it all these years.”

**Graduate students have a unique
experience at CMMAP!**

CMMAP Student Colloquium

Students learning from each other and building partnerships

- 2009: *Climate Policy and Politics*
- 2010: *100 Views of Climate Change*
- 2011: *Climate, Careers and Teaching*
- 2012: *Climate Change and Impacts*
- 2013: *Ecology of Alpine Environments*

After Graduate School...

22 students received PhDs in ATS

Anna Harper - *Postdoc*
University of Exeter

Rachel McCrary - *Postdoc*
National Center for Atmospheric Research

Michael Pritchard - *Assistant Professor*
University of California at Irvine

Luke Van Roekel - *Assistant Professor*
Northland College

Levi Silvers - *Postdoc*
Max Plank Institute for Meteorology

Katherine Thayer-Calder - *Postdoc*
University of Wisconsin at Madison

Gabriel Williams - *Assistant Professor*
College of Charleston

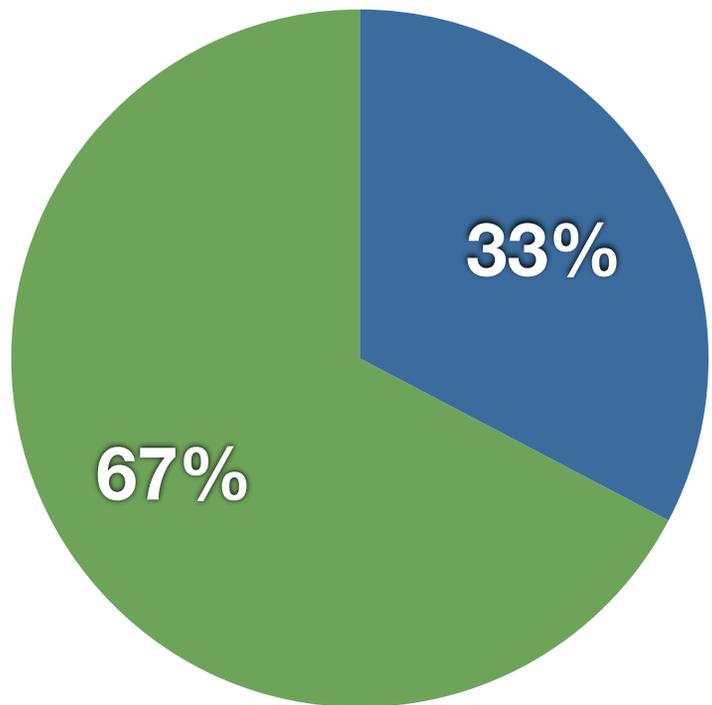


Gabriel Williams

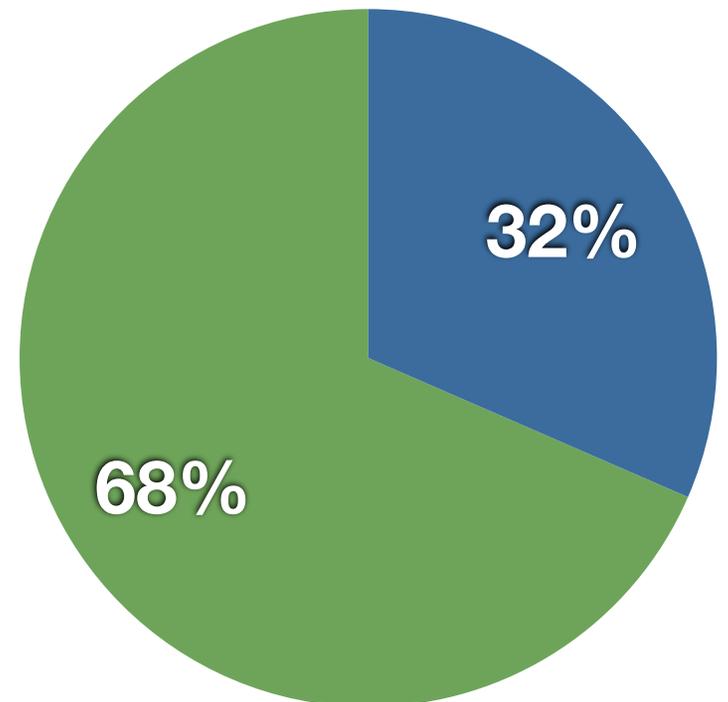


Rachel McCrary

CMMAP ATS Graduate Students



NSF S&E Indicators 2014 Graduate Enrollment



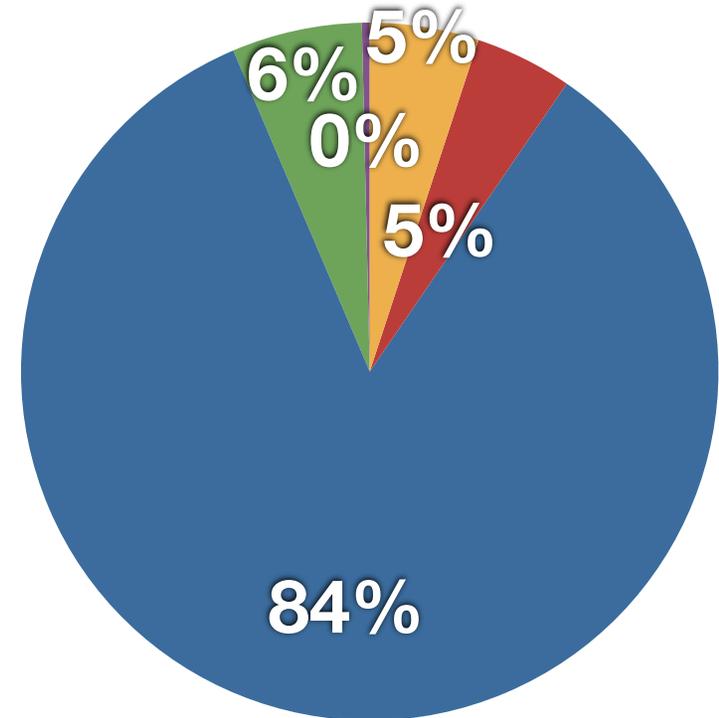
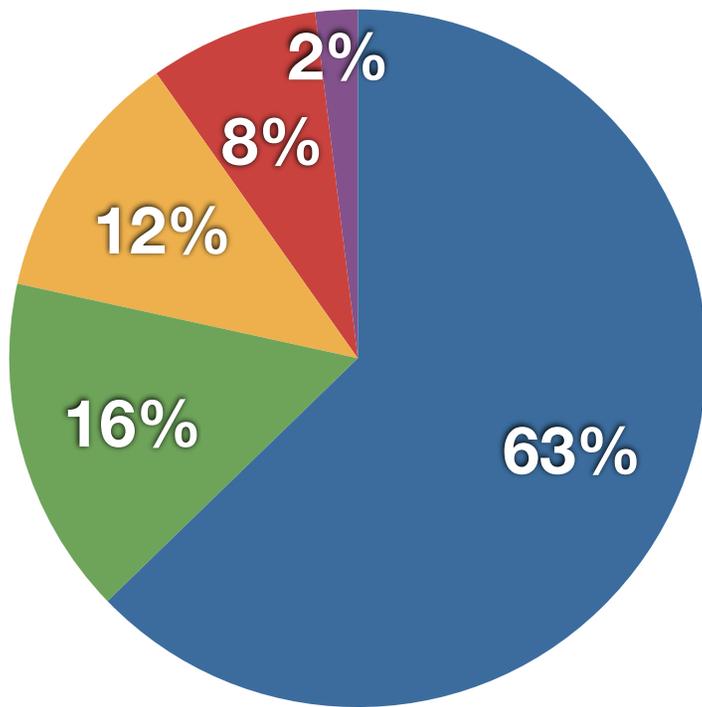
● Female
● Male

*CMMAP Graduate Students funded over Years 1-8, includes CMMAP ATS and CMMAP related project NSF IGERT
**nsf.gov - Women, Minorities, and Persons with Disabilities in Science and Engineering

CMMAP ATS Graduate Students

NSF S&E Indicators 2014 Graduate Enrollment

30% underrepresented groups



- African American
- Caucasian
- Native American
- Asian
- Latino

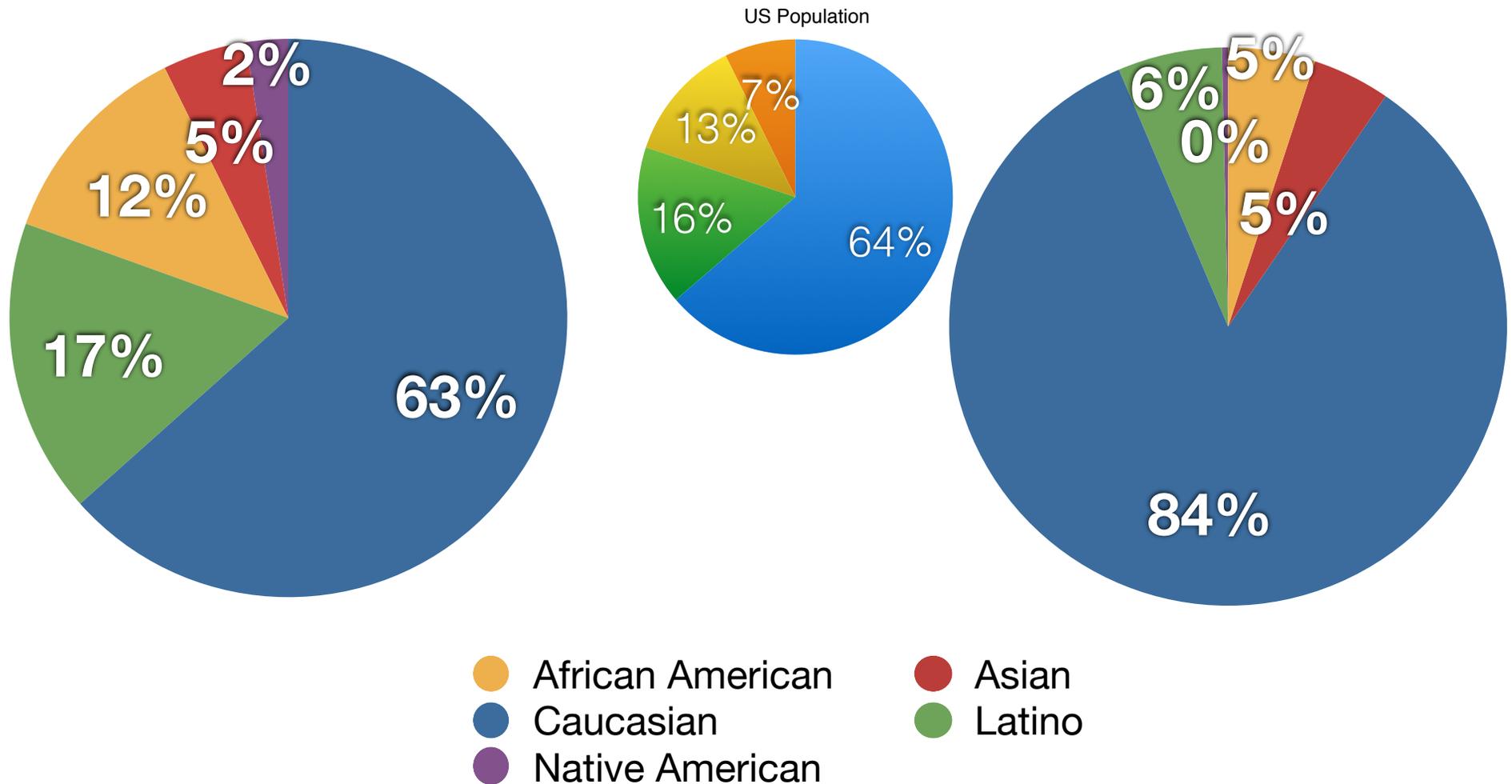
*CMMAP Graduate Students funded over Years 1-8, includes CMMAP ATS and CMMAP related project NSF IGERT

**nsf.gov - Women, Minorities, and Persons with Disabilities in Science and Engineering

CSU ATS Graduate Students

NSF S&E Indicators 2014 Graduate Enrollment

31% underrepresented groups



*CSU ATS graduate students funded by CMMAP over Years 1-8, includes CSU ATS and related project NSF IGERT

**nsf.gov - Women, Minorities, and Persons with Disabilities in Science and Engineering

Working on an article for Bulletin of the American Meteorological Society

A blueprint for increasing the diversity of your graduate program

Melissa A. Burt¹, Rebecca Haacker-Santos², and Rebecca L. Batchelor²

¹ Department of Atmospheric Science Colorado State University, Fort Collins, CO 80523

² SOARS Program, University Corporation for Atmospheric Research, Boulder, CO 80307

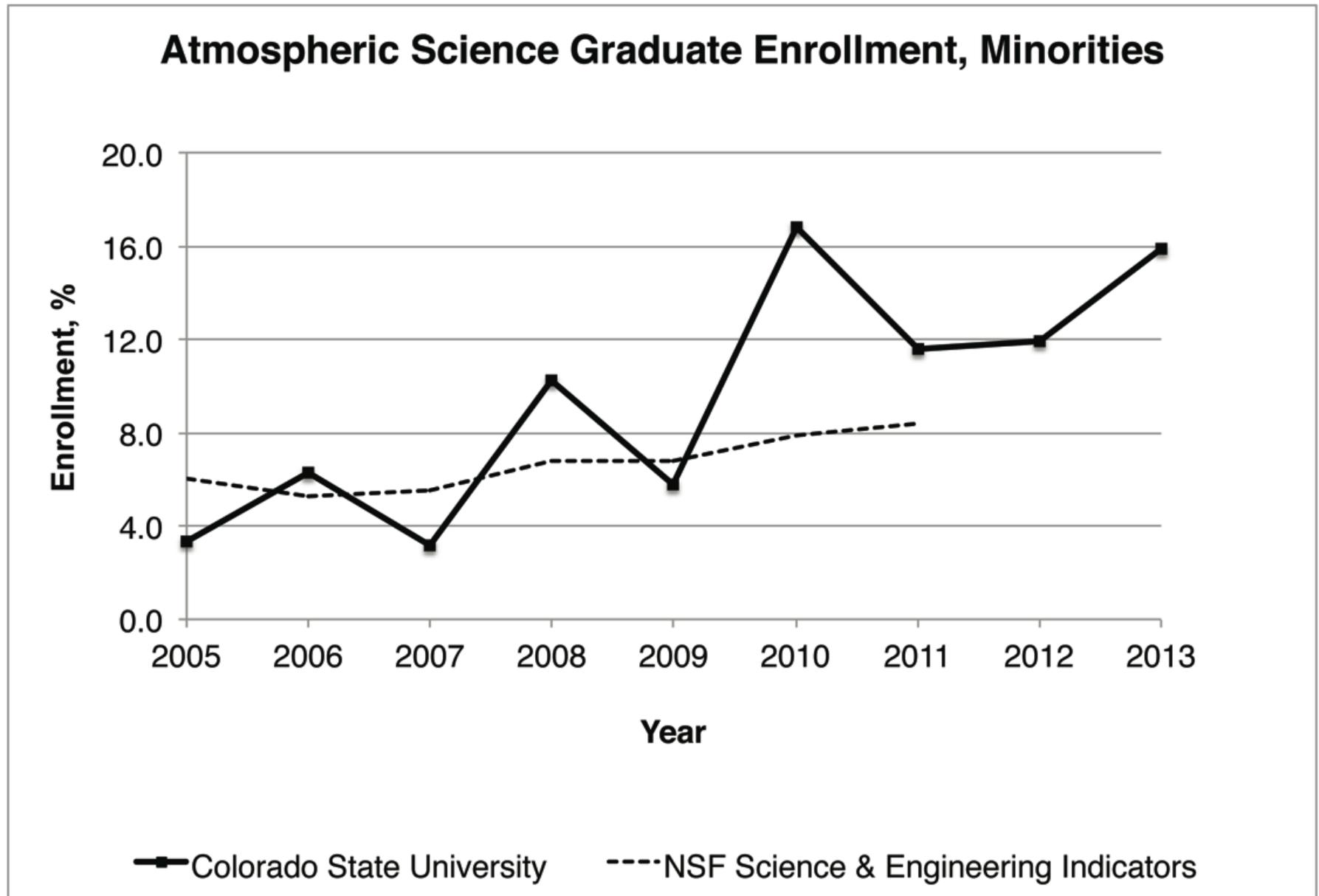
Since 2006 the number of graduate students from historically underrepresented groups in the Department of Atmospheric Science at Colorado State University has nearly tripled.

Increasing the diversity of our graduate program

Six key elements that have contributed to our success:

1. Partnership with a minority serving program
2. Research Experiences for Undergraduates
3. Targeted Recruitment
4. Extensive Mentoring
5. Building a substantial cohort
6. Faculty commitment and multi-tier funding approach

Increasing the diversity of our graduate program



Graduate Enrollment in Atmospheric Science by students from historically underrepresented groups. Figure shows enrollment for Colorado State University Department of Atmospheric Science compared to the NSF Science & Engineering Indicators 2014.



Understanding Diversity in Atmospheric Science

- Prof. Silvia Canetto (Psychology)
- Prof. David MacPhee (Human Development)
- Carlie Trott (Psychology)





CMMAP

Diversity Research



- **Quantitative study of 35 Atmospheric Science Departments across the US**
 - Student demographics (N=1135)
 - Faculty demographics (N=834)
- **Qualitative study of women's persistence in Atmospheric Science (N=25)**



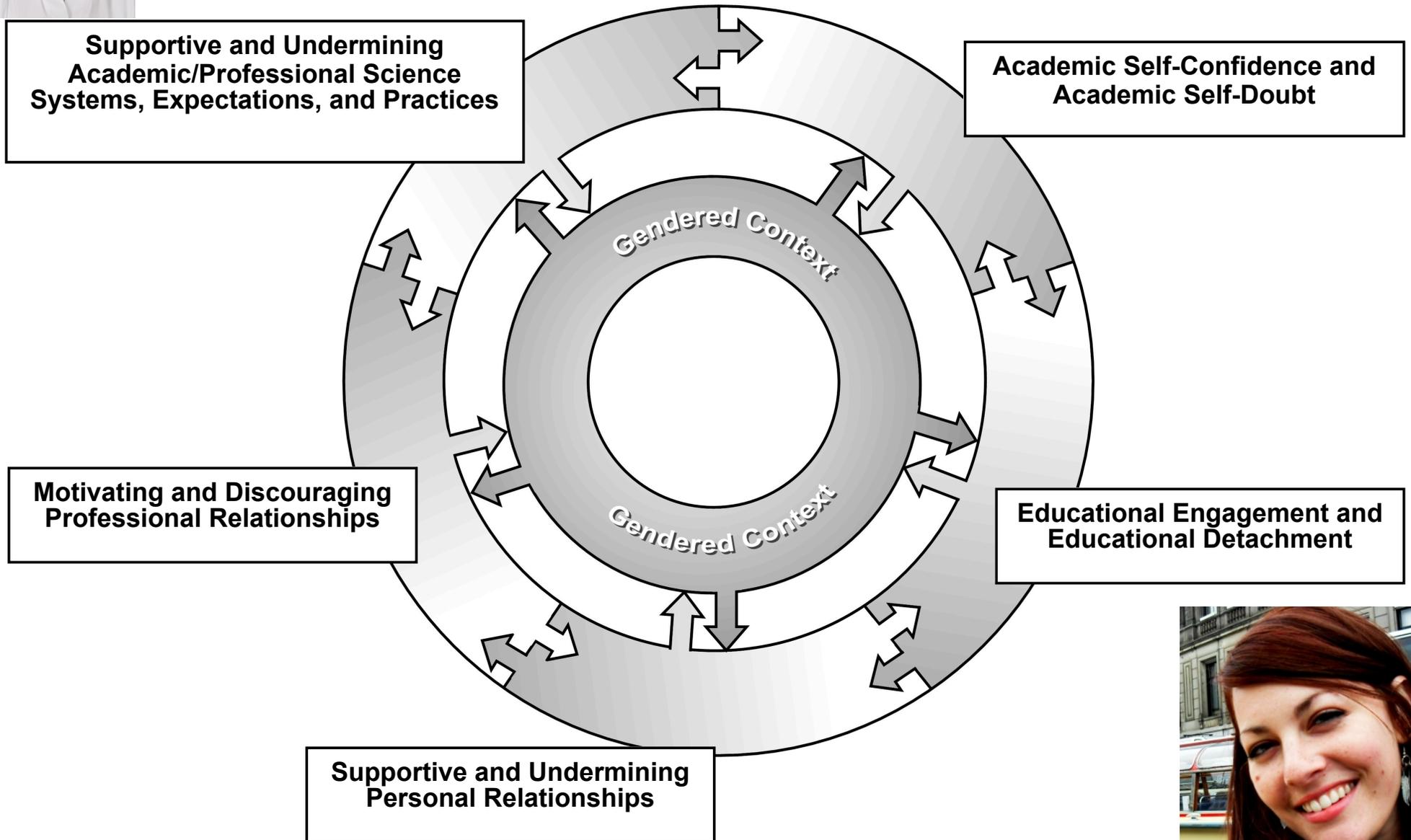


Qualitative Study

- N=25 female ATS graduate students
- 90-120 minute semi-structured interviews
- Team of four coded 4,055 text segments from 25 verbatim transcripts
- 187 emergent codes (107-295 per transcript)
- “Gendered lens”



Qualitative Study





CMMAP

Diversity Pubs



- Conrad, S., Canetto, S. S., MacPhee, D., & Farro, S. (2009). What attracts high-achieving, socioeconomically-disadvantaged students to the physical sciences and engineering? *College Student Journal*. **43**, 1359-1369.
- D'Amico, R., Canetto, S. (2010) Similarities and differences | women's and men's publication and citation record among academic psychologists. *Journal of Women and Minorities in Science and Engineering*, vol **16**, pp. 343-361.
- D'Amico, R., Vermigli, P., Canetto, S. (2011) Publication Productivity and Career Advancement by Female and Male Psychology Faculty: The Case of Italy. *Journal of Diversity in Higher Education*, pp. 1-10.
- Hosei, S. Aka, Canetto, S. (2011) Women in graduate engineering: Is differential dropout a factor in their under representation among engineering doctorates? *Journal of Women and Minorities in Science and Engineering*, vol. **17**, pp 11-27.
- Canetto, S. S., Trott, C., Thomas, & Wynstra, C (2012). Making sense of the Atmospheric Science gender gap: Do female and male students have different career motives, goals, and challenges. *Journal of Geoscience Education*. **60** (4), 408-416.
- MacPhee, D., Farro, S., & Canetto, S. S. (2013). Academic self-efficacy and performance of underrepresented STEM majors: Gender, ethnic, and social class patterns. *Analyses of Social Issues and Public Policy*. In press.
- Byars-Winston, A., & Canetto, S. S. (2011). Accomplishments and challenges for a diversity of women in science, technology, engineering, and mathematics education and occupations. *Journal of Women and Minorities in Science and Engineering*, **17**, 1-3.

Thank you.

