Atmospheric Sciences Section of AGU Newsletter

Volume 6, Issue 4 2012

From the Section President:

Anne M. Thompson

The Pennsylvania State University

Dear Atmospheric Sciences AGU Affiliates,

The 30 October 2012 issue of Eos announced the new AGU Officers, Board and Council Members who will assume office on 1 January 2013. This means my President term ends 31 December 2012 and I will be "Immediate Past President." I will still help out the Atmospheric Science Section but I will no longer be a Council member sending out email "Blasts" and reviewing the Atmospheric Sciences Newsletter.

This is the first time that Council will begin in synch with a calendar year. Atmospheric Sciences will be represented on the new Council by *President Peter Webster*, Professor at Georgia Tech's Earth and Atmospheric Sciences School, who has ably served on the Council Leadership Team the past two years. Our new *President-Elect is William K. M. ("Bill") Lau*, who has led the Lab for Atmospheres at NASA's Goddard Space Flight Center and is now Associate Director of Earth Sciences. Peter and Bill will be working with three Section Secretaries: *Natasha Andronova* (from University of Michigan), *Melody Avery* (from NASA/Langley), and *Athanasios ("Thanos") Nenes* (from Georgia Tech). Congratulations to the newly elected officers!

The same Eos article reminds AGU members of the massive changes in Governance and other aspects of AGU - publications with a new commercial publisher is coming up in January - that have taken place under the out-going Council. In addition to new leadership in the Executive Director's office, participation in Board and Council has been broadened through a greater role for Focus Groups, representation of early-career scientists and students.

Finally, the new leadership - incoming *President Carol Finn, President*

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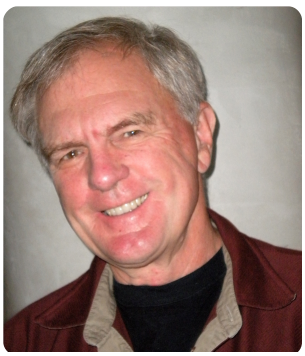
From the Section President –Elect:

Peter J. Webster

Georgia Institute of Technology



Over the last year so much has changed in the AGU. We have a more interactive Council with a leadership team that meets (electronically) once a month and interacts with both the Board and the Council. The Council now meets electronically twice per year and also, traditionally, on the day before the Fall Meeting. I have been fortunate to be a member of the leadership team during the last year and have seen first hand the very positive changes that have occurred. The AGU is now a very "nimble" organization that can react quickly, but still thoughtfully, regarding issues affecting our collective fields and provide scientific input at many levels both national and international. The AGU has a grand tradition in scientific publication. I believe that the changes taking place will embellish this already fine record. Finally, although attendances to annual meetings of many professional societies has gradually decreased over the last decade, *attendance at the AGU annual meetings has continued to grow each year.*

Great changes have occurred in the Atmospheric Sciences Section as well. First, let me thank *Past-President Alan Robock* and *President Anne Thompson* for the transformational accomplishments that we have achieved. They have guided the section through the changes occurring within the AGU and have provided innovative leadership. Alan and *Warren Wiscombe* were responsible for the inauguration of the the Kaufman Award that recognizes prolonged service to the field. During Anne's tenure as President, we have introduced a new set of awards for scientists who have moved on from exciting early careers to establishing excellence in their mid-careers. We noted that the AGU rewarded

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AGU FALL MEETING
San Francisco | 3–7 December 2012

Join us at **the Atmospheric Sciences Banquet, 4 December 2012**. Be sure to sign up for the banquet when you register for the Fall Meeting.

Dear Readers,

I would like to show appreciation to all contributors that make this newsletter possible.
We are looking for new contributions and we hope to hear from you if you have something you would like to share.
Please don't hesitate to contact us at vtoma@eas.gatech.edu
Thanks for reading,

Violeta E Toma , Editor-in-Chief
School of Earth & Atmospheric Sciences
Georgia Institute of Technology, USA

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Lawrence Berkeley National Laboratory

Assisting in 2012: **Steve Massie**, NCAR.

Mike McPhaden and past-President Tim Grove - remind us of the vital role of volunteers in AGU. Enumerating why people volunteer, the article points out that the primary motivation is "to contribute" or "make a difference". Yes, volunteering in AGU is very rewarding in many ways. You will see impact! Making connections through committee service or meeting the new generation through evaluation of student Travel Grant applications or judging of OSPA, the Outstanding Student Paper Awards, is an excellent way to start. (Special thanks to those who responded recently to the call for Student Travel Grant applications; AGU now has a list of 30-40 people they can call on in the next year). However, the contacts one makes in AGU volunteering pay back to you in surprising ways for visibility, networking and extension of research ideas. AGU needs you and you need AGU! As the new Leadership reaches out to fill positions within Atmospheric Sciences, find one that suits you and step up to the plate. Send your name to me or to *President-Elect Peter Webster.*
To those who have served in the past two years, especially *Prof Vickie Connors* (Va Commonwealth Univ.) for OSPA Coordination, *Prof David Randall* (Colorado State Univ.) for Fellows, *Dr Violeta Toma* of Ga Tech and her Editor-helpers for the Newsletter, I give hearty thanks. *President-Elect Peter Webster* spearheaded the concept of our new Ascent Awards and took the idea from drawing board to approval in record time. *Past-President Alan Robock*, Rutgers University, and our *AGU Staff Liaison Danica Williams*, kept me on the deadline track for President duties. I thank you all.

Thanks to all of you in Atmospheric Sciences for your support.
Anne M. Thompson, Atmospheric Sciences President, amt16@psu.edu
(Incoming Section President Peter J. Webster, pjw@eas.gatech.edu)

excellence more towards the end of illustrious careers, and that the AGU fellows were not representative of the demographics of the society as a whole. The Ascent Awards were developed to fill the void between early career and late career by focusing on the 8-20 year post-Ph.D. The winners of the inaugural Ascent Awards are: *Jose Jimenez, Athanasios Nenes, Stephen Klein and Andrew Dessler.*
We are very eager to hear of new ideas for the Section. For example, how can we encourage unrepresented minorities in science to become part of the atmospheric sciences? How can we encourage more international interactions and increase the utility of our science and institutions in the developing world? How can we be more effective in promoting our fellow section members for Union and Section awards? Should we think of teaming with other organizations nationally (for example, the American Meteorological Society) and internationally, in organizing workshops and conferences? This list is far from exhaustive and I look forward to your suggestions.

I look forward to meeting with many of you at the Fall meeting and, especially, at our Section dinner on Tuesday night.

Peter J. Webster, Atmospheric Sciences President-Elect
pjw@eas.gatech.edu

IMPORTANT NOTICE: WORKING WITH NCAR

REGISTER FOR THE TRAIN & ENTRAIN NEW USERS TO REQUEST LOWER ATMOSPHERIC OBSERVING FACILITES (LAOF) WORKSHOP AT THE 2012 AGU FALL MEETING

To register, contact:

Alison Rockwell: rockwell@ucar.edu

303.497.8758

This course will introduce participants to the suite of available NSF observational research platforms and services available through the five LAOF partner organizations, and provide a clear roadmap on how to request these facilities in support of scientific field campaigns and educational activities. Facility Managers and experienced users of LAOF will provide information, guidance and advice on how to incorporate available instruments and platforms into an experiment design, what steps need to be taken to request one or more of these facilities, and how to maximize the success of a campaign.
The process of requesting one or more of NSF's observing facilities can seem overwhelming, especially to new users. The request process varies depending on the size and complexity of a project (i.e., large versus small), the affiliation and funding of the user (i.e., university researcher, cost recovery, NCAR-led), the platform or services requested, and the main focus of the campaign (e.g., scientific, or educational). In addition to describing the capabilities of each of the facilities and services available, instructors will explain the request process and investigator responsibilities, and highlight key issues and potential roadblocks. A large portion of the workshop will be devoted to answering questions and providing advice on how to best plan for an observational research campaign.
URL: http://www.eol.ucar.edu/about/agu-ams-workshops/train-entrain-new-users-workshop-agu-2012

Introducing Natalia Andronova - AGU Atmospheric Science Section Secretary

Violeta Toma

Natalia Andronova, the AGU Atmospheric Science Section Secretary, focusing on Physics, Dynamics, and Climate is a research scientist in the Department of Atmospheric, Oceanic and Space Sciences at the University of Michigan. In 1993 she received her Ph.D. in atmospheric science from the Institute of Atmospheric Physics, Moscow. Her scientific interests include areas of global and regional climate change; climate sensitivity and climate feedbacks; atmospheric interactions and teleconnection patterns. She is author and coauthor of 67 refereed publications, and a participant in the Working Group VIII of U.S.-U.S.S.R. Agreement on Protection of the Environment and its Relationship to the U.S. National Climate Program. She is also a contributing author to the recent IPCC report.

You are the AGU Atmospheric Science Section Secretary, focusing on Physics, Dynamics, and Climate. When did you start your appointment and what does it consist of?

This is my third two-year term, so it has been around four years. My individual responsibilities are to support the AGU in various ways, from improving participation in its Atmospheric Science Section, both nationally and internationally, to promoting cooperation with other sections and related societies.

Can you talk more about your responsibilities, especially as a convener of scientific meetings? Does sometimes feel like having a second full time job?

Conveners organize the various sessions and group discussions related to specific scientific topics that lie at the front edge of scientific knowledge. To this end, we handle invitations to key participants who assess, contribute, and present their progress and new discoveries. While the workload can be pretty significant over a short period of time, these intense bursts of activity are infrequent and, therefore, being a convener never feels like having a second full time job. The difficulty stems primarily from the need to satisfy many conditions such as the number of participants and abstracts versus available space, time, and funding. These conditions inherently incur some frustration from participants, as many prefer oral presentations over poster sessions but may be relegated to the latter. Similarly, those who receive oral presentation slots may be frustrated by the limited time they are assigned. Thankfully, the AGU's staff is very professional and supportive.

While there is a lot work associated with being an active part of AGU, it must be rewarding. Could you "advertise" your job to young scientists who might seek ways to play a more dynamic role in the AGU organization?

I believe that Section secretary positions are not restricted so much by age or experience, but rather by drive and commitment, especially given that prominent scientists often prefer to work on their own projects than spend long hours organizing meetings. However, it is very rewarding to watch the results of your work come to fruition during a well-organized meeting, and secretaries are generally well-respected and renowned for their contributions.

Now, let's talk about your career as an atmospheric scientist. You have a Ph.D. in Atmospheric Science & Geophysics from the Institute of Atmospheric Physics, in Moscow. How different is atmospheric sciences in Russia? Does being a woman make a difference?

I've been doing research in the USA for over 20 years. During this time, Russian science has undergone numerous, dramatic changes, and I cannot speak to how things are now. From my experience, however, there is very little difference in performing research between the two nations. Twenty years ago, Russian science was at a very high level, in that while the computational aspect was not fully developed due to an absence of supercomputers, the analytical aspect was very well developed. I was lucky to work in one of Russia's longest-

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Fall 2012 Meeting AS Highlights (cont.)

Bjerknes Lecture

Robert Houze, University of Washington: "Tropical Convection: A Half Century Quest for Understanding", 4-Dec-12, 10:20 AM (Room 3002 Moscone West)

Charney Lecture

Drew T. Shindell, NASA GISS; Columbia University: *"Mitigating near-term climate change while advancing human development"*, 4-Dec-12, 11:20 AM (Room 3002 Moscone West)

New Atmospheric Sciences Fellows Presentations (I): 5-Dec-12 8:00AM- 10:00AM, Room 3002 (Moscone West)

- A. D. Del Genio, NASA: *"Challenges in Parameterizing the Lifecycle of Cumulus Convection in Global Climate Models"*
- N. M. Donahue, Carnegie Mellon University: *"The Lunatic is in the Grass"*
- R. C. Cohen, UC Berkeley: *"Multifunctional organic nitrates: A decade of TD-LIF Observations"*
- J. Abbatt, University of Toronto: *" Multiphase Oxidation of Tropospheric Aerosol"*
- R. Zhang, Texas A & M University: *"Formation, Transformation, and Climate Impacts of Atmospheric Aerosols"*
- R. Houze, University of Washington: *"Recent Satellite Studies of Extreme Convective Storms over North America, South Asia and South America"*

New Atmospheric Sciences Fellows Presentations (II): 5-Dec-12 10:20AM- 12:20AM, Room 3002 (Moscone West)

- M. E. Mann, Penn State University: *"The Past as Prologue: Learning from the Climate Changes in Past* Centuries"
- R. J. Stouffer: "Geophysical Fluid Dynamics Laboratory/ NOAA;Princeton University: *"Can Earth System Models Explain the observed 20th Century Global Carbon Sink?"*
- C. E. Randall, University of Colorado: *"Atmospheric Coupling by Energetic Particle Precipitation"*
- D. M. Murphy, NOAA: *"The chemical composition of stratospheric aerosol particles"*
- J. Neelin, UCLA: *"Sensitivity of precipitation processes in climate models"*

established geophysical institutions: the Voeikov Main Geophysical Observatory (MGO), founded in 1849. Many prominent scientists – both men and women – worked at the MGO, including the well-known Ekaterina Blinova, who proposed methods of long-term weather forecasting (i.e., A Hydrodynamic Theory of Pressure Waves, Temperature Waves, and Centers of Atmospheric Activity, 1943). Moreover, I have not noticed a difference in a research performance or acceptance between men and women.

You have done a lot of work on global and regional climate change, and you are member of the Intergovernmental Panel on Climate Change (IPCC). Do you think that we currently have a solid picture of what is "climate change" versus "climate variability"?

These two terms are very closely related, but vary by time scale and point of reference. There are inherently variations in climate over any given period of time; the longer such variability is observed, the more concretely you can state whether change is occurring and make predictions. The smallest climate variability scale is a decade, whereas the minimum time scale for detecting climate change is over 3 decades. Therefore, I believe we do, indeed, have a solid grasp on the difference between the two terms.

What do you think is the most important achievement of your career?

I believe the recognition of a scientist's work is their most important achievement. By this standard, I consider my most-cited article, "Objective estimation of the probability density function for climate sensitivity", written in 2001, to be one of my important achievements.

You are also an Undergraduate Advisor at the University of Michigan and you mentor many students. If you were to make a comparison, how did their scientific interest changed throughout the years? Are they more knowledgeable about climate issues when they start?

Students usually come to our department with a great interest in and passion for climate science. In recent years, students have been growing increasingly interested in applying their hard-earned knowledge to real life problems.

What advice would you give a young student, who is passionate about atmospheric sciences?

Professors and advisors can only give you the tools you'll need, but keeping curious and motivated will light your way to success. Don't be afraid to ask questions.

Interview with Vicky Slonosky

Hans von Storch

Vicky in 2000.

Vicky Slonosky has graduated from McGill University with a MSc in Atmospheric and Oceanic Sciences where historical observations were a part of her thesis. More historical observations for precipitation in Paris, and the Gaultier observations for Quebec were uncovered during a post-doc at LSCE near Paris, France. A fellowship for Environment Canada allowed her to look for Canadian historical observations, and continue the analysis of circulation started earlier. In 2002 she took up a research position at McGill University and the Ouranos Consortium. The digitization of historical climate observations as a volunteer project has been Vicky's recent interest, along with an interest in the history and philosophy of climatology.

Vicky, please tell us about your way into and through Atmospheric Sciences.

In high school and college, most students with an interest in physics and mathematics were steered towards engineering, so I started at McGill University in Mechanical Engineering. Once there, I discovered I was more interested in pure research and in earth sciences. One professor pointed out a tiny line in the course catalogue which described a Faculty program in Climatology, with courses in all of the departments I was interested in, as well as math and physics. That summer I came across the works of Hubert Lamb, and once I read Climate: Past, Present and Future, studying the historical observations of past climate became what I wanted to spend my life on.

After graduating (when I was seated by myself, between Chemistry and Computer Science!), I spent two years working on sea-ice and atmospheric circulation for a Master's degree in Atmospheric and Oceanic Sciences, still at McGill, before spending three years at CRU on the project ADVICE. I was particularly interested in the reconstruction and analysis of the atmospheric circulation, since that is the starting point for many changes in climate: in the mid-latitudes especially, the climate changes because the circulation changes. The ADVICE project was a great experience, as it involved many researchers from different countries and institutions working on historical documents and historical instrumental data. Just about everywhere I went, I kept a look out for historical weather data. At CRU, I amused my office mates enormously by telephoning county archives and churches' offices, blithely asking if, by any chance, they had any records from, say, 300 years ago? No? How about 250 years ago? During a post-doc in France, I couldn't get into work one day because of a transit strike, so while working at home, I looked up the number of the Observatoire de Paris in my green Michelin tourist guide. It turned out that not only did they have records of precipitation going back to the 1600s, when the royal architects needed to know how much rain was falling around Paris so they could design the fountains of Versailles, but on learning that I was Canadian, the archivist showed me papers from 18th century Quebec. Those papers turned out to be some of the earliest known weather observations from Canada. I returned to Canada, to work for Environment Canada in Toronto, and later held a research position at McGill University and the Québec government-sponsored Ouranos consortium. I never got to go on any field trips to the Arctic or North Atlantic I had dreamed of as an undergrad: my scientific adventures turned out to be looking for treasure among basements full of old furniture, abandoned equipment, and dusty boxes.

In 2004, you were hit by a severe health problem – you got an auto-immune type of arthritis, which affected your hands badly, so that you could neither type nor hold a pen for several years. What did this mean for your professional life – how did your academic environment react and support you?

It meant that my professional life came to an end at the age of 31. This was very disappointing. For several years, I had virtually no contact with the academic community: it's as if I had ceased to exist! However, one colleague, Cary Mock, kept me on his email list and his updates were my only sustained link to the professional world of climatology. I spent several years in occupational therapy but ultimately my health was too unstable to be able to work consistently. This instability is still one of the main difficulties that I struggle to come to terms with. It makes it very difficult to commit to long-term plans such as meetings or conferences. On the other hand, forced inactivity has given me time to reflect and to read in other fields such as philosophy, history of science, anthropology, and cognitive psychology, which in turn has made me reconsider how I think about science.

Another thing that has been difficult about this

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[condition] is the lack of access to professional publications, which are out of the price range of individuals without professional associations.

What would you consider the most two significant achievements in your career?

One piece of work I'm quite proud of was the reconstruction of monthly rainfall in Paris back to 1688. This work, together with some previous analyses from my thesis, made me think that climate variability had changed a great deal over the past centuries. With several centuries of monthly data, I was able to see that there was much higher inter-monthly and inter-seasonal variability to the data in the centuries before the 20th. The 20th century, especially the second half of the 20th century, seemed to have been comparatively quiet but also comparatively smooth, with fewer drastic changes from one season to the next. This kind of change in the character of the variability is something that can only be resolved with daily or monthly data. I think this is related to the atmospheric circulation, particularly the degree of zonal flow, and so it would be interesting to try to investigate these circulation changes, rather than just to focus on the temperature record. The 2000s appear to have been somewhat a reversion to higher values of meridional flow, as were seen before the 20th century, and which have provoked some of the extreme events of the past few years that appear similar to those of previous centuries.

The second piece of work is the ongoing volunteer effort to collect and digitize historical climate data from Canada. After realizing I was unlikely to return to work, I became worried that the boxes of papers and data I collected would end up collecting dust in my attic, and could be lost altogether. Some of the records had been digitized with the support of Bill Hogg and Francis Zwiers at Environment Canada, and Liza Piper at the University of Alberta had scanned in some of the paper copies with the group NiCHE. Even so, I still had thousands of pages and images that needed to be converted to numeric data. While I had been unable to type, I started volunteering for the wiki project LibriVox, which creates audiobooks of out-of-copyright material sourced by the Gutenberg Project. LibriVox became the inspiration for my historical climate typing project, and I remain gratefully amazed at the people who continue to volunteer to type up 200-year-old manuscript weather diaries. It's taking me a while to compile and analyze them (see question 2!), but my aim is to eventually make all these data available on the web, as it was public volunteer participation which digitized them.

When you look back in time, what where the most significant, exciting or surprising developments in atmospheric science?

One of things I've found most surprising is the extremely high profile climatology now has.

Vicky in 2009.

When I first started to study climatology as an undergrad in 1992, the reaction of nearly everyone I knew was "what-ology?", followed by "so are you going predict the weather on the news?", followed by a change in subject. For much of the 20th century, even up to the 1990s, climatology was considered the most boring discipline in science. Today everyone knows what the climate is. It's become a cultural concept, with scarcely a day going by without some mention of climate change in the media. It's also very interesting to see the number of people who are passionately involved in writing or commenting about climate on blogs on the internet. There are many very interesting discussions going on about climate and climate change on the web. I'm mostly a reader of these sites: by the time I get my thoughts together and typed up, the topic has usually moved on or comments closed!

How would you assess the success, or failure, of efforts of bringing females into atmospheric science and of having females in leading positions?

I haven't been part of the professional climate establishment for close on a decade now, so my observations are based on personal stories of friends; for each statement made below I can easily think of counter-examples and exceptions. This is a very difficult issue, which has been discussed in many contexts and over several generations.

I myself have never felt discriminated against for being a woman, and have had very supportive mentors. What I have noticed is that parenthood is where differences start to occur, and this is true in many disciplines, not just atmospheric science. In academia and scientific research, for the more senior positions, the main consideration of merit is the number of publications over the past 5 or 6 years. A woman who has taken a recent maternity leave will have a reduced number of publications compared to what she would have had otherwise, and so be considered as less competitive for senior positions. A possible solution could be to weight the number of publications by the number of months actually worked in the past 5 years to give a better measure of productivity.

Another difficulty is economic: in some places the cost of daycare is so high that it isn't economically feasible to continue working on the salary of grad student or post-doc, which is at the point in life when many people have children. Some fathers who try to take paternity leave or work reduced or flexible hours have also faced discrimination; and mothers report not being taken as seriously once they have more than one or two children. It really seems to depend on the culture. Many jurisdictions are encouraging paternity leave, so the situation may become more equal as fathers share parental leaves and these choices are respected.

Based on the careers of friends and colleagues who studied in the sciences and engineering at university, the private sector, at least in the fields of engineering and software development, appears to be better at retaining talent in both genders and not discriminating against mothers. It might be worthwhile for the academic world to find out how and why women seem to be more successful and promoted to more senior levels in the private sector.

Is there a politicization of climate science?

Yes, certainly. The impulse towards recognizing limits, reducing our impact on the natural world and trying to reduce consumption is a good one and springs from good intentions. We can and should use reason and science to help us evaluate the best way to carry out the actions we undertake for ethical reasons. But science is about evidence, and to use scientific reasons to dictate ethical behavior does a disservice to both. Science is not fixed, but ethics are, or should be. If science becomes the reason which is used to induce ethical behavior, either the science cannot change, as it should be free to do, or ethics change with the science. If, for example, it's discovered one day that massive amounts of CO2 in the atmosphere are actually beneficial for some reason, that shouldn't mean that greed and excessive consumption become ethically acceptable. It's also very important to examine the potential effects of our good intentions, and try to make sure our proposed solutions don't cause more unintended hardship than the dangers we're trying to avert. This is where the expertise of policy analysts comes in.

From a climatologist's point of view, I find it worrying that the social or political narrative about anthropogenic climate change has outstripped the scientific evidence. This enormous, and to many climatologists, unexpected social interest has placed climatologists in a very difficult position. They recognized and very properly warned society about a potential peril: imagine what the public reaction would have been if they hadn't issued any warnings, and it later came out that scientists had long known about this potential threat but kept quiet about it. But for reasons it would take a political analyst or sociologist to

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thoroughly explore, climate change morphed from a scientific issue about a possible threat (along with countless others which are either ignored or dealt with more or less quietly) to a dominating social narrative of our times. This makes it more difficult to undertake fundamental research into physical climatology and natural climate change and variability; the social message is that we know everything we need to know about climate already, and that anything that happens must be due to humans, so why waste time (and money) on studying the fundamental science or the past? It also makes it difficult to pass on messages of nuance and uncertainty.

I'm also concerned about how this social narrative is putting pressure on children and affecting their view of the world. We must of course teach them how to be good citizens and not to wantonly waste things or pollute their surroundings, but I find it worrisome that children are targeted to feel responsible for, or to change, things that are beyond their control. I find it very discouraging that before children are given a chance to feel wonder and curiosity about the natural world around them or to learn the basics of science, they are inundated with negative views of humanity's influence on the environment. Many museum exhibits, documentaries, and even school texts emphasize the problems that humans are causing. There is an entire wing of the Royal Ontario Museum called "Life in Danger", which causes many children (and adults) to feel anxiety and guilt; my daughter thinks "NOVA" (an American general science TV program) is one of the scariest program on television, and my 7 year-old nephew thinks the weather of the future will kill us all very soon. Giving children nightmares is not the right way to get them to be either good citizens or interested in science.

One aspect which combines questions 5 and 6, and which I haven't seen discussed much, is the impact that higher energy prices related to carbon taxes could have on domestic chores, which in many places are still largely performed by women. One of the factors in the late 20th century participation of women in the workforce was the increased affordability of domestic appliances, such as freezers and washing machines, which eased the burden of many domestic chores. If energy prices become higher as a means to curbing CO2, how will the decreased affordability of running domestic appliances affect women and the work-life balance with which both genders are struggling?

What constitutes "good" science?

My version of good science means on the one hand verifying theories with observations, and on the other, trying to understand what the observations are telling us. In this sense I disagree with Darwin, who said that all observations must be for or against something. Observations can also be independent entities. This is of course a very difficult challenge in climatology, where we don't have the option of running experiments and changing conditions and the variables. This is why I have a lot of respect for modelers; what they're trying to do is not easy and they're always trying to improve their estimations. But in the end, direct observations, flawed though they are, are the only information we have on what has actually happened on our actual planet, and this is why I decided to focus my work on observations rather than modeling.

Science should be discovery, it should be about what we don't know, it should be about trying to see things in different ways, and it should be fun. As Einstein said, "If we knew what we were doing, it wouldn't be called research". Good science should also be humble. What we know is certainly incomplete, and in some cases probably wrong. As science continues, new discoveries, new data, new events and new ways of looking at things will lead to new theories. If we're lucky, we'll have at least been on the right track; if not, our ideas will go the way of phlogiston and ether.

Western thought has a long history of the idea of human induced climate change, going back to shortly after Aristotle. We seem to like to have a narrative, especially one in which we are central, and we easily persuade ourselves that what we want to believe is what is true. Knowing all this, as scientists we have to keep trying to see beyond what we think we know or what we want to see. This is hard, but it's the constant struggle and delight that is science.

What is the subjective element in scientific practice? Does culture matter? What is the role of instinct?

Some histories of science suggest that western science came about in the western world because medieval philosophers in western medieval faiths assumed that the world was mostly reasonable and governed according to fixed laws, rather than by capricious forces common in, for example, the Greek or Babylonian myths. By pushing the limits of reason, they set the stage for using reason to explain the natural world, which eventually led to the development of science. According to this history, science itself only made sense in a certain cultural context: one is which the world was not capricious. Notwithstanding that I'm neither a political analyst nor a sociologist (see question 6!), I wonder sometimes if the anthropogenic climate change narrative is so compelling because it puts us in control, and not at vagaries of random chance (or erratic gods). Every time there is a letter to the editor or opinion on the radio saying something like "If we don't like the kind of weather we're seeing, we'd better get serious about controlling greenhouse gases", it seems to nebulously imply that the weather is within our control: if only we can reduce greenhouse gases, there will no longer be any droughts, floods, storms, or other unpleasant weather events.

It's hard for us to recognize that our surroundings, our peers, the received wisdom in a field of research and our culture do have an influence on our thinking and expectations. Developments in cognitive psychology described in recent books such as Mistakes Were Made (but not by me), by Carol Tavris and Elliot Aronson, The Righteous Mind by Jonathan Haidt, or Future Babble by Dan Gardner make it distressingly evident how easily we all fool ourselves, resolve contradictions and cognitive dissonance by suppressing uncomfortable ideas, and how we are often better at rationalizing than rational thinking. Science is the struggle to get outside ourselves, our biases, our errors in thinking, to try to apprehend the objective world outside ourselves. So there are many elements that are subjective and culturally-based, and the more we can recognize them, the more we can try to take them into account.

Science should be open and reasonably reproducible, but there are many subjective elements in any science dealing with large amounts of data and with measurement, so some aspects of climate science may never be perfectly reproducible. I have a few data points, and a strong correlation, but because the degrees are freedom are so low, it's not significant at the 95% level. Do I throw it away, even though it suggests a possible connection? Conversely, with a large number of data points, almost any correlation can be significant; do I take these seriously? How do I decide which variables are worth investigating for a correlation? Which data are not measuring the intended target, and how do I deal with them? There will always be an element of judgement, and things which are reasonable but which can't be proved. Reason itself and the existence of an objective world can't be proved, so we have to take these assumptions at least as our starting points.

Intuition, in an experienced scientist, is almost like integrated experience; after looking at hundreds of representations of a particular variable, we unconsciously build a picture of what to expect, and can detect an anomaly which might not be evident using automated, statistical screening. It's hard to find a balance between this kind of intuition and reproducibility, which is why details matter, and should be disclosed as much as possible. Intuition can be helpful and reproducibility is highly important, but they're not always compatible: you can't code a hunch.

The opinions expressed in this interview do not necessarily represents those of the reviewer or the AGU.

WRF Makes History in South Asia

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The Weather Research and Forecasting (WRF) model, developed by NCAR and first released to the community in 2001, has since become one of the most used research models in the world, with a registration base of more than 20 000 users. A growing number of WRF users apply the model to climate modeling, which has made it even more popular. It has been used by several countries for understanding changes in climate, for impact studies and for disaster preparedness. A recent WRF Climate workshop in South Asia has made history: a) the first WRF workshop to be organized in Vietnam; b) the first time the WRF model was installed in a computer in Myanmar.

Myanmar had been under military rule for almost 50 years. The severe economic sanctions together with the military regime secluded it from the outside world. Recently, sanctions in Myanmar were lifted and the country opened its doors to the outside world. This has also opened the opportunity for students, professionals and academics there to get access to state-of-the-art scientific resources.

Myanmar is located in the Asian monsoon region and it is prone to severe weather events, such as the Bay of Bengal storm systems. One such example is the cyclone Nargis in 2008, which caused the most severe weather disaster in the history of Myanmar: 138 000 deaths and 10 billion dollars in damage (Wikipedia, 2012). Preparing for such extreme events is crucial for Myanmar's future. The infrastructure in the academic institutions is still precarious and there is a lack of well-trained professionals. There is a huge need for capacity building there.

The Asian Disaster and Preparedness Centre (ADPC) has been at the forefront of promoting climate modeling capacity building in South Asia. They organized the "ADPC Regional Training on WRF", a climate tutorial which attracted several students and researchers across the region. It was partly funded by the Norwegian Ministry of Foreign Affairs (MOFA) and the United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP). The tutorial lectures were organized and taught by researchers from the National Center for Atmospheric Research (NCAR) and the Bjerknes Centre for Climate Research (Norway). Three young researchers from Myanmar attended the WRF Workshop. These three intelligent women were very eager to learn. One of the young ladies, Zin Mie Mie Sein, had just concluded her masters and she

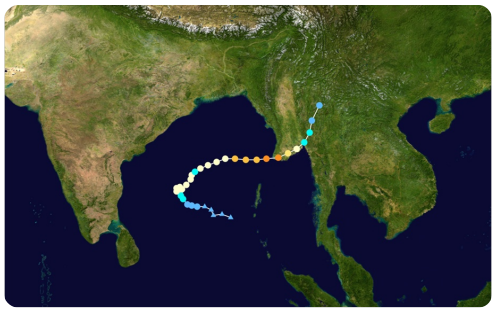

Figure 1 - Track of Cyclone Nargis. It made landfall on Myanmar on May 2, 2008. Nargis took the lives of 138 000 people there (Wikipedia, 2012).

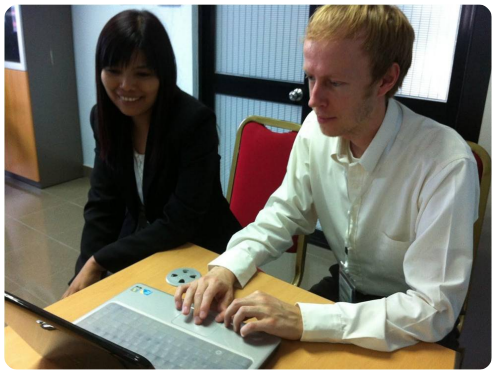

Photo 1 - The first WRF installation on a Myanmar computer: Michael Duda (NCAR) installing WRF on Zin's computer.

Photo 2 - In front of the Vietnam Institute of Meteorology, Hydrology and Environment (IMHEN) in Hanoi, where the WRF workshop was organized from September 24 to 28, 2012. From left to right with the Myanmar participants: Senaka Basnayake (ADPC), Cindy Bruyere (NCAR), Zin Mie Mie Sein (Department of Meteorology and Hydrology, DMH, Myanmar), War War Thein (DMH), Michael Duda (NCAR), Khin Win Maw (DMH), David Gill (NCAR) and Michel d. S. Mesquita (BCCR).

was looking for opportunities to work on a PhD degree. She wanted to have WRF installed on her computer, and so Michael Duda (NCAR) helped her through the installation of Linux, as well as the installation of WRF and other software needed. This was, to our knowledge, the first time the WRF model had been installed in a computer in Myanmar. During the tutorial week, participants also learned how to run WPS and WRF, how to install WRF and how to run WRF for climate projections.

WRF has definitely made history in South Asia.

The students and researchers from Myanmar, the Philippines, Sri Lanka and Vietnam who were present there received an in-depth understanding of how the WRF model works, how it can be used for real-time forecasting and for climate change projections. It will be used for helping these countries to be better prepared for changes in our climate system. When weather-related deaths can be avoided by using better weather forecasting and climate predictions is when one realizes how vital the WRF model can be.

References:

Wikipedia (2012) Cyclone Nargis [Online], 14 October 2012, Available at http://en.wikipedia.org/wiki/Cyclone_Nargis (Accessed 29 October 2012).