and discover a valuable mentor in you. Thus, mentors need to recognize the importance of their personal interactions with the students and the impact of their behavior on the students. Students' experience in their mentor's hands shape their scholarship and reinforce their commitments to their cause.

Remember a mentor is many things rolled into one: Advisor, Teacher, Role Model, and a Friend. A good mentorship emphasizes compassion, self-discovery and empathy, and has power to significantly impact lives long after students finish their internship.

And above all realize this: a student is like a pumpkin seed, which becomes a fruit only under the right conditions! Each person has a unique gift of shaping the future.

Interview with Bette Otto-Bliesner

Hans von Storch

Dr. Bette Otto-Bliesner, Senior Scientist at NCAR.

Dr. Otto-Bliesner is an atmospheric scientist by training with her degrees from the University of Wisconsin-Madison. Her career has spanned synoptic meteorology, climate diagnostics, and climate change modeling, and has included teaching, research and community service. Her early research focused on the development of a climate model of intermediate complexity, which she used to understand the modern climate system and past climate change. Before returning to NCAR in the 90's, she was on the faculty in the Geology Department at the University of Texas at Arlington. She is currently a Senior Scientist in the Climate Change Research Section of the Climate and Global Dynamics Division at NCAR, where she is focused on development and testing, within the framework of the Community Earth System Model, of our understanding of past climate change to enhance the credibility of future projections. Dr. Otto-Bliesner has chaired the International Geosphere-Biosphere Programme, Past Global Changes Project for the last 3 years and was selected to serve as Lead Author of the Intergovernmental Panel on Climate Change 4th and 5th assessment reports. She has been active in educational activities and is the Sigma Xi Distinguished Lecturer for the American Meteorological Society for 2010-2011.

Early period of Dr. Otto-Bliesner's career (1976) with left to right: Dave Williamson, Bette Otto-Bliesner, Akira Kasahara, Warren Washington, and Bob Chervin, outside NCAR, Boulder, Colorado.

Could you briefly sketch the different fields of atmospheric sciences, with which you have dealt over the years?

I started my career in the atmospheric sciences as an undergraduate at the University of Wisconsin in Madison working as a student assistant in the map room, posting the daily maps that were printed on a facsimile machine. This wall of maps was a focal point for discussions of the weather and so in my early years my main interest was in synoptic meteorology, mid-latitude weather, and thunderstorms. My Masters' thesis was with Donald Johnson, moving me towards climate diagnostics, and, of course, using his favorite isentropic coordinate system.

My path to climate modeling began when I worked with Warren Washington and the NCAR atmospheric general circulation model in the 1970s. The speed of the computers at that time only allowed us to run this grid-point model for perpetual months, January and July. This encouraged me to develop a spectral general circulation model (GCM) of intermediate complexity that could be used for seasonal cycle simulations. I returned to the University of Wisconsin Madison to work with David Houghton for my Ph.D. This model also provided me with my first foray into paleoclimate. John Kutzbach and I used it to test the role of Milankovitch seasonal variations in incoming solar radiation on the intensity of the Holocene Asian and North African summer monsoons.

My passion to understand past climates in terms of their forcing and feedbacks has led me to spend much of my career since then using GCMs, as they developed into more and more sophisticated climate models, for this purpose. While in the Geology department at the University of Texas-Arlington, I concentrated on deeper times in the past, modeling the roles of tropical mountains for the formation of the Appalachian coal beds, vegetation on polar warmth in the Cretaceous, and continental position on the hydrological cycle. Since returning to NCAR in the 90's, my research has concentrated on paleoclimate modeling of glacial and interglacial periods of the last 130,000 years and recently also the last millennium.

You paused your employment for a few years for having time for your children. In retrospect, was that the right decision? How difficult was it to "come back"?

Actually I never paused my employment but I did work varying amounts of part-time. This did make it difficult at times for the evaluation of my productivity as compared to those who stayed full-time since the standard is often publications per year since PhD. My part-time status was somewhat necessitated by the challenges of childcare but my non-traditional career path was much more necessitated by the challenges of two-career family. My move to Texas for my husband's career meant I left research for a while and did some consulting and teaching. I also learned a lot more about geology. In the end, this detour gave me a much broader perspective of past climates.

How is the situation of females now in atmospheric sciences? Has the situation improved in the last ten years?

The numbers are increasing. We are starting to have women in top positions – i.e. Susan Avery as President and Director of the Woods Hole Oceanographic Institution, Jane Lubchenco as Administrator of the National Oceanic and Atmospheric Administration, and Marcia McNutt as Director of the United States Geological Survey, but women in these top positions are still few in numbers. As more women are asked to serve on committees and panels (a good thing), there is the challenge to balance this service with research and/or teaching. And it is still requires flexibility and compromises to find the best situations for both partners in two-career families. Although the situation is much improved for women in the sciences, studies have shown that there are still subtle inequalities which remain.

continued on page 6

What would be your advice for a young female student, who has to decide about going into science?

Passion is key as in any field. So if you have a passion for atmospheric science, it would be great to have more women choosing it as their career path. Many jobs in the sciences allow flexibility, which is great for balancing work with family. I would highly recommend that the preparation for a science career also includes a good emphasis on communication skills – writing, conference presentations, and the media. Also studies have shown that there are different communication styles between males and females so understanding these differences can make your interactions more effective.

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

I am proud that I have been involved in using numerical models from their early stages to now to understand the climate processes and mechanisms that explain what we see in the paleo-proxy record from the very deep time of the Carboniferous 300 million years ago through glacial-interglacial periods to the recent last millennium. Since my early days as a participant of COHMAP, I have found that an interdisciplinary approach with close interactions with researchers in the proxy data community has allowed me to achieve the most complete understanding. My recent collaborative work to understand the impact of climate forcings on the Last Interglacial sea level rise and on the evolution of climate during the last deglaciation are two significant achievements for which I am quite proud.

And second, the opportunities to promote the relevance of paleoclimate for understanding climate change, past-present-future, to the wider community is also an achievement that I consider significant. I was asked to chair the AGU Paleoceanography and Paleoclimatology Focus Group when it was first formed in 2002, and have taken leadership roles in IGBP PAGES and the Paleoclimate Modeling Intercomparison Project. I am especially pleased with my roles as Lead Author in the 4th and 5th IPCC assessments.

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

Very exciting in climate research has been the development from atmosphere-only models, to coupled atmosphere-ocean models, to climate models, and now to Earth System Models. At the same time, computers have become more and more powerful. We can now run very long simulations and can explore feedbacks that heretofore have had to be prescribed as forcings. Our first simulations of past climates required us to specify sea surface temperatures, either assuming conditions not that different from today or using reconstructions such as CLIMAP. With the coupling of the oceans, we could then allow the ocean temperature, salinity, and circulation to respond to the forcings, and explore whole new questions such as the stability of the thermohaline circulation. Climate models have allowed us to simulate rather than prescribe changes in sea ice and vegetation. And now Earth System models are letting us explore the growth and demise of ice sheets and changes in the carbon cycle. These developments have allowed paleoclimate research and modeling to more completely explore the mechanism responsible for changes seen in the paleoclimate records.

Using modeling developments together with the data has allowed significant progress in our understanding of the importance of regular variations in the Earth's orbit around the Sun, the so-called Milankovitch cycles, on climate. Early modeling of the role of summer insolation anomalies on the regulating the past African and Asian monsoons has been greatly expanded to include the complexities of the interactions, i.e. between the Northern and Southern Hemispheres, high and low latitudes, and the oceans and continents. Climate models forced with Milankovitch insolation anomalies can now simulate the polar warmth and its effects on the stability of the polar ice sheets and sea level during the past interglacial and the subsequent glacial inception. There is still much more exciting future work to be done to more fully understand Milankovitch and climate with Earth System models and all their new capabilities to simulate rather than prescribe – dust, CO2, wetlands, permafrost, etc. A grand challenge for the future decade will be to simulate glacial-interglacial cycles with these models.

Is there a politicization of atmospheric science?

Science should provide the basis for good political decisions. Scientists should communicate their science in clear and honest ways so that the public and policy makers can make informed decisions. I guess that it is inevitable that atmospheric science has become somewhat politicized because it is relevant to the lives of people and the sustainability of the Earth.

What constitutes "good" science?

Good science advances our understanding. It can be paradigm shifting or it can be incremental. It doesn't matter which, as long as the science is rigorous and honest.

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

Writing in the "Cloud": how Google Docs can be used to write scientific manuscripts

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Cloud computing has become an ubiquitous term nowadays. It has also become part of new projects for storing and sharing climate data. Writing documents, preparing slideshows and spreadsheets have also made their way into the "cloud" world. One does not need to have a suite of programs installed on their computer to do that anymore - everything can be done or updated and stored online. Google has developed a set of products in the "cloud" that makes the collaboration process a lot easier. Your document is always updated. Collaborating on scientific papers could not get any better than that!

Writing Scientific Manuscripts

Working on multiple-author manuscripts or proposals can be very time consuming when it comes to the writing/editing phase: a) creating a first draft file; b) sending it by email to the other co-authors; c) the co-authors then use "Track Changes"; d) the co-authors send the text back; e) the first author reviews the changes and creates a new draft; f) then the endless sending a file back-and-forth. The first author normally spends a lot of time putting bits and pieces of the text together - and they may sometimes miss some information in all of that.

Collaborating on a document in the "cloud" is different. Your text is always updated! Whatever a co-author writes, edits or does, your document is updated! When another co-author logs on to that document, they see the newest draft! Comments can be added along the way for the other authors to see. If two or more authors are logged to the same document at the same time, they can even chat with one another and they can see where each co-author is editing the text. No more sending a file back and forth via email!

One example of a scientific paper where the collaboration was mainly done via Google docs is the recently published paper by Bader et al (2011), "A Review on Northern Hemisphere Sea-Ice, Storminess and the North Atlantic Oscillation: Observations and Projected

continued on page 7