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SOARS NEWSLETTER FALL 2007

SIGNIFICANT OPPORTUNITIES IN ATMOSPHERIC RESEARCH AND SCIENCE

A note from the director...

by R. Pandya

I have a friend, Dan Wildcat, who likes to talk about how American Indian dwellings were ideally suited to their environment. The tepee, for example, was a portable dwelling that was well adapted for regular migration into and out of the flood plains. On the other hand, the lodgings of the Plains Indians, who lived primarily in what we know as tornado alley, were long, low-slung, rounded earthen berms that stood up well to severe winds.

What strikes me about this story is the connection between what people knew about the planet and the way they lived. In other words, the story is about geoscience in action—it seems to me like an example of how a society can use its understanding of the environment to make sustainable choices about fundamental and everyday things, like where to live, how to build a house, what to farm. It is inspiring.

The story is also timely. I don't think there is too much argument that all of us—geoscientists, policy makers, voters—could benefit from paying more attention to Earth science in everyday decisions. Many 'natural disasters' wouldn't be disasters if we didn't try to live in vulnerable areas. Yet the fastest growing regions in the US in the last census include the drought-prone desert southwest and the hurricane-prone Florida coasts. Our energy-intensive lifestyles, fueled by swiftly depleting fossil fuels, have altered the planet's climate and ecology. Meanwhile, according to the EPA, the average fuel economy of American cars and trucks has actually decreased since 1985. In short, we seem to ignore what we know about our planet in deciding how to live on it; geoscience has become disconnected from societal decisions. It is especially ironic, given that we probably know more about Earth now than ever before.

While it would be convenient and perhaps even comforting to blame society for not taking advantage of the knowledge and expertise we have to offer, it probably isn't that productive. Worse, we ourselves may have contributed to the disconnect between Earth science and society by prioritizing the esoteric over the useful, the elegant over the practical, and theory over practice.

Instead of agonizing over the apparent tension between meeting society's needs and doing curiosity-driven research, we should look for opportunities to do both. For instance, Donald Stokes, in the book ***Pasteur's Quadrant***, introduces the idea of use-inspired basic research. In this model, theoretical and applied research are integrated and specific applications inspire and guide basic investigation. The geosciences are well positioned to lead in the area of use-inspired basic research.

As an example, consider research into El Niño and its associated impacts on drought, which has led to both increased understanding of the atmosphere-ocean system and improved famine early-warning systems.

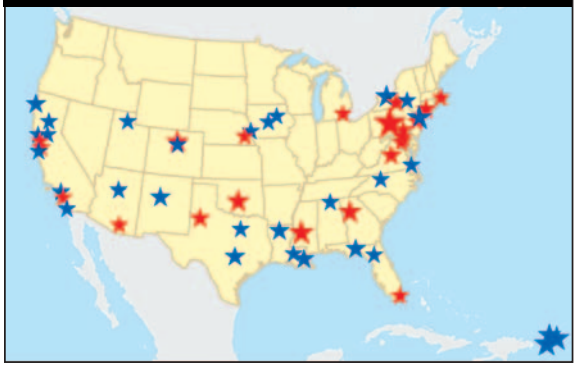
This kind of shift in perspective can provide the broad philosophical framework for reconnecting geoscience and society, but we, as geoscientists, also need to roll up our sleeves and get to work. As scientists we already have a strong standing with the public: we share with doctors the top spot in a 2002 Harris poll of occupations having the most prestige. So how do we leverage this prestige to do the most good? I have three suggestions.

The first is to be public with geoscience. We should be out there, loud and proud. Share your science: talk to a class, bring up your research at a party, write a letter to your congressmen, write a kids' book. In short, get out of the ivory tower and get out on the street. And don't be afraid to use the language of the street, either.

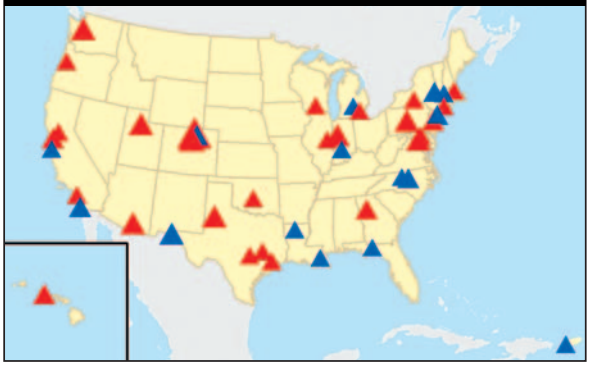
Another way to reconnect geoscience and society might be for us, as geoscientists, to become better listeners. If we want to see geoscience used, then we need to ask what we can do to make it useful. What if we, as scientists, spent more time asking about these concerns, and then based our research on figuring them out.

(continued on page 4)

WHERE PROTÉGÉS COME FROM:
Undergraduate Universities and Colleges



WHERE PROTÉGÉS GO TO:
Graduate Universities



LEGEND

Red = UCAR member or affiliate institution

Blue = Non affiliate institution

NOTE: *Size of symbol indicates relative number of proteges who have attended*

Maps created by Jennifer Boehnert

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The SOARS program is administered by the University Corporation for Atmospheric Research (UCAR), which manages the National Center for Atmospheric Research (NCAR) and the UCAR Office of Programs (UOP). Program funding for 2007 is provided by: NSF, NOAA, CIRES, Center for Multi-Scale Modeling of Atmospheric Processes (CMMAP) at Colorado State University (CSU), and UCAR. Visit the

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EXPLORE

RESEARCH

Alisha R. Fernández researched climate influences on Harmful Algal Blooms (HABs) in Sequim Bay, Washington State. Below, she collects samples aboard a NOAA research vessel off the coast of Washington.

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Research takes protégés to air, sea, forest, and abroad

From operating high-tech instruments to dredging up ocean water to bagging thousands of leaves, protégés involved in collecting data this summer were able to partake in some unusual experiences in a range of locations. Four protégés spent part of the summer participating in field research, and all agreed that the opportunities were as valuable as the data collected. Though hours were long and conditions sometimes rough, the protégés say the field opportunities provided worthwhile experience for their future career directions and were not to be missed.

Third-year protégé Alisha Fernandez spent two weeks of the summer on a research ship as part of her work at NOAA's Northwest Fisheries and Science Center in Seattle, Washington. "Certain phytoplankton produce potent neurotoxins that can get into shellfish. When these shellfish are consumed by humans, they cause a sickness known as Paralytic Shellfish Poisoning (PSP)," she explains. Alisha examined the correlation of local climate factors, including wind speed, sea surface temperature, and streamflow, with Paralytic Shellfish Toxins (PST) data in Puget Sound to help predict shellfish toxicity. She spent two weeks shipboard cruising the Strait of Juan de Fuca into the open ocean near Canada and assisting in collecting measurements. Alisha analyzed the collected data to look for the presence of a phytoplankton species called *Pseudo-nitzschia*. "We found there were not large concentrations of *Pseudo-nitzschia* in the areas we expected, so we didn't find a harmful algal bloom and that was very welcome news."

Theresa Aguilar was on the ground in Germany and France helping deploy a Doppler on Wheels (DOW) during the Convective and Orographically-induced Precipitation Study (COPS). Theresa's research during her second SOARS summer focused on radar measurements of boundary layer convergence zones. These zones, or areas of air coming together near the surface, often mark the location of thunderstorm development and lead to measurable rainfall. For the two weeks Theresa participated in the campaign, weather conditions brought mostly stratiform rain rather than the convective conditions the group was seeking. "We had one day with a boundary but it was a weak boundary," she explains. Still, she had a chance to operate the DOW and observe how the instrument worked in the field. "I really got to better understand radars," she says. "It was also an experience to see how everything comes together in a field campaign and the tremendous amount of work that goes into the projects and the research."

Katherine Fornash, a first-year RESESS protégé, traveled to California to collect samples of fallen leaves from five different species of oak trees. Inspecting the damage to the leaves can provide information about plant-insect interactions and how climate might affect these relationships. For her summer research, Katherine examined 2,390 leaf samples from a 30-million-year time interval. The findings suggested a need for additional information that could be obtained through modern sampling, but acquiring the samples proved to require far more than simply picking up leaves. Over a two-week period, Katherine and her research partner collected nearly 4,500 leaves from the leaf litter of about 50 trees at two California sites and carefully labeled each sample for transport back to the lab in Colorado. "Ultimately, the leaves are digitally scanned so that the extent and type of insect damage can be analyzed. Studying changes over time can provide information on how plant-insect relationships have evolved," she explains.

Theresa Aguilar inspects an incoming cloud system alongside the DOW in Germany.

Anastasia Yanchilina flew aboard NCAR's C-130 research aircraft preparing for and *(continued on page 4)*

PROTÉGÉ AND ALUMNI ACCOMPLISHMENTS

Rynda Hudman completed a PhD in Engineering Science at Harvard University. She received the commencement marshal award for service to the Harvard student community.

Lorenza Levy received a PhD in Astrophysics from the University of North Carolina at Chapel Hill in May 2007.

Bret Harper completed an MS in Energy and Resources at the University of California, Berkeley.

Amber Reynolds successfully defended her master's thesis in July and will receive her MS in December. She presented her results at the International Radar Meteorology Conference in Australia and has received a National Science Foundation Integrative Graduate Education and Research Traineeship (IGERT) fellowship to begin work on a PhD in Wind Engineering at Texas Tech University.

Shanna-Shaye Forbes received a BS in Electrical Engineering from the University of Texas at Austin. She has begun a graduate program in Electrical Engineering and Computer Sciences at the University of California, Berkeley.

Kimberly Trent graduated from Yale University in May 2007 with Distinction in her major and recognitions for Magna Cum Laude and Phi Beta Kappa. She received the Applied Physics prize for her senior thesis, which built on her summer 2006 SOARS research project.

Braxton Edwards received a BS in Meteorology with minors in Mathematics, Hydrological Science, and Geographic Science from the University of Oklahoma School of Meteorology in May 2007. In June, he began employment at the Oklahoma Department of Environmental Quality as an Air Toxins Modeler in the Technical Resources and Projects section.

Armand Silva received a BS in Meteorology from the Pennsylvania State University in May 2007 and is starting an MS program in Geography, also at Penn State.

Waleska Rivera-Rios has accepted a new job as a science teacher at Valle Verde Early College High School in the Ysleta Independent School District.

Yarice Rodriguez is the lead author of a paper accepted for publication. Rodriguez, Y., D. A. R. Kristovich, and M. R. Hjelmfelt, 2007: Lake-to-Lake Cloud Bands: Frequencies and Locations. *Monthly Weather Review*, in press.

Nicole Ngo is beginning a PhD program in Sustainable Development at Columbia University.

Erik Noble is the recipient of the 2008 NASA Graduate Student Research Program Fellowship at the NASA Goddard Institute for Space Studies (NASA GISS) in New York City. This award will fund his PhD thesis work using the Weather and Research Forecasting Model for regional climate modeling applications over West Africa.

Anthony Didlake, Jr. passed his PhD qualifying exam in the Atmospheric Sciences department at the University of Washington.

Marco Orozco has completed the coursework and passed the qualifying exam for his MS program and is currently doing research in the Rowland/Blake Lab at the University of California, Irvine.

Anastasia Yanchilina (right) and her mentor Lee Mauldin preparing instruments on the C-130 research aircraft.

Research...(continued from page 3)

helping to implement the Pacific Atmospheric Sulfur Experiment (PASE). Her work as a first-year protégé explored the best techniques for measuring dimethyl sulfide in the atmosphere. Anastasia was part of the NCAR team studying the sulfur cycle and sulfur's effects on aerosols and cloud formation from Christmas Island in the South Pacific Ocean during PASE this August and September. In the field, she alternated time aboard the aircraft with being on the ground working on the instrument. "We did an eight-hour-long research flight measuring several chemical species at different atmospheric altitudes, including at about 100 feet." Anastasia explains that the data are plotted in real time. "We could see how the concentrations of different gases changed with height. Hydroxyl, or OH, had higher concentrations at lower altitudes and that affected the methane-sulfonic acid and sulfuric acid profiles as well," she says.

All of the protégés describe their time in the field as something totally new in terms of the duration and level of responsibility required, however all also speak highly of their experiences. "It's an opportunity everyone should take advantage of given the chance," says Katherine. "That opportunity to work outside is one of the things that drew me into science in the first place."

From the director (continued from page 1)

This approach has lots of names (use-inspired basic research, usable science) but the basic idea is simple: maybe part of the reason our science isn't used is that we aren't asking people what they want to use.

Finally, implicit in all of these efforts is the need to improve our abilities to work in teams. We are already skilled at dealing with complexity and uncertainty, but we may not be great at actually making the final decisions. So we need to work with people and professions who are. Maybe not all of us should actually come out of the ivory tower and onto the street, but we should all be connected to someone who is.

So, what does all this have to do with SOARS? SOARS helps scientists grow. And we want to nurture scientists who can connect to the world—who have both deep expertise and the ability to contribute that expertise. So that means SOARS helps protégés develop other skills besides research, and sometimes includes different kinds of research. This focus is why we have SOARS protégés working on societal impacts and education, why we have a week-long team-building and leadership training workshop, and why we have teamed with the American Meteorological Society to offer interested protégés a two-week symposium exploring the world of policy. After all, the earthen lodges of the Plains Indians probably were not invented by a scientist alone in a lab looking at anemometer data. However, someone using scientific perspectives in the form of observations of Earth probably was involved in their design. SOARS is working to create scientists similarly connected to their communities' needs.

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