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Just like ‘real’ scientists — high school teacher Paula Dell at the bottom of the world

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Paula Dell is a national board-certified science teacher at Lindblom Math and Science Academy in Chicago, Ill. As a participant in [PolarTREC](#), a teacher field experience program funded by the National Science Foundation, she accompanied Kristin O’Brien’s team to Palmer Station in Antarctica for two months in 2011 to conduct research on antarctic fishes. In June 2012 she took two of her high school students to UAF to work with O’Brien for three weeks, helping analyze samples collected the previous year. Aurora writer LJ Evans interviewed Dell and Janet Warburton of PolarTREC last May for this online supplement to the fall 2012 Aurora magazine.

Dell’s bio on Lindblom’s webpage says, “Dell is a strong proponent of teaching science through inquiry and pushes her students to design their own labs, to think through problems as a team and propose explanations based on the evidence they collect. Just like ‘real’ scientists.”

the background. Photo courtesy Kristin O’Brien.



Aurora: How did you come to be on the R/V *Laurence M. Gould* on your way to Antarctica?

Dell: I was pretty lucky! I do a lot of work with Shedd Aquarium [in Chicago], and one of the people there told me about [PolarTREC](#). I actually applied a couple of times. It's pretty competitive — they get 200 or more applications and only pick 12 every year. I think this was the third time I had applied. Kristin saw my application and she and Lisa and Bruce decided to invite me to come along.

Once we were [in Antarctica], I went out with Kristin and Lisa on the fishing trips. You put the nets down and pull them up, then unload the trawl and quickly put the fish they want to keep in the aquariums on the ship. Most antarctic fish are benthic, they dwell on the bottom. You send a net down about once an hour, in shifts around the clock. We throw back everything that's not used for the studies. It's frantic activity for about 15 or 20 minutes every hour.

I was monitoring time and temperature because this was a very temperature-dependent experiment. We kept track with the timers, and every 10 or 15 minutes we took a temperature reading. Kristin put me in charge of making sure we could get the software on the computers and get it running, and rigging up the temperature monitors on the bottom of the tank. Her grad student and I switched off those responsibilities. To the extent I wanted to do dissections and other lab procedures I was welcome to do that as well.



The 2011 icefish project field team included (left to right) Irina Mueller, Devin Devor, Kristin O'Brien, Lisa Crockett and Paula Dell, here on the deck of the R/V Laurence M. Gould with Palmer Station in the background. Photo courtesy Kristin O'Brien.

I was very lucky to be at Palmer. It's small enough that it's a really nice community but there were a number of different experiments going on so I also had the opportunity to work with other scientists. I went out with a group studying the ecosystems in the fjords, helping collect water samples and filtering them for later analysis. Another group was looking at a very unique species of worm that lives strictly in bones of whales. On another project, while others weighed baby giant petrels I recorded the data, and for another I was one of the dive attendants. In the meantime I was also talking to people on station, trying to learn about what they were doing. I worked with a scientist who collected about 600 individual fish eggs. We put the eggs in cryovials that could be frozen so he could take them back to his research lab in Boston.

One of the most exciting things to come out of the whole experience is that two of my students are coming up to Fairbanks to work with Kristin this summer. The students we selected — both sophomore girls — are interested in science and participate in science fairs and science clubs. Isabel Raymundo is Hispanic; she grew up in Chicago. She went pretty far in the science fair. She got as far as citywide — she had a really interesting project on math and origami. Ololade Olawale was born in Nigeria and came here when she was 5 or 6 years old. She is in my ROV [remote operated vehicle] club. The club took part in an international competition, and she was on the team for that.

This will be an interesting experience for them. They are big-city kids going to Fairbanks, which is a little tiny spot, and they will intersect with the RAHI [Rural Alaska Honors Institute] kids who are coming to the biggest city they've ever seen. (Ololade and Isabel stayed in dorms with the RAHI students while they were on campus, but spent their days in O'Brien's lab).

***Aurora:* You blogged a lot about the Antarctica trip and what you were doing and learning.**

Dell: I was supposed to write one every day, and I pretty much kept to that. There were 64 in all. They're all still there at the [PolarTREC website](#).



Paula Dell shows an image on her laptop of her class back in Chicago, live via an online teleconference. Photo by Devin Devor.

Kristin made sure I had time every day to post my blogs. I was able to log into the PolarTREC website directly, from the *Gould* and then from the station. They set aside what they called a little Internet café time when you could have Internet directly. It varied but usually it was an hour or two in the morning and again in the evening. You had to be organized. I tried to be ready to take advantage of the time when it was available.

I tried to make my posts something that my students would want to read. At one point I had a lot of kids asking, “Did you have to kill the animals?” so I wrote a blog post called [Ethical Experimentation](#).

I did one [webinar](#) with PolarConnect and also a couple of times I hooked up live with my school in Chicago. That was pretty fun. I got to talk to my students and they got to ask questions. It was like a video conference. Look at [the blog from May 27](#) – that’s my kids.

Aurora: What are the most important things you took away from this experience?



Paula Dell says that Antarctica was one of the most beautiful places she probably will ever go. Photo by Paula Dell.

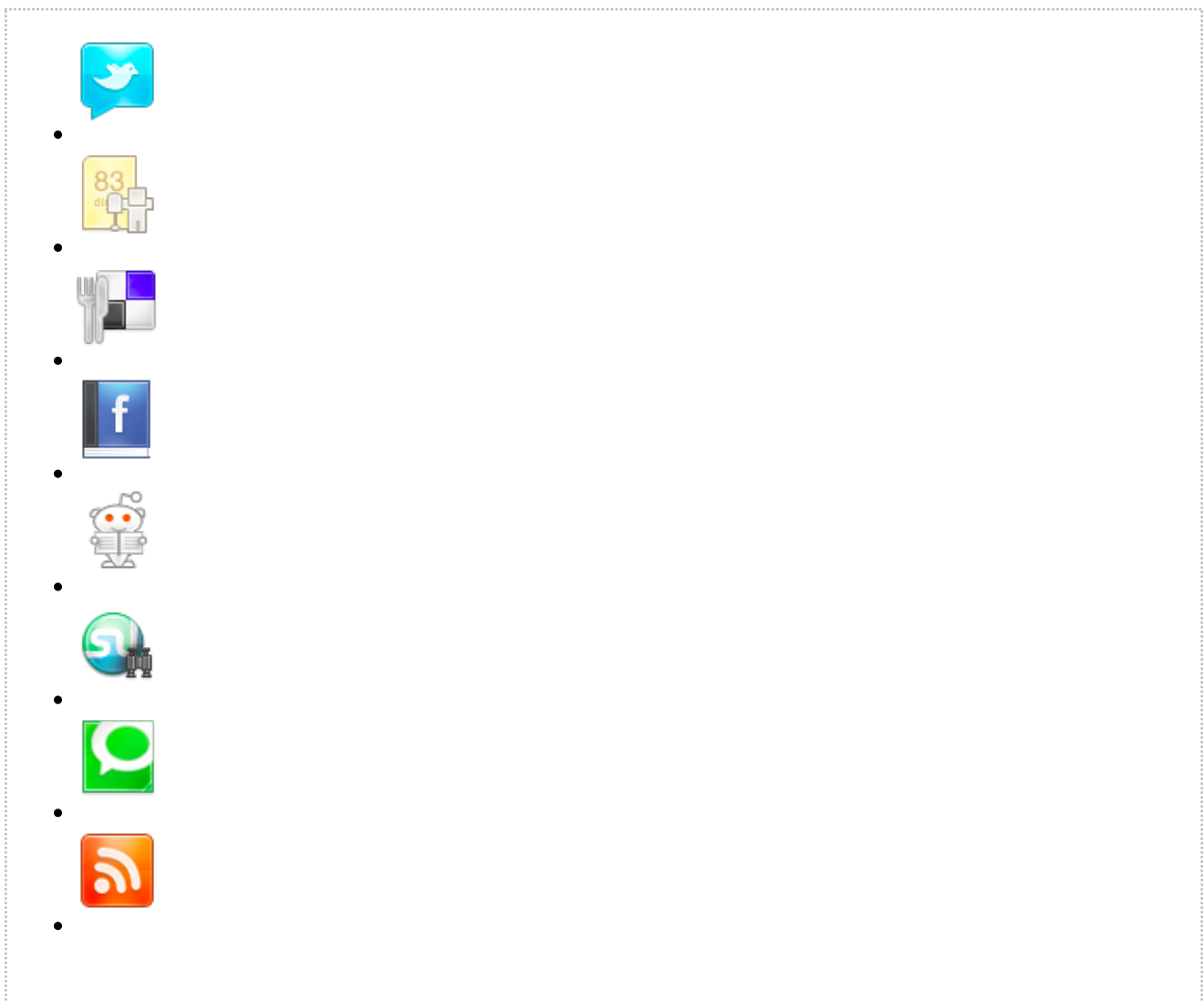
Dell: One of the most memorable things for me was the experience of opening up that whole world of Antarctica. It is so rich and so incredibly intricate and beautiful, all of that continent and the surrounding

area. It really was one of the most beautiful places I probably will ever go. It was spectacularly moving to be there. I had no idea how much science is going on down there. It was very exciting to be part of it. It broadened the breadth and depth of what I know about that area and the research there. As a high school science teacher you don't get an opportunity to do any science yourself so it was great to see some of this on so much a broader scale.

One of the big pluses for me also was that I built a lasting friendship with Lisa and Kristin. The whole experience exceeded my highest expectations, and they were pretty high going in.

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Janet Warburton is the education project manager for the Arctic Research Consortium of the United States, which is based in Fairbanks. She manages the PolarTREC program.

Websites:

- www.arcus.org; www.polartrec.com
- <http://www.facebook.com/pages/PolarTREC/233031165192>

Aurora: What’s the selection process for the PolarTREC program like?

Warburton: On average we get more than 200 applications from teachers around the United States. The target is U.S. teachers but Canadians and teachers abroad have also applied. Those are looked at on a case-by-case basis.

The teacher applications go through a process of review, internal and external. The researchers also apply to the program in order to host a teacher. When we have this pool of teachers and researchers we begin an intensive matching process, then we give the researcher a subset of eight to 10 applications and they select their top three for phone interviews. The researcher makes the final selection. If they have a wide range of

research interests teachers might be matched up with more than one research team. The mix of male to female teachers chosen is right on par with what you see in the classroom — there are more women but there are also men.

Our grant is to match 12 teachers every year with a research project, six each in the Arctic and Antarctic. That's our minimum. Some of the researchers end up having funds already for this kind of support, so they don't need to rely totally on PolarTREC, or maybe there's a partnership with NOAA and their Teachers at Sea program. That kind of support helps the PolarTREC money go further so we can place more teachers. Last year we placed nine in the Arctic and seven in the Antarctic.



Paula Dell is amazed by the size of a caribou antler while in Fairbanks in February 2011 for the PolarTREC training conducted by the Arctic Research Consortium of the United States. Photo courtesy Paula Dell.

Warburton: It costs the teacher and the researcher nothing. Everything is covered except for personal incidentals, for the most part. All the logistical costs are covered by the National Science Foundation. Training is covered through our PolarTREC grant. Pre- and post-travel support is provided for both teacher and researcher so they can continue building on their collaborations. Our grant covers substitute teacher costs at the teacher's school. We provide all the infrastructure, web pages and support — we even pick up miscellaneous costs.

For example, in order to go to Antarctica there is a very intensive medical/dental process, they call it physical qualification or PQ, so we can be sure nothing healthwise will happen while they're in this remote location. We pay for medical bills above what their insurance covers that the teachers incur in order to qualify. The NSF logistics contractor provides any needed equipment and gear, such as boots and heavy socks, insulating layers and specialty equipment like helmets and gloves.

Laptop, camera and necessary adapters for the teachers are covered by the PolarTREC grant. This is a loan — the equipment is returned after all the work associated with the expedition is completed.

Every teacher who goes on a PolarTREC trip is required to produce at least two lesson plans that go in our [online resources database](#). Most of the teachers also produce other things like videos to go along with or expand on their lessons.

***Aurora:* What's in it for the researchers? Why would they choose to do this?**

Warburton: There are lots of different answers to that — each researcher is different. Most of the researchers we work with are applying for federal or NSF funding. There's a section in their proposal called broader impacts that asks them to justify their research by explaining to the public what it all means. In their proposal they have to explain how they are going to get the information about their research out to the public. They find PolarTREC an attractive prepackaged way of addressing that requirement. The teacher comes trained to work with the researcher, already trained on how to do outreach and work with the media and public.

But what's turned out is that we have researchers not just trying to fulfill the obligation of their grants, they really want to have that teacher help translate their work to the public. The researcher will come to us because they see that teachers are good communicators about science and they see them as a valuable component of their team. Maybe initially they took a leap of faith but once they've had that teacher on their team they're very excited about it.

For most teachers this is a one-time experience and they give it everything they've got. They're willing to work 15-hour days, whatever is needed, whatever it takes. The teachers are super enthusiastic, hard workers. They lend a willing and able hand. The researchers tell us the teachers worked long, long hours doing the field work and then they came back and did online journaling for their students. They've told us the teachers put in all this time late at night posting to the blog. Sometimes they work all night until everything is done.

Most of the researchers, once they've had a teacher, if the experience went well, they're converted. They really do value the teachers as professionals to help them communicate the science. The teachers have really become members of their team. We get repeat offenders like Kristin and Paula, researchers that apply year after year to have a teacher on their team. We know we've done really well when we have people who keep on collaborating. Sometimes they say, "I want that person on my team again next year!"

The gold standard is when the researcher says, "We just want to use the PolarTREC website for virtual support. I've written this teacher into my grant." The researcher sees there is a place on their team for education and outreach and they see this role is as valuable as their research. The relationships afterward go on in many different ways and success looks different in each case.

A researcher named Max who took a teacher out in 2004 changed how he does his science "business" because of that experience. We call it the "Max factor." It wasn't so much that he has taken a teacher out every year since then but that now, instead of just addressing the NSF bare minimum to reach the education outreach requirements, he makes the outreach a big part of his proposal in lots of different ways. Education outreach has become part of his research planning. It's integrated into his entire thinking of how he's going to do his research. That's a huge shift.

***Aurora:* Who does the teacher training, and what did it cover?**

Warburton: Whether they're going to the Arctic or the Antarctic the teachers attend a weeklong orientation and ShareFair training here in Fairbanks, which is coordinated by ARCUS. It's usually scheduled in February or early March. For some of the teachers it's the first time they've seen snow or experienced extreme cold.

The weeklong orientation focuses on team building, helps them prepare for what's going to happen on their expedition, how to work with research teams, how to manage the logistics, how to get around. There's a lot of support from alumni — teachers who have done it before — and people to bounce ideas off of and who have tips for working with their school's administration. At the end of that week, most of the teachers tell us in their evaluations it's the best workshop or professional development they've ever participated in. It's an amazing week. When you do those post-fieldwork calls and the evaluation we can see that this is good, this is what needs to happen. You just feel happy to be able to provide these people with these experiences.

Aurora: Where did PolarTREC come from?

Warburton: I started it here at ARCUS in Fairbanks. The initial grant that started it was for a program called Arctic Alive. I hired a teacher, Patrick Lovely, to work with Hajo Eicken at UAF. That was the pilot project for this idea. That evolved into another NSF-funded program called TEA, Teachers Experiencing the Arctic/Antarctic. That ended in 2004, and at about that time, NSF gave ARCUS funding on a year-to-year basis to run TREC, but it was only Arctic-focused.

Then, I took all the things I'd learned through all these programs — best practices, what worked and what didn't, follow-up talks with the researchers about having teachers — and I put together a proposal for the PolarTREC project. In 2007 some special funding for IPY (International Polar Year) became available and I put together a proposal to fund the program for three years. At that time we expanded from just the Arctic to both poles.

There are other programs to connect researchers with teachers but we're one of the only programs that lets researchers select their teachers and we were one of the first ones to start an intensive evaluation process. We have an external evaluator for the entire program. Evaluation had not been part of earlier programs. That evaluation is also in the continuation grant which runs 2010 to 2014, which is funded exclusively by the NSF Office of Polar Programs.

A unique aspect of the evaluation process in this grant is that we are able to do case studies. The evaluator is looking at teachers who participated in expeditions during the period of the IPY grant and examining how they became better teachers of science afterwards. She does classroom observation and looks to see if they're teaching scientific inquiry in their daily teaching practices. Case studies are an expensive evaluation tool but it's really needed and we're planning on being able to share the data with anyone who's interested.

Part of our evaluation package is looking at changes in the students' knowledge of the polar regions. So far even that data shows that when teachers have been out in the field their students definitely have learned more about the polar regions and science in general, and in particular, girls have become more interested in science and in education.

For more information:

- [Paula Dell's blog posts from Antarctica](#)
- [The PolarTREC website](#)
- Websites about Kristin O'Brien's research include <https://sites.google.com/a/alaska.edu/k-m-obrien-lab/> www.iab.uaf.edu/research/research_project_by_id.php?project_id=152&new_window_button=true
- [Story about Kristin O'Brien's research which appeared on National Public Radio's science blog *EarthSky*](#)