field notes
The VECO Polar Resources Newsletter
March 2007

Science Along Alaska's Yukon River

By Patricia Janes

University of Alaska scientist Kenji Yoshikawa is gearing up for a springtime snowmobile trip along the Yukon River. This month, he and Tohru Saito, a researcher at the International Arctic Research Center, will load two Skidoos and sleds with everything from heavy clothes to special warming tents and frozen foods. But they are not embarking on an ordinary camping trip. Following Alaska's longest river across much of the state, the duo plans to stop at one remote village after another. At each stop, they will set up permafrost-monitoring stations at village schools—drilling boreholes into the frozen earth and working with students to set up the stations.

Yoshikawa has been making trips like this one since 2005. That's when the University of Alaska received a grant from the National Science Foundation for the Permafrost Health project. The outreach effort involves students in grades 5 through 12 and is part of Alaska's Experimental Program to Stimulate Competitive Research (EPSCoR). So far the team has installed permafrost temperature monitoring systems at eight schools across the state, in Barrow, Noatak, Nome, Beaver, Fairbanks, Healy, Circle, and Glennallen. The number of schools involved in the project will rise to approximately 25 by the end of Yoshikawa's Yukon trip.

Top Photo: Yoshikawa encounters challenging drilling conditions at Glennallen High School due to boulders and clay till left by glaciers.

Why go to such great lengths to observe permafrost? Depending on calculation methods, an estimated one fifth of Earth's land surface sits atop permafrost, which scientists define as soil that has remained below 0 degrees Celsius year round for two or more consecutive years. Above the permafrost is what's called the active layer, or the layer of soil that thaws out during the summer every year and then refreezes the following winter.

In Alaska, a continuous layer of permafrost occurs north of the Brooks Range, but as one ventures southward, this frozen layer becomes discontinuous. Scientists are worried that as climate change nudges Earth's average temperature ever higher, expanses of permafrost are at risk of thawing out—especially in regions where the frozen ground is currently near the thawing point.

Most of the schools involved in the Permafrost Health project are located in these so-called discontinuous permafrost zones, says Yoshikawa. Data from these schools has shown that in many places, the soil is warmer than –1 degree Celsius—hovering dangerously close to the 0 degree Celsius thawing point. If the permafrost were to thaw, the consequences would be sobering. For instance, bogs and swamps could drain into the newly penetrable soil thereby altering entire ecosystems. Native people who rely on the region's natural resources for their livelihood would face a changed landscape.

Thawing permafrost could also affect engineering calculations, says scientist Doug Goering, a researcher on the EPSCoR permafrost project who manages the outreach effort. "A lot of these remote villages have structures that are on a pile foundation, and permafrost temperatures have a fair amount of effect on the design of those pile foundation structures," he says. It will be important to monitor the way permafrost responds to a warming climate and how that affects the stability of existing buildings. Engineers will then be able to apply that knowledge as they design future structures.

Yoshikawa downloads information from a data logger at Nome Charter School in September 2006.

For this reason, Goering believes that the Permafrost Health program is an important component in the development of a circumpolar permafrost temperature database—one that he would like to see expand into regions like Norway and Siberia. For now, however, Yoshikawa's Yukon trip this spring will add monitoring sites to Alaska's existing stations and expand scientists' overall permafrost dataset. "It is always better to have more data points, especially [in] remote rural areas," says Yoshikawa.

Just as he has done in the past, when Yoshikawa goes to drill the new boreholes, he will look for an undisturbed site. There, he will drill a borehole that is approximately 5 centimeters

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The Art of Student Partners Project Science: Reaching out with Max Holmes

By Kip Rithner

(L) A young critic examines the art. Photo: Ekaterina Bulygina (R) Holiday of the Reindeer by Senya Koryakin, 11 yrs. old, Zhigansk, Sakha Republic, Siberia.

"The last thing I expected to do was curate an art exhibit," says Earth systems scientist Max Holmes with a chuckle. But that's what he did, when, bridging that classic dichotomy between science and art, the researcher from Woods Hole Research Center opened an exhibit, *Young Artists for Global Awareness: The Children of Zhigansk, Siberia,* at the Bancroft Gallery in Boston's South Shore Art Center on March 4. The gallery showcases paintings given to him by Russian schoolchildren who work with Holmes on his NSF grant, Student-Partners: A Pan-Arctic Science and Education Collaboration. Broadly stated, the Student Partners Project is involving students, teachers, and community members living next to the six largest rivers that empty into the Arctic Ocean in Alaska, Canada, and Russia in sampling "their" rivers. (For more on the research, which uses water chemistry to understand freshwater transport to the Arctic Ocean and its impacts, read this newsletter's cover article from August 2, 2006).

Last November during a visit to his colleagues in Zhigansk, Holmes received a collection of paintings from the students. "They were beautiful, and showed amazing talent given that the kids were so young," Holmes recalled during a recent phone conversation. "I knew they were a treasure, but I had no idea what to do with them." A friend suggested he approach the South Shore Art Center, and the exhibit fell in to place when, with what now seems like characteristic Holmesian serendipity, the normal two-year wait evaporated: a previously scheduled exhibit fell through, clearing room for the Zhigansk pieces to show during this March's IPY kickoff.

In addition to about 30 paintings, the exhibit includes other artifacts—beadwork, carvings, and native clothing, including traditional custom-made garb Holmes wore to the opening made by Illnova Maria Nickolaevna, an "elder" in Zhigansk. A highlight of the exhibit opening, which was attended by about 150 people, was the fact that students and teachers in Zhigansk participated throughout via live Skype videocast, which began at 5 a.m. in Zhigansk. In addition to hearing Holmes' remarks, the Zhigansk students and teachers were also able to speak with the audience in the gallery (in English!).

"The opening was a fantastic success," Holmes observed. "There were lots of kids at the opening and they lined up taking turns talking and text messaging with the kids in Zhigansk. Great fun!"

(L) Max Holmes' presentation was well-attended. (R) Max Holmes talks about the Student Partners Project. Photos: Ekaterina Bulygina

The Student Partners Project has had a huge impact on Holmes. More than research associates, the people of Zhigansk have become "important friends," he says.

"I'm so proud of the students in Zhigansk and feel very privileged to be friends with them. I get great satisfaction from feeling like I'm having an influence on them and am also grateful for the influence they're having on me. In some ways they don't have much compared with what we have in the US, but the quality of their education is incredible and the students are extraordinarily insightful. I think we have at least as much to learn from them as they have to learn from us.

"As a scientist it's important to write science papers and to give scientific presentations," Holmes continues. "But when working on issues as pressing as climate change it doesn't seem like enough. To me getting the story to the public may be the most important aspect of what we do, so I get tremendous satisfaction from connecting with the people who live in the places where I'm doing my research—and learning from them about the changes now impacting their lives."

Anya Suslova, the boat captain's daughter who in 2003 sparked the *Student Partners* collaboration by continuing sampling activities after the American researchers had left for the season,

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in diameter and six meters deep. Next he will line the borehole with PVC piping. Then students will join Yoshikawa in calibrating temperature sensors and attaching them to a cable in one-meter intervals. Together, Yoshikawa and the students will lower the installation, which typically has a total of eight sensors—six of which are below ground in the piping, one that is at the ground surface, and another that measures the air temperature. Students will also help to install small, battery-operated data loggers that will collect the temperatures on an hourly basis.

Students at Tri-Valley School in Healy, Alaska, prepare temperature sensors for installation at a permafrost monitoring station.

The data points that are retrieved from the sensors are extremely accurate and make for a valuable classroom lesson about spreadsheets and plotting, says Goering. And since the project uses temperature sensors that are exact to within a small fraction of a degree Celsius, "we get good data out of these borehole measurements," he says.

Of course, it will take years of monitoring to know if the permafrost temperatures at each site are increasing due to global warming. But "with any luck we'll be able to maintain at least some if not most of these sites for many years to come," Goering says.

In the meantime Goering and Yoshikawa have a more immediate goal. Since many of the children involved in the project live in remote villages, they don't have much opportunity to interact with researchers. "It's not like they're next to a big industrial park," says Goering. They hope their program will tap into kids' natural curiosity and get them interested in learning more about the local ecosystem, and in science and technology in general. In addition to gathering useful permafrost data, Goering and Yoshikawa hope that the Permafrost Health project will inspire a new generation of arctic researchers and permafrost specialists.

To get more information about the Permafrost Health project and for updates on Yoshikawa and Saito's progress along the Yukon River, visit: www.uaf.edu/permafrost/

For permafrost data and maps, visit the Frozen Ground Data Center at the National Snow and Ice Data Center: http://nsidc.org/fgdc/

Even if the kids with whom they're partnering do not decide to pursue science as a career, Goering and Yoshikawa believe their work will not be in vain: When the younger natives involved in this program grow up, they will remember their collaboration with the scientists. In fifty years, when they are the elders of their communities, they will be able to speak knowledgably about the presence of permafrost in the early 21st century, says Yoshikawa.

Patricia Janes is the executive editor of Scholastic's Science World and SuperScience—magazines for kids in grades 6-10 and 3-6 respectively.

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is still involved in the work. Now 17 and a college student in Yakutsk, she wrote a letter for the Boston exhibit. Parts read like a manifesto on the gains to be made from *Student Partners*-style research:

I felt part of a great team. We sampled the water, talked a lot . . .and went fishing. I learned to see the unusual in the things I saw everyday – I better understood what those warmer winters, or the fewer fish, really mean. . . . I know that the next generation of the [sic] students is going to be better informed, not just studying the causes of climate change, but taking action on it."

"She's where it all began," says Holmes.

While the Russian collaborations have flourished, those in Alaska and Canada are progressing a little more slowly. "In Russia, the school is a central part of the community, and teachers are usually indigenous and respected community members," Holmes notes. "In North America, the teachers often come from elsewhere and stay for a year or two to get experience and then leave. Since the *Student Partners Project* is built on personal relationships, continuity of participants is critical." Holmes is now working on strengthening project continuity in the North American villages by working with key members of the community, outside of the school systems.

Review pictures of the scientist working all over the Arctic and it's clear that he has not only the mind but the heart for this work. Holmes bends over the students, a smile lending encouragement as he shows them the sampling protocol. The father of a toddler, one senses in talking with him that Holmes knows his work may bear fruit in the next generation of scientists, an important potential payoff.

For if Holmes' generation gets to talk about the weather, future ones may have to do something about it. And Holmes' Student Partners Project is working toward that goal, by inspiring, and educating, those who will live with the legacy we have created for them.

The exhibit, *Young Artists for Global Awareness: The Children of Zhigansk, Siberia*, runs through April 8.

denver

VPR staff were delighted late last month to see a press release on the NSF's website about the Clean Snowmobile Challenge featuring comments from our renewable energy expert, Tracy Dahl. Tracy will attend the challenge this month at Michigan Technical University, judging the zero-emissions category (which is sponsored by the NSF). Contest winners will visit NSF's Greenland research hub Summit Station atop the ice sheet this summer to see their snowmachines in action and meet with scientists working there.

Self portrait of Larry Levin.

We have our own mechanical wizard who could (time permitting) probably design a champion clean snowmobile: recent VPR full-timer, Polar Field Services' Larry Levin. Larry moved to Fairbanks from Lynnwood, Washington in 1992 to attend the university's civil engineering program. Summer work at the Institute of Arctic Biology's Animal Quarters led (as these things so often do!) to the Antarctic Program, where he first worked for Jill Ferris in 1995. Here in the Arctic Program, he's had an array of technical/mechanical tasking since 2000, including the Phase I winter period at Summit Station in 2005. Last year Larry focused on Toolik Field Station infrastructure upgrades, including the generator project. This year, in addition to finishing those tasks, Larry will address Summit Station projects, including expanding the waste heat recovery program and other "green" efforts there. "My tasking is pretty broad," he admits. With his amazing technical savvy and willingness to tackle any job and get it done, he probably wouldn't have it any other way. As for us, we're delighted to show Larry on the list of VPR full-timers.

alaska

Traverse! The VPR Alaska office was busy with preparations for three traverses last month, all of which are either underway or about to be so. First, we helped Kenji Yoshikawa field-test snowmachines for his two-week traverse along the Yukon River this month for EPSCoR permafrost outreach activities. We feature this outreach in our cover story this month.

VPR superheroes Matt Irinaga and Larry Levin prepare to test the new machines.

Next, we prepared for Paul Pregont and dog team's March 9th arrival at our offices to stage for a March 11th departure to Russia. This three-month, GoNorth! dog-sled learning adventure through Chukotka, Russia, will carry NSF-funded participant Aaron Doering (University of Minnesota) as he conducts work for his project, What's Climate Change to You?. Doering will spend about two weeks with GoNorth!, spearheading the educational component of the adventure, and visiting about eight communities en route to discuss with local schoolchildren and others the impacts climate change is having on their lives. Follow along as the team makes its way across Arctic Russia by visiting the project's GoNorth! website.

Finally, we worked with Matthew Sturm (Cold Regions Research and Engineering Laboratory) to finalize our support for his snowmachine traverse from Circle, Alaska, to Baker Lake, Canada—the Barrenlands Traverse. The five-person team will follow the curve of the Arctic Circle on their 3500 km snowmachine trip, through some historic places and remote villages, as they seek answers to this question: *What is the real Arctic?* In addition to community meetings along the way, the team will carry information about and greetings from school children from participating schools, bridging the distances between. Follow along—or better yet, participate!—via the project's website.

greenland

Summit February 10 was "a beautiful day at Summit," writes Phase II manager Kathy Young. The arrival that afternoon of a Twin Otter with the Phase III staff and Summit project manager Sandy Starkweather to assist with turnover meant "many smiles in camp." After several days of turnover, three of the four Phase II crew departed Summit on February 15, with Andrea Isgro staying behind to continue as science technician. Now on station with her: Brad Johnson (manager/equipment operator), Pat Smith (mechanic), and Andy Clarke (NOAA science technician).

The new crew has settled in to life on the world's roof, all experienced hands. As storms buried the station's buildings during the early winter, Brad Johnson began the big job of clearing snow. Early in the month, relatively fine weather led him to remark, "We hope

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Pat Smith, Andrea Isgro, Brad Johnson, and Andy Clarke. Photo: Pat Smith

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the weather will continue to be as nice as it has been. However, we are a superstitious lot and we fear a backlash." Sure enough, low temperatures made outdoor work impossible at times (machinery stalls in the cold). Late in February, the mercury dipped below -64°C.

On March 3, the team observed the scarlet moon during a total lunar eclipse.

IPY news

On your mark! The IPY got underway as about 60 countries around the world got busy on IPY projects after the starting bell on March 1. Read IPY outreach and education leader Rhian Salmon's engaging summary of launch events on the official IPY website.

The United States honored the IPY on February 26, with presentations from directors of the NSF, The National Academy of Sciences, the US Geological Survey, and others. Watch the proceedings here.

Students in Fairbanks and Healy, Alaska, swapped stories about how warming at the poles is impacting their lives with students in Ushuaia, Argentina, courtesy of the University of Alaska-Fairbanks.

Another cool IPY celebration: Ice Fest March 8-12 at the University of Colorado's Cooperative Institute for Climate Research. The weekend was organized around events appropriate for the entire community.

other news

SRI's Todd Valentic wrote from Poker Flat, Alaska, the world's largest land-based rocket range, last month: 'We've been busy here at Poker Flat with the new AMISR radar. AMISR is NSF's next-generation radar for studying the upper atmosphere and near-space environment. The first operational use of the system has been to support the NASA sounding rocket campaigns taking place here in January and February. Of course, this makes for a great time breaking out the camera, so I thought you'd enjoy seeing some pictures.'

Up, up, and away! Rockets and the aurora paint the night sky at Poker Flat. Photo: Todd Valentic

Chilling climate-change metaphor of the month: "I don't think people really comprehend how dramatic a negative impact [warming is having] on Eskimo cultures. This loss of sea ice, we're not just taking away the bison here, we're rolling up the plains behind the bison." Brendan Kelly, NSF, in this Fairbanks Daily News-Miner article about threats to ring seal populations as a result of sea-ice destruction related to warming.

Kenji Yoshikawa also talks to Ned Rozell about his EPSCoR work in this article.

Inuit are Riding the Winds of Change.

Tips from our Planning Staff

As we ramp up for a busy International Polar Year of fieldwork, we want to remind our researchers that some planning tools are available on-line.

- See who's in the field this year: visit armap.org. View the information via an interactive map interface or run a text-based report that offers summaries of the science projects along with links to more information.

- Check out our planning calendars. Available via links on vecopolar.com, view upcoming fieldwork in your choice of daily, weekly, or monthly views, subscribe to email distribution lists or RSS feeds for calendars that interest you, and save events to your personal calendar software.

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