



# THE WOODS HOLE RESEARCH CENTER

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## Innovative Participation to Bring Arctic Science into the Classroom

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An upcoming expedition to study the Yukon and Mackenzie Rivers is not simply a research project for R. Max Holmes, an associate scientist at The Woods Hole Research Center. It is also a means to integrate education and outreach into his work.

In June and July, Dr. Holmes, an ecosystem scientist with broad interests in the responses and feedbacks of ecosystems to environmental and global change, will travel from Woods Hole, Massachusetts, to Canada and Alaska as part the PARTNERS program (Pan-Arctic River Transport of Nutrients, Organic Matter and Suspended Sediments). This 5-year, \$2 million project, sponsored by the U.S. National Science Foundation, is a collaboration of 4 nations to study fresh-water discharge from Russian, Alaskan, and Canadian rivers into the Arctic Ocean. Accompanying him on his travels will be Amy Clapp, an elementary school teacher from Salisbury, Vermont, as part of Teachers and Researchers Exploring and Collaborating (TREC). TREC, a program in which K-12 teachers participate in Arctic research and work closely with scientists as a pathway to improving science education through teachers' experiences in scientific inquiry, builds on the outstanding scientific and cultural opportunities of the Arctic to link research and education through intriguing topics that will engage students and the wider public. This is Dr. Holmes' second year of participating in TREC. During their expedition, Holmes and Clapp will have daily communications with students and the public, using a satellite phone hooked to a laptop computer for internet communications. According to Holmes, "Getting kids excited about science is the most important thing. If they realize that science is an exciting process as opposed to a bunch of boring facts to memorize from textbooks, then this program will have been a tremendous success."



**Max Holmes (center) with school children in the Siberian village of Zhigansk. Photo by Amy Clapp.**



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**Anya Suslova collecting Lena River water samples. Photo by Max Holmes.**

In addition to his work with TREC in the Arctic, Holmes has taken other opportunities to creatively connect science and education. In 2003, Holmes, along with 5 other American and Russian scientists, participated in a two-week water sampling expedition on the Lena River in northeast Russia. While on board, he saw that the boat captain's 13-year old daughter was very interested in the process. Communicating primarily through translators, he explained the work being done and she quickly mastered the basic sampling protocols. At the end of the trip, he explained to her how more frequent sampling would help scientists learn more about the Lena River, and that if she wanted to continue participating in the PARTNERS project she could be a big help. Anya agreed, so Holmes provided her with sample bottles and instructions on how to take samples from the Lena throughout the winter.

Since September 2003, she has collected samples at 2-week intervals, often taking a snowmobile driven by her father out

to holes in the ice and occasionally in temperatures as low as -55 degrees Celsius (-67 degrees Fahrenheit). Anya's samples are already proving to be highly valuable, as her high frequency samples have captured temporal variability that otherwise would have been missed.

Because of Anya's interest, in May and June 2004, Holmes, Clapp, and Alexander Zhulidov, a Russian scientist who had been on the Lena trip, visited her school in Zhigansk, Siberia, to talk about science and the environment. Before leaving, they supplied the school with additional sampling kits, and now other students and teachers are involved in sampling the Lena River for a wide range of chemical constituents.

Holmes plans to expand the kind of student-teacher-scientist partnership they've developed in Zhigansk to several other sites throughout the Arctic. According to Holmes, "capitalizing on the energy and enthusiasm of students has tremendous benefits for education, for science, and for society. The relationship we've developed with the community of Zhigansk is paying huge dividends scientifically, and it also helping us to get our science to the public." Holmes envisions a network of schools in the Russian, Canadian, and Alaskan Arctic, participating in an international research effort and at the same time learning about cultures and ways of life in other parts of the Arctic. "This is a win-win situation, and it's a lot of fun!" says Holmes.

The majority of Holmes' current research takes place in the Arctic (field sites are in Russia, Canada, and Alaska), and addresses how climate change is impacting the cycles of water and chemicals in the environment. Dr. Holmes has also studied desert streams in the southwestern United States, stream/riparian ecosystems in France, and estuaries in Massachusetts. Dr. Holmes earned his Ph.D. from Arizona State University, his M.S. from the University of Michigan, and B.S. from the University of Texas.