

Rock Star Educator Spends Summer at JGI

BY RANDY MONROE

My summer at JGI began before the school year ended, working with Phil Hugenholtz's Microbial Ecology team comprised of Phil, Falk Warnecke, Suzan Yilmaz, Julita Madejska, Hector Garcia Martin, and Victor Kunin.

It was, and still is, a fantastic opportunity to be involved with cutting-edge science that allows the integration of laboratory skill sets for the middle-school level. This unique opportunity began a year ago, with the idea of learning about our local metagenomic resource with a goal to design and introduce a program for the Foothill students. I was presented with the task of finding a relatively little known group of bacteria called OP11.

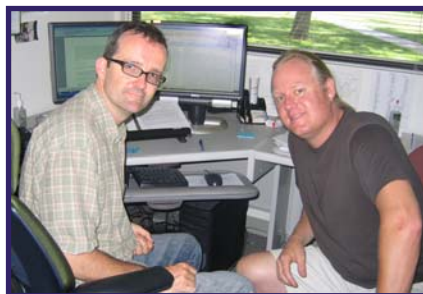
Approximately 10 years ago, Phil discovered some novel thermophilic (a type of extremophile that likes temperatures above 45C) bacteria in Yellowstone National Park, in a hot spring called Obsidian Pool near the Mud Pots in the southeastern side of the park. He named one group of these thermophiles OP11. Since its discovery, OP11 and many related organisms have grown into an entirely previously unknown major bacterial lineage. This lineage has never been cultured and reproduced in the laboratory, nor has it ever been seen under a microscope, but DNA analysis has shown it to be quite abundant in a variety of locations, including the extreme environments of hot springs and hydrothermal vents, in the teeth of people with periodontal disease, and in several other habitats lacking oxygen (anaerobic).

My challenge was to find the critter and get a picture of it! After some initial training in DNA extraction, PCR, and elec-

trophoresis gels, I was to go to Yellowstone and obtain some fresh samples. I coordinated the journey with one of Phil's long-time colleagues, veteran Yellowstone sampler John Spear from the Colorado School of Mines who studied under microbe guru Norman Pace, now at University of Colorado, Boulder.

In Yellowstone, we sampled at Obsidian Pool (78C), OP Prime Pool (56C), and the new mud vent we deemed OP Mud Vent (85C), Sperm Pool (56C), Octopus Pool (88C and 50C edge), Norris Geyser Basin, and Mammoth, and had those samples shipped to JGI.

Upon returning to JGI, Phil wanted to organize a local sampling expedition. I arranged a day trip for Phil, Falk, Suzan and I to visit the East Bay Municipal Utility



Randy Monroe (right) with his mentor JGI Microbial Ecology Program Head Phil Hugenholtz

District's Wastewater Facility near the San Francisco-Oakland Bay Bridge and obtain some samples from two anaerobic digesters. We then headed to East Bay Regional Park in Hayward to the salt ponds, and to the South Bay city of Alviso to Don Edwards National Wildlife Refuge to obtain some truly remarkable smelling anaerobic organisms.



Randy Monroe samples the South Bay salt flats

Back in the lab, I am ultimately going to perform Fluorescence In Situ Hybridization (FISH) to view and photograph one of these remarkable organisms and learn more from those images.

How does all of this tie together? Well, in 1978 my stepfather, Jim Christy, discovered Pluto's moon Charon, naming it after my mother, Charlene. In January 2006, we were invited to NASA's Cape Canaveral for the launch of the New Horizons probe headed to Pluto and the Kuiper Belt on a Lockheed Martin Atlas V rocket. As an educator on the New Horizons Team, I also had the opportunity to work at Lockheed Martin last summer in missile defense studying Infrared Technologies. IR technologies are an important tool in studying hydrothermal vent systems. It is possible that life began on primordial Earth in such vents. If other locations, such as Europa, a moon of Jupiter, have vent systems, there may also be life there, too. It is quite possible that OP11 is living elsewhere in the solar system. Wouldn't it be grand to find it?

Randy Monroe is a 6th grade earth science teacher at Foothill Middle School in Walnut Creek, CA. In addition to his work as an educator, Randy Monroe is the front man for premier Van Halen tribute band, Hot for Teacher: <http://www.hftrocks.com/>. His summer experience was sponsored by Lawrence Livermore National Laboratory's Edward Teller Education Center (ETEC): <http://etec.ucdavis.edu>. In addition, Randy received support from the Industry Initiatives for Science and Math Education (IISME): <http://www.iisme.org/>