

Education and Public Outreach: Indiana University, Bloomington
Reporting Period: 2006 (7/05-6/06)

**IPTAI EDUCATION AND PUBLIC OUTREACH EFFORTS, JULY 2005 - JUNE 2006:
Course Development**

Course Development: Indiana University - Lisa M. Pratt Geomicrobiology G690: Geomicrobiology is a new course taught by Professor Lisa M. Pratt. This class provides an introduction to environmental microbiology and astrobiology for graduate students and advanced undergraduates with interests ranging from biogeochemistry to extremophile adaptation to origins of life. The first six week focus on textbook readings with supporting lectures on microbial phylogeny, growth, metabolism and genetic sequencing in order to build a conceptual framework and a technical vocabulary. During the second six weeks, dialogue and debate are incorporated into lecture through discussion of recent journal articles. The final two weeks of the semester are reserved for student presentations. Students write a three-page executive summary on a topic selected in consultation with the instructor. Each summary is supported by an annotated bibliography with a minimum of 20 journal references. Each student presents a 20-minute oral summary of their term paper to the class. Thirteen students representing four different departments (Biology, Geological Sciences, Public and Environmental Affairs, Science Education) enrolled in the first offering of Geomicrobiology. The course was offered a second time in Spring 2006.

Princeton University - T.C. Onstott Course Development: Princeton Astrobiology Club (PABC) and GEOASTEEBCHM255 In 2005 after the teaching of GEOASTEEBCHM255-Life in the Universe-(a new course supported by Princeton University's sophomore initiative fund and taught by Onstott, Dismuke, Turner, Stiefel and Landweber) students formed an astrobiology club. This club with some 200 members organized field trips and talks. In May of 2005 with support from the Dean and several departments the PABC held a "Human Flight Symposium" during which Sen. Harrison Schmitt (former Apollo astronaut) and two other shuttle astronauts gave lectures and participated with faculty (Onstott and others) in a public evening forum where the sustainability of human flight and the President's initiative were debated.

In 2005 GEOASTEEBCHM255-Life in the Universe took sophomores to Yellowstone National Park for a week to look at the interactions of microbiology and geology. GEOASTEEBCHM255-Life in the Universe-has one more year of support from Princeton's sophomore initiative before it will become part of the regular course curriculum.

University of Tennessee - Susan M. Pfiffner Undergraduate research Andrew Parsons' (left photo) training resulted in a presentation as part of the NAI virtual seminar, an ASM research fellowship, a poster presentation at the regional ASM meeting in November 2005 in Nashville, TN, and an oral and poster presentation at the annual ASM meeting in May 2006 in Orlando, FL. This student will be attending graduate school at the University of Louisville, Kentucky in the department of Biology. Taylor Fielden had one semester of laboratory training with a concluding lecture on deep subsurface microbiology. Kansas Sparks (right photo) started her training May 2006 and will be investigating membrane lipids from Permafrost regions in Canada.

Training the next generation of scientists (professional development) for research associate Sarah Bottomly (left photo), and post-doctorate researcher Yi-Liang Li (right photo) with project experience and research presentations at regional, national and international venues.



Andrew Parsons, left photo; Kansas Sparks, right photo



Sarah Bottomly, left photo; Yi-Liang Li, right photo

IPTAI EDUCATION AND PUBLIC OUTREACH EFFORTS, JULY 2005 - JUNE 2006: Public Outreach

Indiana University - Lisa M. Pratt

Indiana University hosted Dr. John Rummel for the National Science Olympiad on the Bloomington Campus, May 16-18, 2005. Dr. Rummel gave two lectures and participated in an Geological Sciences Open House where he signed hand-out posters and talked with parents and students about the Spirit and Opportunity missions. Graduate students Adam Johnson, Elizabeth

Johnson, Melanie Everett, and NASA interns Cindy Elbaz and Arjan Vermeulen participated in hands-on activities throughout the open house.

The film, "Looking For Life" produced by Geoff Haines-Stiles was broadcast on PBS and the NASA channel in May 2006. This video included footage of a field trip to Lupin Mine in October, 2005. Peter Suchecki, the videographer on that trip, accompanied Lisa Pratt and a team of scientists down 1130 meters into the mine to collect video footage for EPO projects. Peter Suchecki and Ruth Droppo sorted through 40 hours of footage for 20 minutes of material to send to Geoff Haines-Stiles for inclusion in the Looking For Life production. Lisa Pratt and Geoff Haines-Stiles wrote voice-over script for the segment, and Ruth Droppo facilitated the recording at IU Telecommunication's audio lab.

Progress continues on the DVD workbook project, scheduled for release to field-testing in September 2006. It will be presented in a poster session at the Astronomical Society of the Pacific meeting in Baltimore, and will be available for distribution to interested teachers and EPO professionals who would like to participate in the field-testing protocol.

Ruth Droppo assisted NAI teams by redesigning the Astrobiology poster with new imagery, and Susan Pfiffner and Lisa Pratt edited the deep subsurface content prior to reprinting.

Lisa M. Pratt: Newspaper interview with the Indiana University Daily Student (IDS), August 2005; newspaper interview with the Bloomington Herald Times, "Are We Alone" IU Scientists Debate Alien Existence, September 2005

Lisa Pratt: Microbial Adaptations to Biosustainability in Deep-Subsurface Environments on Earth. Phi Beta Kappa lecture, Purdue University February 2006

Lisa Pratt: Exploration for Life in the Deep Subsurface of Earth, talk for the opening of Aliens of the Deep, Louisville Science Center, Louisville KY, February 2006

Lisa Pratt: If we encounter life on Mars, will we recognize it as living? Finnish Geological Survey, May 2006

Lisa Pratt: If we encounter life on Mars, will we recognize it as living? Indiana University Astrobiology Teacher Workshop, Bloomington, IN, June 2006

University of Tennessee - Susan M. Pfiffner We presented a molecular biology session (The molecule of life: DNA) at SHaring ADventures in Engineering and Science (SHADES), an interactive colloquium with hands-on science activities for 100 girls ranging in age from 11-12 years old. The colloquium is designed to attract middle-school aged girls to careers in math and science (November 2005). Astrobiology bookmarks and web sites were distributed. (Fig. 1)



Students extracting DNA from fruit.



John Rummel, Planet Protection Officer, talks to students, parents, and teachers at the National Science Olympiad at Indiana University, Bloomington



Adam Johnson and Melanie Everett conduct freezing-point experiments with sulfate solutions, a hands-on experiment for students, parents, and teachers at the National Science Olympiad, Indiana University Bloomington

IPTAI EDUCATION AND PUBLIC OUTREACH EFFORTS, JULY 2005 - JUNE 2006: Professional Development

Indiana University - Lisa M. Pratt Lisa Pratt: If we encounter life on Mars, will we recognize it as living? Indiana University Astrobiology Teacher Workshop, Bloomington, IN, June 2006

University of Tennessee - Susan M. Pfiffner Sent six middle and high school teachers from the Chattanooga, Tennessee area to two different NAI workshops during 2005. Three teachers attended the Evolution of a Planetary System: Exploring Our Origins workshop at Pennsylvania State University July 24-29, 2005 and three teachers attended the Astrobiology Laboratory Institute for Instructors (ALII) at the University of Hawaii, Manoa July 18 - 22, 2005. Davis and Pfiffner received workshop evaluations from the teachers and will be tracking teacher activities for dissemination of information and methods learned in the workshops. (Fig. 4) Co-PI Kim Davis attended the SETI-sponsored Astrobiology Summer Science Experience for Teachers (ASSET) July 10-16, 2005.

We have introduced the Voyages Through Time curriculum using the samplers at two Astrobiology workshops. The workshops were at Tennessee State University (5-day program, main sponsor was NASA Goddard Center for Astrobiology, Figs 4 and 5) and the School of Education at Indiana University (Indiana University Astrobiology Teacher Workshop. 3-day program, co-sponsored by IPTAI). Both workshops hosted ~20 middle and high school teachers

each (from Tennessee, Washington, DC, and Indiana). During the IU workshop some of the activities in the IPTAI workbook, "Exploring Deep Sub-Surface Life. Earth Analogues for Possible Life on Mars" were pilot tested by the teachers. Glenn Simonelli, who is writing lesson content for the workbook, facilitated the activities program.

Dr. Pfiffner has been involved in the education and public outreach programs for a National Science Foundation program development called the Deep Underground Science and Engineering Laboratory (DUSEL). Our IPTAI team brings experience in underground educational experiences from the mines in South Africa as part of the two sites in contest for the DUSEL facility, Henderson Mine in Colorado and Homestake Mine in South Dakota. The access to the deep subsurface for physics and biogeochemical research is an excellent opportunity to introduce Astrobiology and how DUSEL may play a role in Astrobiology research. We are emphasizing the goals of encouraging students and teachers to continue scientific career development, increasing diversity in the sciences and education arenas, enhancement of multidisciplinary science, and providing opportunities for cultural exposure. Anticipated education projects would emphasize K-16 curriculum development, research experiences for undergraduates, career development for teachers, and inreach and exchange activities for undergraduate and graduate students. Outreach projects would include the use and development of digital media, remote access, and a hands-on visitor center or museum. During the past year both sites have held teacher workshops for engaging the teachers in the scientific research at DUSEL, learning how teachers will want to use DUSEL and how they can take DUSEL to the classroom or the classroom to DUSEL. Most of the teacher workshops have included hands-on activities that could be taken back to the classroom. As part of these activities, astrobiology was introduced using the Molecule of Life: DNA activity and with hand-outs of Astrobiology materials (flyers, bookmarks, planet cards). This hands-on activity was a great success at a science conference for cross-disciplinary learning by physicists, geologists, engineers, mining personnel and other members of the Henderson science team.



Teachers at the TSU workshop collected fossils at a road cut and learning more about how fossils in the rock record relates to Astrobiology in a casual classroom setting.



Dr. Pfiffner helps teachers during their hands-on activity: extraction of DNA from strawberries.