



Great Smoky Mountains National Park, Great Smoky Mountains Association, Friends of the Smokies, and Discover Life in America

Slime Molds of Great Smoky Mountains National Park

John Landolt

One of the taxonomic working groups, or TWIGs, of the ATBI project in Great Smoky Mountains National Park encompasses the slime molds. For the past seven years or so, a number of scientists from the US and other parts of the world, as well as DLIA volunteers, have scoured the Smokies, collecting plasmodial slime molds (myxomycetes) and cellular slime molds (dictyostelids). More recently, a third group of slime molds called protostelids has begun receiving attention by this working group as well.

At this year's meeting of the Association of Southeastern Biologists, held in Gatlinburg, a symposium of research papers on various components of the ATBI was conducted, and one of those papers was devoted to a summary of the activities and discoveries of the Slime Mold TWIG. The presentation was the joint effort of myself and Steve Stephenson (University of Arkansas), who is the TWIG coordinator. Significant recovery results that have been obtained over the past several years include: plasmodial slime mold records, consisting of field collections of fruiting bodies and also records from laboratory moist chamber cultures prepared from suitable litter and bark substrate collections; and cellular slime mold records, consisting entirely of laboratory plate cultures derived from substrate incubation.

It appears that some species of plasmodial slime molds are fairly common throughout the Park while others are more restricted to certain vegetation types or microhabitats. Examples of the former include *Arcyria cinerea*, and for a somewhat more restricted example, there is *Elaeomyxa cerifera*, a species associated with spruce-fir forests. Through the efforts of the Slime Mold TWIG, the Canopy Biodiversity group headed by Harold Keller, and numerous volunteers, the number of plasmodial slime mold species recorded from the Park has almost tripled to a total of approximately 220 since the beginning of the ATBI. Recent new records for the Park and for North America include *Comatricha pinicillata*, *Lamproderma granulatum*, *Licea microscopica*, *L. rufocuprea*, and *L. sambucina*. Keller's group also has reported one species entirely new to science - *Diachea arboricola*.

In addition to the approximately dozen species of cellular slime molds known from the Smokies prior to the ATBI, at least another 18 species have now been recorded, including 10 newly described species. In the Park, cellular slime mold species seem to form several fairly distinct assemblages. One group, including the cosmopolitan species *Dictyostelium mucoroides*, seems rather common and widespread throughout much of the Park. Another group of species (including *D. discoideum*) is more often isolated from substrates collected at



Randy Darrah

Slime Mold TWIG at Purchase Knob.



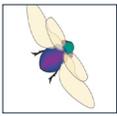
Randy Darrah

Arcyria cinerea

higher elevations, while a third group of species that contains such forms as *D. minutum* are more likely found at lower elevations in the Smokies. Most of the 10 new species seem to be associated with extreme, marginal habitats at high elevation, with low soil pH, and/or low plant diversity. Throughout the Park, the number of species of dictyostelids is about the same at all elevations, but somewhat different in makeup; however, the overall abundance of dictyostelids seems to be clearly reduced as elevation increases.

There are still some parts of the Smokies that have not been sampled extensively for plasmodial and dictyostelid slime molds, and the survey directed toward protostelid slime molds is just getting underway. There is much more work to be done!

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Chair's Message:

Closing Remarks at the ATBI Symposium, Gatlinburg, March 29, 2006

The ATBI symposium at the Annual Meeting of the Association of Southeastern Biologists, which was organized by Patricia Cox, consisted of 23 presentations from 26 institutions in 17 different states, ranging from Connecticut to Colorado to Texas. The presentations were excellent and the day-long session was well-attended from beginning to end. This landmark report on the progress of the ATBI will become a book within the coming year.

The symposium impressed me with many facts. As I sat there, I felt like a biologist again, expanding my view from the botanist and plant ecologist I had become, to the wide array of living things under study. It took me back to my first biology course as a freshman and reminded me of the blinders that specialization can bring! All of life and all of the field of biology were reunited in this room, and I was treated—all too briefly—to being young and a student again. More types of taxonomists were in this one symposium than we usually experience—the result of a kind of balkanization of biology into specialties, separate journals, separate societies, and separate meetings.

Participants also saw that the project was running, full speed ahead, with a life of its own. We saw pictures of students of all ages, citizen scientists, and parataxonomists. We saw a blurring of the line between academic knowledge and human curiosity, regardless of educational level and age (in fact, younger folks are all the more curious and likely to examine the soil, or turn over the rock). We saw a remarkable diversity of methods to detect and find species. We saw old versus new methods, and we saw old versus new diagnostic characters. We saw new applications of tools such as the web, GIS, GPS, databases, and DNA. We learned that a new genus of beetles was diagnosed in just days through e-mail among specialists all over the world.

We learned about habitat diversity from caves to tree tops 100 ft in the air, and places from the lowest to highest elevations in the Park. But we also heard about the microhabitats of a rock wall and the fact that one gram of soil can contain habitats as diverse as deserts or swamps. Beyond lists of species, we heard about abundance, ecology, distribution, mating, feeding, mutualisms, and disease. We learned the importance of biological knowledge to the Park: information on invasives, extinctions, climate change, fire, and other management issues.

All of this work on diversity caused us to reflect on the wonder, importance, and magnetic attraction of Great Smoky Mountains National Park. Thanks are due to Pat Cox and all the participants. Stay tuned - the book will be out and the coming years will produce more discoveries.

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DLIA Volunteers

We are purging our email list! In order to stay in touch about training programs and ATBI activities, please email Jeanie Hilten (jeanie@dlia.org) a request to join the Yahoo! Group, DLIA Volunteers.

A Sampling of 2005 Grant Reports

Paula Furey of Bowling Green State University noted that preliminary research of diatom flora in the Park has identified an algal group (the diatom genus *Eunotia*) that is taxonomically rich and likely contains species that are endemic to GSMNP, restricted in range, and/or new to science. An intensive sampling effort was conducted from May to August 2005 to collect algae from streams and drip walls throughout the Park, focusing on habitat types rich in this acid-loving diatom. Over 370 samples were collected and photographed.

Brian Scholtens of the College of Charleston reported on the Lepidoptera TWIG's 4-day bioblitz last May, which gathered additional DNA barcoding data and cryopreservation samples. They now have DNA samples from approximately 2/3 of the known moth and butterfly fauna of the Park, and efforts continue to add several new records each sampling period.

Paul Super, at the Appalachian Highlands Science Learning Center, reported that two recent college graduates—with assistance from nine high school interns, collected 593 pollinators at 95 sites on the North Carolina side of the Park, either while the insects were visiting one of 46 flowering plants, or by using colored bowls of soapy water to attract and catch bees. Specimens currently are being identified to generate pollinator species lists for each species of flowering plant. Species web pages have been written for the bumble bees and the honey bee and are on the web at www.dlia.org/atbi/species/animals/invertebrates/arthropods/insects/hymenoptera/bees/index.shtml.

For more grant summaries go to the DLIA website.
www.dlia.org/grants/grant_program.shtml

"Astronomical" Diversity of Bacteria in Great Smoky Mountains National Park

Seán O'Connell

"The key to taking the measure of biodiversity lies in a downward adjustment of scale. The smaller the organism, the broader the frontier and the deeper the unmapped terrain. Bacteria, protistans, nematodes, mites, and other minute creatures swarm around us, an animate matrix that binds Earth's surface. They are objects of potentially endless study and admiration." (E.O Wilson)

In 1990, a Norwegian microbiologist, Vigdis Torsvik, used a DNA denaturation and reannealing technique to estimate the diversity of bacteria in soil. She arrived at approximately 4,000 species per gram, only a minority of which were culturable. Recent work has raised that estimate to 10,000,000 total species per 10 grams of soil! These species are distributed among approximately ten billion bacterial cells within the same sample. Considering other estimates that show Earth's prokaryotic inhabitants numbering at 10^{30} cells (compared to the universe's 10^{21} stars), it is clear that the rich microbial diversity on our planet is just beginning to be explored. Microscopically, a gram of undisturbed soil represents a complex set of habitats that could contain millions of microbial niches, thus supporting these "astronomical" diversity figures.

Western Carolina University's Microbe Hunters have been exploring the ATBI plots at Albright Grove, Cataloochee, and Purchase Knob in an effort to catalog species of bacteria which grow on low to rich levels of organic carbon as well as those species that resist cultivation. The culturing work has largely been carried out by undergraduates, including Kristina Reid and Emily York, and a graduate student, Derren Rosbach. The cultivation-independent studies (i.e., solely DNA based) have been completed by a MS student, Melissa Collins. Our overall goal is to compare the microbial assemblages in soil from the three forest plots to determine if bacterial species diversity patterns reflect the vegetational differences.

Our first results from these studies have been encouraging and exciting. We have observed differences in the species assemblages at the three sites, with very different diversity patterns seen by using cultivation-dependent versus cultivation-independent techniques. Even more interesting, perhaps, is that we have not sampled each species more than once, again a testimony to the incredible diversity of microorganisms in soil.

Since the great diversity of bacteria currently prevents us from confidently identifying every species we encounter, we rely on higher taxonomy to find trends in our data. In all cases, we use ribosomal RNA gene sequences to place cultures



Seán O'Connell

Cells from a culture of bacteria belonging to the genus *Paenibacillus* isolated from Albright Grove by Emily York. These cells are of interest because of the sheath-like matrix that surrounds them. The image was taken at 1,000X using a negatively stained culture and a Nikon digital camera.

or environmental DNA samples into a taxonomic hierarchy. What we have found thus far with isolated bacteria is that Albright Grove, an old-growth forest, is dominated (>75% of cultures) by a phylum of bacteria called the Firmicutes, which includes the genus *Bacillus*. Cataloochee and Purchase Knob, formerly disturbed forests, show greater richness, with the Firmicutes again being present, but also the class Proteobacteria, which includes the genera *Pseudomonas* and *Rhizobium*. All sites also contained Actinobacteria, a phylum famous for producing antibiotics. The culture-independent work shows high phylum richness at all sites, but again, community patterns reflect differences in the forests. Remarkably, Melissa encountered six phyla that we had not observed in the Park before, including the Acidobacterium, a group which dominates the planet's soils, but is almost never cultured. In our samples, this monogeneric phylum accounts for nearly a quarter of all of our bacterial sequences!

The microscopic world ironically can be characterized in terms of its enormity; the roles that bacteria and other "infinitely" small but diverse organisms play in global health are powerful ones that we truly are just beginning to understand. The marvels that remain to be discovered in the Smokies are limited only by our ability and creativity to comprehend them: Stay tuned!

Seán O'Connell
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Define Biodiversity

Jennifer Pierce

"Define biodiversity," the Park Ranger requests. A puzzled and unusual silence comes over the group of young people... "No, really. Define biodiversity!"

This is what students are asked to do every year as they participate in the educational programs of Great Smoky Mountains National Park. Parks as Classrooms programs are the outdoor learning experiences taught by Park Rangers to students from our local schools. In kindergarten through eighth grade, classes who participate in an annual field trip are able to progress from an introduction to the natural world in the early years, to proactive stewardship in middle school and high school. As early as third grade, students begin to comprehend the All Taxa Biodiversity Inventory. They are introduced to the study through pre-visit activities taught by their teachers in class before they take their field trip. Upon arrival in the National Park, third graders are quizzed on what they know. Their replies are interesting and significant for how we teach about the natural world and its great variety.

"What is a habitat?" (This answer is a piece of cake). "What do Park Rangers do?" (Again, no problem). "Define Biodiversity." Huh? That word seems to be only rather slowly making its way into the subconscious vocabulary of the third grade mind! It doesn't quite roll off the tongue of an 8 year old.

Yet, in spite of, or perhaps because of, the unfamiliarity of the term, the stage is set for our educators' learning experience. Give Park Resource Education Rangers three hours with a third grade class who can barely pronounce the word "biodiversity," much less define it, and through soil exploration activities, plot studies, and challenging team work focused on ecosystems, the group will return to school with a new word to unveil on their family at the dinner table—and much more!



ScN

Resource Education
Park Ranger Emily Guss
with young naturalists.

The Parks as Classrooms program accomplishes three major goals for Great Smoky Mountains National Park and for the participants. First, it meets third grade curriculum expectations for the states of Tennessee and North Carolina. Second, it demonstrates the mission of the National Park Service to protect and preserve resources while providing enjoyment. Third, it highlights the diversity and abundance of this special place.

Each school year, 800 third grade students, their teachers, and parents come to the Smokies for first hand experiences in this National Park that is their own backyard. In addition to the Parks as Classrooms activities, Great Smoky Mountains National Park educators work with visiting scientists. Through campground programs, walks, talks, and exhibits in the Visitor Centers, they present to the public, in an understandable way, the importance of scientific research to conservation. What a wonderful opportunity to take steps needed to educate, inform, and involve our community in the methods and successes of the All Taxa Biodiversity Inventory.

For more information about Parks as Classrooms and other Resource Education Programs of Great Smoky Mountains National Park, contact Jennifer Pierce. Visit <http://www.nps.gov/grsm/gsmsite/parksasclass.html>

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A Note from a Citizen Scientist

Steve Higdon

I am a citizen scientist, and I might add, the emphasis should be on *citizen*. Though never having a formal education in any particular field of the sciences, I have always had a curiosity about different aspects of the natural world and how all life forms fit together. I was always a collector of just about anything when I was growing up, however, I didn't delve into the study of these specimens. My training was informal. To me, the blue jay was a "bluebird," the cardinal was a "redbird," and all woodpeckers fell into the category of "peckerwoods." All tiny crawling creatures on the ground were "bugs" and a June beetle was a "June bug," useful only for tying a string around its leg and letting it fly around until either the leg broke off or my mother called me in for lunch.

Being a volunteer with the ATBI for the past four years has changed all of that. Through my participation, I have been able to combine my love for the outdoors, my knowledge of the Smokies, and my willingness to contribute in some way to the goals of the program, and in return, I now realize a real sense of accomplishment. When I can, I participate in the various "quests," "forays," and "blitzes" and, as a result, I now know more about beetles, ferns, and leps (hey, there's a word



Deb Tappan

Steve Higdon, on far left, with other ATBI volunteers.

I never thought I would use) than I've ever known before. I've collected various samples, performed as a mule and carried a lot of dirt, and even had the opportunity to operate the vacuum cleaner while cleaning ATBI houses. I've met and worked with some very nice people, volunteers and scientists alike, and I've been impressed by the dedication and professionalism of the scientists with whom I have worked.

I enjoy being a volunteer with the ATBI and encourage others to join in even though they too may be more "citizen" than "scientist."

Steve Higdon
Knoxville, TN

\$69,439 in Awards Presented to ATBI Researchers

Grant money supplied to Discover Life in America by the Great Smoky Mountains Association and Friends of Great Smoky Mountains National Park is supporting All Taxa Biodiversity Inventory research in the Park for the 2006 season. John Morse, Discover Life in America Board member and Science Committee Co-Chair, administers the grant program, now in its seventh year. The review panel included seven DLIA scientists. Requests totaled \$90,480 for this year, and as always, it was difficult for the reviewers to decide among the many fine proposals. Grant summaries may be viewed on the Discover Life in America web site at http://www.discoverlifeinamerica.org/dlia/grants/grant_program.shtml

Eighteen proposals were funded out of a total of 22 submitted. The research will delve into a variety of life forms in the Park, including tardigrades, slime molds, fungi, beetles, grasshoppers and other orthoptera, earwigs, water mites, tephritid flies, lichens, ants, fish, worms, mosquitoes, moths and butterflies, and even viruses. Bio-quests for fungi, and for

life forms of the limestone areas of the Park were funded as well. Some of the proposals are continuations of previous and on-going work and all are coordinated with the Discover Life in America Science Plan. (<http://www.dlia.org/atbi/science/scienceplan.shtml>)

Grant recipients will present a report of their results to-date at the December, 2006 annual meeting of the ATBI, with a final report and geo-referenced data to be submitted by March 1, 2007. They also will send voucher specimens to the Park and other authorized collections. Trained volunteers will be available to assist the researchers in the field, in the lab, and with data entry. Individuals and organizations interested in assisting with the funding of future ATBI research please contact Steve Bohleber, steve@bohleberlaw.com, DLIA Board member and chair of the Development Committee.

Congratulations to these scientists for their selection:

1. Paul J. Bartels – Warren Wilson College
“Tardigrade Inventory 2006-2007”
2. Steven L. Stephenson – University of Arkansas
“Myxo Blitz 2006”
3. Richard Baird – Mississippi State University
“Microfungi of the American Beech and Fraser Fir Forests in Great Smoky Mountains National Park (GSMNP): Litter Studies”
4. Larissa N. Vasilyeva – Institute of Biology and Soil Science, Vladivostok, Russia
“Pyrenomycetes in the Great Smoky Mountains National Park and their Biogeographic Relationships with East Asian relatives”
5. Charles L. Staines – Edgewater, MD
“Web Page Development for Five Families of Beetles (Insecta: Coleoptera) in GSMNP”
6. Matt E. Dakin – Opelika, AL
“Survey of the Orthoptera and Related Orders”
7. Fabian Haas – State Museum for Natural history Stuttgart, Germany
“The Earwigs (Dermaptera) of the Great Smoky Mountains”
8. Ian M. Smith – Agriculture and Agri-Food Canada
“Extending Our Knowledge of the Diversity of Water Mites (Acari-Hydrachnidia)”
9. Gary J. Steck – Florida State University
“Tephritid Flies of Great Smoky Mountains National Park”
10. Adriean J. Mayor – Museum Curator-GSMNP
“Karst Quest 2006”
11. Tör Tønsberg – University of Bergen, Norway
“Discover Lichens in the Great Smoky Mountains National Park 2006”
12. Nathan J. Sanders – University of Tennessee
“Ant Diversity in Great Smoky Mountains National Park, Part III”
13. Patrick L. Rakes – Conservation Fisheries, Inc.
“Snorkel Surveys to Target Potentially Undiscovered Fish Populations in GSMNP”
14. Mark J. Wetzel – Illinois Natural History Survey
“An Inventory of Freshwater Oligochaeta (Annelida) at Selected Sites in the Great Smoky Mountains National Park, North Carolina and Tennessee, USA”
15. Cynthia Roxanne Rutledge Connelly – U. of Florida
“Seasonal Occurrence and Habitat Utilization of Exotic, Invasive Mosquitoes in the Great Smoky Mountains National Park”
16. Kathie T. Hodge – Cornell University
“The first Entomophthorales Expedition: Insect-pathogenic Fungi of the Great Smokies”
17. Sead Sabanadzovic – Mississippi State University
“Investigation of Fern Viruses in the Great Smoky Mountains National Park”
18. Brian Scholtens – College of Charleston
“Great Smoky Mountains Lepidoptera Survey: Late Season Barcoding”

Scientist Profile: Andrea Radwell



I have been interested in the natural world since I was old enough to crawl. I spent the first 18 years of my life in northern Minnesota and developed an affinity for aquatic habitats that has remained with me all of my life. I spent 14 years teaching biology at the high school level, and then went on to earn my PhD in stream ecology at the

University of Arkansas. I started my graduate research working with the most familiar life of streams - fish, crayfish, molluscs, and macroinvertebrates (larval insects). But eventually I learned that there are many small invertebrates (rotifers, copepods, water mites, tardigrades and others) that are the foundation upon which all of the “higher” levels of life depend, and these small invertebrates receive very little attention.

I focused on water mites because they are abundant, remarkably diverse, and ecologically important as both parasites and predators. They are of interest for assessing water quality since the presence of a species rich assemblage of water mites is considered to be an indicator of good environmental conditions. Although there has been a considerable amount of research done on water mites of North America in the last century, research has stalled over the past two decades, particularly in the United States. This is due, in part, to the lack of attention given to the taxonomic work that is necessary to make further progress. It is estimated that almost half of the North American water mite species are not yet described. Presently, the Canadian National Collection of Insects and Arachnids is the only active research center in North America. Ian M. Smith, curator of the collection, has researched the systematics and ecology of water mites for 40 years. He and I currently are collaborating on a survey of water mites in GSMNP for the ATBI.



Andrea shares her knowledge and enthusiasm with high school student Ross Cameron.
Photos by Jeanie Hillten.

There are reasons for optimism about the future. Projects such as the ATBI in GSMNP are drawing attention to the importance of documenting biodiversity. The

National Science Foundation has come to realize that the US needs to focus on developing taxonomic expertise to preserve the knowledge contributed by taxonomists and researchers of the past and current century and to facilitate future research. With the advent of information technology and molecular genetic techniques, we should be able to make significant progress in documenting biodiversity if a concerted effort is made. A recently held workshop on aquatic diversity, by myself and Dr. Smith, was a wonderful opportunity to expose people to the world of water mites and other invertebrates in the bottom of streams and to make people aware that we do, in fact, need to “sweat the small stuff.”

I am looking forward to continuing to collect many water mites in GSMNP and to meet the challenge of identifying known species and describing new ones. The ultimate goal of this effort is to contribute to the development of a more realistic perspective of the structure and dynamics of aquatic communities. It is my hope that this will, in turn, contribute to developing strategies to conserve and protect freshwater ecosystems.

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A Deer Fly New to the Park and to Tennessee

Gary J. Steck

Funding from DLIA in 2005 allowed the Diptera TWIG to process a small fraction (<1%) of the fly specimens that we captured in Malaise traps over 2,000+ days of trapping at various sites throughout the Park. Over 6,200 specimens were pinned, labeled, and sorted to family. These represent 48 different families. With the help of a dozen colleagues, approximately 1,500 of these specimens have been identified to species totaling 135 taxa. Fully 50% (68) of these are new Park records! We did not purposely choose obscure groups or all of the little-bitty things to identify; in fact, most of the prepared specimens were chosen haphazardly with preference given to abundance (especially horse and deer flies), large specimens (easy to separate and pin), or otherwise “interesting-looking” (e.g., colorful, or with distinctive markings or structures that facilitate identification). For example, everyone is familiar with those pesky deer flies that seemingly delight in



Gary Steck

A deer fly, *Chrysops shermani*, a new Park and Tennessee State record.

annoying us by endlessly circling and buzzing around our heads, and you would think their presence would be well-documented in the Park. However, of 15 different deer fly species captured in the traps, six are new Park records and one is a new State record for Tennessee. What might we expect from the other 99% of the material that remains to be processed?!

Gary J. Steck
Florida State Collection of Athropods
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Mark these events on your calendar and stay tuned for more details and other programs. See the website at www.discoverlifeinamerica.org or www.dlia.org. Contact Jeanie Hilten for more information, to add an event to our calendar, to learn about DLIA's volunteer "project teams," and to sign up for activities. (865-430-4752 or Jeanie@dlia.org).

Thursday, May 11: Grand reopening of the Appalachian Highlands Science Learning Center at Purchase Knob. The newly renovated building will be ready for scientists, teachers, students, and volunteers. Contact Paul Super, Paul_Super@nps.gov or 828-926-6251. (see article in the Winter, 2006 ATBI Quarterly)

Saturday, May 20, 9:00am—4:00pm: ATBI Field Day at the Appalachian Highlands Science Learning Center. This event includes a variety of field research activities, featuring an ATBI photography session, bee inventory, McKee Branch hike, searches for leaf miners, aquatic insects, and other special requests from scientists. Register with Jeanie Hilten.

Friday, May 26, 9:00am—4:30pm: Discover Life in America Board Meeting, Appalachian Highlands Science Learning Center. RSVP to Jeanie Hilten.

Saturday, May 27: Fern Foray #1. Volunteers join with botanists to inventory and map the ferns of the Park. This project is in its sixth year and has surveyed over 200 miles of trails. This first foray will meet at the Balsam Mountain Campground on Heintooga Ridge Road off of the Blue Ridge Parkway. Contact Patricia Cox, pbcox@tva.gov.

Sunday, June 11—Friday, June 16: Science Teacher Institute at Tremont. ATBI scientists will be among the instructors. See http://www.gsmit.org/adult/science_teacher_institute.html or call 865-448-6709.

Wednesday, June 14—Wednesday, June 28: Beetle Blitz. Sugarlands Training Room and other locations. There will be an orientation for volunteers and educators on June 17, and a family education day on June 24. Scientists please contact Victoria Bayless, vmosele@lsu.edu. Educators and volunteers please contact Jeanie Hilten.

Saturday, June 24: Fern Foray # 2. Contact Patricia Cox, pbcox@tva.gov.

Wednesday, June 28—Friday, June 30: Hands on the Land Seminar, Appalachian Highlands Science Learning Center at Purchase Knob. Contact Susan Sachs, San_Sachs@nps.gov.



Pat Cox, Jim Lowe, and Rebecca Shiflett confer about ferns.

San_Sachs@nps.gov.

Saturday, July 15—Sunday, July 16: Myxo Blitz 2006, Appalachian Highlands Science Learning Center. This event will bring together a group of researchers, educators, students, and volunteers who will spend two days carrying out field surveys for myxomycetes (slime molds) in a number of localities on the south side of the Park. This portion of the Park has been understudied in previous efforts to document the distribution and occurrence of this group of organisms. Anyone who would like to have more information should contact Steve Stephenson, slsteph@uark.edu.

Thursday, July 27—Sunday, July 30: Karst Quest, Great Smoky Mountains Institute at Tremont, and other locations. Inventory work on limestone habitats primarily at the west end of the Park. Trained volunteers and scientists will survey for a variety of organisms, including leaf and soil creatures, beetles, tardigrades, vascular plants (including Fern Foray #3), bryophytes, lichens, fungi, and slime molds. Contact Adriean Mayor, Adriean_Mayor@nps.gov or 865-436-1295.

Monday, August 14—Tuesday, August 15: Geology Investigations with Rob Young, Appalachian Highlands Science Learning Center. Contact Susan Sachs, San_Sachs@nps.gov or 828-926-6251.

Friday, August 18—Saturday, August 19: Discover Life in America Board Meeting, Balsam Mountain Preserve. RSVP to Jeanie Hilten.

Saturday, September 2: Fern Foray #4. Contact Patricia Cox, pbcox@tva.gov.

New Board Members



John Thompson comes to the DLIA Board after a 35 year marketing career with FMC Corporation, in the Agricultural Products Group. He is a charter member and Vice President of the California Agricultural Pest Control Advisors, a member of the

Western Plant Crop Association, and is a board member of the Southern Plant Crop Association. Mr. Thompson graduated from Fresno State University with a degree in marketing. John is a member of the Kiwanis, and his interests include golf, reading, cooking, and enjoying the outdoors.



Fred Strickland is Vice President of Service and Technical Services for Terminix in Memphis, TN. He has been involved in the pest control industry for the past 28 years. He is a graduate of Louisiana Tech and is a Board Certified Entomologist; however, he respectfully classifies himself as a lifelong student of entomology. He is a member of the Entomological Society of America and

currently serves as the Technical Committee Chair for the National Pest Management Association.



Richard (Rick) Brusca is the Executive Program Director at the Arizona-Sonora Desert Museum, where he oversees all research, conservation and education programs, all living and non-living collections, and public exhibits. He also is an Adjunct Professor at both the University of Arizona and the Centro de Investigación

en Alimentación y Desarrollo (CIAD), Mexico. Dr. Brusca is the author of ~150 research publications and 12 books, including the largest-selling text on invertebrate zoology, *Invertebrates* (Brusca/Brusca, Sinauer Associates), recently named the best new science textbook of the year at the annual New England book show. His areas of research include invertebrate zoology, freshwater and marine ecology, arthropod systematics and phylogeny, field biology, and conservation. His PhD is from the University of Arizona (1975). He has served on panels and boards for many foundations and agencies, including the National Science Board, National Science Foundation, Smithsonian Institution, NOAA, PEW Program in Conservation and the Environment, Public Broadcasting Service, IUCN Species Survival Commission, U.S. Department of the Interior, and others. Rick also is a Fellow in both the American Association for the Advancement of Science and the Linnean Society of London.

The *ATBI Quarterly* is available on the DLIA web site at: www.dlia.org/atbi/quarterly_newsletter/quarterly.shtml or, to continue to receive a hard copy, consider sending a \$10.00 donation to Discover Life in America.

www.dlia.org



ATBI Field Researchers
(photos by Jeanie Hilten)