

SOUTHEASTERN BIOLOGY



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B ASB 69TH ANNUAL MEETING ASB

APRIL 16-19, 2008

B Furman University ASB

Greenville, South Carolina, and

Wofford College

ASB Spartanburg, South Carolina ASB

ASB Abstracts of Papers and Posters ASB
Presented at the Annual Meeting



ASB Courtney M. Kilgore, biology graduate student with Dr. Harold Keller at the University of Central Missouri, is shown ascending a white ash to collect bark samples for myxomycetes. See abstract numbers 96 and 97. Photo by Robert Breshears. **ASB**

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2009: Donald H. Roush, Department of Biology, University of North Alabama, P. O. Box 5181, Florence, AL 35632; (256) 765-4435; FAX (256) 765-4430; dhroush@una.edu.
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PURPOSE

The purpose of this association shall be to promote the advancement of biology as a science by encouraging research, the imparting of knowledge, the application of knowledge to the solution of biological problems, and the preservation of biological resources. The ASB has representation in Section G Committee of the AAAS. Varying types of membership are available to individuals and institutions. See inside back cover.

TIME AND PLACE OF FUTURE MEETINGS

2009 April 1-4: Co-hosted by Jacksonville State University, Jacksonville, Alabama, and University of Alabama, Birmingham, Alabama.
2010 April 7-10: Hosted by Western Carolina University, Cullowhee, North Carolina. Meeting site is Crown Plaza, Asheville, North Carolina.

**ASSOCIATION OF SOUTHEASTERN BIOLOGISTS
EXECUTIVE COMMITTEE MEETING
SATURDAY, 22 SEPTEMBER 2007
BIRMINGHAM, ALABAMA**

ATTENDANCE: 16 individuals attended the meeting

NAME	CAPACITY	EMAIL ADDRESS
Michael Dennis	President	mike@bda-inc.com
Tom Wentworth	President-Elect	tom_wentworth@ncsu.edu
Kim Marie Tolson	Past- President	tolson@ulm.edu
Patricia Cox	Vice President	pbcox@tva.gov
Tim Atkinson	Treasurer	tim.atkinson@carolina.com
Don Roush	EC Member-at-Large	dhroush@una.edu
Doug Rayner	EC Member-at-Large	raynerda@wofford.edu
Jennifer Davis	EC Member-at-Large	jdavis@shorter.edu
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Joe Pollard	LAC 2008	joe.pollard@furman.edu
George Cline	LAC 2009	gcline@jsucc.jsu.edu
Dwayne Wise	Web Editor	daw1@ra.msstate.edu
Scott Jewell	Nominating Committee Meeting Coordinator	a2zconvention@yahoo.com

President Mike Dennis called the meeting to order at 8:35 am. All committee and officer reports were oral; no written reports were provided for the interim meeting.

1. Approval of Minutes

Motion 1. It was moved that the 18 April 2007 Executive Committee Meeting minutes be approved. The motion was made by Dwayne Wise, seconded by Don Roush, and passed.

Outside front cover photo: Courtney M. Kilgore, a graduate student with Dr. Harold Keller at the University of Central Missouri, Department of Biology and Earth Science, ascending the tree canopy of a white ash tree. Bark samples were collected at 3-meter intervals, then cultured in moist chambers for myxomycetes in the laboratory. Tree bark was sampled from 3 meters to 40 meters using the double rope climbing technique and the free end of the rope was used as a foot loop. Notice the reel-bound altitude tape with plastic cover used to measure the height of the bark sample or specimen. This picture shows the climbing saddle attached to a climbing rope and a safety rope around the tree trunk. Note that both hands are free to sample bark or collect fungi, ferns, mosses, liverworts, lichens, insects, slugs, and snails.

Motion 2. It was moved that the 21 April 2007 Executive Committee Meeting minutes be approved. The motion was presented by Dwayne Wise, seconded by Don Roush, and passed.

2. Officer Reports

President – Since becoming President, Mike chaired the 21 April 2007 Executive Committee Meeting in Columbia, South Carolina, conducted routine Association business such as committee appointments, and signed a new contract with the web designer. He also presented the ASB Lifetime Achievement Award to Dr. John Herr. In addition to providing an agenda for today's meeting, he also wrote the President's message for *Southeastern Biology*.

Past President – Kim Marie Tolson reported that she has received all the contact information for Past President's Breakfast from Dwayne Wise. They expect approximately 20 attendees for this Thursday morning event at the 2008 ASB Meeting.

President Elect – Tom Wentworth invited Dr. Bill Schlesinger, President of the Institute of Ecosystem Studies, to give a talk about global climate change for the Plenary Session at the 2008 ASB Meeting.

Vice President – Patricia Cox reported that she is planning the breakfast for the patrons and exhibitors for the 2008 ASB Meeting. The ASB President and President Elect also will be invited to attend.

Secretary – No report was given since Nicole Turrill Welch did not attend the meeting. She and her family left Middle Tennessee in September and moved to Starkville, Mississippi, where she and her husband, Mark, both have new jobs. The Welch's also welcomed the birth of their second son on July 31, 2007 – so it has been a very busy time for them. Nicole thanked Pat Cox for taking the minutes in her absence and apologized for any inconvenience that her absence caused.

Treasurer/Finance Committee – Tim Atkinson reported that there is \$2,000 in checking and the amount rises and falls with the annual meeting. In addition, the meeting budget also changes with each meeting due to differences in attendance and expenses. He initiated a discussion of how to improve our finances and an ad hoc committee consisting of Tim Atkinson, Doug Rayner and Tom Wentworth was formed to examine issues more closely. The three key discussion points regarding ASB finances were (1) monies to cover the *core functions* of ASB, (2) funds to cover the costs of the Annual Meeting, and (3) increasing the principal of the enrichment fund.

After listening to and considering the discussion on these three topics, President Mike Dennis charged the Standing Ad Hoc Committee, consisting of Tim Atkinson and Kim Marie Tolson, to determine how we could restructure our accounting, expenses, and income to improve our finances. Their suggestions will be circulated in an email and discussed and voted upon at the April 2008 Executive Committee Meeting.

Archivist – John Herr noted that the Handbook for Officers and Executive Committee members from March 2003 was never approved. He asked that each officer and committee chair review and edit the duties as listed in the handbook. John also suggested that we change the name of the handbook to the “ASB Leadership Guide” and emphasized that this document will be an evolving instrument for the society.

Print Editor Report – Jim Caponetti reported that there were four issues of Southeastern Biology in 2007, January, April, July, and October. He revised the annual award descriptions for SEB and sent complimentary copies to the families of the deceased members whose obituaries were published in SEB. He shared that postal rates have increased and that Southeastern Naturalist requests a blow-in advertisement in SEB. Lastly, Jim informed the Committee that three ASB affiliates, Southeastern Microscopy Society, Southeastern Fisheries Council, and the Southeastern Division of the Society of Ichthyologists and Herpetologists, will not participate in the 2008 Annual Meeting.

Web Editor – Dwayne Wise shared that Amanda Myrick was hired to replace Adam Jones as the Webmaster. The pay for Webmaster did not change. He reported 10,000 to 20,000 “hits” for several sections of the website. Discussion urged the addition of a graphic describing the goals of the enrichment fund to the index page of the website.

News Editor – Ricky Fiorello encouraged action to increase news submission including (1) a “Submit News” link on the ASB webpage and (2) an email to members.

Meeting Coordinator – Scott Jewell reported that a leather portfolio with the ASB logo is for sale for \$20.00. He delivered a presentation on how to increase membership and member services. Currently, we have no means of assessing demographics or year-to-year changes in our membership. Scott emphasized that membership patterns seem to cycle with the Annual Meeting.

After considering the discussion that followed, President Mike Dennis stressed that a Membership Officer and Member Benefits Committee should have continuity. He appointed an Ad Hoc Committee, consisting of Scott Jewell, Tim Atkinson, Debbie Atkinson, and Pat Cox, to make recommendations on (1) how to deal with membership and (2) what benefits we can offer our members before the April meeting.

3. Committee Reports

LAC 2008 – Joe Pollard and Doug Rayner stated that the 2008 Annual Meeting will be held at the downtown Marriott in Spartanburg, South Carolina. Wofford College will host the Plenary Session and Wednesday evening social. All other events will take place in the Marriott. Their Call for Papers will have two email addresses, one for oral presentations and another for poster presentations, to better organize abstract submission.

Discussion regarding participation of ASB Affiliates in the Annual Meeting followed. Specifically, Southeastern Society of Parasitologists had requested that their members be allowed to register for the meeting at the ASB member rate, even if they were not ASB members. The EC discussion focused on the degree to which ASB dues provide indirect support for the Annual Meeting, and the need to treat all affiliate societies equally rather than singling out Southeastern Society of Parasitologists for special benefits. Affiliate groups should urge their members to join ASB. President Mike Dennis stated our need to convey the benefits that affiliates receive from their association with ASB.

Motion 3. Don Roush moved to support the affiliate members and encourage them to come and participate at the Annual Meeting. All of the affiliates must be treated equally, and all non-ASB members must pay non-member registration rates. The motion was seconded by Doug Rayner and passed after further discussion.

LAC 2009 – George Cline reported that he and Scott Jewell continue their organization of the 2009 Annual Meeting to be held in Birmingham, Alabama.

Conservation Committee – Michael Woods encouraged the compilation of a roster of qualified speakers from each state who can speak on environmental issues.

Enrichment Fund – Bonnie Kelley stated that we should seek outside funding for the enrichment fund. She also shared that the Education Committee has requested \$300 from the Enrichment Fund to cover expenses for their workshop and luncheon at the 2008 Annual Meeting.

Motion 4. It was moved that the request from the Education Committee for funds be supported. The motion was seconded and passed.

Place of Meeting Committee – Don Roush suggested that possible future meeting sites include: Huntsville, Alabama; Gatlinburg, Tennessee (University of Tennessee); Asheville, North Carolina (Western Carolina University); Huntington, West Virginia (Marshall University); and Myrtle Beach, South Carolina (Coastal Carolina University). He stressed that we may need to change the dynamics of how and where to host Annual Meetings. The tradition of a university hosting the meeting sometimes leads to difficulties in finding appropriate venues for paper and poster sessions, luncheons, socials and the banquet on campus or near the university. Discussion followed and five guidelines were developed to help increase membership and financial support, and bring about regional visibility–

1. Try to keep the historical spirit of the meeting places.
2. We cannot afford venues where we lose money.
3. Expand our model and scatter meeting locations throughout the Southeast.
4. After a venue is determined, bring in local universities for support and participation
5. Secure enough venues with enough variety to attract broad interest.

4. Old Business

Concerns regarding the banquet, held at the end of the Annual Meeting, were expressed and discussed. These centered on two main points: (1) who will support the lowered cost for students attending the banquet, and (2) the need to streamline the banquet, perhaps by not having each committee chair give out the awards.

5. New Business

Proposed Symposia for the 2008 Annual Meeting

Scott Franklin has organized "Thems is the Brakes – North American Bamboo," and the proceedings will be published in *Castanea*. Scott has secured funding from Busch Gardens and the Southern Appalachian Botanical Society and requests \$1000 from ASB.

Motion 5. Wayne Van Devender moved that we accept Scott Franklin's symposium proposal and provide the requested funds. Doug Rayner seconded the motion, but the motion did not pass.

Frank Gilliam has organized and submitted a proposal for "The Southeast Regional Knowledge Partnership: From Regional Relevance to Global Significance."

Motion 6. Kim Marie Tolson moved to accept Frank Gilliam's symposium proposal. Dennis Haney seconded the motion and it was passed.

Bill Ensign and Dennis Haney have organized and submitted a proposal for "Research at Undergraduate Institutions: Pitfalls and Possibilities."

Motion 7. It was moved and seconded to accept Bill Ensign and Dennis Haney's proposal. The motion passed.

Revision of the ASB Handbook

The need to thoroughly revise the ASB Handbook for Officers and Executive Committee was discussed. Doing so will mean much work for Archivist John Herr, but the outcome will be valuable to the Executive Committee.

Motion 8. Dennis Haney moved that the ASB President serve a two-year term. Pat Cox seconded the motion. After much discussion that continued via email after the 22 September 2007 meeting, the motion passed 11 in favor and 1 opposed on 22 October 2007.

Additional Sponsorship for Awards

The monetary awards associated with the Senior Research Award and Poster Award are \$1000 and \$300, respectively. Discussion ensued on checking with

book companies such as Pearson, Forestry Supply Company, and Hal Mahan at the Compleat Naturalist for support of these awards.

There being no further business, President Mike Dennis thanked everyone for coming and adjourned the meeting at 2:44 pm.

Respectfully submitted,

Patricia B. Cox, Ph.D., Acting Secretary
22 September 2007

Nicole Turrill Welch, Ph.D., Secretary
16 April 2008

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Lake and Bell Tower at Furman University, Greenville, South Carolina.

ASSOCIATION OF SOUTHEASTERN BIOLOGISTS
69th ANNUAL BUSINESS MEETING
FRIDAY, 18 APRIL 2008
SPARTANBURG MARRIOTT AT RENAISSANCE PARK
SPARTANBURG, SOUTH CAROLINA

President Mike Dennis called the meeting to order at 11:15 a.m. Approximately 86 people attended the meeting.

1. Approval of the Minutes – Secretary Nicole Turrill Welch presented the minutes of the 2007 Business Meeting as published in the July 2007 issue of *Southeastern Biology* [54(3):183-185]. A motion to accept the minutes as published was made, seconded, and approved.

2. Election of Officers – Dwayne Wise, Chair of the Nominating Committee, presented the 2008 candidates. Nominees for President-Elect were Patricia B. Cox, Tennessee Valley Authority, and Terry D. Richardson, University of North Alabama. The nominees for Vice-President were Elaine J. Davis, Bowie State University, and Dennis C. Haney, Furman University. Timothy Atkinson, Carolina Biological Supply Company, was nominated for Treasurer. Members-at-Large had four nominees, and the membership voted for two. The nominees were Ronald V. Dimock, Wake Forest University, Christi Magrath, Troy University, Paul A. Schmalzer, Dynamac Coporation, and Randall L. Small, University of Tennessee. There was a call for further nominations from the floor and, being none, the nominations were closed. Tellers distributed the ballots and the members voted. Mike Dennis asked the tellers to retire and count the ballots.

3. Changes to the ASB Constitution and Bylaws – Mike Dennis presented the proposed amendments to the Constitution and Bylaws to extend the President's term from one to two years. He explained that the Executive Committee had thoroughly discussed the issues and appreciated the continuity that they would bring to both planning and execution. Mike thanked John Herr, Archivist, and Tom Wentworth, President-Elect, for thoroughly researching the implications of the proposed changes. He stressed that a one-year term is insufficient for both planning and achieving goals or initiating programs. Discussion followed, with key points being (1) the person voted President-Elect in 2008 will be the first two-year President, (2) an expression that the President should do his or her planning during their year as President-Elect, and (3) an expression of concern that obtaining nominees for President will become even more difficult than it is now. Mike Dennis called for a vote, the yea's exceeded the nay's, and the amendments were approved.

Amendments to the Bylaws regarding (1) the right of the Print Editor to appoint an Associate Editor, Business Manager and News Editor, (2) the requirement that all nominees for the Meritorious Teaching Award have been members of the Association for at least ten years, (3) the Cengage Learning/ASB Microbiology Award, and (4) the Membership Benefits Committee also were accepted.

4. Secretary Report – Secretary Nicole Turrill Welch read the names of members who passed away since our last meeting, I. W. Carpenter, Wayne R. Faircloth, Bob Short, and Victor Rudis, and asked for a moment of silence to pay our respects to them. She also read the names of members seeking Emeritus status, B. Allen Dunn, Gerhard Kalmus, and J. Kenneth Shull, Jr. A motion to grant these members Emeritus status was made and seconded. The motion carried.

5. Treasurer Report – Tim Atkinson, Treasurer, shared that, for the first time in seven years, the Association did not show a loss. *Southeastern Biology* paid for itself, as did the 2007 Annual Meeting in Columbia, South Carolina. Tim stated that the Enrichment Fund protects the Association's finances in difficult years and donations to this fund must increase. Mike Dennis urged all members to consider an annual contribution to the Enrichment Fund. He also encouraged businesses to become donors to, or Patrons of, the Association.

6. Resolutions – Kim Marie Tolson, Chair of the Resolutions Committee, read the Resolution of Appreciation to the Robert H. Martin, Sr. Family and Martin Microscope Company. Robert H. Martin, Jr., thanked the members and conveyed the importance of the Association to his father. A motion was made and seconded to accept this resolution. The motion passed.

Kim Marie Tolson, read the Resolution of Thanks to Furman University, Wofford College and Converse College. It was moved and seconded to accept the resolution with the discussed additions. The motion passed.

A motion to accept the previous two resolutions by acclamation was received from the floor. This motion was seconded and approved. Let it be noted in these minutes that the Resolution of Appreciation to the Robert H. Martin, Sr. Family and Martin Microscope Company and the Resolution of Thanks to Furman University, Wofford College and Converse College were accepted by acclamation.

7. Announcements – Tom Wentworth asked those interested in serving on committees in 2008-2009 to contact him.

8. Adjournment – Mike Dennis thanked everyone for attending and the meeting was adjourned at 12:03 p.m.

9. Election Results – Announced at the Friday night awards banquet.

President-Elect	Patricia B. Cox
Vice President	Elaine J. Davis
Treasurer	Timothy Atkinson
Members-at-Large	Ronald V. Dimock & Randall L. Small

Respectfully submitted,
Nicole Turrill Welch, Secretary
6 May 2008

Call for Workshop and Symposium Proposals for the 2009 Annual Meeting of the Association of Southeastern Biologists

Deadline for Receipt of Proposals: August 23, 2008

Proposals for Workshops and Symposia to be offered at annual meetings of the Association of Southeastern Biologists must be prepared and submitted for review as described in this Call for Proposals; the same criteria for proposal preparation, submission, and review apply to proposals originating from internal leadership bodies within ASB (such as standing committees) and from individuals or groups outside of ASB. Written proposals for Workshops and Symposia must be submitted to the Chair of the relevant Local Arrangements Committee (LAC), the Program Chair of the LAC, and the ASB President no later than two weeks prior to the fall interim meeting of the ASB Executive Committee. Proposals for Workshops must clearly describe their structure (including maximum number of participants) and concept, as well as prerequisites, space and other facilities requirements, and request for funding from ASB (if any). Proposals for Symposia must clearly address all five of the criteria listed below and be accompanied by letters of endorsement (if any). All proposals will be peer-reviewed and ranked by the Program Chair of the LAC and the ASB Executive Committee. Decisions to accept or reject proposals will be made at the fall interim meeting of the ASB Executive Committee, and proposers will be contacted shortly thereafter.

Workshops

Structure & Concept: Workshops are flexible in their structure. They can be a half-day, full day, or two days in length. Lunchtime Workshops are also offered. Workshop structure is determined by the organizers. Workshops typically have maximum enrollments, and they may specify prerequisites for participation (Workshops should be open to all meeting attendees, first-come first-served, who meet these prerequisites). Workshops often have a registration fee to cover A/V equipment and preparation. Workshops are intended to convey specific knowledge or skills; they are not intended for the presentation of research papers. Workshops are frequently more interactive and informal than sessions within the formal scientific program, and they are not scheduled concurrently with Symposia, contributed oral sessions, or poster sessions. Workshops may involve one or several teachers/presenters, and they may include computer-based or other 'hands-on' training. Weekend Workshops may be linked with a scientific field trip. A Workshop proposal should make clear what participants might expect to gain, and how the Workshop furthers the overall goals of the Association of Southeastern Biologists (these two aspects are the major criteria for Workshop acceptance). Limits of space and time may make it impossible to accommodate all worthy submissions.

Symposia

Structure & Concept: Symposia are a half-day in length. The number of speakers and the length of each talk are determined by the session organizers; talks should be between 15 and 30 minutes long, and presentation times can vary between speakers. Each session should include at least one 30-minute break that will be synchronized with the coffee break of all concurrent sessions. Generally, Symposia should be focused, integrated presentations assessing current understanding regarding a particular research problem, concept, application, or educational theme. Symposia should have broad appeal to members of ASB or involve integration across sub-disciplines.

Symposium proposals will be assessed under the following criteria. Weighting of particular criteria may vary depending on the nature of proposals, but proposals should explicitly address these criteria, as appropriate. There is typically room for only three Symposia at the annual ASB meeting.

Criteria for Evaluation of Symposium Proposals

1. **Scientific strength:** Symposia are the scientific centerpieces of the meeting, and should:
 - offer significant contributions to biological understanding,
 - present innovative or interdisciplinary approaches, including novel collaborations or syntheses across subdisciplines, and
 - have broad enough appeal to generate large audiences (>100 people) at the meeting.
2. **Structure and organization:** Symposia should be more explicitly integrated than other sessions, and should be structured to:
 - provide overall synthesis or overview; they should not be simply a set of related case studies,
 - avoid taking a narrow perspective on the Symposium topic; organizers should carefully avoid appearance of biases toward their own perspectives, and
 - build a well-integrated whole; each talk should have clear relevance to overall synthesis.
3. **Speakers:** Invited speakers should bring new contributions to the session, not simply reviews of previous work. Inclusion of experienced or particularly engaging speakers can strengthen a proposal, but new voices are also important. Proposals with a larger proportion of confirmed speakers will be favored.
4. **Funding:** The ASB Executive Committee has some funding available for Symposium proposals, usually reserved for proposals that come from ASB standing committees. If requesting funds, the Symposium proposer must specify an amount and justify that amount.

5. **Integration:** Proposals may receive higher priority if they are clearly linked to the meeting's overall theme, or if they offer particular value or insight in the context of other sessions proposed for the meeting or of Symposia at recent ASB meetings.

Endorsements

Workshops and Symposia are often endorsed by various groups, agencies, and organizations including international societies, private non-governmental organizations, governmental agencies, or internal leadership bodies within ASB, such as standing committees. These endorsements will be considered in review of proposals, particularly if they emphasize why the group finds merit (in terms of evaluation criteria above) in the proposal. **Each of these groups, organizations, or agencies is allowed to endorse only one Symposium proposal.** If a group submits a proposal, that group is considered to be endorsing its own proposal, and it cannot endorse another. Symposium proposers, in requesting endorsements, should make this policy clear. There is NO guarantee that a proposal endorsed by any group or organization will be accepted. Individuals preparing letters of endorsement should send them directly to those preparing the proposal for inclusion as part of the proposal package.

If Your Proposal Is Accepted

After proposals are accepted and the scheduling for the meeting is underway, cancellations and schedule changes are very disruptive to meeting planning. Hence, organizers of Workshops should obtain firm commitments from their teachers/presenters and organizers of Symposia should obtain firm commitments from as many of their invited speakers as possible before submitting their proposals.

If a proposal is accepted, the organizers must submit a final summary description of the Workshop or Symposium to the Program Chair of the LAC at the same time abstracts are due. This summary will appear on the meeting website and should be written so as to stimulate interest and promote attendance. This description must include a complete and current listing of organizers' names and their affiliations, addresses, telephone and fax numbers, and email addresses; a 400 word narrative description of the session; a 50 word sentence description of the session; and a final, confirmed speaker list.

It is the responsibility of Symposium organizer(s) to see that each speaker submits an individual abstract of his/her talk using ASB's abstract submission criteria by the abstract submission deadline. It is not permissible to submit abstracts by any other means. Contact the Program Chair of the LAC if your situation precludes use of the abstract submission website.

It is suggested and encouraged that a written summary of the Workshop or Symposium be submitted to *Southeastern Biology* for publication.

Workshop/Symposium Proposal Submission Form

Title:

Submitters' Contact Info (address, phone, and e-mail address):

Session Description: In 400 words or less and in sentence form, describe the theme and purpose of this session.

Session Justification: In 250 words or less and in sentence form, provide the justification for this session.

One-sentence Summary: Summarize your proposal in 50 words or less.

Speakers and Titles: List all teachers/presenters (Workshops) or speakers and their titles (Symposia). Next to each participant, indicate if they are confirmed or only contacted and have not yet decided (unconfirmed). Do not list individuals who have not yet been contacted.

This form must be submitted to the following individuals no later than two weeks prior to the fall interim meeting of the ASB Executive Committee (deadline is August 23, 2008).

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ASB

Paper and Poster Abstracts

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Author Index for Papers and Posters with Abstract Numbers
Authors Sorted by Last Name
(numbers = abstract number; P = poster)

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**ASB PAPER SESSIONS
WEDNESDAY, APRIL 16, 2008**

**Southeastern Society of Parasitologists
Presidential Symposium**

- 1 MARCIANO-CABRAL, FRANCINE, MELISSA JAMERSON AND GUY CABRAL. Virginia Commonwealth University School of Medicine—Free-living amoebae as emerging protozoan pathogens.

Free-living amoebae of the genera *Naegleria* and *Acanthamoeba* are found worldwide in diverse water habitats. These amoebae serve as reservoirs for pathogenic bacteria. *N. fowleri* and species of *Acanthamoeba* cause fatal infections in humans. *N. fowleri* is causative of Primary Amebic Meningoencephalitis (PAM), a rapidly fatal disease of the central nervous system that occurs generally in previously healthy children and young adults with a history of exposure to contaminated recreational, domestic, or environmental water sources. Since 1990, the number of human cases of PAM has increased worldwide including in the United States. The majority of these occurred in individuals who had been swimming and diving in freshwater lakes and ponds. In the summer of 2007 six fatal cases of PAM were reported in Florida, Texas, and Arizona. *Acanthamoeba* is causative of granulomatous amoebic encephalitis (GAE) and amoebic keratitis (AK). GAE is a chronic fatal disease of the brain that occurs in debilitated patients while AK is a painful sight threatening infection that affects immune competent individuals. The incidence of GAE has increased due to a greater number of individuals whose immune systems are compromised, including those infected with HIV or who have received organ transplants. The incidence of AK has increased due to use of contact lenses and poor contact lens hygiene. Free-living amoebae constitute a group of emerging pathogens that present an increasing higher risk to human health. Thus, there is a need to monitor recreational and domestic water sources for the presence of these pathogenic free-living amoebae.

- 2 KANIA, STEPHEN A., SHAWN L. LEWIS, AND JOHN C. NEW, Jr. University of Tennessee, Knoxville—Detection of hantavirus in the Great Smoky Mountains National Park.

New world hantaviruses are transmitted by rodents and are endemic to many regions of the United States. Strains affecting humans can cause hantavirus pulmonary syndrome (HPS) which has a high mortality rate. A survey for the presence of hantavirus in national parks was conducted by the Centers for Disease Control and Prevention in 1994 and 1995. This survey, of limited samples and sites, detected the virus in the Great Smoky Mountains National Park (GSMNP). We conducted a more extensive sampling of rodents in the GSMNP to determine the strain or strains of virus, identify animal reservoirs, and examine the geographical distribution of the virus. To facilitate this study a synthetic peptide based enzyme linked immunosorbent assay (ELISA) and a reverse transcriptase real-time polymerase chain reaction (RT-qPCR) test was developed. The ELISA used a 59 amino acid epitope derived from the nucleoprotein. The RT-qPCR targets a highly conserved region of the small (S) genomic segment. The development of these tests, test results, and biological safety considerations for dealing with potentially infected rodents in field studies will be presented.

- 3 YABSLEY, MICHAEL J.^{1,2}, AND LAUREL GARRISON³. University of Georgia, Warnell School of Forestry and Natural Resources¹, University of Georgia, Southeastern Cooperative Wildlife Disease Study², and Georgia Division of Public Health³—Land-use changes and recreation: impacts on tick-borne diseases.

Tick-borne diseases are emerging throughout the world and in the past 40 years and numerous tick-transmitted diseases have emerged in the US since the mid-1900's. Three pathogens (*Borrelia burgdorferi*, *Anaplasma phagocytophilum*, and *Babesia microti*) are transmitted by *Ixodes* species and utilize rodents, primarily white-footed mice as reservoirs. In the southern US, the lone star tick (*Amblyomma americanum*) is the most common human-biting tick and can transmit at least three pathogens, *Ehrlichia chaffeensis*, *E. ewingii*, and a newly discovered *Ehrlichia* sp. that is closely related to *E. ruminantium*. All three of these utilize white-tailed deer as a reservoir. Land use changes, such as suburbanization and reforestation, have significantly increased the risk of tick-borne diseases by providing more suitable habitat for ticks and reservoir hosts. All of these pathogens utilize reservoirs that are highly adaptable and can utilize highly fragmented and degraded habitats. Furthermore, an increase in the amount of time that people, especially those that are immunosuppressed or elderly, spend conducting recreational activities has increased the risk of tick-borne diseases. For example, a recent survey in Georgia found that the majority of people who had ticks attached were participating in recreational activities such as gardening, playing outside, picnicking, or mountain biking. In recently years, the documented distribution of the lone star tick has expanded dramatically and as a result, ehrlichiosis cases in the northern US are expected. Future changes in climate, land-use, and human behaviors are expected to have dramatic effects on the risk of tick-borne diseases.

THURSDAY APRIL 17, 2008 MORNING SESSION

Symposium I

Them's the Brakes: The Past and Future of North American Bamboo

- 4 BRANTLEY, CHRISTOPHER G¹, STEVEN G. PLATT², AND THOMAS R. RAINWATER³. U.S. Army Corps of Engineers¹, Sul Ross State University², and 155 Johnson Ferry Rd., Marietta, GA³.—Descriptions of presettlement and historical canebrakes.

At the time of European settlement, extensive monotypic stands of cane (*Arundinaria gigantea*), known as canebrakes, were a dominant landscape feature throughout the southeastern United States. This monopodial bamboo was likely a significant floodplain species and heavily utilized by Native Americans. Demographic collapse of the Native American population in the 1500s probably resulted in large vegetative expansion into fallow agricultural fields. Burning practices by the remaining inhabitants maintained and expanded canebrakes by eliminating competing woody vegetation. Canebrakes appear to be a dominant landscape feature from historic accounts as well as place names from 16 southeastern states. Historical accounts also suggest that several species may have been specialized for this unique North American habitat.

- 5 PLATT, STEVEN G¹., CHRISTOPHER G. BRANTLEY², AND THOMAS R. RAINWATER³. Sul Ross State University¹, U.S. Army Corps of Engineers², and 155 Johnson Ferry Rd., Marietta, Georgia³.—Native American ethnobotany of cane.

Cane (*Arundinaria* sp.) was one of the most culturally important plants to Native Americans of the southeastern United States. Cane was used to construct houses and other shelters, fences, weapons (bows, arrows, knives, and blowguns), containers, and basketry, cane seeds (and probably shoots) were eaten, and livestock were grazed on the foliage, shoots, and rhizomes. Cane was also used medicinally. The cultural importance of

cane declined rapidly following settlement of the region by Euro-Americans because 1) cane became less available as canebrakes disappeared and 2) manufactured goods obtained through trade were deemed superior and replaced cane in local economies.

- 6 GRIFFITH, ADAM, KATHY MATHEWS, DAVE KINNER, BEN TANNER AND ROB YOUNG. Western Carolina University—The chemical and physical soil properties of *Arundinaria gigantea* in western North Carolina.

Arundinaria gigantea (Walter) Muhl. is one of three bamboo species native to the U.S. and was once abundant in the southeastern states, growing on the floodplains of low energy rivers and streams. Destruction of canebrakes in western North Carolina has resulted in a cultural loss to artisans in the Eastern Band of Cherokee Indians who no longer have sufficient plant resources for traditional baskets, blowguns and other arts. In response to this loss, the Rivercane Restoration Project (RRP) has been initiated with two objectives: establish biophysical controls of *A. gigantea* and educate landowners, land managers, students, and the public about the merits of *A. gigantea*. Soil from 20 canebrakes was characterized for physical and chemical properties. Soil texture analyses using the "feel" method found sands and loams to be dominant in canebrake soils, and laser soil particle analyses of selected samples indicate average sand, silt, and clay contents of 56%, 30%, and 14%, respectively. Canebrake soil bulk densities are low, ranging from 0.484 to 0.789 g/cm³ at each site. Typical Munsell soil colors are chromas of 3 and 4 and saturated soil hydraulic conductivities range from 9.4×10^{-5} to 1.6×10^{-3} cm/sec for canebrake soils. Carbon and nitrogen levels of soils range from 0.642% to 5.672% and 0.056% to 0.387%, respectively. Nutrient analysis for seven micro and macronutrients has also been completed using inductively coupled plasma and atomic absorption spectroscopy techniques. Once optimal biophysical site parameters for the plant are established, recommendations can be made and incorporated into future restoration projects.

- 7 TRIPLETT, JIMMY. Iowa State University—Phylogeny and taxonomy of the genus *Arundinaria* (Poaceae: Bambusoideae).

Arundinaria has a long history of taxonomic confusion, including problems of species delimitation within the North American cane alliance and disagreement on the inclusion of East Asian and African taxa. This study reflects recent efforts to resolve the phylogeny of *Arundinaria* in the context of the temperate woody bamboo clade (19-31 genera, >500 spp.). A revised treatment based on molecular phylogenetic analyses recognizes a narrowly defined genus (*Arundinaria sensu stricto*) endemic to the southeastern United States, and the only native North American representative of the woody bamboos. Within this genus, molecular data (cpDNA sequences, AFLPs), morphology, and phytogeography support the recognition of three species: river cane (*A. gigantea*), occurring inland primarily along river floodplains; switch cane (*A. tecta*), more frequent in acidic swamps, seeps, and bogs of the Coastal Plain; and hill cane (*A. appalachiana*), a recently characterized species from upland forests of the Appalachian Mountains. Diagnostic characters include rhizome structure, number and shape of leaves in clusters at the tips of new shoots, foliage leaf blade texture and persistence, leaf sheath auricles and fimbriae, and primary branch development. Molecular data also confirm the occurrence of natural hybrids, which are found in regions of overlapping distributions and are morphologically intermediate between parent species. The phylogenetic position of *Arundinaria sensu stricto* in relation to other temperate bamboo genera, including *Bashania*, *Pleioblastus*, *Pseudosasa*, *Sasa*, and *Thamnocalamus*, will be discussed.

- 8 MATHEWS, KATHERINE G. Western Carolina University—Genetic diversity of *Arundinaria gigantea* (Poaceae) stands in western North Carolina and evidence for monoclonal flowering based on AFLPs.

River cane (*Arundinaria gigantea*), a native bamboo species, was once abundant in river valleys of western North Carolina. Cane stands are now a rare ecosystem here due to clearing for agriculture and grazing. Our goal is to understand the characteristics of local cane stands to facilitate their restoration for sustainable harvest for craftmaking by the Eastern Band of Cherokee Indians and for ecosystem services. River cane reproduces clonally, producing new culms from underground rhizomes. The extent of clonality and within- and between-stand genetic diversity of cane stands has not been investigated. Reproduction in cane consists of mass flowering and fruiting within a stand, followed by death of the fruiting culms. It has been suggested that fruiting culms are monoclonal, but this has not been tested. If seeds are used to propagate stands, it may be important to know something about the genetic diversity of seeds collected from a single stand. In this study, leaf tissue was sampled from multiple culms along transects from five stands in Jackson and Swain counties, N.C. AFLP fragments were generated for all samples using three primer pairs. Fruiting culms were also sampled from two of these stands. Resulting AFLP fingerprints show low clonal and allelic diversity both within and between stands. The fruiting culms show identical AFLP fingerprints within stands and different fingerprints from those of surrounding sterile culms, indicating monoclonality of the fruiting culms. These data show that typical cane stands in this area consist of few clones that are relatively genetically uniform.

- 9 GAGNON, PAUL R. Louisiana State University—Disturbance ecology and population biology of giant cane (*Arundinaria gigantea*).

The fertile alluvial valleys and stream-side habitats of giant cane (*Arundinaria gigantea*) are subject to a host of natural disturbances. Prior to European settlement, giant cane thrived amidst windstorms, floods, fires and periodic droughts. These potentially interacting disturbances were major influences, and possibly key determinants in the formation of canebrakes. Like all woody bamboos (tribe Bambuseae), giant cane is a large, highly clonal forest grass. We sought to elucidate how interacting ecological disturbances affect the clonal biology of *Arundinaria* at our field-site in northeastern Louisiana in the lower Mississippi alluvial valley. We tagged and tracked individual culms of giant cane in burned and unburned stands growing under forest canopy and in a large tornado blowdown over six years, including a major drought during years 4 and 5. Our results indicate that interacting windstorm and fire disturbances may be critical to canebrake formation. Giant cane appears to be susceptible to drought, but fire may impart a degree of drought-resistance to newly regenerated culms. Fertilization experiments and anecdotal accounts suggest that giant cane may thrive in the alluvial silt deposited by brief, intermittent floods. The disturbance regime in the lower Mississippi alluvial valley has been drastically altered during the last 100 years by river canalization and flood and fire suppression. Knowledge of giant cane's disturbance ecology must serve as a critical baseline for any successful canebrake restoration effort.

- 10 SCHOONOVER, JON, KARL W.J. WILLIARD, CHRISTOPHER R. BLATTEL, AND CHAD YOCUM. Southern Illinois University Carbondale—The utility of giant cane (*Arundinaria gigantea*) as a riparian buffer species in southern Illinois watersheds.

Across the U.S., multiple species of riparian vegetation have proven to be effective filters of sediment and nutrients in agricultural watersheds. A research team at Southern Illinois University Carbondale has focused on giant cane (*Arundinaria gigantea* (Walt.) Muhl.) as a potential candidate to incorporate into riparian buffer designs. To date, 3 studies have evaluated giant cane's attenuation capabilities of sediment and nutrients from surface runoff and groundwater. The initial study monitored nutrient and sediment concentrations from surface runoff and groundwater in Cypress Creek watershed, while two subsequent studies focused on groundwater quality and added additional riparian buffer plots in Big

Creek and Cache River Watersheds. Overland flow collectors and groundwater monitoring wells were used to collect water samples at fixed distances from the edge of three agricultural fields (i.e., 0m, 1.5m, 3m, 6m, 9m, and 12m). Results showed significant nutrient and sediment reductions within the first 3m of the giant cane buffers, whereas equivalent reductions were observed at ~6m in forested buffers. Nutrient reductions in overland flow in the cane buffer were 80%, 81%, 80%, and 68% for phosphate, total ammonium, dissolved ammonium, and dissolve nitrate, respectively. Further, sediment (97%) and groundwater nitrate concentrations (90%) were significantly reduced in the initial 3m of the cane buffer. Plant assimilation and microbial denitrification were likely key mechanisms for the nutrient reductions, whereas increased stem density and infiltration likely promoted deposition of sediment particles. Ongoing research is being conducted on bacteriological fate in giant cane buffers and has been expanded to the watershed-scale.

- 11 OSLAND MICHAEL J., JAMES W. PAHL, AND CURTIS J. RICHARDSON. Duke University—Use of a native bamboo (*Arundinaria gigantea*) for stream restoration in the Southeastern U.S.

A native bamboo species (*Arundinaria gigantea* or giant cane) was once very abundant in wetlands and riparian areas throughout the Southeastern U.S. In many parts of the world, bamboo species are used to restore ecosystem functions and there is much interest in assessing the use of giant cane for stream restoration in the Southeast. However, stream restoration efforts in the region are often hindered by exotic invasive plants and the success of cane restoration efforts will depend upon cane's ability to compete with these species. In this experiment, clumps of *A. gigantea* were transplanted into areas both dominated by and recently cleared of Chinese privet (*Ligustrum sinense*), a widespread invasive exotic shrub in riparian forests of the region. We measured cane survival, cane clonal expansion, privet recruitment, and percent cover of all species for two growing seasons. Cane survival was very high (92%). During the first year, there was little change in clump area, number of culms, culm height, or culm diameter. However, in the second year, the cane clumps in the cleared plots grew taller, produced more culms, and increased in clump area relative to the clumps beneath the privet canopy. Despite high recruitment and percent cover of Japanese stilt grass (*Microstegium vimineum*) and other species, transplanted cane culms continue to grow and expand.

- 12 RUDE, B.J.¹, J.L. PARSONS¹, R.S. SIKES², T. FINLEY² AND H.A. BISSELL³. Mississippi State University¹, University of Arkansas, Little Rock² and University of Wisconsin³—Energy allocation in *Arundinaria gigantea*.

Developing information and tools to make effective management decisions for *Arundinaria gigantea* has been problematic. Understanding seasonal energy utilization and distribution by the plant in preparation for reproduction is essential to effectively manage established stands. This information is also vital for propagation of this species in laboratory settings. Two trials have been completed to evaluate nutrient concentration of both leaf and culm of *Arundinaria gigantea* during August and February. August, protein content was 5.8 and 17.3 % for culm and leaf, respectively, whereas February culm and leaf contained 3.7 and 19.7 %, respectively. Acid-detergent fiber portions did not differ between the two seasons; however, neutral-detergent fiber during August was 84.3 and 68.9 % for culm and leaf, respectively, whereas during February culm and leaf contained 91.7 and 76.5 %. Fat (ether extraction) was increased for both leaf and culm during February (8.9 and 10.7 %, respectively), compared to August (2.9 and 7.5 %, respectively). Independent of these analyses, seeds from flowering *Arundinaria gigantea* were obtained and ether extraction analysis was performed. *Arundinaria gigantea* seeds had 12.4 % fat. This indicates an increase of energy from both lipid and carbohydrate sources available to the plant during the reproductive season. Carbohydrates were readily available (sugars and starch) to the plant during early spring (February) compared to quiescent reproductive seasons

(August). This increase in available energy may be in preparation for reproduction during the spring months.

- 13 BALDWIN, BRIAN.S.¹, MARGARET CIRTAIN², JOHN OUELLETTE¹, D. SCOTT HORTON¹, AND SCOTT FRANKLIN³. ¹ Mississippi State University, ² University of South Carolina and ³ The University of Memphis—Propagation methods and growth enhancement of rivercane (*Arundinaria gigantea*) ramets for use in field restoration projects.

As awareness and interest in canebrake restoration activities in the southeastern U.S. continues to grow, we are faced with numerous challenges. The greatest of these challenges is obtaining enough germplasm to support restoration activities, and providing vested stakeholders an accurate projected cost for these materials. This study evaluated several propagation methods and a restoration trial to begin to elicit information to meet these challenges. Seed germination, micro-propagation, macro-propagation, and transplanting methods were compared and evaluated based on: survivorship, labor intensity, success of establishment, and cost. While each method had its apparent strengths, only the macro-propagation method showed immediate promise with limited investment. Macro-propagated individuals were then used to support an initial restoration trial. Individuals used in this treatment were placed in two field light treatments, from three fertilization regimes, at three distances from a permanent water source. The findings of this study show the first detailed attempt to provide vested stakeholders valuable information for successful cane restoration.

- 14 ZACZEK, J.J., Southern Illinois University Carbondale—Survival and growth of *Arundinaria* rhizomes in greenhouse and field plantings in the Cache River watershed, Illinois.

The drastic loss of giant cane (*Arundinaria gigantea* (Walter) Muhl.) stands or canebrakes has necessitated restoration of this unique habitat. However, practical propagation and restoration methods are underdeveloped. Greenhouse and field studies using rhizomes were monitored for up to five growing seasons at seven different sites with cooperation from The Nature Conservancy, the Cypress Creek National Wildlife Refuge, and the Illinois Department of Natural Resources. In one study, for 115 greenhouse-grown containerized cane propagules that were field-planted, survival was 62%, 48%, and 41% at ages 1, 2, and 5, respectively and was independent of collection origin (putative genotype). For survivors at age 5, the mean number of culms per propagule increased from 1.5 after one year to 80.0 after five years. The maximum lateral spread was 6.9 m with mean of 3.0 m. In another study, prescribed fire in a five-year-old planting reduced percentage cane cover, height, and diameter but increased culm density compared to controls. Burning resulted in a >2x increase in culm density in plots measuring lateral spread. Without burning, fertilization increased percentage cover and culm height compared to controls. Summarizing other studies, survival and growth of planted cane related to collection origin, planting site, and are greater for container-grown versus bare rhizomes. Once established a year after planting, mortality tended to be low and culm height and spread steadily increased. Survival for field-planted bare rhizomes tended to be greater for longer rhizomes with more buds and nodes. Pre-planting herbicide application was not beneficial for survival or growth.

Plant Systematics I

- 15 SMALL, RANDALL. University of Tennessee—Nuclear genes as tools in plant phylogenetics.

Molecular phylogenetic studies in plants have generally relied on a small set of tools, principally DNA sequences from the chloroplast genome (cpDNA) and the nuclear ribosomal internal transcribed spacer (ITS) region. In some cases these tools have been sufficient to provide good resolution of species relationships, but in many cases they do not, especially among closely related species. In particular these data sets often suffer from a paucity of phylogenetically informative characters resulting in incompletely resolved or poorly supported phylogenetic hypotheses. In addition, conflict between data sets may be observed which cannot be resolved without additional data. An alternative source of molecular characters for phylogenetic studies lies in the nuclear genome. Nuclear-encoded genes evolve at a higher rate than cpDNA sequences, and are not subject to anomalous evolutionary processes as ITS sometimes is. Thus nuclear-encoded genes provide a virtually unlimited source of potentially high-quality data. Methods for choosing and isolating nuclear genes from plants will be discussed, and examples from several plant groups will be described.

- 16 SHAW, JOEY¹, JUN WEN², ROSMARIE HABERLE³, CHIN SIEW-WAI³, AND DANIEL POTTER³. The University of Tennessee at Chattanooga¹, The Smithsonian Institution², The University of California at Davis³—Chloroplast DNA phylogeny of *Prunus* L. (Rosaceae) using *trnS-trnG-trnG*, *psbA-trnH*, and *trnL-trnL-trnF* cpDNA sequences.

Prunus L. (Rosaceae), comprising roughly 200 woody species, includes several economically important fruit and nut crop species of temperate regions, such as plums/prunes, peaches, cherries, and almonds, as well as many ornamental species and numerous wild species of ethnobotanical importance. *Prunus* is mostly distributed throughout the north temperate regions of the world, but there are some tropical species of Asia and America. Species of *Prunus* exhibit a diversity of vegetative and reproductive morphologies, some of which (e.g., inflorescence type) have been emphasized in previous classifications, while others (e.g., the position and morphology of the often striking glands present on the leaves) have received surprisingly little attention. Earlier workers divided the genus into five or six subgenera and seven to nine sections that are still recognized today. However, recent DNA sequence-based studies, all of which were based on fewer than about 25% of the species in the genus, have suggested that many infrageneric taxa are not monophyletic. Moreover, none of the aforementioned studies has included adequate representation of *Pygeum*, a group of about 40 species of the Old World tropics, formerly treated as a separate genus. These recent molecular phylogenetic analyses have elucidated various aspects of *Prunus* systematics, but many questions about the status of infrageneric taxa, character evolution, and historical biogeography across the genus remain unresolved. We have generated *trnS-trnG-trnG*, *psbA-trnH*, and *trnL-trnL-trnF* sequences from the majority of the commonly recognized *Prunus* species and here we present the most thoroughly sampled chloroplast DNA phylogeny of *Prunus*.

- 17 BINKLEY, MEAGAN¹, J. HILL CRADDOCK¹, FENNY DANE², and JOEY SHAW¹. University of Tennessee at Chattanooga¹ and Auburn University—Chestnut and chinquapin hybrids are confounding taxonomy: a DNA sequence-based inquiry into a putative hybrid (*C. neglecta* Dode) population.

In North America, *Castanea* L. (Fagaceae) consists of three morphologically variable species: *C. dentata*, *C. pumila* and *C. ozarkensis*. In the southeast, botanists have historically recognized a naturally occurring *C. pumila* x *C. dentata* hybrid (*C. neglecta*

Dode); however, it is possible that these putative hybrids could be either a disjunct *C. ozarkensis* population or North American-Eurasian *Castanea* hybrids introduced during a breeding program in the mid-1900's. We are using DNA sequences from noncoding regions of the chloroplast to test a morphologically confounding population in northwestern Georgia and to compare this population with populations in western North Carolina where morphologically distinct *C. pumila* and *C. dentata* grow in sympatry. Preliminary results indicate that chestnut and chinquapin chlorohaplotypes are not confined to species. Future work will include additional populations in the southeast and the exploration of other genes.

- 18 BRANNON, RICKY D., MIRANDA L. DORNIS, KRISTEN M. SMITH AND KERRY D. HEAFNER. Limestone College—A morphological analysis of allotetraploid segregates of *Isoetes piedmontana* (N.E. Pfeiffer) C.N. Reed.

Isoetes piedmontana (Pfeiffer) Reed was originally described as a variety of *Isoetes virginica* Pfeiffer. The description was based on material collected from the granitic flatrocks of the Piedmont Region of Georgia. Subsequently, quillwort populations ranging from eastern Alabama to east-central Virginia have been identified as *I. piedmontana*. Several populations contain as both diploids ($2n = 22$) and tetraploids ($2n = 44$), with a few populations containing sterile triploids ($2n = 33$). An analysis of the enzyme locus TPI-2 has shown that the tetraploid population in Randolph County, Alabama differs from tetraploid populations in Franklin and Wake Counties, North Carolina by at least one genome. An analysis of thirteen morphological features on plants sampled from these three populations revealed statistically significant differences that help provide the basis for a taxonomic revision of *I. piedmontana*. Significant differences between the Wake and Franklin County, North Carolina populations were not expected. Based on cursory genetic data and these morphological differences, we provide a revised taxonomy of *I. piedmontana* by recognizing two previously undescribed, allotetraploid species and one allotetraploid subspecies: *Isoetes alabamensis* sp. nov., *Isoetes carolinae-septentrionalis* sp. nov., and *I. carolinae-septentrionalis* ssp. *analogous* ssp. nov. These taxa are incorporated into a revised treatment of the granite outcrop *Isoetes* species of the southeastern United States.

- 19 BOLIN, JAY F.¹, REBECCA D. BRAY¹, CARL TAYLOR² AND LYTTON J. MUSSELMAN¹ Department of Biological Sciences, Old Dominion University, Norfolk, VA¹ National Science Foundation, Washington D.C.²—A molecular parentage study of several populations of undescribed tetraploid *Isoetes* in Virginia.

Quillworts (*Isoetes*, Isoetaceae) are cosmopolitan heterosporous fern allies of freshwater aquatic habitats; they consist of slender microphylls and a corm-like root stock. The greatest challenge in species identification is a paucity of usable taxonomic characters. Nonetheless, approximately 200 species of *Isoetes* are recognized and in North America *Isoetes* form a species complex of approximately 31 taxa. Allopolyploidy, interspecific hybridization followed by chromosome doubling, has emerged as an important mechanism of speciation in this group. Of the *Isoetes* in N. America, 16 are diploids ($2n = 22$) and 15 are polyploids ranging from tetraploids ($2n = 44$) to decaploids ($2n = 110$). Molecular techniques will be used to determine parentage in several coastal plain and piedmont populations of Virginia tetraploid *Isoetes*. Low copy genes have been used successfully to determine hybrid origins of *Isoetes*. We will amplify the second intron of LEAFY (*LFY*) homolog, a biparentally inherited nuclear gene, clone PCR products, screen 6-10 clones per individual, and sequence the *LFY* clones. Preliminary *LFY* sequence data indicate that some Virginia tetraploid *Isoetes* in our study are related to *Isoetes* lineages with no extant representatives.

- 20 FURCHES, M. STEVEN AND RANDALL SMALL. University of Tennessee—Assessment of chloroplast variation in the genus *Sarracenia* in the southeastern United States.

Sarracenia is genus of rhizomatous, perennial herbs centered in the southeastern United States with one species extending into New England and Canada. They are primarily found in sphagnum bogs, mountain seeps, and longleaf pine savannas. The group has long been popular in cultivation due to their carnivorous habit and ability to form complex hybrids. Extensive hybridization combined with morphological variation has led to conflicting taxonomies within the genus, consisting of eight to eleven species and numerous subspecies and varieties. Many taxa described and named as species were later discovered to be hybrids and nearly every pair of species that exists in close proximity in nature has been found to hybridize. While several attempts have been made using traditional morphological characters, flavonoids, petal extract chromatography, and DNA-based methods, relationships within *Sarracenia* have yet to be fully resolved. In order to better understand relationships within the genus we examined multiple individuals from eight species in ten populations using three non-coding chloroplast regions. While chloroplast variation exists, there was neither a taxonomic pattern among the three haplotypes nor a discernable geographic pattern. Haplotype A was found in five species in all ten populations, while haplotype B was found in four species in two populations. Haplotype C was restricted to a single species in a single population. Future work using AFLPs may help clarify relationships within this fascinating group.

- 21 ALLISON, JAMES R. DeKalb County Parks & Recreation Dept. (Georgia)—A new, shrubby mint from the Piedmont of Georgia (USA).

The genus *Satureja* L. (Lamiaceae), sensu lato, has been subdivided in various ways by systematists. Of the woody species native to the southeastern United States, four have consistently been recognized in modern times, either as species of *Satureja*, *Calamintha*, or—the treatment employed by the majority of recent workers—*Clinopodium*: *Clinopodium ashei*, *C. coccineum*, *C. dentatum*, and *C. georgianum*. On July 21, 2003 the author discovered the first of several anomalous populations of plants growing where quartzite bedrock was close to the surface in Upson and Pike Counties, Georgia, within the range only of *C. georgianum*, but differing from it in several respects. Unlike *C. georgianum*, these plants are more procumbent; stem vestiture a mix of short as well as long hairs (the short ones less curved than those of *C. georgianum*); leaves persistently hairy, the largest less than 0.9 cm wide and less than 2 cm wide, when crushed sharply (not sweetly) aromatic; peak anthesis in late July through early August (before sympatric *C. georgianum* is in bud); calyces with stipitate glands on the body and lobes; and corollas smaller and proportionally more slender, the tube lacking stipitate-glandular hairs. Many of these differences suggest an affinity with *C. dentatum*, endemic to the Panhandle of Florida. No populations of the new species enjoy formal protection at present. They are threatened by development and by excessive competition resulting from fire-suppression (besides various drought-tolerant oaks and hickories, most notably *Quercus georgiana*, dominant trees include the famously fire-dependant *Pinus palustris*).

- 22 JOHNSON, GEORGE P. Arkansas Tech University—*Platanthera flava* (L.) Lindl. (Orchidaceae): a preliminary study of morphological variation and varietal recognition.

Platanthera flava (L.) Lindl. (Orchidaceae), tubercled-orchid, grows in the moist soils of woodlands, meadows and prairies, often in areas that are flooded during part of the year. Geographically, the taxon is widely distributed in eastern North America, occurring from southeastern Canada to the Gulf Coast of the United States. As would be expected given this ecological and geographic range, plants of this taxon are quite variable in vegetative

and floral characters. Although taxonomic opinion varies, typically two varieties are recognized in *P. flava*: var. *flava*, with a more southerly distribution, and var. *herbiola* (R. Br.) Luer, with a more northerly. Identification to variety has been based primarily on three characters: the number of full-sized leaves, the length of the lip relative to its width, and the length of the bracts which subtend the flowers. While these characters work well in distinguishing the variety of plants which occur towards the extremes of the species' range, distinguishing the variety of plants from the center of the species' range can be problematic. This latter situation is what I have experienced during my work on the Orchidaceae for the Flora of Arkansas Project, and what has prompted this study of specimens from beyond the State's boundaries. I have begun a preliminary study using vegetative and floral characters to try and determine what characters and states, if any, provide a more reliable means to distinguish between varieties; or, if varietal recognition is realistic using morphological characters.

- 23 RICHARDSON, CHANNING AND ALLEN C. RISK. Morehead State University—Pteridophytes of Carter Caves State Resort Park, Carter County, Kentucky.

Carter Caves State Resort Park is located in Carter County in northeastern Kentucky. In order to inventory the ferns and fern allies within the park, pteridophyte specimens were collected from September 2005 through October 2007. Examination of specimens in the herbarium of Morehead State University showed that 27 species had previously been documented for the park. A survey of relevant literature revealed that an additional species, *Adiantum capillus-veneris*, had been collected from the Carter Caves area. Field work within the last year confirmed the presence of all previously documented species, except *A. capillus-veneris*, and also added an additional 17 species to those already known for the park, bringing the total number of species and lesser taxa to 45. Species found in the park that are uncommon within Kentucky are *Trichomanes boschianum*, *Isoetes engelmannii*, and *Dryopteris goldiana*. Species found during the study that are uncommon within the park include *Asplenium resiliens*, *A. ruta-muraria*, *A. trichomanes*, *Dryopteris goldiana*, *Polypodium appalachianum*, *Pteridium aquilinum*, *Trichomanes boschianum*, *Vittaria appalachiana*, *Woodsia obtusa*, and *Woodwardia areolata*.

- 24 FLAGG, RAYMOND O.¹ AND GERALD L. SMITH². Carolina Biological Supply Company¹ and High Point University²—Contributions to Mexican *Habranthus* and *Zephyranthes* by Thad Howard.

Thaddeus M. Howard, Jr., D.V.M. had an early love for plants, and he was an avid collector, trader and hybridizer of amaryllids. He was named 1970 Herbert Medalist "for his outstanding contributions to the amaryllids, notably adding to the knowledge available on *Alliums* (sic), *Bessera*, *Sprekelia* and other genera." Of the approximately 40 species of *Habranthus* and *Zephyranthes* (Amaryllidaceae) native to Mexico, Thad Howard contributed in the finding and naming of 15: *Z. morrisclintii* Traub & Howard (1970), *xCoobranthus coryi* Howard (1990), *H. howardii* (Traub) Howard (1990), *H. vittatus* Howard (1990), *Z. bella* Howard & Ogden (1990), *Z. chichimeca* Howard & Ogden (1990), *Z. crociflora* Howard & Ogden (1990), *Z. nymphaea* Howard & Ogden (1990), *Z. primulina* Howard & Ogden (1990), *Z. reginae* Howard & Ogden (1990), *Z. leucantha* Howard (1993), *H. mexicanus* Howard (1996), *H. oaxacanus* Howard (1996), *Z. dichromantha* Howard (1996), and *Z. moctezumae* Howard (1996). Apparently only one name was erroneously applied to a plant that had been previously described: *H. oaxacanus* Howard (1996) = *Z. konzattii* Greenman (1898). His taxonomic achievements are remarkable for his status as an amateur botanist.

- 25 MURRELL, ZACK E. AND DERICK POINDEXTER. Appalachian State University—The role of networks in meeting the challenges of data integration.

The life sciences have lagged behind other sciences in the development of standards for data acquisition and presentation. This lack of standards has allowed the life sciences to be innovative; however, this has also impeded development of meta-analyses of existing datasets. A wealth of information at the species and community levels is essentially dormant unless we can make these data digitally available in a standard environment. The use of biodiversity informatics to answer broad questions about biodiversity can be most useful when we develop effective means of information acquisition, analysis, sharing and collaboration. The Internet portal for biological information (GBIF: Global Biodiversity Information Facility) has embraced the standards environment provided by Biodiversity Information Standards (formerly known as TDWG: Taxonomic Database Working Group). However, these standards still need to be accepted and augmented by various groups of scientists. Networks, or communities of scientists in similar areas of research, can provide the means of data integration needed to fully utilize the tools of biodiversity informatics. In order to facilitate needed changes in how we do science, networks can help address the challenges of data integration by embracing Web 2.0 technologies.

Microbiology

- 26A JUTRAS, BRANDON L. Eastern Illinois University—Lone Star Tick, *Borrelia lonestari*, the parasite and its tick host - Combining field surveys and molecular diagnostics in the study of STARI in Illinois.

The lone star tick, *Amblyomma americanum* (Ixodidae, Acarina, Arachnida) is a hard tick known for its aggressive feeding behavior, and is unique in that it will readily feed on humans during every life stage. Previous studies have shown that the lone star tick is capable of transmitting five different human pathogens, including *Borrelia lonestari*, the spirochete responsible for symptoms similar to those of Lyme's disease. This newly discovered disease has been named Southern Tick Associated Rash Illness (STARI).

In 2002, the lone star tick bit several children attending a youth camp in Shawnee National Forest in Saline County, IL. These individuals had symptoms characteristic of Lyme disease, but test results were negative for *B. burgdorferi*, suggesting the presence of *B. lonestari*. From May 2007 to August 2007 1439 individuals were collected, identified, sexed, and life stage determined. PCR was used to test for the presence of *B. lonestari*, via the glpQ gene. Thus far 200 ticks have been screened, 22 of which tested positive for *B. lonestari* which is much higher than previous reports in other areas. The distribution of ticks collected is highly variable. However, it is apparent that populations are significantly higher near the fore-mentioned youth camp, as well as near water sheds. Further analysis is required in order to determine the cause for this drastic difference

26 CANCELLED

27 CANCELLED

- 28 LUO, HAIWEI, ROBERT FRIEDMAN AND RICHARD A. LONG. University of South Carolina, Columbia—The occurrence of alkaline phosphatase in marine bacterial genomes and its implication for their phosphorus ecophysiology.

Phosphorus is an essential element for all forms of life. Different microorganisms face distinctive phosphorus status. Many bacteria possess alkaline phosphatase (APase) gene whose expression is induced by phosphate limitation. Using BLASTP and RPSBLAST searches against whole genomic sequences, we identify extracellular APase genes belonging to different families including PhoA, PhoX, and PhoD phosphatases occurring in all of the sequenced genomes from *Alteromonadales* (n=21) and *Enterobacteriales* (n=43), two evolutionarily close but ecologically different phylotypes belonging to *gamma*-

proteobacteria; we also applied this approach to the two dominant marine cyanobacteria genera, *Prochlorococcus* (n=12) and *Synechococcus* (n=8). Our results show that the average number of APase gene copies per genome is 6 times greater in *Alteromonadales* than in *Enterobacteriales*. This may indicate that *Alteromonadales* have been adapted to the relatively phosphate-depleted marine environment by retaining more copies of APase genes than *Enterobacteriales* which is known as typical host-associated bacteria experiencing as phosphate-replete environment. Frequent gene duplication events in *Alteromonadales* genomes may account for the observed high abundance of APase genes. In addition, we find that PhoA gene occurs in some *Prochlorococcus* genomes, while PhoX and PhoD genes which are present in some *Synechococcus* genomes were lost in all *Prochlorococcus* genomes. Whether *Prochlorococcus* spp. possesses PhoA gene may depend on the phosphate concentration at its ecological niche where it was isolated rather than its phylogeny, which is in sharp contrast to the scenario of nitrite reductase gene in *Prochlorococcus* whose occurrence is consistent with the phylogeny of *Prochlorococcus*.

- 29 LONG, RICHARD A. AND HAIWEI LUO. University of South Carolina, Columbia—Marine microbial metagenomic survey of alkaline phosphatase.

Alkaline phosphatase activity has commonly been used as a sensitive indicator for phosphorus limitation in the ocean. Many marine bacteria excrete alkaline phosphatase and hydrolyze phosphoesters, the most abundant phosphorous-compounds in the ocean, to relieve phosphate stress. Here, we systematically apply PSIBLAST, BLASTP, and RPSBLAST to identify different extracellular alkaline phosphatase families including PhoA, PhoD, and PhoX phosphatase genes, occurring in two oligotrophic microbial metagenomes from the Sargasso Sea and the North Pacific Subtropical Gyre (NPSG). We demonstrate that the normalized alkaline phosphatase gene abundance is significantly higher in the surface waters of the Sargasso Sea than in the NPSG. In conjugation with previous studies that found phosphate levels in the surface water of the Sargasso Sea can be approximately two orders of magnitude lower than the NPSG, our results tentatively suggest that the microbial community in the surface water of Sargasso Sea may experience greater phosphate limitation than in the NPSG. Tentative taxonomic assignments of alkaline phosphatase genes suggest that *Alteromonadales* potentially is an important phylotype in dissolved organic phosphorous remineralization in oligotrophic oceans. In addition, *Bacteroidetes*, *Silicibacter*, *Prochlorococcus*, and *Synechococcus* may also be important alkaline phosphatase gene sources. Our discovery of high abundances of PhoD and PhoX alkaline phosphatase genes in the metagenomic datasets implies that alkaline phosphatase has a broader role in phosphoesters hydrolyzation in the ocean as those gene products possess diesterase activity in addition to the previously recognized monoesterase.

- 30 MUSCARELLA, MARIO, JUDY AWONG-TAYLOR AND JENNIFER ZETTLER. Armstrong Atlantic State University—The potential for pathogenic and non-pathogenic *Escherichia coli* to survive in beach sand from Tybee Island, Georgia.

The effectiveness of *E. coli* as a fecal indicator for the North Beach of Tybee Island, GA was evaluated. This was accomplished by determining if the sand at that site could serve as a reservoir for *E. coli*. This was done in a controlled laboratory setting using sand based microcosms. This sand was inoculated with either the non-pathogenic *E. coli* DH5 α or the pathogenic *E. coli* O157:H7. These bacteria were labeled with the pGLO plasmid for identification under UV light. Samples of the sand were tested for the presence of the *E. coli* strains using a dilution method and the microdrop plating technique. It was determined that both strains rapidly declined (d-values: *E. coli* DH5 α – 34.14 hrs and *E. coli* O157:H7 – 23.75 hrs) with first order kinetics. This indicates that they were not able to survive in the sand. However, significantly (p<0.01) more non-pathogenic bacteria survived for longer

time durations than the pathogenic strain. These results confirm the effectiveness of *E. coli* to serve as a fecal indicator used in environmental testing.

- 31 NELSON¹, LAWRENCE, BENJIE BLAIR¹, CHRIS MURDOCK¹, MARK MEADE¹ STEPHEN WATTS² AND ADDISON L. LAWRENCE³. Jacksonville State University¹, University of Alabama in Birmingham² and Texas A&M Experimental Station³—Molecular analysis and comparison of gut microflora in captive-raised sea urchins (*Lytechinus variegatus*) grown in captive culture conditions.

In the United States, sea urchin aquaculture is in its infancy. One concern with current captive culture involves maintaining roe, or "uni", quality. Diet of cultured urchins has been shown to effect roe quality. Sea urchins have a unique digestive system and lack certain digestive enzymes, yet they are able to digest high percentages of food biomass consumed. It is hypothesized that their highly efficient digestion is due to the presence of bacteria in the gut. This study determined bacterial profiles in guts of captive-raised sea urchins, *Lytechinus variegatus*, grown in an open system. The flora was compared to the flora of a captive raised closed system urchin. Using a bacteria-specific forward and universal reverse primer, 16s rDNA genes were amplified from DNA isolated from the gut of three urchins and subsequently cloned. Recombinant colonies containing putative 16S rDNA were randomly selected for sequencing. Sequences generated from these clones were analyzed and compared to published bacterial 16S rDNA sequences available through the NCBI database. Sequence data analysis suggested that the captive-raised sea urchins contained a limited number of representative genera. The genera most commonly identified included *Pseudomonas*, *Vibrio* and various epsilon, and gamma proteobacterium species. The Open system urchins had some of the same representative flora indicating possible microflora selection by the urchin.

- 32 BOGARD, AMY, JUSTIN CONLEY, ARCHANAA JOHN, JESSICA LEET, CARRIE ROSS, BEVERLY SWITTER, AND HENRY SPRATT. University of Tennessee at Chattanooga—Bioremediation potential of compost/mulch mixture for waste motor oil.

The use of compost or mulch to adsorb and degrade organic wastes has been demonstrated many times. Previous work has suggested that a compost/mulch mixture used by the City of Chattanooga may help comply with National Pollutant Discharge Elimination System (NPDES) requirements for a vehicle repair yard known to have runoff contaminated with waste motor oil, herbicides, and other organic wastes. The compost/mulch mixture used by the City has high levels of microbial heterotrophic activity capable of degrading or at least tolerating waste compounds adsorbed. This study focused on waste motor oils, monitoring both potential toxicity and rates of motor oil mineralization. Heterotrophic microbial activity was monitored in microcosms using ¹⁴C-glucose mineralization. Motor oil mineralization was monitored using a hexane extraction procedure gravimetrically. In all cases controls (not previously exposed to oil) had significantly higher heterotrophic activity than compost/mulch exposed to oil. Oil mineralization was also affected by prior exposure to waste oil. To determine whether or not bioaugmentation might enhance the breakdown of oil, oil-degrading bacterial cultures were isolated from soil having been contaminated with waste oil for decades using enrichment culture techniques (waste oil as sole carbon source). Four cultures were isolated, grown to high density, washed with sterile saline and added to experimental and control compost/mulch. Heterotrophic activity was somewhat reduced in augmented compost/mulch. Final assessment of the efficacy of bioaugmentation on waste oil mineralization in these compost/mulch mixtures will require comparisons of the actual rates of oil mineralization both pre and post augmentation.

- 33 ROSS, CARRIE AND HENRY SPRATT. University of Tennessee at Chattanooga—Electrical current generation and organic matter degradation in bacterial batteries metabolizing raw sewage.

Bacterial batteries are proven sources of electrical energy and have been used with varying carbon sources to fuel the bacteria. Previous work in this lab has described the use of both raw sewage and sewage sludge as fuels for bacterial batteries. The main goal of this study was to determine if further modifications of bacterial battery design might lead to enhanced electricity production at the expense of organic matter present in raw sewage, while reducing the BOD of the sewage. These battery cells were modified by isolating the aerobic cathodes from the anoxic anodes in separate tanks, connecting these electrodes via conductive bridges. Six battery cells were set up, with two sets differing in the surface area of the electrodes. All six batteries were connected to electric meters that monitored the energy production of the battery cells. Raw sewage, obtained from the Chattanooga, Tennessee sewage treatment plant was added to the anode tanks approximately every two weeks. In addition to the electrical current production, which was continuously monitored, water samples were collected from the raw sewage and the tanks at various times for chemical assessments. These chemical assessments included dissolved O₂, pH, conductivity, and dissolved and particulate organic carbon. To date current generation in the cells is in the 10 mA range. However, in a previous version these batteries generated current in the mA range. Additional modifications to the design of the cells will be tested to attempt to increase current generation and to determine the effect on chemical parameters.

- 34 WEAVER, AMANDA, AND HENRY SPRATT. University of Tennessee at Chattanooga—Microbial mineralization of select organic wastes adsorbed to a compost/mulch absorbent.

Rates of microbial mineralization of organic wastes were measured in mesocosms filled with a compost/mulch absorbent used to filter parking lot runoff. The mesocosms (10 gallon aquaria) were exposed to three organic wastes: used motor oil, phenanthrene (a PAH), and simazine (a herbicide). Control mesocosms were not exposed to any wastes. Compost/mulch slurries were prepared in microcosms (200 ml sealed bottles) to measure microbial activities monthly for four months. Microcosms were used to monitor total heterotrophic activity for all mesocosms using ¹⁴C glucose addition. Additionally, ¹⁴C-phenanthrene and ¹⁴C-simazine mineralization were added to separate microcosms to measure their mineralization rates. Rates of mineralization were measured by trapping ¹⁴CO₂ released from the radiolabeled compounds in 0.1 N NaOH traps within the microcosms. Similar tests were run on uncontaminated control microcosms. Heterotrophic activity was observed in all mesocosms, contaminated and control. Additionally, ¹⁴C-phenanthrene and ¹⁴C-simazine were mineralized in control compost/mulch, albeit at rates much lower than for ¹⁴C-glucose. For mesocosms contaminated with phenanthrene and simazine, these wastes were mineralized at rates higher than observed in controls. Interestingly, control mesocosms showed declining rates of heterotrophic activity over the four-month period of this study. This suggests that the microbial communities within this compost/mulch may need to be replenished over time to maintain the efficacy of these systems to mineralize waste compounds absorbed into them. Further studies may determine if bioaugmentation with targeted microbes could help enhance levels of organic waste mineralization adsorbed into the absorbents.

- 35 HOWLETT, INIGO, AND HENRY SPRATT. University of Tennessee at Chattanooga—Geospatial distribution and activity of polycyclic aromatic hydrocarbon degrading bacteria in riparian soils near Chattanooga, Tennessee.

This study is a geographical information system (GIS)-enhanced investigation of the distribution and activity of polycyclic aromatic hydrocarbon (PAH)-degrading soil bacteria in Chattanooga, Tennessee area riparian soils. Control sites include a wetland from a former industrial area not known for any organic contamination, and a site only known for prior agricultural activity. The contaminated site is located along Chattanooga Creek, designated an EPA Superfund site due to massive contamination with coal tars containing high levels of PAH's. Multiple soil samples were taken from each of these wetland sites in July 2007 using transects across each wetland from higher ground to the center of the wetlands. The precise location of each sample site was noted using a global position satellite device giving meter-level accuracy. Data generated for these samples will ultimately be used to establish GIS-based data files. Two methods were used to quantify bacterial activity in all soil samples. Soil bacteria were placed in microcosms along with ^{14}C phenanthrene tracer over a period of several days. Rates of phenanthrene mineralization were determined by monitoring the production of $^{14}\text{CO}_2$ during these incubations. Concomitantly, bacterial DNA extractions were performed on the soil samples. Real-Time PCR procedures were performed to determine the presence and copy number of aromatic dioxygenase genes related to the degradation of PAH's, including *nahAc* and *nidA*. Data available to date from these samples suggest a strong bias for prior exposure to contaminants in both the rate of PAH degradation and the dioxygenase gene copy numbers present in the soil.

- 35A KILGORE, COURTNEY M., HAROLD W. KELLER, AND JOSEPH S. ELY. University of Central Missouri—Distribution of myxomycete species assemblages on aerial reproductive structures from living trees and herbaceous prairie species.

Myxomycetes exist on a variety of substrata including decaying wood, leaf litter, and living vascular plants. Little is known about myxomycetes on the reproductive structures of vascular plants, especially grassland plants. No studies exist that compare myxomycete species assemblages on reproductive structures and bark/stems. This study focused on the distribution of myxomycetes on vascular plant reproductive structures, including 209 individuals of *Asclepias syriaca*, *Echinacea spp.*, *Cercis canadensis*, *Pinus echinata*, *Yucca glauca* and *Y. smalliana* that occur in Kansas, Kentucky, and Missouri. Myxomycetes were grown in moist chamber cultures consisting of sterile Petri dishes (150 X 25 mm) lined with filter paper along with reproductive structures or stems or bark. The moist chamber cultures were wetted with distilled, (de-ionized) sterile and pH neutral water. After full saturation (24 hours), the unabsorbed water was decanted and pH measured. Four pH readings were taken for each plate (total 2180). Cultures were scanned on day 4, 8, 16, and 32. The pH of reproductive structures did not differ from the pH of the bark or stems. Moist chamber cultures (total 545) had myxomycete species assemblages that differed between trees and grassland species. Communities were compared statistically using the Sørensen coefficient of community index and the multi-response permutation procedure. A possible novel species of *Arcyria* was discovered on short-needle pine cones. Financially supported by the National Science Foundation DEB Award #0343447, Discover Life in America Award #2001-26, #2002-17, and National Geographic Society Committee for Research and Exploration Award #7272-02.

Southeastern Society of Parasitologists I

Byrd-Dunn Student Paper Competition

- 36 CHAD GROCE AND CHERYL D. DAVIS. Department of Biology, Biotechnology Center, Western Kentucky University—High prevalence of *Trypanosoma cruzi* infection in raccoons and opossums from Kentucky.

While only 6 autochthonous cases of human Chagas' disease have been documented in the U.S., it has been estimated that as many as 50/1000 immigrants in the U.S. may be infected with *Trypanosoma cruzi*. The parasite has been isolated from a wide variety of mammals indigenous to the southern U.S., but it has not been reported from the state of Kentucky. The principal goal of the present study was to determine if the sylvatic cycle of *T. cruzi* infection occurs in the state, and if present, to assess the prevalence of infection in Warren and Barren counties. Raccoons and opossums were live-trapped between June and December, 2007. Animals were anesthetized using an inhalant anesthesia, and blood samples were collected using a vacutainer system. Sera were frozen at -80°C for subsequent analysis, and whole blood samples were inoculated in duplicate into liver infusion tryptose (LIT) medium and cultured at 27°C . To date, eighteen *T. cruzi* isolates from raccoons have been positively identified by hemoculture. No opossum blood samples have yielded positive hemoculture results, however, 15/49 opossum sera were identified as positive by immunofluorescence antibody test (IFAT). A total of 18/46 raccoon samples were judged to be seropositive by IFAT. We are currently optimizing a parasite-specific ELISA to measure antibody titers in seropositive raccoons and opossums. To our knowledge this is the first time *T. cruzi* has been reported in Kentucky. The partial support of NIH Grant Number 2 P20 RR-16481 from the National Center for Research Resources is gratefully acknowledged.

- 37 EDENFIELD, KATIE¹, CAROL RUCKDESCHEL², CAROLINE CHAMPION¹, SAM POSEY¹, EMILY PIERCE¹, WHITNEY BULLARD¹, AND C. A. HALL¹.
¹Department of Biology, Berry College and ²Cumberland Island Museum of Natural History, Georgia—A species diverse survey of southeastern Georgia for the sylvatic distribution of *Trypanosoma cruzi*.

Specimens (n =110) representing fifteen different mammalian species were collected to evaluate the host diversity of *Trypanosoma cruzi* in southeastern Georgia. Tissues were harvested and subjected to PCR analysis using the *T. cruzi* specific TCZ primers. A positive result was generated from 117 (71%) of the samples, representing fourteen of the fifteen species tested. Cotton mice (*P. gossypinus*) emerged as a significant reservoir species with 21 of 29 individuals testing positive. High prevalence rates were also found in raccoons (*P. lotor*), armadillos (*D. novemcinctus*), opossums (*D. virginiana*), Eastern moles (*S. aquaticus*), and Short-tailed shrews (*B. carolinensis*). Interestingly, of the five species of bats tested, all generated at least one positive result. This confirms that *T. cruzi* is widely distributed throughout the sylvatic mammalian population in southeast Georgia, with significant prevalence rates in most of the species tested.

- 38 BROWN, EMILY L.^{1,2}, MOURAD GABRIEL³, MATTHEW GOMPPER⁴, RYAN MONELLO⁴, KRISTA M. WENNING⁵, AND MICHAEL J. YABSLEY^{1,2}.
¹Southeastern Cooperative Wildlife Disease Study, College of Veterinary Medicine, University of Georgia, Athens, GA, ²Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA, ³Department of Veterinary Medicine and Epidemiology, Center for Vector-Borne Diseases, University of California Davis, Davis CA, ⁴Department of Fisheries and Wildlife Sciences, University of Missouri, Columbia, MO, and ⁵USDA-APHIS, Wildlife Services, Phoenix, AZ—Seroprevalence of *Trypanosoma cruzi* in mammals of the United States.

Trypanosoma cruzi, the causative agent of Chagas' disease, is a substantial public health problem in Latin America. In the US, many species of wildlife are infected, but domestic animal and human cases are relatively rare. The two primary reservoirs in the US are believed to be raccoons (*Procyon lotor*) and opossums (*Didelphis virginiana*). Mammals from five states across the natural geographic range were tested for anti-*T. cruzi*

antibodies using the indirect immunofluorescent antibody test. From Georgia and Florida, antibodies were detected in raccoons (36%, 201/559), opossums (30%, 122/403), bobcats (*Lynx rufus*) (4.2%, 2/48), and coyotes (*Canis latrans*) (4.4%, 1/23), but not in 15 gray fox (*Urocyon cinereoargenteus*) or 5 red fox (*Vulpes vulpes*). In Missouri, 69% of 108 raccoon serum samples were positive for antibodies to *T. cruzi*. In Arizona, one raccoon (20%), 3 striped skunks (9%), and one ringtail (100%) were seropositive, while 20 domestic dogs and one hooded skunk (*Mephitis macroura*) were negative. From northern California, 10 ringtails, 21 fishers (*Martes pennanti*), 3 raccoons, 10 striped skunks, and 10 gray fox were all negative. Seroprevalence rates for raccoons and opossums from Georgia and Florida were similar to each other but were higher compared to culture-based prevalence rates (difference significant only for opossums). These data suggest that opossums have similar exposure rates to raccoons but maintain lower parasitemias or have shorter patent periods. This comprehensive serologic survey shows the relative importance of different species as reservoirs, as well as regional differences in *T. cruzi* prevalence.

- 39 PIERCE, EMILY, KATIE EDENFIELD, SAM POSEY AND C. A. HALL. Department of Biology, Berry College, Mount Berry, GA 30149—Vertical transmission of type I and type IIa isolates of *Trypanosoma cruzi* from the southeastern United States in BALB/c mice.

The dynamics of *Trypanosoma cruzi* transmission in the southeastern United States are poorly understood. Mathematical models suggest that the high prevalence in sylvatic reservoir populations in the region cannot be supported by vector transmission alone. We have compared regionally acquired Type I (n = 3), and Type IIa isolates (n = 3), for their ability to be vertically transferred in BALB/c mice. Effects of infection on fecundity were also noted. Consistent with our previous findings, pups (n=127) born to Type IIa infected female mice were more likely to provide a positive *T. cruzi* specific PCR result than pups (n=56) born to females infected with regional Type I isolates, with prevalence values of 75% and 53.5 respectively. The Type IIa infected mice also birthed more pups over the period of study. This was largely due to an increase in the number of litters compared to Type I infected female mice and mortality in the Type I infected females. These data confirm that the Type IIa strains of *T. cruzi* in the southeast are more highly adapted to placental transmission than the Type I strain. This may explain in part the described strain dichotomy in regional host preference.

- 40 ROELLIG, DAWN M.^{1,2}, ANGELA E. ELLIS³, and MICHAEL J. YABSLEY^{2,4}. Department of Infectious Diseases, College of Veterinary Medicine, The University of Georgia¹; Southeastern Cooperative Wildlife Disease Study, Department of Population Health, College of Veterinary Medicine, The University of Georgia²; Athens Veterinary Diagnostic Laboratory, College of Veterinary Medicine, The University of Georgia³; D.B. Warnell School of Forestry and Natural Resources, The University of Georgia⁴—Infections with geographically and genetically different strains of *Trypanosoma cruzi* in two North American reservoir hosts induce dissimilar infection dynamics.

Trypanosoma cruzi, etiologic agent of Chagas disease, is capable of infecting a variety of mammalian hosts within a wide geographic range in the Americas. In addition, *T. cruzi* is genetically and biologically diverse with molecular associations occurring between strain type and host origin. The objective of the present study was to determine dynamics of *T. cruzi* infection in *Didelphis virginiana* and *Procyon lotor* and to provide experimental evidence for an observed host species-parasite strain dichotomy. Based on previous molecular typing and hemoculture evidence from wild-trapped animals, we hypothesized that raccoons would have a longer patent period than opossums, and raccoons would be more competent reservoirs for all genotypes of *T. cruzi* compared with opossums. Individuals (n=2 or 3) of each species were intraperitoneally or intravenously inoculated

with 1×10^6 culture-derived *T. cruzi* trypomastigotes of Type IIa (North America-raccoon), Type I (NA- opossum), Type IIb (South America-human), or both Type I and IIa. One animal in each group was euthanized during acute (1 and/or 2 months) and chronic stages (4 months) and tissues collected for PCR and histopathology. Opossums had a more gradual increase in parasitemia, peaking around 35DPI, and a rapid decline by week six; raccoons quickly reached peak parasitemia at 18-21DPI and maintained relatively high parasitemia for 5 weeks. Additionally, raccoons became infected with all *T. cruzi* strains, while infection was not detected by PCR, serology, or hemoculture in opossums inoculated with either Type II strain. Serology as determined by IFA demonstrated raccoons seroconverted sooner (3-7dpi) than opossums (10dpi).

- 41 SHULMAN, MARISA ETTA, HOLLY J PETERS, ALYCIA CHAPMAN, CHARLES FAULKNER, GERI GECHEVA AND SHARON PATTON. University of Tennessee College of Veterinary Medicine (UTCVM)—Prevalence of *Toxoplasma gondii* and *Dirofilaria immitis* in feral cats (*Felis catus*) in eastern Tennessee.

The term "feral cats" usually refers to cats that were once domestic, but now live in the wild. In conjunction with a larger study of eastern TN feral cat populations (ETFCP), serum samples collected between 2005 and 2007 were titrated for *Toxoplasma gondii* antibodies (modified agglutination test) and *Dirofilaria immitis* antigen and antibody (Synbiotics DiroCHEK and Heska Solo Step). Results were analyzed using the Epi Info Software package. Almost half the cats tested (111/254, 43.7%) were positive for *T. gondii* antibody. Chi Square and Odds Ratio (OD) statistics showed no significant difference in the prevalence of *T. gondii* between males and females, but adults were almost twice (1.9) as likely to be positive as juveniles. Compared to the 31% (87/283) prevalence in pet cats tested at UTCVM during 2005-2007, the ETFCP was 1.75 as likely to be positive as pet cats and perhaps a major source of oocyst contamination for birds, domestic and wild animals. For *D. immitis*, 16% (26/162) were antibody positive and 0.4% (1/162) antigen positive. The antigen positive cat was also antibody positive. There was no significant difference in prevalence between males and females or adults and juveniles. Comparing the 8.6% prevalence (48/560) from our previous study in pet cats from eastern TN to the 16% in feral cats reported here, feral cats may be at greater risk of *D. immitis* infection than pet cats. This study was funded in part by the UTCVM Center of Excellence Student Research Program.

- 42 PETERS, HOLLY J, MARISA ETTA SHULMAN, AMANDA FANNING, ALYCIA CHAPMAN, AND SHARON PATTON. University of Tennessee College of Veterinary Medicine—Prevalence of endoparasites in cats (*Felis catus*) in eastern Tennessee based on fecal examination.

The prevalence of endoparasites in cats being held in shelters was estimated using Sheather's sucrose and zinc sulfate centrifugal flotation methods and *Giardia* ELISA antigen detection kits. During the summer of 2007, 336 fecal samples were collected and processed from 4 shelters in eastern Tennessee. Parasites were detected in over half the samples (58.9%). The most prevalent parasites, based on centrifugal recovery, were the nematodes: the ascarid *Toxocara cati* (38.4%), the hookworm *Ancylostoma tubaeforme* (19.3%), and capillarids (10.4%). The only other nematode found was the lungworm *Aelurostrongylus abstrusus* (1.5%). Tapeworms recovered were Taeniid species (3.9%), *Dipylidium caninum* (3.3%), and, in one sample, *Mesocestoides* sp (0.3%). Protozoal parasites included *Isospora felis* (10.7%), *Isospora rivolta* (10.1%), *Giardia* sp (10.3% by ELISA, 1.5% by flotation), *Cryptosporidium* sp (0.6%), *Sarcocystis* sp (0.6%), and *Toxoplasma gondii*-like oocysts (0.6%). The *T. cati*, *A. tubaeforme*, *D. caninum*, and perhaps *Mesocestoides*, *Cryptosporidium* sp, *Giardia* sp, and *Toxoplasma gondii*-like oocysts are zoonotic. The benefits of pet ownership are well established, and house cats

are excellent pets that enrich the lives of their owners. The prevalence of parasites found in the felids in this study supports the need for prevention and control practices including keeping cats indoors, good personal hygiene, and cleaning up pet feces regularly to reduce environmental contamination. Parasite testing and strategic deworming for cats and kittens, especially those adopted from shelters is necessary to maintain healthy cats and healthy people. This study was funded in part by the UTCVM Center of Excellence Student Research Program.

- 43 STOCKDALE, HEATHER D.¹, SOREN P. RODNING², M. DANIEL GIVENS¹, A. RAY DILLON¹, JOSEPH C. NEWTON¹, JENNIFER A. SPENCER¹, CHRISTINE C. DYKSTRA¹, DAVID S. LINDSAY³, AND BYRON L. BLAGBURN¹. ¹Auburn University College of Veterinary Medicine, ²Auburn University College of Agriculture, ³Virginia Tech V-M Regional College of Veterinary Medicine—Experimental infection of cats with *Tritrichomonas foetus* supports differences between isolates of bovine and feline origin.

Tritrichomonas foetus is recognized as the causative agent of bovine trichomoniasis, resulting in fetal death, infertility and pyometra, and feline trichomoniasis, manifests as chronic, large-bowel diarrhea. The hypothesis that *T. foetus* is the causative agent of both diseases is supported by morphological characteristics and genomic sequencing data. To verify this hypothesis, cross-transmission experiments were performed. Our earlier results indicated that infection dynamics in cattle infected with either the bovine (D-1) or feline (AUTf-1) isolate of *T. foetus* are comparable however the disease induced by the AUTf-1 isolate of *T. foetus* was less severe. Our second experiment involved eight cats less than one year of age experimentally infected with *T. foetus* via orogastric intubation. Six cats were infected with the D-1 isolate of *T. foetus*, one cat was infected with the AUTf-1 isolate and one cat was not infected with either isolate, serving as a negative control. Of the six cats infected with the D-1 isolate, only one was fecal culture positive occurring on the final day of sampling (PI day 32), while the cat infected with the AUTf-1 isolate was fecal culture positive by PI day 16. Of the intestinal contents collected at necropsy, the cat infected with the AUTf-1 isolate was culture positive in the ileum, cecum, medial and posterior colonic sections. Two cats infected with the D-1 isolate were culture positive in the cecum only. The results of post-necropsy in vitro cultivation and fecal cultures from each cat further support differences between the D-1 and AUTf-1 isolates.

- 44 TACKETT, KRISTINA, MEGAN BOWLING, CHAD GROCE, AND CHERYL D. DAVIS. Department of Biology, Biotechnology Center, Western Kentucky University—Raccoons and opossums as potential reservoir hosts for tick-borne zoonoses in Kentucky.

The incidence of tick-borne zoonoses such as Ehrlichiosis, Rocky Mountain Spotted Fever, and Lyme Disease has steadily increased in the southeastern United States in recent years. According to the CDC, the southeastern states accounted for 515 cases of the 19,931 total reported Lyme Disease cases in the US in 2006. Although *Ixodes scapularis* is the most commonly recognized vector for *Borrelia burgdorferi*, the causative agent of Lyme disease, *Dermacentor variabilis* (a common vector for Rocky Mountain Spotted Fever) also has been shown to be a viable host for this pathogen. The goal of the present study was to evaluate the potential for raccoons and opossums to serve as reservoir hosts for tick-borne diseases in Kentucky. Raccoons and opossums were trapped in Barren and Warren counties of Kentucky between June and December, 2007. Ticks were removed and placed into 70% ethanol. Four different tick species were obtained from raccoons; *Dermacentor variabilis*, *Haemaphysalis sp.*, *Amblyomma sp.*, and *Ixodes sp.* *Dermacentor variabilis* was the only tick species found on opossums. Although ticks were abundant in the summer months, their numbers declined dramatically in the fall, and no ticks were recovered from animals trapped in October through December, 2007.

To determine if the ticks were infected with zoonotic agents such as *Ehrlichia chaffeensis*, *Rickettsia rickettsiae*, and *Borrelia burgdorferi*, DNA will be isolated using Qiagen mini kits and PCR based detection methods will be employed. The partial support of NIH Grant Number 2 P20 RR-16481 from the National Center for Research Resources is gratefully acknowledged.

- 45 MURDOCK, JESSICA H.^{1,2} MICHAEL J. YABSLEY^{1,2}, CHANDRASHEKAR RAMASWAMY³, TOM O'CONNOR³, AND SUSAN E. LITTLE⁴. University of Georgia, Warnell School of Forestry and Natural Resources¹, Southeastern Cooperative Wildlife Disease Study², IDEXX Laboratories³, Oklahoma State University Center for Veterinary Health Sciences⁴—Evaluation of white-tailed deer as natural sentinels for *Borrelia*

Assessing the risk of exposure to Lyme disease can be difficult and laborious. Lyme disease, caused by the spirochete *Borrelia burgdorferi*, is common in the northern and western United States and is transmitted by the blacklegged tick (*Ixodes scapularis* and *Ixodes pacificus*). Although endemic in southern rodents and ticks, confirmed Lyme cases in humans are rare, and a Lyme-like disease is commonly seen. This syndrome may be caused by *B. lonestari* which is transmitted by the lone star tick (*Amblyomma americanum*) and naturally infects white-tailed deer (*Odocoileus virginianus*). To date, 628 white-tailed deer from 20 eastern states were tested for anti-*Borrelia* spp. antibodies using an indirect immunofluorescent antibody test (IFAT), of which 133 (21.2%) were seropositive at a 1:64 dilution. Using a highly specific *B. burgdorferi* IDEXX 4Dx SNAP test, 67 (10.7%) deer were positive. Thirty-eight (6.1%) were positive by both assays, but 95 (15.1%) were IFAT positive and SNAP negative, suggesting exposure to another *Borrelia* spp. The majority of *B. burgdorferi*-positive deer were from northern-tier states, corresponding with the known risk of human exposure to Lyme disease. These data suggest that deer are exposed to at least two *Borrelia* spp., including *B. burgdorferi*, and could be used to delineate areas of Lyme disease risk. Furthermore, these data provide additional evidence that *B. burgdorferi*, although endemic in rodents and ticks in the South, rarely infects deer. This corresponds with a lack of human and canine cases in the region. The reason for this dichotomy is unclear and deserves further research.

- 46 MERWAD, ABDULLAH¹, SHEILA MITCHELL^{2*}, ANNE ZAJAC², GEORGE FLICK² AND DAVID LINDSAY². Zagazig University, Zagazig, Egypt¹ and Virginia Tech²—Effect of high pressure processing on *Hymenolepis diminuta* eggs.

Hymenolepis diminuta is a rodent parasite with beetle intermediate hosts that are commonly found in storage areas of grain and other dry foods. Humans, usually children are accidental hosts of *H. diminuta* and become infected through ingestion of cysticercoids infected beetles. High hydrostatic pressure processing (HPP) is an effective non-thermal alternative food processing treatment. The present study identified the efficacy of HPP on the viability of *H. diminuta* eggs. One thousand unhatched *H. diminuta* eggs in Hanks balanced salt solution were packaged in Kapak[®] pouches and exposed to 100-600 megapascals (MPa) for 60 seconds in a commercial HPP unit. Treatments were done in duplicate. Eggs were hatched using an alpha-amylase and trypsin hatching solution. Trypan blue was added to the hatched oncospheres to determine viability. Non-viable oncospheres stained blue. Eggs treated at 200 MPa had a viability rate between 28-61%. No viable eggs were observed when treated at 300-600 MPa. Treatment at 400 MPa and above caused rupturing of the oncosphere. Results from this study indicate that HPP is a possible treatment method for *H. diminuta* eggs. Treatment of dry goods, such as cereals and grains with HPP should be considered to prevent future human infections.

- 47 JONES, REBECCA D. AND STEPHEN C. LANDERS. Troy University—Morphological analysis of the trematode parasite *Alloglossidium*.

Alloglossidium renale is a trematode found in the antennal glands of the freshwater shrimp, *Palaemonetes kadiakensis*. Unlike many trematodes this species develops to maturity in the invertebrate host. The parasite was originally described from *P. kadiakensis* in Louisiana and has recently been observed in the same host from southern Alabama. Shrimp were collected from the Conecuh River in Pike County, Alabama, where we found 22 of 71 shrimp infected. The average size of infected shrimp was larger than the average size of uninfected animals. Trematodes and infected shrimp tissue were fixed in 5-10% formalin, and prepared for paraffin sectioning. Whole mount animals and sections were stained with Gill's hematoxylin with or without fast green counterstaining. The average length and width of the whole worms was 897 X 340 μm (N= 10), which is smaller than the original species description. The average size of the ova was 22 X 14 μm (N=30). To date, we have not observed moribund or dead worms within the antennal glands as previously reported. We have observed only healthy worms within the antennal glands and ova within the nephridial tubules for release to the outside of the host.

- 48 SHEEHAN, KATE L.^{1,2}, JUST CEBRIAN^{1,2}, JOHN F. VALENTINE^{1,2}, AND JACK O'BRIEN¹. University of South Alabama¹, Dauphin Island Sea Lab²—Spatial and seasonal variability of parasite assemblages of the common grass shrimp in Mobile Bay

The common grass shrimp, *Palaemonetes pugio* is a common prey species to economically and ecologically important fishes and crustaceans in estuarine habitats. *P. pugio* is host to a number of obligate, facultative, and transient symbionts. A survey consisting of twenty-two sites was conducted around Mobile Bay, AL during the winter (January) spring (May) and summer (September) of 2007 to determine the general prevalence and distribution of *P. pugio* parasites. The obligate parasites documented are those easily observed on or within live hosts with the aid of dissecting microscope (microphallid trematodes, haplosporidian hyperparasites, loricate ciliates, and bopyrid isopods). Overall abundance and frequency of all parasites was compared among seasons and parasite assemblages were analyzed using multivariate techniques for examining community ecology. Results suggest parasite frequency and abundance does not change seasonally, however seasonal changes in parasite assemblages are common. After the spatial and temporal variability was documented, the prevalence of the most common *P. pugio* parasite, the trematode *Microphallus turgidus*, was compared at two particular sites in Mobile Bay with greater temporal resolution over a twenty-one month period. These surveys are useful for developing a better understanding of the natural history of these organisms and this data will aid in the development of sound manipulative experiments in the future.

Animal Ecology I

- 49 BURGER, JOSEPH ROBERT¹, ADRIAN S. CHESH¹, RODRIGO A. CASTRO², LILIANA ORTIZ TOLHUYSEN², LUIS A. EBENSPERGER², AND LOREN D. HAYES¹. The University of Louisiana at Monroe¹ and Center for Advanced Studies in Ecology and Biodiversity, Pontificia Universidad Católica de Chile²—Island theory of social hosts and parasitism.

Several studies have linked high parasitism to decreased fitness in social species. However, a model that predicts parasite prevalence (percentage of host individuals infected), intensity (parasite abundance per host individual), and richness (number of parasite species per host individual), in social animals has not been formalized. We present a modified island model that explains how the size of social groups, and the intergroup contact rate may predict parasite prevalence, intensity, and richness in social

animals. This model predicts that large social groups with high intergroup contact will have higher parasite prevalence, intensity, and richness than smaller, isolated social groups. Our model assumes that parasites are transmitted by contact, have an ideal free distribution dependent on resources provided by the host, and that host allogrooming is ineffective. We test this model using field data from the social, caviomorph rodent, *Octodon degus*, in central Chile. Our 2006 data showed a positive relationship between group size and parasite intensity, as well as a strong negative relationship between per capita fitness and parasite intensity of females during lactation. Parasite prevalence was greater than 90%. During 2007, we used daytime telemetry to incorporate measures of intergroup contact, including intergroup space overlap to explain parasite prevalence, intensity, and richness in this social species.

- 50 SUPER, PAUL E.¹, KEITH LANGDON², BECKY J. NICHOLS², CHARLES R. PARKER³ AND BRIAN G. SCHOLTENS⁴. Appalachian Highlands Science Learning Center, NPS¹, Great Smoky Mountains National Park, NPS², US Geological Survey, Biological Resources Division, Great Smokies Field Station³ and College of Charleston⁴—The Great Smoky Mountains National Park all taxa biodiversity inventory—what to do with what we've got.

The All Taxa Biodiversity Inventory (ATBI) in Great Smoky Mountains National Park, launched in late 1997, has completed its first ten years. It is the first effort of its kind to document with georeferenced observations all of the plant, animal, and fungal life within a United States National Park. As of December, 2007, the effort has documented 858 species previously undescribed by science and over 5,000 additional new park records for a total park species count of 15,379. Similar ATBIs have been initiated or planned in protected areas across the country and in Europe. Though the effort continues in the Smokies, it is time to examine some of the lessons learned from this project, to seek partners to use the data for ecological studies, and to envision the future of protected areas with a clear understanding of what species they are protecting.

- 51 STEELMAN, CHARLOTTE K. AND MICHAEL E. DORCAS. Department of Biology. Davidson College—Optimizing amphibian monitoring programs: Development of predictive models of anuran calling activity.

Recent declines in amphibian populations have been dramatic and alarming, and most declines have been documented in anuran populations. In response, monitoring programs have been established to study anuran populations, and many of these programs rely on calling surveys. Understanding how the environment influences calling variation can be used to optimize such surveys. In an effort to understand how environmental variation affect anuran-calling activity, we measured calling activity at an ephemeral wetland in the Piedmont of North Carolina using automated recording systems. We determined which environmental variables significantly affected the calling activity of *Pseudacris crucifer*, *P. feriarum*, and *Rana sphenocephala*. Models developed using logistic regression showed that for *P. crucifer*, day of year, time, precipitation and water temperature positively influenced calling and air temperature negatively influenced calling; for *P. feriarum*, time, precipitation, air temperature and water temperature positively influenced calling, and day of year negatively influenced calling; for *R. sphenocephala*, day of year, time, precipitation and air temperature positively influenced calling, and water temperature negatively influenced calling. Using these results, we developed models predicting the best conditions in which to conduct anuran-calling surveys. The models were tested using previously collected data from calling surveys performed in the same region of North Carolina. Models accurately predicted calling activity approximately 70% of the time.

- 52 BLUE, JARROD¹, ELIZABETH J. BREWER¹, DANIEL BUSH¹, CHRISTOPHER CASTILLO¹, JUSTIN GOLDBERG¹, KATHERINE HAWKINS², JOSH HAYWOOD¹, TYLER KRENTZ, AND CHRISTOPHER J. PARADISE¹. Davidson College¹ and Middlebury College²—Colonization and community dynamics in a simulated treehole metacommunity.

We used a mesocosm approach to test predictions about metacommunity dynamics in aquatic treeholes. Treeholes distributed in a forest function as a metacommunity, as patches are linked by dispersal of component species. Treeholes have low patch similarity and insect larvae are subject to local factors within a patch, while adults disperse to other patches and are subject to regional factors. We predicted that species would sort among patch type according to ability to survive in a patch type, but that community dynamics would also be determined by the high dispersal abilities of some species. Diversity would thus be explained by a combination of local and regional processes. Our experiment consisted of a metacommunity made up of 16 mesocosms (patches) within the Davidson College Ecological Preserve. Mesocosms were deployed at one of three distances from any other known patch, and were one of two different patch sizes. Insect larvae were identified and counted weekly for ten weeks in summer 2006, six weeks in fall 2006, and seventeen weeks in the spring of 2007. As predicted, several species were found primarily in one patch type, indicating that species were sorted in the metacommunity by local factors. However, we also found evidence of synchronization of dynamics, in that some species colonized habitats at the same time of year. There was an effect of patch type – for some species, synchronization was higher within certain patch types. We conclude that treehole metacommunity dynamics are determined primarily by environmental variation between patch types.

- 53 PARADISE, CHRISTOPHER¹, JARROD BLUE¹, JOHN BURKHART², LAUREN HARSHAW³ AND LESLIE SMITH⁴. Davidson College¹, University of South Alabama², University of Florida³, University of Rhode Island⁴—Local and regional factors influence the structure of treehole metacommunities.

We used three years of monthly censuses in treehole communities to test predictions generated from the four major paradigms of metacommunity dynamics. We predicted that the species sorting paradigm, where species sort according to ability to survive in a patch type, and mass effects paradigm, where patches become more similar due to high dispersal, would both partially explain diversity in treeholes. In contrast to mass effects, the patch dynamics and neutral paradigms predict that community similarity decreases with patch distance, caused by limited dispersal and stochastic processes. Each species tested responded to at least one of three environmental factors, supporting species sorting. Most species were affected by water volume. Leaf litter mass positively affected densities of *Aedes triseriatus*, abundance of several dipteran species, and presence-absence of *Toxorhynchites rutilus*. The top predator *T. rutilus* affected the relative abundance of the two most common species, *A. triseriatus* and *C. guttipennis*. Treeholes with *T. rutilus* had an average of two more species than treeholes without *T. rutilus*. All this supports species sorting, but the other paradigms also had weak support. We found very little evidence of synchrony between pairs of treeholes, either spatially or temporally. There were high levels of spatial and temporal turnover, and spatial turnover increased with distance between patches. The lack of synchrony and the strong distance effects are suggestive of patch dynamics and neutrality. We conclude that treehole metacommunity dynamics are determined primarily by environmental variation between patch types, although an integration of paradigms would better explain metacommunity dynamics.

- 54 BRANNON, M. PATRICK AND MELISSA A. BURT. Highlands Biological Station and the University of North Carolina at Chapel Hill—Discarded bottles as a source of small mammal distributional data along an elevational gradient in the southern Appalachians.

Skeletal remains were collected from discarded bottles at 90 roadside sites along the southern Blue Ridge escarpment of North Carolina, Georgia, and South Carolina to examine the distributions of regional small mammal species. Vertebrate remains were found in approximately 5% of the open bottles we examined, and greater than 74% of the study sites yielded bottles containing small mammal specimens. A total of 220 specimens of small mammals was collected representing four species of shrews and four species of rodents. The Northern Short-tailed Shrew (*Blarina brevicauda*) and the Smoky Shrew (*Sorex fumeus*) were abundant and widespread, while the Masked Shrew (*S. cinereus*) and the Southeastern Shrew (*S. longirostris*) appeared to maintain contiguous allopatry along an elevational and habitat gradient. The White-footed Mouse (*Peromyscus leucopus*), the Deer Mouse (*P. maniculatus*), and the Woodland Vole (*Microtus pinetorum*) were distributed throughout the study area but the Eastern Harvest Mouse (*Reithrodontomys humulis*) occurred only at lower elevations. Given the prevalence of small mammal entrapment, the accumulation of discarded bottles along highways should be regarded as a potentially serious conservation threat.

- 55 CANCELLED

- 56 CRUZ, ANGEL, DENNIS C. HANEY AND SURESH MUTHUKRISHNAN. Furman University—Relationships between urban land cover, fish assemblage structure, and channel geomorphology in the Enoree River basin, South Carolina.

Urbanization affects many chemical and physical characteristics of stream ecosystems, yet relatively little is known about the specific effects of urbanization on stream microhabitats or fish assemblages. In this study we measured fish diversity and abundance, stream velocity, and turbidity in three microhabitats (pools, riffles, runs) at nine stream reaches (designated as primarily rural, residential, or commercial) in the Enoree River basin of northwestern South Carolina. In addition, we measured geomorphologic characteristics (percent impervious surface cover, incision, entrenchment and width/depth) at each site. Because commercial sites had the greatest impervious land cover, we hypothesized that species richness and diversity would be lowest at commercial sites, and that fish assemblages would be more homogeneous among the microhabitats at the commercial sites. Additionally, we hypothesized that stream velocity, turbidity, and geomorphic characteristics would reflect the greater instability of commercial sites. Commercial sites had the lowest species richness and diversity. Richness and diversity did not differ significantly among microhabitats within each land cover and otherwise reflected differences seen at the reach scale. Abundance was highest in commercial sites, but assemblages were dominated by pioneer species. Turbidity was greatest at rural sites and within runs among microhabitats. Index of Biotic Integrity scores were significantly negatively correlated with percent impervious surface cover. Within commercial sites, entrenchment and total fish abundance were significantly negatively correlated, and at rural sites there was a significant negative correlation between width/depth and diversity. Our study demonstrates that urbanization negatively impacts fish communities both at the stream reach and microhabitat scales.

- 57 PRICE, STEVEN J.^{1,2} AND MICHAEL E. DORCAS². Wake Forest University¹ and Davidson College²—Factors at spatial and temporal scales influence stream salamander abundances in western Piedmont streams.

Processes at both local and landscape scales are often important determinants of species' abundances, yet abundances may also be influenced by temporal processes. Amphibian abundances may be determined by processes at various scales because many species require multiple habitats, have poor dispersal abilities, and populations are patchily distributed throughout the landscape. During 2005, we sampled stream salamanders in 30 Piedmont streams, and recorded land-use at various spatial scales, including the entire watershed, a 92.6 m core terrestrial habitat recommended for stream salamanders, a 10.7 m water quality buffer, and local-scale variables of each sampled stream reach. To examine temporal processes, we calculated forest-cover at the various spatial scales during three periods, 1938, 1978, and 2005. Using an information-theoretic approach, we found best supported models for northern dusky salamander (*Desmognathus fuscus*) and southern two-lined salamander (*Eurycea cirrigera*) abundances to contain local and landscape-scale factors. In particular, models that included the percentage of forested land within the entire watershed had more support than percentage of forested land at other spatial scales. However, temporal analyses suggested *Eurycea cirrigera* abundance was strongly influenced by the current (2005) forest cover, whereas best supported models for *Desmognathus fuscus* abundance included forest cover in 1978. Our results suggest that factors at various scales influence contemporary abundances of stream salamanders in western Piedmont streams, and future investigations on habitat determinants of amphibian abundance should consider the role of temporal processes.

- 58 PITTMAN, SHANNON AND MICHAEL DORCAS. Davidson College—Population dynamics and demography of a bog turtle (*Glyptemys muhlenbergii*) population in a Piedmont meadow bog.

The bog turtle (*Glyptemys muhlenbergii*) is a small, elusive turtle that occurs in isolated populations throughout the mountains and western Piedmont of North Carolina. Fragmentation and alteration of bog turtle habitat resulting from anthropogenic development have led to federal and state protection of this species. Habitat fragmentation results in the creation of small, isolated populations whose viability is threatened by demographic stochasticity, inbreeding depression, and lowered genetic diversity. Understanding the dynamics of isolated populations will provide information crucial to both directed conservation efforts and generalized management practices. We have intensively sampled one such isolated population in the Piedmont of North Carolina. Using historical mark-recapture data and program MARK, we have modeled adult survivorship and population growth from 1992 to the present. We found a constant adult survivorship of 0.896 (SE = 0.022) and a constant population growth of 0.935 (SE = 0.020). Recapture probabilities varied temporally. Jolly-Seber models predicted an initial adult population size of approximately 42 turtles (SE = 3.72). Current adult population size is estimated at approximately 17 turtles. Data from this study indicate that this population is steadily declining, potentially due to low juvenile recruitment. Demographic factors such as low juvenile recruitment and adult emigration are often associated with environmental factors such as reduced habitat quality. Effective management of wetland habitat is crucial for the continued survival of this population. However, in the absence of sufficient habitat connectivity, long-term population viability will remain uncertain.

- 59 SHEPARD, BENJAMIN R. E. AND RUSSELL L. MINTON. University of Louisiana, Monroe—Constancy of morphological plasticity in a freshwater snail (*Elimia proxima*).

The genus *Elimia* is the most speciose and diverse of the freshwater snails of the family Pleuroceridae. Previous studies have shown high levels of inter- and intra-population level morphological divergence in the snail *Elimia proxima*, beyond what can be explained by genetic divergence alone. This variation has been correlated to multiple environmental variables previously using size-dependent morphological analyses. In this study we

perform a size-independent geometric morphometric analysis of multiple populations of *E. proxima* from the upper New River and surrounding drainages of North Carolina and Virginia. We re-examine conclusions of earlier studies of divergences between populations of this species of snail and address the matter of species delineation in the genus *Elimia*.

- 60 KANES, JESSICA, KEITH WALTERS, JOHN HUTCHENS AND JAMES LUKEN. Coastal Carolina University—Micro-metazoan use of *Spartina alterniflora* stems of different ages.

We analyzed the relative age composition of *Spartina alterniflora* (smooth cordgrass) in a South Carolina salt marsh in 2007 and determined abundance of epifaunal micro-metazoans and diversity of the major taxa relative to stem age. Stem age potentially is an important factor affecting micro-metazoans because age may affect stem suitability as a habitat due to changes in structural characteristics. We hypothesized that there was a higher abundance and diversity on stems of intermediate age because they may be a superior structural habitat due to the presence of leaf sheaths attached to the core stem. We conducted the study on Waites Island in a mid-marsh zone because the area was easily accessible at low tide and because *S. alterniflora* was the predominant plant species. *Spartina alterniflora* stems co-occurred at a range of ages throughout the mid-marsh zone. We collected stems from three age categories (early, intermediate, and late) approximately every thirty days. The early and intermediate categories refer to live stems (early = ~10-30 cm, intermediate = ~30-140 cm). The late category refers to dead standing stems ranging from ~10-80 cm. Nematodes were the most abundant taxa, representing ~58% of all stem epifauna. Harpacticoid copepods and mites each represented ~10% of epifauna sampled. Twelve additional taxa inhabited the stems in fewer numbers. Stems in the intermediate and late age categories generally had more epifauna than stems in the early category. The study contributes to our knowledge of micro-metazoan densities above the marsh sediment.

- 61 RICE, CHRIS L. AND KIM MARIE TOLSON. University of Louisiana at Monroe—Ambient temperature effect on roost site selection by *Corynorhinus rafinesquii* (Rafinesque's big-eared bat) in a bottomland hardwood forest streambed.

Corynorhinus rafinesquii (Rafinesque's big-eared bat) is found in scattered localities throughout the southeastern United States and is listed federally as a "species of concern". Research efforts were initiated in an attempt to determine roost site preference during periods of fluctuating ambient temperatures. Twelve individuals were outfitted with 0.42g radio transmitters attached to the interscapular region with surgical cement. Telemetry was conducted over the course of 52 days from 15 September to 26 December 2007 on the Upper Ouachita National Wildlife Refuge in northeastern Louisiana. Tree cavities of 59 potential roost sites (water tupelo, *Nyssa aquatica*; bald cypress, *Taxodium distichum*; willow oak, *Quercus phellos*; persimmon, *Diospyros virginiana*; and water oak, *Quercus nigra*) were also searched for 22 days during the last quarter of 2007. All trees were classified according to the location of tree cavity openings: Type 1 (basal opening only), Type 2 (basal opening and chimney opening), and Type 3 (chimney opening only). When ambient temperature fell below 6° C, 14 of 17 (82%) transmitter "fixes" were located in Type 3 trees, while the other three "fixes" were in Type 1 trees. Cavity searches of all 59 trees revealed *C. rafinesquii* were found in only water tupelo and bald cypress trees (Types 1 and 2), and that presence of these bats increased as ambient temperature increased ($R^2 = 0.7014$). Data will be analyzed on distance of movements, frequency of tree use, and site characteristics for all trees.

Aquatic, Wetland, and Marine Biology

- 62 CIANCHETTI, JOHN¹, WILLIAM BERTI² AND DEAN COCKING¹. James Madison University, Harrisonburg VA¹ and DuPont Co., Central Research & Development, Newark, DE²—Survey of the mercury content of earthworms on the South River Virginia floodplain.

Mercury was introduced into the South River, VA ecosystem prior to the middle of the 20th century from an industrial point source that is no longer active. The goals of this study were to survey Hg concentrations in earthworms in the floodplain, and to observe the relationship between Total Hg (THg) and Methyl Hg (MeHg) concentrations in paired earthworm and soil samples. Twelve vegetated, relatively undisturbed locations were selected along the South River floodplain. These sites included a control 1.6km upstream from the legacy industrial point source and eleven others between Waynesboro, VA and the confluence forming the South Fork of the Shenandoah River at Port Republic, VA, which is about 40km downstream of the source. In fall 2006, a 10x10m plot was located at each of the twelve sites and subdivided into 100 1x1m quadrats. Earthworms and soils were sampled from five randomly selected quadrats at each site. THg and MeHg were quantified in depurated and undepurated earthworm tissue and paired soil samples. THg concentrations measured in the earthworm samples roughly paralleled THg measured in paired floodplain soils, reaching peak concentrations within 19km downriver of the source. In contrast, MeHg ranged 62 to 177 times greater in earthworm samples compared to that measured in paired soil samples. The study also demonstrated that THg and MeHg concentrations can be as variable within a site as between sites for both soils and earthworm samples. This study confirms that Hg from the soil enters the detrital food web of the floodplain biota.

- 63 PEDERSON, CHARLES L. AND ROBERT J. KRENZ. Eastern Illinois University—Use of photopigments as a descriptor of phytoplankton assemblages for biotic assessment of Illinois reservoirs.

Biocriteria may be useful for monitoring the ecological health of Illinois reservoirs, and while similar efforts have been undertaken in other states, these focused primarily on lakes of glacial origin. Phytoplankton assemblages may prove to be the best candidate for this purpose because they are not stocked, they are readily sampled, and they are sensitive to environmental change. Whereas identification and enumeration of phytoplankton is time consuming and potentially biased by the relative skills of the analyst, photopigment signatures as determined by HPLC provide a more rapid and objective evaluation of taxa present in a given sample. Analysis of historical data available through Illinois Environmental Protection Agency (IEPA) by way of the Ambient Lakes Monitoring Program (ALMP) has enabled us to determine that Illinois lakes and reservoirs are best divided into three geographical regions. We have confirmed that specific genera of phytoplankton appear to respond to environmental gradients within each of the three regions. In addition, we have identified which lakes can be considered as "minimal impact reference" sites (relatively unimpaired) and which are stressed reference sites (highly impaired) in the context of relevant environmental data. We collected samples from 50 lakes and reservoirs throughout Illinois in summer, 2007 for determination of relevant environmental variables and photopigment concentrations. For all sites within a given region, we identify the photopigment metrics which offer the best discrimination between unimpaired and impaired reference sites. These preliminary efforts will be augmented with additional sampling during the 2008 index period.

- 64 HAWLEY, JOANNA E. AND DENNIS C. HANEY. Furman University—Fish health in rural and urban streams within the Enoree and Saluda River basins, South Carolina.

The biological impacts of expanding urban land cover on streams are expected to intensify in the future. The loss of riparian vegetation, altered hydrological patterns, decreased channel stability, and increased levels of contaminants have been associated with degradation of stream communities in urban landscapes. Stream fishes may be especially susceptible to stresses imposed by urban land cover. Damage at the biochemical and physiological levels in fishes have been used by some previous studies as indicators of the quality of stream habitats and water quality. In this study, we measured a number of bioindicators at twelve stream sites in the upper piedmont of South Carolina, a region in which urban land cover is expanding rapidly. Locales selected were located downstream of primarily rural, residential, or commercial land covers and were chosen to detect potential effects of increasing levels of urbanization on fish health. Parameters measured included condition factor, erythrocyte count, hematocrit, hemoglobin concentration, and somatic indices. We also measured EROD activity and levels of acid phosphatase and lactate dehydrogenase in liver and muscle tissues. Erythrocyte counts, condition factor, liver somatic indices, acid phosphatase activity, mean corpuscular hematocrit, and mean corpuscular volume were significantly lower in fishes collected from commercial and residential sites than in fishes from rural sites. These differences demonstrate that urban land cover influences fish health negatively and point out the need for improved management of urban streams.

- 65 WOTAWA, AMY M. AND NEIL BILLINGTON. Troy University—Elucidation of genetic markers for distinguishing between the northern and southern walleye strains in Alabama via PCR-RFLP analysis.

The walleye (*Sander vitreus*) is widely distributed in North America, both naturally and as an introduced species, from the Northwest Territories south to the lower Mississippi River basin. In Alabama, two distinct strains of walleye have been identified. The northern walleye strain has been observed in the Tennessee River while the southern walleye strain is found in the Mobile basin and its tributaries. The southern strain is genetically distinct from the northern strain based upon whole-molecule mitochondrial DNA (mtDNA) analysis. Because of the low numbers of southern walleye, a petition has been filed to list them under the Endangered Species Act. Whole-molecule mtDNA analysis requires that fish be sacrificed for the removal of their livers, thus an alternative non-lethal approach for determining their genotype was sought. We used a PCR-RFLP approach to provide mtDNA profiles and elucidate genetic markers for distinguishing these two strains in Alabama for conservation purposes. Mitochondrial DNA was amplified by PCR using primers for various regions of the molecule including the D-loop, the ND 3/4 genes, and the 12S and 16S rRNA genes. Amplified fragments were digested with several restriction endonucleases and diagnostic polymorphisms were revealed. We have found at least three diagnostic PCR-RFLP site changes in the D-loop region with this method. This should enable southern strain fish to be confirmed by genetic analysis prior to them being used in conservation breeding programs.

- 66 LYLE, SONIA, NEIL BILLINGTON, RACHAEL N. KOIGI, JANET GASTON, AMY M. WOTAWA, RONALD E. CREECH, AND CARLA RASUCK. Troy University—Genetic variation in walleye and sauger populations determined by protein electrophoresis.

Walleye (*Sander vitreus*) and sauger (*S. canadensis*) are large predatory fish species in the family Percidae that are common in the mid-western U.S. and the Great Plains region. Because these two species are popular with anglers, information on their population genetic structure will be useful for their management. Genetic variation was screened by cellulose acetate gel electrophoresis in 1164 walleye from eight populations and 1021 sauger from 12 populations. Two polymorphic loci were surveyed in walleye, general

muscle protein (*PROT-3** with two alleles) and malate dehydrogenase (*mMDH-3** with three alleles), and two polymorphic loci were surveyed in sauger, super oxide dismutase (*SOD-2** with two alleles resolved) and esterase (*EST** with five alleles resolved). Highly significant among population heterogeneity was found for walleye at *PROT-3** and at *mMDH-3**. Highly significant among population heterogeneity was found for sauger at both *SOD-2** and *EST**. Several populations showed significant deviations from Hardy-Weinberg expectations, all of which were due to heterozygote deficits. This was likely caused by the Wahlund effect, because samples were mostly collected during the summer or fall, when walleye and sauger are highly mobile, rather than during their spring spawning period. Fisheries managers are encouraged to manage walleye and sauger populations that are genetically distinct separately, because these populations likely exhibit local adaptations.

- 67 DE STEVEN, DIANE¹ AND RICHARD LOWRANCE². USDA Forest Service, Southern Research Station Center for Bottomland Hardwoods Research¹ and USDA Agricultural Research Service, Southeast Watershed Research Laboratory²—The CEAP-Wetlands Project: assessing wetland ecosystem services provided by agricultural conservation practices.

Wetlands provide significant ecological "services" such as floodwater storage, water-quality improvement, wildlife habitat, and production of harvestable resources. Historically, agricultural land use was a major cause of wetland degradation and loss in the United States. Under current Farm Bill programs, defined conservation practices may be installed to reduce agricultural impacts on environmental quality, and certain practices are aimed specifically at protecting or restoring wetland functions. The USDA Natural Resources Conservation Service established the Conservation Effects Assessment Project (CEAP) to assess the ecological benefits derived from conservation programs and practices. One component (CEAP-Wetlands) is evaluating wetland-related practices through field studies and regional literature syntheses. In this paper, we: 1) present an overview of the CEAP-Wetlands Project, 2) describe wetland-related conservation practices, and 3) summarize the state of knowledge regarding practice effectiveness in the Piedmont and eastern Coastal Plain. Across this region, riparian forest buffers and wetland habitat management were the most commonly applied practices, whereas wetland restoration and creation were less frequent. Of all wetland-related practices, only riparian buffers have received much study on regional agricultural lands, where water-quality benefits have been well documented. In contrast, we know little about the outcomes of wetland restoration, creation, or habitat management in agricultural settings. In a wetland-rich region such as the Piedmont-Coastal Plain, diverse wetland types differ in the ecological services they provide. Thus, documenting the wetland types created or restored could improve our understanding of the ecological benefits of wetland practice application.

- 68 HUDSON III, HERMAN W. AND ROBERT ATKINSON. Christopher Newport University—Comparing the rate of water table drawdown to vegetative prevalence index values in five restored Virginia wetlands.

Hydrology is thought to be critical for formation of wetlands and performance of many wetland functions, as well as delineating wetlands and monitoring success in wetland compensation. Saturation of soils within a major portion of the root zone leads to anaerobic conditions that favor hydrophytic plant species. Historically, duration of saturation in the root zone has been viewed as the key hydrologic criterion but is a logical consequence of the drawdown rate of the water table, and we compared both to the plant community. At 5 sites, 28 permanent plots were centered around a continuously recording shallow groundwater well (RDS Ecotone WL Standard, CP Series, and WM series). The drawdown rate of each hydrograph was evaluated after three precipitation events that occurred early during the growing season. Vegetative prevalence index values were

calculated based on the mean of three cover class estimates within 1-m² plots recorded at the peak of the growing season (August), and Pearson Correlation Coefficients were used to assess the relationship between these hydrologic parameters and prevalence indices. All hydrologic parameters were significantly correlated with prevalence index, but highest predictive coefficients were attained from the average drawdown rate of the three drawdown events ($r^2=-0.46$, $p=0.013$) and the drawdown rate after the third rain event ($r^2=-0.51$, $p=0.006$). These results highlight the importance of the water retaining capacity of the soil and suggest that drawdown rates may be a better measure of the hydrologic success criterion in wetland compensation sites.

- 69 ROQUEMORE, JACQUELINE D., ROBERT B. ATKINSON, AND HERMAN W. HUDSON, III. Christopher Newport University—An evaluation of wetlands restored as part of the in-lieu-fee program in Virginia: the value of third party monitoring by a university.

The Virginia Aquatic Resources Trust Fund provides a mitigation alternative in which permittees contribute money to the fund in lieu of completing their own mitigation project. One component of Virginia's in-lieu-fee program is mitigation for forested wetland impacts through restoration of prior converted agricultural land. Compliance monitoring was performed by graduate and undergraduate students under the direction of a faculty member at a public university. Evaluation criteria included duration of saturation, hydrophytic vegetation based on prevalence index, and a minimum tree count per acre. Data were collected from 34 continuous recording wells and 160 vegetation plots in six restored wetland mitigation sites during August 2007. Compliance results found that 58% of wells met the 5% of growing season hydrology criteria, 64% of the vegetation plots met the Prevalence Index criterion of less than 3.0, and 73% plots met the woody vegetation criterion of greater than 400 tree stems per acre. Data analysis beyond compliance was conducted and implications regarding species assemblages, native species colonization, floristic quality, and the effect of site distance from a forest/woody vegetation seed source were explored. The average species richness per site was 62 (SE \pm 6.6), average coefficient of conservatism was 3.0 (SE \pm 0.27), and distance to seed source was significantly related to colonization at 40% of the sites. Third party monitoring by a university yielded comprehensive compliance documents that were received in a timely manner and allowed for additional data analysis which forms a feedback loop to assist future restoration efforts.

- 70 EGERTON, TODD A., ROBERT J. JOHNSON AND HAROLD G. MARSHALL. Old Dominion University—Extended blooms of the potentially harmful dinoflagellates *Karlodinium veneficum* and *Cochlodinium polykrikoides* in Virginia tributaries.

Two significant widespread harmful algal bloom events occurred in Virginia tributaries of Chesapeake Bay between March and October, 2007. Elevated concentrations of the toxic dinoflagellate *Karlodinium veneficum* were identified in the Potomac, Rappahannock, and York Rivers, as well as along the Eastern Shore of Virginia. The highest cell densities were found throughout the Potomac River during June and July, reaching 337,000 cells/ml. This bloom was associated with several fish kill events, the largest involving 300,000 menhaden. Additionally, bloom levels of *Cochlodinium polykrikoides* were observed across the lower Bay between August and October. The cell concentrations were as high as 30,000 cells/ml producing discolored waters and subsequently were responsible for a swimming beach closure in the James River. Compared to previous studies of the region, it appears that the distribution of both species has increased throughout the Bay.

Invertebrate Zoology and Entomology

- 71 MILNE, MARC A¹, VICTOR R TOWNSEND JR², PENELOPE SMELSER³ AND FRANCIS SMITH³. Old Dominion University¹, Virginia Wesleyan College² and Norfolk Vector Control³—Parasitizing the parasite: mite parasitism of mosquitoes in an urban environment.

In natural and urban environments, mosquitoes often harbor parasitic mites that attach to their host during both the aquatic and terrestrial life stages. The density, distribution, and frequency of mites that parasitized mosquitoes in Norfolk, Virginia was quantified by examining caught mosquitoes from light and gravid traps over one and a half seasons. The species of mites and mosquitoes found, location of mite attachment, and mosquito infection rate were also calculated and correlations between species of mite, species of mosquito, and location were conducted. There was high variability in mite density between seasons, as the mosquito density from two months in season one exceeded the density of mosquitoes found on mosquitoes from eight months in season two. At the most dense location, mosquito infection rate was 7.1%. Correlations existed between the type of mosquito caught and the type of mite found, the prevalence of infection and the location of parasitism, and the type of trap checked and mite density. These data may be important in determining the role of mosquitoes in transporting mite populations, the method by which mites choose arthropod hosts, and the role of mites in controlling mosquito populations.

- 72 STOCKS, IAN C. Department of Entomology, Soils, and Plant Sciences, Clemson University—Repeated functional convergence of wing coupling structures in Trichoptera.

Convergences in form and/or function are common phenomena in organismal biology. A wide ranging functional convergence is seen in the wing-coupling structures of many groups of Caddisflies (Trichoptera). Although widespread throughout Trichoptera phylogeny, the phenomenon is largely unrecognized and remains unsynthesized. The form-functional complex is illustrated by several examples, and discussed in the context of a "many-to-one" mapping approach. The relationship between homology detection and the hierarchical distribution of characters in a functional complex will also be discussed.

- 73 GRAHAM, JOHN¹, ANTHONY KRZYSIK², DAVID KOVACIC³, JEFFREY DUDA⁴, CARL FREEMAN⁵, JOHN EMLER⁴, JOHN ZAK⁶, RUSSELL LONG¹, MICHAEL WALLACE³, CATHERINE CHAMBERLIN-GRAHAM¹, JONATHAN NUTTER¹, and HAL BALBACH⁷. Berry College¹, Prescott College², University of Illinois³, Western Fisheries Research Center⁴, Wayne State University⁵, Department of Biology, Texas Tech University⁶ and U. S. Army ERDC-CERL⁷—Ants as indicators of landscape disturbance at Fort Benning, Georgia.

Ants are valuable indicators of landscape disturbance caused by military training at Fort Benning, a military installation in west-central Georgia. We sampled ants, environmental variables, and forest composition at 40 sites on a smooth continuum from nearly pristine forest to highly disturbed landscapes. Sites disturbed by military training had fewer trees, less canopy cover, more bare ground, and more compact soils with shallower A-horizons than comparable undisturbed sites. *Pheidole bicarinata*, *Dorymyrmex smithi*, and *Pogonomyrmex badius* dominated the most highly disturbed sites. Competitively submissive myrmecines, such as *Aphaenogaster* and *Crematogaster*, and formicines, such as *Camponotus* and *Formica*, were abundant in the undisturbed sites. *Solenopsis invicta* occurred in all but the least disturbed sites. Ant species richness was greatest with a relative disturbance of 43%, but equitability was greatest with no disturbance. Ant abundance was greatest with a relative disturbance of 85%. High species richness at intermediate disturbance was associated with greater within-site spatial heterogeneity.

Species richness was also associated with intermediate NDVI (normalized difference vegetation index), a correlate of net primary productivity (NPP). Available NPP (the product of NDVI and the fraction of days that soil temperature exceeded 25°C), however, was positively correlated with species richness, though not with ant abundance. Species richness was unrelated to soil texture, total ground cover, and fire frequency. Because of the non-linear response of ant species richness to disturbance, it is a useful indicator of landscape disturbance only when other information, such as equitability, community composition, soil compaction, and vegetation structure, are available.

- 74 RAY, MARGARET W., HAROLD F. HEATWOLE, AND THOMAS R. WENTWORTH. North Carolina State University—Limno-terrestrial tardigrades of North Carolina: initial findings of a study along an east-west transect.

Preliminary results of a survey and ecological analysis of limno-terrestrial tardigrades along a statewide transect at 35.5° North latitude are reported. Tardigrades were found in all ten collection sites, which were systematically placed from the Outer Banks, through the Piedmont region, to the mountains near the NC/TN state line. Within each of the ten collection sites, samples were taken from seven distinct microhabitats, and descriptive data were recorded. The GIS library at NC State University provided additional environmental data, allowing for expanded analyses of possible biotic and abiotic associations, gradient responses, and habitat preferences. A species list and results of multivariate analyses provide new baseline knowledge of the biodiversity and biogeography of tardigrades in this part of the southeastern US, and, more broadly, in the temperate zone of the eastern portion of North America. Comparisons with similar studies in other regions, as well as the All Taxa Biodiversity Inventory (ATBI) currently being carried out in the Great Smoky Mountains National Park, are discussed.

- 75 CANCELLED

- 76 ROGERS-LOWERY, CONSTANCE L. Catawba College—Ontogenetic changes in the localization and metabolism of calcium in scleractinian coral.

Larvae and newly-settled polyps from several Caribbean coral (*Acropora palmata* and *Montastraea faveolata*) were loaded with Calcium Orange to examine calcium localization as the organism transitions from a motile, non-calcifying planula larva to a sessile, calcifying adult polyp. In the planulae, calcium is primarily localized in the apical portions of ectodermal cells, the amount of which is influenced by concentrations of calcium in the seawater and modulators of calcium-transport proteins. This pattern of calcium localization persists after settlement. As polyp structures begin to form, the distribution of calcium becomes more localized in spirocysts and early calicoblast cells. Additionally, calcium is more basally distributed. In *Acropora*, sclerosepta and skeleton begin to form rapidly after settlement and calicoblast cells in the region of these structures are evident by their calcium fluorescence. In contrast, spat of *Montastraea* do not calcify as quickly and require attachment to substrate to begin secreting skeleton. A greater understanding of the mechanisms of calcification during the development of these threatened organisms may provide valuable insight for rearing larval coral to restore reefs.

- 77 FLAGG, RAYMOND O.¹ AND GERALD L. SMITH². Carolina Biological Supply Company¹ and High Point University²—Contributions to Mexican *Habranthus* and *Zephyranthes* by Thad Howard.

Thaddeus M. Howard, Jr., D.V.M. had an early love for plants, and he was an avid collector, trader and hybridizer of amaryllids. He was named 1970 Herbert Medalist "for his outstanding contributions to the amaryllids, notably adding to the knowledge available on *Alliums* (sic), *Bessera*, *Sprekelia* and other genera." Of the approximately 40 species of

Habranthus and *Zephyranthes* (Amaryllidaceae) native to Mexico, Thad Howard contributed in the finding and naming of 15: *Z. morrisclintii* Traub & Howard (1970), *xCoobranthus coryi* Howard (1990), *H. howardii* (Traub) Howard (1990), *H. vittatus* Howard (1990), *Z. bella* Howard & Ogden (1990), *Z. chichimeca* Howard & Ogden (1990), *Z. crociflora* Howard & Ogden (1990), *Z. nymphaea* Howard & Ogden (1990), *Z. primulina* Howard & Ogden (1990), *Z. reginae* Howard & Ogden (1990), *Z. leucantha* Howard (1993), *H. mexicanus* Howard (1996), *H. oaxacanus* Howard (1996), *Z. dichromantha* Howard (1996), and *Z. moctezumae* Howard (1996). Apparently only one name was erroneously applied to a plant that had been previously described: *H. oaxacanus* Howard (1996) = *Z. conzattii* Greenman (1898). His taxonomic achievements are remarkable for his status as an amateur botanist.

- 78 SEKORA, NICHOLAS S., KATHY S. LAWRENCE, EDZARD VAN SANTEN, AND JOHN A. MCINROY. Auburn University—A step-wise dilution scheme to determine the number of nematodes required for accurate FAME identification.

Identification and quantification of the plant parasitic nematodes *Rotylenchulus reniformis* and *Meloidogyne incognita* requires time-consuming extractions and microscope work. A series of dilutions ranging from 10,000 to a one was used to determine the minimum number of nematodes needed to discriminate between *R. reniformis* and *M. incognita* by FAME gas chromatography. While a single nematode can be detected, 250 nematodes allow for the more consistent differentiation of the two nematode genera. At this concentration, five of the six fatty acids significant for discrimination between *R. reniformis* and *M. incognita* are present. The fatty acid observed at the greatest concentration is 18:1 ω 9c, whose concentration in *M. incognita* is consistently at least twice as high as it that of *R. reniformis*. The fatty acids 14:0 and 16:1 ω 5c are present as well at this dilution and are also key to distinguishing between these two nematode genera. The concentration of 14:0 in *R. reniformis* is three times that of *M. incognita*, while 16:1 ω 6c is virtually absent in *M. incognita* samples but appears in *R. reniformis*. It may be possible to determine the genus of nematodes infecting field samples.

- 79 DAVISON, PAUL G.¹, HENRY W. ROBISON², NIELS VAN STEENKISTE³, AND TOM ARTOIS³. University of North Alabama¹, Southern Arkansas University², Hasselt University, Belgium³—Microturbellarians—an addition to the limnoterrestrial fauna of mossy tree trunks.

Microturbellarians represent an artificial grouping of small (generally < 1 mm in length), free-living members of the phylum Platyhelminthes, exclusive of the triclads. Though understudied, microturbellarians are well known from marine and freshwater environments. Those from terrestrial habitats are very poorly known and are essentially aquatic as they move within interstitial films of water. Through modifications of Baermann pans and Whitehead trays, microturbellarians are easily obtained from matrices of terrestrial material. Unexpectedly, we discovered microturbellarians (Rhabdocoela, Typhloplanidae) to be common one to two meters above ground in mosses on tree trunks. Records from the southeastern U.S. are from various forest types, e.g. longleaf pine-mixed hardwoods (AL), islands of *Juniperus* in limestone cedar glades (AL), northern hardwoods above 5000 ft elevation (NC), dwarf oak forest (Rich Mtn., OK), upland hardwoods-pine (TN), and planted roadside pecan trees (MS). Incidental collecting suggests tree trunk microturbellarians are rare in cool, mossy stream ravines and are common in areas prone to rapid drying following rainfall. Indeed, we found microturbellarians to be quite common in the mosses *Leucodon julaceus* and *Clasmatodon parvulus* on trees of open, urban habitats (*Catalpa* sp., *Celtis* sp., *Cornus florida*, *Fraxinus* sp., *Liquidambar*, *Magnolia grandiflora*, *Paulownia*, *Quercus* spp., *Ulmus* spp.). Microturbellarians join nematodes, rotifers, and tardigrades as aquatic metazoans fully adapted to temporary waters found on tree trunks. Long periods of desiccation are

survived in thin-coated, transparent mucous cysts (they appear to be anhydrobiotic as adults). We report behaviors of tree dwelling microturbellarians feeding upon nematodes, rotifers, and tardigrades.

- 80 BATSON, SANDI M., JONATHAN S. TEDETON, AND KRISTEN G. VAN DEN MEIRACKER. North Greenville University—Environmental factors impacting gemmulation of freshwater sponges (Porifera: Demospongiae): An ongoing study.

Freshwater sponges are commonly found in areas of rapid water movement. Gemmulation of these sponges occurs when environmental factors are less than optimal for sponge survival. In previous studies, temperature has been found to be a factor in gemmule formation. Light intensity, turbidity, pH, salinity, water depth, flow rate and temperature were measured bi-weekly at three sites in a freshwater run-off area of a private lake in Travelers Rest, SC, from September to December 2007. Each site had large submerged stones that served as substrates for freshwater sponge growth. Sponge-covered stones were briefly pulled to the surface weekly to inspect for gemmulation and integrity of sponge tissue. Preliminary data suggests that temperature is the prevailing factor in inducing gemmulation. Data collection continues.

- 81 RASHLEIGH, BRENDA. U.S. Environmental Protection Agency—Benthic macroinvertebrate assemblages and environmental correlates in springs of the Ridge and Valley Province.

Springs are unique features in the landscape that provide important habitat for benthic invertebrates, yet there are few studies characterizing the distribution of benthic macroinvertebrates in springs. Benthic macroinvertebrate and water quality data were collected at 35 springs in the Ridge and Valley region of the upper Tennessee River basin. Benthic macroinvertebrate taxa comprised 75 families, most occurring in the orders of Trichoptera and Diptera. The number of families per site ranged from 10-26. Classification tree analysis of benthic macroinvertebrate data identified five groups of springs based on elevation, conductivity, temperature, and coliform bacteria. High elevation and oxygen favored diversity especially in the Ephemeroptera, Plecoptera, and Trichoptera (EPT) taxa. Springs with higher temperature and pollutants supported more families within Coleoptera and Odonata. These findings for spring ecosystems can guide future assessments of springs in the Southeastern region.

THURSDAY APRIL 17, 2008 AFTERNOON SESSION

Plant Ecology I

- 82 JOLLS, C. L., J. E. MARIK, C. GOODWILLIE AND H. VANCE-CHALCRAFT. East Carolina University, Greenville, NC—The effects of fertilization on plants and their herbivores in a disturbed pine wetland.

Many factors shape ecological communities, however, their effects are not always predictable. In 2002, we established a field experiment to ask how disturbance and nutrients affect a mineral wetland at ECU West Research Campus, a former Voice of America site. The site was logged, ditched, then maintained by mowing and burning. We tested the effects of disturbance, nutrients, and their interaction, using replicated treatments in a randomized block design on eight 20 x 30 m. Disturbance is applied with annual mowing; nutrients are manipulated by fertilization three times per year. Not

surprisingly, plant species responded uniquely to treatments. Lack of mowing promoted more woody plants and grasses when combined with higher nutrient regimes; wetland species were suppressed by mowing and fertilization. In 2007, we asked whether mowing and fertilization might also affect higher trophic levels and plant-herbivore interactions. We assayed insect communities using standardized sweep netting during a 4 d period and identified insects to family. We harvested leaves of *Packera tomentosa* to determine whether herbivory differed between fertilized and control mowed plots. True bugs and beetles were most abundant; pilot work suggested a trend of greater insect species diversity in fertilized plots. *Packera* leaves appeared to suffer higher levels of herbivory from a sucking insect, however, preliminary analyses could not detect differences in the percentage of leaf area removed between treatments. These results add to the increasing knowledge base on plant-insect communities, suggesting complex relationships based on diversity, structure and nutritional content.

- 83 MCLETCHE, D. NICHOLAS, KELLY RENIGAR, GISELA GARCIA-RAMOS AND PHILIP H. CROWLEY. University of Kentucky—Intraspecific effects of plant extracts on germination of sexual and asexual propagules in *Marchantia inflexa*.

In species where both sexes can expand clonally, the relationship between germination ability of sexual propagules and the presence of adult plants can have significant impact on local sex ratio dynamics. Several studies suggest that germination and establishment of sexual propagules are inhibited by adult tissue. We examined whether inhibition of sexual and asexual germination occurs in *Marchantia inflexa*, a dioecious clonal liverwort. Various plant extracts and plant tissues were used to test for germination inhibition in spores, and a subset of these extract types also were used on asexual propagules. We found that spore germination was significantly inhibited by some plant extract, whereas asexual germination was enhanced. These results suggest that establishment by spores in small occupied sites is unlikely in *M. inflexa*; consequently, the likelihood of patches colonized sequentially by a single sex and then the other sex is low. Thus this chemical interaction might facilitate the maintenance of unisexual local populations.

- 84 LETT, CARLY AND LAURA E. DeWALD. Western Carolina University—Effects of mycorrhizal fungi on the growth of *Celastrus orbiculatus*.

The effects of mycorrhizae fungi (MF) on the growth of the exotic plant species *Celastrus orbiculatus* were studied to better understand the role MF might play in facilitating the spread of this invasive species. *C. orbiculatus* was grown in a greenhouse in pots that received one of four treatment combinations: with or without phosphorus (P), and with or without mycorrhizae for 28 weeks. Analysis of photosynthetic rate, total height, total leaf area, and shoot and root biomass data indicate that P significantly improves above ground growth and development of *C. orbiculatus* and that MF also significantly improves growth of leaf area, shoot mass, and number of branches when soil P is limited. Results also show that although MF improves growth of above ground components, this association is a cost to the plant. Implications of these results regarding the growth and invasiveness of *C. orbiculatus* will be discussed, as well as possible management strategies.

- 85 CRABTREE, CHRISTOPHER D., JOSEPH S. ELY, and HAROLD W. KELLER. University of Central Missouri—Association of macrofungal species and assemblages with vascular plant communities at Ha Ha Tonka State Park, Missouri.

Fungal and vascular plant communities involve numerous interactions that are necessary for community structure and stability. Most fungal species serve as decomposers of organic matter, while others have evolved symbiotic interactions that may be beneficial or detrimental to the vascular plant. The terrestrial natural communities of Ha Ha Tonka

State Park, Camden County, Missouri, vary from glades to deep karst sinks, which allow for great floral and fungal diversity. Five different community types were studied that include glades, open-woodlands, flatwoods, closed-canopy forests, and karst areas. Over 200 plots were established and periodically monitored from May 2006 until October 2007. A stratified random sampling technique was used in each community with a 0.01 ha circle quadrat for macrofungal and overstory sampling, and a 1m² quadrat for vascular plants. Collections documented more than 225 macrofungi, including an undescribed false truffle species (*Elaphomyces*), and more than 250 floral taxa. Non-metric multi-dimensional scaling was used to explore the possible association of fungal species or assemblages with that of plant communities and multi-response permutation procedures were used to test the hypothesis of no association among fungal taxa with herbaceous and overstory plant communities. Periodic sampling of temperature, humidity, and photosynthetic active radiation were also performed for additional analysis of community and species associations. Various mycorrhizal and non-mycorrhizal fungal associations were identified among the terrestrial natural communities. This project was financially supported in part by the Missouri Department of Natural Resources Award #226001-02 and the National Science Foundation-DEB #0343447.

- 86 HUSTAD, VINCENT¹, VERNIER, KIMBERLY¹, ANDREW S. METHVEN¹, SCOTT MEINERS¹, AND ANDREW N. MILLER². Eastern Illinois University¹, Illinois Natural History Survey²—Ecology of terrestrial macrofungi in old growth prairie groves.

This study is investigating ecology of terrestrial macrofungi in Brownfield (26.1 ha) and Trelease Woods (24.5 ha), Champaign Co., Illinois. These woods are remnants of a larger, pre-settlement prairie grove now encircled by houses, fragmented forests, prairie and agricultural land. Although initially a virgin, deciduous upland forest dominated by oak, ash and maple with a high, closed canopy and fairly open (Brownfield Woods) to moderately dense (Trelease Woods) understory, sugar maple is rapidly becoming the dominant tree species. Beginning in Spring 2006, terrestrial macrofungi and macrofungi inhabiting wood fragments <15cm diameter at each forest site were surveyed along twenty separate 100m permanent transects. Over 90 genera of macrofungi were identified from Brownfield and Trelease Woods. Plant litter composition, soil composition, site precipitation, and relative dominance of tree species were characterized at each site and used to analyze macrofungal diversity. Macrofungal community composition was found to be significantly affected by seasonality and forest division between sites. This study represents the initial phases of a long-term study in which these data will be used as a baseline to characterize changes in macrofungal community composition over time as shade-tolerant sugar maple becomes more dominant.

- 87 WILEY, JOHN J., JR. AND BRIAN C. MCCARTHY. Ohio University—Silvicultural effects on bryophyte community composition in eastern deciduous oak forests of North America.

Bryophytes are often overlooked in ecological studies, and there is often little knowledge of the ecological importance of bryophytes within local environments. Modern forestry practices generally lack a focused examination of bryophyte species and these species' responses to management activities are not well known. The goal of this investigation was to explore changes in bryophyte communities associated with the common forestry practices of understory burning and overstory thinning over a range of substrates in oak forests of southeastern Ohio. Study sites were within the USDA Forest Service Fire and Fire Surrogate (FFS) Research Program located in three southeastern Ohio forests. Each of these forests contained four treatments: untreated control, prescribed fire only, overstory thinning only, and combined prescribed fire and overstory thinning. Bryophyte cover by species was estimated on soil, standing stems, and woody debris within 540, 2 ×

5 m quadrats evenly distributed among a range of moisture classes. Associated environmental variables dealing with substrate abundance and type, topography, and available light were also measured. Several taxa were commonly encountered, including *Platygyrium repens*, *Polytrichum* spp., *Atrichum* spp., and *Dicranum* spp. Several additional species were noted as first occurrences within Vinton County, Ohio. This study has contributed to an increase in the number of known species in this county from fifty-four to over one hundred species in the last ten years. Detailed abundance analyses suggest strong community differences among silvicultural treatments and along moisture gradients, but it is clear that substrate type and abundance greatly determine bryophyte community composition.

- 88 HUGHES, NICOLE M¹., WILLIAM K. SMITH¹, AND THOMAS C. VOGELMANN². Wake Forest University¹ and ²University of Vermont ²—The functional significance of red abaxial coloration in understory plants.

Red/purple coloration is commonly observed in lower (abaxial) leaf surfaces of deeply-shaded understory plants. However, the functional significance of the trait as it relates to photosynthetic adaptation remains unclear. Here we test two possible functions of abaxial coloration in understory plants: the pigments (1) enhance light capture by back-scattering red wavelengths transmitted through the upper (adaxial) surface, and (2) function in photoprotection by absorbing internally scattered light during periods of high-sunlight exposure (i.e. sun-patches). The hypotheses were tested by comparing optical properties and chlorophyll fluorescence profiles of abaxially anthocyanic/acyanic (red/green respectively) variegated tissues of *Begonia palomar* (var. Whirlwind). Maximum quantum yield of PSII (F_v/F_m) was also used to compare sustained photoinhibition of red and green tissues before and after high-sunlight exposure. Results did not support a back-scattering function, as red surfaces did not reflect more red light than green surfaces, and no difference in mesophyll absorptance of red light was detected between red and green tissues. Consistent with a photoprotective function, mesophyll absorption of green light was significantly reduced when abaxial anthocyanins were present. During high-sunlight exposure, red tissues also had significantly (c. 11%) higher F_v/F_m than green tissues. We suggest that abaxial coloration is likely adaptive in understory plants for reducing photoinhibition during short periods of high-sunlight exposure, in order to maximize light capture during these brief, but critical, periods of carbon fixation.

- 89 KOONTZ, STEPHANIE M. AND JAMES O. LUKEN. Coastal Carolina University—Effect of prescribed burning on growth-stage structure of longleaf pine at Sandy Island, South Carolina.

Longleaf pine (*Pinus palustris*) has several well-defined growth stages from seedling to adult. We compared growth-stage structure between unburned and recently burned sites at Sandy Island, a riverine island nature preserve in coastal South Carolina. The stages examined were seedling, grass, post-grass, sapling, and adult. Our results showed there were significantly more seedlings in recently burned plots. Significant differences were found in grass-stage individuals with more surviving in unburned sites and more re-sprouts found in burned sites. Collar diameters and population sizes of post-grass individuals were larger in unburned sites. Tall saplings measured by dbh and collar diameters were also larger in unburned sites, however, this difference was not found for shorter saplings. Adults showed no difference in dbh between sites. Overall, frequent burning in this Sandhill type of ecosystem may strongly influence the growth-stage structure of longleaf pine, but it is currently not clear how this may affect the long-term trends of adult longleaf pine population structure.

- 90 GROEN, KRISTEN E., CHRISTOPHER STIEHA, PHILIP H. CROWLEY, AND D. NICHOLAS MCLETCHE. University of Kentucky—Sex-specific plant responses to light intensity: implications for spatial segregation of the sexes.

Spatial segregation of the sexes (SSS) within and among populations has been a subject of recent interest for plant ecologists, especially the possible causes of SSS. However, links among sex-specific morphology, physiology, and variation of these plant traits along environmental gradients have rarely been made. Using the non-vascular plant *Marchantia inflexa*, we investigated these linkages using a comprehensive field study. We hypothesized that males are adapted to higher light conditions and are better able to tolerate water stress than females, because male *M. inflexa* are found in locations of less tree-canopy closure than females. Our field study determined how morphological and physiological traits interacted with canopy openness and light intensity to affect photosynthetic rate. Using path analysis, we found that pore density was negatively correlated with canopy openness in both sexes but positively correlated to light intensity in males. For males, variation in edge pore density was important, and for females, support tissue was important in the path analyses. Consistent with our hypothesis, these results revealed for males that variation in pores and its linkage to water stress may be important in determining sex-specific population structures in *M. inflexa*.

- 91 MARCHIN, RENÉE, PAMELA ABIT, ON LEE LAU AND WILLIAM HOFFMANN. North Carolina State University—High levels of embolism observed in temperate deciduous forest trees during an extreme drought.

More intense and longer droughts have been observed since the 1970's and are a result of increased drying linked with higher temperatures and decreased precipitation. The six-month period (June-November 2007) prior to and included in this study was the driest on record (since 1895) for the state of North Carolina. Four study sites in the mixed deciduous forest of central NC were chosen to encompass a range of drought conditions, from areas of widespread tree mortality and foliage desiccation to areas with low visible signs of stress. There was a consistent negative relationship between wood density and leaf water potential, with the relationship being more accentuated at heavily stressed sites. Because trees with high wood density are more cavitation-resistant, it is possible for these species to operate at lower water potentials. Levels of native embolism were significantly higher at droughted versus undroughted sites in ten of the twelve diffuse-porous tree species studied, while only one of six ring-porous species exhibited a significant difference among sites. Contrary to predictions, there was a significant positive relationship between wood density and native embolism. Patterns of stomatal regulation likely evolved to balance carbon gain with cavitation risk in order to maximize stomatal conductance without introducing embolisms to the xylem. Since species with higher wood density operate closer to the threshold where xylem dysfunction will cause runaway cavitation, these species may be more susceptible to tree dieback. Extreme droughts could potentially cause rapid shifts in species composition in the temperate forests of NC, due to the increased mortality of drought-sensitive species.

- 92 DENSLOW, MICHAEL W. AND ZACK E. MURRELL. Appalachian State University—Spatial patterns of botanical exploration in North Carolina: a study using local floras.

Local floras provide key information for biodiversity studies by providing a comprehensive picture of the floristic composition of a specific study area. However, most areas worldwide do not have baseline floristic information. In a time when biodiversity information is so critical, we must utilize available resources efficiently to augment missing data on the floristic composition of local areas and the geographic distributions of plant taxa. This study examines (1) the spatial distribution of published North Carolina local

floras and (2) identifies the geographical survey gaps in botanical exploration. We compiled a database of >70 local floras completed within the state of North Carolina between 1834 and 2007. These floras cover areas of varying size, from small islands and state parks to entire counties. The analysis included journal articles, government publications, technical reports and Master's theses. Study locations and spatial extents were mapped and the spatial patterns were analyzed using GIS. Spatial statistics were employed to address survey gaps and site selection bias. Significant botanical survey gaps were identified, suggesting that some areas within North Carolina remain inadequately explored botanically. By revealing spatial patterns of botanical information using existing floristic data in conjunction with methods employed here, we show that this type of analysis can have strong implications for conservation planning, as well as for macroecological and biogeographic studies.

- 93 HINKLE, C. ROSS¹ AND PAUL A. SCHMALZER². University of Central Florida¹ and Dynamac Corporation²—Acquisition and management of environmentally endangered lands to protect biodiversity in Brevard County, Florida.

In 1990 voters in Brevard County (east Central Florida) approved an ad valorem tax to collect up to \$55M for the acquisition and management of "environmentally endangered" lands to protect biodiversity, provide for passive recreation, and support environmental education. In 2004 a second referendum was passed to authorize up to \$60M for continuing the original acquisition and management program. A scientific advisory committee has established criteria to select the lands and to work with county staff to develop management plans for the conservation areas. After 17 years of acquisition activities, approximately 9000 ha of environmentally endangered lands have been acquired for protection. The sanctuary network established by this program includes ecosystems such as coastal barrier islands, Florida oak scrub, pine flatwoods, mesic hammocks, and coastal wetlands. The program is now moving from primarily acquisition activities to primarily resource management activities. A seven-member scientific advisory committee and county land managers are developing a systematic evaluation of conservation priorities and establishing a sustainable management program to optimize biological diversity on the sanctuary sites.

Plant Biology I

- 94 HUSKINS, STACY AND JOEY SHAW. University of Tennessee at Chattanooga—A flora of the North Chickamauga Gorge State Natural Area, Hamilton County, Tennessee.

The North Chickamauga Creek Gorge State Natural Area (NCCG) consists of 7,073 acres and is located in Hamilton and Sequatchie counties in eastern Tennessee. The NCCG is on the eastern edge of the Cumberland Plateau and is bordered by the Ridge and Valley physiographic province. Broadly defined habitat types support a diverse assemblage of plants on the NCCG's upper plateau surface, gorge slopes, stream banks, and ruderal areas. Fifty collecting trips were made during the 2006 and 2007 growing seasons and 526 species of vascular plants in 108 families were documented. Seven species with either a state or federal listing were documented: *Spiraea virginiana*, *Nestronia umbellula*, *Sabatia capitata*, *Diervilla sessilifolia* var. *rivularis*, *Panax quinquefolius*, *Viola tripartita* and *Glyceria acutifolia*., and several populations of *Scutellaria montana*. Over fifty species of non-native species have also been documented, including *Microstegium vimineum*, *Lespedeza bicolor*, and *Albizia julibrissin*.

- 95 LAMONT, E. E.¹ AND RICHARD STALTER². Honorary Research Associate, Institute of Systematic Botany, The New York Botanical Garden, Bronx, NY¹ and Department of Biological Sciences, St. John's University, Jamaica, NY²—Orchids of Atlantic coast barrier islands from North Carolina to New York.

During the past 25 years, we have documented the occurrence of 17 orchid species from Atlantic coast barrier islands from North Carolina to New York, including *Calopogon tuberosus*, *Corallorhiza wisteriana*, *Cypripedium acaule*, *Epipactis helleborine*, *Goodyera pubescens*, *Habenaria repens*, *Listera australis*, *Malaxis spicata*, *Platanthera cristata*, *Pogonia ophioglossoides*, *Spiranthes cernua*, *S. lacera* var. *gracilis*, *S. laciniata*, *S. odorata*, *S. praecox*, *S. vernalis*, and *Tipularia discolor*. For each species, we present data on localities of extant orchid populations, fluctuations in population size, flowering dates, habitat preferences, threats to some populations, results of herbarium and literature searches, and our opinion on the status of orchid species reported by others but not observed by us in the field. *Spiranthes vernalis* is the most common orchid on mid-Atlantic coast barrier islands. Other species occurring in large (>1000 individuals) populations include *Platanthera cristata*, *Spiranthes cernua*, *S. praecox*, and *Tipularia discolor*. Four orchid species occur in moderately large (50 to 100+ individuals) populations but have limited distributions, including *Calopogon tuberosus*, *Cypripedium acaule*, *Epipactis helleborine*, and *Pogonia ophioglossoides*. When analyzed by locality, several regions of high orchid diversity can be identified, including False Cape, Virginia and the region between and including Nags Head Woods and Kitty Hawk Woods on Bodie Island, North Carolina. These orchid "hot spots" occur in regions that provide a high diversity of habitats.

- 96 KELLER, HAROLD W, JOSEPH S. ELY, COURTNEY M. KILGORE, ANGELA R. SCARBOROUGH, SYDNEY E. EVERHART, KENNETH L. SNELL, AND ROBERT BRESHEARS. University of Central Missouri—Rock Creek National Park BioBlitz, 2007, Washington, D.C.: tree canopy myxomycete survey.

Rock Creek National Park in Washington, D.C. hosted the first 24-hour BioBlitz held May 18-19, 2007 and jointly sponsored by the National Geographic Society (NGS) and the National Park Service (NPS). All members of the tree canopy biodiversity team were associated with the University of Central Missouri including Harold W. Keller, Joseph Ely (faculty team leaders), former UCM student Kenny Snell, current students Courtney Kilgore, Sydney Everhart, Angela Scarborough, and photographer Robert Breshears. Climbers used the double rope technique when sampling bark for myxomycetes from 13 living trees that included *Carya glabra*, *Fraxinus americana*, *Liriodendron tulipifera*, *Prunus serotina*, *Quercus alba* and *Q. velutina*. Bark placed in moist chamber cultures yielded 18 myxomycete species, including the first record outside of Europe for *Licea eleanorae*. Abundant sporangia of *Cribraria microcarpa* were obtained (3 to 30 meters) from moist chamber cultures. More than 800 participants collected approximately 700 species in the 24-hour period. Beginning in 2007 a BioBlitz will be held each year in urban areas of NPS units for the next 10 years with the goal of increasing public awareness through the documentation of species inventory, public outreach activities, and science education for all age groups. The second BioBlitz is scheduled for the Santa Monica Mountains National Recreation Area May 30-31, 2008 joined by the California State Parks and the Santa Monica Mountains Conservancy. This activity was financially supported in part by the National Geographic Committee for Research and Exploration 7272-02 and National Science Foundation, Biodiversity Surveys and Inventories, Award DEB-0343447.

- 97 KELLER, HAROLD W, COURTNEY M. KILGORE, SYDNEY E. EVERHART, ANGELA R. SCARBOROUGH, JOSEPH S. ELY, AND CHARLY POTTORFF. University of Central Missouri—The double rope climbing technique: tree canopy studies of the Great Smoky Mountains National Park, Daniel Boone National Forest, Kentucky, and Pertle Springs, Missouri.

Tree canopy access is possible using dirigibles, cranes with gondolas, cherry pickers, elevated platforms or walkways, inflatable platforms, tree houses or bridges, ladders, towers, boats, free hand or rope climbing techniques. A non-invasive, double rope climbing technique was used because all climbing gear could be carried in backpacks and allowed the climber to advance the rope higher in the tree canopy. More than 20 students have climbed and sampled myxomycetes from more than 450 trees using this method. All students participated in a tree climbing school taught by professional arborist Charly Pottorff or former student Kenny Snell and passed a knot-tying test consisting of the Figure Eight stopper knot, Anchor Hitch, Blake's Hitch (friction knot), and a series of half hitches. The buddy system was used where each climber was paired with a ground crew member instructed in safety procedures. A pre-climbing inspection ensured suitable trees were free of dead branches, poison ivy, and thorns. The Big Shot, a slingshot, was used to shoot a weighted throw bag attached to a slick line over crotches and branches usually at heights of 18 to 24 meters. Dress, gear and vertical climbing techniques are described here along with a hand-held foot loop created by doubling-over the end of the climbing rope. This field research was financially supported in part by the National Science Foundation, Biodiversity Surveys and Inventories, Awards DEB-0079058 and 0343447, Discover Life in America 2001-26 and 2002-17, and National Geographic Committee for Research and Exploration 7272-02.

- 98 RAYNER, DOUGLAS A., BRENDA WICHMANN, SARA CORFMAN, KAKI BRUCE, ERIN CAUDILL, BLAKE DERRICK, AND MIRANDA WORSTER. Wofford College—Population biology/ecology of *Sisyrinchium dichotomum* (Iridaceae): Insights from studies spanning 10 years.

Sisyrinchium dichotomum, white iredette, is a federally endangered plant known from just a few populations in the foothills of the Carolinas. In the fall of 1998 all plants in the Chestnut Ridge SC population (337) and in the lower elevations of the Melrose Mountain SC-NC population (602) were pin flagged, categorized by size class, and assessed for fruit production; aspect and slope were recorded for each colony in each population; and for each plant four measurements were taken on soil depth and leaf litter depth. Both populations experienced significant mortality between 1998 and 2001 (Chestnut Ridge = 60.0%, Melrose Mountain = 65.2%). Tests for correlations between size class, soil depth, leaf litter class, and mortality were examined using the Pearson Product Moment Correlation. At Chestnut Ridge there was a significant positive correlation between size class in 1998 and size class in 2001 ($p = 0.0005$) and between mortality and leaf litter class ($p = 0.032$) for Colony 6, but not for the population as a whole. At Melrose Mountain there was a significant negative correlation between soil depth and size class ($p = 0.028$) and between leaf litter class and size class ($p < 0.00001$). There were no significant correlations that included both the Chestnut Ridge and the Melrose Mountain populations. Population size at Chestnut Ridge fluctuated in the five times it was assessed between 1998 and 2007 (337 in 1998; 92 in 2001, 191 in 2002, 299 in 2005, and 179 in 2007). The implications of these and other results will be discussed.

- 99 BRENDECKE, WILLIAM¹ AND JAMES ZACZEK¹ AND KAREN MANGAN². Southern Illinois University¹ and U.S. Fish and Wildlife Service²—Effects of collection and planting dates of different *Arundinaria gigantea* collection sources on field-scale restoration.

Arundinaria is a native North American bamboo forming monotypic stands called canebrakes with historic distribution encompassing floodplains of the southeastern U.S. Land conversion and altered disturbance regimes have limited cane to 2% of historical accounts. Canebrake restoration efforts face difficulties such as infrequent seeding and low viability, limited availability of seedlings or rhizome planting stock, and inefficient establishment and management techniques. To address these problems, we are developing cane propagation and field-scale restoration techniques on the Cypress Creek National Wildlife Refuge and in the Cache River watershed in southern Illinois. The objective was to determine if genotype (3 collection sources) and collection: planting date (fall: fall, fall: spring, spring: spring) affect survival and growth of giant cane. Study design was a randomized complete block design with between 12 and 20 rhizomes per each of 3 collection sources (subplots) planted in each of 3 rows (collection date:planting date main plots) blocked 6 times across 2 sites (N=2086). Subplots and plots were randomly chosen and rhizomes were planted in rows using a tree planter. Mean survival after one growing season was similar for each site with a mean of 11.1%. Survival was dependent on collection source and collection:planting dates. Survival ranged from a high of 38.3% for the spring collected:spring planted Upper Cache River source to 0.4% for the two other treatment combinations. Collecting and planting rhizomes in the spring for two of the three collection sources produced the highest percent survival compared to stock collected in the fall then planted or stored until spring.

- 100 MATTHEWS, TONY^{1,2}, MELANIE DEVORE² and KATHLEEN PIGG³. ¹Old Dominion University, ²Georgia College & State University, ³Arizona State University—Evolutionary significance of fossil *Isoetes* from the Paleocene of North Dakota.

Quillworts (*Isoetes* L., Isoeteaceae, Lycophyta) are small, aquatic to semi-aquatic pteridophytes with a long fossil lineage. The oldest unequivocal record for the genus is *Isoetites rolandii* Ash and Pigg dating to the Jurassic Period in North America. Other North American *Isoetes* are well represented in the Paleocene and Early Eocene Epochs of Tertiary Period sediments. A recent discovery of a silicified *Isoetes* in the Late Paleocene Beicegel Creek flora of western North Dakota provides a significant keystone for more thoroughly understanding morphological evolution in *Isoetes*. Comparison of these anatomical remains with compression fossils is valuable for interpreting several important morphological features, including leaves and megaspores. In this study, the utility of morphological features for inferring potential habitat preferences (aquatic, semiaquatic, and terrestrial) of extinct and extant isoetalean taxa is explained. Megaspores discovered at Beicegel Creek were compared to other megaspores of similar age from other fossil localities. Differences in spore morphology (surface ornamentation, spore structure, and the presence or absence of aquatic dispersal features) and the evolution of these megaspore characters among species of *Isoetes* will be highlighted.

- 101 NEUFELD, HOWARD S. AND GUICHUAN HOU. Appalachian State University—Anatomical distribution of anthocyanins in the stems of several herbaceous plants: Speculations on their functional significance.

Many plants accumulate anthocyanins in their leaves when either young or stressed. These anthocyanins may serve as either light shields or antioxidants. However, many plants also have red colored stems, veins or petioles, yet no studies have been published examining similar functions in such support organs. Our study was designed to look at the anatomical distribution of anthocyanins in support organs, as a basis for testing the hypothesis that anthocyanins function similarly in these organs as in leaves. We examined the distribution of anthocyanin containing cells in a variety of plant species, and we have begun in-depth examination of the physiological role of stem anthocyanins in purple-stemmed aster (*Symphotrichum puniceum*). Anthocyanins were distributed mainly in

epidermal or subepidermal layers (single or multiple), while in strawberry (*Fragaria virginiana*) stolons we observed two distinct anthocyanic layers, one epidermal, and one just external to the vascular stele. In evening primrose (*Oenothera biennis*) anthocyanins were primarily restricted to cells directly above patches of chlorophyllous cells, but not in-between. In all stems, anthocyanins were more prevalent (as assessed visually) on the side of the stem facing direct sunlight. These observations suggest that anthocyanins are produced under conditions of high light and may be serving the same function as they do in leaves. They may also be sinks for reactive oxygen species, such as hydrogen peroxide. A model will be presented describing the relationship between carbon assimilation and stem/vein structure, and how this can predispose such organs to photoinhibition and susceptibility to reactive oxygen species.

- 102 HAMISSOU, MIJITABA. Jacksonville State University, Jacksonville, AL 36265—The physiological and oxidative stress responses of *Arabidopsis thaliana* and *Nicotiana tabacum* plants grown in perchlorate-containing water.

Perchlorate is a man-made anion contaminant used as an oxidizer in manufacturing propellants, ballistics, rocket, and in missile fuel. Contamination by perchlorate occurs in the proximities of military bases and rocket assembly plants. It is hypothesized that perchlorate will affect plant health by inducing physiological changes in the form of oxidative stress and by affecting photosynthesis. The objective of this research is to use *Arabidopsis thaliana* and *Nicotiana tabacum* plants to study the effects of perchlorate to plants health. *Arabidopsis* plants, at 8-rosette-leaf stage, and tobacco plants, at 3-fully-expanded-leaf stage, were irrigated with varying concentrations of perchlorate for 7 days. At the end of perchlorate treatment, chloroplasts were isolated and their photosynthetic activities measured. Proteins were harvested by homogenizing leaf tissues and analyzed. The plants' anti-oxidative enzymes superoxide dismutase (SOD) and ascorbate peroxidase (APO) were analyzed. Photosynthetic activities of the plants chloroplasts were also measured as the rate of NADPH₂ formation. The data indicated that perchlorate primarily affected tobacco plants shoot apical meristems but caused general dehydration in *Arabidopsis*. Low concentrations of perchlorate were sufficient to induce chlorosis and necrosis in tobacco leaves, and desiccation in *Arabidopsis*. Perchlorate caused a decreased in the rate of NADPH₂ formation. The total protein yields were enhanced 1.9 folds by perchlorate treatment in both *Arabidopsis* and tobacco. Perchlorate treatment caused *Arabidopsis* and tobacco plants to induce SOD activities statistically higher than control plants. In response to perchlorate, 4 SOD isozymes were expressed in tobacco but only 3 in *Arabidopsis*. The effects of perchlorate on APO activities were not conclusive.

- 103 CANCELLED

- 104 ELLIS, JENNIFER. Vanderbilt University—Detection of rare paternal inheritance in controlled crosses of the endangered sunflower *Helianthus verticillatus*.

A variety of questions in population and evolutionary biology are studied using chloroplast DNA (cpDNA). The presumed maternal inheritance in angiosperms allows for certain assumptions and calculations to be made when studying plant hybridization, phylogeography, molecular systematics, and seed dispersal. Further, the placement of transgenes in the chloroplast to lessen the probability of "escape" to weedy relatives has been proposed since such genes would not move through pollen. In many studies, however, strict maternal inheritance is assumed but not tested directly, and some studies may have sample sizes too small to be able to detect rare paternal leakage. Here, we study the inheritance of chloroplast DNA simple sequence repeats in 323 offspring derived from greenhouse crosses of the rare sunflower *Helianthus verticillatus* Small. We found evidence for rare chloroplast paternal leakage and heteroplasmy in 1.86 % of the offspring. We address the question of whether one can extrapolate the mode of

chloroplast transmission within a genus by comparing our results to the findings of another sunflower species study. The findings of occasional paternal transmission of the chloroplast genome are discussed in the framework of using these markers in studies of population and evolutionary biology both in *Helianthus* and other angiosperms.

- 105 GRANT, STEPHANIE AND LAURA E. DEWALD. Western Carolina University—Changes in genetic diversity of *Quercus rubra* following different harvesting regimes and the decline of *Castanea dentata* in Western North Carolina.

Quercus rubra is an important species in the southern Appalachian ecosystem. However, efforts to facilitate regeneration in western North Carolina have met with limited success and the subsequent population decline may be resulting in loss of genetic diversity in this species. This study used nine microsatellite markers to determine if *Quercus rubra* populations have experienced a change in genetic diversity following: 1) the disappearance of *Castanea dentata* overstories; and 2) changes in timber harvesting. Cambial samples were collected from 250 individuals located in four harvested and four preserved sites in the Nantahala National Forest. These sites were historically dominated by *Castanea dentata* and each harvested site was located within a mile of a preserved site of similar forest type. Genetic diversity was compared using allele frequencies, observed and expected heterozygosities, effective number of alleles, and fixation indices. Preliminary data has shown a significant difference in the genetic diversity of *Quercus rubra* established before and after the disappearance of *Castanea dentata* overstories (P-value = .046). In harvested stands, preliminary data has also shown a significant difference in the genetic diversity of *Quercus rubra* in trees established pre- and post-harvest (population differentiation P-value=0.033).

Herpetology I

- 106 MCCOARD, NOAH S. AND THOMAS K. PAULEY. Marshall University—Reproduction of the common ribbonsnake (*Thamnophis sauritus sauritus*) and eastern gartersnake (*Thamnophis sirtalis sirtalis*) in West Virginia.

The Common Ribbonsnake (*Thamnophis s. sauritus*) is among the rarest snake species in West Virginia whereas the Eastern Gartersnake (*Thamnophis s. sirtalis*) is among the most common. Although habitat and diet are very specific for *T. sauritus* and very general for *T. sirtalis*, other variables may account for the difference in occurrence, such as reproduction. Reproduction of these two species was compared using specimens caught in the field as well preserved specimens from the West Virginia Biological Survey Museum and the Carnegie Museum of Natural History. Eight gravid female *T. sauritus* which had been collected from 1936 to 2007 and twelve gravid female *T. sirtalis* which had been collected from 1937 were used for this study. These species are viviparous and time of breeding was estimated to occur in the spring as early as April and May by identifying gestational time and documenting time of birth which occurs during July and August. Breeding occurs slightly earlier for *T. sirtalis* than for *T. sauritus*. Average number of offspring was calculated from number born as well as counting number of embryos in preserved specimens. Sex, average snout-vent length and tail length of offspring were recorded from the live-born specimens. Neonate morphometrics and clutch size were compared to the size of the mother to determine correlations. Statistical analysis was conducted to determine differences in clutch size, snout-vent length, and tail length. *T. sirtalis* had a higher reproductive success than *T. sauritus* which could be an additional factor affecting their more common occurrence.

- 107 TUBERVILLE, TRACEY D.¹, TERRY M. NORTON², TRAVIS C. GLENN^{1,3} AND BRADLEY J. WAFFA⁴. Savannah River Ecology Lab¹, St. Catherines Island Wildlife Center², University of Georgia³ and University of the South⁴—Mating system in a gopher tortoise population established through multiple translocations: apparent advantage of prior residence.

Population manipulations such as translocation are becoming increasingly important tools in the management of rare and declining species. Evaluating the effectiveness of such manipulations requires comprehensive monitoring of population processes, including dispersal, survivorship, and reproduction. We investigated the mating system of a translocated population of gopher tortoises (*Gopherus polyphemus*) established through multiple releases, which occurred primarily during 1987-1994. During 2006-2007, we sampled and genotyped 27 candidate males, 34 candidate females, and 121 offspring from 19 clutches at 5 polymorphic microsatellite loci to determine the relative frequency of multiple paternity and to estimate individual reproductive success. Multiple paternity was detected in 57% of clutches genotyped, and females of single-sire clutches and females of multiple-sire clutches were of similar size. Reproductive success varied among male tortoises, and successful sires were significantly larger than males to which no offspring were attributed. Among successful sires, previously established resident males sired a disproportionate number of the offspring sampled, despite being significantly smaller than subsequently released males. The high variance in individual reproductive success and the apparent reproductive advantage associated with prior residence observed in this gopher tortoise population has important implications for the design of future translocation studies.

- 108 BROWN, JOSHUA R. AND JOHN L. CARR. University of Louisiana at Monroe—Feeding ecology of musk turtles in a North Louisiana bayou.

Examinations of resource partitioning among closely related species may provide indices of the overall structure and stability of a community. Musk turtles are found throughout the eastern United States and Canada and have been documented in a variety of aquatic habitats. In Northeast Louisiana there are two species of musk turtles. The common musk turtle (*Sternotherus odoratus*) is the most widespread species in the genus. The razor-backed musk turtle, the largest species of the North American musk turtles, (*S. carinatus*) is endemic to the Lower Mississippi River drainage. The study was conducted in Bayou DeSiard, Ouachita Parish, Louisiana. The bayou is over 30 miles in length with a soft substrate and is the source of water for the city of Monroe. Turtles were captured using hoop nets, fyke nets, and by hand from July of 2006 until present. Captured turtles were weighed, measured, and placed in individual containers. Digested food items were collected and placed in ethanol until they were identified. Several mollusks, crayfish, and snails were the dominant prey items for both species. Insects were more common in smaller turtles. There is evidence of dietary-niche overlap among the musk turtles, which may suggest that their diets reflect the relative abundance of potential prey items. Although their diets are similar, it was rare to find both species in the same trap at the same time, possibly suggesting both spatial and temporal partitioning of similar resources.

- 109 SAFER, ADAM B.¹ AND MICHAEL S. GRACE². Armstrong Atlantic State University¹ and Florida Institute of Technology²—Infrared imaging in basal boid and pythonid snakes: the relationship between neuroanatomy, pit organ arrangements, and ecology.

The evolution of the unique infrared imaging system in boid, pythonid, and crotaline snakes has resulted in the formation of a supplemental trigeminal sensory system that terminates in a novel brainstem nucleus: the nucleus of the lateral descending trigeminal tract (LTTD). The LTTD is specifically associated with the ability to detect and process

infrared information, and it has been found in all infrared imaging species in which it has been sought. In an effort to broaden our understanding of the evolution of infrared imaging systems in snakes we set out to: (1) search for the LTTD in species other than those that are known infrared imagers by focusing on basal (or less derived) members of known infrared imaging groups that lack pit organs (*Calabaria* among the boids and *Aspidites* among the pythonids), and (2) investigate how the anatomy of the LTTD relates to pit organ arrangement, habitat, and ecology in boid and pythonid snakes. To address these issues we examined the neuroanatomy of several species of boids and pythonids (including the basal *Calabaria* and *Aspidites*). Our results indicate that basal members of the Boidae and Pythonidae possess the LTTD and, therefore, the necessary neural components for infrared imaging. In addition, we found that the size of the LTTD is associated with pit organ arrangement and habitat selection within the boid and pythonid species that we examined. The evolutionary and ecological significance of our findings are discussed.

- 110 DIEFENBACHER, ERIC H. AND THOMAS K. PAULEY. Marshall University—Comparison of the digit morphology of an arboreal salamander with potential competitors.

Organisms such as insects, geckos, and frogs exhibit adhesive properties on their digits. However virtually no studies have been done on possible adhesive structures of North American arboreal salamanders, or how these structures may influence competitive interactions between species for particular habitats. The Cumberland Plateau Salamander, *Plethodon kentucki*, has recently been found to be a major competitor in behavioral experiments involving the Green Salamander, *Aneides aeneus*. This evidence combined with field data suggests there may be potential for *P. kentucki* to compete for rock crevices with *A. aeneus* where their respective ranges overlap in West Virginia. If *P. kentucki* is competing with *A. aeneus* for arboreal habitats, then *P. kentucki* must have the digit morphology to exploit arboreal habitats. We compared the cellular morphology of digit structures and morphometric data among *A. aeneus*, *P. kentucki*, and the Slimy Salamander, *Plethodon glutinosus*, another sympatric species. Morphometric data from all three species were analyzed on anatomical features derived as crucial to utilizing arboreal habitats. Analysis shows *P. kentucki* is more similar to *A. aeneus* in front limb length and hind limb length. However, *P. kentucki* was found to have a significantly higher trunk and tail height than *A. aeneus*. Histological preparations show varying amounts in the curvature of the terminal phalanx and amount of dermal cell layers with *A. aeneus* having the greatest curvature and dermal cell layers followed by *P. kentucki* then *P. glutinosus* which had the flattest terminal phalanx and fewest cell layers.

- 111 BEAMER, DAVID A. AND TRIP LAMB. East Carolina University—A phylogenetic survey of the *Desmognathus fuscus* complex in the southeastern US.

Salamanders of the genus *Desmognathus* have proven to be difficult taxonomically and this is especially true for members of the *Desmognathus fuscus* complex. The members of this complex have variously included *D. fuscus*, *D. conanti*, *D. santeetlah*, *D. welteri* and *D. auriculatus*. These species span almost the entire range of *Desmognathus* and a wide variety of habitat types. As a result we have designed a sampling protocol designed to provide rangewide sampling at a scale appropriate for a phylogenetic reconstruction of this species complex and the genus overall. Since all species in the *D. fuscus* complex are semiaquatic, upland dispersal is probably minimal; instead, most inter-population movement likely occurs via streamside (and/or other wetland) conduits that are eventually circumscribed within a given river drainage system. Thus, river drainages provide a logical starting point for investigating distribution patterns and evolutionary relationships of *Desmognathus*. Level IV Ecoregions denote areas of general similarity in ecosystems as well as in the type, quality, and quantity of environmental resources available. These

discrete, biologically-relevant geographic parcels should represent an ideal sampling unit for organisms with low vagility, high philopatry, small home ranges, and non-migratory life histories. Here we present the results of our phylogenetic reconstruction of the *D. fuscus* complex that suggests strikingly different distributions of most species and reveals the presence of additional cryptic lineages.

- 112 JOHNSON, EMMY AND THOMAS K. PAULEY. Marshall University—A study on the origin, population size, and natural history of the eastern six-lined racerunner, *Aspidoscelis s. sexlineata*, in West Virginia.

Species will expand ranges through natural or human-mediated means. Such an occurrence has happened in West Virginia with Eastern Six-lined Racerunners a species that has been found to thrive in areas of high disturbance from humans. While found abundantly in other states, they are thought to occur only in the eastern panhandle of West Virginia (Morgan County) where they are believed to have come from Maryland via a railroad bridge. Without the bridge, the Potomac River forms a natural barrier between these two states. The objectives of my study were to determine the origin, population size, and natural history of these lizards. My hypotheses were that these lizards came from Maryland and they are well established in a small area of West Virginia. The origin of this species will be determined by how much genetic variation exists between the Maryland and West Virginia lizards. The population size will be determined using mark-recapture analysis. Currently, 52 lizards, representing three different species, have been captured. Forty-eight of these were racerunners, including recaptures. Eastern Six-lined Racerunners were most active from 11 am until 3 pm, but limited activity was observed from 9 am until 7 pm. Fifty-eight percent of lizards were caught in June. Gravid females were captured during May, June, and July. This population appears to be well-established and it may be expanding.

- 113 MOORE, MICHAEL K.^{1,2}, JULES M. TORAYA¹, AND V. R. TOWNSEND, JR.³ Departments of Earth and Environmental Science¹ and Biology², Mercer University, Macon, GA 31207 and Department of Biology³, Virginia Wesleyan College, Norfolk, VA 23502—Population decline of the golden tree frog, *Phyllodytes auratus*, on Cerro del Aripo, Trinidad, W. I.: a climate-pathogen connection?

Many amphibian species have exhibited significant population declines, and multiple causes have been identified (e.g., habitat destruction, pollution). Recently, an interaction between an emerging infectious disease (EID), *Batrachochytrium dendrobatidis*, and an increase in annual mean temperatures has been proposed as the likely cause of the extinction of > 60% of the species of *Atelopus* from Central America (Pounds et al., 2006). On a global scale, stream-dwelling, tropical anurans from higher elevation habitats seem particularly susceptible to infection by *B. dendrobatidis*. In this study we investigated the abundance and distribution of two bromeliad-dwelling frogs (the golden tree frog, *Phyllodytes auratus*, and the marsupial frog, *Flectonotus fitzgeraldi*) that inhabit the elfin forest canopy on Cerro del Aripo, Trinidad, W. I. Previous studies reported that golden tree frogs occupy appx. 50% of bromeliads present (Clarke et al., 1995). We observed a single individual golden tree frog (i. e., a 1.6% rate of occurrence) and no marsupial frogs in a sample of 62 bromeliads in this habitat. Sometime between 1994 and 2007, the canopy-dwelling frogs of Cerro del Aripo suffered a serious and persistent decline in numbers. A literature review of likely causes suggests that these frogs may have declined due to a spread of chytrid fungus facilitated by an increase mean temperatures in this region.

- 114 HAMILTON, AMY AND THOMAS PAULEY. Marshall University—Status of Blanchard's cricket frog, *Acris crepitans blanchardi*, relative to environmental conditions in southern Ohio and western West Virginia.

Amphibian populations have been declining worldwide since 1970. Specifically, *Acris crepitans* has displayed a notable trend towards extinction in the United States. The subspecies, Blanchard's Cricket Frog (*A. c. blanchardi*), is being monitored by the Ohio Division of Natural Resources to determine a ranking in Ohio and is listed as possibly extirpated in West Virginia. One study on its distribution in the western part of Ohio, noted a large-scale decline. *Acris c. blanchardi* is also suffering declines in Wisconsin, Michigan, Illinois, and Indiana. Acidic conditions and habitat degradation are thought to contribute to these major declines. I surveyed 50 sites in both Ohio and West Virginia beginning in May 2007 and ending in September. Dissolved oxygen, water, air, and soil temperatures, and pH were recorded at each site. Preliminary results suggest dissolved oxygen and pH may differ significantly between sites with and without frogs. Eighty-one adult cricket frogs were weighed and measured. The mean weight was 1.4g, snout to urostyle length was 22.6mm, tibia length was 13.3mm, and cranial width was 6.7mm. Frogs began calling prior to May 15th, declined through July, and stopped calling on August 1st. Vegetative analysis determining percent cover is being conducted at 5 presence and 6 absence sites in Ohio and 3 absence sites in West Virginia. Analyses of pH will be used to test the effect of acidity on populations and percent plant cover will be used to determine vegetation differences between presence and absence sites.

- 115 PICCININI FRANK AND THOMAS K. PAULEY. Marshall University—Marbled salamanders *Ambystoma opacum* as "eco-indicators": An overview and some data from a monitoring protocol for ambystomatid salamanders.

Land managers and conservationists often rely on software to help guide management and conservation efforts. Software in turn relies on accurate and precise field data to provide meaningful and useful models. Unfortunately, data on all species in a given habitat is logistically difficult and cost prohibitive to obtain. To deal with this paucity of information, managers and conservationists often use indicator species as a metric for evaluating ecosystem health and integrity. Here we present an overview of a fine scale (temporal and spatial) quantitative approach to monitoring three ambystomatid salamanders (spotted salamanders, *Ambystoma maculatum*, jefferson salamander, *Ambystoma jeffersonianum*, and the marbled salamander, *Ambystoma opacum*), draw limited conclusions on ambystomatid habitat use, and make a case for using marbled salamanders as indicators of ecosystem complexity and integrity. A chi-square test for homogeneity was used to test for a significance difference in capture rates of marbled salamanders. We found that four captures rates are statistically different among transects (P values <.0001, <.0001, =.00013, and <.0001 for adult captures, adult recaptures, juvenile captures and total captures respectively). Interpretations of this analysis suggest that ambystomatid salamanders are associated with late successional forests, wetlands and the gradient between these habitats. We also demonstrated the propensity of marbled salamanders to persist near human disturbances. Based on our data interpretation and the available literature, we contend that that marbled salamanders may be excellent indicators of habitat complexities that develops over time, early-late successional habitat gradients, and the severity of anthropogenic impacts on the environment.

Southeastern Society of Parasitologists II

- 116 HILSINGER, K. CLAIRE, MIRANDA PAGE AND DANA NAYDUCH. Georgia Southern University—Analysis of *Skryabinoptera phrynosoma* burden on stomach-flushed *Phrynosoma platyrhinos*.

Skrjabinoptera phrynosoma is a Spirurid nematode parasite of a number of lizards across the US, and a common gastric parasite of the horned lizard *Phrynosoma platyrhinos*. When ready to reproduce, the gravid female worm exits the lizard via the cloaca and is carried by foraging *Pogonomyrmex* spp to the ant's nest and fed to the larval ants. As these ants develop into adults, the larval *S. phrynosoma* develops into its infective stage inside the ants. The life cycle is completed when the infected ants are eaten by the lizard definitive host. Twenty-two *P. platyrhinos* were stomach-flushed in the Alvord Basin of the Great Basin Desert in southeastern Oregon and the resultant *S. phrynosoma* were analyzed for sex ratio (male, female, and juvenile), and worm burden and sex ratio in relation to host sex and size. There was no significant difference between worm burden and composition in relation to host sex. *P. platyrhinos* are not sexually dimorphic, so males and females were grouped together when analyzing worm burden in relation to snout-vent length. Larger lizards had significantly more worms overall, but female worms were more numerous in larger lizards, while male and juvenile worms did not become more numerous as lizard size increased. While *S. phrynosoma* exhibit an interesting life cycle, little is known of the worm burden on the infected lizards. These data and more to be collected in 2008, will help to explain the interaction between the host and parasite in this system.

- 117 GERHOLD, RICHARD W.¹, ANDREW B. ALLISON¹ AND JOHN F. ALDERETE². Southeastern Cooperative Wildlife Disease Study, College of Veterinary Medicine, The University of Georgia¹ and The University of Texas Health Science Center at San Antonio²—Failure to detect intracellular double-stranded RNA viruses in *Trichomonas gallinae* and identification of a novel sequence of a *Trichomonas vaginalis* virus.

To determine if intracellular double-stranded RNA (dsRNA) viruses exist in *Trichomonas gallinae*, virus purification via ultracentrifugation was followed by gel electrophoresis of extracted RNA, reverse transcriptase-polymerase chain reaction, and transmission electron microscopy. Double-stranded RNA viruses were not detected in any of the twelve examined *T. gallinae* isolates. Sequence analysis of a dsRNA virus from a previously determined virus-infected *T. vaginalis* positive control isolate revealed a unique sequence of the RNA-dependent RNA polymerase gene of *Trichomonas vaginalis* virus (TVV) or related virus.

- 118 DENNIS, MATT, HOWARD WHITEMAN AND CLAIRE FULLER. Murray State University—Encapsulation ability of dragonfly nymphs, *Plathemis Lydia*, is affected by water pollution.

Many organisms are facing major changes in their environments with respect to pollutants and these pollutants can result in non-viable habitats. Current indicators of environmental quality, particularly in aquatic habitats, focus on the presence or absence of key species: i.e., if such a species has become locally extinct, the water is too polluted. We are looking for a more sensitive indicator of water quality – one that can be easily detected before the indicator species begins to die. Insect immune systems can provide such an indicator because they are sensitive to environmental change and some aspects, such as encapsulation, are easy to measure. We measured encapsulation in the nymphs of the dragonfly *Plathemis lydia*. These animals spend up to one year in ponds, are common and large enough to manipulate easily, thus have the potential to be excellent indicators. Nymphs (N = 59) were collected from 13 ponds in Western KY. A piece of monofilament was inserted into the hemocoel of each nymph and retrieved 24 hrs later. The area of encapsulation was measured for each monofilament. Water quality variables from each pond included PCB and pesticide concentration as well as levels of 14 inorganic elements. We found that encapsulation was significantly negatively correlated with the presence of

pesticides. Levels of four inorganic elements (Mg, Al, Ca and Cu) were also significantly correlated with the ability of animals to encapsulate the foreign object. Thus, sampling animals for encapsulation may provide a much-needed indicator of environmental quality before species become locally extinct.

- 119 CARLETON, RENÉE E¹. AND MICHAEL J. YABSLEY². Berry College¹ and University of Georgia²—Parasites of eastern bluebirds (*Sialia sialis*): A review and survey of a population nesting within a grass-dominated agricultural habitat in Georgia.

A review of parasites associated with eastern bluebirds (*Sialia sialis*) is dated and excludes many species reported since 1977. We compiled an updated list using reports from the literature and database searches. Because bluebirds are subject to infection with many generalist parasites, additional species were likely to be reported. Additionally, we surveyed parasite communities associated with a population of eastern bluebirds nesting on a grass-dominated agricultural habitat in northern Georgia during the 2004, 2005, and 2006 breeding seasons by live examination, fecal examination, necropsy, pcr technique, and examination of nesting material. Fifteen species of parasites were detected including seven species not previously reported in eastern bluebirds: *Plagiorhyncus cylindraceus*, *Capillaria* sp., a species of Strongyloid nematode, a species of Spiruroid nematode, *Carnus floridensis*, a *Sarcocystis* sp., and an *Atoxoplasma* sp. Prevalence based on pooled data over 3 years varied by species and ranged from 0.7% to 71.4%.

- 120 FAULKNER, CHARLES T.¹, ALYCIA CHAPMAN¹, RANDALL JUNGE², GRAHAM CRAWFORD³, AND CHARLES WELCH⁴. ¹University of Tennessee College of Veterinary Medicine, Knoxville TN, USA 37996, ²St. Louis Zoo, St. Louis MO, USA 63110, ³San Francisco Zoo, San Francisco CA, USA 94132, and ⁴The Madagascar Fauna Group, Betampona Reserve, Tamatave, Madagascar—Host distribution of endoparasitic helminths of Malagasy lemuroids.

Fecal samples (n=229) representing 7 genera of wild-caught and captive Malagasy lemuroids were examined for diagnostic products of endoparasitic helminths as part of the Madagascar Fauna Group's health monitoring program (<http://www.savethelémur.org>). Individuals in the host genus *Eulemur* accounted for most of the infections and 55/229 specimens were positive for at least 1 endoparasite species. Eggs of *Callistoura* sp. were predominate in 29/55 infected *Eulemur* spp., and 5/17 infected *Varecia* spp. Strongylate-type eggs probably from *Lemurostrongylus* sp. (62x38um) and *Pararhabdonema* sp. (75x40um) had a broader host-distribution in *Eulemur* spp., *Varecia* spp., *Indiri indiri*, *Hapalemur* spp., and *Propithecus* spp. Pinworm eggs from the genus *Lemuricola* were found in *Eulemur* spp, *Varecia* spp., and *Lepilemur* spp, and *Propithecus*. Spiruroidea eggs (50x30um, thick-shelled with larva), presumably *Mastophorus muris*, were found only in 2 samples from *Daubentonia madagascariensis*, and likely reflect the insectivorous dietary habits of the host. *Trichuris* spp eggs (90x45um) occurred in feces of 15/55 infected *Eulemur* spp.. The dimensions of these eggs are much larger than other *Trichuris* spp. from primate hosts and may represent an undescribed species unique to *Eulemur*.

- 121 KYLE, DENNIS E.,¹⁻³ KOSOL YONGVANITCHIT³, JENNIFER M. PETERS,⁴ NANHUA CHEN,³ MICHELLE GATTON,⁵ QIN CHENG,⁴ AND H. KYLE WEBSTER.^{2,3} University of South Florida,¹ Walter Reed Army Institute of Research,² Armed Forces Institute for Medical Sciences,³ Australian Army Malaria Institute,⁴ and Queensland Institute of Medical Research.⁵—Artesunate and dihydroartemisinin induce dormancy in ring stages of *Plasmodium falciparum*: implications for a mechanism of recrudescence.

Artemisinin antimalarial drugs derive from Qinghaosu, an ancient Chinese herbal extract of *Artemisia annua* (sweet wormwood). Derivatives from this class (e.g., artesunate) are the most effective drugs currently used for the treatment of malaria. Artemisinin drugs produce rapid clearance of parasites in peripheral blood and reduction of malaria symptoms, yet when used alone recrudescence infections occur frequently. The reasons why such potent antimalarial drugs are associated with a high rate of recrudescence are unknown. Here we show that exposure of ring stage *Plasmodium falciparum* to artesunate or dihydroartemisinin (DHA) induces a dormant parasite that survives for 6-8 eight days *in vitro* before resuming growth. Other commonly used antimalarial drugs did not produce this effect. Recovery of ring stages from DHA-induced dormancy was time of exposure and dose dependent. These observations suggest that dormant ring stage parasites are the forms that survive artemisinin drug treatment to initiate recrudescence infections. Selection of combination partner drugs must encompass a strategy for interdicting artemisinin-induced dormancy in *P. falciparum*.

- 122 ANDREW WEST¹, MARIELLE POSTAVA-DAVIGNON², REBECA ROSENGAUS² AND CLAIRE FULLER¹. Murray State University¹ and Northeastern University²—Susceptibility to fungal infection in the Caribbean termite is affected by habitat and colony of origin.

Termites are one of the most important degraders of woody debris in tropical and subtropical environments. Environmental change (e.g., warming temperatures) that impacts termites could also affect wood recycling and soils. Our previous work suggests that temperature is negatively related to one aspect of immunity (phenol oxidase activity) in the Caribbean termite, *Nasutitermes acajutlae*. Here we examine the affect of temperature and habitat on susceptibility to the pathogenic fungus, *Metarhizium anisopliae*. Termites were collected from 10 colonies in each of 2 habitats (cool/moist and hot/dry). Termites were exposed to one of 4 levels of fungus (Control, 10³, 10⁵, 10⁷ conidia per ml), then kept in either warm (31.4 C) or cool (27.8 C) conditions. Termites were maintained in social groups (6 animals) or alone; both soldiers and workers were exposed. Temperature after exposure (warm or cool) did not significantly affect survival. However, exposure level, group living, caste and habitat of origin all significantly affected termite survival (P < 0.001 for all variables). Termites maintained alone had a hazard ratio 1.5 times greater than termites living in groups; workers had a hazard ratio of 1.7 compared to soldiers. Termites from cool/moist habitats had a hazard ratio 1.5 times greater than those from hot/dry habitats. While temperature after exposure did not impact survival, temperature during development (i.e., habitat) may. However, differences in genetic structure in populations from different habitats could also explain our results.

- 123 PUNG, OSCAR J.¹, MICHAEL WALKER² AND WHITNEY L. BARFIELD¹. Georgia Southern University¹ and Armstrong Atlantic State University²—The trematode *Microphallus turgidus* cultured *in vitro* produces eggs infective to hydrobiid snails.

The successful *in vitro* cultivation of trematodes could obviate the need for vertebrate hosts in the laboratory and facilitate studies on the basic biology of the parasites and the development of antihelminthic drugs. Metacercariae of the trematode *Microphallus turgidus* cultured *in vitro* mature into egg-secreting adults. Our goal was determine if these culture-produced eggs are infective to hydrobiid snails, the first intermediate host of *M. turgidus*. To do so, wild-caught grass shrimp, *Palaemonetes pugio*, were dissected to obtain metacercarial cysts. Metacercariae were excysted in warm saline, washed and incubated 4 days at 37° C in RPMI-1640 medium supplemented with 20% horse serum. Eggs were counted on a hemacytometer, transferred to seawater and embryonated 0-30 days at 30° C. Wild-caught hydrobiid snails, *Spuwinkia salsa* and *Onobops jacksoni*, were maintained at 30° C in seawater in 24-well tissue culture plates (1 snail/well) and

examined for trematode cercariae twice a week for 5 weeks. Infected snails were discarded. Uninfected snails were fed 5 to 40 embryonated *M. turgidus* eggs and checked twice a week for 8 weeks for the presence of microphallid cercariae. Seven of 52 (13.5%) egg-fed snails began to shed microphallid cercariae after 4-6 weeks. Control snails remained uninfected in the same time interval indicating that culture-produced *M. turgidus* eggs are infective to snail hosts. Five of the 7 infected snails were fed 20 or 40 eggs embryonated 21 or 30 days. Experiments designed to further optimize the infection process are in progress.

124 STEPHEN C. LANDERS. Troy University—Staining improvements for apostome ciliates using a modified Chatton-Lwoff technique.

In protozoological studies the Chatton-Lwoff technique uses silver nitrate to stain the surface of the cell and reveal the ciliary patterns. The technique is simple, but inconsistent with some ciliated protozoan groups. For this study, a modification of the Chatton-Lwoff technique was used to increase the reliability of the stain, as applied to the study of apostome ciliates. The symbiotic apostome *Hyalophysa bradburyae* was obtained from the freshwater grass shrimp *Palaemonetes kadiakensis* collected locally in Pike County, Alabama. This ciliate has a complex life cycle involving separate feeding, divisional, migratory, and phoretic stages. After fixation in 1-2% glutaraldehyde, all stages of the life cycle were stained using the protocol published by Chatton and Lwoff (1935) or using a slight modification in which salt was added to the wash water during silver reduction. The salt concentration (1 drop of 30 ppt seawater/ml wash water or ~0.1% sea salts) was the same concentration as recommended for the saline gelatin solution by Chatton and Lwoff (1 drop seawater/ml gelatin solution). The results demonstrated a greater success in staining the various life cycle stages than experiments with distilled wash water, though silver precipitate in the gelatin blanket was increased. This study was supported by a Faculty Development grant awarded by Troy University.

125 NAYDUCH, DANA. Georgia Southern University—Temporal progression of *Herpetomonas muscarum* (Kinetoplastida: Trypanosomatidae) in the midgut of the housefly, *Musca domestica* (Diptera: Muscidae).

Herpetomonas muscarum is a kinetoplastid protozoan symbiont of the housefly, *Musca domestica*. Unlike parasitic, heteroxenous genera (*Trypanosoma*, *Leishmania*), this symbiont is monoxenous, being transmitted between flies via contaminated feces. Although this organism eventually resides in the fly hindgut/rectum, its temporal location/transition within the fly midgut has been understudied. In this study, the location of *Herpetomonas*, in reference to the peritrophic matrix (PM), and mid- and hindgut was examined. The housefly PM is a double-layered, open-ended physical protection barrier that separates ingested food from the midgut epithelium. Previous studies showed that microbes such as bacteria remain within the inner layer of the PM in the midgut, are lysed by digestive enzymes, and compacted into fecal pellets within 12-24 h. In contrast, *Herpetomonas* initially resides within the inner PM, but many move to the inter-PM space within a few hours. Additionally, viable protozoa rapidly progress to the open end of the PM at the midgut/hindgut junction, in as little as 4-6 h post-ingestion, and attach to the epithelium. Thus, *Herpetomonas* likely needs to hasten progression to the hindgut to avoid being immobilized, lysed and enclosed in a fecal pellet by the inner PM. While flies do not have permanent bacterial "flora" (since bacteria cannot escape the PM and are lysed), this protozoan has found a way to circumvent this fate, and establish as a permanent hindgut symbiont. These results have applicable relevance to human-parasitic trypanosomatids that utilize stercorearian (posterior station) transmission from vectoring insects, such as *Trypanosoma cruzi* in Triatomine bugs.

- 126 STROBL, JEANNINE¹, RANA NAGARKATTI² AND DHARMENDAR RATHORE².
¹Biomedical Sciences, Edward Via Virginia College of Osteopathic Medicine, and
²Virginia Bioinformatics Institute, Blacksburg, Virginia 24060—Nullscript, an apicomplexan selective inhibitor.

Toxoplasmosis and malaria are widespread diseases caused by apicomplexan parasites, *Toxoplasma gondii* and *Plasmodium falciparum*, respectively. More effective treatments are needed particularly for young children, pregnant women, and immunocompromised persons. *T. gondii* and *P. falciparum* possess histone deacetylase enzymes (HDAC) and HDAC inhibitors interfere with their growth and survival suggesting that this enzyme is a potential apicomplexan drug target. To test this hypothesis, we compared the anti-apicomplexan activity of scriptaid, a mammalian HDAC inhibitor, and nullscript, a congener inactive in mammalian cells. For anti-proliferative assays, human cells and apicomplexan-infected human cells were treated for 48 hours with identical drug stocks diluted to 0.015-2 uM in culture medium. Normal human fibroblasts (HS68) and human breast cancer cells (MDA-MB-231) were 100% resistant to 2 uM nullscript, while 2 uM scriptaid reduced cancer cell numbers by 73% (IC₅₀ ~ 1 uM). Normal HS68 cells were completely resistant to scriptaid as expected due to the tumor-selective effects of HDAC inhibitors. In contrast, the apicomplexans showed remarkable sensitivity to both nullscript and scriptaid. *T. gondii* tachyzoites propagated in HS68 cells were inhibited 100% by 2 uM scriptaid (IC₅₀ <0.031 uM) and 2 uM nullscript (IC₅₀ ~ 0.8 uM). In *P. falciparum*, nullscript was more active than scriptaid; 2 uM nullscript reduced parasitemia by 80%. In conclusion, nullscript shows significant activity against apicomplexan parasites while its inactivity in host cells suggests that it may be specifically targeting parasite HDAC.

Symposium II

Research at Undergraduate Institutions: Pitfalls and Possibilities

- 127 ENSIGN, WILLIAM, RONALD MATSON AND SCOTT REESE. Department of Biology and Physics, Kennesaw State University, Kennesaw, GA—Risk and reward in undergraduate research in the Southeast: A survey of institutional support at southeastern institutions.

There is increasing empirical and anecdotal evidence that an undergraduate research experience can be a key element in retention of students in scientific fields. Undergraduates involved in research cite increased confidence in their understanding and appreciation for their field of choice, a better understanding of the scientific process and improvements in technical skills as primary benefits. Although the evidence supporting the advantages that accrue to students is clear, the benefits and costs of mentoring students in the undergraduate research process for faculty are poorly documented. In an effort to understand the landscape of risk and reward for faculty in undergraduate biology programs, we are distributing a survey to departmental chairs at over 120 institutions in the southeastern United States. The survey focuses on key institutional descriptors (institution size, funding source and number of program majors), resources (dedicated lab space, start-up funds), faculty workload, weighting of undergraduate research in the tenure and promotion process and research productivity. The survey results, although primarily descriptive in nature, should provide a basis for evaluating the potential for establishment of effective undergraduate research programs. They should also provide guidance to both faculty and administrators on reasonable expectations for faculty involvement in mentoring undergraduate researchers at their own institutions.

- 128 PILGRIM, M. A. University of South Carolina Upstate—Choosing research at an undergraduate institution: bridging the gap between research and teaching universities.

When pursuing a career in academia our professional development is critically impacted by the size of the institution we choose to serve. Obviously, universities range in size from small teaching universities to large research universities. Within this range is a special category of liberal arts institution — branch campuses of large research universities. Having a significant tie with a large university opens the door for a world of interesting possibilities and inherent challenges. I will discuss both advantages (e.g., access to internal funding opportunities and research facilities) and disadvantages (e.g., tenure decision depends on support from both your home institution and the main research campus) of accepting a tenure-track faculty position at a branch campus. Whether or not the advantages outweigh the disadvantages of such positions largely depends on the administrative and departmental infrastructure within each branch campus. I will provide a “suggested” list of questions for prospective faculty to consider bringing with them if interviewing at a branch campus. In addition, I will outline a strategy for building an active undergraduate research program at a branch campus. Specifically, I will use my experiences developing Upstate Herpetology, an undergraduate research group at USC Upstate, as a case study.

- 129 GOWAN, CHARLES. Randolph-Macon College—Incorporating problem-based learning into traditional courses as a way to mentor students in research.

Mentoring undergraduate research is personally rewarding but time consuming. Institutions vary in how time spent mentoring student research is counted towards tenure and teaching loads, but a recent National Science Foundation survey indicates that most institutions do not place significant weight on such mentoring. As such, faculty need strategies to maximize the efficiency of research mentoring and the recognition of this effort by the institution. One way to accomplish both objectives is to incorporate research mentoring into traditional courses. Advantages are that mentoring becomes part of the normal teaching load, and groups of students are mentored simultaneously. Problem-based learning (PBL), a pedagogy in which development of skills and content knowledge is driven by the need to analyze a problem, is perfectly suited to the task. The Environmental Studies Program at Randolph-Macon College (Virginia) has instituted a series of PBL courses designed to develop student research skills. Each course requires students to investigate a real-world environmental problem, with real stakeholders and off-campus collaborators. Courses were designed based on pedagogical research indicating that PBL engages students by having them investigate a challenging problem that does not have a known answer. As in traditional research activities, students have to define the problem, research the literature, propose hypotheses, design experiments, gather data, draw conclusions, and write, present, and defend their results. Our experience to date indicates that students who have completed one of these courses are ready to undertake individual research with much less supervision and much more success than those who have not.

- 130 DORCAS, MICHAEL E. AND STEVEN J. PRICE. Davidson College—Herpetology at Davidson: development of an effective, multi-disciplinary undergraduate-based research program.

We describe a successful undergraduate-based herpetological research program at Davidson College in Davidson, North Carolina. Herpetology, the study of amphibians and reptiles, forms the core of a teaching/research program designed to get undergraduate students engaged in quality research. Herpetology is an ideal field for such a program because of, 1) the current interest in the biology and conservation of amphibians and reptiles, 2) the diversity of amphibians and reptiles offers an immense variety of natural history characteristics that can be studied, and 3) most species of amphibians and reptiles are easy to work with in the laboratory and field. Strategies that enhance our program

include using technology to facilitate research, focusing on ecosystems in which students may have had previous class work, establishing long-term projects, collaborating with outside organizations, and involving the local community in our research program. Our students regularly publish in peer-reviewed journals, present at scientific meetings, and receive external funding for their research. Conducting research with undergraduate students does present challenges; however they can generally be overcome by close mentoring and developing strong working relationships with everyone involved. Overall, undergraduate students can serve as highly productive researchers to investigate interesting herpetological questions and phenomena.

- 131 HANEY, DENNIS C.,¹ GREGORY P. LEWIS¹ AND C. BRANNON ANDERSEN².
¹Biology Department and ²Earth and Environmental Sciences Department, Furman University—How interdisciplinary collaboration enhances research productivity at an undergraduate institution.

One of the greatest challenges facing faculty at primarily undergraduate institutions (PUI) is how to maintain a productive research program. Undergraduate students cannot make the same time commitment to research projects as do graduate students, and PUI faculty often have fewer resources available to them than do faculty at larger research-intensive universities. Our approach to solving some of these problems has been to form an interdisciplinary research program (the River Basins Research Initiative) involving faculty and students from the Biology, Chemistry, and Earth and Environmental Sciences Departments at Furman University. By combining resources from multiple departments and by conducting collaborative interdisciplinary research, we have been able to fund a successful research program that has resulted in 12 peer-reviewed publications and over 120 presentations since 2001, mostly with undergraduate co-authors. The RBRI has involved more than 170 student participants since 1997, and the program has been funded by grants from NSF, EPA, NASA, South Carolina Department of Health and Environmental Control, the Associated Colleges of the South, the Rockefeller Brothers Foundation, the Saluda-Reedy Watershed Consortium, the Mellon Foundation, and Furman University. We feel that interdisciplinary research is an ideal solution to many of the problems faced by PUI faculty, so a discussion of the history and development of the RBRI will be presented as a model for developing interdisciplinary research programs at other institutions.

- 132 MCELROY, THOMAS AND PAULA JACKSON. Kennesaw State University—Research for the masses: conducting undergraduate research when N exceeds 1000.

Successful mentoring of undergraduates requires regular and direct interaction between the student and the faculty member. The mentor must contribute to the technical needs of the student as well as the social and emotional needs of the student. Undergraduate research often addresses a well-specified problem that is challenging and appropriate. Successful undergraduate research requires, financial support, technical resources, and faculty and student time. Time was, is and will be a top concern. Tenure and Promotion guidelines at most academic institutions require faculty to engage in some level of research with some expectation of product. This is a difficult proposal at any institution and has particular challenges at undergraduate institutions that often have high teaching loads. This talk will present a model for conducting extracurricular undergraduate research, a strategy when class sizes limit or eliminate the opportunity for "in class," independent student research projects. Kennesaw State University (KSU) has > 1200 majors in Biology/ Biotech/ Bioeducation. Class sizes range from 24 to 200 students with most classes having 48 students. Faculty are expected to engage undergraduates in independent, directed study projects, produce peer-reviewed manuscripts and seek extramural funding. Students are not required to participate in directed study projects, but

they often seek the benefit of enhanced academic credentials. Our system is a two semester process that guides the student through proposal development, data collection and analysis, and presentation of results to the community. For every three students that complete the process, the faculty mentor receives a course release.

133 FARRELL, T. M. Stetson University—The critical and devalued role of undergraduate research in the tenure and promotion process.

The importance of research experience in undergraduate education is now widely recognized and there has been a strong focus on how to institutionalize undergraduate research (UR). Valuing the faculty role of mentoring UR is a crucial, but often neglected, aspect of truly institutionalizing UR. I will present information about the tenure and promotion process from a variety of colleges and universities to illustrate how several impediments often arise that devalue the mentoring of UR. These impediments include: 1) a lack of any standardized data that quantify faculty success as a mentor of undergraduate research, 2) a lack of "release time" for faculty strongly involved in mentoring UR, 3) a lack of colleagues who strongly value UR on key promotion committees, and 4) the widespread view that mentoring UR is neither an important teaching role nor a major research effort for faculty. I will present ideas on how institutions should alter their policies to promote the mentoring of undergraduate research to avoid each of these four impediments. I also will present a more pessimistic, but hopefully useful, set of guidelines for faculty who are negotiating the tenure and promotion process. In conclusion, I suspect it will be extremely difficult to develop strong undergraduate research programs without meaningful institutional incentives that influence tenure and promotion decisions.

134 JORGENSEN, DARWIN. Roanoke College, Virginia—Support, encouragement, and mentoring of beginning faculty members at undergraduate institutions.

Beginning faculty members at undergraduate institutions face a number of challenges unique to that particular academic venue. New faculty members should be encouraged to carefully prioritize efforts during those critical first few years. Teaching, invariably and justifiably, is the principal area of emphasis and will demand, during the first year certainly, substantial time and effort as each offering is likely to be a new preparation. The offering of a laboratory course is in some ways tantamount to two new preparations and this is true even if the faculty member is offering a course that already existed in a Department's curriculum. This should be carefully considered when scheduling plans are made. At institutions with research expectations, the initiation of a research program is also of high importance. The development of the program must be encouraged and supported especially during the first two years both fiscally and with an eye toward effective scheduling. Writing must be encouraged and supported (again, principally through effective and economical scheduling). The importance of completing and submitting manuscripts from graduate and/or post-doctoral work should be underscored, and preparation of grant proposals to obtain extramural support should be given high priority as a faculty member will never be more fundable than during the early years of an academic appointment. A third area of participation, departmental (and even perhaps, institutional) service, may also compete for the the already over-extended new faculty member's time. Service commitments must be chosen carefully and placed in proper priority.

Genetics and Cell Biology I

- 134A KASSEM, ABDELMAJID. Fayetteville State University—Genetic and QTL mapping of several important agronomic traits in soybean [*Glycine max* (L.) (Merr.)].

Soybean (*Glycine max*) is an important crop cultivated in the world and in the US. The US is the second largest producer and exporter of soybean after Brazil. Soybeans are important for their proteins, oils, and nutraceuticals with various health benefits to human and animals. Methods of genetic and quantitative trait loci (QTL) mapping used in modern agricultural research are emphasized. Our recent research findings on QTL mapping of sudden death syndrome (SDS), soybean cyst nematode (SCN) resistances, seed isoflavone contents, resistance to manganese toxicity, root, shoot, seed yield, plant height, and other important agronomic traits are detailed (Kassem et al., 2004a,b; 2007a,b; Alcivar et al., 2007; Jacobson et al., 2007). The recent 'Essex' by 'Forrest' genetic linkage map of soybean (Kassem et al., 2006) as well as recent ongoing research projects at Fayetteville State University will be detailed. Understanding these complex polygenic traits is very important for soybean breeders to produce high yielding superior cultivars and germplasm.

- 135 BLEENDA, ANNA V.¹, WILLIAM P. WECHTER², GREGORY L. REIGHARD¹, AND ALBERT G. ABBOTT¹. Clemson University¹ and USDA-ARS, Vegetable Laboratory, Charleston²—Peach tree short life syndrome and new approaches to solve the problem.

Peach Tree Short Life (PTSL) is a complicated disease syndrome that has been extensively studied among multiple disciplines for many years. Significant progress has been made in terms of identifying and describing the major contributing factors associated with PTSL tree death in peach, which include symptoms and tree death from the syndrome, detailed studies of the changes in tree physiology caused by PTSL, and alternatives to chemical control of the ring nematode. More recently, research at the molecular level have been undertaken at Clemson University, SC, to further address the PTSL problem. Biochemical and genetic analyses, as well as greenhouse and field studies, of *Pseudomonas synxantha* BG33R has shown this bacterium to possess great potential as a biological control agent of the PTSL-predisposing ring nematode. The approach of genetic and molecular analysis of peach rootstocks also demonstrates a potential for application of MAS in development and evaluation of peach rootstock germplasm for tolerance to PTSL. It also permits the early selection of useful genotypes and saves time and expense in improving peach rootstocks tolerant/resistant to PTSL. Early selection is important because the symptoms of the PTSL syndrome do not generally appear until the third to fifth year after planting.

- 136 WEEKS, KATHERINE F.¹, JAMES L. HAMRICK² and JOAN L. WALKER³. Clemson University¹, University of Georgia² and U.S. Forest Service³—Genetic diversity and structure in *Macbridea caroliniana*, a rare floodplain mint.

Macbridea caroliniana is a globally imperiled perennial herb associated with bottomland hardwoods in the Carolinas and Georgia. We used starch gel electrophoresis to describe the allozyme diversity and structure in this species. We sampled the young leaves of 24-48 individuals from 11 populations distributed across the species range. Of the 17 loci analyzed, ten (58.8%) were polymorphic, with an average of 26.2% of the loci polymorphic within populations. Gene diversity measures for the species ($H_{ES} = 0.183$) and for the populations ($H_{EP} = 0.096$) are similar to those found for the only congener of the species, *M. alba*. However, in contrast to the near uniformity among *M. alba* populations, we found more than 40% of the total allelic diversity in *M. caroliniana* explained by population

differentiation ($G_{ST} = 0.440$). Further, genetic distance in *M. caroliniana* is correlated with geographic distance. These results suggest historic and/or recent obstacles to gene flow as might be expected for an insect pollinated species found in discrete watersheds. The study highlights the importance of conserving multiple populations for long term species security.

137 TALLEY, JENNEL AND KATHERINE FRIEDMAN. Vanderbilt University—Examining the role of the telomerase subunit Est3p in *Saccharomyces cerevisiae*.

Telomerase is a ribonucleoprotein complex that extends the ends of most linear, eukaryotic chromosomes to ensure complete chromosomal replication each cell cycle. In *Saccharomyces cerevisiae*, telomerase is composed, minimally, of four components, Est1p, Est2p, Est3p and *TLC1*. Est1p is necessary and sufficient to recruit Est3p to the complex. Since, Est3p is the last known component to associate before telomerase is active, understanding Est3p function(s) is of interest in the telomerase field. The first "function" of Est3p is to mediate its own assembly into the complex; there is genetic evidence suggesting that Est3p assembles through interaction with Region I of Est2p. The second function is to "activate" the complex; to date there has been no compelling, testable hypothesis of this Est3p function. To test for interactions between Est2p and Est3p *in vivo*, I have designed yeast strains that have different epitope tags on each telomerase component: myc-Est2p, Est1p-HA, and Est3p-Flag. I have introduced a number of different Est2p mutants with the *myc* epitope tag into these strains to assay their ability to interact with Est3p. I have also set-up an *in vitro* co-expression system to try and test the ability of Est2p and Est3p to interact in an organism without telomerase. To address the second function of Est3p, I am pursuing crystallization of Est3p. I have obtained milligram quantities of highly purified Est3p from *E.coli*, and crystallization trials are underway.

138 EVANS, ELIZABETH AND DWAYNE WISE. Mississippi State University—CHO-Human hybrid cells as models for chromosome nondisjunction.

We have used Chinese hamster ovary (CHO) - human hybrid cells containing one to three human chromosomes to test the ability of unreplicated human kinetochores to successfully bind to spindle microtubules and to be distributed to the daughter cells. Hybrid cells in culture are treated with hydroxyurea (HU) and caffeine in order to arrest cells in S-phase and to promote unscheduled mitosis. Cells were grown on coverslips fixed with aldehyde and permeabilized with a buffer detergent solution. Kinetochores were identified by using the antibody activity present in the CREST scleroderma antiserum. Human centromere DNA probes have been used for fluorescence in situ hybridization (FISH) in order to test for the successful passage of human kinetochore to daughter cells during anaphase. Preliminary data indicate that different human kinetochore vary in their ability to properly engage the spindle and to be successfully distributed.

139 JOHNSON, MARY AND DWAYNE WISE. Mississippi State University—The spindle checkpoint in cells that undergo mitosis without chromosome replication.

Precise control of cellular events is critical for proper cell function and division. Control is exerted through a variety of cell checkpoint events, including the spindle checkpoint. We have used Chinese hamster ovary (CHO) cells as a model for checkpoint control. These cells can be arrested with hydroxyurea at the beginning of the DNA synthesis phase of the cell cycle. Subsequent treatment with the xanthine, caffeine, induces cells to bypass the S-phase checkpoint and enter unscheduled mitosis. Cells so treated build a normal spindle and distribute kinetochores, unattached to chromosomes, to daughter cells. Immunocytochemistry was used to study the presence and localization of checkpoint proteins in this unusual mitosis. We also detected anaphase a, and observed mitotic

behavior when these cells were treated with taxol. Our results imply in treated cells, MUG kinetochores behave similarly to controls, and probably have an operational spindle checkpoint.

- 140 IGLESIA, MICHAEL¹, APRIL MACKELLAR² AND ARNO GREENLEAF². Guilford College¹ and Duke University Medical Center²—Binding interactions elucidate function of yeast transcription factor lws1.

lws1 is an essential transcription factor lacking enzymatic activity in the yeast *Saccharomyces cerevisiae*. Its human ortholog has been shown to bind with Spt6, a transcription factor which binds to the carboxyl-terminal domain of elongating RNA Polymerase II, and functions in 3' mRNA processing through that interaction. Interactions between human *lws1* and REF1/Aly (Yra1 in yeast), an RNA export factor, have also been demonstrated, and it is believed that human *lws1* aids in recruiting REF1/Aly to Spt6-dependent genes. In this study, His-tagged recombinant yeast *lws1* is overexpressed in strains of *Escherichia coli* and isolated and purified through immobilized metal ion chromatography. The pure *lws1* is then used in far-western protein binding assays to determine its binding interactions in vitro and clarify its function in transcription. These binding experiments are used to test for association between *lws1* and Yra1 and confirm the location of that interaction on Yra1. Resulting data show *lws1* to associate with the middle portion (not either of the terminal portions) of Yra1 with good specificity. The binding patterns of *lws1* provide insight into the machinery of transcription and mRNA export in yeast.

- 141 THATCHER, ELIZABETH J., IMA PAYDAR AND JAMES G. PATTON. Department of Biological Sciences, Vanderbilt University, Nashville, TN—Regulation of vertebrate regeneration by microRNAs.

Zebrafish are an ideal model organism for the study of genes involved in vertebrate regeneration with the ability to regenerate spinal cords, optic nerves, hearts, and fin. microRNAs (miRNAs) are highly regulated in a tissue- and time-specific manner to direct cell movement, specification, and development. While miRNAs are required for stem cell maintenance, their role in vertebrate regeneration is not known. Here we show that inhibition of miRNA synthesis by Dicer knockdown prevents regeneration and we provide the first detailed analysis of miRNA expression patterns between regenerating and non-regenerating tissues. Among differentially expressed miRNAs, we show that *miR-203* directly targets *lef-1* and can functionally repress regeneration when over-expressed. We were also able to rescue the growth defects by co-expressing *lef-1* without its 3'UTR. Moreover, we were able to show that a knockdown of endogenous *miR-203* levels promotes over-regeneration in the fin.

- 142 HENDERSHOTT, CHRISTINE E.¹ AND WILLIAM STONE². Converse College¹ and East Tennessee State University Quillen College of Medicine²—Alpha-tocopheryl succinate, a vitamin E derivative, induces apoptosis in LNCaP cells, a prostate cancer cell line.

Alpha-tocopheryl succinate, also known as vitamin E succinate (VES), a semisynthetic vitamin E analogue, has been reported to have potent anticancer activities. In this study, the hypothesis that VES inhibits the growth of androgen-dependent prostate cancer cells (LNCaP) in culture was tested. LNCaP cells were cultured and treated with α -tocopheryl succinate in various concentrations and in various time intervals to determine the apoptotic effect on these malignant cells. The IC₅₀, the concentration of an inhibitor that is required for 50% inhibition of its target, and time interval of α -tocopheryl succinate to inhibit cell growth was measured using a cell viability (MTT) assay. After treating the LNCaP cells with the IC₅₀ value of α -tocopheryl succinate in the time dependent

experiment, an initial decrease followed by an increase in cell viability was seen as the time interval after treatment with α -tocopheryl succinate increased. The hypothesis that VES is unstable in solution and degrades over time was tested using a UV/Visible Spectrophotometer and the resulting spectra confirmed the hypothesis.

- 143 CARIVEAU, MICKAEL^{1,2} AND BO XU¹. Mount Olive College¹ and Southern Research Institute²—Combination therapy of Clofarabine with radiation: Inhibiting DNA repair and increasing local tumor response.

Clofarabine is a second-generation nucleoside analogue that was recently FDA approved for the treatment of pediatric leukemia. Clofarabine is a potent inhibitor of DNA polymerase α and ribonucleotide reductase and can block DNA synthesis and possibly inhibit DNA repair. Therefore, we hypothesized that clofarabine could work synergistically with radiation to increase Tumor response. We found that, low doses of clofarabine (≤ 10 nM) alone did not induce significant γ -H2AX foci formation, an early event of ionizing radiation (IR)-induced DNA damage, but prolonged their presence up to 24 hrs. Low doses of clofarabine also increased IR-induced γ -H2AX foci formation; while larger doses (100-1000nM) alone induced significant DNA double strand breaks. These data suggest that clofarabine could inhibit DNA repair, and therefore, be tested as a radiosensitizer. To investigate clofarabine-induced radiosensitization, Hela cells were treated with clofarabine (10-100nM) and IR (0-6Gy). A significant decrease in clonogenic survival was observed in irradiated cells treated with clofarabine, demonstrating a strong synergistic effect between clofarabine and radiation. Finally, clofarabine-induced radiosensitization was established *in vivo* using a colorectal cancer model, DLD-1, in athymic nude mice. When used alone, at a moderate dose (30mg/kg, X12, *i.p.* injection), Clofarabine had limited effects on tumor growth. However, when combined with fractionated radiotherapy, it led to a significant increase in tumor growth inhibition. These results suggest that clofarabine has the ability to act as a potent radiosensitizer both *in vitro* and *in vivo* by perpetuating DNA damage, culminating in decreases in tumor survival and can be easily translated into clinical studies.

FRIDAY APRIL 18, 2008 MORNING SESSION

Plant Ecology II

- 144 PERLMUTTER, GARY B. North Carolina Botanical Garden—Lichen biota of Mason Farm Biological Reserve: a tale of two forests.

As part of a baseline project to document the lichen biodiversity of the North Carolina Piedmont, the lichen biota of Mason Farm Biological Reserve (MFBR) at the North Carolina Botanical Garden, the University of North Carolina at Chapel Hill, was inventoried in 2007 via a survey of permanent 0.1 ha vegetation plots in two distinct Piedmont forest communities: Basic Oak-hickory Forest with diabase outcrops, and Piedmont/Mountain Swamp Forest lacking outcrops. Plots yielded 34-56 species each, with a total of 104 taxa. Twenty-six species are considered common to MFBR, and 14 taxa are newly reported for the North Carolina Piedmont. Beta diversities were calculated using Jaccard indices (J) to assess similarities in species composition of lichen communities between the two forest types as well as a larger scale comparison between the MFBR lichen biota *in toto* and that of William B. Umstead State Park (WIUM), a recently surveyed Piedmont forested area in Mixed Mesic Hardwood Forest with granitic outcrops. Within MFBR results included moderate similarity indices (J = 0.42-0.51) for the canopy and midbole layers, and a markedly low similarity index for the forest floor (J = 0.07) between the two forest types; a moderate similarity was also detected between the MFBR *in toto* and

WIUM. Differences in lichen biotas are likely due to substrate variability. Plot canopy cover was measured and correlated against lichen data, resulting in a negative correlation with summer shade and midbole lichen spp. Descriptions of the lichen communities within MFBR's two forests are presented.

- 145 METHVEN, ANDREW, CHARLES PEDERSON, AND VINCE HUSTAD. Eastern Illinois University—Site variation in corticolous lichen assemblages on sweet bay in coastal floodplain forests.

Weeks Bay National Estuarine Research Reserve, a microtidal estuary located on the eastern shore of Mobile Bay in Alabama, embraces a variety of terrestrial habitats including coastal floodplain forests. Forests adjacent to Weeks Bay are dominated not only by deciduous species such as tupelo, water oak, live oak and sweet bay but gymnosperms including bald cypress, slash pine and longleaf pine. While some of the forests are relatively undisturbed, others have been negatively impacted by agriculture, timber cutting, and turpentine production. Although the effects of these disturbances on biotic communities within the reserve are largely unknown, a previous study of corticolous lichens in the reserve revealed that: 1) rather than considering all known lichen species in a community analysis, a subset of lichen species could be effectively utilized; and 2) it is more efficacious to examine a single sentinel tree species, sweet bay, along three permanent transects rather than all of the trees. Lichen assemblages were analyzed using multidimensional scaling (MDS) based on the Bray-Curtis Index of Similarity. Differences in lichen assemblages on sweet bay were determined with an Analysis of Similarity test (ANOSIM). Overall, corticolous lichen assemblages on sweet bay in the C-1 transect differed ($p < 0.01$) from those on the C-2 and R-1 transects but the C-2 and R-1 lichen assemblages did not differ significantly. Spatial homogeneity of lichen assemblages was observed on sweet bay in the R-1 and C-2 transects (both of which differed from C-1 sweet bay).

- 146 MATTHEWS, ELIZABETH R.¹, ROBERT K. PEET¹, ALAN S. WEAKLEY¹, AND THOMAS R. WENTWORTH². University of North Carolina at Chapel Hill¹, North Carolina State University²—Alluvial plant communities of Piedmont brown-water rivers.

Despite the ecological significance of bottomland plant communities, there is relatively little documentation or understanding of the bottomland vegetation types in North Carolina or elsewhere on the southeastern Piedmont. Our current understanding of these brownwater bottomlands is based primarily on qualitative data, and there has been no comprehensive, data-based classification and description of these community types. Many of these landscapes have been converted to agriculture, damaged by impoundments, or otherwise destroyed or degraded. Knowledge of the vegetation composition and structure of these communities can inform management decisions and future restoration projects. To expand upon our current understanding of these communities and guide future restoration, plot data were collected in the three North Carolina Piedmont river basins: the Cape Fear River Basin, the Neuse River Basin, and the Tar-Pamlico River Basin; all plots were collected following the Carolina Vegetation Survey protocol. We used ordination and clustering techniques to refine and improve documentation of the brown-water riparian plant communities recognized by the N.C. Natural Heritage Program and the U.S. National Vegetation Classification. In addition, we have documented the range of environmental settings associated with these types and their variation among the three watersheds in order to provide better targets for restoration activities.

- 147 MOORE, JAMES E. AND SCOTT B. FRANKLIN. The University of Memphis—Flooding effects on plant diversity along hydrological gradients of Mississippi riverine islands.

Elevations on five of the lower Mississippi River islands were surveyed and then corrected with the nearest river gage elevation to link island elevation with hydrological patterns. Six transects were placed on each island from fore side waters edge to zee side waters edge to encompass all elevations on the island. Two 1 x 2 m herbaceous vegetation plots were placed at every 1 m increase in elevation, with one randomly placed plot in the center of each elevational zone and the other placed to ensure maximum diversity. Total richness was regressed with island area and maximum elevation to determine if there were significant relationships. Larger islands tended to have greater elevational change, and the largest island with the greatest elevation change had the highest richness. However, there were no relationships among total richness and island area nor between total richness and maximum elevation. Suggesting islands may be acting independently. Nonparametric statistics were then used to test for significant differences in total richness among elevations (hydrologic regimes), and between fore and zee sides. Zee sides had significantly greater richness (random=58; high diversity=66) compared to fore sides (random=42; high diversity=53). The elevation with the greatest richness for random plots was at 2m elevation with richness =10, and high diversity plots was at 3m elevation with richness = 10, corresponding to a hydrological regime of 37 inundations/year averaging 49 days inundation/year for random plots and 32 inundations/year averaging 38 days inundation/year for high diversity plots.

- 148 MICHOT, ALLEN III¹, CHRISTOPHER A. ADAMS², AND RICCARDO FIORILLO³. University of West Georgia¹, King College², and University of Louisiana-Monroe³—Seed germination ecology of *Xanthium strumarium* in a vernal pond habitat.

Xanthium strumarium is a weedy species that produces dimorphic seeds, which only differ by their weights. Dimorphic seeds are produced by plants in order to allow for the greatest range and chance of survival. The purpose of this study was to determine if there are any significant differences in the germination requirements of the dimorphic seeds of *X. strumarium*. In August 2005 and November 2006, fruits were collected from a population found in a dry seasonal pond in Marshall Forest located in Rome (Floyd County), Georgia. In the first year, approximately 200 fruits were weighed; then had their seeds extracted, separated into their perspective phenotypes, and weighed. For two months, 110 seeds of each phenotype (10 replicates of 11 seeds each) were subjected to a cold stratification treatment (over-wintering) and then moved to 25°C. Then, 50 seeds from each phenotype were maintained at 25°C in a growth chamber, after receiving a 6 week cold stratification treatment. Finally, 50 seeds from each phenotype were stored in a warm dry environment for a period of five months. Following this period of dry storage, these seeds were maintained at 25°C in a growth chamber. In the second year, approximately 500 fruits were weighed; then had their seeds extracted, separated into their perspective phenotypes, and weighed. For approximately three months, we conducted extended cold stratification and dry storage studies. The germination phenology of all seeds were monitored. We present data on germination and growth rate.

- 149 BLECHA, STACI B. AND FRANK P. DAY. Old Dominion University—Inter-island variability in above and belowground plant biomass in interior marshes on the Virginia barrier islands.

The Virginia Coast Reserve's Long Term Ecological Research (LTER) site is of great interest because the barrier islands have been migrating, rapidly at times, and are exceptionally dynamic. The barrier islands have tidal saltwater marshes on the lagoon side and freshwater marshes on the island interiors resulting from freshwater lenses. In these interior marshes on North Hog Island, South Smith Island, and North Parramore Island, salinity and depth to water table were measured to determine if these factors were

influencing biomass in the marsh. Hog Island had the freshest interior marshes (0 and 0.7 ppm), but had the least aboveground biomass (75 and 193 g/m²). Smith and Parramore Islands were much more saline (18.6 and 19.8 ppm, respectively) and had higher aboveground biomass values (424 and 457 g/m²). The saltiest marsh, Parramore Island, had the most aboveground biomass. The depth of the water table did not seem to be strongly related to aboveground marsh biomass on these islands. Belowground biomass determinations are in progress and will allow examination of biomass allocation.

- 150 SHAFER, JUSTIN K. AND FRANK P. DAY. Old Dominion University—Interisland variability of dune plant community biomass on Virginia's Eastern Shore.

The barrier islands of Virginia's Eastern Shore provide an excellent site for the study of interisland variability of dune plant communities. Our research focused on the variation in biomass and diversity of these communities among islands and dune positions. Grassy dunes of young, intermediate and old age were sampled on Smith, Hog, and Parramore Islands. Above- and belowground biomass were obtained in 15 haphazardly selected plots along each dune ridge. Root cores were taken every 10 cm to a depth of 40 cm to provide an estimate of variation with depth. Variation in mean aboveground biomass was evident among the islands: Hog (247.78 g/m²), Smith (238.13 g/m²), Parramore (128.32 g/m²). Variation in belowground biomass was even greater: Smith (796.02 g/m²), Hog (375.41 g/m²), Parramore (155.29 g/m²). Results also provided evidence of variation in biomass among the different age dunes. Aboveground biomass was greatest on intermediate dunes (285.66 g/m²), followed by the older dunes (177.17 g/m²). As may be expected, the young dunes, constantly disturbed by overwash, had the least aboveground biomass (151.40 g/m²). Greater variation in belowground biomass was also found among the different age dunes. The oldest dunes had the highest biomass (734.32 g/m²), followed by the intermediate (285.66 g/m²), and young (170.65 g/m²) dunes. Further analysis of the data is expected to reveal the influence of total soil nitrogen and depth to the freshwater lens on biomass and species diversity.

- 151 HANCOCK, THOMAS E. AND WILLIAM K. SMITH. Wake Forest University—Plant strategies for mediating water stress in a North Carolina barrier beach environment.

In beach habitats, a variety of factors create an environment in which plants can experience water stress. A study was undertaken on Topsail Island (North Carolina) to explore mechanisms that species employ to maintain high rates of carbon gain in an environment that may be water limiting. Micrometeorological measurements, in conjunction with xylem water potential and gas exchange measurements were taken for *Amaranthus pumilus*, *Cakile edentula*, *Hydrocotyle bonariensis* and *Iva imbricata* from June 2002 until June 2004. During the hottest and driest measurement period, the lowest water potential recorded was -1.1 MPa, -1.5 MPa, -0.7 MPa and -0.3 MPa for *A. pumilus*, *C. edentula*, *I. imbricata* and *H. bonariensis*, respectively. The maximum photosynthetic rate recorded was 19 $\mu\text{mol m}^{-2} \text{s}^{-1}$, 16 $\mu\text{mol m}^{-2} \text{s}^{-1}$, 16 $\mu\text{mol m}^{-2} \text{s}^{-1}$ and 9 $\mu\text{mol m}^{-2} \text{s}^{-1}$ for *A. pumilus*, *C. edentula*, *I. imbricata* and *H. bonariensis*, respectively. Species with the highest photosynthetic rates had the shortest growing seasons. During mid-day on hot, dry days, stomatal conductance (g) for *A. pumilus*, *C. edentula* and *I. imbricata* markedly decreased resulting in a reduction of photosynthetic carbon gain (A) and transpiration (E). Alternatively, g for *H. bonariensis* decreased gradually at mid-day, helping to maintain steady A values. Transpiration rates of *H. bonariensis* were often below those of the other species suggesting that *H. bonariensis* may be able to regulate water loss via non-stomatal mechanisms, such as leaf orientation. This study suggests that the species examined employ a variety of mechanisms for mediating water stress in the North Carolina barrier beach environment.

- 152 SUGAR, JAMES¹, JON STUCKY¹, LISA KELLY², AND LEON JERNIGAN². North Carolina State University¹ and University of North Carolina at Pembroke²—Vascular flora, plant community types, soils and water tables in clay-based Carolina bays in North Carolina.

Carolina bays are elliptical landscape depressions each with its long axis oriented northwest-southeast. Those bays underlain by mineral soils, clay-based bays, occur mainly in the inner coastal plain from southern North Carolina to Georgia. Although there are no complete, vouchered plant inventories of these bays in North Carolina, they are thought to be floristically rich and to support populations of several rare plant species. In May, 2007, we began a study of the flora, plant community types, soils and water table elevations in four clay-based bays in North Carolina. So far, we have collected eight federally and state-listed species, described vegetation in concentrically arranged zones within each bay, documented consistently deep water tables, and documented soil profile features indicating long-term water table differences among bays. This study will continue at least until the end of the 2009 growing season.

- 153 CANCELLED

Genetics and Cell Biology II

- 154 CHAPMAN, MISTY A., MARK E. MEADE, BENJIE G. BLAIR AND CHARLES P. OLANDER. Jacksonville State University—Evaluation of morphological and physiological changes in *Tetrahymena pyriformis* for the in vitro assessment on the effects of phloxine B.

Phloxine B is a photo-activated, water-soluble halogenated xanthene dye that has been widely used as an insect pesticide. Tissue damage and the ultimate demise of the organism are achieved following the incorporation of the dye and light exposure. Current applications and research involving the model protozoan *Tetrahymena pyriformis* are used to assimilate the possible reactions of phloxine B to the similar protozoan *Ichthyophthirius multifiliis*, a more pathogenic parasite. In this study we examined the effects of phloxine B through a series of in vitro cytotoxicity assays which included population growth impairment, oxygen consumption, and morphometric analyses. Growth rates, physiological, and morphological changes of *T. pyriformis* cell cultures were assessed at the following conditions: different non-lytic and lytic concentration of phloxine B, varying exposure periods, and non-illumination and illumination. Compared to controls, Phloxine B at 100, 1000, and 10000 ppb significantly reduced cell number and influenced cell morphology and physiology of cultures incubated in the dark. A more profound effect was exhibited with the addition of light.

- 155 OREBAUGH, CLINTON¹, SCOTT HARVEY², TOM HOLLIS², YANICK CROW³ AND FRED PERRINO². Guilford College¹, Wake Forest University² and Leeds Institute of Molecular Medicine³—TREX1 mutations in autoimmune disease.

Mutations in the TREX1 3'→5' exonuclease gene have been identified in individuals diagnosed with the autoimmune disorders Aicardi-Goutieres Syndrome (AGS), Familial Chilblain Lupus, and Systemic Lupus Erythematosus. In addition, TREX1 has been linked to an apoptotic cell death pathway indicating that TREX1 participates in DNA degradation during apoptosis protecting against autoimmune response to DNA. TREX1 mutations in AGS mostly exhibit autosomal recessive genetics. However, some AGS patients have been identified with heterozygous TREX1 mutant alleles in which one TREX1 allele encodes a TREX1 enzyme containing high levels of catalytic activity. These data suggest a possible dominant or partially dominant effect exhibited by the inactive TREX1 allele

perhaps related to the dimeric structure of the TREX1 enzyme. Here we have investigated the mechanisms by which the dominant phenotype of TREX1 dysfunction might result in autoimmune dysfunction in heterozygote AGS patients by studying the heterodimer TREX1 enzymes. We are measuring the effects of mutations in the TREX1 dimer by comparing exonuclease activities of homodimer and heterodimer enzymes to determine if one TREX1 protomer could affect the other TREX1 protomer in the dimer complex. These data highlight the complications of heterozygous disease genotypes in genes encoding functionally dimeric enzymes.

- 156 PROUTY, DALENE, MEGAN BURDETTE, BELDA THOMAS, HATICE NEVAL ERTÜRK, AND RICHARD KEEN. Converse College—Effects of caffeine on temporal perception.

Caffeine, the most commonly used psychoactive drug in the United States, antagonizes adenosine by blocking the ability of the adenosine molecule to bind properly to its receptor. Several researchers have studied the effects of caffeine on temporal perception. However, most of these studies were correlational or used poor methodological designs. Because of these shortcomings, we used a methodologically sound experimental procedure to study the effects of caffeine on temporal perception. Using a within-subjects design, 14 adult Wistar rats were trained in a temporal-bisection procedure to discriminate between short (i.e., 2 s) and long (i.e., 8 s) signals. After training, testing consisted of trials with short, long, and intermediate duration signals. During these sessions, rats received oral doses of 0 mg/kg (sham control), 9.6 mg/kg (low dose), and 96 mg/kg (high dose) in a counterbalanced order. Caffeine had a significant, dose dependent effect on temporal perception ($p < .05$). Rats in the low dose condition were more likely to treat signals as long durations (i.e., faster time perception) and rats in the high dose condition were more likely to treat signals as short durations (i.e., slower time perception), relative to the control. These results are consistent with the hypothesis that the sensitivity of adenosine receptor subtypes is dose dependent to caffeine.

- 157 SHORTER, KIM AND H. NEVAL ERTÜRK. Converse College—An investigation of the genotoxic effects of the pesticide Sevin.

Carbaryl, whose active ingredient is 1-naphthyl N-methylcarbamate, is a broad spectrum insecticide widely used in South Carolina to fight insects in agricultural and domestic settings on plants, shrubs, and on pets and in their beds. The clastogenic effects of Carbaryl were investigated on male albino mice (*Mus musculus*) by using the micronucleus test. Acute dose equivalent to 10% of LC_{50} (Low Dose) and 25% of LC_{50} (High Dose) were orally administered to mice. A negative control group was treated with water where as the positive control group was treated with Colchicine. Mice were euthanized by cervical dislocation 72 hours following treatments. Bone marrow smears from femurs were prepared and were then examined under the microscope. A small significant and dose-related increase in the frequency of micronucleated erythrocytes was observed ($p < .05$) indicating that Carbaryl has clastogenic effect in bone marrow cells.

- 158 CANCELLED

- 159 AGHORAM, KARTHIK¹, JOHN A. MECHAM¹, WALDA A. POWELL AND MICHAEL OTIENO². Meredith College¹ and Kenyatta University²—Identification of an HIV protease inhibitor in tuberous roots of the plant *Tylosema fassoglensis*.

Acquired Immunodeficiency Syndrome (AIDS) is a global epidemic that results in millions of annual deaths worldwide. It is caused by immunosuppression due to infection of specific immune cell types by the human immunodeficiency virus (HIV). The retroviral HIV encodes within its RNA genome a viral protease (HIV protease). The enzymatic activity of

HIV protease is critical for viral infection – the enzyme proteolytically processes polyprotein precursors into functional protein products required for viral attachment, replication and integration. Thus, inhibitors of HIV protease are extensively used in anti-HIV drug therapy. It is well-documented that food crops such as sweetpotato (*Ipomea sp.*) and the African Marama bean (*Tylosema esculentum*) are rich sources of general protease inhibitors. Remarkably, the tuber of *Tylosema fassoglensis*, a closely related species of the Marama bean plant, is a key ingredient in an herbal supplement used to treat AIDS patients in Kenya. We hypothesized that *T. fassoglensis*, like *T. esculentum*, expresses a general protease inhibitor. We also hypothesized that this protease inhibitor has HIV protease inhibitor activity. Using chromatography techniques and trypsin inhibitor assays, we have purified and identified protein fractions with general protease inhibition activity. These fractions are being assessed for HIV protease activity using a fluorometric assay. The results of these experiments will be presented and discussed here.

Southeastern Society of Parasitologists III

- 160 BURON, ISAURE de ¹, SCOTT FRANCE ², WILLIAM A. ROUMILLAT ³, LAM TSOI ⁴, VINCENT A. CONNORS⁵, AND TIMOTHY BRYAN¹. College of Charleston, Charleston SC, ²University of Louisiana, Lafayette LA, ³ South Carolina Department of Natural Resources, Charleston SC, ⁴ Medical University of South Carolina, Charleston SC, ⁵ University of South Carolina Upstate, Spartanburg SC—The philometrids of the southern flounder: An update

The southern flounder *Paralichthys lethostigma* is host to two species of philometrid nematodes in the estuarine systems of South Carolina. Individuals of the species *Philometroides paralichthydis* are associated with the bones of the buccal cavity of the fish, as well as among muscles that control its dorsal and anal fin rays. Individuals of the species *Philometra overstreeti* are located between the teeth and inside the bony portion of the branchial arches of the fish. Sequencing of part of the CO1 gene split the species into two clades each, with 3.62% and 6.71% variation between the closest and furthest apart clades, respectively. Significantly, each clade was found to correspond exactly to each location of the parasite in the host. Histological studies confirmed that the host-parasite interface varied according to each location and thus to each clade. Moreover, the population dynamics was different for each clade, with 68%, 22%, 30%, and 17% of the flounders being infected by the buccal bone, fin muscle, teeth socket, and gill arch worms, respectively. Further, the buccal bone associated worms infected flounders of all sizes, whereas those from the gill arches, fin muscles, and teeth sockets did not infect fish smaller than 50 mm total length (TL). Teeth socket worms were found to infect fish over 300 mm TL, whereas fin worms were almost never found in those large fish and mostly infected fish from 151-300 mm TL. These data provide evidence to support the contention that the four genetic clades are likely four distinct species.

- 161 HERRON, BROOKE, TIFFANY G. BAKER, AND ISAURE DE BURON, College of Charleston, Charleston SC, ² Medical University of South Carolina, Charleston SC—Population dynamics of a monogenean parasite of the esophagus of the Atlantic croaker, *Micropogonias undulatus*, in the South Atlantic Bight and inshore waterways.

The monogenean *Diplectanotrema sp.* is a parasite found in the esophagus of the Atlantic croaker, *Micropogonias undulatus*, and is known so far only from the South Atlantic Bight (SAB). Its absence offshore during the spring in fish returning to the estuaries, where they spend the summer, led us to the hypothesis that recruitment of this parasite occurs inshore and that its life cycle happens in the estuaries. To address this, the population dynamics of the monogenean was studied in the SAB and in South Carolina estuaries

from Winyah Bay to the ACE basin National Estuarine Research Reserve. Preliminary data showed that estuarine fish were infected only in the Charleston Harbor estuary. Further, young of the year (YOY) fish were not infected when migrating down the low salinity rivers that feed the estuary but were infected once in the higher salinities of the lower estuary. Although this data at first appears to support our hypothesis, a large component of the monogenean's life cycle may in fact occur offshore where prevalences, abundances, and intensities of the worm were found to be significantly higher. Alternatively, the life cycle may occur inshore with the higher numbers of parasites offshore reflecting a loss of individuals in the parasite population. Additionally, the finding of these parasites only in the Charleston Harbor estuary remains problematic. In conclusion, the life cycle of this monogenean remains at this point enigmatic and will require further investigation involving understanding of the host biology.

162 LAURSEN, JEFF AND ANDREW CLAXTON. Eastern Illinois University—Impact of coal mine effluent on fish parasite assemblages in southern Illinois streams.

This study was designed to determine the impact of coal mine effluent on the helminth community structure in fish from the Saline River Basin in Illinois. Sunfish (*Lepomis spp.*) were collected from three sites upstream, and three sites downstream of a mine effluent point source, below which the Illinois EPA has documented a "dead zone" extending for several miles. Distributions of both fish host species and parasites varied in relation to coal mine effluent. Bluegills (*L. macrochirus*) and Green sunfish (*L. cyanellus*) were common in all sites, but Long ears (*L. megalotis*) were significantly more common upstream. Twelve genera of adult helminthes were recovered. These included 3 Acanthocephalans (*Neoechinorhynchus*, *Eocollis*, *Acanthocephalus*); 5 Nematodes (*Spinitectus*, *Camallanus*, *Capillaria*, *Spiroxys*, *Contraecaecum*); 2 Cestodes (*Bothriocephalus*, *Proteocephalus*); and 2 Trematodes (*Pisciamphistoma*, *Crepidostomum*). The majority of these parasites were too rare to use in analysis, but common parasite taxa responded differently to coal mine impact. For example, *Spinitectus*, which use mayflies as intermediate hosts, were significantly more common upstream and may be useful as bio-indicators of quality habitats. *Eocollis*, which typically use crustacean intermediates, were more common downstream and may be indicative of stressful habitats. *Camallanus*, which use copepod intermediate hosts, did not follow any clear trend related to coal mine effluent. These differences may be due to changes in intermediate host assemblages above and below the point source, diet shifts associated with intermediate host prey availability or fish gape size limits due to growth retardation, or the effect of physiologic stress on host fish.

163 DEREK A. ZELMER¹ AND THOMAS R. PLATT². University of South Carolina Aiken¹ and St. Mary's College²—Structure and similarity of helminth communities of six species of Australian turtles.

Patterns of infracommunity structure and infra- and component community similarity were examined for helminths of 6 species of turtles (*Elseya latisternum*, *Emydura krefftii*, *Em. macquarii dhara*, *Em. m. macquarii*, *Chelodina longicollis*, and *C. oblonga*) collected from Australia in 1993 and 1994. Local parasite species richness was not correlated with host geographical range. Differences in parasite diversity among host species were related primarily to differences in evenness; a pattern attributed to habitat characteristics, rather than species-specific differences. Ordination and Analysis of Similarity demonstrated the patterns of infracommunity structure of *Chelodina* spp. to be distinct from those of the other host species sampled, which demonstrated considerable overlap among patterns of infracommunity structure. In spite of overlap with the component communities of *Em. krefftii* and *El. latisternum*, the component communities of *Em. m. dhara* and *Em. m. macquarii* were more distinct from one another, than either was to the component communities of *Em. krefftii* or *El. latisternum*.

- 164 ROSYPAL, ALEXA C.¹, J. A. CORTÉS-VECINO², SOLANGE M. GENNARI³, J.P. DUBEY⁴, RICHARD R. TIDWELL¹, AND DAVID S. LINDSAY⁵. ¹University of North Carolina at Chapel Hill, Chapel Hill, NC, USA ^bUniversidad Nacional de Colombia-Sede Bogotá, Bogota, Colombia, South America, ^cDepartamento de Medicina Veterinária Preventiva e Saúde Animal, USP, São Paulo, SP, Brazil, ^dUnited States Department of Agriculture, Animal Parasitic Diseases Laboratory, Beltsville, MD,USA, ^eVirginia Tech, Blacksburg, VA, USA—Prevalence of antibodies to of *Leishmania infantum* and *Trypanosoma cruzi* in dogs from urban areas of Brazil and Colombia.

Leishmania infantum and *Trypanosoma cruzi* are zoonotic parasites that are endemic throughout many parts of Latin America. Infected dogs play an important role in transmission of both parasites to humans. A serological survey of *Leishmania* and *Trypanosoma* infection was conducted on 365 dogs from São Paulo, Brazil and Bogotá, Colombia, South America. Serum samples were examined by the indirect immunofluorescent antibody test (IFAT). Anti-*Leishmania* IgG antibodies were detected in 5 of 107 from Brazil (4.7 %) and in 4 of 258 dogs (1.6 %) from Colombia. Titers ranged from 1:25 to 1:100. Anti-*T. cruzi* antibodies were not detected in any of the dogs from either Brazil or Colombia. The results show a low prevalence of anti-*Leishmania* antibodies and no antibodies against *T. cruzi* in these canine populations. Our study suggests that dogs play a limited role in the spread of *L. infantum* and *T. cruzi* in these urban areas of Brazil and Colombia.

- 164A GOODWIN, DAVID G.¹, JEANNINE STROBL², SHEILA M. MITCHELL¹, ANNE M. ZAJAC¹, AND DAVID S. LINDSAY¹. Virginia Tech¹ and Edward Via Virginia College of Osteopathic Medicine²—Evaluation of mood stabilizing and anti-psychotic drugs for activity against *Toxoplasma gondii*.

Traditional thought is the obligate intracellular, two host, cyst forming parasite *Toxoplasma gondii* is usually benign for the immunocompetent intermediate host. Recent research suggests *T. gondii* has significantly higher antibody prevalence within the schizophrenic population. Clinically, a drop in antibody titers to *T. gondii* has been observed in some cases of schizophrenia after initial treatment with anti-psychotic drugs. The purpose of this study was to evaluate antipsychotic drugs for anti-parasitic properties. Drug testing is performed with an in vitro screening assay that evaluates cell monolayer destruction and tachyzoite replication. Cell monolayer evaluation is accomplished using a crystal violet stain for better visualization of monolayer lesions. Supernatant tachyzoites are counted using SYBR green. Valproic acid, Halperidol, Clozapine, Trifluoperazine, Pimozide, and Fluphenazine were tested with varying results. To achieve a dose response curve all drugs are tested with a positive, negative control and at 6 different concentrations, ranging from 0.5 μ M to 10 μ M. Drug concentration range was contingent on the results of previous drug screens. The results varied widely among the drugs sampled. Some antipsychotic drugs decrease tachyzoite counts and protected the cell monolayer. While other drugs offered no cell monolayer protection from tachyzoites and at lower doses (6 μ M) the drugs appear toxic to the cells. The mechanism of anti-toxoplasmic activity is yet to be elucidated, but evidence exists some anti-psychotic/mood stabilizing drugs do work in vitro. Fluphenazine a common anti-psychotic drug, displayed the highest level of activity against *Toxoplasma*, suggesting a link between antipsychotic treatment and a decrease in antibody titer seems plausible.

Plant Systematics II

- 165 OGEZ, BRITTNEY D. AND DOUGLAS P. JENSEN. Converse College—Floristic diversity within the upper Cretaceous Middendorf beds of eastern South Carolina.

The Upper Cretaceous Middendorf beds of the Coastal Plain in South Carolina, first studied in depth by Berry (1914) contain a diverse assemblage of vascular plant leaves preserved either as impressions in a clay matrix or as a mineral precipitate upon those impressions. The Middendorf beds are considered stratigraphically as either a facies of the Black Creek Formation (Prowell et al. 2003) or as a separate formation. We studied the diversity of the plants within the type section of the Middendorf and compared the flora with that of the Black Creek. Building on prior work, we collected, prepared, and identified over 40 species (mostly Berry's names) within the Middendorf by dégagement. The abundance of each species was estimated as the sum of all the leaf surface areas. A rank-abundance curve indicates the Middendorf to have been dominated by *Ficus atavina* closely followed by *Sequoia reichenbachii*, which together account for nearly 50% of the leaf biomass. Both the Shannon-Weiner Index and Simpson's index show that the diversity within the Middendorf flora is comparable to that found in modern oak-hickory forests. We used Sorenson's Community Coefficient to compare the Middendorf flora with the floras of several Black Creek localities. Our results indicate that these represent different plant communities.

- 166 BUSH, CATHERINE M. AND KATHLEEN KRON. Wake Forest University—The phylogeny, biogeography and morphological evolution of the Gaultherieae (Ericaceae).

Phylogenetic relationships among the Gaultherieae (*Chamaedaphne*, *Leucothoe*, *Diplycosia*, *Tepuia* and *Gaultheria*) were examined using molecular (*matK*, *ndhF* and ITS) data. Parsimony analyses were performed in PAUP for each gene, combined chloroplast data and total combined data. These analyses show that the Gaultherieae is likely monophyletic although bootstrap support was less than 50%. The wintergreen group (*Diplycosia*, *Tepuia* and *Gaultheria*) is strongly supported as being monophyletic. *Diplycosia* is monophyletic and sister to *Gaultheria* members. *Tepuia* is clearly a member of the wintergreen group but its relationship to other clades in the group is unclear. Biogeographic areas and morphological characters were mapped using MacClade onto a single most parsimonious tree of the Gaultherieae obtained from the total combined analysis. The biogeography analysis indicated a temperate origin (North American/Himalayan) for the tribe as well as the entire wintergreen group. Five tropical clades are supported within the wintergreen group including: *Diplycosia*, *Tepuia*, two South American *Gaultheria* clades and *Gaultheria borneensis*. The combined analysis indicates that the ancestor to the Pacific species of *Gaultheria* (Australian/Tasmanian) may have undergone two dispersal events. The analyses of some morphological features within the group reveals that a dry fruit without a fleshy calyx is the ancestral condition for Gaultherieae but that a fleshy accrescent calyx is plesiomorphic for the wintergreen group. Awned anthers are the ancestral condition for most Gaultherieae. Analysis shows that the presence of solitary flowers is not phylogenetically informative and that the character has evolved in several different lineages within the group.

- 167 BECK, JAMES B. Duke University—The phylogeny of *Selenia* (Brassicaceae) and its relation to the origin of the southeastern U.S. cedar glade flora.

Selenia Nutt. (Brassicaceae) is a genus of five herbaceous species distributed from the midwestern and southwestern U.S.A. to northern Mexico. The genus has recently been shown to be sister to *Leavenworthia* Torrey, a genus of eight species endemic to cedar

glades in the southeastern and midwestern U.S.A. Both chloroplast and nuclear sequence data were used to reconstruct the evolutionary relationships among *Selenia* species, and the total phylogeny of the *Selenia/Leavenworthia* clade was used to evaluate hypotheses regarding the origin of the cedar glade flora. The chloroplast and nuclear phylogenies are generally well supported and congruent, with one exception involving a clear case of historical hybridization and subsequent chloroplast capture. A reconstruction of the historical biogeography of the *Selenia/Leavenworthia* clade is consistent with the suggestion that the endemic flora of southeastern U.S. cedar glades is largely derived from floristic elements west of the Mississippi embayment. A research program designed to broadly test this claim is proposed.

- 168 GILLESPIE, EMILY L AND KATHLEEN A KRON. Wake Forest University—Evolution and biogeography of the genus *Kalmia* (Ericaceae: Phyllodoceae).

The genus *Kalmia* (which now includes *Leiophyllum buxifolium* and *Loiseleuria procumbens*) is comprised of 10 species of ericaceous shrubs distributed across much of North America, in eastern Asia, in Europe and in Cuba. Members of the genus are found in a variety of habitats, including wet coastal pinelands, pocosins, pine savannahs, rock outcrops, dry sandhills, bogs, fens and alpine meadows. *Kalmia* includes widespread species, narrow endemics, disjunct species and circumboreal species, which provide an opportunity to ask interesting biogeographical questions in an evolutionary context. Despite the recognizability of *Kalmia* and its horticultural and ethnobotanical interest, evolutionary relationships within the genus have remained unclear. The current study represents the first cladistic analysis of the entire genus. Phylogenetic utility was evaluated for eight nuclear and chloroplast DNA regions, including nrITS, GBSS-1 (*waxy*), *LEAFY*, *rpb2*, *matK*, *rbcL*, *ndhF* and *trnS-G* intergenic spacer. Evolutionary relationships among all *Kalmia* species were determined with strong support, along with re-interpretation of morphological evolution and historical biogeography. Relative utility of Maximum Parsimony, Maximum Likelihood and Bayesian Inference, as well as aspects of molecular evolution, were examined. More broadly, the phylogenetic position of *Kalmia* within the taxonomically challenging tribe Phyllodoceae and the subfamily Ericoideae were addressed.

- 169 RISK, ALLEN C. Morehead State University—*Atrichum* (Polytrichaceae) of the Cumberland Plateau: taxonomy, ecology, and distribution.

The Cumberland Plateau is a rugged region that extends from eastern Kentucky and western Virginia through eastern Tennessee into northern Alabama and extreme northwestern Georgia. Field and herbarium work showed that five *Atrichum* species occur in the plateau: *A. altecristatum*, *A. angustatum*, *A. crispulum*, *A. crispum*, and *A. cylindricum*. Variation in sexual condition, leaf width, lamella height, and cell vestiture can be used to separate these taxa. *Atrichum crispum* is easily distinguished by its wide leaves (>1.5 mm) and verrucose leaf teeth. *Atrichum angustatum* can be recognized by its narrow leaves, high lamellae (>6 cells high), and leaf cells papillose in section. The other three species are segregates of the *Atrichum undulatum* complex. *Atrichum crispulum* and *A. cylindricum* both have lamellae 2-4 cells high, but can be separated by the presence (*A. crispulum*) or absence (*A. cylindricum*) of abaxial teeth in oblique rows on the lamina. *Atrichum altecristatum* can be distinguished from the latter two taxa by its tall lamellae (4-7 cells high). *Atrichum angustatum*, *A. altecristatum*, and *A. crispulum* characteristically occur in habitats that experience some sort of disturbance such as along trails, dirt roads, or streambanks. *Atrichum crispum* and *A. cylindricum* are restricted to habitats that are quite wet at least part of the year. Both occur in bottomland swamp forests with *A. crispum* also present in wet areas along streams in narrow ravines and gorges.

- 170 HORN, CHARLES N. Newberry College—Preliminary studies on hybridization between *Asimina triloba* (common pawpaw) and *Asimina parviflora* (dwarf pawpaw).

During 2007 field work was initiated to study the potential hybridization between two species of pawpaw found in the Piedmont of South Carolina, *Asimina triloba* and *Asimina parviflora*. Ecological and morphological data were collected on a minimum of four populations each of two putative parental species and the suspected hybrid. *Asimina parviflora* populations included individuals scattered on woodland slopes well above floodplains. In contrast, *Asimina triloba* populations appeared to be clonal and grew on floodplains adjacent to streams and rivers. Putative hybrid populations were clonal and located at the base of or on the lower reaches of slopes near streams. Leaf measurement data included blade length, blade width, and distance from base to widest blade point. For all three parameters, statistically significant differences were found with the putative hybrid exhibiting intermediate values. The greatest difference between the three taxa was for blade length while the least was for blade width. Floral measurements will be analyzed, but that data could not be collected in 2007 because of a freeze at the time of flowering in April.

- 171 RAVEILL, JAY A., SELENE S. NIKAIIDO AND ANDREA L. DIXON. University of Central Missouri—*Desmodium humifusum*: a hybrid or a species?

Ground-spreading tick-trefoil (*Desmodium humifusum*: Fabaceae) is a rare plant found largely in the northeast and was at one time considered for listing as a federally endangered species. A concerted effort in the early 1990s failed to relocate plants at any of the 35 historical locations of the species but new populations were discovered, two in Massachusetts and one in Connecticut. At each of these locations, two congeneric species (*D. paniculatum* and *D. rotundifolium*) were present and a hypothesis of hybridization was proposed because the rare species was roughly morphologically intermediate between the two related species. The possible the hybrid origin of *D. humifusum* was supported by the morphological diversity of its offspring. Additionally protein (allozyme) electrophoresis indicated that most *D. humifusum* had a composite profile expected of an F₁ but some could only be explained as later generation hybrids. The possibility that *D. humifusum* was a stabilized hybrid species that was self-perpetuating and genetically isolated from the parental taxa could not be conclusively rejected. More recently other locations for *D. humifusum* have been found including two in Missouri and one in Tennessee that will be the subject of this study. Several methods of detecting DNA variation will be used to determine if *D. humifusum* individuals are closely related to each other or if they represent different hybridization events. At these three locations, unlike the New England sites, a number of *Desmodium* species grew in close proximity to the *D. humifusum* and potentially other species could hybridize with *D. rotundifolium*.

Animal Ecology II

- 172 JANSON, ERIC M. AND PATRICK ABBOT. Vanderbilt University—Sterol usage in the *Solidago* galling midge *Asteromyia carbonifera* (Diptera: Cecidomyiidae): fungal symbiont as a source of sterols.

Unlike most animals, insects are unable to synthesize sterols (e.g., cholesterol) *de novo* and must therefore obtain necessary sterols exclusively from their diet. This presents a unique challenge for plant-feeding insects, since plants generally lack cholesterol—the primary sterol of most animals. To overcome this difficulty, many insects have formed symbiotic associations with microbes (especially fungi), which provision specific sterols

that are readily metabolized into usable sterols and/or used directly in cell membranes or as hormone precursors. Here, we investigated if the ectosymbiotic fungal symbiont (*Botryosphaeria dothidea*) of the goldenrod-galling midge *Asteromyia carbonifera* acts as a sterol source for its host. Galls and plant material were collected from *Solidago altissima* near Dayton, OH. Galls were dissected and larvae/pupae, leaf, and fungal tissue were subjected to sterol extraction. CG-MS revealed that *B. dothidea*'s primary sterol was ergosterol, which is the primary sterol of most filamentous ascomycetes. *A. carbonifera* larvae and pupae were devoid of cholesterol and instead their tissues contained ergosterol and ergosterol metabolites. The leaves of *S. altissima* lacked free sterols and instead the majority of the isolated sterols appeared to be conjugated to other molecules. These results demonstrate that *A. carbonifera* derives a significant nutritional benefit from its fungal symbiont and appears to be a strict mycophage. The lack of free sterols in *Solidago* may present a significant nutritional barrier to phytophagous insects, and *A. carbonifera*'s evolutionary radiation and ecological specialization on the genus may be in part due to the nutritional relationship with its fungal symbiont.

173 CANCELLED

174 EXTINE, JENNIFER L. AND LAURA E. DEWALD. Western Carolina University—Comparison of potential habitat among golf courses in western North Carolina.

Habitat fragmentation is a major contributor to the loss of biodiversity. Golf courses often contain potential habitat that could provide connectivity across fragmented landscapes for interior-forest species if appropriate conditions can be maintained in and among habitat patches. This study evaluated fourteen golf courses in western North Carolina to assess their potential to provide interior habitat and potential connectivity across golf courses. GIS was used to identify forested patches for sampling and presence of interior-forest birds was used to identify golf courses that may provide interior forest habitat. Patch characteristics of golf courses with interior-forest birds were compared to those lacking interior-forest birds. Vegetation was classified by seral stage and structure and mapped to analyze vegetation patterns. 'Fragstats' was used to analyze various patch metrics such as edge to interior ratio, shape, and proximity to adjacent forest. Preliminary data analyses showed a significant negative relationship ($p = 0.004$) between the presence of interior-forest birds and amount of edge, but there was no significant relationship with patch area ($p = 0.085$), or edge-to-interior ratio ($p = 0.106$). The relationship of patch characteristics to interior-forest bird distribution, and the variation in patch characteristics among golf courses will be discussed. Results of this study can be used to evaluate the potential of golf courses to connect landscapes needed by interior forest species. Designers can use this information to strategically arrange patch composition and structure to provide potential connectivity across fragmented landscapes through new and existing golf courses.

175 DILUZIO, NICHOLAS A., MARK T. STANBACK, AUSTIN MERCADANTE, AND JEAN OLBERT. Davidson College—The effects of the threat of predation on nest site selection in Eastern Bluebirds (*Sialia sialis*).

Because nest predation is the single largest source of nest failure in most passerine birds, passerines should be very sensitive to the vulnerability of their nests to predators. We tested whether the presence of a nest predator at the nest site prior to the completion of nest-building would induce Eastern Bluebirds (*Sialia sialis*) to abandon their nesting attempt and move to an alternate box 10 m away. Once we detected the onset of nest-building, we placed either a rubber Black Rat Snake (N = 30 trials) or a model female Northern Cardinal (N = 30 trials) on the focal nest box for 15 minutes and recorded the responses of the resident pair of bluebirds. We returned 4 days later to determine whether the presence of the snake/cardinal had an effect on the nest site choice of the bluebirds.

We found that more bluebirds dispersed in response to the snake model than the cardinal model. Of the 30 pairs presented with cardinal model, 29 continued to nest build. Only 20 of the 30 pairs presented with a snake remained in their original box. During the model presentations, four of 30 bluebird pairs mobbed the cardinal, while 14 of the 30 bluebird pairs mobbed the snake. Eight of the 14 pairs that mobbed the snake model switched boxes, while only two of the 16 that did not mob switched boxes. We found no relationship between nest stage and a willingness to disperse.

- 176 FALCONE, JOSEPHINE F. AND LAURA E. DEWALD. Western Carolina University—Effects of a hemlock woolly adelgid (*Adelges tsugae*) insecticide treatment on arthropod community diversity and food availability for insectivorous birds in Great Smoky Mountains National Park.

In response to hemlock woolly adelgid (*Adelges tsugae*, HWA) infestation, Great Smoky Mountains National Park (GSMNP) is administering systemic imidacloprid insecticide to eastern hemlocks (*Tsuga canadensis*) in designated Hemlock Conservation Areas (HCAs). The effects of imidacloprid treatment on non-target hemlock communities will be important for other parks and agencies managing for HWA infestation. The purpose of this study was to investigate the effects of imidacloprid on arthropod communities and on food availability for three hemlock-associated, migratory, insectivorous, foliage-gleaning bird species: black-throated green warblers (*Dendroica virens*), black-throated blue warblers (*Dendroica caerulescens*), and blue-headed vireos (*Vireo solitarius*). Effects of hemlock treatments were explored using two independent methods: quantifying densities of focal birds, and sampling the arthropod community on which focal birds prey. Bird densities were based on spot-mapping of territorial males in six treated HCAs and six paired untreated hemlock stands. Canopy arthropods were sampled from these same plots by clipping 1m branch samples from the mid-canopy of 10 hemlocks per plot. Approximately 2000 arthropods were collected and identified to order. Preliminary results of the differences in birds and differences in arthropod diversity between treated and untreated stands will be presented. Relationships between bird densities and arthropod densities and diversity within and between treated and untreated stands will also be presented. Implications of these results for using imidacloprid to control HWA infestation will be discussed.

- 177 BROWN, CHRISTOPHER G. AND DANIEL J. FUNK. Vanderbilt University—The effects of fecal cases on the survival of *Neochlamisus* leaf beetles (Coleoptera: Chrysomelidae): a trade-off in extreme humidity conditions.

Camptosomate leaf beetles share an amazing building behavior in which females wrap their eggs in plates of fecal material to form a case. The larvae remain in this case, carrying it over their backs, enlarging and elaborating it until pupation. The final instar completely seals the case and pupation takes place inside. Here we present the first fully detailed study that evaluates how this unique animal architecture affects survival across a range of humidity conditions. We first determined whether or not the sealed fecal cases of pupae limit the amount of water lost in dry conditions or gained in more humid conditions. We then evaluated the effect this case has on the survival of beetles in these environments. We found a very drastic influence on case strength that presents a trade-off between normal development and the defensive function of the case. This affect could play an important role in the evolution of case hardness as a function of local humidity regimes.

- 178 GREENBERG¹, CATHRYN H., T.G. FORREST² AND THOMAS WALDROP¹. USDA Forest Service, Southern Research Station¹; University of North Carolina at Asheville²—Effect of fuel reduction treatments on ground-dwelling macroarthropod communities in a southern Appalachian upland hardwood forest.

As part of the multidisciplinary National Fire and Fire Surrogate Study we compared the effects of 3 fuel reduction techniques and a control on ground-dwelling macroarthropod communities. Four experimental units, each > 14-ha were contained within each of 3 replicate blocks at the Green River Game Land, Polk County, North Carolina. Treatments were (1) prescribed burning (B); (2) mechanical felling of shrubs and small trees (M); (3) mechanical felling + burning (MB), and; (4) controls (C). Treatments were implemented incrementally, but were complete by spring 2003. We collected macroarthropods using drift fences with pitfall traps that were open continuously and concurrently during May – September 2003. After treatments (2003) leaf litter depth decreased in B and MB, and snag density and light levels were highest in MB. We captured 282g (dry biomass) of 5,569 adult individuals within 21 orders and 48 identified families (108 morphospecies), and 177g of 1,207 non-adult (larvae and pupae) individuals within 7 orders and 18 identified families (37 morphospecies). Dry biomass of macroarthropods was similar among the treatments and control. This study will help land managers to understand what effects their fuel reduction prescriptions will likely have for macroarthropods.

- 179 CARTER, ELOISE¹, STEVE BAKER¹, SARAH PARSONS² AND DAVID WAGNER³. Oxford College¹ and Emory College² of Emory University, and University of Connecticut³—Ecology and life history of *Stiria rugifrons*: a cryptic caterpillar utilizing *Helianthus porterii* on granite outcrops.

After a Herculean effort to collect and identify a cryptically colored caterpillar rarely seen on its host plant the Confederate daisy (*Helianthus porterii*), we successfully raised larvae to adulthood for identification. *Stiria rugifrons* is a noctuid moth that is widely distributed in the Midwest but not well known from the Southeast. The caterpillar avoids predation by cryptic coloration and behavior that models the flower heads of the Confederate daisy, a granite outcrop endemic. The life history of the *S. rugifrons* follows the timing of flowering of its host, with adults emerging in the early fall, larvae feeding through flowering, followed by pupation in mid to late October, depending on seasonal conditions. Early instar larvae were observed feeding on pollen, followed by petals and finally flower and seed heads as late instars. Feeding trials indicated larvae preferred *Helianthus* over two other fall flowering outcrop plants. When presented with *H. porterii* and *H. angustifolius*, the larvae successfully fed on both and gained weight. Understanding the ecology, distribution, life cycle and behavior of this moth caterpillar extends our knowledge of the unique plant and animal communities of southeastern rock outcrops.

180 CANCELLED

181 CANCELLED

Teaching Biology

- 182 RAYBURN, JAMES R. Jacksonville State University, Jacksonville, AL 36265—The use of a student response system for teaching general biology.

In seeking to improve teaching of Biology classes at the freshman level I have incorporated many methods including, inquiry based methods, PowerPoint and audio visual aids in the class room. As part of an assessment of General biology 101 class I included the use a new method using a Student Response System which allowed me to get real time feed back during my classes. The "Turning point" software used worked within power point as a tool bar and was easy to incorporate in to PowerPoint lectures. The system provides some very useful information however there is some cost involved. The system does require the students buy a response device. The instructor must

incorporate the student ID numbers with individual response device ID numbers if you wish to track individual students. One of the purposes was to take attendance using the response device to eliminate the time consuming alternative of taking roll. During setup period there is learning curve and difficulties that must be surmounted. Overall the student's response to the system was positive after the initial cost of the response devices. This method proved an excellent method for giving real time pop quizzes in class and providing an avenue for discussion in the class room. Students enjoyed the question and immediate answers during the class. Overall the method is useful and for teachers using PowerPoint lectures it is easy to incorporate into the class room.

- 183 WELCH, NICOLE TURRILL. Mississippi University for Women—Do students in redesigned introductory biology courses perform as well as those in traditional classroom offerings of the same course?

Course redesign uses instructional technology in large, introductory courses to meet increasing enrollment demand and lower course costs. Some question whether the amount of knowledge gained in redesigned courses differs from that gained in traditional classroom settings. I compared student performance in my redesigned (online and hybrid) and traditional classroom offerings of a one-semester, introductory biology course for nonscience majors. The same lectures, labs and exams were used in all formats. Lectures delivered in the traditional classroom were provided to the online and hybrid students via an instructor-created CD. Students in the online sections did not meet in a traditional classroom setting, whereas those in hybrid courses did, although lecture attendance was not required. Data collected over three semesters included exam scores, course grade, student acquisition of knowledge measured using a 20-question pre-test and post-test, and composite ACT scores for students who received a letter grade in the course. Course grade and knowledge gained did not vary significantly between online, hybrid and traditional sections. D and F students in the hybrid format fell a full letter grade behind their counterparts in traditional sections by the second and third exams. Results suggest that student performance in this course is independent of lecture delivery method, and, instead, depends upon the study skills and knowledge of biology students gained from their primary and secondary education. Well-prepared students succeed in all formats, whereas less-prepared students struggle particularly in hybrid formats, with instructional technology perhaps acting as a false security blanket.

- 184 SAUTERER, ROGER. Jacksonville State University, Jacksonville, AL—Use of modified amphibian biotoxicity assays in instructional laboratories.

The FETAX assay is a widely used, standardized developmental toxicity assay that involves incubation of late blastula *Xenopus laevis* embryos in control and test solutions through a 96-hour endpoint. With slight modifications, this assay is highly adaptable for undergraduate instructional laboratory exercises in ecology, environmental sciences, aquatic ecology and developmental biology. Modified FETAX assays are relatively easy for students to perform and analyze, and allow student investigation of effects of relevant pollutants and environmental stressors. Tests can be performed using purified toxins, combinations of different toxins, concentration ranges or actual field samples. This assay is highly amenable to student-directed projects. It also gives students experience in data analysis using either simple or more sophisticated statistics. Modifications of the FETAX assay can be performed in a wide range of institutional settings using minimal equipment. The major costs are the purchase of frogs, and the Human Chorionic Gonadotropin (HCG) that is required to induce mating and gamete release. Aside from initial costs and the HCG, these experiments are relatively inexpensive. This presentation will describe basic procedures, animal care, obtaining gametes, embryo sorting and possible modifications, as well as potential suggestions for classroom applications.

- 185 HERR, J. M., JR. University of South Carolina-Columbia—A technique for the study of vascular plant anatomy from unstained whole mounts and thick sections.

The use of calcium chloride as a mounting medium for sectioned and whole mount plant tissues over a brief period in the 19th century was soon abandoned in favor of glycerin, glycerin jelly, and other media. Late in the 20th century, its value was again recognized for the clarity of structural detail it imparts to stained, thick sections and whole mounts of plant tissues. A modification of the technique for use of this mounting medium produces a markedly similar clarity in structural detail without the use of stains. Portions of leaves for whole mounts and Hooker microtome or hand sections of stems, roots, and leaves 120 µm to 500 µm thick were fixed in Carnoy's #1 fixative (100% ethanol and acetic acid, 3:1) from 4 to 24 hr and then stored in 70% ethanol. Direct transfer of the plant material from storage ethanol to water for 10 to 20 minutes and then to 20% aqueous CaCl₂ did not produce any structural distortion. The plant material can be stored in the CaCl₂ solution indefinitely, or it can be mounted immediately on a slide in 20% aqueous CaCl₂, covered with a cover glass, and examined with bright-field optics at low and high magnification. The character of natural but variable coloration combined with inherent structural distinctions permits recognition of various cell types and features of tissue organization.

- 186 NELSON, DIANE R.¹, BONNIE PARKS¹ AND JEANNE ZAVADA². East Tennessee State University¹ and Natural History Museum and Gray Fossil Site²—Educational opportunities at the Natural History Museum and Gray Fossil Site.

The Natural History Museum and Gray Fossil Site provide exceptional opportunities for research and education for all age groups. The museum, located off I-26 between Johnson City and Kingsport, TN, opened August 31, 2007, and in four months hosted ~40,000 visitors. Scientists have discovered an entire ecosystem that existed on the site 4 to 7 million years ago, during the Miocene. The fossil remains of the Gray site have been uniquely preserved by the rich organic matter that filled a sinkhole that had served as a watering hole attracting a variety of organisms. The site is nearly five acres in size and 100 feet deep. Tapirs, rhinos, saber-toothed cat, shovel-tusk elephant, and alligators are among the large animals discovered and exhibited in the museum. Oak, hickory, and pine were the dominant plants. The museum offers tours, permanent and traveling exhibits, outreach programs, resources for teachers, and other educational programs correlated with the standards of learning in Tennessee, North Carolina, and Virginia. The traveling exhibit until April 27, 2008 is "Sue"—the largest *T. rex* ever found, on loan from the Field Museum of Chicago. An active research program is continuing to discover additional plants and animals at the site, including new species, as they endeavor to reconstruct the ecosystem that existed here long ago. Students and volunteers participate in the educational and research programs. See the website for more details: www.grayfossilmuseum.com.

- 187 KOSAL, ERICA¹, PEARL R. FERNANDES², AND JOHN MECHAM³. ¹North Carolina Wesleyan College, Rocky Mount, NC, ²University of South Carolina Sumter, SC and ³Meredith College, Raleigh, NC—Improving science education through globalization.

Communication in scientific research has encompassed globalization for several decades. However, globalization of scientific education is a relatively new phenomenon and is still evolving. The objective of our present study was to improve science education through globalization at the undergraduate level using a global problem such as HIV for students to gain insight into how science, society, and policy interact to tackle real world issues. Through an NSF-CCLI funded grant (DUE 0510368) "Life Science In Context: Sub-Saharan Africa" a collaboration was developed between North Carolina Wesleyan

College, Meredith College and University of South Carolina Sumter in the U.S.; and Kenyatta University in Kenya to develop teaching modules on HIV/AIDS to improve student knowledge and retention and help students think globally. The collaborative effort was continued further as students from these institutions worked in teams to write papers and address various issues in the field of HIV/AIDS using the internet as a means of communication. Assessment of the papers was conducted using a rubric developed by the consortia faculty. Peer evaluation and a final evaluation of the entire collaboration were conducted among the participating students. Even though the initial communication among students was difficult, they were able to produce a better finished product as a team than as individuals. Students learned that issues surrounding HIV/AIDS such as stigmatization, prevention education and healthcare are global in nature and that activism at all levels is required to tackle this problem.

- 188 JONES, RONALD L. AND HUMBERTO JIMENEZ SAA. Eastern Kentucky University, Richmond, KY, and Tropical Science Center, San Jose, Costa Rica—Opportunities for teaching and research at Los Cusingos Neotropical Bird Sanctuary, Costa Rica.

Los Cusingos Neotropical Bird Sanctuary is a 77-hectare preserve located in southwestern Costa Rica, operated by the Tropical Science Center in San Jose. It is the former home and farm of the world-renowned ornithologist, Alexander F. Skutch, who lived at the site for more than 60 years, conducting ground-breaking studies of avian sociobiology and life history. Most of the site is forested, with habitats varying from river corridors to steep slopes to ridges. Both a visitor's cabin (sleeps 6) and visitor's center (with a large meeting room) are available on-site. Food services are available nearby, and a modern city, San Isidro de El General, is only 15 minutes away. There are nearby motels, lodges and other nature preserves with additional housing for students. The site is less than one hour from the Pacific Coast and about one hour from the base of the highest mountain (Mt. Chirripó) in Costa Rica. In addition to the numerous birds, there is a rich variety of animal life in the area, especially mammals and reptiles. *Los Cusingos* provides an excellent site for a variety of learning experiences in Neotropical biology. There is an on-going effort to establish a corridor of protection to link the few remaining forested sites in the area (including *Los Cusingos*) with the Chirripó region, and both student and faculty researchers are encouraged to participate in the project. This information was gathered while conducting a botanical project at the site from January to May, 2007.

Plant Ecology III

- 189 RAYNER, DOUGLAS A. AND DANIEL S. HENDERSON. Wofford College—Response of a suburban bottomland forest to removal of invasive plants.

In the fall of 2004 a study was initiated to document the response of the ground and shrub layers of a suburban bottomland forest to removal of heavy, moderate, or sparse infestations of invasive plant species. Twelve 10 m X 10 m permanent plots (8 experimental, 4 control) were selected based on degree of infestation with Chinese privet (*Ligustrum sinense*). In the experimental plots all stems of *L. sinense*, *Lonicera japonica*, *Hedera helix*, and *Rosa multiflora* were cut and painted with herbicide (or pulled) and weighed as a measure of dominance. Vegetation was surveyed in late fall of 2004 and again in late fall of 2007. Both experimental and control plots showed a significant increase in species richness between 2004 and 2007, with dense experimental plots showing the greatest increase (390%) and sparse experimental plots showing the smallest increase (40%). In all cases the increase in species richness was due more to recruitment of native bottomland species and native non-weedy species than to recruitment of native weedy species and non-native species. Non-native species decreased from 31.7 % in

2004 to 18.5 % in 2007, and the number of native species whose preferred habitat included bottomland forests increased from 24 to 49, which constitutes a high percentage of species expected to be present in an undisturbed bottomland forest. Although there was a significant decrease in the percent of species that are weedy or non-native between 2004 and 2007, non-native and weedy species continued to dominate the ground and shrub layers in all plots. The implications of these and additional results will be discussed.

- 190 KUPPINGER, DANE M. Sewanee University—Invasion of the exotic *Paulownia tomentosa* at Linville Gorge and changes in its habitat distribution over time.

Paulownia tomentosa (*Paulownia*), a native of Asia, began invading xeric forests of the southern Appalachians following wildfires in the 1980's and heavily invaded Linville Gorge (Pisgah National Forest) following a wildfire in 2000. *Paulownia* habitat models were developed for the Gorge utilizing Classification Tree models and survey data from 5 fires across the Southern Appalachians. Resurveys of the plots at Linville Gorge, allowed for an analysis of changes in *Paulownia* habitat over time. In 2002, these models predicted *Paulownia* habitat to exist over 6.57km² of the Gorge. That shrank to 2.43km² of habitat in 2004 and to 1.79km² of habitat in 2006. *Paulownia* habitat losses are particularly concentrated on more mesic sites, at lower elevations, on flatter slopes, and in areas that burned with lower severity as measured by the variables Topographic Convergence (TCI), elevation, slope, and difference in the Normalized Burn Ratio (dNBR) respectively. Lack of significant habitat restriction on the steepest, driest portions of the landscape suggests that although *Paulownia* may suffer range restriction, it is not likely to be expatriated from the Gorge during the course of succession. That these areas are also habitat to two rare endangered species, *Liatris helleri* and *Hudsonia montana*, leaves open the possibility of potential impact to these species' populations within Linville Gorge.

- 191 MCQUAIDE, JOHNATHAN AND JAMES FRALISH. Southern Illinois University Carbondale—Change in forest composition and structure of compositionally stable forest stands at Land Between The Lakes National Recreational Area, KY and TN: 1988-2007.

Information on forest composition and change over time is necessary to better understand processes, relationships and ecosystem management. In the late 1980s, 64 compositionally stable stands were studied at Land Between The Lakes National Recreational Area with the purpose of relating species composition to soil and topographic factors. Compositional Stability was determined by Franklin (1990, 1993) using a Similarity Index and a differential in composition indexes between overstory and understory for each stand. Tree species and diameters were recorded within two circular 0.06 ha plots with a minimum of 27 m between plot centers. At a distance of 6.91 m from plot centers and in cardinal directions seedling and sapling stem numbers were record by species using four nested 0.003 ha and 0.006 ha plots, respectively. We remeasured 61 stands in 2007 to determine how each has developed and what changes occurred over the past 20 years. Using COMPAH Franklin delineated eight forest community types. In our study, PC-ORD correctly placed nearly all stands within the eight community types suggesting there were no major compositional changes in 20 years. Minor changes in basal area shifted three stands to a different community type. A correlation coefficient of 0.947 indicated no major changes in basal area. However, 20 stands showed a reduction in total basal area indicating a loss of trees and a decrease in density with stand age. We are presently identifying the tree species and sizes that were lost between measurements.

- 192 SCHROEDER, RACHEL E.¹, FRANK P. DAY¹, DANIEL B. STOVER², JOHN R. BUTNOR³ AND BERT G. DRAKE⁴. Old Dominion University¹, Florida Gulf Coast University², U.S. Forest Service³, and Smithsonian Environmental Research Center⁴—Coarse root biomass and architecture under elevated CO₂ in a Florida scrub-oak ecosystem determined by ground-penetrating radar.

Carbon dioxide enrichment studies are instrumental in determining the effect of increasing concentrations of atmospheric CO₂ on vegetation, including roots. Studies have shown increases in root-to-shoot biomass ratio and changes in root spatial distribution (root architecture) of plants grown under elevated CO₂. The scrub-oak ecosystem at Kennedy Space Center, Florida was the site of a CO₂ enrichment study using open-top chambers from 1996-2007. Ground-penetrating radar (GPR) was used to measure the effects of elevated CO₂ (ambient + 350 ppm) on coarse root biomass within the chambers. Greater coarse root mass was found in the elevated CO₂ plots compared to ambient plots. CO₂ enrichment at the site was terminated in June 2007, and all aboveground biomass from within the experimental chambers was harvested. The cleared chamber plots were intensively scanned at the soil surface using a 1500 Mhz GPR antenna, and coarse root biomass was estimated for the experimental plots. GPR was successfully used to estimate root biomass in a separate biomass validation plot. The root dry mass for a 2 m² pit excavated to 60 cm depth was 8222 g/m²; 20 soil cores taken from the plot estimated the biomass at 9970 g/m²; and GPR scans at 20 random points within the plot gave an estimate of 9122 g/m². Root architecture (branching patterns and horizontal and vertical distribution) was also analyzed using 3-D image processing of the GPR scan data.

- 193 McCARTHY, BRIAN C. Ohio University—American chestnut restoration and mineland reclamation: Bring technologies together.

The American chestnut (*Castanea dentata*) was long recognized as the premier timber and wildlife tree species in the eastern United States. It has been largely ignored by those doing modern restoration ecology because of its virtual loss from the Eastern Deciduous Forest due to blight. However, new possibilities exist for chestnut. Long-term breeding experiments by the American Chestnut Foundation have led to a blight resistant form of the species through backcrosses with resistant Chinese chestnut. These hybrids will soon be ready for deployment. Release of these seeds and seedlings could be directly into competitive forest environments. Alternatively, deployment as part of a chestnut restoration program might occur as part of a reclamation effort. Throughout the central Appalachians, coal mining activities have disturbed thousands of acres that have been reclaimed largely as grassland. These grasslands typically represent arrested succession—they are unable to return naturally to the pre-mine condition of forest habitat. I have experimented with different methods of soil treatment to permit the reintroduction of chestnut on minelands while assisting with natural successional processes. Using combinations of deep soil ripping (to 1 m) combined with plowing and disking, we have achieved high rates of chestnut survival (> 90%; 1200 seedlings) after one year. All metrics of seedling vigor (height, diameter, leaf area, etc.) indicate that they are able to grow well on mineland environments after aggressive grasses have been controlled and soil compaction has been lightened. We propose the use of these soil treatments in mineland reclamation efforts and associated chestnut restoration projects.

- 194 FRALISH, JAMES AND MIR FERDOUS. Southern Illinois University—Predicting *Quercus alba* site index from measurable soil water, nutrient, and topographic characteristics: what should be measured/calculated?

For decades, forest researchers have attempted to relate forest growth (e.g., site index) to measurable soil water and nutrient characteristics. Few early attempts were completely successful. At Land Between The Lakes National Recreation Area in Kentucky and

Tennessee, the age and height (site index) of *Quercus alba* trees and soil and topographic data were collected from 72 stands. Statistically, site index was not related to the soil texture fractions, water holding capacity (%), or nutrient levels (PPM) of either the A or B horizon. However, percent available water, bulk density, and horizon depth were integrated to estimate the available water capacity (AWC in cm) for a given horizon. Horizon AWC was reduced by the percentage of stone (particles > 2.0 mm). These AWC values were summed for all horizons to 90 cm (maximum rooting) or to a zone impermeable to roots (bedrock or fragipan). Horizon nutrient levels (in PPM) were converted to km/ha and summed for all horizons to rooting depth. We found *Quercus alba* site index strongly related to distance to opposing slope or to lake shore ($r = 0.78$, $p < 0.0001$), calcium (lnCa; $r = 0.61$, $p < 0.0001$), slope position ($r = 0.76$, $p < 0.0001$), transformed aspect ($r = 0.66$, $p < 0.0001$), AWC ($r = 0.46$, $p < 0.0001$), and Magnesium ($r = 0.28$; $p < 0.0003$). In stepwise multiple regression, these variables accounted for 90% of the variance. It appears that the soil reservoir and topography (microclimate) have an equally important influence on growth.

- 195 GIUNTA, ANTHONY JR.* AND DANNY J. GUSTAFSON. The Citadel—Evaluating spatial genetic structure of an endangered dioecious shrub (*Lindera melissifolia*) in South and North Carolina.

Lindera melissifolia (Walt) Blume is an endangered perennial dioecious clonal shrub that occurs in seasonally flooded wetlands located in 1 – 4 counties in eight states (AL, AR, FL, GA, MO, MS, NC, SC). Microsatellite genetic markers were used to determine the number of genetic individuals within and among populations in North and South Carolina. All populations showed extensive genotype clones, with two to six genotypes per SC populations and 16 to 17 genotypes in the two NC populations. The NC populations were larger, had male and female flowering plants, and multiple genotypes of both sexes within each population. Some SC were as large as the NC populations, however no female flowering plants were observed, there were few genetic individuals, and these few genotypes formed large single genotype stands. Coupling the lack of genotypic diversity and the potential to have single sex populations, as evident by only male flowers observed in the SC sites, seems to indicate that sexual reproduction in many of the SC populations will not likely occur without some type of introduction of known female plants.

- 196 SCOTT, GERALD R., AND BRIAN C. McCARTHY. Ohio University—Vegetation differences between stands infested with *Ailanthus altissima* (P. Mill.(Swingle) and those that are uninfested in Southern Ohio mixed oak forests.

Prevailing thought has generally relegated *Ailanthus altissima* (Tree-of-Heaven: TOH) to highly disturbed, urban plant communities, but recent investigations have shown the ability of TOH to colonize interior forestlands as well. The 42,097 ha Ironton District of the Wayne National Forest, a third-growth mixed-oak forest in southern Ohio, provides an excellent opportunity to analyze patterns of TOH colonization and broader vegetation effects. TOH invasion has been exacerbated by the fragmented nature of this forest interspersed with many private landholdings, in addition to disturbance from logging and a 2004 ice storm. These factors have led to TOH colonization. Twenty-five sets of paired 10 x 25 m Whittaker plots were established in late spring of 2007 to analyze differences in vegetation composition between infested and adjacent, non-infested control sites. Each pair was sited in similar forest vegetation of similar age and composition, slope, aspect and elevation to minimize variation. Vegetation data for trees, saplings, woody shrubs, seedlings, and forest herbs was collected in late July/early August of 2007. Tree data was gathered from the 10 x 25 m plot, sapling/shrub data was collected from two 5 x 5 m subplots, and seedling/herbaceous data was collected from ten .5 x 1 m subplots within each Whittaker plot. Initial data analysis has shown that the TOH-infested plots on average are similar in number of trees (535 stems/ ha v. 565 stems/ ha), but have almost

5 times more saplings (1010 stems/ ha v. 236.66 stems/ ha) than their adjacent, uninfested counterparts. Furthermore, it appears there may be a negative correlation between forest herb density and basal area of TOH.

- 197 HERALD, DOUGLAS, AND RAYMOND PETERSEN. Howard University, Washington, DC—The role of Diptera larvae in controlling *Euglena* concentrations in the pitchers of *Sarracenia purpurea* L.

Field studies revealed that high concentrations of *Euglena* were found in the phytotelmic communities of a *Sarracenia purpurea* population in which the pitcher-plant specific Diptera larvae of the mosquito *Wyeomyia smithii* and the chironomid midge *Metriocnemus knabi* were absent. Conversely, a pitcher plant population in which these larvae were present had low concentrations of *Euglena* and algae, in general. *In vitro* experiments demonstrated that the pitcher-plant mosquito and midge larvae suppressed the growth of *Euglena*. The *Euglena*-concentration in the control treatment, in the absence of larvae, rose from near zero to 100,000cells/mL after 14 days. By day 28 it exceeded 300,000 cells. When only *M. knabi* midge larvae were present the *Euglena*-concentration rose to 70,000cells/mL by day-14 and to 200,000 by day 28. When the larvae of the mosquito *W. smithii* were present, either by themselves or together with *M. knabi* larvae, the *Euglena*-concentration remained below 10,000cells/mL. Microscopic inspection of *M. knabi* midge larvae and *W. smithii* mosquito larvae revealed that, in the presence of *Euglena*, their guts turned green. Based on the findings of this combined field and laboratory study, it is concluded that the larvae of the pitcher-plant specific mosquito and midge suppress the growth of *Euglena*, and by inference algae in general, by feeding on them. By doing this, these larvae prevent algae from overwhelming the pitcher-plant phytotelmic community and thus play a critical role in maintaining the health and integrity of the inquiline community of the *S. purpurea* phytotelms.

- 198 DEVINEY, DAVID E., JASON HARKEY, JOHN HARKEY AND HOWIE NEUFELD. Appalachian State University—Influence of trichomes on the spectral characteristics of leaves on the purple velvet plant (*Gynura aurantiaca*) in the visible and near-IR wavelengths.

Trichomes can reflect and scatter light, and reduce the amount of radiation absorbed by a leaf. Lower absorptances can allow a leaf to maintain a lower leaf temperature, and to better avoid photoinhibition. Trichomes can also reduce transpirational water loss by their ability to increase the thickness of the boundary layer. Most studies of the spectral qualities of trichomes have focused on plants with silver to white trichomes, which do effectively reduce leaf radiation loads. We studied the purple velvetleaf plant (*Gynura aurantiaca*), which has deeply purple trichomes, and asked the question, do these purple trichomes function similarly to silver/white trichomes? We addressed this problem by comparing spectral curves obtained with a spectroradiometer on intact leaves, and on leaves where we shaved off the trichomes. Contrary to our expectations, trichome removal increased leaf reflectance and transmittance in the visible and near-IR wavelengths, resulting in decreased absorptance. This suggests that the pigmented trichomes in this species do not function to reduce light stress, but more likely contribute to high water use efficiency by increasing boundary layer resistances and lowering water loss from the leaf or possibly function as a deterrent to insect herbivores. Further research is needed to fully understand the ecological significance of these colored trichomes.

- 198A FLOYD, ROBERT H. AND ROBERT E. CARTER. Jacksonville State University—Plant community analysis of Thunder Scout Reservation and nearby Sprewell Bluff, Upson County, Georgia.

Plant communities were identified in the Pine Mountain Region of Upson and Talbot Counties, GA through ordination and cluster analysis. These included longleaf pine-turkey oak, post oak-mockernut hickory, longleaf pine-post oak, longleaf pine-heath, chestnut oak-sand hickory, and yellow-poplar-sweetgum. Environmental variables significantly related to the plant communities were identified through discriminate analysis. Abiotic variables also considered include slope percent, aspect, slope position, A-horizon depth, B-horizon depth, landform index, soil texture, and chemical analysis.

Plant Systematics III

- 199 MCKINNEY, LANDON¹ AND LELA MCKINNEY². ASC Group, Inc.¹ and Erlanger, Kentucky²—The Violaceae of the Great Smoky Mountains National Park.

A study was completed on the Violaceae of the Great Smoky Mountains National Park. Objectives were to update the taxonomy and nomenclature in line with current treatments, and additional fieldwork was accomplished to further document populations of all violets throughout the park especially those considered rare or historic in nature. Currently, there are 22 species, three varieties, and one hybrid from confirmed occurrences. This survey documented 85 populations of violets in the park at 32 different sites in Sevier and Blount counties, Tennessee and Swain County, North Carolina. Three new violets documented for the park were *V. sagittata* var. *ovata*, *V. sororia* var. *missouriensis*, and *V. subsinuata*. *Viola tripartita* was originally considered to be part of the park's flora; however, after annotating the existing collections, it was discovered these locations for this species were actually outside of the park boundary. *Viola pubescens* var. *pubescens* was known to occur in the park but since existing collections were made prior to 1940 and it was not encountered during this study, its occurrence in the park is now considered historical. Taxa considered rare in the park include *Hybanthus concolor*, *V. lanceolata*, *V. primulifolia* var. *primulifolia*, *V. sagittata* var. *ovata*, and *V. walteri* var. *walteri*.

- 200 DALEY, DANE¹, PAUL THREADGILL¹ AND DWAYNE ESTES². Maryville College¹ and Austin Peay State University²—The *Asarum canadense* (Aristolochiaceae) complex in Tennessee.

Asarum canadense (Aristolochiaceae) is a perennial herb common to mesic temperate forests throughout much of eastern North America. Most current taxonomists consider *A. canadense* to be a single variable species, but some have recognized a single species with multiple varieties, and still others have considered these varieties to be distinct species. The status of these segregates still remains unsettled. These segregates have largely been recognized by the size, shape, and orientation of the calyx lobes, features that are often obscured, modified, or damaged during herbarium specimen preparation, making it difficult or impossible to interpret variation in floral features using herbarium specimens alone as many former taxonomists have done. Resolution of the taxonomic status of these segregates has also been hampered by the species' large range. For this study, we examined morphological variation in *A. canadense* sensu lato in eastern Tennessee, a region where three of the segregates of *A. canadense* have historically been recognized. For this investigation, we examined herbarium specimens at the University of Tennessee Herbarium (TENN), the Austin Peay State University Herbarium (APSC), and the Missouri Botanical Garden Herbarium (MO). We also studied living plants from 13 natural populations in 10 Tennessee counties. Our observations of living plants combined with the examination of herbarium specimens and morphometric analyses provide compelling evidence supporting the recognition of three taxonomic entities in Tennessee. However, we acknowledge that a thorough systematic investigation of the *A. canadense* complex, across the range of the species, should be conducted before formal taxonomic changes are made.

- 201 MUSSELMAN, LYTTON J. AND J. F. BOLIN. Department of Biological Sciences, Old Dominion University—Branched broomrape, *Orobanche ramosa* (Orobanchaceae), in the Southeastern United States.

In May 2007 we located a population of the branched broomrape, *Orobanche ramosa* at a vacuuming station in a car wash in urban Norfolk. This is the first report in the region of this serious parasite of such agronomic hosts as tomato, potato, cabbage, eggplant, tobacco, and various legumes. Sustained populations of branched broomrape are extant in California and Kentucky and the parasite has been introduced at seaports in the Northeast. Botanists and agricultural workers should be aware of the possibility of spread of this important pathogen. The taxonomy of *O. ramosa* and related taxa often confused with it will be discussed as well as a review of introduced broomrapes in the United States.

- 202 BRANNON, JEFFREY M. AND JOHN B. NELSON. The University of South Carolina—Vascular plants and landscape inventory of Aiken State Natural Area, Aiken County, South Carolina.

Aiken State Natural Area (=Aiken State Park), administered by the SC Department of Parks, Recreation and Tourism, is comprised of 1067 acres of pristine bottomland forest, dry sandhill pine forest and several artificial and natural wetlands. The park is within the fall-line sandhill province bordering South Carolina's inner coastal plain, and is adjacent to the South Fork Edisto River, a blackwater stream whose headwaters originate in upper Aiken County. This relatively intact area has been protected for nearly 70 years and is easily separable from the surrounding highly disturbed landscape, which is dominated by farmland. Aiken County, one of the largest in South Carolina, is well known for its diverse flora. It is our intention to provide the park personnel with a better understanding of the local flora that will in turn assist them in addressing plant-related management. Cyperaceae, Poaceae, and Fabaceae are especially well represented. Collecting trips began in June of 2007 and will continue through May of 2008. All specimens will be housed in the A.C. Moore Herbarium. This project was funded in part by the Stephen L. Hester Scholarship for undergraduate biology study at USC.

- 203 CELY, WILLIAM E. AND JOHN B. NELSON. University of South Carolina—A survey of the vascular flora of Sesquicentennial State Park, Richland County, South Carolina.

Sesquicentennial State Park was created by the Civilian Conservation Corp in 1930's and occurs in the sandhill province of South Carolina, in the north-central part of Richland County. Within its 1419 acres is a diverse assemblage of natural communities, including xeric sandhill scrub, mesophytic forests, and a black water creek that is impounded in the center of the park. A year-long survey of the vascular flora of the park was begun in May 2007. A total of 280 species have been collected to date. The study area includes populations of the increasingly rare *Ceratiola ericoides* and *Chamaecyparis thyoides*. On upland sites, historic disturbance and a relatively prolonged absence of fire have changed the dominant woody species from *Pinus palustris* to *Quercus laevis*. This project has been supported in part by the June Trapp Swanson undergraduate scholarship at USC.

- 204 BARGER, T. WAYNE, BRIAN HOLT, AND JOHN TRENT. State Lands Division, AL-DCNR—Preliminary Survey of the Vascular Flora of the Indian Mountain Forever Wild Tract, Cherokee County, AL.

The Indian Mountain Tract, located in Cherokee County, Alabama, is a relatively small (240 ha), contiguous tract that was purchased by the State of Alabama Forever Wild Program in separate parcels in September 1998 and December 2001. The tract lies in

east-central Alabama, 24 km southeast of the county seat, Centre, AL. The tract is managed by the Alabama Department of Conservation and Natural Resources with an emphasis on hiking/recreational uses, habitat management and small game hunting. Due to a lack of biological surveys on the tract and within the county, little is known of the biodiversity of Cherokee County. For this study, the vascular flora of the Indian Mountain tract was surveyed intensively beginning March 2007. As of the deadline for this abstract, 328 plant specimens had been collected, identified, verified and repositied in the herbarium at the Anniston Museum of Natural History. Thus far, 230 genera from 91 families have been collected from the tract. Asteraceae was found to be the largest family with 58 species collected. Poaceae and Fabaceae were the next largest families with 20 species each. *Quercus* was the largest genus represented with 10 taxa.

- 205 MCINTOSH, AMY V. AND RONALD L. JONES. Eastern Kentucky University—The vascular flora of Kentenia State Forest additions (Greene, Cupp and Golden Tracts), Pine Mountain, Kentucky.

Four tracts of land totaling 351 ha on Pine Mountain in Harlan and Bell Counties (southeastern Kentucky) were investigated for vascular plant constituents during two growing seasons (May 2004-October 2005). These tracts within the Cumberland Mountains section of the Appalachian Plateaus Province are inhabited by mixed mesophytic forest. This study yielded approximately 497 taxa representing 105 families and 283 genera. Constituents of the flora include 29 pteridophyte, six gymnosperm, 366 dicot and 96 monocot taxa. The flora was dominated by three families: Asteraceae, Poaceae, and Fabaceae, accounting for 27.9% of the total flora. A total of 50 species of naturalized or persistent non-native vascular plants were collected, comprising 10.1% of the total flora. Of these, eight taxa are considered to be significant or severe threats to the native flora of the state. No federally threatened or endangered species were observed or collected. However, a total of nine taxa are state listed by the Kentucky State Nature Preserves Commission. These include *Castanea dentata*, *Baptisia tinctoria*, *Cypripedium parviflorum* var. *parviflorum* and var. *pubescens*, *Eupatorium steelei*, *Solidago curtisii*, *Corydalis sempervirens*, *Gentiana decora*, and *Prosartes maculata*. In addition, the collection of *Robinia hispida* var. *rosea* is considered notable.

- 206 McMULLEN, CONLEY K., BENJAMIN A. GAHAGEN AND DOUGLAS W. McPHERSON. Dept. of Biology, MSC 7801, James Madison University, Harrisonburg, VA 22807—Ongoing floristic projects at James Madison University - Edith J. Carrier Arboretum and Smith Creek Restoration Area.

Two floristic surveys, both located in Rockingham County, Virginia, are currently being conducted by students at James Madison University. One survey involves the Edith J. Carrier Arboretum on the campus of JMU. Construction on this arboretum began in 1985, and it officially opened in 1989. The arboretum comprises 125 acres, 87 of which are primarily forested with hickory and oak trees that are believed to have been seeded around 1899-1900. During the first years of the arboretum, thousands of additional plants were introduced, both natives and exotics. Additionally, there is a pond that supports limited aquatic vegetation. No floristic survey of the arboretum prior to the initiation of this study (2007) has been conducted. The second floristic study involves the Smith Creek Restoration Area, which is located at the base of Massanutten Mountain in northeastern Rockingham County. This section of land had been abandoned after approximately 200 years of agricultural use, and was recently made available by its owner for an agricultural site restoration project. Trees have been planted to provide shade for Smith Creek, in the hopes of lowering the water temperature and bringing back native brook trout. The plants of this site are typical of an old meadow, and still lack any substantial amount of mature trees. The purpose of the research described here is to catalog the flora of the area, which

will be part of a larger project to monitor and document the restoration progress. Results of these surveys to date will be described.

- 207 JONES, RONALD L. AND HUMBERTO JIMENEZ SAA. Eastern Kentucky University, Richmond, KY, and Tropical Science Center, San Jose, Costa Rica—Plant life of *Los Cusingos* neotropical bird sanctuary and the Valle del General, Costa Rica.

From January to May, 2007, a botanical survey was conducted at a 77-hectare bird sanctuary in the Valle del General in southwestern Costa Rica. *Los Cusingos* is operated by the Tropical Science Center, in San Jose, which encourages research in a variety of fields on their properties (including the Monteverde Cloud Forest). It is the former home and farm of Alexander F. Skutch, who was widely known for his many studies of tropical birds. The main objectives of this study were to conduct a basic inventory of the vascular plants, especially the lianas, epiphytes, shrubs, and trees. Specimens were collected and processed for depositing in herbaria, and digital images obtained for most species. Nearly 450 sets of specimens, collected in quadruplicate, were processed. Using available keys, other references, and the National Herbarium in San Jose, about 250 different species in 100 families were identified. Identification efforts are continuing for about 100 other sets of specimens. Families with the most species were: Fabaceae (~30), Melastomataceae (~25), Rubiaceae (~15), and Clusiaceae (~15). Genera with the most species were: *Miconia* (~12), *Psychotria* (~8), *Clusia* (~6), and *Piper* (~6). A total of 175 new district records were documented. *Los Cusingos* is part of a network of preserves run by the Tropical Science Center and formally established in the year 2000, with the goal of conserving tropical forests, providing environmental education, research opportunities, natural resources protection, environmental services, and ecological tourism.

Herpetology II

- 208 BUHLMANN, KURT A.¹, DENO KARAPATAKIS^{1,2}, THOMAS B. AKRE^{1,3}, JOHN B. IVERSON⁴, AND J. WHITFIELD GIBBONS¹. Savannah River Ecology Lab¹, Savannah River National Laboratory², Longwood University³ and Earlham College⁴—A global analysis of tortoise and freshwater turtle distributions with identification of regional priority conservation areas.

We compiled museum and literature occurrence records for all of the world's tortoises and freshwater turtle species. Verified locality points were correlated with GIS-defined hydrologic unit compartments (HUCs). We constructed "projected" distribution maps for each species by selecting additional HUCs that connected known point localities in the same watershed or physiographic region, and similar habitats and elevations as the verified HUCs. A total of 305 species were recognized for this analysis and assigned to one of seven geographic regions of the world. In only two areas of the world did as many as 18 species co-occur in individual HUCs. Patterns of global species richness were determined and compared to existing large-scale conservation strategies. Of the 34 recognized Biodiversity Hotspots, 30 contain turtles and 221 species occur within them; 75 species are considered endemic. All five major Wilderness Areas contain turtles (86 species), and 17 are endemic therein. Smaller wilderness areas collectively contain 94 species, with 1 endemic. However, 116 turtle species have either more than 50% of their projected ranges outside of these three conservation strategies collectively or do not occur in them at all. For these remaining species we identify priority Ecoregions that should receive conservation consideration in order to assure that all 305 species fall under a large-scale conservation umbrella.

- 209 CLINE, GEORGE, CHRIS EDMONSON, AND ROBERT CARTER. Jacksonville State University—Analysis of southeastern herpetological communities: snakes.

In this study, we examine the snake communities of 23 sites in the southeastern United States. All species lists were taken from published manuscripts, or from unpublished projects with the approval of the researchers. Taxonomic changes that have been made since these papers were published have been corrected here when possible. Thirty-eight species were recorded from these sites. Of these, six species were venomous (Viperidae or Elapidae). Species richness ranged from 2-22 species present. Nine sites had 16 or more species, 9 sites reported 7-13 species, and 5 sites reported only two species. Most species were rarely reported (occurring at 6 or fewer sites), 12 species were more common (occurring at 8-12 sites), and 4 species were mostly common (occurring at 14-19 sites). Distribution patterns were analyzed using cluster analysis and detrended correspondence analysis.

- 210 PAWLIK, KATHRYN R. AND THOMAS K. PAULEY. Marshall University—West Virginia streamside salamander guilds and environmental variables.

Amphibian distributions are greatly influenced by environmental variables, due in part to their semi-permeable skin which makes them susceptible to both desiccation and toxin absorption. This study was conducted to determine which streamside salamander species occurred together and how environmental variables affected their habitat choices. One hundred sixty streams were surveyed in West Virginia during the summer of 2007. At each site, I established a 10 m² quadrat around a central aquatic habitat. While surveying, I looked under natural cover objects and set funnel traps in streams for overnight passive collecting. I recorded snout-vent lengths, total body lengths, sex, and life stages of captured animals. Environmental data, including water pH; water, soil, and air temperature; and relative humidity, were collected to assess habitat specificity. Eight streamside species (*Pseudotriton ruber*, *Desmognathus fuscus*, *D. ochrophaeus*, *D. monticola*, *Eurycea bislineata*, *E. cirrigera*, *E. longicauda*, and *Gyrinophilus porphyriticus*) were commonly encountered in various combinations. Population densities varied from 0.14 m² (*E. longicauda*) to 0.6 m² (*D. fuscus*). *D. monticola* individuals were significantly farther apart (525 cm, P<0.05) from each other than most other combinations of individuals, both within and among species. *E. bislineata* were most often found to be the closest (238 cm, P<0.05). Environmental tolerance ranges overlapped; however, *D. fuscus* and *E. bislineata* were the least specific in their environmental preferences while *E. cirrigera* was the most selective. Habitat characteristics appeared to play the most significant role in determining species composition; however, environmental variables are important determinants that should continue to be considered.

- 211 PICCININI, FRANK AND THOMAS K. PAULEY. Marshall University—The power of observations: case studies from a monitoring protocol for ambystomatid salamanders.

Some of the most useful literature and contributions for planning of research have not been quantitative but strictly observational. Observations from different spatial and temporal extents spark research ideas and provide insights for data interpretation. With this in mind, we discuss observations that were most useful to us, and present observations from the field. Some observations from this project include the temporal aspects of ambystomatid migration, notable patterns of ambystomatid migration, an unusual habitat association for spadefoot, *Scaphiopus holbrookii*. If these observations are consistent in different spatial or temporal extents, then they are extremely important for the conservation of a wide variety of wildlife.

- 212 O'KELLEY, JEFFREY J¹., BENJIE G. BLAIR² AND CHRIS MURDOCK³. Jacksonville State University—Analysis and classification of intestinal microbiota of *Plethodon glutinosus* (the slimy salamander) by 16S RNA sequencing.

Although there have been many studies conducted where intestinal microbiota of various vertebrates has been examined using conventional culture methods and 16S ribosomal DNA sequencing, no research has been conducted with Caudata, especially Plethodontidae. Many studies involving the classification and distribution of intestinal symbionts and digestive fermentation have been conducted with amphibians and reptiles, but there has been very little current research concerned with the classification and distribution of amphibian intestinal microflora. Some of the current research involves digestive fermentation experiments primarily in herbivorous reptiles where it has been shown that fermentation is taking place in the large intestine resulting in the production of multiple short chain fatty acids (SCFA). Microbiota and the presence of various gut symbionts are believed responsible for fermenting such material as plant tissue, insect exoskeletons and producing the SCFA that are in turn used for energy by the animal. No research has been conducted where the specific population groups of intestinal microbiota have been classified that are responsible for SCFA production in these vertebrates. This research has classified over 35 bacterial species that reside in the gut of *Plethodon glutinosus* (Slimy Salamander). Approximately 40% of the cloned sequences belong to the Bacteriodes/Clostridium group, and the remaining 60% comprising species such as *Escherichia coli*, *Pedobacter sp.*, *Ruminococcus sp.*, and *Eubacterium sp.* Four sequences were not related to any other bacterial species. This is the first account of the classification of intestinal microbiota for *P. glutinosus*.

- 213 BALDWIN, TIMOTHY E¹. AND THOMAS K. PAULEY². Alabama A&M University¹, Marshall University²—Habitat selection of rough greensnakes and smooth greensnakes (*Opheodrys aestivus* and *Opheodrys vernalis*) in West Virginia.

In West Virginia, Rough Greensnakes are a species of concern with occurrences declining to under one hundred within the last ten years, while Smooth Greensnakes populations are secure. The objective of this study was to determine why Smooth Greensnake populations have stabilized, while Rough Greensnakes are declining. This analysis compared Rough and Smooth Greensnake habitat and potential reasons for distribution differences. I predicted that elevation and land-use type would be variables that distinguished Rough and Smooth Greensnake habitat. Historic sites from the West Virginia Biological Survey at Marshall University were cross referenced with habitat descriptions in journal articles to determine suitable habitat. Visual encounter surveys were conducted at forty three sampling sites during the summer of 2006. Forty one Smooth Greensnakes and ten Rough Greensnakes were captured. During the surveys gps coordinates, climate, and habitat data were collected. Using ARCGis 9.2, macrohabitat variables such as aspect, slope percentage, and elevation were compared. Habitat and climate data were referenced using historic records for twenty one Rough Greensnakes and fourteen Smooth Greensnakes. A principle components analysis (PCA) and a binary logistic regression were conducted to determine habitat differences between Rough and Smooth Greensnakes. In this analysis relative humidity, temperature, and elevation were found to be significantly different between the greensnake species ($p < 0.01$). Elevation and climate variables appear to affect the distribution of both greensnake species. The data suggest that habitat preference may explain population structure differences.

- 214 SCHNEIDER, AMY AND THOMAS K. PAULEY. Marshall University—A continued study of the use of created ponds for amphibian breeding in fragmented forested areas.

Amphibian populations are declining worldwide due to factors such as habitat degradation, fragmentation and destruction. A study was conducted to explore the use of created ponds in a forested habitat by breeding amphibians, specifically *Rana sylvatica* and *Ambystoma maculatum*, as potential conservation tools. The objectives were to examine the movement of these animals after leaving the ponds, to estimate juvenile survival, to compare species diversity between created and natural pools and to look at fragmentation affects on these species. Nine ponds were constructed in December 2003 in the MeadWestvaco Wildlife Ecosystem Research Forest in Randolph County, West Virginia. Three fragmentation treatments were created in all compartments in August 2006; (1) clear-cut to one hectare surrounding a pond, (2) clear-cut to one hectare surrounding a pond with a forested corridor, and (3) no treatment. Drift fences with funnel traps surrounded each pond to monitor amphibian movements. *R. sylvatica* adults were fitted with radio transmitters and tracked for ~35 days to determine movements after leaving the ponds. Amphibian surveys were conducted at nine natural ponds to compare species diversity to these created pools. No amphibians bred in the ponds in 2003, therefore the ponds were stocked with *R. sylvatica* and *A. maculatum* egg masses from nearby permanent populations. Thirty *R. sylvatica* juveniles and three *A. maculatum* juveniles emigrated from the ponds in 2005. Only five *R. sylvatica* and no *A. maculatum* juveniles emigrated from the ponds in 2006. Forty-nine *R. sylvatica* and no *A. maculatum* juveniles have emigrated to date in 2007.

- 215 BALLENGER, JARED J., LAUREN M. HORTON, WILL W. REID AND MELISSA A. PILGRIM. University of South Carolina Upstate—Assessing the use of artificial structure in a fragmented landscape: herpetofauna as a case study.

As habitat fragmentation increases due to urbanization and/or agriculture, the likelihood of remaining habitat patches being able to support viable animal populations decreases. Herpetofauna are model organisms for studying the impact of habitat fragmentation on animal populations, as they are relatively easy to sample and often rely on more than one habitat type for population persistence. We discovered an abandoned homestead on our campus and completely encircled the homestead with a drift fence. Our objectives with the drift fence study were to (1) inventory and monitor local herpetofauna, (2) assess the use of the homestead as a rookery site and (3) assess the use of the homestead as a hibernaculum. Between 4/25/07 and 11/15/07 we captured 473 animals, representing 9 reptile species and 7 amphibian species. Interestingly, the *Agkistrodon contortrix* (Copperhead) and *Thamnophis sirtalis* (Garter Snake) we captured during the summer were all gravid and entering the homestead site. Thus, data we collected this summer supported our hypothesis that artificial structure provided by the homestead may be used as a rookery area for some herpetofaunal species. In addition, 8 of 10 snakes captured in late fall (9/26 – 10/26/07; represented the last month of snake activity at the fence) were entering the homestead site. Thus, data collected during the fall supported our hypothesis that artificial structure provided by the homestead may be used as a hibernaculum area for some snake species.

- 216A LUHRING, THOMAS M. Savannah River Ecology Laboratory, Odum School of Ecology, University of Georgia—Population ecology of greater siren (*Siren lacertina*) and two-toed amphiuma (*Amphiuma means*).

We have, at best, a basic understanding of the life histories of the permanently aquatic "giant salamanders" of the southeastern Coastal Plain (Amphiumidae and Sirenidae). The role that *Siren* and *Amphiuma* play in wetland ecology is also poorly understood. What we do know from previous studies is that *Siren* and *Amphiuma* can attain substantial biomass (233 g/m² and 44 g/m², respectively), influence keystone predators such as eastern newts (*Notophthalmus viridescens*) and prey on consumers such as crayfish and snails. I

conducted a mark-recapture study at Dry Bay, a 5-ha Carolina bay in South Carolina, from September 2006 to September 2007. Monthly capture sessions consisted of 10 consecutive nights of sampling with a variety of traps. A robust design was used for the first and last four months of the study to permit population analysis with program mark. Preliminary estimates at Dry Bay indicate a much more conservative estimate of biomass and densities of greater siren (1.71 g/m^2 and $0.0058 \text{ salamanders/m}^2$) and two-toed amphiuma (0.365 g/m^2 and $0.0022 \text{ salamanders/m}^2$) than previous studies. I also present estimates for, survivorship, recapture probability, size classes, individual growth rates, minimum size at first reproduction, and seasonal changes in the average body condition index of individuals within the population.

Symposium III

The Southeast Regional Knowledge Partnership: From Regional Relevance to Global Significance

- 216 COVICH, ALAN P., University of Georgia—Connecting stakeholders views on ecosystem services in the southeast.

Ecosystem services are beginning to help ecologists communicate with a wide range of stakeholders regarding the total values of natural processes. However, translating ecosystem processes such as breakdown of organic matter and nutrient cycling into "goods and services" remains in the initial stages of development. These concepts of ecological values have deep roots in early studies by ecologists in the southeast. For example, the importance of wetlands in processing nutrients was proposed by Eugene P. Odum, Howard T. Odum, Charles Wharton and others in the 1960s and expanded throughout the region in the 1970s. It remains timely to ask stakeholders interested in working to improve environmental quality for their ideas on how to advance better understanding of these types of services. The Ecological Society of America has worked for nearly 100 years to communicate ecological concepts to stakeholders at the national scale. ESA's goal now is to make these connections more effective at regional scales. The recent drought and the likelihood of increasing high frequencies of extreme variability is one example of how ESA and other ecologists can rapidly respond to assist individuals and governmental agencies. There is an immediate need to deal effectively with challenges associated with ecosystem services such as sustaining clean drinking water. Adapting to climate variability and its ecological consequences will be important in the southeast where prolonged and frequent droughts have not usually been issues of persistent regional concern.

- 217 CANCELLED

- 217A LYMN, NADINE. Ecological Society of America—ESA's Rapid response teams: Placing science at the heart of environmental decision making.

In 2005, the Ecological Society of America established its Rapid Response Teams (RRTs), inviting approximately 40 of its members to serve as 'rapid responders' to inform policy and media issues with ecological science. ESA's RRTs enable the Society to weigh in on policy and media opportunities, providing relevant ecological information to the congressional, executive, and judicial branches of federal government. Issues have included biofuels, climate change, Hurricane Katrina, and pollinator ecosystem services. ESA hopes to work with the Society's Southeastern Chapter to launch regional RRTs modeled after the Society's national level initiative.

- 218 SHARITZ, REBECCA R. Savannah River Ecology Laboratory—The future of freshwater wetlands in the Southeastern United States.

Nearly half of the wetlands in the conterminous United States are in the southeastern states. The landscape in this region has been altered dramatically over the past 250 years, and freshwater wetlands have declined more rapidly than estuarine wetlands throughout most of the area. Numerous studies and reports have attributed declines in southeastern freshwater wetlands principally to activities associated with agriculture, forestry and urbanization. The southeast is one of the more rapidly-growing regions of the country in terms of population increases and urban development, and water is likely to become one of its most critical natural resources, as evidenced by severe shortages in this current year. Although knowledge of the ecological functions and values of wetlands to our society, including protection of water resources, has increased vastly in recent decades, many decisions that affect the integrity of wetland ecosystems are made without appropriate application of this information. Indeed, decisions affecting the future of wetland resources often are made in the private sector or by local governments. It is thus imperative that ecologists and wetland scientists work with community leaders and local government officials to bring the best available ecological knowledge into decision-making. The Edisto River Basin project, lead by the Water Resources Division of the South Carolina DNR in the 1990s, is an example of the way in which various stakeholders, including business leaders, governmental officials, and local citizens, can work effectively with environmental scientists to plan for future sustainability of regional resources.

219 CHRISTENSEN, NORMAN L. Duke University—The future of Southeastern forests.

Over the past 200 years, the forest landscapes of the Southeast have witnessed enormous change. By 1860, approximately 70% of land had been cleared for agriculture, and virtually all of the remaining forests were impacted by high-grading and livestock grazing. Between 1860 and WWII, much of this land was reforested to even-aged pine stands. Since 1980, forest cover has been lost in many places, often associated with urban development. The forest (and their associated ecological communities) that remain are undergoing rapid change as a consequence of continued successional change, changes in spatial pattern (scale, connectivity, and contrast), and changes in complexity and diversity. Ninety-five percent of southeastern forest land is privately owned, and the future of these landscapes will be determined by changing human values and demands. Changes in technologies and global wood fiber markets have significantly altered the nature of land ownership and associated management incentives in many places. This has created opportunities for permanent forest conservation, but continued urban development continues to generate demand for forested land independent of its trees. Evolving (and possibly conflicting) interests in forests for biofuels and carbon storage will likely influence forest management in many places. The future of our forests depends on public understanding of the important ecosystem services they provide and consensus around integrated public policies for their stewardship and conservation.

220 WEAR, DAVID N. Southern Research Station, US Forest Service—The Southern Forest Futures Project: Forecasting and sustainability.

The US Forest Service, Southern Research Station and Southern Region, in partnership with the Southern Group of State Foresters, are launching the Southern Forest Futures Project. This effort builds on the Southern Forest Resource Assessment (2002) which identified several forces of change reshaping forests and the potential implications of these changes for economic conditions and ecological services. The Southern Forest Futures Project further examines how these and other emerging factors could reshape forests over the next half century and beyond. The SFFP will focus on forecasting future change and its potential implications for forest ecosystems, their services, and human communities. Completing the SFFP will require a combination of cooperative "visioning" to

define possible future scenarios and interdisciplinary science to evaluate their implications. In order to ensure public relevance and application of the best science, the SFFP will engage communities of interest in natural resources including research, management, and nongovernmental organizations throughout the project. Teams of scientists and analysts will construct forecasts for the region and conduct research and utilize existing knowledge to evaluate ecosystem and community implications of forecasts. Extensive peer review will be employed to ensure that the SFFP represents the best available science and builds the best possible understanding of the potential future for southern forests.

POSTER SESSION I – THURSDAY, APRIL 17

Animal Ecology I

- P1 LOBATO, D. N., C. MORGAN WILSON, AND RENEE D. GODARD. Hollins University—Intermittent incubation and microbial growth on eggs of eastern bluebird (*Sialia sialis*).

Previous research has shown that prolonged exposure of eggs to ambient conditions prior to incubation can reduce egg viability due to pathogenic microbial colonization. However, recent studies suggest that intermittent incubation during egg laying may reduce microbial growth, maintaining egg viability. We investigated patterns of incubation and microbial colonization of eggs in eastern bluebirds (*Sialia sialis*). To determine incubation patterns, we used wireless thermocouples placed in three locations (in the nest, within the nest box, and outside the box) to record temperature every five minutes. Six of the 11 first clutches and the 4 second clutches showed interpretable incubation patterns. Egg shell microbes were sampled daily during morning hours until clutch completion. Our results suggest: 1) all females began intermittent incubation (a positive 1.5°C difference between the nest cup and the top of the nest box) after the first or second eggs were laid in first clutches, while all females began intermittent incubation on the day the first egg was laid in second clutches, 2) the first egg laid in a clutch appears to have more microbial colonization on the day laid when compared to subsequent eggs, 3) microbial growth on eggs appears to decline after 48h in the nest. Our findings suggest that intermittent incubation does reduce microbial growth on eggs prior to full-time incubation. It may be that many bird species classically defined as synchronous incubators actually employ an intermittent incubation strategy to increase egg viability while maintaining a synchronous hatch.

- P2 SESLER, CHERYL L., ROBERT A. CARR, AND H. DAWN WILKINS. University of Tennessee at Martin—Use of TreeTop Peeper™ to investigate cavity succession in a fragmented habitat.

Cavities are a limited resource because only primary cavity users have the ability to excavate cavities. It is advantageous for animals to use and nest in cavities for protection from harsh environmental conditions. By observing cavity succession from primary to secondary cavity users, we gain understanding of competition for cavities and learn how often usurpations occur. Competition increases in fragmented habitats due to exposure to open fields, resulting in competition from both forest and open field species such as European Starlings (*Sturnis vulgaris*). Our goals were to determine the effectiveness of the TreeTop Peeper™ II system and to observe interactions between primary and secondary cavity users in a fragmented habitat. To observe the contents of cavities we used the TreeTop Peeper™ II system which consists of a camera mounted on a 15m telescoping pole. While the TreeTop Peeper is lightweight and easy to use in the field, it is limited to cavities with diameters smaller than the camera and becomes unstable on windy days. During the summer of 2007, we observed a cavity excavated by a Red-bellied

Woodpecker (*Melanerpes carolinus*). The woodpeckers were usurped by European Starlings who were unsuccessful in their breeding attempt. After the starlings, the cavity was abandoned until a pair of Eastern Bluebirds (*Sialia sialis*) successfully nested in the cavity. As we continue this research, we want to look at cavity succession and use this information to build nest webs. We also want to determine if distance from the edge increases competition between cavity users.

- P3 JACKSON, JEFFREY A. AND STEPHEN C. RICHTER. Eastern Kentucky University—Genetic variation and viability of gopher tortoise populations at a military installation in southern Mississippi.

Habitat loss and fragmentation are the greatest threat to nonhuman organisms. Habitat fragmentation reduces and disconnects once continuous habitat and results in patches of preferred habitat surrounded by a matrix of unsuitable habitat. As distance between patches increases, populations may suffer from the effects of geographic isolation. Military installations often provide large areas of continuous land that become surrounded by altered landscapes. Depending on how the land is managed, these sites may provide habitat for rare and endangered species that may not exist otherwise. Gopher tortoises (*Gopherus polyphemus*), which are listed as federally threatened in the western portion of their range, are found primarily on protected public lands. Camp Shelby Military Training Base in Hattiesburg, Mississippi provides a large, protected area of habitat for the tortoises. However, populations have potentially become fragmented due to installation of training and firing points used for tank exercises and lack of proper habitat management. This study investigated tortoise populations across the site using molecular genetic data to estimate population parameters and dispersal among populations. Specifically, twelve microsatellite DNA loci were used to study genetic health of populations with varying distances and features surrounding them. We found relatively low population genetic diversity across the site in that several loci were fixed for certain alleles and others had low allelic variation and heterozygosity. Additionally, we found no relationship between geographic and genetic distance of populations. Further research will incorporate GIS to help explain the pattern of genetic differentiation across Camp Shelby.

- P4 RICE, CHRIS L. AND KIM MARIE TOLSON. University of Louisiana at Monroe—Roost site selection by two Vespertilionid bats (*Myotis austroriparius* and *Corynorhinus rafinesquii*) in a northeast Louisiana bottomland hardwood forest.

Myotis austroriparius (southeastern myotis) and *Corynorhinus rafinesquii* (Rafinesque's big-eared bat) are listed federally as "species of concern" throughout their range of the southeastern United States. A paucity of information exists on either species, but both are known to roost in water tupelo (*Nyssa aquatica*) and bald cypress (*Taxodium distichum*) cavities. Fifty-nine potential roost sites located in cavities of water tupelo, cypress, persimmon (*Diospyros virginiana*), water oak (*Quercus nigra*) and willow oak (*Quercus phellos*) were identified within a 1700 m stream bed in the Upper Ouachita NWR. Cavities have been monitored since 24 May 2007. Forty-one cavity searches revealed that thirty-four cavities (water tupelo and cypress)(58%) have been utilized as roosts for one or both species. *C. rafinesquii* inhabited thirty-three cavities (water tupelo and cypress)(56%) and switched roosts frequently. Fourteen trees were occupied >50% of the time by this species. *M. austroriparius* established more permanent roosts in only six cavities (water tupelo)(10%). On occasion, *M. austroriparius* and *C. rafinesquii* were found sharing roost sites in five cavities. Site characteristics have been obtained for all trees in an attempt to determine roost site preferences for both species. Additionally, mist nets are being used to survey bat species within the study site. Since 2 March 2007, 112 individuals consisting of four species (*M. austroriparius*, *C. rafinesquii*, *Eptesicus fuscus*, and *Lasiurus borealis*) have been captured. Data were collected on gender, weight, forearm length, reproductive

status, and age of all bats. Ambient temperature and time of capture for each individual were recorded.

- P5 TRIERWEILER, ANNETTE AND TRAVIS PERRY. Furman University—Using GIS to characterize cougar (*Puma concolor*) movement and activity for management and conservation.

Cougar (*Puma concolor*) management on the Fra Cristobal range, New Mexico, has become complicated by the introduction of the endangered Desert bighorn sheep (*Ovis canadensis mexicana*) to the range in 1995. Current cougar management is based on the most cost-effective method to diminish sheep predation. As part of a new management strategy, this study analyzed the movement and location of predation events of a collared male cougar on the Fra Cristobal range. From 23 October 2004 to 25 May 2005, the collar collected GPS locations daily at 2 AM, 5 AM, 9 AM, and 12 PM. Cougar movement was statistically greater during the early morning hours as the cougar covered the most distance (km/hr) between the 2-5 AM and 5-9 AM time periods. The average daily distance (km) covered in the spring months were significantly higher than in the winter months (10.23 ± 0.97 and 6.76 ± 0.99 , respectively). Location characteristics (elevation, slope, aspect, topographic roughness, and vegetation type) of cougar points (n=711) were statistically different from the characteristics of randomly generated points (n=711) within the study area, indicating the cougar's preference for areas of steeper slopes, higher elevations and greater topographic roughness. When kill sites were compared to the random points, only elevation differed significantly with kill sites higher than the random points. The results of this study provide data for more detailed cougar habitat modeling of the Fra Cristobal range and are applicable to long-term cougar management.

- P6 RAE, JOHN G. Francis Marion University—Distributional relationships of major taxonomic groups of interstitial lotic animals with one another and their habitats.

Benthic habitats in streams are highly complex, largely because of many interacting environmental factors. Therefore, meiofaunal taxa inhabiting these sediments have a broad array of microhabitats from which to choose as they drift downstream. One objective of this study was to discover if these major taxa, within a single point bar in the Lynches River, South Carolina, tended to form assemblages, or did they segregate from one another. For one year, monthly benthic core samples were taken and sectioned vertically. Fourteen physical parameters were measured for each section of each sample, extracted fauna were identified to major taxon, and data were analyzed by multivariate analysis. A number of taxa, most notably, Tardigrades, Nematodes, and Harpacticoids tended to isolate themselves from the other taxa. A second objective, also through multivariate methods, was to determine which physical parameters were important to taxa in selecting microhabitats. The most significant factors were the physical location (e.g. Distance along the shore and depth in the sediments), current speed, and the proportion of 0.5 mm sediment in the sample. At this one stream site, there was some clear evidence that there was segregation of high level taxa and that physical factors played a role in their separation.

- P7 HOBBS III, HORTON H¹ AND ERIN R. HAZELTON². Wittenberg University¹, Ohio Department of Natural Resources, Division of Natural Areas and Preserves²—The limestone and dolomite cave bioinventory project in Ohio.

The western "half" of Ohio is underlain predominantly by carbonate rocks (limestone, dolomite) and extends from the Bass Islands in Lake Erie south to Adams County. Although limestone and dolomite rocks occur to the east, they are thicker and more continuous in the western half and karst features are developed sporadically and are separated conveniently into seven karst regions. Within these karst areas caves,

sinkholes, and springs occur and harbor a variety of biota, most of which are dominated by insects (terrestrial) and crustaceans (aquatic). Historically very little research has been conducted on Ohio's cave fauna and during spring 2007 a biological inventory project was initiated and supported in part by the U.S. Fish and Wildlife Service. Since that time approximately 90 caves have been sampled using hand collecting as well as a variety of baits and traps. At least 12 state-listed species have been observed utilizing caves and of these, two are troglomorphic, site-specific endemics (the troglobiont beetle, *Pseudanophthalmus ohioensis* Krekeler and the stygobiont isopod, *Caecidotea filicispeluncae* Bowman & Hobbs). A second troglomorphic carabid, *Pseudanophthalmus krameri* Krekeler, was not observed, has not been seen since the 1970's, and likely has been extirpated from its only known locality in Adams County. The stygobiont isopod, *Caecidotea rotunda* Bowman & Lewis, was found in several southwestern Ohio caves (known previously in Ohio from a single cave) and even occurred syntopically with *Caecidotea stygia* Packard. Research will continue in 2008 and data will be used to help protect and manage Ohio's cave ecosystems.

Herpetology I

- P8 PRICE, STEVEN J.^{1,2} AND MICHAEL E. DORCAS². Wake Forest University¹ and Davidson College²—The Carolina Herp Atlas: A citizen-science approach to reptile and amphibian monitoring.

Citizen-science based wildlife monitoring programs are gaining in popularity and have proven to be effective for many species. Yet, few citizen-science programs focus solely on monitoring reptiles and amphibians. The Carolina Herp Atlas (CHA), developed by Davidson College, is an online database that uses observations by citizen scientists to track reptile and amphibian distributions in North and South Carolina. Users of the CHA maintain an online, personal database of the reptiles and amphibians they observe. These data are used to update county-level distribution maps for each species. Other specific features of the CHA include the ability to accurately geo-reference observations, and upload and observe voucher photographs. Since the launch of the CHA in March 2007, citizen scientists, field naturalists, and biologists have provided over 6200 reptile and amphibians observational records from the Carolinas. The CHA has documented distributions for 129 species, including the occurrence of 30 anurans, 37 salamanders, 37 snakes, 10 lizards, 15 turtles, and the American alligator. Several records of amphibians or reptiles considered rare, threatened or endangered by North and/or South Carolina have been contributed to the CHA. Thus far, the CHA represents a significant step towards the development of a better understanding of distributions of reptiles and amphibians in the Carolinas.

- P9 ESKEW, EVAN A.^{1,2}, JOHN D. WILLSON² AND CHRISTOPHER T. WINNE². Davidson College¹, University of Georgia, Savannah River Ecology Laboratory²—Ambush site selection and ontogenetic shifts in foraging strategy in a semi-aquatic pit viper, the Eastern cottonmouth (*Agkistrodon piscivorus*).

Although habitat selection has been studied in a variety of snake taxa, little is known about habitat selection in aquatic snake species. Additionally, due to their small size and secretive nature, juvenile snakes are seldom included in habitat selection studies. The Eastern cottonmouth, *Agkistrodon piscivorus*, is a semi-aquatic pit viper known to use ambush (i.e., sit-and-wait) foraging strategies. Ambush hunters are likely to actively select habitats that increase opportunity for successful prey capture while minimizing predation risk and maintaining optimal thermal and hydric conditions. We characterized the foraging strategy and microhabitat use of cottonmouths at Ellenton Bay, an isolated Carolina Bay freshwater wetland on the Savannah River Site, SC. We collected habitat data on 55

ambush sites used by 51 individual cottonmouths located during nighttime visual surveys, as well as 225 randomly-selected sites within our search area. Cottonmouths exhibited an ontogenetic shift in foraging strategy with juveniles using predominately ambush foraging strategies around the edge of the wetland while adults actively foraged within the wetland. Principal components analysis revealed that juveniles selected foraging microhabitats that were different from random and consisted of mud substrate with sparse vegetation, whereas adults occupied a greater variety of microhabitats that did not differ from random. Additionally, free-ranging cottonmouths exhibited ontogenetic shifts in diet: juveniles consumed mostly salamanders, while adults ate a greater variety of prey including birds and other snakes. Our results highlight the importance of understanding how ontogenetic changes in morphology, diet, and predation risk influence foraging strategy and microhabitat selection in snakes.

- P10 REAM, JOSHUA T. AND A. FLOYD SCOTT. Austin Peay State University—Preliminary observations on habitat preference, movement patterns, and survival of introduced juvenile Alligator Snapping Turtles (*Macrochelys temminckii*) in Fayette County, Tennessee.

We used marked-recapture and radiotelemetry to monitor non-native juvenile Alligator Snapping Turtles, *Macrochelys temminckii*, following release at the Wolf River Wildlife Management Area, Fayette County, Tennessee. Data were collected from May to November of 2007. The turtles exhibited non-random use of habitat, strongly associating with the water's edge, shallow depths, cover objects, moderate canopy cover, and aquatic vegetation. Considerable movement occurred in the days directly following release and fell dramatically thereafter. Two juvenile individuals were captured that were not among the 74 released by us and are suspected to be survivors from an unmarked group released by personnel of the Tennessee Wildlife Resources Agency in 2005. No adults, native or previously introduced, were captured. Future efforts will involve continued trapping and radio tracking of the cohort of study animals released in 2007 plus additional radio-tagged individuals to be released in spring 2008. This work is being supported by the Tennessee Wildlife Resources Agency and Austin Peay State University's Center for Field Biology.

- P11 ROHRBAUGH, LINDSAY¹ AND PAUL V. CUPP, JR.². Eastern Kentucky University—Analysis of physicochemical habitat characteristics and turtle assemblage of two pond size classes in Fayette and Madison County, Kentucky.

Freshwater turtle species in Kentucky have been studied along the Kentucky River and in management areas, but few studies have looked at the habitat and turtle composition of farm ponds located in Kentucky. Physical and chemical characteristics of ponds play an important role in habitat necessary for turtle communities to live. The objective of this study was to determine if physicochemical components of ponds were significantly different in small and large ponds and if that had a possible influence on turtle assemblage. The second objective was to determine if physicochemical measurements and turtle assemblages are different between farm ponds in Fayette County, Kentucky and ponds on the Central Kentucky Wildlife Management Area (CKWMA) in Madison County, Kentucky. Three large and three small ponds were studied at each site. Traps were checked daily and turtles were measured, marked, and released. Physical (vegetation, fish, pond substrate) and chemical (pH, temperature, dissolved oxygen, depth, clarity, nitrites) measurements were taken from each pond during the week of its trapping. Results showed no significant difference for variables tested between site or size, with the exception of pH. Results, however, do show a significant difference in site and size interaction in relation to the numbers of turtles. Fayette County ponds yielded a higher number of turtles in both smaller and larger ponds than Madison County. These results suggest that although there is a difference in turtle assemblage between the two sites, it is not necessarily due to any of the variables tested.

- P12 PITTMAN, SHANNON AND MICHAEL DORCAS. Davidson College—Habitat selection and thermal ecology of the bog turtle (*Glyptemys muhlenbergii*) in a North Carolina Piedmont meadow bog.

The bog turtle (*Glyptemys muhlenbergii*) is a small, freshwater turtle that occurs in isolated populations throughout the mountains and western Piedmont of North Carolina. Fragmentation and alteration of bog turtle habitat resulting from anthropogenic development have led to federal and state protection of this species. Because this turtle commonly occurs in isolated populations, effective habitat management strategies are needed in order to increase the viability of these isolated populations. A detailed understanding of habitat use, movement, and thermal biology of bog turtles will elucidate factors integral in the development of effective management strategies for the bog turtle. We radiotracked 11 adult bog turtles at a Piedmont meadow bog in North Carolina 3 times per week from May 2007- August 2007 and one time per week from September 2007 to February 2008. We attached micro-dataloggers to the carapaces of all turtles to record temperatures at 30-min intervals. We found that turtles preferred wet, muddy areas of the bog but readily retreated to stream beds when the wetland became dry. All but one turtle overwintered in an adjacent stream bed. We describe temperatures of these turtles from May 2007 to February 2008 and using comparisons to environmental dataloggers make inferences about activity times. We found that turtles buried under mud or debris during hot weather in order to maintain body temperatures significantly lower than ambient temperature. Information from this study will be useful in determining critical habitat for bog turtles both during the active season and while overwintering.

- P13 JENDREK, AMORY L., JOY M. HESTER, STEVEN J. PRICE AND MICHAEL E. DORCAS. Davidson College—Seasonal body temperatures of resident and relocated eastern box turtles (*Terrapene carolina*) in North Carolina.

Relocation of eastern box turtles (*Terrapene carolina*) is a conservation measure often suggested to protect populations. After being relocated, turtles must adjust to a new environment and locate appropriate microenvironments for thermoregulation. Our objective was to examine the effect of relocation on body temperatures of 10 resident and 10 relocated eastern box turtles for one year. Because relocated turtles are unfamiliar with the environment, we hypothesized that they would have different body temperatures and experience a wider range of temperatures than resident individuals. We used micro-dataloggers attached to the turtles' carapaces to continuously measure their temperature. During the active season, relocated turtles averaged significantly higher daily average (resident: mean=19.22, SE=0.11; relocated: mean=20.00, SE=0.11), minimum (resident: 15.72±0.12; relocated: 16.63±0.12), and maximum (resident: 25.05±0.17; relocated: 25.59±0.17) temperatures than resident turtles. Resident turtles experienced a significantly greater range of temperatures than relocated turtles (relocated: 9.34±0.16; resident: 8.95±0.16) during the active season. During the inactive season, relocated turtles were again found to have slightly higher daily average (resident: 8.22±0.10; relocated: 8.72±0.10), minimum (resident: 6.83±0.10; relocated: 7.27±0.10), and maximum temperatures (resident: 9.82±0.10; relocated: 10.37±0.11) and experienced a wider range of temperatures than resident turtles (resident: 2.99±0.06, relocated: 3.11±0.07). Knowledge of the effects of relocation on body temperature variation will give us insight into the broader effects relocation on this species and help in the development of more effective conservation measures.

- P14 CONNETTE, GRANT M., STEVEN J. PRICE, AND MICHAEL E. DORCAS. Davidson College—Abiotic factors influencing activity in stream salamanders.

Stream salamanders play important roles in ecosystems and serve as key indicators of ecosystem integrity. Thus, monitoring efforts have been initiated that focus on stream salamanders. Monitoring is most effective when the target populations are active and most detectable. In this study, we sought to determine how environmental variation affects stream salamander activity. Over the course of 2 months we captured stream salamanders in aquatic funnel traps during both day and night trapping sessions. We created models to elucidate the effects of (1) mean water temperature, (2) cloud cover, (3) days since last rain and (4) time of day on total salamander captures, larval and adult salamander captures. We captured over 6 times as many salamanders during night trapping as during day trapping ($p < 0.016$) and also observed increased activity following recent rainfall ($p < 0.007$). Water temperature had a marginally significant influence on salamander activity ($p < 0.053$), with peaks in activity corresponding to intermediate temperatures. Cloud cover alone had no influence on salamander activity ($p < 0.573$). We also found that adults and juveniles varied in their responses to recent rainfall and time of day. Our models suggest that salamander activity may also be triggered by interactions between many of these variables. Ultimately, time of day and recent rainfall probably have the strongest independent influences on observed activity patterns. Where possible, monitoring of stream salamander populations should focus on nocturnal sampling, while rainfall events and temperature should be considered when comparing relative abundances across time or between sites.

- P15 MORGAN, COURTNEY A., DOROTHY H. LLOYD AND DAVID A. BEAMER. East Carolina University—The big picture on tiny salamanders: A phylogenetic survey of dwarf salamanders.

The dwarf salamander (*Eurycea quadridigitata*), perhaps concomitant with its small stature, have consistently been overlooked by systematists. Due to the physical resemblance of one another, all populations of dwarf salamanders have traditionally been viewed as a single species. The recent description of a second species *E. chamberlaini* that was long confused with *E. quadridigitata* suggests a need to carefully examine populations rangewide. We have sampled over 50 populations of dwarf salamanders across their entire distribution (the coastal plain from North Carolina into Texas). In order to reconstruct the evolutionary history of these salamanders we have amplified, purified, and sequenced 1100 bp's of the mitochondrial gene *Cty-b* and 1000 bp's of the nuclear gene *RAG-1*. We have produced a phylogenetic reconstruction using Bayesian Inference, with separate partitions for each gene and codon position. Our results suggest that dwarf salamanders are more speciose than reflected by current taxonomy and as a result we propose to elevate several populations to specific status.

- P16 WILLIAMS, JOSHUA S., CAROL M. BUKER, ALFRED H. KOKWARO, AND STEPHEN C. RICHTER. Eastern Kentucky University—Evolutionary pattern of mitochondrial genome order in amphibians.

Vertebrate mitochondrial genomes typically have 37 genes in a fairly consistent order along the circular molecule. Gene order for most vertebrates follows a standard arrangement with some variation, however, based on existing data, amphibians appear to be an exception in that they exhibit wide variation in mitochondrial genome order. To date, no one has systematically addressed mitochondrial genome order for all amphibians. Thus, our objectives were to (1) describe variation in genome order for amphibians and (2) determine the evolutionary history of the origin of variations by taking a comparative phylogenetic approach. We used bioinformatic methods to gather existing genetic sequence data from an online source (GenBank database). These existing data were collected by other scientists for evolutionary studies of single species or small taxonomic groups of amphibians. We found that only 79 of the 6240 species of amphibians had genetic sequence data for the entire mitochondrial genome. Of the 79 species of

amphibians studied to date, we found that 27 (4 caecilians, 7 salamanders, and 16 frogs) deviate from the standard vertebrate mitochondrial genome order. We supplemented these data with results we obtained in the molecular laboratory for species selected based on obvious gaps in the preexisting dataset. Our results suggest that some of the variations in amphibian mitochondrial genome order are due to single evolutionary events, whereas others are due to independent evolutionary events.

Ichthyology

- P17 SCULL, GREGORY AND MARK MEADE. Jacksonville State University—Hypoxia tolerance of creek chub, *Semotilus atromaculatus*.

Headwater streams in mountainous regions of NE Alabama often contain the creek chub, *Semotilus atromaculatus*, as its sole resident fish. In isolated pools, water quality conditions such as dissolved oxygen content can deteriorate quickly. Hypoxia tolerance in creek chubs and other typical fish inhabitants of NE Alabama streams were examined using a closed-chambered respirometer. At least five fish of each species were maintained at the same temperature for several days before all measurements. Fish were also starved one day prior to measurements to normalize nutritional metabolic status. In a given experiment, a single fish was placed into the respirometer at 100% oxygen saturation (8 ppm). The chamber was then closed and oxygen tensions were monitored until the fish could not consume any more oxygen. At this point the fish was immediately removed from the chamber for recovery. Oxygen consumption rates were recorded on a computer and analyzed using Statview® to determine P_c (critical partial pressure where oxygen consumption begins to conform). Creek chubs maintained oxygen consumption rates until oxygen tensions fell below 1 ppm. Other species, including the tricolor shiner (*Cyprinella trichroistia*) and silverstriped shiner (*Notropis stilbius*), reacted as many fish species and maintained oxygen consumption until dissolved oxygen reached 2 ppm. These data suggest that creek chubs may be more tolerant to hypoxic conditions relative to other minnow species. Hypoxia tolerance may give this species an advantage when occupying transient aquatic habitats such as headwater pools.

- P18 TURNER, JOSHUA, MARK MEADE, AND GREGORY SCULL. Jacksonville State University—Occurrence of holiday darter, *Etheostoma brevirostrum*, in Talladega National Forest.

Shoal Creek in NE Alabama is a contributor to the Coosa River system. The headwaters of Shoal Creek occur in the Shoal District of the Talladega National Forest. The holiday darter, *Etheostoma brevirostrum*, is a threatened species with populations observed in NE Alabama and NW Georgia. Along Shoal Creek, populations of holiday darters have primarily been documented at Pine Glen Campground. Holiday darters have also been recorded in regions where Shoal Creek flows into Choccolocco Creek (which directly enters the Coosa). Surveys of other sites on Shoal Creek have not been reported mainly due to accessibility in this mountainous region of the state. Three remote sites of Shoal Creek were surveyed in June of 2007. Ichthyofaunal surveys were conducted using standard electroshocking and seining techniques. All of the major fish families in this region were observed (for example, Centrarchidae, Ictaluridae, Cyprinidae, Fundulidae, Percidae, Cottidae). Holiday darters were also found at the sites. These sites were approximately 1.5 mi. north, 1 mi. south, and 2 mi. south of Pine Glen campground. In a section of one site, holiday darters were the major fish present with at least 24 individuals observed. This site was particularly dense with aquatic grasses and other vegetation. At present, it is unclear if holiday darter populations exist closer to Choccolocco creek.

- P19 HOLLADAY, CHASE G. AND RICCARDO A. FIORILLO. University of Louisiana, Monroe—Fish assemblage of Sicily Island Hills Wildlife Management Area in central Louisiana.

We will report preliminary data on the fish assemblage of Big Creek which drains the catch basin of the Sicily Island Hills Wildlife Management Area in central Louisiana. We will electro-shock (single pass) four 100m reaches, each including at least two riffle-pool sequences, along this system. At 10m transects along each reach, we will characterize each site's physical attributes by measuring stream width, depth, current velocity, substrate composition, canopy cover and a number of other variables. These sites vary in size, habitat heterogeneity, substrate characteristics, and hydrology. Fishes and environmental parameters will be sampled monthly for one year, but we will report the results of our initial collections and characterize the physical attributes of each site. This study is the first comprehensive survey of the fishes of Sicily Island Hills WMA in 20 years and will also provide an assessment of the status of the central stoneroller, *Campostoma anomalum*, a species listed as imperiled in Louisiana.

- P20 CANCELLED

- P21 MEADE, MARK, AL NICHOLS, AND JENNIFER WALLACH. Jacksonville State University—Mercury along the Coosa River system.

Mercury (Hg) can enter an aquatic environment through several natural or anthropogenic point sources. Atmospheric transport and deposition of Hg from coal-burning power plants is considered a major source of contamination in aquatic systems. Soils from industrial sites in Oxford AL have been documented to contain mercury and other contaminants. Mercury has been also documented in earthworms from these soils and in fish inhabiting small streams near these areas (particularly Snow Creek, a tributary of Choccolocco Creek and the Coosa River). In fish, concentrations > 100 ppm were observed in many minnow and sunfish species. Recent efforts have focused on examining other tributaries of the Coosa River and the Coosa River itself for Hg contamination. It has been hypothesized that Hg may bioaccumulate in the food chain and occur in higher concentrations in larger river systems. Substrate (river bottom) and fish samples were recently obtained from various sites on the Coosa River. Mercury concentrations were determined using atomic absorption (AA) techniques and tissue localization was determined using scanning electron microscopy (SEM). In almost all analyses liver tissue contained the largest concentrations of Hg.

Aquatic Wetland, and Marine Management

- P22 CAMPO, JESSICA M., JACQUELINE D. ROQUEMORE AND ROBERT B. ATKINSON. Christopher Newport University—Floristic analysis of vascular flora in six restored wetlands in Virginia.

Establishment of appropriate wetland vegetation is a common objective in restoration but sometimes difficult to achieve. In summer 2007, six wetland compensation sites of the Virginia Aquatic Resource Trust Fund were investigated. The VARTF focuses site selection on wetland restoration areas within targeted corridors. Sites ranged in age from 3 to 7 years post construction and were 1.8 ha to 49.4 ha in size. Using a class system to estimate colonizing vegetation cover (dominance), we analyzed species richness, conservation values (C-values), and percent native species in 501 randomly established 1-m² plots. The number of species per plot averaged 6.4 (SE +/-0.36, range 5.3 – 7.6) and the number of species per site averaged 62 (SE +/-6.6, range 42 – 89). C-values were based on the Virginia Wetland Plants C-Value List and represent a species likelihood of

occurrence in pristine versus disturbed sites. Based on a 0-10 scale, the average C-value per site was 3.0 (SE +/-0.27, range 2.7 -- 3.2). Percent native species, based on the Atlas of Flora Virginia, averaged 89% (SE +/- 4, range 79-94%). Our estimates of high species richness and low average C-values are similar to those reported in the literature for young restored sites and likely represent a colonization phase in early site development. The dominance of native species may result from favorable site selection practices that (1) prioritize wetland restoration over creation and (2) identify natural corridors in an effort to restore ecological integrity at the landscape scale.

- P23 OGASAWARA, MASAMICHI. Clemson University—Plant coverage and biomass analysis of herbaceous vegetation in South Carolina tidally influenced freshwater forested wetlands.

Tidal fresh water forested wetlands comprise a unique forested wetland condition because of their physiographic position of occupying low lying coastal areas where they are subjected to both upland runoff and tidal flooding. While these systems have received rather nominal scientific attention they are among the most sensitive ecosystems at risk from climate change due to sea-level rise and increased drought or flood frequency. The current study is being conducted at three tidally influenced forested wetlands sites along the Waccamaw River and Turkey Creek. Baldcypress is the dominant tree at all sites, with herbaceous vegetation differing among sites due to variations in elevation, salinity and canopy coverage. Two 20-m transects were established at each of the three study sites. Plant cover was estimated for each species in 1-m² subplots along each transect. Salinity is measured monthly in two salinity wells, while water levels are monitored continuously. Relative elevation was measured along transects. Ten random samples of 0.25 m² were collected from the three study sites for above ground biomass estimation in July 2007. Herbaceous biomass was greatest (716.68g) at the highest salinity site followed by less saline sites which is opposite of total tree biomass on the sites. Chi-Square presence absence analysis was used to examine species differences among the three sites. Nineteen of the 58 species identified showed significant differences among three sites. Regression analysis indicated that only *Murdannia keisak*, *Itea virginica*, and *Iris virginica* plant coverage might be related to salinity differences among sites.

- P24 MEADOR, JEFFREY A. AND ROBERT B. ATKINSON. Christopher Newport University—Success in restoration of a 31-hectare forested wetland: a third party perspective.

A 31-hectare prior converted agricultural field in Virginia was restored to a non-riverine wet hardwood forest, dominated by a mix of hardwood species including hydrophytic oak species. Restoration efforts included the plugging of field ditches, constructing a berm system, planting 44,450 bare root saplings and 9,600 shrubs, and applying an herbicide. At the end of the first growing season (August), Carolina Vegetation Survey methods were employed. All woody stems were identified to species within the 37 10x10m plots and given a vigor code ranging from 0 (dead) to 4 (excellent). Drought conditions prevailed through mid summer and planted stock health was 41% (based on a vigor rating ≥ 2.0) including high survival rates for *Nyssa sylvatica* (73%) and *Quercus michauxii* (73%), but low rates were recorded for *Betula nigra* (22%), *Alnus serrulata* (17%), and *Plantanus occidentalis* (7%). Planted stems averaged 460/ha and colonizing stems (predominately *Acer rubrum* and *Liquidambar styraciflua*) averaged 442/ha resulting in a total average of 902 stems/ha; which is below the year two goal of 988 stems/ha. Vegetation cover for each species was estimated in 111 1-m² nested subplots and hydrophytic vegetation criterion was assessed using a prevalence index value < 3.0 . The mean for all 37 plots was 3.46 and hydrophytic vegetation was met by only 8 plots (22%). The effects of herbicidal treatment and drought were readily apparent, as indicated by total aerial cover per plot of 19.8%, but corrective actions may still be needed to meet year two goals.

- P25 HURLEY, STEPHANIE L., HERMAN W. HUDSON, III, JACQUELINE ROQUEMORE, AND ROBERT B. ATKINSON. Christopher Newport University—The importance of seed sources in restoration of forested wetlands.

Nontidal forested wetlands are the most commonly impacted wetland type in Virginia. Reestablishment of woody vegetation is a common monitoring requirement and establishment is difficult in some sites. In this study, planted and colonized species of trees and shrubs were quantified in 140 ten-m radius plots at 5 restored forested wetlands in Virginia. The distance of each plot to the nearest seed source (forest) was quantified using GIS and compared to woody plant density using linear regression. The percent of each site that complied with woody species density (1 stem per 10-m²) averaged 71.2%. Regressions detected a significant and negative effect of distance from a seed source and woody plant stem density for 2 of the 5 sites ($R^2 = 0.38$ and 0.30 , $p < 0.02$). Dominant colonizing woody species included *Liquidambar styraciflua* and *Acer rubrum*. Stem density of *Liquidambar styraciflua* was negatively related to distance from a seed source ($R^2 = 0.40$ and 0.32 , $p < 0.001$) for 2 of 5 sites, while *Acer rubrum* stem density was negatively related to distance from a seed source at 1 of 5 sites ($R^2 = 0.12$, $p < 0.01$). At a site that was four years post restoration, colonizing species became established as far as 269m from the forest edge. Better predictive models of colonization are needed, but planting strategies should reflect the likelihood of colonization from adjacent sites.

- P26 CANCELLED

- P27 SOOS, ROBERT, PEARL R. FERNANDES, AND JEFFREY STEINMETZ. University of South Carolina Sumter, SC—Water quality monitoring of the Pocotaligo Swamp.

The Pocotaligo River and Swamp is a blackwater river system with its headwaters in Sumter County, South Carolina. The Sumter Waste Water Treatment Plant adds 45 million liters/day of treated sewage into the Pocotaligo Swamp and has plans for further expansion of the treatment plant. We are conducting a long term study on the effects of effluents from the Waste Water Treatment Plant on biological indicators of water quality, including fecal coliforms, macro and micro invertebrate populations; chemical indicators of water quality such as nitrates, nitrites and phosphates; and physical parameters such as temperature, total suspended solids, dissolved oxygen concentration, pH and flow rate. Samples were taken from an upstream (control) site, a site at which the effluent is released, and a downstream site. Our results indicate that fecal coliforms were higher at the site of the effluent as compared to the upstream and downstream sites. There was a positive correlation between fecal coliforms and physical parameters such as pH, total suspended solids and dissolved oxygen levels. The effluent site contained higher micro and macro invertebrate populations when compared to the upstream and downstream sites. Nitrate and phosphate levels were also significantly higher at the effluent site. We conclude that the treatment plant has effects on the water quality of the Pocotaligo River and Swamp. Continuous monitoring for these indicators of water quality as well as a study of other point sources is crucial in order to maintain a healthy ecosystem in the Pocotaligo Swamp.

- P28 STONE, PETER¹, MARIE-THERES GRAF², MARGO SCHWADRON³, MICHAEL ROSS⁴ AND GAIL CHMURA². SC Dept. Health and Environmental Control¹ McGill University² US National Park Service³ Florida International University⁴—Prehistoric disturbances and shifts in southern Everglades plant communities.

Mineral layers within peat sediments of the mid-southern Everglades evidence several types of strong disturbances, ranging from events up to prolonged stages. In some tree-

islands there are what appear to be thick ash layers, while widely in the peat marshes themselves a layer of marsh marl (calcareous silt) represents an extended (~1000 ^{14}C year) shift in sedimentary environment, presumed to be less wet and of sparser marsh compared to the peat-marshes of before and after. On highest parts of many tree-islands (on the "hammock heads") is a very peculiar hard rock-like carbonate (calcrete) layer with soft archeologically-rich humus both above and, astoundingly, below it. The causes of these several types of pronounced sedimentary changes are not yet proved beyond reasonable challenge but the events seem mainly to be severe (deep) peat fires in pre-European times, presumably in drought, and the stages (which may simply be manifestations of a single cause) from a prolonged significant shift in hydrology, presumably under climatic control. A suspected archeological control on the calcrete formation is now challenged by initial evidence more suggestive of caliche-type formation under seasonal aridity. The far northern Everglades show evidence for expansion and retraction of adjacent Lake Okeechobee, implying rainfall changes, though all these shifts occurred long after establishment of the vast Everglades peatland and thus the present overall climatic regime. The natural pre-drainage Everglades of a little over a century ago—being the idealized "target" for today's restoration efforts—had recovered from substantial disturbance before, which lends encouragement to restoration.

Invertebrate Zoology and Entomology

- P29 BRYANT, MATTHEW AND DARWIN JORGENSEN. Roanoke College, Salem VA—The relationship between gill chamber hydrostatic pressure and the gill circulation in the Atlantic blue crab, *Callinectes sapidus*.

Blue crabs (*Callinectes sapidus*) move around underwater both by swimming (using the modified 5th pair of pereopods), and also by walking along the substrate. Blue crabs are known to migrate substantial distances underwater by walking and/or swimming. We are interested in characterizing physiological support of underwater walking. Blue crab gills are located in a pair of branchial chambers (BC) that extend laterally along both sides of the crab's thoracic region. At the exhalant opening of each BC, a ventilatory pump (the scaphognathite) is located. This scaphognathite moves cyclically generating suction that pulls water through the BC. Increased ventilation accompanying underwater walking is driven by increased scaphognathite activity and decreased BC pressure (greater suction). We hypothesized that hydrostatic pressure would be equivalent throughout a BC, both at rest and during periods of walking. We have observed, instead, that pressure is unequally distributed in the BC. During exercise on a submerged treadmill, suction pressure is greater in the posterior region of the BC. We suggest that this greater suction pressure may result in increased transmural pressure across gill hemolymph vessel walls, causing passive dilation of hemolymph vessels in posterior gills, and resulting in unequal hemolymph distribution across a gill set. Hemolymph flow was measured with Doppler flow probes affixed to gill efferent vessels. Measurements were recorded pre-walk, during a 30-min period of walking, and during the post-walk (resting) period. These measurements were compared with the hydrostatic pressure gradient in the BC observed during exercise.

- P30 STANTON, DANIEL AND JULIAN P.S. SMITH III. Dept. of Biology, Winthrop University—Melatonin alters fissioning rate in *Stenostomum virginianum* (Platyhelminthes, Catenulida).

Melatonin, although best known as a "Zeitgeber" in vertebrate chronobiology, also has biological activity in organisms ranging from unicells to humans. In triclad flatworms, melatonin levels have been shown to vary in a circadian fashion (peaking in darkness), and it has been shown that continuous melatonin treatment inhibits asexual fission in at

least two triclad species. Accordingly, it might be expected that melatonin would have similar effects in other members of the Phylum Platyhelminthes. *Stenostomum virginianum* Nuttycombe is a common freshwater catenulid flatworm that reproduces prolifically by paratomic fission under laboratory culture conditions. *S. virginianum* were exposed to melatonin for 8 days at concentrations ranging from 1mM to 0.001mM in conditions of continuous darkness (worms were briefly exposed to light daily during feeding). We found that there was a statistically significant suppression of fissioning rate (as compared to control) by 0.1mM melatonin and by 0.01mM melatonin ($p < 0.05$ in both). Treatment with .0001 mM melatonin did not affect fissioning rate, and treatment with 1mM melatonin was lethal by day six. No significant effect on the number of fission planes/per worm was observed in any of the treatments, suggesting that melatonin may exert its effects on the net production of new cells, rather than on morphogenetic processes. At present, it is unclear whether melatonin acts in *S. virginianum* primarily by down-regulating cell-cycle progression or by up-regulating apoptosis (or by a combination of the two), as both effects are observed in different mammalian tissue-culture systems.

P31 GEISE, JUSTIN J., SCOTT B. FRANKLIN AND JACK W. GRUBAUGH. University of Memphis—Arthropod community composition of native canebrakes—preliminary results.

Native stands of giant cane (*Arundinaria gigantea*) were historically common in the Southeastern United States. Currently, stands of giant cane or canebrakes only occupy <2% of their original area as highly fragmented populations, and are considered a critically endangered ecosystem. To date, there has been very little research on Arthropod communities in canebrakes. This study begins to investigate what species of Arthropods occupy native canebrakes, and if certain species are indicative. We utilized pitfall traps and light traps in canebrakes and adjacent areas without canebrakes to determine matrix dwelling species and cane dwelling species in Southeastern Shelby Co., TN in October 2007. We determined that there were four species found in canebrakes that were not found in adjacent non cane areas: one species of Diptera (flies), one species of Hymenoptera (ant, bees, and wasps), and two species of Araneae (spiders). Species richness was higher in pitfall traps located in canebrakes compared to non cane areas ($P = 0.0028$). However, species richness in light traps in non cane areas was higher. This information is preliminary and more intensive sampling will be undertaken during April-June 2008 and 2009 at multiple sites.

P32 YODER, JAY A. AND JUSTIN L. TANK. Wittenberg University—Long-term tick survival through resistance to infection conferred by an endosymbiotic fungus.

Fungi are commonly used to control tick populations as > 90% of a tick's life is spent off-host, crawling through moisture-rich soil, leaf litter and organic debris containing several molds, many of which are pathogens. The distribution of the American dog tick, *Dermacentor variabilis*, vector of Rocky Mountain spotted fever, is widespread. Unique to this tick is the occurrence of an internal mycosymbiont *Scopulariopsis brevicaulis*, acquired from the mother, that grows in the hemolymph and integumental glands without causing harm to the tick. An ablation-rescue experiment was performed using water balance relationships (vital for tick life off-host) as a tool and internal fungus culturing to monitor the course of infection by a topically applied entomopathogenic fungus, *Metarhizium anisopliae*. When removed of *S. brevicaulis* by glass capillary tube feeding with antimycotic (Amphotericin B), tick death resulted by disrupting water balance. As a pathogenic consequence of *M. anisopliae*, net transpiration rate (0.52%/h) increased 3-fold, infection by *M. anisopliae* was observed through internal fungus cultures, and water vapor absorption was limited (critical equilibrium humidity, CEH = 93% RH). Re-establishment of *S. brevicaulis* back into the tick by intracoelomic injection restored protection: no internal recovery of *M. anisopliae* and water loss rate and water vapor

absorption abilities (0.21%/h, CEH = 85% RH) like controls. Thus, *S. brevicaulis* acts as a deterrent to invasion by *M. anisopliae*. This is consistent with combative strategy in fungal ecology where capturing of a substrate (tick) by one kind of fungus blocks the occurrence of a second fungus.

- P33 RICHARDSON, TERRY^{1,2}, MICHAEL MCCONNEL^{1,2} AND JEFF SELBY². University of North Alabama¹ and AST Environmental Group²—Intrabasin range extensions for two federally endangered snails, *Tulotoma magnifica* and *Leptoxis plicata*.

New locations were documented for two snails listed as endangered by the U.S. Fish and Wildlife Service; the Plicate Rocksnail, *Leptoxis plicata*, listed in 1998 and Tulotoma, *Tulotoma magnifica*, listed in 1991. The Plicate Rocksnail is endemic to the Black Warrior River system in Alabama and was thought to be restricted to 15 shoals in a 30-kilometer reach of Locust Fork all upstream of the U.S. Highway 78 crossing. During a routine presence-absence survey, *L. plicata* was found at two additional shoals downstream of the Highway 78 crossing: one 2.2 (87° 01' 00", 33° 41' 30") and the other 5.6 (87° 00' 30", 33° 39' 20") miles downstream. The rocksnails were extremely abundant at each of these locations. Tulotoma, once thought extinct, is endemic to the Mobile Basin. It was previously known only in Alabama in the Coosa River downstream of Jordan Dam, Kelly Creek in St. Claire County and two streams in Coosa County; the previously known Kelly Creek location was well downstream of the U.S. Highway 231 crossing. A routine biological survey found *T. magnifica* at a shoal immediately downstream of Highway 231 in Shelby County (86° 23' 30", 33° 26' 00"), 3-4 miles farther upstream than previously reported. The snails were found attached to the underside of large rocks, as is their habit. While appropriate habitat was sparse, snails were relatively abundant when present. Each of these findings represents significant new locations and intrabasin range extensions for each of these endangered species.

Ornithology

- P34 MURDOCK, JESSICA H. AND MICHAEL J. YABSLEY. University of Georgia, Warnell School of Forestry and Natural Resources, Southeastern Cooperative Wildlife Disease Study—*Salmonella* spp. and general bacterial growth on bird feeders in Clarke County, Georgia with implications for disease transmission.

Bird feeders are a source of enjoyment for many wildlife watchers. However, they have also been implicated as reservoirs for avian diseases which can be detrimental to wildlife health. Aggregations of birds at a single location increase the chances of disease transmission, and outbreaks have been linked to contaminated feeders or transmission from bird to bird contact while visiting feeders. While research on *Salmonella* spp. has largely focused on birds and fomites in poultry and livestock farms, there is little information about bird feeder contamination. Avian salmonella causes severe disease, with clinical signs ranging from mild, including depression, ruffled feathers, weight loss and discolored droppings, to severe, including blindness and sudden death. This project aimed to survey feeders in Clarke County, Georgia for *Salmonella* spp. by culture analysis. Seventeen feeders were swabbed from eight locations in Clarke County using cotton swabs that were subsequently incubated for 16-18 hours in *Salmonella* selective broth. Media was spread onto XLT-4 agar plates, incubated for 24 hrs, and any bacterial colonies were characterized. One feeder out of 17 (5.9%) showed growth consistent with *Salmonella*, while 9 out of 17 (52.9%) showed other bacterial colonies. These results indicate that bacterial growth on feeders can be highly prevalent in localized areas, and remains a valid concern for transmission to wild populations. The isolation of *Salmonella* on surfaces where birds aggregate further bolsters the concern that contaminated feeders

are adequate fomites for avian salmonella transmission. Future work includes additional sampling and isolating colonies for characterization using PCR.

- P35 PANNKUK, EVAN L. Appalachian State University—Comparative integumentary microscopic anatomy and tensile strength of a color polymorphic species: the eastern screech owl (*Megascops asio*).

The Eastern Screech Owl (*Megascops asio*) is a color polymorphic species, rufous and gray, that exhibits clinal variation. The rufous morph is virtually nonexistent in the northern and westernmost extensions of its range where the gray morph predominates. The rufous morph predominates in humid deciduous areas in the center of their range. While color polymorphism is exhibited widely in birds as well as many orders of animals, there is no apparent explanation for the maintenance of clinal variation. Differences in feather morphology could lead to difference in thermal insulation and physical resistance. To date there have been no studies on the plumage morphology of a color polymorphic bird. This study employed light, scanning, and transmission electron microscopy to investigate the microscopic anatomy of *M. asio* feathers. The tensile strength of contour feather barbs was also measured and the breakage point was imaged with scanning electron microscopy. Transmission microscopy indicates that the coloration of *M. asio* is caused by melanin, eumelanin (gray) and pheomelanin (rufous), which is deposited in the cortex wall of the feather barb. While the rufous morph exhibits lower ventral nodal pigmentation than the gray morph, there does not appear to be a significant difference between gross morphological feather structures. Also, the two pigment variants do not differentially thicken the cortex wall or lead to a difference in tensile strength. The results of this study provide evidence that there are no structured differences between the gray and rufous plumage.

- P36 CANCELLED

- P37 BARRIOS, NICOLE L. AND EDWARD D. MILLS. Wingate University—Vocal adjustments of Pharaoh Quail (*Coturnix coturnix*, X1d1) as a result of anthropogenic noise pollution.

Many different animal groups may experience impaired communications due to anthropogenic noise sources in their environments. Species that depend on particular auditory signals may have those signals masked by noises operating at the same frequencies, or may be unable to receive auditory signals due to high levels of background noise. Pharaoh Quail (*Coturnix coturnix*, X1d1) produce flocking calls whenever new food sources are discovered, so we examined the abilities of Pharaoh Quail to communicate their flocking calls in the presence of high levels of white noise. At the beginning of their normal flocking call, these quail produce a high frequency (~2370 hz, 91 db) sound that falls to a lower frequency component (~1680 hz, ~88db) at its conclusion. After ten days of continuous exposure to white noise (86 db), the Pharaoh Quail adjusted their calls to the noisy conditions. The experimental quail significantly elevated the frequencies of the low-frequency components by 182.3 hz ($p < 0.05$, $df = 87$) and increased the volume by 50.7 decibels ($p < 0.001$, $df = 77$). In addition, the experimental quail increased the frequency of their high-frequency components an average of 330.4 hz ($p < 0.001$, $df = 87$), and amplified these parts by 11.84 db ($p < 0.001$, $df = 87$). This research is the first to demonstrate that simple calls given by *Coturnix* quail may be adjusted for more effective communication as a result of anthropogenic noise.

- P37A HATMAKER, SHANNON. The University of Tennessee at Chattanooga—Effects of exotic invasive vegetation on breeding birds along the North Chickamauga Creek.

Included in Tennessee's rich faunal diversity are 170 species of breeding birds. An important avian conservation effort today involves protecting riparian areas from habitat loss as they often serve as ecological corridors for bird movement and support a large number of species. However, the North Chickamauga Creek riparian forest located in Hamilton County, Tennessee is being fragmented by urbanization. These urban landscapes allow for the invasion of exotic vegetation and the replacement of native species. This project examines the avian community response to exotic invasive shrubs in southeastern riparian forests. Many invasive plant species are present along the North Chickamauga Creek where native vegetation is primarily oak-pine forest. I am examining the effects of exotic invasive vegetation on breeding bird diversity and density, and associated changes in biotic interactions. This is a critical concern for conservation efforts and this research may be utilized to address complex issues of biodiversity and exotic plant management.

Parasitology

- P38 SMITH, ALAN F., LESLIE ALDRICH, LAURA BOWER, MANDY CARTER, KATHRYN CLEVELAND, KIMBERLY JOHNSON AND MARIA KULYA. Mercer University—Detection of the causative agents and prevalence of *Borrelia burgdorferi*, *B. lonestari*, and *Ehrlichia* spp. from individual *Ixodes scapularis* collected from white-tailed deer of the Piedmont National Wildlife Refuge.

In an ongoing study, adult and nymphal ticks, predominantly Southern black-legged ticks (*Ixodes scapularis*) and lone star ticks (*Amblyomma americanum*), were collected from the carcasses of recently harvested white-tailed deer during the 2004 and 2005 prescribed hunts in the Piedmont National Wildlife Refuge (Jones Co. and Jasper Co., GA). Collected ticks were maintained individually at -20°C until ready for processing, a procedure involving genomic DNA extraction and PCR-amplification of diagnostic, disease-specific fragments. Previously, several aliquots of genomic DNA from an individual tick were separately analyzed with nested primers designed for each of the three diseases and a tick-specific control. Consequently, 7-8 PCRs were required to assay each tick. The goal of the current phase of this project was to modify and streamline the original procedure. Primers were redesigned from specific gene sequences: *Borrelia* spp. FLA-I gene (Lyme and STARI); *Borrelia burgdorferi* rOmpA gene (Lyme); *Ehrlichia* spp. 16s rRNA gene fragment; and the *Ixodes* spp. nuclear ribosomal gene cluster (ITS2). Various combinations of primers and temperature profiles were tested to ensure noncompetitive amplification. As a result, we were able to generate multiple size-specific amplicons from different templates within a single reaction mixture. We are in the process of cloning and sequencing the amplicons to confirm their identities. Faculty Research and Development Grants from the College of Liberal Arts, Mercer University provided funding for the project.

- P39 GERHOLD, RICHARD W.¹, M. KEVIN KEEL¹, KIM ARNOLD² AND DOUG HOTTON³. Southeastern Cooperative Wildlife Disease Study, College of Veterinary Medicine, The University of Georgia¹, Maryland Department of Agriculture², and Maryland Department of Natural Resources³—Verminous meningoencephalitis in a Sika deer (*Cervus nippon*). An apparent case of parelaphostrongylosis.

An adult, female, free-ranging, Sika deer (*Cervus nippon yakushimae*) from Wicomico County, Maryland was submitted for postmortem examination. The animal was circling and had no fear of humans when it was euthanized by personnel of the Maryland Department of Natural Resources. There were no gross lesions and the deer was negative for rabies. Microscopic examination revealed lymphoplasmacytic, neutrophilic, and eosinophilic meningoencephalitis with intralesional, adult nematodes, larvae, and

eggs. The nematodes were characterized by a thin cuticle, polymyarian coelomyarian musculature, accessory hypodermal chords, and large multinucleate intestinal cells with a low microvillus border and no more than 2 cells per cross section. These features are consistent with *Parelaphostrongylus tenuis* and related nematodes in the family Protostrongylidae. Inflammation was also present in the optic nerves, pituitary glands, and surrounding connective tissue which contained emboli of larvated and embryonated eggs. To our knowledge, this is the first report of protostrongyle-induced encephalitis in a Sika deer.

P40 CANCELLED

P41 Moved to Abstract #26A

P42 ROELLIG, DAWN M.^{1, 2}, KATHERINE McMILLAN², ANGELA E. ELLIS³, AND MICHAEL J. YABSLEY^{2, 4}. Department of Infectious Diseases, College of Veterinary Medicine, The University of Georgia¹; Southeastern Cooperative Wildlife Disease Study, Department of Population Health, College of Veterinary Medicine, The University of Georgia²; Athens Veterinary Diagnostic Laboratory, College of Veterinary Medicine, The University of Georgia³; D.B. Warnell School of Forestry and Natural Resources, The University of Georgia⁴—Experimental infection of two South American animal reservoirs with distinct strains of *Trypanosoma cruzi*.

Trypanosoma cruzi, causative agent of Chagas disease, is a diverse species with two primary genotypes, Type I and Type II, with Type II further subdivided into five subtypes (IIa-e). Isolates are highly variable and differ in numerous biological characteristics including host range and virulence. This study evaluated infection dynamics of four genetically and geographically diverse *T. cruzi* strains in *Octodon degus* and *Monodelphis domestica*. We hypothesized that *O. degus* (placental) would more readily become infected with *T. cruzi* II than *M. domestica* (marsupial) which would be a more competent reservoir for *T. cruzi* I. Individuals (n= 3) of each species were intraperitoneally inoculated with 1×10^6 culture-derived *T. cruzi* trypomastigotes of Type IIa (North America-raccoon), Type I (NA-Virginia opossum), Type IIb (South America-human), Type IId (SA-triatome), or both Type I and IIa. Infection dynamic differences between species were dramatic; *O. degus* parasitemias peaked earlier (7-14DPI) with a nearly 4-fold higher parasitemia than *M. domestica*. Infections established in both species when inoculated with any strain, except Type IIa, which was not infective to *M. domestica*. Seroconversion as determined by indirect IFA occurred by 14DPI in all animals. One animal in each group was euthanized at 1, 2, and 4 months and major organs were examined for *T. cruzi* and histopathologic lesions. Lesions associated with *T. cruzi* I were more severe with *O. degus* than *M. domestica*. These results indicate that both South American reservoirs support infections with parasites from North and South America; however, infection dynamics differed with host and parasite strain.

P43 SCHOBER, JESSICA, KATE SHEEHAN AND JACK O'BRIEN. University of South Alabama—Effect of the trematode, *Microphallus turgidus*, on growth of the common grass shrimp, *Palaemonetes pugio*, under laboratory conditions.

As part of a study of factors affecting the distribution and prevalence of the trematode, *Microphallus turgidus*, in populations of the common grass shrimp, *Palaemonetes pugio*, in Mobile Bay, it was observed that, on average, large shrimp contained more metacercarial stages of the parasite than did small hosts. One of a number of possible explanations for this phenomenon is that growth of infected hosts is accelerated by the parasite. To test this hypothesis, control (uninfected) and experimental (containing varying numbers of metacercariae) shrimp were isolated in individual chambers in a recirculating

seawater system and maintained on a diet of ground fish flakes. Shrimp were checked daily for molt activity. Cast-off exoskeletons (exuviae) were preserved in 90% ethanol and measured at a later time. Statistical analyses compared molt interval (duration of time between molts) and molt increment (change in size at molt) against pre-molt size for both uninfected and infected shrimp as well as whether the number of metacercarial stages affected host growth.

Developmental Biology

- P44 MEULENERS, CANDICE AND VICTORIA TURGEON. Furman University—PAR-1 activation by SFLLRNP decreases myelin deposition on lumbar motoneuron axons.

Working through protease-activated receptors (PARs), serine proteases have been shown to play important roles in neuronal and glial cell survival during development and in neurodegeneration. Past studies have shown that PAR-1 activation by the serine protease, thrombin, or its tethered ligand, SFLLRNP, during the period of lumbar motoneuron programmed cell death leads to a decreased number of surviving motoneurons by embryonic day 10 (E10). Preliminary observations of thionin-stained spinal cord sections taken from serine protease-treated embryos suggested that surviving motoneuron axons were also lacking myelin. However, thionin staining is not diagnostic. Therefore, we reevaluated spinal cord sections for myelin-deposition using a cupric silver stain, which has been previously used to stain unmyelinated axons. Chick embryos were treated daily with 200 μ L of 100 μ M SFLLRNP (E5-E9), sacrificed on E10, and histologically prepared. Lumbar motoneuron hemispheres were examined for areas of demyelination characterized as punctuate (one missing segment of myelin) or linear (adjacent missing segments of myelin) silver markings in the white matter. Experimental embryos had more punctate markings (Student's t-test; $p=0.0312$) as well as linear markings (Student's t-test; $p=0.0280$) representing gaps in the myelin sheath. Therefore, PAR-1 activation appears to decrease myelin deposition in the developing spinal cord, perhaps by decreasing oligodendrocyte viability which is currently being assessed in our laboratory. Together this information will help us to better understand the consequences of PAR-1 activation involved in development and neurodegenerative diseases.

- P45 CANCELLED

- P46 FROST, EMILY S., ELISE M. BRANCH, C. MORGAN WILSON, AND REBECCA L. BEACH. Hollins University, Roanoke, VA—Teratogenic effects of the pesticide malathion on the development of zebrafish (*Danio rerio*).

Malathion is the most widely used organophosphate pesticide in the United States, with estimates of over 30 million pounds used per year. The overwhelming popularity of malathion is largely due to its relatively low toxicity and short half-life compared to other insecticides. When applied as recommended, malathion toxicity is considered low for birds and mammals, moderate for aquatic life, and high for nontarget insects. Problems arise when malathion is stored improperly and applied frequently with inadequate time to allow for complete degradation. Malathion contamination of surface and ground waters has been measured at levels far exceeding those cited by the EPA as potentially damaging to nontarget organisms. In this study, zebrafish (*Danio rerio*) embryos were exposed to concentrations of consumer-grade malathion and analytical-grade malathion at and above national recommended water quality levels. We observed dose-dependent increases in embryo mortality and reproducible larval deformities, including axial defects and pericardial edema. Initial results indicated that exposure to consumer-grade malathion produced significant increases in mortality in embryos exposed to higher concentrations

(≥ 5.0 mg/L). Significant increases in incidence of deformity were observed in larvae exposed to concentrations as low as 0.5 mg/L. Exposure to analytical-grade malathion resulted in increased mortality and higher incidence of deformity primarily at higher concentrations. These results suggest that exposure to low concentrations of consumer-grade malathion can be especially detrimental in the early stages of development, which emphasizes the need for tougher safety and usage standards for this chemical.

P47 PARIHAR, MANISH, LOGAN CLOESSNER, AND CHRIS R. GISSENDANNER. University of Louisiana at Monroe—Regulation of molting by an ecdysone receptor homolog in *Pristionchus pacificus*.

The free-living nematode *Pristionchus pacificus* is being developed as a genetic model system for studies in nematode developmental evolutionary biology, including the evolution of parasitism. Its genome has been sequenced and thus it possesses the necessary tools for evolutionary studies at the molecular and genetic level. Nematodes belong to the Ecdysozoa, a clade of molting invertebrates that also includes the arthropods. Molting in arthropods is controlled by the hormone ecdysone. The actions of ecdysone are mediated by the ecdysone receptor which consists of two proteins, EcR and USP/RXR. The ecdysone receptor is a transcription factor that regulates gene expression in response to ecdysone signaling. Our recent findings show that genes encoding putative homologs of EcR and RXR/USP are encoded in the *P. pacificus* genome. Ecdysone receptor genes have been identified in filarial parasitic nematodes but not in other free-living species, such as the highly-characterized free-living nematode *C. elegans*. We are exploring the biological functions of the ecdysone receptor homolog in *P. pacificus* using a variety of genomic and genetic approaches. This study represents a new approach towards understanding the functions and evolution of ecdysone signaling in the development of nematodes. Since molting is a critical component of the parasitic nematode life cycle, and since ecdysone has been hypothesized to regulate molting in parasitic nematodes, studies of ecdysone signaling in an experimentally tractable nematode species could be important to understanding an area of parasitic nematode biology that has potential therapeutic importance.

Microbiology

P48 KHAN, RABIA AND PREMILA N. ACHAR. Kennesaw State University—Intraspecies variation in *Aspergillus parasiticus* in peanuts.

Aspergillus species are among the most toxigenic fungi that affects the human food chain. Aflatoxin contamination of peanut is a crucial problem for peanuts producers. Several methods have been developed for the detection of fungal infection in peanuts, unfortunately most of these methods have limitations. Molecular approaches are now being developed to provide a more rapid and objective identification of fungi compared to traditional phenotypic methods. The present study investigates the presence of *Aspergillus parasiticus* in peanuts from commercial outlets and PCR based protocols to establish genetic diversity within population of *A. parasiticus* from different locations in Georgia. For cultural characterization, isolates were transferred onto PDA plates and incubated at 30 °C. After 7 days of incubation, based on morphology and colony character, potential colonies were screened for *A. parasiticus*. Monoconidial colonies were checked under stereomicroscope, subcultured on PDA plates and incubated at 25 °C. In the present study, PCR based protocols was developed to compare the ITS 1 and 2 nucleotide sequences of *A. parasiticus* and determine whether sufficient variability existed for identification at species level. PCR amplification of genomic DNA was performed using universal (ITS)1 and (ITS)4 primers. PCR amplification of ribosomal DNA for *A. parasiticus* from different geographical areas showed a common banding pattern at 550-

600 bp. Genetic variation among strains of *A. parasiticus* was minimal. Restriction digestion of PCR products with specific enzymes and sequencing of the same may give additional information of the molecular relatedness among isolates of *A. parasiticus* in peanuts from different geographical areas.

P49 GALDO, GUSTAVO M. AND PREMILA N. ACHAR. Kennesaw State University—Biochemical changes in Georgia peanut infected by *Aspergillus flavus*.

Aspergillus flavus is one of the fungal species known to produce aflatoxin and is a common contaminant in peanuts (*Arachis hypogea* L.) Host-pathogen interaction leads to biochemical changes and reduction in the nutrient value of peanuts. Protein content was estimated by Bradford method (BioRad) and fluorescence absorbance was measured at the 595 nm wavelength. The soluble protein content in seeds extracts of peanuts was significantly higher in healthy than either naturally or artificially infected with *A. flavus*. Level of soluble proteins in buffer extracts of contaminated seeds decreased with incubation time. Protease activity was higher in artificially inoculated seeds than either naturally infected or healthy. Protease activity also increased with incubation time. Enzyme activity varied from sample to sample. While starch content decreased with incubation time from week 1 to 3, reducing sugars increased from week 1 to 2 of incubation period thereafter concentration of reducing sugar decreased. Amylase activity was lower in diseased tissues either artificially inoculated or naturally infected than healthy ones. However, invertase activity was higher in both naturally and artificially infected than healthy ones. Of all the commercial samples tested, those from Kennesaw showed least concentration of starch and sugar and related enzyme activities in both healthy and infected samples. Changes attributed to host response to infection, contribution by *A. flavus* or due to biochemical alterations that occur naturally during the transition from endosperm to seedling during incubation, are discussed.

P50 KHAN, SANA AND PREMILA N. ACHAR. Kennesaw State University—Detection of fungal flora in peanut seeds by conventional methods and PCR.

The Georgia Peanut Commission estimates that peanuts are a \$2.0 billion industry in Georgia and that the State produces approximately 45% of peanuts in the United States. In spite of strict control measures against *Aspergillus* species, the peanut industry in Georgia is still facing economic loss due to contamination by this mold. The present study investigates the presence of *Aspergillus* species in peanuts from commercial outlets using traditional methods and PCR based protocols. The most common fungi detected in contaminated peanuts from commercial outlets were *A. parasiticus*, *A. flavus*, *A. niger*, *Penicillium* and *Fusarium*. Mycelia and spores were detected in the seed coat and hyphae established inside the embryos by maceration technique. Infection percentage varied with mold type. Light microscopy is an inexpensive and quick method of identifying fungi by colony color and characteristic features of the conidiophores and conidia. Ribosomal DNA was amplified using PCR with universal primers, internal transcribed spacer (ITS)1 and (ITS)4. While ITS region for *A. flavus*, *A. parasiticus* and *A. niger* ranged from 550-600 bp, *Fusarium* showed a band at 700 bp and *Penicillium* at 600 bp. Maceration technique is reliable for detection of fungi in peanut seeds, however, for differentiation of fungi specially the *Aspergilli* group, PCR is a preferred tool. We also conclude from our study that detection of *A. parasiticus* and *A. flavus* in commercial peanuts does not always indicate harmful levels of aflatoxin, however, it does mean that the potential for aflatoxin production is present.

P51 GALLANGO-BRUN, CAROLINA AND PREMILA N. ACHAR. Kennesaw State University—Molecular characterization of *Aspergillus flavus* in commercial peanuts in Georgia.

Aspergillus flavus can invade peanuts in the field before harvest, during post harvest and during storage or transportation. Poor storage can lead to aflatoxin production. Aflatoxins have received greater attention than any other mycotoxins because they have a potent carcinogenic effect in laboratory rats and acute poisonous effects in humans. A number of DNA based techniques are currently available for molecular characterization of the fungal populations. The aim of this study was to use polymerase chain reaction (PCR) to selectively distinguish toxin and non-toxin forms of *A. flavus* in contaminated peanuts from commercial outlets in Georgia. Peanuts were plated on potato dextrose agar (PDA), incubated at 30°C for 7 days. After incubation period, based on morphology and colony character, colonies were screened for *A. flavus*. Colonies which glow under fluorescent blue light (toxin form) were further subcultured. DNA was isolated using standard method. Ribosomal DNA (rDNA) was amplified using PCR with three primers: universal primer, internal transcribed spacer (ITS) 1 and (ITS) 4, *Nor-1* & *Nor-2*, and *Ver-1* & *Ver-2*. *Nor* and *Ver* are genes associated with aflatoxin biosynthesis in *A. flavus*. PCR amplification with ITS primers revealed one common band at 600 bp for non-toxin forms of *A. flavus* while no amplification was obtained with either *Nor-1* & -2, or *Ver-1* & -2 primers. In our investigation, none of the samples tested, were contaminated by toxin form of *A. flavus*. Future research will emphasize on screening and detection of *A. flavus* in contaminated peanuts from other geographical areas.

- P52 BARRON, SAMUAL¹, BLAIR, BENJIE¹, BEJ, ASIM² AND CHRIS MURDOCK¹. Jacksonville State University¹ and University of Alabama at Birmingham²—Investigation of effective DNA isolation methods from cave soils for bacteria diversity analysis.

Modern molecular biology techniques have provided pathways for culture-independent approaches for assessing phylogenetic composition of bacterial communities from different types of environmental samples. However, for effective application of these genetic analysis techniques one must be able to obtain nucleic acid samples that are clean enough for enzymatic reactions (e.g., PCR, cloning, sequencing, etc.). Two methods for cave soil DNA isolation were assessed. First, a modified phenol/chloroform methodology was utilized, which included the use of polyvinylpyrrolidone (PVPP) for humic acid precipitation and removal. Secondly, a commercial kit (MO BIO Laboratories, Inc.) specific for soil samples was utilized for nucleic acid isolation from soil samples. The efficiency of DNA recovery by each method was determined by spectrophotometry, agarose gel electrophoresis, and by use as template for PCR using bacteria-specific 16S rDNA oligonucleotide primers. Both methods allowed for the isolation of DNA suitable for enzymatic reactions (i.e., PCR). However, further analysis of both techniques revealed that combining methods from both techniques resulted in larger yields of PCR-ready DNA. Currently, these soil DNA samples are being utilized for the construction of DNA libraries that will be used in assessing the bacterial communities from cave soils. Analysis of specific bacteria genera present from these samples will be conducted using a conserved region of 16S rDNA gene. These data could provide for an increased understanding of the bacterial communities in cave ecosystems.

- P53 BLAIR, BENJIE, ASHLEY WARD, MARK MEADE AND MIJITABA HAMISSOU. Jacksonville State University—Effects of photodynamic dyes on representative gram-positive and gram-negative bacteria.

Photodynamic therapy using fluorescing xanthene dyes is an active area of antimicrobial research with potential application in the agricultural and clinical industries. These therapeutants would have a significant impact against increasingly drug resistant bacteria, fungi, yeasts, and viruses. Two potential xanthene dyes with a broad spectrum of pathogenic activity are phloxine b and rose bengal. Photoactivity is initiated by exposure to visible light of specific wavelengths, and creates active oxygen species (ROS) that are

cytotoxic to lipids, enzymes, and internal cellular structures. The photo-toxicity of phloxine b and rose bengal were compared using concentrations of 0.1 ppm, 1 ppm, and 10 ppm of each dye against pathogenic stationary growth strains of *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli*, and vegetative and sporulated *Bacillus thuringiensis*. Both dyes exhibited significant dose-response inhibition of the Gram-positive strains *S. aureus*, and *B. thuringiensis*, particularly with the 10 ppm concentrations, but failed to inhibit the growth of Gram-negative strains *E. coli* and *P. aeruginosa* at any dose level. CFU analysis further supported these findings. The relative effects of each dye were compared between phloxine b and rose bengal using ANOVA statistical analysis which indicates that while both dyes exhibit efficacy inhibiting Gram-positive bacterial growth, neither dye yielded a superior response. Due to phloxine b's approval for human consumption by the Food and Drug Administration, this dye potentially has broader applications to agricultural products and medical therapies in healthcare.

P54 CANCELLED

P55 MEYER, SHELLI L. AND RICHARD A. LONG. University of South Carolina, Columbia—Patchy distribution of *Vibrio vulnificus* in a Texas bay.

Vibrio vulnificus is a facultative human pathogen that proliferates in the estuarine environment. During the summer of 2004, several fishermen contracted infections near Matagorda Bay, Texas, driving the goal of this study to better understand the ecology of *V. vulnificus* to improve predictive models for its abundance and distribution. Previous studies have focused upon this pathogen's distribution relative to temperature and salinity using culture based techniques and broad sampling patterns. This study is based on an intensive sampling pattern over time and space, utilizing quantitative polymerase chain reaction for direct detection and quantification of the *V. vulnificus* hemolysin gene from environmental water samples. We observed spatial and temporal patchiness in the distribution of *V. vulnificus* throughout Matagorda Bay. The variation seen between surface and bottom samples, and also sites within close proximity to one another, contributes to the inability to identify any point-source for *V. vulnificus* within the bay system. This study supports that more intensive spatial and temporal sampling is needed to better represent the distribution of pathogens in aquatic environments.

Genetics, Cellular and Molecular Biology

P55B DOGAR, MARYAM, ANH GIANG, YULON STEWART, AND SARAH LEA MCGUIRE. Millsaps College—The *S. cerevisiae* Kin3 gene is involved in response to DNA damage.

Proper cellular response to DNA damage is essential to ensure cell survival upon exposure to DNA damaging agents. Recent synthetic genetic analysis in our lab showed that Kin3 interacts with several genes that are involved in response to DNA damage, including Mms22, Hur1, and Kar3, suggesting that Kin3 is also involved in this important cellular process. To test this hypothesis, we subjected cells harboring a deletion in the Kin3 gene to various DNA damaging agents. These included an inhibitor of DNA synthesis (hydroxyurea), alkylating agents (methyl methane sulfonate and 4-nitroquinoline oxide), UV light and a UV mimetic (camptothecin), and double-strand break inducers (phleomycin and zeomycin). Results showed that the Kin3 deletion strain is hypersensitive to phleomycin and to zeocin when compared to a wild-type strain. Both of these agents induce double-strand breaks in DNA. The deletion strain was not sensitive to agents which cause damage other than double-strand breaks. One of the Kin3 interacting genes identified in SGA is Mms22, which is involved in double-strand break repair. Taken

together, the phleomycin and zeomycin sensitivities and synthetic lethality suggest that Kin3 may be involved in cellular response to double-strand breaks.

P56 SCULL, GREGORY AND ROBERT CARTER. Jacksonville State University—A method for obtaining genetic samples from feral hogs.

True wild pigs (Suidae) are not endemic to North or South America and exist as a direct result of intentional translocation, escape, and abandonment following European settlement. Feral hog abundance and distribution is escalating in the Southeast, and like in other invaded regions they are a serious threat to biodiversity, agriculture, and a vector for the spread of many infectious diseases. Genetic studies on many populations of feral hogs have been conducted in the past where sample collection coincided with capture. While monitoring for black bear in Northeast Alabama by-catch hair samples at monitoring sites led to the examination of modifying the technique of erecting barb wire hair snares to sample feral hogs. By acquiring supplemental hair samples for analysis additional questions could be addressed that cannot be answered by utilizing capture and suppression methods alone. The results of this evaluation show that by utilizing low cost hair snares it is possible to obtain adequate samples for genetic analysis.

P56A STEWART, YULON, TERREL SUGAR, BROOKE FURRH, AND SARAH LEA MCGUIRE. Millsaps College—The *S. cerevisiae* Kin3 gene affects a variety of cellular processes.

KIN3 is the *S. cerevisiae* member of the NIMA family of protein kinases, a poorly understood family of protein kinases. To elucidate the functions of KIN3 in budding yeast, we undertook a genome-wide screen for genes that interact with Kin3. Genetic interactors with Kin3 were identified using synthetic genetic analysis (SGA), in which a strain deleted for Kin3 was crossed to a library of deletions of non-essential genes. The Kin3 gene was deleted by gene replacement with the nourseothrecin (clonazepam) resistance gene and effects of deletion of Kin3 on cells was assessed. In rich media, deletion of KIN3 results in an increase in the percent of large-budded cells, suggesting a delay in G2/M. FACS analysis confirmed that the deletion strain exhibits a delay in G2/M compared to non-deleted cells. These data suggest that KIN3 affects cell cycle progression. Genetic interactors identified by SGA suggest a role for Kin3 in five specific cellular processes, including response to DNA damage, chromatin structure/telomere maintenance, protein folding, ubiquitin-dependent endosome sorting, and cell cycle control. Taken together, the phenotypic and genetic findings here suggest that Kin3 is involved in a variety of processes, some of which are novel functions for the NIMA family of protein kinases.

P57 MURDOCK, CHRIS¹, BARRON, SAMUAL¹, PONDER, DAVID¹ AND THANE WIBBELS². Jacksonville State University¹ and University of Alabama at Birmingham²—Regulation of *Dmrt1* gene expression via estrogen in a reptile with temperature-dependent sex determination.

Most turtles possess temperature-dependent sex determination (TSD). The red-eared slider turtle, *Trachemys scripta*, has served as a model organism for many TSD studies and much of what is known about TSD comes from studies using this particular species. Three key findings regarding the physiology of TSD have been elucidated from this species: (1) temperature exerts its effects on sexual development during the middle third period of incubation, (2) exogenous estrogens can stimulate sex reversal in embryos incubated a male-producing temperature, (3) blocking endogenous estrogen synthesis pathways can result in sex reversal in embryos incubated a female-producing temperatures. Additionally, many recent TSD studies have focused on the possible roles of genes first identified in the sex determination pathways of mammals and their possible roles during TSD. *Dmrt1* is one such gene that has been implicated as an important factor

in sex determination in vertebrates. Specifically, Dmrt1 is expressed at much higher levels in *T. scripta* embryos incubated at male-producing temperatures, and it appears that this increase in expression is critical for male development in *T. scripta*. Further, it appears that exogenous estrogen treatment on *T. scripta* embryos can inhibit Dmrt1 expression, suggesting a possible regulatory mechanism for estrogen's feminizing effects at male-producing temperatures. Currently, the possible roles of endogenous estrogen synthesis on the regulation of Dmrt1 expression are being addressed. These studies are providing the foundation for understand the early events of TSD and the possible elucidation of the pivotal temperature sensitive "switch" controlling the sex-determining pathways during TSD.

- P58 BLEND, ANNA¹, ERIC FANG¹, TODD VISION², JOHN WILLIS³ AND JEFFREY TOMKINS¹. Clemson University¹, UNC at Chapel Hill² and Duke University³—Physical mapping of *Mimulus*, model plant species for ecological and evolutionary studies.

Due to ecological and phenotypic diversity, the genus *Mimulus* has been a powerful tool for the study of speciation events, particularly in regard to flowering and reproductive traits. Comprehensive structural, functional and comparative studies of any genome are increasingly dependent upon the availability of integrated physical/genetic maps. The high information content fingerprinting (HICF) technique was used to construct physical maps for two *Mimulus* species, *M. guttatus* and *M. lewisii*, by assembling contigs of fingerprinted clones from the species BAC libraries. From the contig assemblies using the program FPC, ~5,000 clones for each species were re-arrayed into minimum tile libraries for comparative studies and BAC-end sequencing (BES). The minimum tiling path BES data was analyzed for homology and mined for sequence repeats. Simple sequence repeats (SSR) were discovered in about 30% of the BESs in both *M. guttatus* and *M. lewisii*, suggesting highly repetitive DNA composition of the genomes. Anchoring molecular markers to specific BACs associated with various traits, particularly QTLs, is an important objective in developing a physical framework. To integrate the genetic and physical maps, cDNA-derived markers were anchored to all three *Mimulus* BAC libraries by overgo hybridization using a high-throughput probe pooling approach. 523 and 376 ESTs have been anchored to the *M. guttatus* and *M. lewisii* physical maps, respectively. BAC libraries and physical map data for the two *Mimulus* species, as well as SSR primer sequences and homology results are available at <http://www.genome.clemson.edu/activities/projects/mimulus/>.

- P59 KOVACH, KATHERINE E., SHEPARD M. ZEDAKER, MUHAMMAD JAVED IQBAL AND EM ULRICA EGERTSDOTTER. Virginia Polytechnic Institute and State University—Assessing genetic variation of *Acer rubrum* and *Liriodendron tulipifera* populations in unmanaged forests of the Southeast United States.

Acer rubrum and *Liriodendron tulipifera* are becoming increasingly dominant in forest types throughout the Southeast United States. Little is known concerning the genetic makeup of these species and polymorphisms in their genotypes across their native range. This study utilizes amplified fragment length polymorphism (AFLP) to determine the degree of genetic polymorphism of *A. rubrum* and *L. tulipifera* throughout their ranges. In addition to identifying genetic polymorphisms in *A. rubrum* and *L. tulipifera*, this study will address genetic associations with variations in wood density. For these species it has been found that the greatest differences in wood densities are between mountain sites of high latitude and coastal plain sites of low latitude. Due to the interrelatedness of environmental factors and genetics in phenotypes of species, this study seeks to examine the role of genetic polymorphisms in wood density of *A. rubrum* and *L. tulipifera*. Wood density and DNA analysis will be utilized. The study sites include unmanaged stands in Georgia, Mississippi, North Carolina, Ohio, South Carolina, Tennessee, and Virginia. Sites

have been characterized by physiographic region, management intensity, and latitude/longitude. The strongest genetic differences are expected between the mountain sites of highest latitude and those of coastal plain with lowest latitude. *A. rubrum* and *L. tulipifera* are prolific throughout the Southeast United States, and have increasingly important roles in forestry and wood products in this region.

- P60 BOURGOIN, STEFAN¹ AND H. WAYNE SHEW². Florida State University¹ and Birmingham-Southern College²—A survey of acetylcholinesterase activity in bryophytes and the molecular form of the enzyme present in *Polytrichum commune*.

Acetylcholine is a neurotransmitter found primarily at neuromuscular junctions. At these junctions, acetylcholine is broken down by its specific catalyzing enzyme, acetylcholinesterase (AChE). Previously thought only to exist in the Kingdom Animalia, recent studies have discovered traces of AChE present in plant species, most notably the taxa Leguminaceae (legumes), Bryophyta (mosses), and Hepaticophyta (liverworts). AChE has been shown to exist in one of two forms, globular (G form) or asymmetric (A form). Asymmetric forms have been found only in vertebrates, while globular forms are found in all other organisms. This study used a modified Ellman's Assay to determine if AChE was present in selected bryophytes. The molecular form of the AChE enzyme present in the moss *Polytrichum commune* was characterized using velocity sedimentation rates in sucrose density gradients. *P. commune* contained a significant amount of AChE based on the Ellman's Assay. The AChE in *P. commune* exhibited sedimentation coefficients in sucrose gradients of 11.3S and 22.6S, (corresponds to G₄ and A₁₂ forms of the enzyme). A collagenase digestion failed to remove the form having the sedimentation coefficient of 22.6S, indicating that it was not a true A₁₂ form of the enzyme. Thus, *Polytrichum commune* contains the G₄ form of AChE. Questions about the function of AChE in plants remain, but this study provides insight into the molecular form of the enzyme likely to be present in other plants and additional information about its distribution in the plant kingdom.

- P61 O'HARA LONG, LINDSAY, STINA JENNIFER WEBB, JONATHAN ROBERTS, STEPHEN A. TAYLOR AND JUDY AWONG-TAYLOR. Armstrong Atlantic State University—Cfol polymorphisms in a nicotinic receptor subunit gene (CHRNA4) and mental rotation task performance.

Behavior genetic analyses have clearly established that intellectual performance is highly heritable, but few links have been made between genetic polymorphisms and specific aspects of intellectual performance. Here we investigate the association of *Cfol* polymorphisms in a nicotinic receptor subunit gene (CHRNA4) and performance on mental rotation tasks. Mental rotation tasks strongly activate cholinergic circuits in the parietal lobes. Eighty subjects (31 males, 49 females) were administered the Vandenberg Mental Rotation Test, genotyped for the C1545T (*Cfol*) polymorphism of the CHRNA4 gene, and grouped as either homozygous (TT or CC) or heterozygous (TC). A 2x2 Between Subjects ANOVA was conducted to assess mental rotation performance by both sex and genotype. Results indicated main effects for sex ($F=8.25$, $p<.01$) and genotype ($F=4.75$, $p<.05$), though not a significant sex x genotype interaction ($F=.163$, ns). Sex differences were found in the expected directions (males performing significantly better than females), and CHRNA4 C1545T homozygosity also produced higher mental rotation scores. Homozygous individuals had significantly higher mental rotation scores than heterozygous individuals. Our results imply that mental rotation ability may involve a genetic component.

- P62 ABERA, MAHLET¹, JOHN J.G TESMER² AND MOHAMED AITTALEB². Guilford College¹ and University of Michigan²—Preliminary crystallization study for the interaction between the c-terminus of plexin B1 receptor and the PDZ domain of Leukemia Associated RhoGEF (LARG) to activate RhoA.

Leukemia associated RhoGEF (LARG) serves as a direct link between heterotrimeric G proteins and RhoA. RhoA is a small G-protein that plays a major role in cytoskeletal regulation, actin filament rearrangement and oncogenesis. The activation of RhoA is linked with the signal transduction that involves the semaphorins 4D ligand, a G protein coupled transmembrane protein plexin B1, and Leukemia Associated RhoGEF (LARG). Previous studies using Immunoprecipitation (IP) assays indicated that the c-terminus of plexin B1 interact with the PDZ domain of LARG during signal transduction. However, the molecular signaling mechanisms and the structure for the PDZ in complex with plexin B1 have not been elucidated yet. With the aim of forming a complex between the c-terminus of plexin B1 and the PDZ domain of LARG, and harvesting crystals, plasmids for the two proteins each bound with the gene for maltose binding protein (MBP) were expressed in *E.coli Rosseta* cells. MBP increases the solubility of proteins and enhance the purification process. Affinity and size exclusion columns were used to separate the pure proteins. The results indicated that the plexin B1 is impure, unstable and forms aggregates. However, by optimizing the salt concentration in the gel filtration buffer from 300mM to 100mM, we were able to collect 7.54 mg/mL of pure PDZ. As a model for plexin B1, a ready-made 6 amino acid peptide that corresponds to the last amino acid sequence of plexin B1 was bound to the purified PDZ in a 96 well plate.

- P63 EBIRINGA, CHIOMA¹, LAURENCE WOODRUFF² AND KRISTEN JOHANSEN². Bowie State University¹ and Iowa State University²—Isolation and purification of GST-GFP protein for the screening of ANTI-GFP antibody.

The Green Fluorescent Protein (GFP), found in jellyfish, is used to study the spindle matrix. The spindle matrix is found in the cell and is essential for the segregation and stabilization of chromosomes during mitosis. There are five known proteins in *Drosophila* that form this spindle matrix; they are Asator, Chromator, East, Megator, and Skeletor. To study these proteins, they were tagged with GFP protein to make recombinant proteins. Sometimes the green illumination of this GFP protein is quenched during the fixation process. By applying an antibody to the GFP, we can find the GFP tag on these proteins, thereby locating the spindle proteins. Our goal was to produce GST-GFP protein that would be used to screen the GFP antibody that has been produced, to ensure that the antibody will function well against GFP. GST stands for Glutathione S-transferase and it has an affinity for Glutathione beads. *E.coli* cells were used as an expression system and these cells were transformed using plasmids that code for GST-GFP protein. The GST-GFP protein produced by this bacteria has an affinity for Glutathione Agarose beads. After culturing the bacteria, the protein was released from the cells, bound to the beads, purified, and eluted. The concentration of each elute was estimated by analyzing an SDS PAGE Gel. The protein was then stored for later use.

- P64 WIESE, CARRIE B. and MARGARET J. KOVACH. University of Tennessee at Chattanooga—Evaluation of gene expression patterns associated with genomic instability in colon cancer.

The onset and progression of many cancers are characterized by genetic rearrangements and overall genomic instability. Two types of genomic alterations associated with cancer are variability in microsatellites and global changes in DNA methylation status. Accumulation of these variants affects cancer progression by influencing gene expression and chromatin architecture as it relates to the methylation status of DNA, position of regulatory elements, and mRNA stability. The purpose of this study is to evaluate whether

genes in the molecular pathways of cancer are subject to gene regulation by microsatellite repeat variability and to correlate microsatellite variability with methylation status and cancer progression. We predict that microsatellite variants generate alternate secondary structures important in the recruitment of transcriptional proteins that directly influence the rate of transcription and transcript stability. We also predict a relationship between the DNA structure induced by microsatellite variability and the methylation status of CpG islands, presenting an indirect mechanism by which genomic instability influence transcription. To examine the effect of microsatellite variability on gene expression, DNA from 14 colon cancer cell lines were characterized for 22 microsatellite elements in 7 genes associated with colorectal cancer. Secondly, the methylation status of CpG islands within these genes was analyzed by combined bisulfite restriction analysis (COBRA). Preliminary evaluation indicates that microsatellites near the 5' and 3' ends of transcripts exhibit a higher degree of variability. Although primarily methylated, candidate genes displayed differential methylation patterns among samples. Statistical analysis will determine if a correlation exists between microsatellite variability and CpG methylation status.

P65 WISE, JONATHAN, STEPHANIE KAMOROFF, MEGAN SHINE AND ELI V. HESTERMANN. Furman University—Estrogenic properties of aryl hydrocarbon receptor ligands in human breast cancer cells.

The aryl hydrocarbon receptor (AhR) is a ligand-activated transcription factor known to be involved in the initiation and progression of tumors. Interestingly, in animal models AhR ligands that promote cancer in other tissues actually prevent the formation of breast cancer. This is likely the result of an interaction between AhR and the estrogen receptor (ER). We hypothesized that AhR antagonists would reduce expression of genes regulated by the ER without producing the carcinogenic effects observed with other AhR ligands. Treating breast cancer cells with an AhR antagonist should decrease the expression of genes linked with breast cancer cell proliferation. We treated MCF-7 and T47D breast cancer cells with several AhR ligands and measured the expression of AhR and ER target genes via real time RT-PCR. Our results show that induction of the ER target gene cyclin D1 by the hormone estrogen was reduced after treatments for 3 and 24 hours with CH-223191, an AhR antagonist, or TCDD, an AhR agonist. The induction of the AhR target gene CYP1A1 by TCDD was reduced after being treated with CH for 3 and 24 hours. Thus it appears that an AhR antagonist can inhibit the effects of estrogen while also blocking the action of carcinogenic AhR ligands. Future studies will reveal if these antagonists decrease the cells' rate of proliferation.

P66 PLAGENS, ROSEMARY AND ELI V. HESTERMANN. Furman University—Regulation of the zinc-finger transcription factor Slug by the aryl hydrocarbon receptor in human breast cancer cells.

The aryl hydrocarbon receptor (AhR) is a known mediator of the effects of toxic environmental pollutants such as 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in human cells. Activation of AhR may be involved in certain cancers, particularly breast cancer. Activity of the AhR can be inhibited by the expression of the AhR repressor (AhRR) protein or by the presence of 2-methyl-2H-pyrazole-3-carboxylic acid (2-methyl-4-*o*-tolylazo-phenyl)-amide (CH). One gene considered to be regulated by AhR is the zinc-finger transcription repressor, Slug, which may induce tumor development and progression. The current study found additional evidence that TCDD agonizes the AhR and that CH antagonizes the AhR. The induction of AhRR was measured to determine the amount of active AhR. Treatment of BP-1 transformed breast cells with TCDD increased AhRR expression by more than 4-fold, and CH significantly decreased AhRR mRNA expression. The expression of Slug mRNA was increased in the presence of CH, suggesting that AhR constitutively inhibits Slug expression. The study also found that

TCDD increases the recruitment of AhR to DNA sequences near the Slug gene by more than 2-fold. These findings suggest that the AhR does not induce the expression of Slug in human breast cancer cells, but future studies should determine whether this is true of other mammalian cell lines.

- P67 SHALABI, RULA, KATHERINE MITCHUM AND ELI V. HESTERMANN. Furman University—Agonistic and antagonistic responses of AHR ligands on gene expression in H1G1 mouse hepatoma and MCF-7 human breast cancer cells.

The aryl hydrocarbon receptor (AHR) is a ligand-activated transcription factor that controls the toxic and carcinogenic effects of its ligands by regulating the expression of many genes, including cytochromes p450 1A1 (CYP1A1) and 1B1 (CYP1B1). Identification of AHR antagonists is a promising approach to prevent the effects caused by harmful AHR agonists such as the environmental contaminant 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD). Many AHR ligands with reported antagonistic properties have conflicting supporting evidence revealing partial agonism upon treatment. In this study, the agonistic and antagonistic effects of AHR ligands were tested in H1G1 mouse hepatoma cells as well as human breast cancer MCF-7 cells. The effects of the ligands on endogenous CYP1A1 and CYP1B1 expression were tested and measured using real time RT-PCR. A reported specific antagonist of AHR, 2-methyl-2H-pyrazole-3-carboxylic acid (CH-223191), revealed antagonistic properties. Another antagonist, 3',3'-diindolymethane (DIM), also inhibited gene expression. Partial agonism was seen with 3'-methoxy-4'-nitroflavone (MNF), 6-methyl-1,3,8-trichlorodibenzofuran (MCDF) and α -naphthoflavone (ANF). Results from endogenous CYP1A1 and CYP1B1 genes did not show complete inhibition upon treatment with AHR antagonistic ligands, suggesting partial antagonism with the majority of reported antagonists.

Plant Biology

- P68 IVEY, SHERRIE, EVANDREW WASHINGTON, SAMANTHA WOODS, DIONDRA WOODERT, JAMES WALKER, BAILEY GRETCHEN, NICOLE KRUEGER, ROY WANG, AND ABDELMAJID KASSEM. Department of Natural Sciences, Fayetteville State University, Fayetteville, NC—Quantitative trait loci underlying seedling root traits in soybean [*Glycine max* (L.) (Merr.)] plants grown in the greenhouse and in the field.

Crop productivity is severely reduced by root diseases, water deficit and drought in many plant species. Extensive root systems contribute highly to tolerance. The objective of this study was to identify QTL for root traits in soybean using mainly microsatellite markers and a soybean [*Glycine max* (L.) Merr.] recombinant inbred line population derived from 'Essex' and 'Forrest' cultivars. The root traits studied were basal root thickness (BRT), lateral root number (LRN), maximum root length (MRL), root fresh weight (RFW), root dry weight (RDW), shoot fresh weight (SFW), shoot dry weight (SDW), RFW/SFW, and RDW/SDW. A total of 12 QTL underlying 8 traits were located on 9 different linkage groups (LG). Two QTL underlying LRN (*qLRN-1-2*) were identified on LG C1 and O-2; three QTL were identified for MRL (*qMRL-1-3*) were identified on LG B2, C2, and F-2; one QTL underlying RFW (*qRFW*) was identified on LG F-2; two QTL for RDW (*qRDW-1-2*) were identified on LG B2 and F-2; three QTL for SDW (*qSDW-1-3*) were identified on LG C2, D2, and F-2; three QTL for the ratio RFW/SFW (*qRFW/SFW-1-3*) were identified on LG A2, D1a+Q, and D2; and one QTL for the ratio RDW/SDW (*qRDW/SDW*) was identified on LG G. No QTL were found for BRT trait. The QTL underlying root traits presented here may be important for soybean breeding programs that aim to produce superior high yielding cultivars and germplasm tolerant to drought and diseases.

- P69 JACOBSON, JOSIE¹, ALLEN ALCIVAR¹, JENNIFER RAINHO¹, AND ABDELMAJID KASSEM². Department of Biological Sciences, Kean University, Union, NJ¹ and Department of Natural Sciences, Fayetteville State University, Fayetteville, NC²—Genomic regions containing QTL for plant height, internodes length, and flower color in soybean [*Glycine max* (L.) (Merr.)].

Crop yields are reduced by drought, diseases, and deficiencies that reduce plant height in many species. Conversely plants that are too tall may lodge to reduce harvestable yield. The objective of this study was to identify quantitative trait loci (QTL) for plant height (PLH), internode lengths (INL), and flower color (FLC) traits in soybean using mainly microsatellite markers and a recombinant inbred line (RIL) population derived from 'Essex' and 'Forrest'. A total of 14 QTL for the 3 traits were located on 7 different linkage groups (LG). Twelve QTL for INL were identified on LGs A2, C2, E, F, G, I, and K. LOD scores ranged from 2.53 to 4.48 and R^2 from 18.4 to 33.7 %. One QTL for PLH (qPLH) was identified on LG F by the marker interval Satt554-CCA19 and has peak LOD scores of 4.63 with an R^2 of 25.0%. One QTL for FLC (qFLC) was identified on LG G by the marker Satt122 and has peak LOD scores of 2.60 with an R^2 of 15.5%. The QTL presented here are important to plant height manipulation during soybean breeding to produce superior high yielding cultivars and germplasm.

- P70 ALCIVAR, ALCIVAR¹, JOSIE JACOBSON¹, JENNIFER RAINHO¹, KHALID MEKSEM², DAVID A LIGHTFOOT², AND ABDELMAJID KASSEM³. Department of Biological Sciences, Kean University, Union, NJ¹; Department of Plant, Soil, and Agricultural Systems, Southern Illinois University, Carbondale, IL²; and Department of Natural Sciences, Fayetteville State University, Fayetteville, NC³—Genetic analysis of plant height, hypocotyl and internodes length in soybean [*Glycine max* (L.) (Merr.)].

Diseases, mineral deficiencies, and water deficit reduce plant height and yield in many crop species. Conversely, plant growth regulators, water sufficiency and some diseases can increase plant height cause plants to lodge and may reduce yield. The aims of this study were to identify quantitative trait loci (QTL) for plant height (PLH), internode lengths (INL), and hypocotyls length (HYL) traits in soybean using the 'Essex' by 'Forrest' recombinant inbred line (RIL) population. Seedlings were grown in the greenhouse in replicated experiments. A total of 21 QTL for the 3 traits were located on 9 different linkage groups (LG). Sixteen QTL for INL (qINL1-16) were identified on LG A2, B1, C1, C2, D1b+W, D2, F, G, and K. LOD scores ranged from 2.64 to 4.5 and R^2 from 45.22 to 70.64 %. Three QTL for PLH (qPLH1-3) were identified on LG C2 and F. Their LOD scores ranged of 2.65 to 2.99 with R^2 ranging from 41.43 to 45.80 %. Two QTL for HYL (qHYL1-2) were identified on LG F with peak LOD scores of 2.51 and 2.85, and R^2 of 39.54 and 39.21 %, respectively. The traits studied here are components of yield and the QTL presented are important in soybean breeding programs to produce high yielding cultivars and germplasm.

- P71 WOODERT, DIONDRA, IVEY SHERRIE, EVANDREW WASHINGTON, SAMANTHA WOODS, DIONDRA WOODERT, JAMES WALKER, BAILEY GRETCHEN, NICOLE KRUEGER, ROY WANG, AND ABDELMAJID KASSEM. Department of Natural Sciences, Fayetteville State University, Fayetteville, NC—Is there a correlation between plant height and yield in soybean?

Soybean is an important crop in the US and the world. Our objective was to investigate whether there is a correlation between plant height and yield in soybean using a population of 94 recombinant inbred lines (RILs). The plants were grown in the FSU greenhouse for two weeks then transferred into a field in Harnett County (May 11 – September 16, 2007). After harvest, extensive data was collected for several important

agronomic traits including plant height, yield (100-seed weight), nodules number, and several root traits. A correlation test was performed using the statistical software SPSS. Concerning plant height and yield, RILs were classified into low yield (1.28 – 10.28 grams) and plant height (31.2 – 59.2 cm) and high yield (10.28 – 22.84 grams) and plant height (59.4 – 170 cm) groups. There was no correlation between yield and plant height in the population. Certain high yielding RILs have low plant heights and vice-versa. This demonstrates that yield and plant height are polygenic, complex, and hard to study although they important agronomic traits.

- P72 HARTZ, CHRISTINA AND ABDELMAJID KASSEM. Department of Natural Sciences, Fayetteville State University, Fayetteville, NC—Influence of iron, potassium, magnesium, and nitrogen deficiencies on the growth and development of sorghum and sunflower seedlings.

Plant mineral nutrition is a vital area of research to understand the mineral needs of plants, especially crops, and increase crop yields. The objective of this study was to investigate the impact of iron (Fe), potassium (K), magnesium (Mg), and nitrogen (N) on the growth and development of sorghum and sunflower. Fe-deficient sorghum plants had slightly reduced plant height, root length, and leaf numbers and exhibited extreme chlorosis and necrosis at the base of their leaves compared to the controls. Fe-deficient sunflower plants also exhibited slightly reduced plant height, root length, and leaf numbers; however, leaf chlorosis and necrosis is slight and limited to the leaf edges. K-deficient sorghum plants had slightly reduced plant height and leaf number but highly reduced root length, and had several lesions and necrotic spots at their leaf tips. K-deficient sunflower plants had also slightly reduced plant height and leaf number but highly reduced root length and died before the end of the experiment. Mg-deficient sorghum plants had similar plant height, leaf number, and root length; however, their leaves were brown and chlorotic. In contrast, Mg-deficient sunflower plants had highly reduced plant height, leaf number, and root length, and had stunted growth, brown, necrotic, and chlorotic leaves. N-deficient sorghum plants had severely reduced plant height, leaf number, and root length compared to the controls. These plants exhibited extreme stunted growth and leaf chlorosis before most of them died. N-deficient sunflower plants had had also reduced plant height, leaf number, and root length before they died.

- P73 REDOBLADO, TRACY¹, THOMAS MCELROY¹, PAULA JACKSON¹, JOSE LUIS ANDRADE² AND CASANDRA REYES-GARCIA². Kennesaw State University¹, Centro de Investigación Científica de Yucatán²—Characterization of growth and dispersal patterns for a clonal tree *Gymnopodium floribundum* (Polygonaceae) in the Yucatan Peninsula, Mexico.

The tropical dry deciduous forest of the Yucatan Peninsula, Mexico is one of the world's most endangered terrestrial ecosystems. This study took place in the archeological park, Dzibilchaltún (89°49'W, 21°9'N), which is dominated by this forest type. We examined the distribution of *Gymnopodium floribundum* (Polygonaceae), a small tree with shredded bark. *Gymnopodium* had a strong clumped distribution both near and far from a *cenote* (underground body of water with an opening to the surface). Morphological data (flowers and rhizomes) indicated that this tree species can reproduce sexually and clonally. The objective of this study was to examine the size distribution of stems for *Gymnopodium*. Field data was collected In May 2006 (far site) and 2007 (near site). At the field sites, a large, central individual was identified at both sites. An area of 355 m² around this individual was sampled. All tree stems were labeled, measured, and leaf samples were collected. The average stem size was not significantly different between sites (2.17cm near; 2.13cm far; $P > 0.05$). The range of stem diameters, and variability within clusters, was higher at the near site. The near site contained a mixture of cluster types with respect to stem composition (site variance/ mean = 2.20). The far site had an abundance of

clusters that contained relatively uniform sized stems (site variance/ mean = 0.48). This difference in variability of stem size between sites may be related to site specific (habitat) characteristics, or could be due to differences in rainfall between years.

P74 SMITH, BLAKE AND DALE VOGELIEN. Kennesaw State University—The use of AFLP to identify daylily cultivars.

Approximately 56,000 daylily cultivars are currently registered with the American Hemerocallis Society. Distinguishing one cultivar from another or identifying garden "escapees" can be challenging even for the expert gardener since identification would be based largely, if not solely, on phenotypic features. This study explored the possible use of the AFLP (amplified fragment length polymorphism) DNA fingerprinting technique as a means of distinguishing daylily (*Hemerocallis*) cultivars. In this preliminary study, three modern daylily cultivars and one early cultivar were evaluated using one EcoRI/MseI AFLP primer combination. A total of 34 useful markers ranging in size from 50 to 364 base pairs were generated with the one primer combination. Of these, 16 (47%) were polymorphic. The total number of markers generated for each cultivar was relatively consistent, ranging from 25 to 28. When comparing the fingerprints of Joan Senior and Morman to their hybrid offspring (cv. Betty Siegel), 12 polymorphic markers were detected. Joan Senior's fingerprint contained 2 markers not shared by Morman or Cypriani, both of which were inherited by Betty Siegel. Morman's fingerprint also contained 2 unique markers, with 1 being inherited by Betty Siegel. A distinct collection of markers was obtained for each of the four cultivars, suggesting that this technique would be potentially useful in distinguishing and identifying daylily cultivars.

P75 MONTGOMERY, MEREDITH and JOEY SHAW. University of Tennessee at Chattanooga—Toward an understanding of *Clematis fremontii* S. Watson (Ranunculaceae) in the southeastern United States.

Cedar glades are unique habitats ranging from the Midwest through the Ozarks and into the southeastern United States. They are areas of Ordovician, Silurian, or Mississippian dolomite or limestone bedrock with characteristically shallow and rocky soils that create harsh environmental conditions for plant survival. Consequently, cedar glades are marked by high numbers of endemic plant species. One such species is *Clematis fremontii* S. Watson, which is normally restricted to the Midwest. However, two disjunct populations of *C. fremontii* inhabit cedar glades located in Rome, GA and Chattanooga, TN. The existence of these populations outside of the Midwest is an anomaly. We are using floristic studies, GIS mapping, field surveys, and tools from molecular genetics to determine whether these two southeastern populations are recent introductions or disjunct relict populations. This diverse combination of methods will provide unique insight into the population dynamics, biogeography, and gene flow of this rare plant species.

P76 JOHNSON, ELIZABETH G., BENJAMIN A. VAUGHAN, HOWARD S. NEUFELD AND LIBBY G. PUCKETT. Appalachian State University—Better red than dead: the role of anthocyanins in stems.

Two popular theories for the roles of anthocyanins in plants are that they serve as light shields to prevent photoinhibition or as antioxidants against reactive oxygen species (ROS). Most functional studies have been done on leaves, but many plants also have red colored stems, petioles and veins, yet no studies have been published examining the roles of anthocyanins in these organs. We studied the physiological role of anthocyanins in purple-stemmed aster (*Symphotrichum puniceum*). We used chlorophyll fluorescence, light stress, H₂O₂ staining, and cross-sectioning to examine the distribution and function of anthocyanins in the stems and to test the hypothesis that the anthocyanins were functioning as photoprotectors and/or scavengers of H₂O₂. We found that almost all of the

anthocyanins were located in the epidermal areas of the stem on the side exposed to high light. We evaluated light stress in red and green sections of stem by measuring maximum photosystem II efficiency using the ratio of variable to maximum chlorophyll fluorescence (Fv/Fm) before and after 4 hrs of high light ($1079 \mu\text{mol sec}^{-1} \text{m}^{-2}$). Low Fv/Fm ratios indicate more stress. We found that high light significantly ($p = 0.04$) reduced Fv/Fm more for green than for red stems (0.55 vs 0.70, respectively). There was little evidence that high light stress resulted in the production of H_2O_2 as determined by staining with diaminobenzidine. These results suggest that anthocyanins probably act primarily to attenuate blue-green light to provide photo-protection for areas of stem exposed to excessive radiation.

- P77 VAUGHAN, BENJAMIN A., ELIZABETH G. JOHNSON, LIBBY G. PUCKETT AND HOWARD S. NEUFELD. Appalachian State—An investigation of the odor associated with *Galax urceolata*.

Galax urceolata is an evergreen understory herb native to the mountains of western North Carolina whose shiny foliage is valued in the horticulture trade as a table decoration. The odor associated with Galax has been noted since at least 1916, but analysis of the compound(s) responsible for the smell has proven difficult due to the elusive and unpredictable nature of the odor. In this project, portable solid-phase microextraction (SPME) field samplers equipped with 100- μm PDMS, 65- μm PDMS/DVB Stableflex, and 75- μm CarboxenTM/PDMS extracting fibers were used to collect volatile organic compounds (VOCs) from the headspace surrounding Galax both in the field and in controlled laboratory experiments. Sampling in the field proved inconclusive. In the lab, detached Galax leaves were placed inside inert PFA TeflonTM sampling bags which were then sealed during a two to three-hour collection period. VOCs extracted by all SPME samplers were analyzed using gas chromatography-mass spectroscopy (GC/MS) and identified using an electronic MS library. From the analysis of all three SPME coatings, 21 compounds, mostly terpenes, were identified as headspace VOCs emitted by Galax. Though the VOCs identified did not individually exhibit the typical Galax odor, it is possible that the odor may be caused by a combination of the identified compounds.

- P77A CANCELLED

Plant Ecology I

- P78A KILGORE, COURTNEY M., HAROLD W. KELLER, AND JOSEPH S. ELY. University of Central Missouri—Myxomycete species assemblages on herbaceous grassland plants and interactions of nematodes with plasmodia.

Yucca glauca, *Y. smalliana*, *Echinacea paradoxa*, *E. angustifolia*, *E. pallida*, and *Asclepias syriaca* are prairie plants that have a pH of 7.0-8.0 for flower stalks and fruits and a distinctive assemblage of myxomycete species. The slightly alkaline pH of prairie plants is more similar to plants in desert regions than most living trees in temperate forest areas. This study compared species assemblages of the above mentioned prairie plants to tree species (pH 7.0-8.0) such as *Juniperus virginiana* and *Fraxinus americana*, which may occur near prairie areas. Myxomycete species assemblages of the near neutral pH trees were compared to more acid (pH 4.0) trees such as *Tsuga canadensis*, *Pinus strobus* and *Quercus alba* (pH 5.0-6.0). Is there a difference in species assemblages between herbaceous grassland plants and living trees based on pH and habitat? A total of 303 moist chamber cultures of 200 individual plants collected at several prairies in Kansas and Missouri were scanned for myxomycetes. Four pH readings were taken from each culture (total 1212). Analysis of myxomycete species composition from 25 individual trees was evaluated from previous studies. A myriad of microscopic animal communities was

observed on the various substrata in moist chamber cultures. Nematodes were observed for the first time interacting inside plasmodia of myxomycetes on the capsules of *Y. glauca* and the follicles of *A. syriaca*. Experiments are in progress using *Physarum polycephalum*, which has a bright yellow plasmodium, to determine if nematodes are plasmodial feeders. Financially supported by National Science Foundation Grant DEB-0343447.

- P78 ABIT, PAMELA P. AND WILLIAM A. HOFFMANN. North Carolina State University—Ecological and physiological basis for the distribution of woody plants along water availability gradients in the eastern US mixed forest.

Higher temperatures under climate change are likely to result in greater evaporation and increased soil moisture deficits. Increased drought will likely cause a shift in the vegetation distribution. This study focused on woody plants of the Southeastern US mixed forest. Although water is not limiting in this forest, species distributions suggests that water availability exerts a strong control on the success of woody plants. We used a comparative approach to understand environmental factors and corresponding species traits that determine species composition across a gradient of water availability. We compared hydraulic architecture and the ability of xeric and mesic species to germinate, grow and survive under varying levels of drought stress. Congeners from either xeric or mesic sites were used. Seeds were subjected to polyethylene glycol solutions of different water potentials to test the constraints of water availability on germination. We performed a dry-down experiment to compare the ability of the xeric and mesic species to survive extreme drought by evaluating survival after re-watering subsequent to drought exposure. Growth was evaluated by measuring electron transport rate, shoot and root biomass of seedlings that were exposed to different levels of water availability. Results indicate that hydraulic architecture and the ability to germinate under water stress are not the primary determinants for the observed distribution of these species across a gradient of water availability. However, the ability of the seedlings to avoid cavitation and to survive extreme water stress appears to play an important role in determining such distribution.

- P79 LISK¹ RYAN, JOSH HUNT¹, THOMAS MCELROY¹, CASANDRA REYES-GARCIA², JOSE LUIS ANDRADE², AND PAULA C. JACKSON¹. Kennesaw State University¹, Centro De Investigación Científica De Yucatán²—Comparison of physiological responses of tree species in a tropical dry deciduous forest. Dzibilchaltun, Yucatan Peninsula, Mexico.

Although tropical dry deciduous forests are among the most endangered ecosystems of the world, information on the ecology and physiology of trees of these ecosystems is still scarce. This study took place at the height of the dry season (May 2007) and during the transition from dry to wet season (June 2006) in the dry deciduous forest of Dzibilchaltun, Yucatan, Mexico. Light response curves (LiCor 6400) were determined for three tree species that differ in their leaf flushing patterns (deciduous, brevi-deciduous, and evergreen) and sap flow (heat probe method) was determined for a brevi-deciduous species. Results from light response curves indicated that the brevi-deciduous species had the highest maximum photosynthetic rate and light saturation point, followed by the evergreen species; however, the deciduous species did not reach saturation at 1800 $\mu\text{mol m}^{-2} \text{s}^{-1}$. Sap flow for the brevi-deciduous species followed the expected circadian flow, with a midday depression at the time of maximum heat. Trees in dry forests present a variety of adaptive physiological responses to the high evaporative demand and prolonged dry season found in these ecosystems. Gaining insight to these adaptations is a necessary first step in predicting the impact of global climate change and in planning a sustainable management of the forests.

- P80 STOWE, KIRK A.¹ and CRIS G. HOCHWENDER². University of South Carolina-Columbia, SC¹ and University of Evansville, IN²—Environmentally dependent expression of the cost of glucosinolate production in *Brassica rapa*.

Theoretical models of optimal levels of plant defense against herbivores are based on the assumption that defense is costly. Experimental attempts to quantify costs have often failed to detect costs, perhaps because expression of costs are environmentally dependent. In our study, lines of *Brassica rapa* plants, previously divergently selected for high or low foliar glucosinolate content (a defense), were grown at two nutrient levels and at two temperatures to examine the effects of these environmental factors on expression of costs of defense (measured as reduction in flower production). Nutrient environment had a significant effect on flower production at 23°C; individuals given higher nutrients produced more flowers than those given lower nutrients. Still, no significant effect of glucosinolate line and no significant interaction between nutrient environment and glucosinolate line were detected at 23°C (i.e., no cost of defense occurred). In contrast, nutrient environment had no significant effect on flower production at 32°C, but a significant effect of glucosinolate line was observed (i.e., a cost of defense occurred). No significant nutrient environment by glucosinolate line interaction was detected at 32°C. These results suggest that defense was not costly in a low temperature environment, but that defense had similar costs in both high and low nutrient environments at 32°C. Simultaneously, the effect of nutrient environment on flower production disappeared at the higher temperature. Such findings may be especially important in the evolution of defense in species that occupy wide geographic ranges because these species are likely to experience a variety of temperatures.

- P81 HUGHES, NICOLE¹, KENT BURKEY², KEITH REINHARDT¹, AND WILLIAM SMITH¹. Wake Forest University¹, and North Carolina State University²—Red and green coloration in winter leaves: why do some evergreen species synthesize anthocyanins while others don't?

Leaves of many evergreen species turn red when exposed to high sunlight during winter due to production of photoprotective anthocyanin pigments, while leaves of other species, lacking anthocyanin, remain green. Why some species synthesize anthocyanin pigments while others do not is currently unknown. Here we test three hypotheses to explain this difference in color change: species which synthesize anthocyanins in winter leaves correspond to those with (1) the most drastic seasonal photosynthetic declines, as reduced energy sinks increase vulnerability to photoinhibition and need for photoprotection, (2) the greatest vulnerability to drought stress, as osmotic stress has been linked to anthocyanin production, or (3) decreased reliance on other photoprotective strategies, including antioxidants and xanthophyll cycle pigments. Our results did not support hypothesis (1), as we found no difference in mean seasonal photosynthetic capacity between red and green-leaf species. Hypothesis (2) was also not supported, as red and green species did not significantly differ in mid-day or pre-dawn water potentials. However, red species did have significantly lower osmotic potential at turgor loss (as evidenced by pressure-volume curves), and significantly higher sucrose content in winter leaves compared to green-leaved species, consistent with osmotic induction of anthocyanin synthesis. Hypothesis (3) was partially supported, as red-leaved species utilized xanthophyll de-epoxidation less than green-leaved species; however, there was no relationship between redness and antioxidant capacity. We conclude that anthocyanin production during winter is likely not associated with diminished photosynthetic capacity or vulnerability to drought-stress, but rather, may simply represent an alternative photoprotective strategy to increased non-photochemical quenching.

- P82 WENK, EVELYN S.¹, G. GEOFF WANG¹, AND JOAN L. WALKER². Clemson University¹ and U.S. Forest Service²—Chemical properties of fuels in a longleaf pine ecosystem with altered understory vegetation.

The dominant ecosystem in the Carolina Sandhills National Wildlife Refuge (McBee, SC) is the longleaf pine (*Pinus palustris*) / wiregrass (*Aristida stricta*) ecosystem characterized by frequent fire. Due to extended periods of human use and fire suppression, though, some of the forests now have increased turkey oak (*Quercus laevis*) and decreased wiregrass cover. In addition, the invasion of an exotic grass, weeping lovegrass (*Eragrostis curvula*), is changing the fuel complex. Because fuel properties influence fire behavior and effects, understanding properties of the new fuel complex is necessary for effective management and restoration. We used a bomb calorimeter to measure the energy content of five species (*P. palustris*, *Q. laevis*, *A. stricta*, *E. curvulus*, and *Schizachyrium scoparium*). Initial results show a range of energy content from 17544 – 20344 J/g, with longleaf needles containing more energy than turkey oak leaves, and little bluestem (*S. scoparium*) less than either wiregrass or lovegrass. Results suggest that fire temperature will be lower in areas with more oaks, potentially encouraging the persistence of turkey oak. The consequences of the energy differences of the grasses are difficult to predict, as the morphology of the grasses differs significantly. Lovegrass forms large, dense clusters close to each other, while wiregrass bunches have air-space between blades, and bunches may be separated by bare ground. Field experiments monitoring fire behavior and temperature are necessary to fully compare the fuel properties of the grasses.

- P83 KOONTZ, JOSHUA M. AND SCOTT B. FRANKLIN. University of Memphis—Effects of fire on riparian plant communities at Land Between the Lakes.

Fire has played an important role in shaping the distribution of plant communities. The use of fire in the United States has come full circle; heavy use in the 1800's, suppression in the 1900's, and now approximately 1,600,000 hectares each year are subject to prescribed burns in the South to achieve various forest management objectives. Riparian ecosystems often vary from upland counterparts in vegetative composition, hydrology and fuel loading, which alter fire properties and frequency. However, with landscape burns becoming more common, effects of fire on riparian zones must be elucidated. Study sites were chosen at Land Between the Lakes National Recreation Area. Data were collected in upland and riparian sites during summer 2006 and again in the spring and summer 2007, before and after a landscape burn. M.R.P.P. results indicate species compositional changes in riparian areas at the herbaceous stratum ($p = 0.008$) as well as seedling stratum ($p = 0.024$). Upland sites exhibited changes at the herbaceous stratum ($p = 0.002$) and also in sapling stratum ($p = 0.025$). Litter consumption, both depth and weight, were greater in upland sites than in riparian sites. Fire temperature was significantly greater in upland sites at the ground and 33 cm above ground levels. Increased fuel consumption and higher fire temperatures in upland sites were attributed to lower fuel and soil moisture levels compared to riparian sites, which subsequently rendered less impact on riparian vegetation.

- P84 BYTHE, TYLER, TROY EVANS, CHRISTINE LATTIN, NEIL PEDERSON AND KACIE TACKETT. Eastern Kentucky University—Effects of climate and geography on the radial growth of seven eastern tree species.

Understanding the impact of climate change on forests requires investigating the influence of climate on growth of multiple species across large regions. WE USED ESTABLISHED METHODS. All species were limited by growing season precipitation, especially in June, except for *Chamaecyparis*. Warm daytime temperatures during these months also limited radial growth for these species. Several species show some winter temperature limitation,

of which AWC was the strongest. Of the ring-porous species, precipitation limits *Quercus montana* from May-Jul, *Q. rubra* in Jun-Jul and only Jun for *Carya spp.*; *Q. montana*, however, appears to also be limited by early-season precipitation and warm daytime temperatures. *Carya* lacked a consistent minimum temperature response while *Q. rubra* responded to late growing season minimum temps in northerly locations. Warm daytime temperatures limits all ring porous species in June. *Liriodendron tulipifera*, our only diffuse-porous species is strongly limited by prior and current precipitation and warm daytime temperatures in Jun & Jul. Interestingly, even though *L. tulipifera* is an indeterminate species, it has a strong correlation to the prior summer season. Southern *Q. rubra* pops had less of a pcp signal than northern pops, but stronger neg Tmax corr. *C. thyoides* has a very strong geographical temperature response: temperatures become less important moving south. *Tsuga canadensis* has a similar pattern, although its temperature response reflects seasonal changes. These results indicate that June limits growth most consistently across species. However, there seems to be important species-level and geographic differences that may influence phenology and future forest productivity and composition.

P85 PERKINS, FERN S. AND HOWARD S. NEUFELD. Appalachian State University—Impacts of elevated nitrogen deposition on the morphology and physiology of the lichen *Umbilicaria mammulata*.

Atmospheric N has quadrupled due to anthropogenic inputs and is projected to double by 2050. The lichen *Umbilicaria mammulata* relies primarily on atmospheric deposition for nutrients, including N. Much of this species' geographic distribution coincides with the N deposition gradient in the eastern U.S. We were interested in the potential impacts of N deposition on this species in realistic field conditions. Lichens were collected at six sites, ranging from Maine (low deposition) to West Virginia (high deposition). Thalli were analyzed for %C, %N, C:N, specific thallus weight (STW), chlorophyll, and Chl fluorescence. Differences across the N gradient were nonlinear with respect to N deposition, and therefore were analyzed using ANOVA. Percent C, C:N, and STW were negatively related to N deposition, while %N and Chl *a* were positively related. Chl fluorescence and Chl *b* did not differ among the sites. The Chl fluorescence trend was similar to the %C pattern. The lower STW suggests that lichens from areas of high N deposition may be more easily damaged as they are thinner. We are currently analyzing lichens for ergosterol to determine the chl *a*:ergosterol ratio. A high ratio would indicate greater investment in the algal photobiont, whereas a low ratio would indicate greater investment in the mycobiont. Lichens are also being fertilized *in situ* at Grandfather Mountain near Boone NC to determine the impacts of excess N under controlled levels of deposition. These results should bring us closer to understanding the effects of realistic levels of increased N deposition on lichens.

P86 PERKINS, FERN S. AND HOWARD S. NEUFELD. Appalachian State University—Impacts of elevated O₃ and CO₂ on corticolous lichen communities in the AspenFACE free-air exposure system in Rhinelander, WI.

Lichens rely primarily on atmospheric deposition of water and nutrients to satisfy their metabolic demands. Many are also very sensitive to air pollutants, especially SO₂ and heavy metals. Because of this, lichens have been used extensively as bioindicators of pollution. In recent years, the levels of SO₂ and heavy metals have declined, while those for O₃ and CO₂ have risen. While there is a moderate amount of work on lichen responses to CO₂, there are far fewer on their responses to O₃, and to the best of our knowledge, only one study of their response to elevated levels of both gases, and that was done under laboratory conditions. The AspenFACE experiment in Rhinelander, WI provided us with the opportunity to study the long-term (~7 years) effects of these two gases on corticolous lichen communities. Aspen (*Populus tremuloides*) and white birch (*Betula*

papyrifera) trees have been subject to free-air exposures of ambient air, elevated O₃, elevated CO₂, or elevated O₃ + CO₂ for nearly a decade. We digitally photographed a 5 cm x 20 cm area of the lower trunk (where most lichens occurred) on the north-facing side of five randomly selected birch and aspen trees in each of the 12 exposure rings. From these images we will determine community composition (species richness and evenness) and relative species coverage (line intersect method). This will be the first study of the impacts of long-term free-air exposures to elevated O₃ and CO₂ on corticolous lichen communities.

- P87 CRABTREE, CHRISTOPHER D., JOSEPH S. ELY, AND HAROLD W. KELLER. University of Central Missouri—Important soil attributes associated with macrofungi and vascular plants among terrestrial natural communities at Ha Ha Tonka State Park, Missouri.

Terrestrial fungal and plant communities tend to be distributed along ecological gradients. Factors that determine the habitat requirements of any given species may be linked to soil. Fungi are no exception and typically follow soil gradients in both mycorrhizal and non-mycorrhizal associations. The purpose of this study was to explore possible associations of soil with macrofungi and plant communities. Five terrestrial natural communities were selected for study within Ha Ha Tonka State Park, located in central Missouri. Specific natural communities included glades, open woodlands, flat woodlands, closed-canopy forests, and karst sinks. Macrofungi species, herbaceous and overstory vegetation, and soils were surveyed for each terrestrial community type from May 2006 to January 2008. Non-metric multidimensional scaling was used to show which soil characteristics tend to be associated with fungal and plant communities. Soil pH had the highest association with both plant and fungal communities. Magnesium, potassium, and phosphorus were also found to have strong associations. Karst sinks, which are dominated by lowland forest vegetation types and lack mycorrhizal fungi, were associated with higher phosphorus levels. Mycorrhizal fungi are linked with phosphorus uptake in plants, therefore it is expected that there is more available phosphorus in non-mycorrhizal communities. The results of this study show that soil pH and phosphorous levels tend to delineate vegetation types, mycorrhizal, and non-mycorrhizal fungi. This project is financially supported in part by the Missouri Department of Natural Resources Award #226001-02 and the National Science Foundation-Division of Environmental Biology Award #0343447.

- P88 TACKETT, KACIE¹, NEIL PEDERSON² AND STACY CLARK³. Eastern Kentucky University^{1,2} and USDA Forest Service³—Age structure of two hemlock-dominated ravines and adjacent upland oak-hardwood forests within the Cumberland Plateau Region.

Age structure data was collected from an upland oak forest and adjacent hemlock-dominated ravine in the Cane Creek Wildlife Management Area (CCWMA) and from a hemlock-dominated ravine in Rock Creek Research Natural Area (RCRNA) of the London District, Daniel Boone National Forest (DBNF), Laurel County, Kentucky. Trees ages were determined using standard dendrochronological techniques for six dominant tree species (*Tsuga canadensis*, *Quercus alba*, *Q. coccinea*, *Q. montana*, *Q. velutina* and *Acer rubrum*). The ravine forest from CCWMA was predicted to be less disturbed and significantly older than the uplands due to lack of accessibility for timber harvesting. The upland forest was high-graded around the early 1900's; most trees were 60-100 yrs old. Surprisingly, the uplands had trees over 200 yrs old within one 6 ha area, including a 293 yr-old *Q. alba*. The oldest hemlocks (216-281 yrs) in the ravine forest were found adjacent to obvious skid rows; most hemlocks were 50-100 yrs old. The valuable timber species from the ravine forest of CCWMA might have been harvested. The ravine forest of RCRNA is a federally protected old-growth stand. The oldest hemlocks found within RCRNA were 220-225 yrs old; younger hemlocks date to the mid-1900's. An investigation

of other canopy trees within the hemlock-dominated ravines of CCWMA and RCRNA will further reveal forest history. The final goals of these studies are to reveal stand history, climatic influences, growth trends, and successional patterns in response to natural disturbances to provide a more accurate understanding of current forest health in the DBNF.

- P89 STEHN, SARAH¹, CHRISTOPHER WEBSTER¹, AND MICHAEL JENKINS². Michigan Technological University¹ and Great Smoky Mountains National Park²—Ground-layer vegetation dynamics in southern Appalachian spruce-fir forests.

Now considered one of the most threatened vegetation communities in North America, spruce-fir forests of the southern Appalachians have been devastated by the combined impacts of the exotic balsam woolly adelgid (*Adelges piceae*) and chronic acid deposition. Endemic Fraser fir (*Abies fraseri*), the dominant overstory species in these forests, has experienced near complete overstory mortality as result of the adelgid. Patchy regeneration of young fir and spruce has further altered light and moisture conditions on the forest floor and has likely influenced ground-layer vegetation patterns. Additionally, spruce-fir forests of the southern Appalachians receive some of the highest rates of acid deposition in the United States, incurring up to 45 kg/ha/yr of deposited nitrogen and 49.7 kg/ha/yr of deposited sulfur. Within Great Smoky Mountains National Park, we selected and stratified sixty plots into areas receiving 6-14, 15-23, 24-32, and 33-41 kg/ha of sulfur annually. We visited 33 plots in summer 2007 sampling the overstory, understory, and seedling layers of woody vegetation, as well as herbaceous and bryophyte community composition and distribution. We analyzed soil samples from each plot for aluminum toxicity, calcium availability, nitrogen saturation, and standard soil measures. We will discuss preliminary trends in vegetation distribution based on the initial set of 33 sample plots. Sampling will continue in summer 2008 to increase the robustness of our dataset and further examine patterns occurring across the landscape.

POSTER SESSION II – FRIDAY, APRIL 18

Animal Ecology II

- P90 BUCKLEY, MORIAH, ALISA BENTLEY, REGGIE COLEMAN AND ROGER SAUTERER. Jacksonville State University, Jacksonville, AL—Potential toxicity of water from Snow Creek, Anniston, AL on developing frog embryos using developmental toxicity assays and development of protein analysis by 2-D gel electrophoresis.

The Anniston, AL Monsanto plant produced PCBs from the 1920's to the 1970s, resulting in heavy contamination of both soils and local watersheds. In order to investigate the effects of current levels of contamination on a model organism, we are performing developmental toxicity assays on *Xenopus* embryos using water from nearby Snow Creek. We perform both the standard 4-day FETAX assay starting with late blastula embryos and a 25-day extended assay. Previous data using the standard FETAX assay shows subtle but significant growth inhibition of the embryos, but no increases in either mortality or malformations. The extended assay shows growth inhibition in some experiments, but substantial experiment-to-experiment variability which is difficult to interpret. We are modifying protocols to reduce experimental variability. We are also developing protocols for the analysis of the major proteins in control and experimental embryos by 2-dimensional gel electrophoresis using IPG strips, pre-cast SDS gels and a software analysis package. The goal is to determine if there are any significant and consistent

changes in the expression of specific proteins in embryos exposed to Snow Creek water, indicating possible toxic effects or responses to toxic exposure.

- P91 COLLIER, ALEX, CRYSTINA BRONK, BRETT LARSON AND STEVE TAYLOR. Armstrong Atlantic State University—Predation stress impacts tadpole behavior, growth and overall size at metamorphosis.

In this experiment, southern leopard frog tadpoles (*Rana sphenocephala*) raised in the presence of predatory largemouth bass (*Micropterus salmoides*) exhibited a behavioral drop in foraging activity and a significant reduction in growth rate compared to controls. The larvae were exposed to a mix of visual and chemical cues including "kairomones" from the bass and alarm cues released by injured conspecific prey that the bass consumed. Control tadpoles that were later reassigned to tanks containing bass also exhibited this same behavioral response and subsequent drop in growth over time. Control and predator-stressed tadpoles that survived development metamorphosed at the same time but were significantly different in terms of size. Control tadpoles were statistically longer and heavier than their predator-stressed counterparts. These data suggest that rapid metamorphosis even at a smaller body size may be advantageous in the presence of large-gape predators like bass.

- P92 BRONK, CRYSTINA, ALEX COLLIER, BRETT LARSON AND STEVE TAYLOR. Armstrong Atlantic State University—The impact of predation stress by largemouth bass (*Micropterus salmoides*) on the growth of leopard frog tadpoles (*Rana sphenocephala*).

Predator-induced behavioral and phenotypic plasticity are well documented among amphibian larvae. In addition to visual stimuli, prey respond to a mix of chemicals released by aquatic predators (kairomones) and injured prey (alarm cues). In this study we examined the impact of visual stimuli and chemical cues released by largemouth bass and the prey they consumed on the growth of leopard frog tadpoles. Tadpoles were exposed to a combination of bass kairomones and alarm cues from conspecific or unrelated prey (mosquito fish). Visual cues between predator and prey were controlled by individually rearing tadpoles in either opaque or clear tubes. The ends of each tube were covered with screen mesh to allow chemical diffusion while preventing predation from the free-swimming bass. Control tadpoles were raised in clear and opaque tubes in tanks without predators. Larvae exposed to kairomones and conspecific alarm cues exhibited the slowest growth and were statistically shorter and lighter than animals from all other treatments. Tadpoles exposed to kairomones and mosquito fish alarm cues grew at an intermediate rate, while tadpoles from control tanks experienced the fastest growth. When visual cues were limited, tadpoles exposed to kairomones and mosquito fish alarm cues grew much faster than those that could see the predator. When conspecific alarm cues were present, this relationship was not observed and tadpoles from clear and opaque tubes grew at a similar rate. These results provide additional evidence that amphibian larvae detect and are impacted by a wide range of both chemical and visual predatory cues.

- P93 MITCHELL, DAVID AND WILLIAM ENSIGN. Department of Biology and Physics, Kennesaw State University, Kennesaw, GA—Fish species richness in adventitious streams of the Etowah River Basin.

Increased species richness with increased stream size is a well-documented pattern in the ecological literature. Species richness in adventitious streams (lower-order streams that drain into streams of much higher order) is often much higher than would be expected based solely on stream size. To explore this phenomenon, we investigated patterns of species richness at 60 sites in the Etowah River Basin. Fish collections were obtained

during the summers of 2000 through 2007 using a standardized fish collection protocol. For each site three physical descriptors were estimated using mapping software, watershed area above the collection site, stream distance from the site to the next downstream confluence, and the watershed area of the receiving stream. Expected species richness as a function of watershed area was estimated using regression and site-specific residuals obtained. The ratio of watershed area above the site to watershed area of the receiving stream was used to identify adventitious (ratio < 0.20) and non-adventitious (ratio > 0.75) streams. Comparison of residuals between adventitious and non-adventitious streams using a t-test indicated no significant difference between the two groups. Within adventitious streams, there was a moderately strong negative correlation between species richness residuals and distance to confluence ($r = -0.31$, $p < 0.10$) while no pattern was observed in species richness residuals was observed in the non-adventitious streams. Our results suggest that an adventitious stream effect on species richness occurs in Etowah Basin streams, but the influence of that effect decreases with distance of the sampling site from the receiving stream.

P94 PAGE, CAROLINE, WILLIAM ENSIGN AND THOMAS MCELROY. Kennesaw State University—Haplotype variation in *Campostoma oligolepis* in the Etowah River System.

The largescale stone roller (*Campostoma oligolepis*) is ubiquitous in the Etowah river system and a useful indicator of system connectivity. Previous analysis of microsatellite genotypes suggests that populations of *C. oligolepis* collected above and below Allatoona Dam are genetically distinct. Further analysis has revealed three genetically distinct populations exist across the spatial area sampled. This study investigated the distribution of mitochondrial D-loop haplotypes for these collection sites. We tested the following hypotheses: 1) populations above and below Allatoona Dam have genetically distinct mitochondrial lineages, (2) contemporary habitat fragmentation from water control structures strongly influences population dynamics and genetic structure; however, these disturbances have been relatively recent. This study makes use of mtDNA (this study) and microsatellite DNA (previous studies) to investigate how historical and contemporary evolutionary processes have influenced the spatial and temporal distribution of genetic diversity in *C. oligolepis*. Our work has a direct impact on understanding historical and contemporary gene flow in the Etowah River ecosystem for which there is currently very little information. Preliminary data suggests that the Etowah river *C. oligolepis* population is derived from a single historical population, thus the detected divergence among sample sites for microsatellite genotypes was likely the result of contemporary ecological factors.

P95 PENGSIK, JARASPUN, WILLIAM ENSIGN AND THOMAS MCELROY. Kennesaw State University—Delineation of genetic variation for *Campostoma oligolepis* in the Etowah River System.

The largescale stone roller (*Campostoma oligolepis*), is an abundant fish species in the Etowah River ecosystem. The broad distribution of this species makes it a useful organism to assess the conservation implications of severing the connectivity of a water system that is home to many species. We have examined the variability at several highly variable genetic loci (STR, microsatellites) among 22 collection sites of *C. oligolepis*. We have integrated these data with geographic and hydrologic data to analyze the spatial genetic structure and gene flow for this species. Our work has a direct impact on understanding of fish movement and gene flow in the Etowah River ecosystem for which there is currently very little information, and delineating the impacts of natural and artificial barriers to fish movement to identify potential driving forces behind spatial arrangements of genetic variation. We tested the following hypotheses: 1) populations above and below Allatoona Dam are genetically distinct, (2) anthropogenic change strongly influences population dynamics and genetic structure causing the magnitude of genetic difference

between pairs of sites to be related to hydrological disturbance patterns rather than the geographic river distance separating them; however, in regions where the river is relatively undisturbed genetic differences will be driven primarily by isolation by distance (IBD). Our data suggests that the populations above and below Allatoona Dam are genetically distinct. Further, anthropogenic disturbance significantly impacted connectivity among sites.

- P96 VAN DEVENDER, ROBERT WAYNE AND AMY S. VAN DEVENDER. Department of Biology, Appalachian State University, Boone, NC and 797 Little Laurel Rd. Ext, Boone, NC—Land snail diversity along three Carolina railroads.

Land snails are often diverse and abundant in eastern USA habitats but details about distributions and actual diversity in small areas are poorly known. To provide such data 2004 land snails were collected from three sites along railroad rights of way in North and South Carolina and identified using all available keys. Four visits to a site in Raleigh (Wake Co.) NC produced 490 identifiable snails assignable to 22 species. Relatively even distribution of individuals among species ($J=0.85$) produced a diversity of $H' = 2.62$. Three visits to another site in Gastonia (Gaston Co.) NC produced 379 identifiable snails in 35 species. Evenness ($J=0.84$) and diversity ($H'=2.99$) were maximal at this site. The third site in Ruffin (Colleton Co.) SC produced 1135 identifiable specimens in 26 species. Large numbers individuals of three species (*Pupoides albilabris*, *Gastrocopta pellucida*, and *Gastrocopta contracta*) reduced evenness to $J=0.63$ and diversity to $H'=2.05$. Only 9 of 53 species were found at all three sites. Conversely, 32 species were found at only one site. Three species (*Triodopsis hopetonensis*, *Allopeas clavulinum*, and *Ventridens demissus*) seem to be using railroads as invasion routes for expansion of their lowland, southeastern distributions into new areas. Only 17 of the 53 species were found in previously known state and county combinations. Five species are reported for the first time in one or both of the states.

Herpetology II

- P97 SAUNDERS, K., C. BARTKUS, A. SPRIGGS AND T.K. PAULEY. Marshall University—Tail fat storage and egg deposition of female *Desmognathus monticola* and *Desmognathus ochrophaeus*.

Data containing tail fat and ovarian egg follicle sizes were compared between females of *Desmognathus monticola* and *Desmognathus ochrophaeus* to estimate periods of parturition. *Desmognathus monticola* has been observed courting in April, September, and October in Virginia, and some debate exists on whether this species reproduces annually or biennially. Female *D. monticola* guard their eggs throughout the incubation period, necessitating adequate fat stores for this period of reduced foraging. The breeding season of *D. ochrophaeus* appears to span the spring, summer, and fall in Ohio, though females reproduce annually. *Desmognathus ochrophaeus* females often have a negative energy budget and are sometimes forced to ingest their own eggs or larvae to maintain adequate energy levels. While fat is drawn from the females of each species to yolk their eggs, they must maintain additional fat in order to sustain themselves throughout the incubation period while they guard their nests. This fat is stored primarily at the base of the tail. Fat stores most likely reach their lowest point toward the end of the incubation period, just before females leave their nests to forage for food.

- P98 DOWNER, H. REID, JUSTIN A. WEISS, TOMI BERGSTROM AND THOMAS K. PAULEY. Marshall University, HUNTINGTON, WV 25755—Comparison of tail fat content and ovarian follicle size of gravid and non-gravid female *Plethodon cinereus* and *Plethodon hoffmani*.

Tail fat content and follicle size data of female *Plethodon cinereus* and *Plethodon hoffmani* were collected and analyzed in order to compare how much fat gravid and non-gravid females store, when fat content is greatest, and when eggs are deposited. Female *Plethodon* salamanders have been found to store fat in their tails prior to and during the development of ovarian follicles. The storage of this fat could be important in the production of yolk for developing embryos after fertilization. Tail fat may also be important in providing energy to brooding females because female *P. cinereus* and *P. hoffmani* guard their nests following egg deposition, which reduces their opportunity to forage. Brooding is therefore energetically expensive and increases the necessity of fat storage. Eggs are guarded in order to defend them from predators and protect them from desiccation. In more northern clines or higher elevations where climate may prevent foraging during winter, thereby reducing the length of the growing season, *Plethodon* females often breed biennially. Reproducing every other year allows females the necessary time to replenish fat stores for the following reproductive season. The collected tail fat and follicle size data will be used to determine if there are any significant differences in the reproductive cycles of *P. cinereus* and *P. hoffmani*, and if there is any difference in tail fat content between them.

P99 BLANCHARD, TOM, HEATHER BROWN AND SETH WILLIAMSON. University of Tennessee at Martin—Hatching chronology and larval growth rates of three species of ambystomatid salamanders in northwest Tennessee.

Reproductive activity and timing of hatching is known to be geographically variable among populations of ambystomatid salamanders. However, few studies of the reproductive ecology of this group have been conducted in northwest Tennessee. In this study, we determined timing of oviposition and hatching in three species of salamanders at three locations within the Obion River Wildlife Management Area in Weakley County, Tennessee. Known breeding ponds were frequently surveyed for egg masses and aquatic dip-nets were used to document the presence of newly hatched larvae. Additionally we calculated growth rates in *Ambystoma opacum* by making weekly measurements of the total length of 10-20 individuals from each of the three locations. Appearance of eggs and larvae in breeding ponds was variable among the three species. Growth rates in *A. opacum* larvae also varied among the three sites.

P100 GASKIN, PATRICK AND PAUL CUPP. Eastern Kentucky University—Thermal tolerance of tadpoles of three temperate-zone anurans.

Critical Thermal Maxima (CTM) were determined across stages of larval development and immediately post-metamorphosis for tadpoles of *Rana catesbeiana*, *Bufo americanus*, and *Hyla chrysoscelis* at an acclimation temperature of 20° C. CTM was determined as the point at which the tadpoles became motionless and failed to respond to prodding with forceps. Data were analyzed by Analysis of Variance (ANOVA) to compare mean CTM, with values of $P < 0.01$ considered significant. Mean CTM generally differed significantly between successive stages of development in *R. catesbeiana* and *B. americanus*, but not for *H. chrysoscelis*. CTM generally decreased markedly during the late stages of metamorphosis in all three species. Significant differences were also observed in most of the same stage comparisons between species. The trend of decreasing thermal tolerance during late metamorphosis has been demonstrated in other anuran species. The difference in mean CTM between species likely reflects seasonal variations in environmental temperature that occur during each species' larval development. The observed trends in thermal tolerance during larval development may be in response to the stressful physiologic reorganization that occurs during metamorphosis, or this could be a result of an overall downward shift in anuran thermal tolerance that occurs after the completion of metamorphosis. It is also possible that changes in hormone activity and

function impact thermal tolerance, as new enzyme systems are initiated at the climax of metamorphosis.

- P101 WEISS, JUSTIN¹ AND PAUL CUPP². Marshall University¹ and Eastern Kentucky University²—Odor studies in the southern two-lined salamander, *Eurycea cirrigera*.

Most members of the Plethodontidae use olfactory sense to attract mates, avoid dangers, and set up territories. Much research has been completed on this family of salamanders but little work has included *Eurycea cirrigera*. We examined the responses of *Eurycea cirrigera* to determine if they avoided chemical cues of *Thamophilis sirtalis* (Eastern Garter Snake) and if they detected their own individual odors. Both tests were set up as a two choice chamber where one side contained no odor and the other contained either an individual odor substrate or snake odor substrate. There was no difference in the substrate choices as regarded by the χ^2 and Wilcoxin tests in both snake odor and individual odor runs. This may have been caused by not collecting enough odor of the individual or snake or by collection of immature salamanders since there was an absence of an extended nasolabial groove, which is typical of male breeding salamanders of this species.

- P102 GRIBBINS, KEVIN AND JUSTIN RHEUBERT. Department of Biology, Wittenberg University, Springfield, OH 45501—The ultrastructural evaluation of spermiogenesis within the testis of the western cottonmouth, *Agkistrodon piscivorus*.

Agkistrodon piscivorus testes were examined ultrastructurally to determine the morphological changes that spermatids undergo during spermiogenesis. This is the first complete ultrastructural study of spermiogenesis within the subfamily Crotalinae. Testes from cottonmouths (n=36) were collected year round from swamps near Hammond, Louisiana. Tissues were treated and embedded using standard histological techniques for TEM. Cottonmouth spermatids show many similarities in morphology to the spermiogenic cells of other squamates. Acrosomal proteins are produced via the golgi and packaged as granules within acrosomal vesicles during the early stages of spermiogenesis. These proteins eventually form a condensed ring just under the acrosomal vesicle's membrane, which is absent in previously studied squamates. Nuclear chromatin condenses and adopts a spiral configuration during elongation. Distinct microtubules, termed the manchette, run parallel to and assist in the elongation of the spermatid nucleus. The microtubules that run perpendicular to the nucleus, which are present in other squamates, are absent in the cottonmouth. Two centrioles aligned perpendicular to each other at the base of the elongated nucleus demonstrate the conserved 9 + 2 microtubule arrangement of the flagellum. There are a number of morphological differences during spermiogenesis that are unique to the Cottonmouth. These differences may be useful nontraditional data that could be useful in phylogenetic analysis once more ultrastructural data on spermiogenesis and mature spermatozoa are collected for Serpentes. These data also may be useful in toxicological studies because previous research has shown that toxins can alter spermatid morphology at the ultrastructural level.

- P103 ROBERTSON, LACEY D. AND BETSIE B. ROTHERMEL. Austin Peay State University—Preliminary results of treefrog occupancy surveys in western Kentucky and adjacent Tennessee.

Our study will examine factors influencing the occurrence of hylid treefrog populations in agricultural wetlands of Kentucky and Tennessee. We will use calling surveys and Geographic Information Systems (GIS) to determine habitat associations of hylids, including barking treefrogs (*Hyla gratiosa*), a species of concern. In 2007, we randomly

selected historical and recent *H. gratiosa* sites and established survey routes. During preliminary sampling, we surveyed 46 sites and detected 8 species of anurans, including *H. gratiosa* at 3 sites. In 2008, we will maximize the number of surveys per site, and use the computer program Presence to estimate occupancy of *H. gratiosa*. We will also use landcover layers and aerial photographs to compare landscape characteristics between occupied and currently unoccupied sites. This data will help document changes that have occurred in *H. gratiosa* populations in Kentucky and Tennessee, and infer possible relations to landscape features.

P104 DIEFENBACHER, ERIC H. AND THOMAS K. PAULEY. Marshall University—An update on the status and life history of the Eastern Wormsnake (*Carphophis a. amoenus*) in West Virginia.

Small fossorial snakes such as the Eastern Wormsnake, *Carphophis a. amoenus*, are often neglected in studies because they lead a subterranean life and are therefore hard to find. Here we present an update on the distribution, habitat preferences, and dietary habits of *Carphophis a. amoenus* in West Virginia since it was last studied nearly 30 years ago. Field studies indicate this species occurs in only 3 of 27 historical sites due to habitat destruction from industry, residential and agriculture. Habitat data from this study suggests this species can tolerate a range of soil temperatures (15°C-24°C), air temperatures (23.1°C-34.3°C), relative humidity (24.5%-80%), soil moistures (0%-43.8%), and can be found on nearly all slope directions. Dietary analysis shows *Carphophis a. amoenus* eat a small amount of arthropod prey; however annelids make up the majority of their diet. Morphometric data indicate that females have a significantly larger snout-vent length, fewer sub-caudal scales, and shorter tails than males which are useful in determining sex in the field. A population of Midwest Wormsnakes, *Carphophis a. helenae*, was also found in southwestern West Virginia. Habitat, dietary, and morphometric data indicate no significant difference in the life histories of these two subspecies.

P105 DIEFENBACHER, ERIC H. AND THOMAS K. PAULEY. Marshall University—Iris Pattern Identification (IPID): A technique for identifying amphibians and reptiles during field studies.

Numerous techniques have been published regarding the marking of individual amphibians and reptiles for capture/recapture studies. Two popular marking techniques, toe clipping and passive integrative transponder (PIT) tags, are not without pitfalls. Toe clipping severs tendons crucial for mobility in some species; affects survivorship where multiple digits are clipped; causes inflammation and the potential risk for infection, plus digit loss and regeneration has been noted to be natural events in many species. PIT tags are expensive and often get lost, destroyed, malfunction, or cannot be used on small individuals. Here we suggest a technique that takes high resolution images of iris patterns that are unique to each individual. This technique can be done easily with any single-lens reflex (SLR) camera and a set of diopters. This technique meets the criteria set forth by Ferner 1979 where 1) the technique should not affect the survivorship or behavior of the organism; 2) allows the animal to be as free from stress or pain as possible; 3) identify the animal as a particular individual; 4) should last indefinitely; 5) be easily read and/or observable; 6) be adaptable to organisms of different sizes; 7) be easy to use in the laboratory, field and easily obtained material at minimal cost.

Animal Behavior

- P106 HAYES, LOREN¹, ADRIAN CHESH¹, JOSEPH BURGER¹, RODRIGO CASTRO², LILIANA ORTIZ TOLHUYSEN², AND LUIS EBENSPERGER². University of Louisiana at Monroe¹ and P. Universidad Católica de Chile²—Fitness consequences of sociality in the South American rodent, *Octodon degus*.

Understanding the evolutionary significance of sociality i.e., the propensity of individuals to form groups is critical to sociality theory. The objective of our study is to determine the fitness consequences of group-living in the degu (*Octodon degus*), a social rodent endemic to Chile. During the austral winter-spring (June-November) of 2005-2007, we conducted night-time telemetry and live trapping at burrow systems to determine the size and composition of social units at Riconanda de Maipu, a shrubland habitat located 20 km SW of Santiago, Chile. To estimate fitness, we quantified (i) the per capita number of emerging pups, and (ii) change in mass of pups between emergence (September) and weaning (November). We compared the physical condition of adult females (an index of future reproduction) and group size. The per capita number of emerging pups of social groups decreased with increasing group size in 2005, but not in 2006. In 2005, females in large groups did not compensate for a reduction in fitness by increasing the mass of pups. The per capita number of emerging pups of social groups was not influenced by the number of adult males per social group. During 2005 and 2006, adult females did not experience an increase in body mass. These results suggest that sociality does not enhance and may result in a cost to the direct fitness of adult females. Currently, we are analyzing fitness data from 2007. Since degus occur in kin groups, we are also developing microsatellite primers to test predictions from inclusive fitness theory.

- P107 ISBELL, KATIE, ROBYNN MACKECHNIE, DAVID GARRETT, AND G. R. DAVIS. Wofford College—Does daily limited access to a highly palatable sweet food induce binge eating in laboratory rats?

When rats or humans eat to satiety on one food, they consume very little of that food offered as a second meal but will consume a more palatable food offered as a second meal. This form of overeating is called sensory specific satiety. Another form of overeating is binge eating, defined as the consumption of a larger than normal amount of food within a given time. Binge-eating in humans often follow periods of restricted access to palatable foods. Several laboratories have shown that *ad libitum* access to highly palatable food for two hours daily does not result in binge eating in laboratory rats. In this study, we provided 23 male Sprague-Dawley rats with a small limited quantity (1.1 g) of Froot Loops™ (FL) daily for at least two weeks and then measured FL intake when FL were available *ad libitum* to see if limited daily access triggered binge eating. Food intake was compared to a group of rats which were not given daily access to FL. The only affect of limited daily access to FL was a small significant increase in the intake of FL offered as a second meal. Although total food intake was greater if FL were offered as either the first or second meal, overall food intake for a two meal sequence was not affected by limited daily access. Thus, these data do not support the hypothesis that limited daily access to a highly palatable food triggers binge eating in a sensory specific satiety experiment.

- P108 MACKECHNIE, ROBYNN, KISHAN GOVIND AND G.R. DAVIS. Wofford College—Does scheduled access to a highly palatable carbohydrate-rich food trigger binge eating in laboratory rats?

Does scheduled limited access to Froot Loops® (FL; 3.8 kcal/g) trigger binge eating as reported for a high fat food? Male Sprague-Dawley rats matched for body weight and overnight FL consumption were assigned to four groups of 10 rats each: C(ontrol) animals did not receive FL during the 28 day experiment. R(egularly scheduled)7 rats received *ad*

libitum FL 2-4 pm every day. R3 rats received FL on MWF. I(regularly scheduled) rats received FL on 12 of 28 days. FL intake was measured from 2-4 pm. All rats received *ad libitum* rodent chow (3.3 kcal/g) and water. Chow intake was measured daily at 4 pm (lights off.) Daily energy intake (~100kcal/day), cumulative caloric intake for 28 days, and body mass were not different for C and R7 rats. R3 and I rats consumed ~100 kcal daily when FL were provided and thus did not over-eat. By week 2, R3 and I rats consumed significantly fewer calories (~80 kcal) on days when FL were unavailable. Cumulative caloric intake and body mass for R3 and I rats were significantly less than C and R animals. Thus, unlike a previous report of binge-eating on high fat food when access was intermittent, none of the access schedules in the present study resulted in over-eating of this carbohydrate-rich food. Surprisingly rats given intermittent access to FL consumed fewer calories suggesting that binge eating depends in part upon food characteristics (energy density, macronutrient content, etc.) Support: Fullerton Foundation.

P109 GOVIND, KISHAN, ROBYNN MACKECHNIE AND G.R. DAVIS. Wofford College—Limited intermittent access to a highly palatable food combined with chronic mild stress induces overeating in laboratory rats.

Does scheduled limited access to Froot Loops® (FL) in combination with Chronic Mild Stress (CMS which produces symptoms of depression in laboratory rats) trigger episodes of binge eating? Male Sprague-Dawley rats were divided into 8 groups of 10 rats; 4 groups were subjected to CMS. All rats received *ad libitum* chow and water. C(ontrol) animals did not receive FL during the 28 day experiment. R7 rats received *ad libitum* FL 2-4 pm every day. R3 rats received FL on MWF. I(regularly scheduled) rats received FL on 12 of 28 days. CMS animals (CS, R7S, R3S and IS, n= 10 each) maintained on identical feeding schedules were exposed to stressors (prolonged photoperiod, water deprivation, wet bedding, and tilted cage) for 4 weeks. FL intake was measured from 2-4 pm. Daily chow intake was measured at 4 pm (lights off.) By Day 10, CMS rats weighed less than non-stressed rats. Daily and cumulative caloric intake did not differ for CS and R7S rats (approximately 75-100 kcal/day) but was less than that of non-stressed C and R7 animals. By the second week of CMS, R3S rats consumed significantly more (~120 kcal/day) on MWF than CS and R7S rats. IS rats often consumed fewer calories on days after FL access. Thus, only MWF access combined with CMS triggered overeating. This behavior may also be expressed in humans who tend to binge eat when stressed and when access to highly palatable foods is intermittent. Support: Fullerton Foundation

P110 MCDONALD, ASHLEY M. AND TERRY D. RICHARDSON. University of North Alabama—Prey profitability of Caribbean spiny lobster, *Panulirus argus*, when foraging on dwarf cerithid snail, *Cerithium lutosum*.

Understanding prey size preference in Caribbean spiny lobster *Panulirus argus* when feeding on cerithid snails, *Cerithium lutosum*, is necessary to estimate size-specific prey profitability. Profitability (E/t) of different size snail prey depends on the amount of tissue eaten (E) and the amount of time required to crack the shell and eat the tissue, or handling times (t). To estimate prey profitability, algal, post-algal, sub-adult, and adult lobsters were each fed individual snails from each of three size classes (<9.5, 9.5-13, and >13.0 mm) and the time required to crush and eat each snail recorded. A regression of snail size versus dry tissue mass was used to estimate amount of tissue gained. E/t was calculated for each lobster size class feeding on each snail size class. E/t's for algal phase ranged from 11.6 (±1.58) to 11.0(±1.83) µg/s for small and medium snails, but they were unable to consume large snails. The average E/t for post-algal lobster was 37.7(±4.19) µg/s for small snails and up to 27.7(±10.8) µg/s for large snails. The sub-adult stage had E/t averages ranging from 114(±10.9) to 66.7(±18.0) µg/s. The adult lobsters E/t's had ranges of 299 (±33.9) up to 332 (±45.2) µg/s. Overall, prey profitability increased with lobster size due to shorter handling times (t). Accordingly, algal and post-algal lobster size

classes should feed on the more profitable small snail size class, while the sub-adult and adult lobsters should feed on the more profitable medium and large snail size classes.

- P111 SWEDA, MICHAEL T. AND TERRY D. RICHARDSON. University of North Alabama—Prey size selection in Caribbean spiny lobster, *Panulirus argus*, when foraging on dwarf cerithid snail, *Cerithium lutosum*.

Little is known about the prey size selection of Caribbean spiny lobster *Panulirus argus* preying on dwarf ceriths *Cerithium lutosum*. Studies indicate lobster selection of prey is complicated by complex life cycles that include algal, post-algal, sub-adult, and juvenile phases. To examine relationships in prey size selection among juvenile phases, dwarf cerith snails were collected and separated into small (<9.5mm shell length), medium (9.5-13mm), and large (>13mm) size classes. Juvenile spiny lobsters were offered excess amount ceriths of each size class overnight and the number eaten from each size class recorded. Algal phase lobsters preferred small snails by eating an average of 21.6 (\pm 3.31 SE) small, 12.8 (\pm 2.58) medium, and 6.20 (\pm 1.60) large. Post-algal spiny lobsters also preferred small snails, but included more medium snails eating 59.6 (\pm 6.34) small, 28.7 (\pm 4.88) medium, and 19.4 (\pm 3.94) large snails. Sub-adult lobster showed little preference among size classes by eating 57.5 (\pm 8.50 SE) small snails, 40.5 (\pm 7.29) mediums, and 30.6 (\pm 5.57) large snails. Adult lobster also showed less size preferences overall, but did tend to eat more medium (99 \pm 0.71) and large (99 \pm 0.71) snails. Lobsters ate a combined average of 46.2 (\pm 6.05) smalls, 27.3 (\pm 4.92) mediums, and 18.8 (\pm 3.70) large snails. Although larger lobster show less size preference and smaller lobsters show a significant preference for smaller snails, both may be selecting prey based on prey profit and capability of handling.

- P112 ISBELL, ASHLEY D. AND TERRY D. RICHARDSON. University of North Alabama—Risk of mandibular damage in Caribbean spiny lobster, *Panulirus argus*, when foraging on dwarf ceriths, *Cerithium lutosum*.

Prey size selection in Caribbean spiny lobster, *Panulirus argus*, is complicated by a complex life cycle with numerous juvenile stages. It is further exacerbated by risk of mandibular damage encountered when foraging on gastropods. To examine potential risk due to fracture of mouth parts when foraging, pairs of lobster mandibles were obtained from algal, post algal, subadult, and adult lobster phases and subjected to increasing amounts of pressure using a force gauge until fractured. Dwarf cerithid snails (*Cerithium lutosum*) were also collected and divided into small (<9.5 mm shell length, SL), medium (9.5-13.0 mm SL), and large (>13.0 mm SL) size classes and fractured with the force gauge. On average the force required to fracture the crushing mandible increased linearly from a minimal force of 56.23 (\pm 13.022) in algal phase juveniles to 142.53 (\pm 21.488) N in adult lobsters and from 31.14 (\pm 4.204) to 284.54 (\pm 51.799) N for receiving mandibles. Whereas, the average force required to fracture cerithid shells ranged from 75.26 (\pm 5.989) for small, 103.11 (\pm 7.984) for medium, and 144.79 (\pm 7.425) N for large snails. Based on this fracture information, algal phase juveniles should forage mostly on small snails while post algal lobsters should begin to include some medium snails. Subadults should forage on small, medium, and a few large snails. Adults are well suited at eating all size classes of snails without risk of damage. These results help explain ontogenetic shifts observed previously in Caribbean spiny lobster foraging ecology.

Plant Ecology II

- P113A FLOYD, ROBERT H.¹, GEORGE R. CLINE¹ AND PAUL F. THREADGILL². Jacksonville State University¹ and Maryville College²—A survey of the trees of a mixed-hardwood forest in Haralson County, Georgia.

To collect tree-strata data before performing a more extensive plant community analysis, trees were surveyed on a 40 ha tract in Haralson County, Georgia. The county is located in west Georgia at the border between the Ridge and Valley and Piedmont and contains trees common in both. A series of 100 m transects were established in four habitats—three oak forests and one bottomland hardwood forest. Trees were sampled using point-quarters at 10 m intervals along each transect. Informal observations to include all tree species present were also made to include less frequent species which were not included in transect sampling. Thirty-nine species representing 27 genera and 20 families were encountered. Importance values (IV) were calculated for every species both within each habitat and for the tract as a whole. Southern Red Oak (*Quercus falcata*) had the highest IV overall and in two of the oak forests. White Oak (*Quercus alba*) and Sweetgum (*Liquidambar styraciflua*) had the highest IV in the third oak forest and the bottomland hardwood forest respectively. Simpson's Index (C) and Shannon-Weinner Indices were calculated to quantify the diversity of each region and transect. In addition Stander's Similarity Index (SIMI) and Jaccard's Coefficient (CC_J) were calculated to evaluate the similarity between each transect and region. The most striking results were the differences which existed between individual transects and dissimilarity between the bottomland forest dominated by *Liquidambar styraciflua* and the other regions within the survey area; these differences were also reflected in the aforementioned mathematical calculations.

P113 CANCELLED

P114 LATTY, ERIKA AND PAMELA CRUZ. Hollins University—Earthworm effects on tree seedling biomass and survival in a mesocosm experiment.

There has been increasing concern about the effects of introduced earthworm species on the structure and function of forested ecosystems. We hypothesized that root grazing by nonindigenous earthworm species would have a more negative effect on the survival of ectomycorrhizal tree species than endomycorrhizal species. To examine the impact of the introduced earthworm, *Lumbricus terrestris* (nightcrawler), on common, dominant tree species we constructed mesocosms of the Appalachian forest. Each mesocosm contained two seedlings in one of three different planting schemes, monocultures of (1) endomycorrhizal *Acer rubrum* (red maple) or (2) ectomycorrhizal *Quercus rubra* (red oak), or (3) a combination of the two species. Three adult individuals of *L. terrestris* were added to 60 of the 120 mesocosms. After one growing season the earthworms had no significant effects on the growth and survival of the different tree species. There were no significant differences in mean soil moisture (%), soil pH, and photosynthetically active radiation (PAR, $\mu\text{mol}/\text{m}^2$) among the treatments. After two growing seasons, the oaks grown in the presence of earthworms showed significantly less growth than those grown without earthworms. However, the earthworms appeared to have little effect on the growth and survival of maples. Preliminary analyses show similar patterns for the above- and belowground biomass of the tree species. Overall, those mesocosms with earthworms had noticeably less surface leaf litter than the earthworm-free treatments. Our results suggest that introduced earthworms may influence long term patterns of community composition due to their differential effects on tree seedling survival.

P115 CHANDLER, HEATHER, JOEL M. GRAMLING, DANNY J. GUSTAFSON AND LEIGH THACKSTON. The Citadel—The impact of laurel wilt disease on coastal forests in South Carolina.

The red bay ambrosia beetle (*Xyleborus glabratus*), was first detected in the United States in 2002 near Port Wentworth, Georgia. This exotic insect carries a symbiotic fungus, which has been reported to cause tree mortality (laurel wilt disease) in Lauraceae species, including red bay (*Persea borbonia*), swamp bay (*P. palustris*), endangered pondberry

(*Lindera melissifolia*), sassafras (*Sassafras albidum*), and avocado (*P. americana*). During the five years since introduction, a large number of red bay and swamp bay trees have been found dead in over thirty counties of Georgia, Florida, and South Carolina. In the fall of 2007, we established three permanent 10 m by 50 m plots in order to determine the status of swamp bay trees at Caw Caw Interpretive Center in Charleston County (South Carolina), which is the northern most front in the expansion of laurel wilt disease (LWD). Of the 53 swamp bay trees observed in these plots, 31 trees were in good health (average dbh = 7.5 +/- 0.7 cm with less than 1 re-sprout per tree), 7 trees were dead but showed no signs of LWD (dbh = 5.7 +/- 1.2 cm with 3.6 re-sprouts), and 15 trees were dead (dbh = 10.7 +/- 1.1 cm with 1.5 re-sprouts) with the presence of fungal tubes or active tunneling that confirms LWD. We will resample the marked trees in the spring of 2008, estimate the spread of LWD in these permanent plots, and compare these findings to other maritime and swamp or bottomland forests in South Carolina.

- P116 CIPOLLINI, MARTIN, JENNIFER BLALOCK, PETER BROWING, GLENN CASSELL, EVAN LANE, NICOLE MALLOY AND ERIC SWANSON. Berry College—Short-term effects of restoration burning and herbicide treatment on aboveground biomass and tree community structure in a relict Mountain Longleaf Pine ecosystem.

The Berry College Longleaf Pine Management Area consists of relict fire-suppressed montane longleaf pine (*Pinus palustris*) stands embedded within encroaching matrix of mixed hardwood forest. As of 2001, longleaf pine-dominated stands occurred predominantly on S- and SW-facing slopes whereas mixed hardwood forest occupied other slope aspects. Since then, portions of the management area have been subjected to restoration efforts involving prescribed burning and hardwood control using herbicide. Effects on tree community structure and aboveground biomass as of summer 2007 were evaluated by comparing treated stands with reference untreated stands. Biomass data were collected for downed woody debris, litter, duff, herbs, shrubs, and "small trees" (< 3.05 m tall) using a planar transect method. Data for "large trees" (> 3.05 m tall) were collected using the point-centered-quarter method and biomass was calculated using allometric equations based upon radius-at-breast-height. From 70-85% of total biomass was in large trees, ranging from $2.8 \times 10^5 \text{ kg ha}^{-1}$ in treated longleaf pine stands to $4.8 \times 10^5 \text{ kg ha}^{-1}$ in untreated longleaf pine stands. Burned and unburned hardwood stands were similar to one another in total biomass, averaging $3.2 \times 10^5 \text{ kg ha}^{-1}$. While decreasing total aboveground biomass substantially, restoration treatments have increased the relative biomass of *P. palustris* in longleaf pine stands. As longleaf pine regeneration ensues in treated stands, future biomass accrual is expected.

- P117 CIPOLLINI, MARTIN, CONNIE FRANCIA, CAROLYN KUJALA, ANGELA LOTTES, NICOLE MALLOY, MARGARET MANN, ERIC SWANSON AND NATHANIAL WIGINGTON. Berry College—Effects of restoration prescribed burning on post-fire mortality in relict Montane Longleaf Pine (*Pinus palustris*) in northwestern Georgia.

Fire suppression has contributed to the loss of longleaf pine (*Pinus palustris*) habitats in the southeastern United States. Reintroduction of fire into fire-suppressed relict longleaf pine stands is a necessary step in restoring such habitats, but delayed mortality of adult trees has been commonly observed following such efforts. This delayed mortality has been hypothesized to be related to the smoldering of duff (consolidated organic matter) into which feeder roots have extended following periods of fire suppression. This study examines possible sources of delayed mortality and other effects on adult longleaf pines following a 2004 prescribed burn in the Berry College Mountain Longleaf Pine Management area in northwestern Georgia. A census of adult trees was made following the fire to determine immediate post-fire effects (duff damage, crown scorch, and bark

damage) and then again two and three years later to determine effects on mortality, growth, and indicators of post-fire stress (e.g., beetle attack, sap seepage). Multiple logistic regression suggested that duff damage was the primary determinant of mortality. Multiple linear regression, on the other hand, suggested that trees that did survive were positively influenced by duff reduction, possibly as a result of the release of nutrients as organic matter was mineralized or as a result of the reduction in competition from surrounding vegetation.

P118 CANCELLED

P119 CANCELLED

P120 KEITH E GILLAND¹, CAROLYN H KEIFFER² AND BRIAN C. MCCARTHY¹.
Ohio University¹ and Miami University²—Seed production of forest-grown American chestnut *Castanea dentata*.

Few records exist concerning the pre-blight mast potential of American chestnut *Castanea dentata* in a forested setting. An ongoing breeding program has now made blight-resistant chestnut hybrids available for reintroduction. Consequently, wildlife and conservation groups are interested in the tree's reproductive capability and potential as a food source in the forest ecosystem. Trees were sampled from a disjunct population in West Salem, Wisconsin in October 2005 as part of a long-term ecological study. These trees were sampled again in November 2006 with the addition of trees from a stand in Bernard, Wisconsin. Ten large diameter (>23 cm dbh) trees sampled the first year in West Salem were selected for intact canopies that showed little or no blight damage. Trees were measured for height, crown spread and trunk diameter. The second year, only 5 of the 10 original trees were available for sampling although 3 additional trees from the site were added. By the second year of the study blight infection had progressed much further than anticipated with all trees showing some evidence of blight damage. The Bernard, Wisconsin site consisted of three forest-grown trees that showed no evidence of blight infection. All tree morphometrics were taken for both groups of trees the second year of the study. Average seed production over the two years was 150.6 g/m² (1303 lbs/acre). These results should provide important insight into both the reproductive potential and the ability to act as a wildlife food source of American chestnut as it is readied for reintroduction.

P121 JONES-HELD, SUSAN¹, MICHAEL E. HELD² AND JOE E. WINSTEAD³.
Rutgers University¹, Saint Peter's College² and Southern Arkansas University³—Preliminary analysis of the soil algal community of an oil and metal contaminated site in southwestern Arkansas.

The southwestern region of Arkansas has historically been an area of oil drilling and excavation that continues today. This history of oil excavation has left large tracts of land that are contaminated with hydrocarbons and elevated concentrations of metals and salts. In terms of the soil biota, other studies at oil contaminated sites throughout the world have focused on the analysis of the microbial communities. In contrast to these studies, we were interested in studying the soil algal community within a contaminated site. In the summer 2006 we collected soils samples from such an oil contaminated site in southwestern Arkansas. Comparable soils samples were collected from a site that had never been subjected to oil drilling. Elemental analysis of the soil from the contaminated site indicated high levels of manganese and boron relative to the uncontaminated site. The algae were isolated by serial dilution and cultured on BG-11 medium or Bristol's medium. The algae were purified by successive culturing. From these algal cultures, DNA was isolated and PCR amplified using primer sets for Cyanobacteria and Chlorophyta. PCR products were purified and sequenced. Sequence data were used to identify the

algae. We began to physiologically characterize how these algae adapt to high concentrations of manganese by examining the growth of the isolated algae on different concentrations of manganese.

- P122 BHATTARAI, GANESH P. AND JOHN D. HORNER. Department of Biology Texas Christian University—Deciphering the importance of pitcher size in prey capture in the carnivorous plant, *Sarracenia alata* Wood.

Prey capture in pitcher plants has been found to be positively related to pitcher size, but the actual importance of size is not clearly understood. Size may be important solely because larger capture area allows for more prey capture. Alternatively, larger size could correlate with a greater quantity of attractants produced. To distinguish between these alternate hypotheses, we compared the rate of insect capture per unit capture area by pitcher plants (*Sarracenia alata*) with that of nonbiological models and traps placed among pitchers in the same bog over the same time period. Insects belonging to nine orders were captured by the pitchers studied. The total mass of insects captured was significantly positively related to capture area for both the biological and nonbiological systems, explaining 54% variations in plants, 33% in models, and 47% in traps. However, the rate of insect capture was more than 40 times greater for plants than for models and traps, which suggests a role of attractants in insect capture in pitcher plants. In a subsequent experiment, the odor of decaying insects was found to have a significant effect on insect capture in experimental attraction cups. Results from this study provide the first experimental evidence for a role of attractants, and specifically odor, in pitcher plants. Further study should focus on the nature of other attractants, including nectar, UV reflectance, and plant volatiles to determine the mechanism of insect attraction by pitcher plants.

- P123 STEWART, SUNNI D., JOHN J. HUTCHENS, JR. AND JAMES O. LUKEN. Coastal Carolina University—Functional response of the Venus flytrap (*Dionaea muscipula*).

Individual predators respond to increased levels of prey according to one of three functional responses according to ecological theory. We investigated how a carnivorous plant, the Venus flytrap (*Dionaea muscipula*), responded to increasing numbers of insect prey (crickets) in two greenhouse studies. Individual flytraps having the same number of traps per plant captured at a rate that was directly proportional to increasing numbers of crickets as they became available (i.e., a linear increase) until reaching an asymptote, after which they did not collect more prey. This Type I functional response curve displayed by flytraps was partly due to their long handling time after collecting prey (i.e., individual traps containing prey did not reopen for nine to eleven days). The Type I functional response of the Venus flytrap indicates that flytraps function similarly to filter feeders.

- P124 MITCHELL, CHAD H., MICHAEL W. DENSLOW AND ZACK E. MURRELL. Appalachian State University—Floristic education in North Carolina 1930-2007: where do we go from here?

Floristic research is essential to our understanding of biodiversity. Floristic studies are conducted in a specific area to generate a representation of the vascular plants at that site. In this study, we searched college and university library catalogues of all North Carolina schools, using specific keywords, to examine the frequency and distribution of floristic studies. A database was created and the data statistically analyzed. Patterns emerged from this dataset, the most striking being an overall decline in floristic studies over the past five decades. Much of the floristic research has been conducted by students at UNC-Chapel Hill, working under the direction of Albert E. Radford. This study highlights how Radford contributed significantly to the overall advancement of floristic research in

North Carolina. Implications of this study include: 1.) A need for easier access to floristic studies, 2.) A further need for increased training in floristics, and 3.) Recognition of the need to conduct floristic studies in both pristine and disturbed areas. Using the methods developed in this analysis, we hope to expand the scope of our research in order to provide a more complete understanding of floristic research needs in the southeast region. This study will facilitate information access for further research as education in floristic methods increases in importance. As we become more aware of the global biodiversity crisis, it is critically important to develop means to determine what we do know about biodiversity and where we need to direct resources to augment the gaps in our knowledge.

Plant Systematics

- P125 MURRELL, ZACK E. AND DERICK POINDEXTER. Appalachian State University—A report on the progress and goals of SERNEC: SouthEast Regional Network of Expertise and Collections.

SERNEC (SouthEast Regional Network of Expertise and Collections) is a five-year project funded by the National Science Foundation as a Research Coordination Network (RCN). RCNs are designed to advance a field of scientific inquiry by encouraging interactions among scientists and to implement novel networking strategies. SERNEC is a network of herbarium curators working to provide an electronic database of herbarium specimen labels and images. Facilitated by collaborations with the National Biological Information Infrastructure (NBII), SunSITE at the University of Tennessee, mapping projects at UNC-Chapel Hill and University of Tennessee-Chattanooga, and Morphbank, we are developing our capability to build a regional database and provide a mechanism for review by the collective taxonomic expertise of this virtual community. This infrastructure, when coupled with the community expertise, will result in an increasingly accurate portrayal of the biogeography of the region. SERNEC hosted a regional meeting of curators in year one and is hosting a second regional meeting in year two at the annual ASB meeting. SERNEC facilitated the meeting of curators in Virginia, Tennessee and Louisiana and these meetings have, to date, resulted in one proposal to a non-profit and one proposal to NSF. SERNEC provided funds for East Tennessee State University to host a Specify workshop to train curators in the use of this databasing software. It is our goal over the remainder of the life of the grant to mobilize the curators of the region to effectively use the available funds to further their research goals.

- P126 MORRIS, MICHAEL WAYNE¹, JOHN WILLIAMS², MAGGIE PSCHANDL², AND RENEE' VAN CLEAVE². Troy University¹ and North Georgia College & State University²—A floristic study of Burks Mountain ultramafic woodland, Columbia County, Georgia.

Burks Mountain ultramafic woodland is located in the lower Piedmont of Georgia in close proximity to the Savannah River. Three monadnocks support xeric herb-dominated barrens intermixed with pine-oak woodlands over circumneutral soils that are generally high in magnesium and low in calcium. Both mesic and hydric habitats are present downslope from the barrens. Thirteen collecting trips were made at regular intervals during the growing season from September 2005 to October 2006 in this floristic survey. A total of 481 species of vascular plants was documented and includes 12 pteridophytes, 4 gymnosperms, and 465 angiosperms. The largest families present are Poaceae, Asteraceae, Cyperaceae, and Fabaceae, with 71, 65, 37, and 34 species, respectively. *Bouteloua curtipendula*, *Clematis ochroleuca*, *Marshallia ramosa*, *Paronychia virginica*, and *Pediomelum piedmontanum* are listed as species of special concern in Georgia; and an additional seven taxa, including *Asclepias viridiflora*, *Platanthera lacera*, and *Stenaria*

nigricans are on the state watch list. Only 7.7% of the species recorded are regarded as exotic, indicating that growing conditions here are harsh for most vascular plants. This project was funded by a grant from the Georgia Native Plant Society.

- P127 ZOMLEFER, WENDY B. AND DAVID E. GIANNASI. Department of Plant Biology, University of Georgia—Vascular plant survey of Cumberland Island National Seashore, Camden County, Georgia.

Cumberland Island National Seashore, Camden County, Georgia, is administered by the National Park Service, United States Department of the Interior, and comprises 14,740 ha (36,415 acres) that include property and historic residences once owned by the Thomas Carnegie family. The National Park Service is required to balance potentially conflicting management directives: preservation of historic and natural resources while encouraging and supporting public visitation. Plant communities on Cumberland Island continue to undergo succession under the influence of human factors despite concerns about deleterious impacts on these fragile environments. Current challenges include impending increased public access to previously secluded historic areas (mandated by recent legislation that lifts Wilderness Area restrictions), effects of decades of fire suppression, and population control of feral hogs and horses that destroy natural habitats. A floristic survey of the 7,880 ha (19,472 acres) owned by the National Park Service was conducted to provide park service personnel with a vouchered plant species checklist, supplemented with salient information such as relative abundance, locality data, and general community type. Six intensive collecting trips conducted in 2004–2006 yielded 498 species of plants, including 227 species not previously vouchered for the island. The largest families were Poaceae (74 spp., 3 varieties), Cyperaceae (54 spp.), Asteraceae (52 spp., 1 variety), Fabaceae (33 spp.), Euphorbiaceae (16 spp.), and Ericaceae (13 spp.) Identifications of specimens in the Cumberland Island National Museum herbarium were also verified and incorporated into the annotated list. Maps, descriptions, and photographs of 11 general plant community types were also compiled.

- P128 BRUEHL, ADAM¹ AND PETER FRITSCH². Guilford College¹ and The California Academy of Sciences²—Comparative pollen morphology of the genus *Symplocos*.

The genus *Symplocos* comprises about 325 species of flowering plants found in tropical to sub-tropical regions around the world. Pollen samples from thirty-nine representative species of *Symplocos* were examined through scanning electron microscopy to evaluate the significance of pollen morphology to the systematics of the genus. *Symplocos* pollen morphology varies greatly throughout the genus with geometry ranging from oblate to spheroidal, aperture morphology ranging from tri-colporate to tri-porate, and equatorial diameters ranging from 20 μm to 45 μm . These characteristics appear to carry significant phylogenetic signal. In the largest New World clade, *Symplocastrum* (including *Neosymplocos*), pollen grains are primarily spheroidal to sub-spheroidal, with a sub-circular/triangular to circular equatorial outlines. Nearly all are tri-colporate; however, a few are bi-colporate with an elliptical equatorial outline. This clade is unique in that many species exhibit a primarily psilate (smooth) ornamentation and rarely if ever have any protruding ornamentation. New World clade, *Urbaniocharis*, differs from other New World clades by exhibiting a primarily rugulate ornamentation. Species in New World clade *Epigenia*, differ from *Symplocastrum* by exhibiting protruding ornamentation. Also, whereas most species primarily exhibit the tri-colporate morphology, many in *Epigenia* also produce some 4-colporate grains or 3-colporate grains with one additional pore. *Hopea*, the main Old World clade, produces pollen that is small, oblate, and triangular in comparison to New World clades, and also exhibits a highly variable ornamentation. We found that *Symplocos* pollen exhibits a strong phylogenetic signal in terms of

ornamentation, shape, and aperture morphology, which roughly correlates with established clades in *Symplocos*.

- P129 KEY, JANN AND MICHAEL WOODS. Troy University—The genus *Rhynchosia* (Fabaceae) in Alabama.

Rhynchosia Loureiro, commonly known as snout bean, is a member of tribe Phaseoleae and subtribe Cajaninae of the family Fabaceae (Leguminosae). The genus consists of 200 species worldwide. Fourteen species and two infraspecific taxa have been reported from the United States. Of these, five species and no infraspecific taxa are recognized as occurring in Alabama. In Alabama *Rhynchosia* is a conspicuous taxon of open dry woodlands, savannahs, prairie openings, fields and roadsides. Based on the results of this study, the most common species of *Rhynchosia* in Alabama are *R. tomentosa* (48 counties), *R. reniformis* (24 counties), and *R. difformis* (16 counties). The least common species are *R. cytisoides* (eight counties in south Alabama) and *R. minima* (one county in the southwestern section of the state). We have constructed dichotomous keys and descriptions that are modifications from earlier authors; however, all measurements are based on morphological features of the vegetative and reproductive structures of the plants studied during the project. Data for the distribution maps was gathered from personal collections and plant specimens deposited in the herbaria of Troy University (TROY), Auburn University (AUA), The University of Alabama (UNA), The University of South Alabama (USAM), Jacksonville State University (JSU), University of North Alabama (UNAF), and Vanderbilt University (VDB), which is housed at the Botanical Institute of Texas (BRIT) in Fort Worth.

Teaching Biology

- P130 SONGER, STEPHANIE AND IRENE KOKKALA. North Georgia College & State University—Biology in Second Life.

Virtual worlds have been used in education for several years, but recently there has been an increased interest in delivery of courses using three-dimensional interactive learning environments. One of these multi-user virtual worlds is Second Life, created and maintained by Linden Laboratories in San Francisco, California since 2003. All content is constructed by the users who use avatars while present in world. More than one hundred universities are actively engaged in educational activities in Second Life. Since 2007 North Georgia College & State University has had an in-world presence with its island Auraria, which serves as a home base for faculty and students to experience Second Life. During the summer and fall semesters, the Second Life interactive environment was used as part of the delivery of courses in Introductory Biology and General Microbiology. Virtual field trips were designed based on existing scientific sites within Second Life, of which there are several. Most of the virtual field trips were centered on the area called Genome created by Mary Anne Clark ("Max Chatnoir"), Professor of Biology at Texas Wesleyan University. Genome contains several learning modules including: prokaryotic and eukaryotic cell structures, Mendelian genetics, genetic transformations, molecular genetics, bacterial genetics, and bioinformatics. This poster presentation will focus on the activities designed for the Introductory and General Microbiology courses, and the preliminary assessment of these experiences with recommendations for future uses of Second Life in biology courses.

- P131 MOELLER, JOHN AND G.R. DAVIS. Wofford College—Does consulting with the professor result in greater improvement on the grade of a revised written assignment?

The purpose of this analysis was to determine if face-to-face consultation with the professor would improve scores on a written laboratory assignment intended to develop skills in scientific writing. Students in the Fall 2007 Human Physiology course wrote one-page abstracts addressing hypotheses related to action potential conduction velocities. Data was obtained during a laboratory exercise examining velocities in their own ulnar nerves. Abstracts were graded according to a rubric made available to students in advance. Written comments were returned to students for revision, resubmission, and regrading of abstracts two weeks later. Students were given the option to meet with the professor and discuss ways to improve the abstract. During regrading, the grader was not aware of original grade, name of student, or whether they had consulted with the professor. Those students who consulted with the professor ($n=37$) improved their score by 22 ± 10 points (mean \pm standard deviation), while students who did not ($n=17$) improved their score by 13 ± 11 points. The difference was significant (t-test, $p = 0.005$). The final grade on the abstract was significantly higher ($p = 0.021$, t-test) for those who consulted with the professor (88 ± 6) than those who did not consult (84 ± 7). Thus, consulting with the professor resulted in greater improvement than revising abstracts based on written comments alone. Further analysis of the data, such as time spent consulting with professor, suggests that face-to-face consultation is a crucial element in developing proficiency at this style of scientific writing.

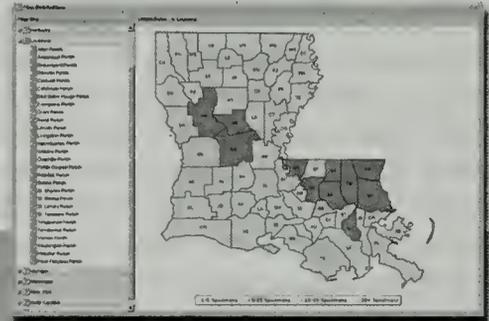
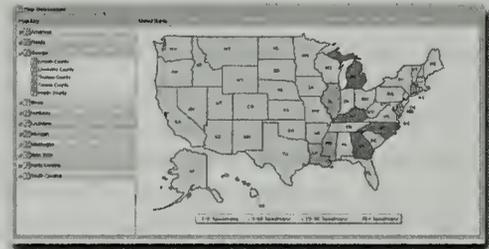
P132 DELFINO, JOHN AND BEVERLY W. JUETT. Midway College—Collaborative research at Midway College: a blend of faculty pursuits and development of undergraduate scientists.

Faculty at small colleges are typically faced with the challenge of balancing teaching responsibilities with their desire to conduct and produce publishable research projects. This challenge must be met because faculty want to pursue their research endeavors while not only educating undergraduate students with the traditional lecture, laboratory and field work, but also exposing them to the rigors of scientific research. Perusing the Chronicle of Higher Education, we see faculty are being sought, who in addition to teaching undergraduates, will also mentor these students, engage these students in undergraduate research projects. We have met and continue to meet this challenge at our school. We are 4 strong in biology with areas of expertise ranging from microbiology to neuroscience to ecology and statistics; with 1 organic/analytic chemist. With this core we collaborate among ourselves and with our students to produce oral and poster presentations or publications in both scholarship of teaching and discovery. A total of 7 faculty colleague oral presentations has been made along with 2 each faculty – student oral and poster presentations. From 1999 – 2007 our students have made 14 poster and 15 oral presentations at various scientific meetings, namely, Annual Meetings of the Kentucky Academy of Science, and Beta, Beta, Beta Annual District Meetings held in conjunction with the Association of Southeastern Biologists Annual Meetings. Collaboration within the Biology Department and between biology and chemistry has and continues to provide foremost group benefits while transcending but recognizing individual expertise.

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Search Specimen DB

Filters

Family: Asteraceae

Genus:

Species:

State:

Parish/County:

Locality:

Collector:

Catalog #:

Catalog #	Family	Genus	Species	State	Parish/County	Locality
Family: Asteraceae (100 Specimens)						
17429	Asteraceae	Achillea	millefolium	Louisiana	Assumption Parish	Paincourtville
17430				Louisiana	Bienville Parish	unspecified
17431				Louisiana	East Baton Rouge Parish	Baton Rouge
17432				Louisiana	East Baton Rouge Parish	Plains
17433				Louisiana	East Feliciana Parish	Clinton
17434				Louisiana	Lincoln Parish	unspecified
17435				Louisiana	Morehouse Parish	Bonito
17436				Louisiana	St. Helena Parish	Greensburg
17437				Louisiana	St. Helena Parish	Greensburg
17438				Louisiana	St. Helena Parish	Greensburg
17439				Louisiana	Vernon Parish	Leesville
15907				Louisiana	East Baton Rouge Parish	Ben Hur Woods
27784				Louisiana	St. Martin Parish	Cypress Island Preserv
13268				Louisiana	Ascension Parish	Brittany
13269	Asteraceae	Ageratina	altissima	Louisiana	Ascension Parish	New River

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Beta Beta Beta

Paper and Poster Abstracts

***From the 51st
Tri-Beta Annual Meeting***

***Held with the 69th
Annual ASB Meeting***

Co-Hosted by

***Furman University
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Spartanburg, South Carolina

April 16-19, 2008

**DISTRICT I
PAPER SESSION
FRIDAY, April 18 2008**

- 1:00 Ross, Brittany J. Tau Xi, Meredith College. Phenotypic Analysis of *Arabidopsis thaliana* Mutants Lacking Homologs of a Soybean Drought Responsive Protein

Drought is a major limiting factor for plant growth and thus crop productivity. Plants sense hyperosmotic stress, leading to cellular changes that may help them better tolerate the stress. A putative lipid transfer protein, Ssh1p, has been implicated in water stress responses, but its *in vivo* function remains unknown. To determine the function of Ssh1p, two *Arabidopsis thaliana* Ssh1p homologs (AtSsh1_1 & AtSsh1_5) were identified. T-DNA insertion mutations that knocked out expression for each AtSsh1 gene were obtained and cross-pollinated to generate individuals that were nonfunctional for both genes. Phenotypic analyses were conducted to determine the growth rate and the effects of different hyperosmotic stresses on the mutants. In addition, my preliminary data suggested a role for these proteins in seed germination. The double mutant showed a decreased germination rate when germinated without vernalization. Addition of gibberellic acid to the growth media partially rescued the germination defect while vernalization completely rescued the low germination phenotype. My results suggested that Ssh1p plays a role in seed germination and may also have a role in conferring drought tolerance.

- 1:15 Clayton, April M. Sigma Gamma, Erskine College. Connections between Mitochondrial Fatty Acid Synthesis and Mitochondrial DNA in *Trypanosoma brucei*.

Trypanosoma brucei is the causative agent of African sleeping sickness in humans and nagana in livestock. Two interesting facets of *T. brucei*'s mitochondrion are the mitochondrial genome, kinetoplast DNA (kDNA), and mitochondrial fatty acid synthesis, (FAS). kDNA is a network of DNA circles, consisting of thousands of minicircles and several dozen maxicircles. Mitochondrial FAS is a type II FA synthase. The connection between FAS and kDNA maintenance is not obvious. However, a knockout of the gene acyl carrier protein (ACP), an important protein in mitochondrial FAS, results in loss of kDNA. Southern blot analysis showed that total minicircle levels remain constant, indicating that minicircle replication is likely not affected. Also, changes in free minicircle replication intermediates were not consistent with a replication defect. However, maxicircles were decreased, and FISH further demonstrated that maxicircle levels are affected by ACP KO. Quantitation of DAPI-stained ACP KO cells showed kDNA loss via asymmetrical division of the kinetoplast. These results indicated that the effect of ACP KO is mainly on kDNA segregation. Aberration of the mitochondrial membrane due to FAS inhibition may lead to the membrane's imprecise fit around the kDNA network, resulting in abnormal kDNA segregation and ultimately asymmetrical division.

- 1:30 Beals, Erica S. & Amber Litesy. Meredith College, Tau Xi. Isolation and purification of potential HIV protease inhibitor in *Tylosema fassoglensis*.

The search for new treatments for HIV/AIDS is of great importance to the global community. Recently, an herbal treatment known as Sunguprot has been used in regions of Kenya and is thought to be a relatively effective method of treating the symptoms of the virus. Sunguprot is a combination of nutrients and the powdered root extract of the plant *Tylosema fassoglensis*. It is hypothesized that a protease inhibitor can be found in *T. fassoglensis*, and may be responsible for the positive reaction in patients who receive

treatments. The application of protocols developed by Sugiura et al. (1973), created for the isolation of trypsin inhibitors from sweet potatoes, was used to isolate a potential HIV protease inhibitor from *T. fassoglensis*. Initial results suggest that *T. fassoglensis* does contain protease inhibitors, which may have HIV protease inhibitor qualities. Further research is needed to determine definitively if the isolated protease inhibitor is indeed an HIV protease inhibitor.

****1:45** Cross, Andrea M. Sigma Psi, Florida Institute of Technology. Functional Architecture of Retinal Photoreceptor Arrays in the Endangered African Spurred Tortoise, *Geochelone sulcata*.

Vision is critical for tortoise survival. While tortoise vision is poorly studied, all previous studies reported cone-only retinas. I used immunohistochemistry to test the hypothesis that tortoise retinas contain complex photoreceptor arrays. Eyecups from captive-hatched *Geochelone sulcata* (all procedures IACUC approved) were fixed in glutaraldehyde/paraformaldehyde, and 1 μ m plastic sections stained with azure-II/methylene blue. From other eyecups, 10 μ m frozen sections were incubated with antisera against rod and cone opsins (anti-cone CERN-906, anti-rod CERN-922, MAB5136). Sections were secondarily labeled with goat-anti-rabbit IgG-Alexa-488 (green) and goat-anti-mouse IgG-Alexa-555 (red), coverslipped with DAPI, and viewed by fluorescence microscopy. Negative controls omitted primary antisera. Light microscopy showed morphologically similar cone-like cells throughout the retina, as previous literature described. Immunofluorescence, however, clearly showed rod and cone opsins in distinct cellular arrays in the retina. This provides the first biochemical analysis of vision in a critically endangered group of turtles, and the results indicate greater spectral and absolute sensitivity than previously described. This work may have important conservation implications, and will be used to examine developmental plasticity of vision in endangered terrestrial and marine turtles.

2:00 McKuen, Mary J. Sigma Psi, Florida Institute of Technology. Evolution Canyon III: Comparison of Carbon Source Utilization by *Bacillus* species.

Traditionally, bacteria have been categorized by phenotypic similarity of membrane content, morphology, and metabolic differences. More recently, it is becoming based on gene sequences and whole genome similarities. Differences in strain relationships of traditional species have been found, raising the question of how to accurately organize the microbial domain and species. The Evolution Canyon I and II work of Sikorski and Nevo found that habitat influences the genetic structure of *Bacillus simplex* and not distance, suggesting the presence of potentially adaptive phenotypes. Following this work, 15 *Bacillus* isolates were examined from 5 different Death Valley, CA ecotypes. Biolog Phenotypic MicroArray plates were used to analyze the strains' utilization differences of 192 carbon sources. The cells' phenotypic responses to their utilization of substrate were colorimetrically monitored using tetrazolium dye reduction during respiration. Strains were organized by phenotypic carbon utilization, and compared to genotypic REP-PCR and *gyrA* gene sequencing. It was found that the genotypic and phenotypic phylogenies of the *Bacillus* strains were congruent. Since many more diagnostic carbon sources were found than expected, this methodology can be used to define bacterial species as well as in reorganizing the microbial domain using a genotypic linked observable phenotypic difference.

2:15 Pennington, Britney O. Sigma Psi, Florida Institute of Technology. Cytochemical Investigation of Lignin Redistribution During Thermochemical Pretreatment

Due to the increasing demand for oil, the United States has developed starch ethanol programs, but corn cannot support both the food and fuel industries. Cellulosic ethanol is a promising alternative to starch-based ethanol but is more difficult to generate due to biomass' intrinsic resistance to degradation. Lignin contributes to this recalcitrance by inhibiting hydrolytic cellulases, thus presenting an obstacle to producing bioethanol. Dilute acid pretreatment (DAP) of biomass minimally removes lignin content, but at high temperatures, sufficient enzymatic digestion still occurs. To address this paradox, this study utilized microscopy and cytochemical stains to determine lignin redistribution at different temperatures during DAP. The lignin-specific, cytochemical stains showed evenly distributed staining patterns at 80°C but became concentrated towards the cell edges as temperatures approached 160°C. The biomass surface was also investigated using scanning electron microscopy. At 140°C, half-sphere droplets appeared on the tissue surfaces; their morphologies seem to coalesce into larger spheres at higher temperatures. Round droplets were also observed using light microscopy. The results suggest that melted lignin is pushed out of the cell wall and forms spheres due to hydrophobic forces. Understanding lignin redistribution and its resulting implications on cell structure will help biologists explain pretreatment effects on biomass.

2:30 Break

2:45 Aiken, Molly S. Tau Xi, Meredith College. The combined immunostimulatory effect of *Tylosema fassoglensis* and whey protein concentrate (WPC) on mice

Tylosema fassoglensis and whey protein have been used as herbal drugs in Kenya to treat HIV, but the combined effect of *T. fassoglensis* and WPC is unknown. The study reported here attempts to determine if *T. fassoglensis* and WPC can be used as an immunostimulant on mice. I hypothesized that although the combination of *T. fassoglensis* and WPC is known to improve the health of people living with AIDS, the substances do so due to the fact that one or more may interfere with viral replication, not because they are immunostimulants. Information about the mice such as the normal differential white blood cell count was determined prior to the study. The test mice were fed *T. fassoglensis* and WPC three times a week for two weeks. At the end of the supplement administration, blood smears were made and compared to controls. Neutrophil counts in test mice were 26.5 ± 9.3 (2 S.E.) per mm^3 vs. 19.5 ± 12.3 per mm^3 ; for lymphocytes 70.8 ± 9.4 per mm^3 versus 77.3 ± 14.4 per mm^3 . *T. fassoglensis* and WPC do not appear to stimulate lymphocyte or neutrophil production. Further research is required to determine if *T. fassoglensis* or WPC can ameliorate the effects of an immunosuppressant such as Cyclosporin A.

3:00 Buckingham, Christine M. Beta Eta, Florida Southern College. Observing Rail Species Concentration in a Suburban Lake Habitat as a Function of Disturbance Effects and Resource Availability

Lake Hollingsworth, situated in Lakeland, Florida is an active suburban area and serves as a habitat rich in resources for many of the bird species found in central Florida. Three such species, belonging to the family Rallidae are observed in this study; the American Coot, Common Moorhen, and Purple Gallinule. Because the lake is surrounded by a two lane road it is possible that human disturbance could affect the birds' distribution. In this observation, their locations and behaviors were recorded in sectors to determine if points of disturbance exist and to locate these points. In the second part of this observation, the habitat resource availability and utilization was also studied by observing correlations and consistencies in species concentration and behaviors within areas in and around the lake. Together, the two parts of this observation display correlations behind the rail distribution in Lake Hollingsworth. They display what areas of the lake are being used by these

species and why each specific area is conducive to the species found there. Pin-pointing areas utilized for foraging, nesting and other activities is important in studying and protecting not only the rails but the entire ecosystem that exists in Lake Hollingsworth.

- 3:15 Davis, Ashley C., Marlena Westcott, & Elizabeth M Hiltbold. Sigma Phi, Guilford College. Level of LLO at the time of *Listeria monocytogenes* infection does not affect its escape from vacuoles in Dendritic Cells.

Listeria monocytogenes is a facultative intracellular pathogen that causes Listeriosis in humans, a food-borne illness that can cause a serious food-borne illness in pregnant women and immunocompromised individuals. Its primary virulence factor is Listeriolysin O (LLO), a secreted pore-forming toxin that allows escape of the bacteria from primary host cell vacuoles to the cytosol where they can grow. Mutant bacteria in which *hly* (hemolysin), the gene that encodes LLO is deleted, are avirulent in a mouse model of infection. In this study we examined how growing *Listeria monocytogenes* in different growth media affects the amount of LLO produced and in turn how the amount of LLO produced affected subsequent infection of a critical immune cell type, the dendritic cell (DC). My research has shown that the amount of LLO being produced by the bacteria at the time of infection had little effect on the ability of bacteria to enter the cytosol. However, we found that bacterial growth phase (logarithmic versus stationary) at the time of infection did influence the outcome of DC infection.

**Brooks Award winner for best paper in session

**DISTRICT II
PAPER SESSION
FRIDAY, APRIL 18, 2008**

- 1:00 Lucas, Bliss. Mu Omicron, Columbus State University. The Effects of Curcumin on the Growth and Viability of Human Colon Carcinoma

Curcumin, a yellow pigment that can be attained from the rhizomes, or roots, of *Curcuma longa* L., is a major component of the Asian spice, turmeric. Over the last 50 years, scientists have studied this ingredient and found promising advancements in its role in cancer prevention. Six hundred and eighty-eight studies confirm curcumin's outstanding anticarcinogenic abilities. In this study, there were four treatment groups of human colon carcinoma cultures. Three groups were exposed to curcumin for 24 hours at concentrations of 9 µg/ml, 18 µg/ml, and 36 µg/ml. The fourth group was the control and was not exposed to curcumin. Although it appears that curcumin slowed the rate of carcinoma cell growth and decreased the viability of subsequent cell populations at the highest dose and that curcumin was ineffective at lower dosages, none of the differences were statistically significant.

- 1:15 Bomboka, Linda. Mu Omicron, Columbus State University. The Effects of Calcium on Myoblasts Exposed to Hypoxia

Oxygen plays a vital role in the function of myocytes. Recent research shows that calcium can aid in maintaining cellular viability during hypoxic stress. However, further studies demonstrated that very high levels of calcium in a hypoxic cell can induce apoptosis. The purpose of this research was to determine what levels of calcium are sufficient to maintain

cellular viability in cells during hypoxia. Cultured rat myoblasts were treated with concentrations of 0.001 mM, 0.01mM, and 0.1mM of calcium for two hours. Cells were exposed to either hypoxic or normoxic conditions. To determine cell viability, an MTT assay was performed. Under hypoxic conditions, myoblasts treated with 0.001 mM, 0.01mM, and 0.1mM of calcium had average absorbance values of 0.16 (+/- 0.03), 0.14(+/- 0.04), and 0.14(+/- 0.05), respectively. Under normoxic conditions, myoblasts treated with 0.001 mM, 0.01mM, and 0.1mM of calcium had average absorbance values of 0.14(+/- 0.12), 0.12(+/-0.04), and 0.09 (+/- 0.04). Results suggested that calcium did not affect the cellular viability of cells exposed to hypoxia. For further studies, other concentrations of calcium should be measured with a different method for inducing hypoxia.

- 1:30 Batts, Richard K. II. Mu Omicron, Columbus State University. Burrow usage by *Gopherus polyphemus* within a metapopulation in Marion County, Georgia.

Gopherus polyphemus burrow usage and movement patterns of a metapopulation (N=21) were assessed from April (2006) to October (2006) in Marion, county Georgia. During this study tortoise captures, movements, and burrows constructed peaked in August. Male Gopher tortoises were found to use an average of 2.9 burrows and females were found to use an average of 1.9 burrows. Burrow activity status remained relatively constant and indicated no significant relationship between burrow status and the sampling period. Five movements occurred between subpopulations and 19 movements occurred within subpopulations, with males averaging three movements and females averaging two movements. No significant results were found in the number of tortoises captured, the number of movements, and the mean number of burrows used. However the results obtained from this study are similar to previous studies that indicate males are more active than females, male's movement patterns peak in August and September, and males use more burrows than females.

- 1:45 Batts, Richard K. II. Mu Omicron, Columbus State University. Burrow usage by *Gopherus polyphemus* within a metapopulation in Marion County, Georgia.

Gopherus polyphemus burrow usage and movement patterns of a metapopulation (N=21) were assessed from April (2006) to October (2006) in Marion, county Georgia. During this study tortoise captures, movements, and burrows constructed peaked in August. Male Gopher tortoises were found to use an average of 2.9 burrows and females were found to use an average of 1.9 burrows. Burrow activity status remained relatively constant and indicated no significant relationship between burrow status and the sampling period. Five movements occurred between subpopulations and 19 movements occurred within subpopulations, with males averaging three movements and females averaging two movements. No significant results were found in the number of tortoises captured, the number of movements, and the mean number of burrows used. However the results obtained from this study are similar to previous studies that indicate males are more active than females, male's movement patterns peak in August and September, and males use more burrows than females.

- 2:00 Wotawa, Amy M. & Neil Billington. Mu Epsilon, Troy University. Distinguishing southern and northern mitochondrial DNA haplotypes of Alabama walleye.

Two genetically distinct groups of walleye (*Sander vitreus*) exist in Alabama: southern or Gulf Coast walleye from the Mobile drainage basin and northern walleye from the Tennessee River. These groups are separated by a sequence divergence of 2.36% based on whole-molecule mitochondrial DNA (mtDNA) analysis, meaning that they likely

diverged more than 1 million years ago. Gulf Coast walleye numbers are declining. The Alabama Department of Conservation is interested in restoring Gulf Coast walleye populations and seeks a non-lethal sampling regime to confirm their genetic identity because northern walleye have been able to access the western part of the Mobile drainage basin via the Tennessee-Tombigbee Waterway in Mississippi. A search of published mtDNA D-loop sequence data from both northern and Gulf Coast walleye revealed three restriction site changes in this region that could be used to distinguish between their haplotypes. A site loss for *Tru9* I and two site gains for *Rsa* I were detected in Gulf Coast walleye mtDNA when compared to northern walleye. PCR-RFLP analysis with four-base recognition endonucleases will be used to discriminate northern and Gulf Coast walleye. This should allow genetic confirmation of female Gulf Coast walleye prior to them being used in conservation breeding programs.

2:15 Vanderpool, Natasha D. Mu Chi, Midway College. Biotic and abiotic factors influencing the distribution of *Orconectes rusticus* (rusty crayfish) in Lee's Branch during the fall season: A preliminary study.

A field study of habitat sites occupied by *Orconectes rusticus* (rusty crayfish) was conducted along a 355 m section of the Lee's Branch in the fall of 2007. Occupied sites were designated as those where crayfish were either live-trapped, or observed on or under live traps, or found within a 1 m² quadrat centered around live traps. Captured crayfish were sexed, sized, and released. For microhabitat and landscape features, habitat sites occupied by rusty crayfish were compared to unoccupied randomly selected sites. Of the 13 features at the microhabitat scale, water depth was higher at occupied sites than at unoccupied sites, and percent cover of miscellaneous litter was greater at occupied sites compared to unoccupied sites. Of the 4 landscape features, distance to the nearest vegetation was important to occupied sites, with these sites farther from vegetation than unoccupied sites.

2:30 Break

**2:45 Burwinkel, Karen. Mu Iota, Northern Kentucky University. Cytochrome P4501A1 and Arsenic in Benzo(a)pyrene-induced Carcinogenesis

The environmental pollutants arsenic and benzo(a)pyrene (BaP) are well-known human carcinogens commonly found together in substances such as cigarette smoke. Arsenic is considered a non-mutagenic co-carcinogen, with the potential to enhance the effects of mutagens such as BaP, although the mechanisms remain unclear. BaP exerts its carcinogenic effects by leading to the formation of DNA adducts, resulting in DNA replication errors and subsequent mutations. Detoxication of BaP in the liver is a multi-step process requiring several enzymes, notably cytochrome P4501A1 (CYP1A1). In this study we examined the impact of arsenic on the enzyme CYP1A1 at different cellular levels, utilizing zebrafish (*Danio rerio*) as a model species. Experimental procedures included the EROD assay to measure enzymatic activity, SDS-PAGE / immunoblotting to quantify existing protein, and quantitative PCR to determine transcriptional changes. Co-exposure of arsenic and BaP led to significant decreases in CYP1A1 protein levels and CYP1A1 enzyme activity when compared to those of BaP alone. The effect is likely transcriptional, as CYP1A1 mRNA levels decrease as a result of exposure to both arsenic and BaP. Experimental evidence suggests that arsenic alters typical CYP1A1 activity in the presence of BaP. However, the outcome may lead to a diminished capacity for BaP-induced carcinogenesis.

- 3:00 Iker, Brandon. Mu Iota, Northern Kentucky University. Biologically Mediated Atrazine Degradation in Subterranean Aquifers.

Groundwater contamination in agricultural environments is a growing problem for maintaining safe drinking water. Due to the increasing use of herbicides, atrazine is becoming a common groundwater contaminant. To examine the fate of atrazine in open groundwater aquifers, observations of the aquifer in Cold Water Cave, Iowa, have shown very high levels of atrazine, decreasing during passage through the cave. This reduction in atrazine levels is not explained by simple dilution. We therefore theorized that the loss of atrazine in the aquatic cave system may be biologically mediated. Understanding such microbial processes, previously unrecognized in groundwater systems, may allow us to understand how atrazine affects microbial activity in aquifer systems and the bioremediation potential of such species in removing this herbicide from groundwater.

- 3:15 Banks, Eric D. Mu Iota, Northern Kentucky University. A Physiological Role for the Bacterial Precipitation of Calcium Carbonate Minerals.

The ability of microbial species to precipitate calcium carbonate, CaCO_3 , has been a described phenomenon for over 100 years. Nonetheless, to date no study has adequately described a physiological necessity that would explain the widespread conservation of this phenotype. To investigate this phenomenon, microbial species from CaCO_3 cave deposits were isolated. Many of these isolates demonstrated the ability to precipitate and/or dissolve carbonate minerals. Using 16S rRNA data, we identified these isolates, which demonstrated broad diversity within the Bacterial domain. Interestingly, the phylogenetic placement of these species corresponded well with their calcite precipitation and dissolution phenotypes. This correlation between clade and phenotype was sufficiently strong that phylogenetic placement could be a predictor for phenotypes of well-studied species, such as *Salmonella* and *Escherichia coli*. While calcium is readily available in the environment for calcite formation, we wondered if fixed carbon dioxide, via carbonic anhydrase, was forming the carbonate of the calcite. Various gene knockouts were performed that demonstrated the essential nature of this gene. By correlating the phylogenetic distribution of the responsible gene(s), we hope to determine whether the ability to precipitate calcite is a broad physiological adaptation within the Bacteria that allows species to survive under otherwise toxic, calcium-rich conditions.

- 3:30 Isbell, Ashley D. & Terry D. Richardson. Beta Zeta, University of North Alabama. Optimal foraging in Caribbean spiny lobster, *Panulirus argus*, under risk constraints.

Foraging behavior in Caribbean spiny lobster, *Panulirus argus*, is complicated by a complex life cycle with numerous juvenile stages. Prey size selection for different life stages may be further complicated by risk of damage to mouthparts when lobsters are feeding on their mollusk prey, *Cerithium lutosum*. Prey size selection, prey profitability, and risk of mandibular damage were observed for algal, post algal, subadult, and adult phases of spiny lobster in order to examine ontogenetic shifts and damage constraints in their foraging behavior. Potential risk for mandibular damage seems to be influencing the spiny lobsters' prey size selection when foraging on cerithid snails and may be playing an important role in shifts seen in prey size selection throughout their life phases. For a given size class of lobster foraging on cerithid snails, the risk of mandibular damage increases considerably as prey size class increases. Results indicate that algal phase juveniles should forage mostly on small snails while post algal lobsters should begin to include some medium snails into their diet. Subadults should forage on small, medium, and a few

large snails. Adults are well suited to forage on all size classes of snails without risk of damage to their mandibles.

****Brooks Award winner for best paper in session**

**DISTRICT I & II
PAPER SESSION
FRIDAY, APRIL 18, 2008**

1:00 Hickey, Graham J.M. and Melanie J. Lee-Brown. Sigma Phi, Guilford College. Characterization of an understudied bacterium, *Azotobacter zettuovi*.

The family *Pseudomonadaceae* contains a diverse group of bacteria that includes the genera *Pseudomonas*, *Azorhizophilus*, *Azotobacter* and *Azomonas*. Traditionally, organisms were placed in these genera based on niche, metabolic abilities and cell morphology. The genera *Azotobacter*, *Azomonas* and *Azorhizophilus* are capable of fixing nitrogen but are subdivided based on whether they form cysts (*Azotobacter*), or not (*Azomonas*) or whether they are found in association with the roots of certain grasses (*Azorhizophilus*). The genus *Pseudomonas* exhibits the largest diversity, including the potential human pathogen (*P. aeruginosa*) and nitrogen-fixing species (*P. stutzeri* and *P. azotoformans*). This study focuses on the placement/naming of an understudied species, *Azotobacter zettuovi* (*Azotobacter* spp.) through genomic and metabolic analysis including genome size determination, rRNA operon (*rrn*) organization and copy number, and metabolic profiles. Preliminary 16S rRNA phylogenetic analysis places *A. zettuovi* within the *Pseudomonadaceae* family, between the genera of *Pseudomonas* and *Azomonas*. The information from this study will be used to redefine the criteria used in the classification of members of *Pseudomonadaceae*.

1:15 Thomas, Emilyy and Gary Kurtz. Beta Eta, Florida Southern College. Botanical Census of a Created Wetland System

In 2004 an artificial wetland system was created to filter storm water runoff from the areas surrounding Lake Hollingsworth. This wetland was christened Southern Landing, and has been the subject of student research at Florida Southern College. Originally planted with native species, both negative and positive changes have since occurred. Invasive aquatic plants were introduced from the lake. Naturalized ornamental tree species were planted. And the city of Lakeland was pressured to re-landscape Southern Landing to achieve greater visual appeal. Late in 2007 the city removed several invasive and overgrown species, replacing them with ornamental flowering plants. But in the process they disturbed the brush habitat for marsh rabbits and other animals. This census will compare the original intended landscaping of Southern Landing to the current one. Our ultimate intention is to provide a base of information, to investigate the changes in flora as the possible cause for loss of biodiversity in this system. To quote Horace Smith, "Your voiceless lips, O, flowers, are the living preachers—each cup a pulpit, and each leaf a book."

1:30 Giunta, Jr., Anthony* & Danny J. Gustafson. Tau Nu, The Citadel. Evaluating spatial genetic structure of an endangered dioecious shrub (*Lindera melissifolia*) in South and North Carolina.

Lindera melissifolia (Walt) Blume is an endangered perennial dioecious clonal shrub that occurs in seasonally flooded wetlands located in 1 – 4 counties in eight states (AL, AR, FL, GA, MO, MS, NC, SC). Microsatellite genetic markers were used to determine the number of genetic individuals within and among populations in North and South Carolina. All populations showed extensive genotype clones, with two to six genotypes per SC populations and 16 to 17 genotypes in the two NC populations. The NC populations were larger, had male and female flowering plants, and multiple genotypes of both sexes within each population. Some SC were as large as the NC populations, however no female flowering plants were observed, there were few genetic individuals, and these few genotypes formed large single genotype stands. Coupling the lack of genotypic diversity and the potential to have single sex populations, as evident by only male flowers observed in the SC sites, seems to indicate that sexual reproduction in many of the SC populations will not likely occur without some type of introduction of known female plants.

1:45 Not Presented

2:00 Abraham, Jeevan. Tau Pi, Wofford College. Antibodies to detect Beta-Secretase: the first proteolytic step in generating Alzheimer's amyloid peptide.

Amyloid plaques and neurofibrillary tangles are pathological hallmarks of Alzheimer's disease (AD). Amyloid plaques are primarily composed of a peptide known as A β . The production of A β depends on the proteolytic cleavage of the amyloid precursor protein (APP) by beta-site APP-cleaving enzyme (BACE), a transmembrane aspartic protein and γ -secretase. β -secretase (BACE) is the first rate-limiting enzyme involved in the production of A β . This enzyme is considered as a potential drug target to lower the levels of A β . Therefore, studying the levels of BACE, its localization and regulation is a significant step in Alzheimer's research. O690 is an antibody, which was raised in a rabbit against the synthetic peptide based on the C-terminal cytoplasmic domain of BACE. The aim of the present study is to optimize conditions for the O690 antibody. The purpose of this was to optimize the sensitivity and specificity of this antibody for use in Western blot analyses. To accomplish this goal, we examined the natively expressed protein in hamster and human cell lines and in mouse brain. In addition, we included a cell line transfected with recombinant BACE as well as BACE-chimera protein to ensure that adequate quantities of the protein were expressed for detection. In addition, we included extracts from a BACE knockout mouse to ensure that we can exclude nonspecific reactivity in this important system. Optimization of the blot involved the optimization of sample preparation, running conditions, blocking conditions and analysis of the various bleeds of the antibody.

2:15 Morales, Marvin J, [†] and Neil Chartier[‡]. Sigma Phi, Guilford College[†] and North Carolina State University[‡]. Breeding Biology of *Limnothlypis swainsonii* (Swainson's Warbler) in a Bottomland Hardwood Forest of North Carolina.

Swainson's Warbler (*Limnothlypis swainsonii*) is the most secretive and least understood Neotropical migrant species of the southeastern U.S. Additionally, Southeastern U.S. Neotropical Migratory Bird prioritization schemes consider Swainson's warbler to be a species of high management concern because of habitat destruction on its breeding range in the southeastern U.S., altered flooding regimes, relatively low population density, small wintering range in the Caribbean basin, and a lack of information about breeding biology. This study focuses on specific habitat requirements, nest success, failure causes, and how the flow regime of the Roanoke River affects these outcomes.

****2:30** Gladden, Jena. Sigma Gamma, Erskine College. Abatement of an Exotic Invasive Species and Restoration of a South Carolina Piedmont Riparian Ecosystem.

Turkey Creek river corridor in McCormick County, South Carolina, is a biodiverse region threatened by invasive plant species. Machinery used to reconstruct Old Key Bridge along Turkey Creek created a disturbance resulting in an invasion by exotic Japanese stilt grass (*Microstegium vimineum*). A restoration project was developed to remove stilt grass, to plant native species, and to monitor the initial growth period. In September 2006, the area was divided into six 10x10 plots. Two plots were planted with 42 river oat seedlings and two with 4 native shrubs and 42 river oats. Two plots were left unplanted. In March 2007 two additional plots were directly seeded with river oats. Plantings in plots were monitored monthly from March to November. Analysis of data demonstrated: 1) Species richness increased in all plots from September 2006 to September 2007, 2) Shrubs exhibited 100% survival, 3) River oats survival was higher in plots planted with river oats only, 4) Over half of surviving river oats produced multiple shoots by the end of the study, 5) No germination to date has occurred in the plots directly seeded with river oats.

2:45 Varkas, Jillian. Tau Eta, Catawba College. Aquatic turtle diversity in the Catawba College Ecological Preserve.

Diversity of aquatic turtles was measured in the Catawba College Ecological Preserve. The Preserve includes a lake, a waterfowl impoundment, ponds, fields and forests. Turtles were captured from April to May 2007, August to October 2007, and February to April 2008. Three taxa were caught in the lake: *Chrysemys picta*, *Trachemys scripta scripta*, and *T. scripta elegans*. Three turtles with traits intermediate between *T. scripta scripta* and *T. scripta elegans* were also found; these may be hybrids. A total of 55 individuals were captured, and *C. picta* was the most abundant with 31 individuals. The data were compared to a study from 2000 by Klimstra to examine potential changes in the turtle community in the Preserve. *C. picta* was the most common species in both studies, and the Shannon diversity index was similar in both studies. However, the non-indigenous and invasive *T. scripta elegans* is a newly established taxon since the study eight years ago. Further study is needed to determine its impacts on the aquatic ecosystems in the Preserve.

3:00 Glenn, Joelle C. & Nolet, Melissa J. Beta Eta, Florida Southern College. Investigation of the Etiology of Daily Fluctuating Coliform Levels in Lake Morton, Winter 2008.

Fecal coliform bacteria, such as *Escherichia coli*, fecal *Streptococci*, and *Enterobacteriaceae*, are known indicators of eutrophicated lakes when the number of colony forming units (CFU) is greater than ten CFU per 100 milliliters. This study investigated the possible influences of pH, nitrates, nitrates, water temperature and water level on the number of fecal coliforms present in Lake Morton, located in Lakeland, Florida. The sources of the fecal coliforms for this lake are attributed to the large bird population it supports, including domestic, wild, and migratory waterfowl. Water samples were collected from the lake at eight separate sites, and then transported on ice to the microbiology laboratory at Florida Southern College. Prior to inoculation of the Petrifilm™ coliform count plates, a 1:2 dilution of the samples were performed. The plates were incubated at 44.5°C for further coliform selection, and identification of several of the colonies was performed using EMB plates and API 20 E® strips. All data and observations were statistically analyzed using Minitab 15 statistical software™. The results indicated

that lake temperature, water level, nitrates, nitrites or pH are not correlated with the increase or decrease in fecal coliform levels of Lake Morton.

- 3:15 Nasir, Amjad¹, Florence Okenkpu¹, John Hisey^{1, 2}, Popoh Atairu¹, Michael Kennedy², & Brian Carver^{2, 3}. Psi Omega, Lee University¹, The University of Memphis², and Freed-Hardeman University³. Raccoon movements, mating tactics, and effective population size.

Rate of loss of genetic variation from populations is currently a major concern in biology. Effective population size (N_e), broadly applied in evolutionary and conservation genetics, is the size of a randomly breeding group that would lose genetic variation at the same rate as the actual population studied. Typical determinations yield N_e smaller than the actual, or census population size (N_c). A few atypical recent studies of social mammalian species incorporate effects of lineages of nearby related individuals and reveal N_e larger than N_c indicating reduced loss of genetic variation over time. In the solitary mammals which are much more abundant than their social counterparts, many species also maintain local lineages through philopatry of only one sex. Our study on raccoons (*Procyon lotor*) provides support for the first time for the hypothesis that incorporation of lineage and other substructuring effects in a genetics model yields effective population sizes larger than census population sizes for a solitary mammal. Our N_e values for raccoons were substantially larger than N_c but inversely correlated with dispersal of the philopatric sex. Conservation breeding programs ignoring these effects and incorporating artificial dispersal of the philopatric sex can actually decrease N_e and hasten loss of genetic variation.

- 3:30 Atairu, Popoh¹, John Hisey^{1, 2}, Michael Kennedy², & Brian Carver^{2, 3}. Psi Omega, Lee University¹, The University of Memphis², and Freed-Hardeman University³. Breeding patterns and genetic group structure of a solitary carnivore.

Population genetics models typically assume both equal dispersal among the sexes and random mating, which actually do not occur in many species. Results have included artificially high estimates of inbreeding. Recent "lineage-structured" models have been developed to accommodate ecological factors like sexual differences in dispersal and unequal breeding among individuals. Such models have been applied to social and semisocial mammals, in which these factors may produce lineages of female kin and highly interrelated offspring living in close proximity. To test for the first time the hypothesis that genetic structuring is similarly affected in solitary mammals which also share such ecological factors, we applied raccoon (*Procyon lotor*) data to a lineage-structured genetics model. This produced estimates for F_{IL} (nonrandom breeding within lineages) of -0.121, indicating outbreeding, and F_{LS} (genetic differentiation among lineages) of 0.108. These measures are similar in magnitude to estimates for more social species and indicate breeding orders of magnitude less random than previously obtained measures for larger groups of raccoons. These dominant effects in local gene dynamics should be incorporated into analyses. They may deter inbreeding within lineages while maintaining genetic differentiation among lineages that allows development of cooperative traits and adaptation to local conditions.

- 3:45 Sriram, Preethi, Krishnapriya Chagarlamudi, and Frances Cuffney. Tau Xi, Meredith College. Effects of PPCP's on *Corbicula fluminea* (Mollusca, Bivalvia) of varies age classes

Pharmaceutical and Personal Care Products (PPCP's) have been found in surface waters of the United States. This study examined the effects of fluoride, acetaminophen, caffeine

and aspirin on the Asiatic clam *Corbicula fluminea*. *Corbicula* collected from the Nease River were measured and sorted into age classes. Measurements of shell length, width, and depth were taken for 120 clams. Correlation of measurements allowed for sorting of clams into four age classes based on width. Clams were categorized into three size groups for PPCP exposure experiments. Clams were exposed to lethal doses of the PPCP's based on previous experiments. The hypothesis was that smaller clams would be more susceptible to PPCP exposure. The results of our experiments showed that in caffeine, there was a direct correlation between size and survival rates. In the case of fluoride and aspirin, the small clams had the highest survival rates. For acetaminophen exposure, the small and large groups seemed to have the best survival rates.

**Brooks Award winner for best paper in session

**DISTRICT I
POSTER SESSIONS
FRIDAY, APRIL 18, 2008**

1. Irving, Savannah N. Sigma Phi, Guilford College. Completing the Puzzle: Classifying Two Strains of *Azotobacter salinestris* through Genomic Comparison of Ribosomal DNA and Metabolic Profiles

The bacteria, *Azotobacter salinestris*, belongs to a diverse family called *Pseudomonadacea*. This family also includes the genera *Pseudomonas*, *Azorhizophilus*, *Azomonas*. These genera were classified based on niche, metabolic abilities, and cell morphology. *Azorhizophilus*, *Azomonas*, and *Azotobacter* are classified based on their ability to fix atmospheric nitrogen and subdivided on whether they form cysts (*Azotobacter*), or not (*Azomonas*), or whether they are only found in association with the roots of certain plants (*Azorhizophilus*). The genus *Pseudomonas* exemplifies the greatest diversity including potential human pathogens (*P. aeruginosa*) and nitrogen fixing species (*P. azotoformans*). This basis for this study is to reclassify this diverse family based on genomic profiles. This is done by comparing the genomic size, rRNA operon (rrn) organization and copy number, and the metabolic profiles of the different organisms in the family. The focus of this study is the two strains of *Azotobacter salinestris* (184 and 253). The information gathered will determine whether these two strains are in actuality the same organism and in a broader sense to redefine the criteria of classification for the whole *Pseudomonadacea* family.

2. Hector, Clare. Beta Rho, Wake Forest University. The Effects of Estrogen on Leptin Synthesis and Signaling

Recently discovered in 1994, the leptin protein has been linked to obesity, a deadly health problem facing America today. While obesity can be the result of environmental factors, it can also be the result of genetic disorders including defects in the gene(s) coding for leptin and/or the leptin receptors. Leptin is secreted by adipocytes and signals the brain to control cravings and increase energy expenditure when the level of stored fat increases; if leptin and/or leptin receptors are non functional, metabolism is affected and obesity can result. Since leptin is more abundant in females than males, I am testing the hypothesis that estrogen is directly responsible for synthesis of leptin and leptin receptor. These experiments use a muscle cell culture line (3T3 L1) that can be induced to differentiate into adipocytes. Receptors for sex hormones have been found on adipocytes which

suggest that a sex hormone such as estrogen could have a regulatory effect. I am examining the effect of estrogen treatment on the levels of leptin mRNA and leptin receptor mRNA, and leptin protein secretion using reverse transcriptase-polymerase chain reaction (RT-PCR) to quantify the levels of the mRNA and ELISA assays to quantify levels of secreted leptin.

3. Campbell, Ashley[†] & Gloria MaGee[‡]. Guilford College[†] and Xavier University[‡]. Development of a microfluidic method for transcription factor assays.

Modern bioanalysis presents many challenges, from the inherent complexities of biological systems to the analytical challenges of studying these systems *in vitro*. Additionally, the typical laboratory environment coupled with the traditional labor-intensive and operator-dependent assays presents other complications. For example, the transcription factor assay, an important affinity-based bioassay for the detection and identification of transcription factors, may provide a means of early detection for some diseases. However, this assay in its conventional format is employed in 96-well plate format, which suffers from many disadvantages. In this study, the Nuclear Factor kappa B (NFκB) transcription factor model associated with some cancers was chosen as an application for study. In preliminary analysis, the conventional 96-well plate format showed poor reproducibility with long incubation times due to diffusion limitations. As an alternative, a micro-Total Analytical System using self-contained microfluidic devices with photopolymerized streptavidin-doped hydrogels could be used to immobilize consensus (DNA) sequences specific for NFκB transcription factors and leveraged for affinity-based assay and fluorescence detection. This electrophoresis-driven method reduces incubation times significantly and yields improvements in reproducibility. Fluorescence used with this system enables a greater sensitivity for detection of samples. This method shows to be an efficient alternative to the 96-well plate system.

4. Webb, Stina Jennifer, Traci L. Ness, Judy Awong-Taylor, & Jennifer Zettler. Tau Chi, Armstrong Atlantic State University. Effects of Ultraviolet Radiation on *E. coli* in Beach Sand.

Escherichia coli is commonly used as an indicator of contamination of public waterways. Recent studies show that beach sand can serve as a reservoir for this bacterium. Therefore, its measurement in water may not reflect actual levels of contamination. Many environmental factors influence *E. coli* survival in sand. This study analyzed the effects of UV radiation on *E. coli* in surface versus subsurface environments. To replicate surface conditions, 25g of sterile beach sand were inoculated and exposed to UV light. Alternatively, subsurface environments were created by layering an additional 25g (50g total) or 50g (75g total) of sterile sand over the inoculated layer prior to UV treatment. After 15 minutes of UV treatment, a 53% reduction was seen in the surface-exposed *E. coli*, whereas only 39% and 26.5% decreases were observed for the 50g and 75g plates, respectively. All exposure times reflected similar trends, with 94% (25g), 69% (50g) and 66.5% (75g) reductions at 180 minutes. These data suggest that *E. coli* survives UV radiation at subsurface levels, which may contribute to its overall load in water. Therefore, when utilizing *E. coli* as an indicator for water quality, these confounding factors must be considered in the evaluation of water safety.

5. Elam, Ashley, Alex Polsinelli, Judy Awong-Taylor* & Jennifer Zettler*. Tau Chi, Armstrong Atlantic State University. Prevalence of antibiotic resistant bacteria in near-shore marine environments.

The presence of antibiotic resistant bacteria in the environment is a common occurrence due to medical and social misuse of antibiotics. Antibiotics are often inappropriately used to treat infectious diseases in humans and more recently have been commercially used with livestock. Antibiotic resistant bacteria have the potential to spread to aquatic systems and waterways via wastewater discharge and/or agricultural runoff. In this study, we sampled five sites along the mouth of the Savannah River and Tybee Island to determine the prevalence of bacteria that were resistant to the antibiotics ampicillin, kanamycin, and tetracycline. Samples were analyzed for concentrations of both antibiotic resistant bacteria as well as total bacteria. Our results indicate differences among the five sites. Kanamycin resistant bacteria were most prevalent and accounted for 0-95% of the total bacterial population at different sites. Ampicillin and tetracycline resistant bacteria were also detected but at much lower rates of 0-6%. Our study indicates that the presence of the antibiotic resistant bacteria may be associated with both the Tybee Island wastewater treatment plant and the Savannah River.

6. Clark, Amanda. Psi, Winthrop University. The Role of Thrombomodulin in Angiogenesis

We investigated the role of the endothelial cell (EC) receptor, thrombomodulin (TM), in angiogenesis by determining its contribution to EC microtubule formation, invasion and cell-cell adhesion. We first established a method to quantitate microtubule formation *in vitro* using stereology. Digital images of HUVECs grown in MatrigelTM were overlaid with a 4800-pixel grid. The mean number of points where one of the grid's vertices crossed a microtubule was determined and divided by the number of vertices per well (surface area covered by microtubules). Using this quantitative method, we determined that monoclonal antibody (MAb) binding to epidermal growth factor-like domains 4-6 of TM increased microtubule formation. Addition of thrombin, which binds to these EGF-like domains, decreased the augmented microtubule formation. We also investigated TM's involvement in EC invasion *in vitro*. Binding to the lectin-like domain of TM by MAb decreased invasion of HUVECs. Finally, we determined that binding to TM's extracellular EGF-like domains affected the ability of HUVECs to adhere to each other. We conclude that TM, specifically the EGF- and lectin-like domains of TM, is involved in angiogenesis by regulating the ability of endothelial cells to proliferate, invade, and adhere to each other.

7. Brunson, Lacey. Psi, Winthrop University. The Effect of Activated Protein C on Prostate Tumor Cell Invasion

We investigated the role of the prostate tumor cell protein, thrombomodulin (TM), in prostate tumor cell invasion. We determined if TM, thrombin, protein C, and activated protein C (APC) affect invasion by regulating interactions between plasminogen activator inhibitor I (PAI-1) and urokinase type plasminogen activator (uPA). We first determined that monoclonal antibodies to the extracellular chondroitin sulphate domain of TM increased the DU-145 cell line migration in a modified Boyden chamber. Addition of thrombin and protein C did not affect DU-145 invasion. Addition of 0-10 ng/ml APC also did not affect tumor cell invasion, however, higher than 10 ng/ml slightly decreased DU-145 invasion. Since APC has been shown to affect tumor cell invasion in ovarian cancer by competing with uPA for PAI-1, we further determined if APC also regulates tumor cell invasion in prostate cancer by competing for PAI-1. In the presence of uPA and PAI-1, APC competed with uPA for binding to PAI-1, enabling uPA to increase the invasiveness of DU-145 cells. We conclude that in the presence of TM, thrombin, protein C, PAI-1 and uPA, TM regulates tumor cell invasion by generating APC, which can bind to PAI-1, freeing uPA to facilitate tumor cell invasion.

8. Acharekar, Shreya S. Psi, Winthrop University. Effects of Atmospheric Oxygen and Hypoxia on 3D Cardiac Tube Cultures.

During a myocardial infarction (MI), ischemia and hypoxia cause a loss of cardiac function through apoptosis and necrosis, which is further complicated by inflammation and an immunological response. To understand how cardiac tissue responds to injury independent of these in vivo complexities, a 3D cardiac tissue culture system was used to model a MI by exposing the cultures to hypoxia and hyperoxia. To determine if they mimic in vivo tissue, we measured the release of inflammatory cytokines (IL-1 β , IL-6, and TNF- α) and myocyte cell death (cardiac troponin-I). In our experiment, two sets of cardiac tubes matured at 21% oxygen (hyperoxic) and three sets matured at 6% oxygen (normoxic). One set, maintained at 21%, was then transferred to 6% oxygen. Two sets, previously maintained at 6%, were challenged at 1.5% (hypoxic) for 3 and 10 hours. The troponin-I levels for the 21% tubes were significantly higher than the 6% tubes while the results for the IL-6 showed a significant difference as well. Overall, the results indicate that different cellular pathways are associated with the oxidative stress under hypoxia as compared to the stress associated with hyperoxia.

9. Stanton, Daniel and Julian P.S. Smith III. Psi, Winthrop University. Melatonin alters fissioning rate in *Stenostomum virginianum* (Platyhelminthes, Catenulida)

Melatonin, although best known as a "Zeitgeber" in vertebrate chronobiology, is biologically active in organisms ranging from unicells to humans. In triclad flatworms, melatonin levels have been shown to vary in a circadian fashion (peaking in darkness), and it has been shown that continuous melatonin treatment inhibits asexual fission in two triclad species. Accordingly, it might be expected that melatonin would have similar effects in other members of the Phylum Platyhelminthes. *Stenostomum virginianum* Nuttycombe is a common freshwater catenulid flatworm that reproduces prolifically by paratomic fission under laboratory culture conditions. *S. virginianum* were exposed to melatonin for 8 days at concentrations ranging from 1mM to 0.001mM in conditions of continuous darkness (worms were briefly exposed to light during feeding). We found that there was a statistically significant suppression of fissioning (as compared to control) by 0.1mM and 0.01mM melatonin ($p < 0.05$ in both). Treatment with 0.001 mM melatonin did not affect the fissioning rate, and treatment with 1mM melatonin was lethal by day six. At present, it is unclear whether melatonin acts in *S. virginianum* primarily by down-regulating cell-cycle progression or by up-regulating apoptosis (or by a combination of the two), as both effects are observed in different mammalian tissue-culture systems.

10. Webb, Stefanie J. Psi, Winthrop University. Social structure of a captive hamadryas baboon (*Papio hamadryas*) group.

This study focuses on the process of group formation in hamadryas baboons (*Papio hamadryas*) at Riverbanks Zoo and Garden in Columbia, South Carolina. A new group of baboons was formed by the addition of two females and one male to a previously existing group of one male and one female. Wild hamadryas baboons are a fission-fusion species meaning that a large group will split into a number of smaller groups, known as one-male units (OMUs). OMUs consist of one male and several females. Adolescent males may follow OMUs until reaching maturity and establishing an OMU. This study seeks to determine whether all five animals will remain one group, with one leader male, one follower male, and three females, or whether they will form two OMUs. Data was collected through ten minute focal animal samples of each individual and instantaneous scan samples of the entire group. These samples provide data on frequency and intensity of associations. Associations were broken into several behavioral categories based on

behaviors described by Kummer (1995). Behavioral categories of greatest interest are ones pertaining to dominance, submission, and aggressive behaviors. The associations and behavioral categories to which they belong determine whether a single group or two OMUs have formed.

11. Lambert, Chris. Psi, Winthrop University. The role of thrombomodulin in tumor cell adhesion to endothelial cells.

Prostate Cancer (CaP) is the second most common type of cancer in men. CaP occurs when the epithelial cells of the prostate proliferate unchecked. CaP metastasis occurs when tumor cells lose their ability to form cell-to-cell adhesions, invade surrounding tissues, and then metastasize via the blood or lymphatic vessels. We investigated the role of the transmembrane protein, thrombomodulin (TM), in the metastatic process. The goal of our research was to determine how TM, on endothelial and CaP cells, is involved in tumor cell adhesion to endothelial cells therefore regulates metastasis. First, we established a calcein based cell adhesion assay to test the influence of TM on cell adhesion using the endothelial cell line EAhy926 and CaP cell line DU-145. We determined that MAb binding to the EGF1-3, EGF 2, EGF 4-6, and EGF 5-6 domains of endothelial cells and tumor cells decreased the ability of the cells to adhere to each other. Cell-to-cell adhesion between the EC and CaP decreased by 70% in the presence of each MAb to the EGF-like domains of TM. Therefore, we conclude that TM may be involved in CaP cell metastasis by regulating cell-to-cell adhesion properties of tumor cells to endothelial cells.

12. Welch, Erin, Kian Morris, Robyn Pippin, Jennifer Zettler, & Gregory Knofczynski. Tau Chi, Armstrong Atlantic State University. Are fire ant mounds hotspots for mineral nutrients?

Previous studies have reported that the chemical properties of soil from red imported fire ant *Solenopsis invicta* mounds differ from surrounding soils. Ant occupation can result in changes to soil pH and nutrient levels. Accordingly, researchers have determined that grasses growing in mounds have higher protein levels than the surrounding vegetation. To ascertain how fire ants might alter soil chemistry over time, we collected soil from four newly formed mounds and tested them monthly using the LaMotte Smart 2 soil testing kit (Chestertown, MD). For controls, we also tested soil from four nearby uninhabited sites. In doing so, we evaluated ammonia, nitrate, nitrite, phosphorous, copper, and iron levels during the months of September 2007 to February 2008. Contrary to other reports, ours showed neither consistent nor statistically significant trends between mound and non-mound soils. This disparity may reflect seasonal effects and limited sample sizes. Unlike other studies that were conducted during spring or summer months, our data were collected over the fall and winter when ant activity is at a seasonal low.

13. Dimitrova, Valentina S. Sigma Upsilon, Agnes Scott College. Evaluating New Candidates for Enzymatic Therapy for Celiac Disease.

Celiac disease is an autoimmune disorder triggered by the presence of gluten in the diet. Gluten collectively labels a protein family in wheat, barley and rye characterized by regions abundant in proline and glutamine amino acids. Such regions cannot be digested in the human organism, since it lacks enzymes capable of cleaving after proline and glutamine. Celiac patients are advised to abstain from gluten-containing food products. Since gluten-free diet is the only therapy presently available to patients, alternative approaches to the disease need to be developed. One intriguing therapeutic option is to target the undigested gluten regions by proline and glutamine-cleaving enzymes from

microorganisms. We expressed and purified three bacterial prolyl endopeptidases (PEP), and tested their activity profiles using small chromogenic substrates. We found out that all three enzymes can cleave after proline residues. Two of the three enzymes are efficient at cleaving the substrate (have higher k_{cat}/K_M values), and are thus better candidates for enzymatic therapy. A successful drug candidate needs to remain stable in the presence of physiological conditions found in the upper intestine. Pancreatic proteases and bile acids both destabilize the PEPs. We are using *in vitro* assays to examine the interactions between bile acids, PEPs and pancreatic proteases.

14. Vannoy, Rebecca. Tau Xi, Meredith College. Effects of whey protein concentrate on differential white blood cell counts.

The HIV/AIDS pandemic is of great importance in today's world health arena. A relatively new area of HIV drug research is the use of herbal supplements, such as whey protein concentrate (WPC), to treat the effects of AIDS. Those with HIV commonly have a glutathione deficiency (Marshall, 2004). Glutathione is a naturally occurring antioxidant found in the body and is linked to immune system health. In clinical studies, whey protein has shown to boost glutathione production, therefore improving immune responses (Clouatre, 1999). The purpose of this study is to examine the effects of WPC on differential white blood cell counts of BALB-C mice. My hypothesis is that mice receiving a diet supplemented with WPC will have an increased immune system response as evidenced by an increase in lymphocytes. In this study, groups of mice were administered dietary supplements of WPC. A differential white blood cell count was determined prior to and after experimentation to evaluate the effects of the WPC on white blood cell counts. Preliminary findings did not show a statistically significant increase in lymphocytes, however further testing is required.

15. Schwartz, Shelby, & Dr. Moses Okello. Sigma Phi, Guilford College, The School for Field Studies. Wildlife displacement: The effects of human activities and structures on wildlife migration and dispersal in Mbirikani Group Ranch, near Amboseli, Kenya.

Increasing human population and development in the areas surrounding Amboseli National Park pose a serious threat to these areas as wildlife dispersal areas and migration corridors. This study investigates the impact of human activities and structures on the spatial distribution of wildlife in Mbirikani Group Ranch. Global Positioning System (GPS) units and Geographic Information System (GIS) were used to gather data and create maps of wildlife and human structures. Displacement effects were also calculated. While only 1.73% of the study area was physically occupied by human structures, when the displacement effects were taken into account, the area occupied was 25.02%. Of particular concern is the spatial arrangement of structures, activity, and roads which leave the area highly fragmented. Development is clustered around swamps, limiting wildlife's access to water and dry season foraging areas, and along the pipeline road, leaving only a 2.35km gap for wildlife traveling between Amboseli National Park and Chyulu Hills/Tsavo. Mbirikani Group Ranch is still functioning as a wildlife dispersal area, but immediate action is needed for its continued viability.

- **16. Santiago, John C. Sigma Psi, Florida Institute of Technology. Modulation of cardiovascular gap junction proteins by stress catecholamines and their metabolites.

Elevated catecholamine levels are cardiotoxic and the effects have been directly attributed to adrenaline. Patients with cardiovascular events mimicking a heart attack following a

stressful event have shown elevated catecholamine levels. The oxidation of the catecholamine adrenalin to its metabolites, adrenochrome and adrenolutin, occurs very rapidly. We have shown that these agents affect expression of the two key cardiovascular gap junction proteins connexins 40 and 43. This study examines whether adrenaline and its metabolites have the same effects on the channel proteins in the cardiovascular following lower doses and shorter exposure times. The A7r5 rat aortic smooth muscle cell line which expresses both connexins was treated with these agents at time points ranging from 45 minute to 24 hours. Changes in Cx40 and Cx43 protein expression was evaluated and compared to results observed at 24hours using standard immunoblotting, immunoprecipitation and immunohistochemistry techniques. Cx40 protein expression was reduced with all treatments. Cx43 expression decreased initially but later increased. Exposure to adrenolutin resulted in the most profound affect on expression for both connexins. Altering the relative cellular expression of the two connexins in the myocardium and the vasculature has implications for changes in blood vessel tone and normal heart rhythm.

17. Jones Jr., Stephen K. Sigma Psi, Florida Institute of Technology. A search for PLC γ binding proteins active in calcium release at fertilization of starfish oocytes.

A hallmark of fertilization is the transient increase in intracellular free Ca²⁺ that occurs in the egg. This Ca²⁺ release is regulated by the enzyme phospholipase C γ (PLC γ). In other cell types, PLC α is regulated by SH2-domain mediated interaction with tyrosine-phosphorylated signaling proteins. How PLC α is regulated in the egg during fertilization is unknown. In this study, a PLC γ SH2 domain recombinant fusion protein was used as an affinity matrix to screen for PLC α -binding proteins that may be involved at fertilization. Protein samples prepared from sperm, unfertilized eggs, or fertilized eggs were incubated with the PLC α SH2 domains. Interacting proteins were analyzed by gel electrophoresis and silver staining to visualize total protein; or by immunoblotting to identify tyrosine-phosphorylated proteins. Tyrosine-phosphorylated proteins of approximately 20 kDa, 40 kDa, 70 – 80 kDa, and 100 – 200 kDa bound in a fertilization-specific manner. Several of the 100 – 200 kDa and the 20 kDa and 40 kDa protein are derived from the sperm, suggesting that these proteins transferred into the egg during fertilization. The coupled results strongly suggest that PLC γ is regulated during fertilization by tyrosine-phosphorylated signaling molecules from the egg and sperm.

18. Hemphill, Jennifer A. Sigma Psi, Florida Institute of Technology. Plankton selectivity in the diet of the invasive Asian green mussel *Perna viridis* in Ponce Inlet, Florida.

The impact of the invasive Asian green mussel *Perna viridis* in Florida estuarine and coastal ecosystems is not well understood, particularly in the area of diet and community grazing effects. This study set out to answer the following questions: what planktonic species are consumed by *P. viridis*; does *P. viridis* feed selectively on particular members of the native planktonic community of Ponce Inlet? These questions were addressed by examining the gut contents of field collected *P. viridis* (n = 14 for fall sampling and n = 18 for winter sampling) and comparing the ratios of their components to the ratios of plankton collected simultaneously drifting in the surrounding water column (n = 4 tows for fall and n = 6 for winter). Diatoms were the primary food found in the guts for both seasons collected with the top three most abundant genera being *Coscinodiscus*, *Navicula*, and *Pleurosigma*. Proportions of these species to overall gut contents were 0.20 \pm 0.1336, 0.32 \pm 0.1962, and 0.36 \pm 0.1957, respectively for fall samplings and 0.34 \pm 0.1557, 0.31 \pm 0.1176, and 0.31 \pm 0.1165, respectively for winter samplings with the second most abundant genera being *Thalassiosira*. The analysis of the less abundant zooplankton

revealed disproportionate abundances of crustacean appendages and nematodes consumed by the mussels for both samplings.

19. Richardson, Philina. Sigma Psi, Florida Institute of Technology. Surface changes associated with maturation of starfish eggs and oocytes as observed using scanning electron microscopy (SEM)

Changes occur in the surface of eggs and oocytes at various times during development that may affect gamete interaction during fertilization (Schroeder 1978, Schroeder 1979 and Schroeder and Stricker, 1988). To learn more about these changes, and to develop novel methods for examining the egg membrane, starfish oocyte and egg surfaces were visualized by scanning electron microscopy. Techniques were developed to remove extracellular vestments that surround the egg (follicle cells, egg jelly, vitelline coat) and each step was visualized by SEM. Obstacles encountered during the course of this project, including egg viability and fragility following removal of the vitelline coat, needed to be overcome even before imaging could take place. High resolution images were obtained from immature oocytes and mature eggs both with and without the vitelline coat. These images show that pores measuring $\sim 1 \mu\text{m}$ in diameter found on the surface of eggs matured with 1-methyladenine (1-MA) are lacking on eggs that spontaneously mature during the process of vitelline coat removal. Additionally, surface microvillar structure differed between 1-MA matured eggs and spontaneously matured eggs. These new techniques allow the visualization of actual egg plasma membrane and should prove valuable for the study of gamete interaction at fertilization.

20. D'Agostino, Adrienne B. Sigma Upsilon, Agnes Scott College. Summer daytime vertical distribution of seven zooplankton species in Lake Constance, Germany.

To provide a basis for further understanding the ecosystem dynamics of Lake Constance, Baden-Württemberg, Germany, a vertical distribution population survey was conducted at three different sites in the lake during the summer of 2007 for seven zooplankton species: *Daphnia hyalina*, *Daphnia galeata*, *Cyclopoida*, *Calanoida*, *Leptodora kindtii*, *Bythotrephes longimanus*, and *Bosmina*. *D. hyalina* and *Bosmina* inhabited primarily the epilimnion and hypolimnion of the lake. Both *D. galeata* and *L. kindtii* remained in the epilimnion and *Cyclopoida* in the hypolimnion. These observations agree with previous vertical migration studies. Calanoid copepods were found to be most populous within the thermocline. This conflicts, however, with analyses placing the species in the epilimnion and hypolimnion. Unusual data were also collected for *B. longimanus*: unlike for the other six species, each of the three sites had different distributions across the lake strata. This discrepancy is most likely due to the relatively small sample and extrapolated population sizes of *B. longimanus* compared to other zooplankton species.

21. Paper presentation 1:15 PM in District I & II

22. Kanter, Lauren C. Beta Eta, Florida Southern College. Behavioral Study of the Least Killifish (*Heterandria formosa*) in a Predator/Prey Environment.

The behaviors of the Least Killifish (*Heterandria formosa*) were studied in a predator/prey environment. The predator used in this study was the Firemouth Cichlid (*Thorichthys meeki*). The purpose of this study is to determine if the behaviors of *Heterandria formosa* are consistent. A ten gallon tank with a 10 by 12 inch partition was used along with a moveable visual barrier between the prey and the predator. The behaviors of *Heterandria formosa* were observed after raising the visual barrier for thirty minutes exposing the prey to the predator. Seven female fish will be used individually with ten trials being performed

on each fish. The shelter being used is an artificial aquarium plant. In order to reduce human influence, visual barriers were set up around the tank with a hole being made in one of the visual barriers for observational purposes. The observed behaviors after raising the barrier were: Avoiding the partition by seeking shelter (behavior one), Avoiding the partition outside of the shelter (behavior two), Approaching the partition from the top (behavior three), Approaching the partition from the bottom (behavior four). Preliminary data has shown that *Heterandria formosa* is unaffected by the predator's presence because it continuously approaches the partition.

23. Desai, Khushbu, Matthew Aussprung, & Emily Templeton. Psi Nu, Furman University. Magnesium and Manganese accumulation by *Phytolacca americana* in natural and controlled environments.

Phytolacca americana has been found to take up potentially toxic amounts of manganese in a process known as hyperaccumulation. Numerous hypotheses have been proposed for this function. One hypothesis, inadvertent uptake, suggests that hyperaccumulation may be a side-effect of an efficient nutrient acquisition mechanism. This experiment investigated the relationship between the uptake of Mn and magnesium in *P. americana*. Seedlings of *P. americana* were germinated in hydroponic solutions including 1mM Mn and Mg at one of three concentrations: 0.1, 0.5, or 2.5 mM. Field plants were also collected and the concentrations of Mn and Mg in all leaf samples were measured. There was no significant correlation between Mn and Mg in the field plants, and there were no significant differences in Mn concentration between plants from the three hydroponic Mg treatments. However, there was a highly significant correlation between Mn and Mg concentrations within each Mg treatment. Our results provide some support for the inadvertent uptake hypothesis, suggesting that individuals with more efficient Mg uptake mechanisms also are stronger Mn accumulators. Further study is needed to better understand the connection between Mg and Mn in *P. americana*.

24. Desai, Khushbu, Matthew Aussprung, & Emily Templeton. Psi Nu, Furman University. Magnesium and Manganese accumulation by *Phytolacca americana* in natural and controlled environments.

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25. Chandler, Heather, Joel M. Gramling, Danny J. Gustafson & Leigh Thackston. Tau Nu, The Citadel. The impact of laurel wilt disease on coastal forests in South Carolina.

The red bay ambrosia beetle (*Xyleborus glabratus*), was first detected in the United States in 2002 near Port Wentworth, Georgia. This exotic insect carries a symbiotic fungus, which is known to cause tree mortality (laurel wilt disease) in Lauraceae species, including *Persea borbonia*, *P. palustris*, *Lindera melissifolia*, *Sassafras albidum*, and *P. americana*. Since introduction, a large number of bay trees (*Persea* spp.) have died in over thirty counties of Georgia, Florida, and South Carolina. In the fall of 2007, we established three permanent 10 m by 50 m plots to determine the status of *P. palustris* at Caw Caw Interpretive Center in Charleston County (South Carolina). 53 trees were observed in these plots, 31 trees were in good health (average dbh = 7.5 +/- 0.7 cm with less than 1 re-sprout per tree), 7 trees were dead but showed no signs of LWD (dbh = 5.7 +/- 1.2 cm with 3.6 re-sprouts), and 15 trees were dead (dbh = 10.7 +/- 1.1 cm with 1.5 re-sprouts) with evidence of fungal activity that confirms LWD. We estimate the spread of LWD by resampling these permanent plots, and compare these findings to other *Persea* habitats in South Carolina.

26. Kale, Emily B. Tau Xi, Meredith College. Expression of CYP4A in *Corbicula* clams caused by exposure to acetaminophen.

Pollution of local water supplies by pharmaceutical run-off is a major environmental problem. Understanding the metabolic impact of this pollution on the aquatic invertebrate *Corbicula* could lead to the development of a sensitive biomarker. This method would be beneficial in areas where water is constantly moving making conventional water testing methods ineffective. I have developed methods to study and use the expression of a stress-induced gene in *Corbicula* exposed to acetaminophen. I can determine if there is pollution in a given freshwater system by comparing the levels of CYP4A gene expression in the clams under chemical stress compared to those that have not been exposed. Previous work has also shown that *Corbicula* clams exposed to acetaminophen alter the drug and turn the surrounding medium dark brown. The molecular basis of this metabolism is an intriguing problem, which I am also trying to solve. I developed methods of RNA extraction for the total tissue of the clams. I then used RT-PCR to specifically amplify CYP4A. By using gel electrophoresis to visually examine expression levels, I found that the CYP4A levels were down-regulated over time and exposure level. Further methods including immunoblotting will be used to confirm these results.

27. Givens, Priscilla and Susanne Cappendijk. Sigma Tau, Dept. of Biomedical Sciences, College of Medicine, Florida State University. DNA extraction from fixed Zebra Finch tissue

In most species of birds, the gender of a juvenile bird is nearly impossible to tell because the physical secondary sexual characteristics have not yet developed (Arnold et al., 2004). The gender of juvenile animals can be determined from a blood sample of a living animal, but DNA can also be extracted from fixed tissue (Greer et al., 1994). Our laboratory successfully performs the DNA analysis from a live animal using a so-called FTA card. However, due to some fatalities with juvenile animals induced by a malfunction of the water system in our recording room, we were in need to develop a protocol to extract DNA from fixed tissue and define the gender of this specimen. We used the following protocol: DNA was extracted from fixed liver tissue a classic phenol-chloroform extraction, followed by a temperature-gradient PCR protocol. The presence of DNA is confirmed by horizontal gel electrophoresis. For the amplification of DNA we use specifically designed sex primers (Griffiths, et al., 1998). The female birds are heterozygous for the sex determining chromosome (ZW), while the males are homozygous (ZZ), which results in the observance of two bands for the female bird DNA and one band for the male bird. This method permits us to identify the gender of a juvenile animal using fixed tissue.

This research is funded by the James and Esther King Biomedical Research Grant to S.C. (06-NIR02).

28. Henderson, M., S. J. Godbey, D. A. Fadool. Sigma Tau, Florida State University. Glucose and diet-induced obesity modulation of object memory and ion channel biophysics.

The voltage-gated potassium channel Kv1.3 is more than a conductor of ions. We found that when current through Kv1.3 channel is completely absent, channel knock-out mice show an inability to gain weight when challenged with a high fat diet. Using mouse behavioral phenotyping experiments, channel knock-out mice show resistance to obesity-induced memory loss. Following a 26 week high-fat diet, we measured significant increases in blood insulin, leptin, and glucose in the obese mice that was abrogated in the channel knock-out mice. Since glucose was one of the components that was elevated in the fat mice, we questioned whether it could modulate electrical activity of the potassium channel. We transiently transfected Kv1.3 cDNA into human embryonic kidney cells (HEK293) to access by patch-clamp electrophysiology how elevations in glucose (5-20 mM) might alter channel activity. We found that high glucose decreased peak current amplitude (1200 \pm 225 pA control vs. 711 \pm 254 pA glucose), and increased channel inactivation rate but did not affect deactivation kinetics, voltage at half activation or voltage-dependence. Showing that Kv1.3 biophysics are modulated by glucose at physiological levels can elucidate how ion channel activity is linked to energy substrates in pathways related to the regulation of metabolism.

This work was supported by NIH Grant r0103387, FSU's Bess Ward Honors Grant, the College of Arts and Sciences, and faculty contributions.

29. Beckham, Kate D., Debbie Figueroa, and Hank W. Bass. Sigma Tau, Florida State University. Bioinformatic Selection of Sorghum BACs for use as FISH probes in developing a Cytogenetic Map of Maize.

Maize (*Zea mays* L.) is an important crop and a model system for cytogenetic research. The goal is to develop a cytogenetic map of the maize genome. This provides insight into the structure and evolution of an essential crop species in the US, and contributes to corn improvement programs for food, fiber, and bio-renewable fuel. Here we describe our progress toward mapping maize Core Bin Markers (CBMs) on chromosomes 2, 7, and 10. By annotating the locations of the CBMs onto SyMAP (www.agcol.arizona.edu/symap) we identify regions of genetic preservation between selected maize chromosomes that encompass CBMs and corresponding sorghum BACs. Subsequently, we are able to choose sorghum BAC clones that are suitable FISH probes. For each CBM we choose 4-5 BAC clones that undergo a series of molecular analysis and verification steps. Southern Blot Analysis is used to verify and confirm BAC sample identity. One BAC clone is selected for each CBM to be used as a probe in cytogenetic fluorescent *in situ* hybridization (FISH) mapping. Finally, we apply FISH to identify and confirm the exact location of CBM sequence on a chromosome. This project is described at cytomaize.org and project results will be accessible on MaizeGDB (www.maizegdb.org).

30. Lynch, Traci. Tau Pi, Wofford. Pulmonary Lymphatic Development in Mice

Pulmonary lymphatics maintain proper fluid homeostasis and promote efficient gas exchange in the lung, but the molecular mechanisms involved in their development are unknown. Previous research shows that lymphatic endothelial cells (LEC) arise from blood endothelial cells (BEC) in a Prox-1 dependent manner [4]. In developing mouse lung

lymphangiogenesis is promoted by over expression of vascular endothelial growth factor-A (VEGF-A) [3]. The new LEC are characterized by expression of VEGF-R3 and the transcription factors Prox-1 and NFATc1. We hypothesize that Prox-1 and NFATc1 function downstream of VEGF-A in pulmonary lymphatic development and induce the expression of VEGF-R3 in LEC. We tested this hypothesis *in vivo* by breeding VEGF-A inducible bitransgenic mice (SPCrTA/tetoVEGF) to mice with impaired calcineurin activation of NFATc1 (CnA β -/-). Embryonic mouse lungs were harvested at day E18.5 and sections stained using immunohistochemistry. Morphometric analysis was used to quantify pulmonary Prox-1, NFATc1, and VEGF-R3 staining using MetaMorph software. We found that VEGF-A induces expression of Prox-1 and VEGF-R3 and that disruption of calcineurin resulted in decreased NFATc1 and VEGF-R3 expression. These findings support our hypothesis that VEGF-A induced VEGF-R3 expression requires Prox-1 and NFATc1.

31. Smith, Laura E and Laura Murray. Tau Pi, Wofford College. UBP 296 Suppresses Feeding Elicited by Lateral Hypothalamic Injection of ATPA

We have previously demonstrated that both kainite (KA) and 2-Amino-3-(3-hydroxy-5-tert-butylisoxazol-4-yl) propanoic acid (ATPA) dose-dependently elicit intense feeding when injected via indwelling guide cannulas into the lateral hypothalamus (LH) of satiated, adult-male, Sprague-Dawley rats. Further, we have demonstrated that injection of ATPA, a selective GluR₅-subunit containing KA receptor agonist, increases feeding behavior without eliciting the generalized behavioral hyper-excitability observed upon LH injection of KA. We next questioned whether LH injection of a selective GluR₅-subunit containing KA receptor antagonist, 1-(2-Amino-2-carboxyethyl)-3-(2-carboxybenzyl)pyrimidine-2-4,dione (UBP296) could suppress feeding elicited by subsequent injection of ATPA. In order to test this, we injected 0.3 μ l volumes of UBP 296 (0.3 or 3nmol) or its DMSO vehicle prior to injection of ATPA (0.1 or 1nmol) or its artificial cerebrospinal fluid (aCSF) vehicle into the LH and systematically observed minute by minute changes in feeding, drinking, grooming, locomotive alert, or resting/sleeping behaviors. Injections were delivered 5 minutes apart and all treatment combinations were tested in a counterbalanced Latin square design. Further, cumulative food intake was measured at 60 and 90 minutes post injection. Rats were given ad libitum access to water and a milk-mash diet of powdered Harland Teklad rat chow (550 g), sugar (440 g), and evaporated milk (354 ml). At 60 min post-injection, the DMSO + 1 nmol ATPA treatment combination selectively increase food intake [7.7 +/- 2.0 g] when compared to DMSO + aCSF [0.95 +/- 0.3 g], 3nmol UBP 296 + 1 nmol ATPA [3.9 +/- 1.1 g], and 3 nmol UBP 296 + aCSF [1.95 +/- 0.6 g] treatment combinations without increasing time engaged in other behaviors ($p < 0.02$, by one way RM ANOVA and Student-Newman-Keuls). In the 3 nmol UBP296 + 1 nmol ATPA treatment combination, UBP 296 suppressed ATPA-elicited feeding by 48% ($p < 0.02$). No other treatment combination elicited a significant effect on food intake when compared to DMSO + aCSF control treatment at any time tested. However, the 3nmol UBP 296 + aCSF treatment increased time spent resting at 30 minutes post injection when compared to DMSO + aCSF control treatment ($p < 0.05$). No other effects on behavior were observed in response to injection of any other treatment combination. These data suggest that activation of lateral hypothalamic GLU₅-subunit containing KA receptors with ATPA can elicit a behaviorally specific feeding response and that this response can be suppressed by inhibition at these same receptors with the selective antagonist, UBP 296.

32. Iglesia, Michael and Robert Whitnell. Sigma Phi, Guilford College. Computational molecular dynamics of vibrational energy flow from dichloroethane to haloalkane dehalogenase.

The vibrational energy relaxation (VER) of a small molecule is a process instrumental to chemical reaction, spectroscopic observations, and other molecular phenomena. Extensive work has been put into the investigation of VER in small solvated molecules as well as of biomolecules and proteins. In this work, molecular dynamics simulation and visualization is used to examine VER of 1,2-dichloroethane (DCE) in two systems: DCE solvated in water and DCE within the active site of the enzyme haloalkane dehalogenase (from *Xanthobacter autotrophicus*), for which it is a known substrate. VER within this enzyme is the primary focus, as the active site of the enzyme environment provides a unique and interesting environment for observing VER. Additionally, understanding the flow of vibrational energy within such an environment holds the promise of better understanding of processes occurring in proteins, such as enzyme catalysis. In this work, through the use of molecular dynamics simulation and novel computational visualization and analysis techniques, the VER of DCE is examined in both the aqueous and enzyme environments, clarifying the time frame and pathways for VER in these significantly different environments.

33. Bánsági, Tamás, Kevin Meyer and Oliver Steinbock. Sigma Tau, Florida State University. Optical Tomography of Three-Dimensional Reaction-Diffusion Waves in the Excitable Belousov-Zhabotinsky Reaction.

Traveling fronts and wave patterns exist in numerous excitable systems including living cells, tissue and organs as well as homogenous and heterogeneous catalyzed reactions. We study self organized wave structures in the auto-catalytic Belousov-Zhabotinsky reaction monitoring self-absorption changes of the employed redox catalyst $\text{Fe}[\text{batho}(\text{SO}_3)_2]_3$. An algorithm based on filtered-back projection is employed to obtain high resolution three-dimensional reconstructions of the catalyst's concentration. Specifically, we present the first example of three-dimensional waves in systems with anomalous, finite bandwidth, dispersion relations.

This research is supported by the National Science Foundation under Grant No. 0513912.

34. Fredette, Natalie C., Brown, Amber N., and Hank W. Bass. Sigma Tau, Florida State University. Genetic Analysis of Telomere Length Variation in Maize (*Zea mays*, L.).

This project investigates telomere biology using the genetic model organism maize (*Zea mays*). Telomeres are specialized nucleoprotein complexes at the ends of linear chromosomes. They carry out essential functions in maintaining genomic integrity, meiotic chromosome behavior, and solving the chromosome end-replication problem. Telomere length is controlled by multiple genes, each contributing to a heritable change in the copy number of the telomere DNA repeat sequence, $(\text{TTTAGGG})_n$ in higher plants. Association mapping uses natural allelic variation to examine gene functions by relating genotypic DNA sequence information to a phenotypic trait, telomere length, across a diverse set of inbred lines. The 25 lines chosen are a subset of inbred lines from an extensively developed 300-line mapping population. The purpose of this project is to obtain telomere length data from the 25 line subset, and utilize that data for association mapping to test candidate genes implicated in telomere length control. In order to measure telomere length, total DNA from each inbred line has been isolated and subjected to one or more telomere length assays such as Southern blot or slot blot analysis. Progress on DNA isolation and analysis will be presented along with a description of the association mapping strategy to be employed.

35. Tyson, Elizabeth, Guilford College. Case Study of Local Biodiesel Co-Operative: Lifecycle Carbon Budget.

This case study analyzes the lifecycle of carbon for making a 95-gallon batch of biodiesel from waste vegetable oil at a local co-operative. The total input and output of consumables was measured. Inputs involved the manufacture and transport of the ingredients methanol and potassium hydroxide and energy used for the transesterification process. Only transportation of waste vegetable oil was measured because it was assumed to have a zero input due to its secondary use as a waste product. Output measured was the emissions from 95-gallons of biodiesel. A final study compared the carbon balance for the production and emissions of one gallon of biodiesel made at the co-operative to that of diesel, gasoline and ethanol.

****Johnson Award winner for best poster in District I**

**DISTRICT II
POSTER SESSIONS
FRIDAY, APRIL 18, 2008**

1. Muench, Brittany. Mu Iota, Northern Kentucky University. Degradation of Urea by Cave Microorganisms Through Bioremediation

When humans camp or explore caves, under some circumstances they cannot remove the urine they excrete due to safety concerns. In dry, desert caves this can have a negative effect on the subterranean environment and its microbial inhabitants. Urea, the major component of urine, can be broken down into other compounds such as ammonia, nitrate, nitrite, and nitrogen gas through various pathways of the nitrogen cycle. This introduces a significant nitrogen source into the starved environment of the cave system. We have isolated cave microorganisms capable of carrying out urine bioremediation in these environments, breaking down urea into nitrous oxide and nitrogen gas which are not usable. Our results demonstrate the breakdown of urea to ammonia, nitrate, and nitrite under aerobic conditions. Under anaerobic conditions, urea must be pretreated with urease. Our results suggest that there are microbial species, present in the cave system, that are capable of doing urine bioremediation as part of a consortium. Therefore, exogenous microorganisms do not have to be introduced to the cave systems for bioremediation of urea. As a result, the urine may be disposed of in the caves with pretreatment, limiting the adverse effects it could have on the environment.

2. Lehmann J, A. B. Sheppard, L. Amine, and R.W. Brown. Pi Delta, East Tennessee State University. Nicotine-conditioned hyperactivity in adolescent male and female D2-primed rats.

The aim of this study was to determine the ability of a nicotine-conditioned context to elicit locomotor hyperactivity in a neonatal quinpirole animal model of psychosis, and whether this conditioned hyperactivity could be blocked by the D2 antagonist eticlopride. Sprague-Dawley rats were treated with either saline or the dopamine D2 receptor agonist quinpirole from postnatal days (P) 1-21 to create priming of the dopamine D2receptor, a phenomenon that we have shown persists throughout the animal's lifetime. Beginning on P33, animals were injected i.p. with either nicotine (0.5 mg/kg), the D2 antagonist eticlopride followed by nicotine, or saline and placed into the arena 10 min after injection every other day through P49. A non-paired group was included. Results showed that, D2

priming blocked the typical initial hypoactivity produced by nicotine, and these animals also sensitized to nicotine more rapidly than controls. Eticlopride blocked sensitization to nicotine in both D2-primed and non D2-primed rats. On P50, a portion of these animals were administered a drug-free test in which rats were given saline before being placed into the locomotor arena. Interestingly, control animals administered nicotine demonstrated conditioned hyperactivity on the drug free test that was blocked by eticlopride, but eticlopride did not affect nicotine-conditioned hyperactivity in D2-primed rats. This result indicates priming of the D2 receptor was able to overcome D2 receptor blockade in adolescent rats. Further studies are analyzing the role of nicotinic receptors in this phenomenon, as collaborators have shown that D2 priming produces alpha7 nicotinic receptor upregulation.

3. Gayles, Michael R. & Terry D. Richardson. Beta Zeta, University of North Alabama. Parasite prevalence in onyx rock snails (*Leptoxis praerosa*).

Leptoxis praerosa is a member of the Pleuroceridae family which is an important part of freshwater life in the eastern United States. Parasites, generalists and specialists, frequently use snails as intermediate hosts in their life cycle. In order to determine if onyx rock snail serves as an intermediate host, 100 snails from each of six different sites in Cypress Creek, Lauderdale County, Alabama were examined. The sites were on the upstream and downstream sides of a bridge and within the midstream, far, and near shore riffle zones. The snails were sampled in late February, 2008. Overall, the snails examined ranged in size from 4.8 mm – 14.0 mm in length. The dominant parasitic specimens were yellow sporocysts containing cotylocercous cercariae at different developmental stages. Encysted metacercariae were observed as well as two cestodes. Parasite prevalence ranged from 12% to 19% in sites 1 through 4, and 44% and 47% in sites 5 and 6, respectively. Reasons for such high prevalence levels at these two sites are unknown but we believe the differences in substrata and snail population density are significant factors to be considered.

4. Yu, Eunice. Mu Omicron, Columbus State University. The neuroprotective effects of estrogen in the brain: role of astrocytes?

Estrogen executes neuroprotective effects through two isoforms of estrogen receptors (ER): ER α and ER β . Although astrocytes appear to express ER in vivo and in vitro, no evidence exists as to whether astrocytes express estrogen receptor (ER) genes. The hypothesis for this study is that the addition of 17- β estradiol to rat astrocyte cells (RAC's) will increase the number of viable cells in a given culture and increase ER α and ER β receptor expression compared to the control. Both of these responses would indicate that estrogen stimulates the release of astrocyte-derived neuroprotective factors, which aid the neuroprotective effects of estrogen on the brain. Cells treated with 100pM 17- β estradiol exhibited a 10% decrease in cell viability when compared with the control, whereas cells treated with 100nM 17- β estradiol exhibited a 9% decrease when compared with the control. The addition of H₂O₂ to cells treated with 17- β estradiol caused a 29% decrease when compared with the control. The addition of H₂O₂ to cells treated with 100nM 17- β estradiol caused a 54% decrease when compared with the cells treated with 100 pM 17- β estradiol. However, not enough trials were completed to run statistical analyses; preliminary data indicate that E2 does not have a neuroprotective effect.

5. Cason, Chevelle,¹ Thomas Fabré,¹ Donald Tomalia,² Kristi H. Martines,³ and Heather A. Bullen¹. Mu Iota, Northern Kentucky University, ²Zeta Theta, Central Michigan University. Characterization of Functionalized Poly(amidoamine) PAMAM Dendrimers as Potential Drug Delivery Vectors Across the Blood Brain Barrier

Dendrimers have attracted significant attention as drug delivery systems due to their highly branched properties and ability to act as nanocontainers. This research is aimed at developing analytical approaches to characterize dendrimers and monitor their interaction with *in vitro* models of the blood brain barrier (BBB), a tight seal of cells that limits drug therapy to the brain. Ultra performance liquid chromatography (UPLC) analysis was found to provide an improved analytical method for the characterization of variances in dendrimer surface modification compared to other chromatographic methods. Understanding the degrees of modification is critical in designing and characterizing these nano structures for numerous applications. The interaction of dendrimers with model BBBs utilizing Langmuir Blodgett methods and spectroscopy were evaluated. In addition, a novel capture surface platform was developed to quantify dendrimer passage, which utilizes scanning probe microscopy. This method was correlated with other chromatographic approaches of quantification.

6. Cunningham, Dana. Mu Iota, Northern Kentucky University. Quantification of cytokine expression from human immune cells by real-time polymerase chain reaction

Real-time polymerase chain reaction (RT-PCR) has broadened the horizons of molecular studies by providing advances in areas such as quantification of gene expression, immunoassay validation, and viral quantitation from clinical specimens. The purpose of this project was to establish RT-PCR-based cytokine detection assays that would facilitate the discovery of novel immunomodulators. Complimentary DNA (cDNA) was prepared from RNA harvested from mitogen-stimulated human T cells (CEM) and monocytes (U-937). The cDNA was then screened for cytokine gene expression via RT-PCR. The contribution of genomic DNA to cytokine detection was insignificant. Primer pairs were designed for interleukin (IL)-6, IL-8, IL-10, macrophage inflammatory protein (MIP)-1, and tumor necrosis factor (TNF)- α using Primer3 software. Quantification of cytokine expression was verified for the IL-8, IL-10, and TNF- α primers by dissociation curve analysis and cDNA titration. Optimal primer concentrations for the detection of IL-8, IL-10, and TNF- α expression were determined. Future studies will utilize these assays to examine the effects of proteins involved in neurodegenerative diseases, such as Alzheimer's and prion-mediated encephalopathies, on cytokine gene expression. Discovery of immunomodulatory pathways triggered by these agents may accelerate the development of drugs and therapies for neurodegenerative diseases.

7. Pourmorteza, Mehdi and Tom Laughlin. Pi Delta, East Tennessee State University. The Incidence and Prevalence of *Batrachochytrium dendrobatidis* in temporary wetland populations of *Ambystoma macalatum* in the Holston River Valley

Chytridiomycosis is an emerging infectious disease affecting amphibians worldwide. It is caused by the chytrid fungus *Batrachochytrium dendrobatidis*, a fungus causing sporadic morbidity and mortality in amphibian populations. The fungus infects the surface layer of the frog's skin, causing damage to the keratin layer. Many researchers believe that this infection inhibits the frog's ability to respire and osmoregulate. To better understand the dynamics of the chytrid fungus, the incidence and prevalence of Chytridiomycosis will be

measured in salamanders in three different populations; one in Shady Valley where water is polluted with cattle waste, and the other two in the South Holston River floodplain and at Bays Mtn. Park where water conditions are relatively unpolluted. DNA from salamanders has been extracted from two different populations thus far using Qiagen DNeasy tissue kits. The isolated DNA will be used for PCR reactions using primers previously developed for this species.

8. Waddell, Joel & Thomas F. Laughlin. Pi Delta, East Tennessee State University. Incidence and prevalence of *Frog Virus 3* (FV3) in temporary wetland populations of *Ambystoma maculatum* in the Holston River Valley.

Frog virus 3 (FV3), a Ranavirus in the family *Iridoviridae*, is an infectious disease of recent concern because it has been associated with morbidity and mortality in wild and commercial amphibian populations on several continents. Recent evidence suggests that environmental degradation can impair amphibian immune systems. This project will investigate the incidence and prevalence of FV3 in three *Ambystoma maculatum* populations in the Holston River Valley. I will screen DNA samples for the presence of FV3 from approximately 100 individuals from each of three different populations in Sullivan County, Tennessee, characterized by varying degrees of human impact. The extracted DNA will be screened using PCR to amplify a ~500 base pair region of the major capsid protein of FV3. If FV3 is present, I expect to find a direct correlation between poor water quality and an increased incidence and prevalence of this Ranavirus.

- **9. Jackson, Sara W. Mu Epsilon, Troy University. Heat shock protein inhibition by 17-allylamino-17-demethoxygeldanamycin disrupts androgen receptor activity.

Heat shock proteins have long been known to be involved in steroid receptor activity. These interactions are an integral step in developing a viable receptor to which hormones can bind. The ultimate goals of this project are to functionally describe the mechanisms of heat shock protein interactions with the androgen receptor before hormone activation, a field of study that has lagged behind other steroid receptors. Cell lines expressing an epitope-tagged androgen receptor protein and an androgen-responsive luciferase reporter gene have been developed as a model cell system to study heat shock proteins that interact with the androgen receptor. Adding a known heat shock protein inhibitor, 17-allylamino-17-demethoxygeldanamycin (17-AAG), to this cellular system resulted in a dose-dependent inhibition of androgen receptor activity. The ultimate goal of this research is to compare heat shock protein interactions in androgen receptor systems to those of the well-characterized glucocorticoid receptor system. With new reports emerging on the correlation between heat shock protein disruption and cancer treatment, it is important to learn as much as possible about the mechanisms of heat shock protein involvement in androgen receptor signal transduction.

10. Barnes, Jennifer M. Mu Epsilon, Troy University. Impact of non-essential gene deletions on the growth of *Saccharomyces cerevisiae* in water from differing environmental sources.

In the yeast *Saccharomyces cerevisiae*, over six thousand genes have been identified on sixteen chromosomes with each gene directing the production of a unique protein with a specific function in the cell that contributes to the maintenance of various cellular processes. A unique research tool exists for researchers using *Saccharomyces cerevisiae*—the *Saccharomyces* Genome Deletion Strains. In this collection of 4700 individual yeast strains, each member harbors one unique gene deletion in a non-essential gene. This allows identification of genes involved in various cellular processes.

In previous research, lead was analyzed using the deletion strains, and the effects of water from the Troy Waste Water Treatment Plant were assessed and compared to water from upstream of the treatment plant using channel catfish. This project merges and expands these two projects by using the deletion strains to assess the impact of the Troy Waste Water Treatment Plant on the growth of various yeast strains as compared to distilled water and water upstream of the treatment plant. This research may help elucidate important metabolic pathways that are activated by exposure to the materials in water samples, as well as assist in identifying possible biomarkers for environmental toxins.

11. Wellborn, Ida R. Gatlinburg Pittman High School, Gatlinburg, TN. Twenty-four hour snail watch.

Six snails were watched during a twenty-four hour period to observe patterns of behavior and also to prove or disprove the following hypotheses: during a twenty-four hour period, snails limit their movements to within a ten foot radius from where they begin moving, and snails stay active for at least twelve hours per twenty four hour period. Watches were done in various locations in and near the Great Smoky Mountains National Park. During a watch, the snail's movements, along with precise times, were recorded, a map of the snail's movements was made, and pictures were taken. The soil around each site was also tested for ph, nitrogen, and moisture levels. Temperature, humidity, vegetation, and weather qualities were recorded as well. The snail species watched included *Appalachina chilhoweensis*, *Mesodon normalis*, *Mesomphix capnodes*, and *Mesomphix cupreus*. The first hypothesis was correct; the second was disproved. Several other snail-behavior patterns related to moisture; feeding, sleeping, and grooming habits; and weather conditions were observed.

12. Harmon, Ashley. Mu Chi, Midway College. The impact of traumatic brain injury on vocation: a retrospective case study.

This study examined the vocational outcomes of nineteen patients that had previously suffered a traumatic brain injury (TBI). Subjects analyzed in this study were those who had received two Life Care Plans; one at the onset of the injury and an update of that Life Care Plan at a later date, as well as a vocational assessment at the time of the second Life Care Plan. The vocational outcomes, as valued by the Return to Work (RTW) scale, were compared to several factors including: severity of TBI, educational level completed at the time of injury, age at the time of injury, and sex of subject. The RTW scale classified vocational outcomes as return to work, supported employment, return to school or training or permanent-total disability. Of the nineteen patients assessed, seventeen were classified as permanent-total disabilities. One patient returned to school or training and another returned to work. No significant trends were identified for severity of TBI, level of education, age group or sex of subject. The limitations of the study and future research directions are discussed.

13. Mavroides, Alexis L. Mu Chi, Midway College. Creating a web-based data management and storage system for researcher.

Bioinformatics is a growing field that is increasingly important in experimental science. This web-based data management system will provide scientists a significant tool, capable facilitating large scale, collaborative research. The benefits can include ease of manipulation of data, space-saving way of storing data and a tool that will potentially eliminate geographical boundaries when collaboration and exchange of experimental findings is necessary. The first step is to create a database to store the information. The

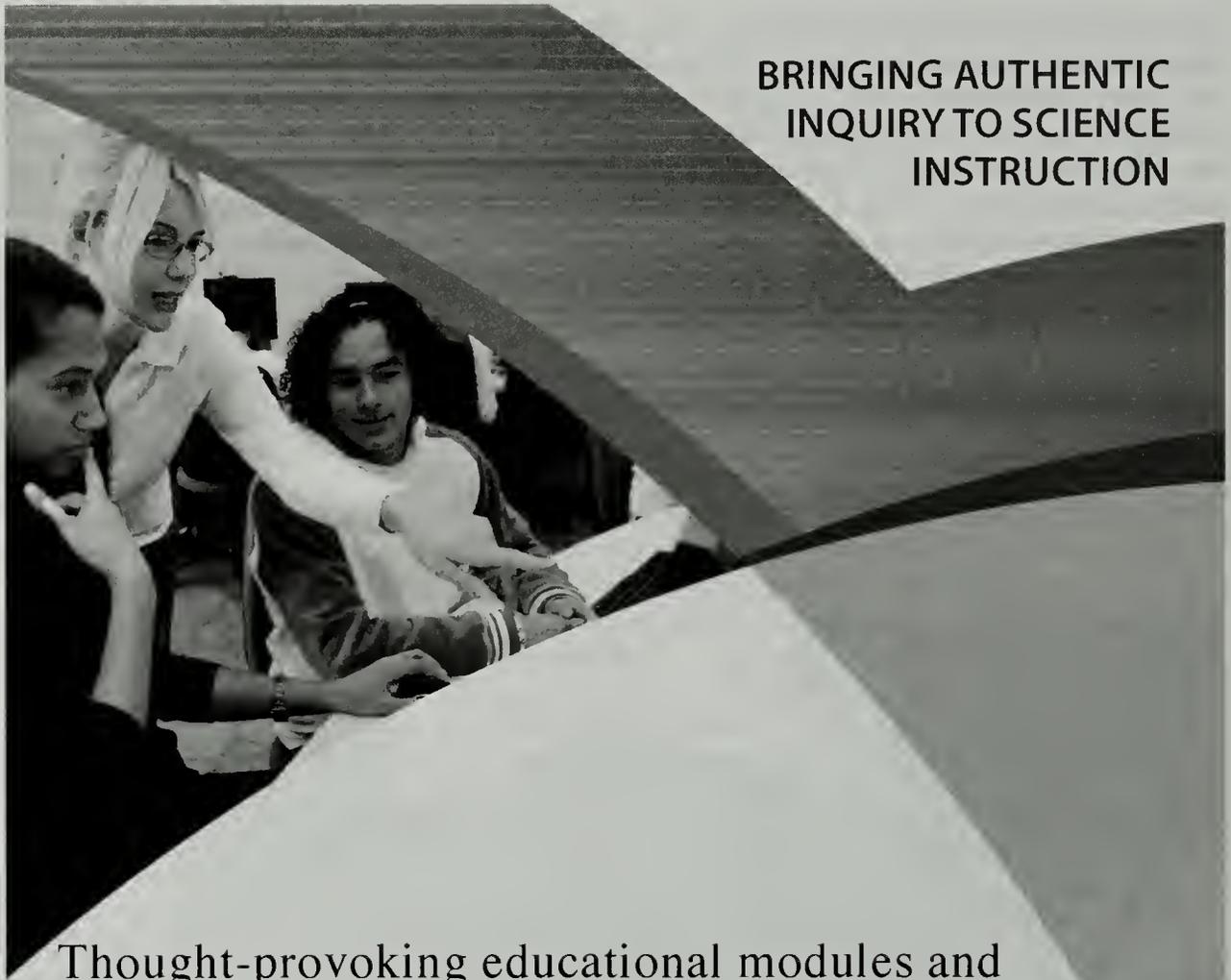
next step, using Java programming, is to parse the experimental data and write it into corresponding database tables. The Java software creates a connection to MySQL database and writes the experimental data into the corresponding two tables. One table stores the general information of the experiments, while the other table is responsible for the results of each test. Additionally, a security model, based upon database views, is created. Once the system has demonstrated it functions properly in development, it is migrated from MySQL to an Oracle database. From here, scientists can use a web interface to access their existing data and easily upload more. The program can easily be modified to suit the needs of other projects

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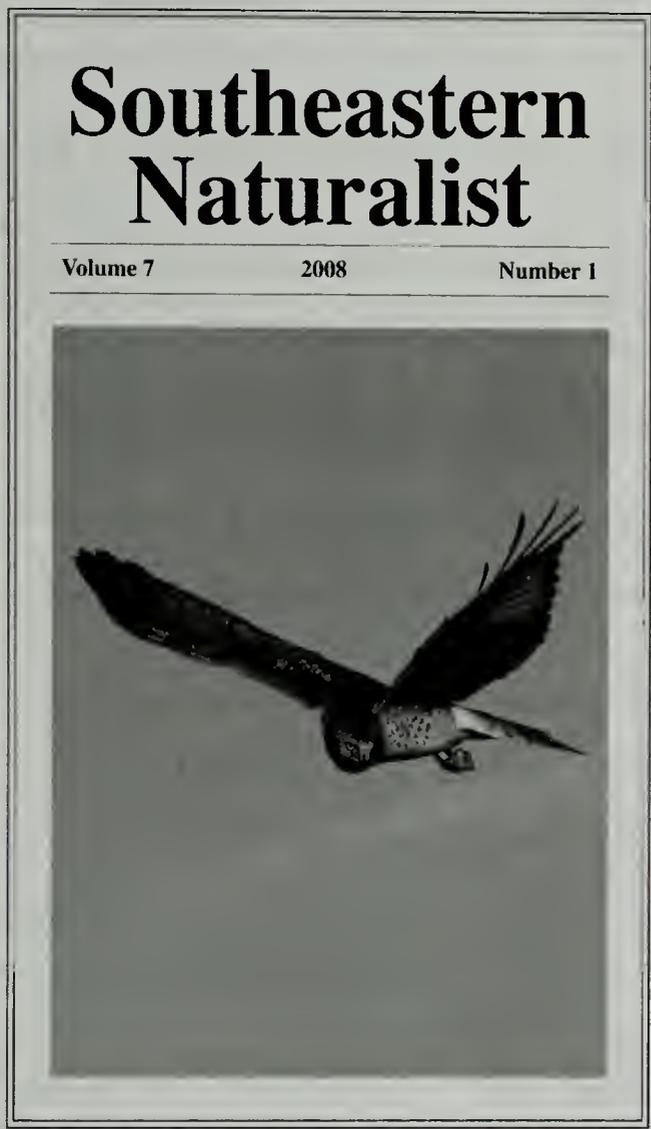
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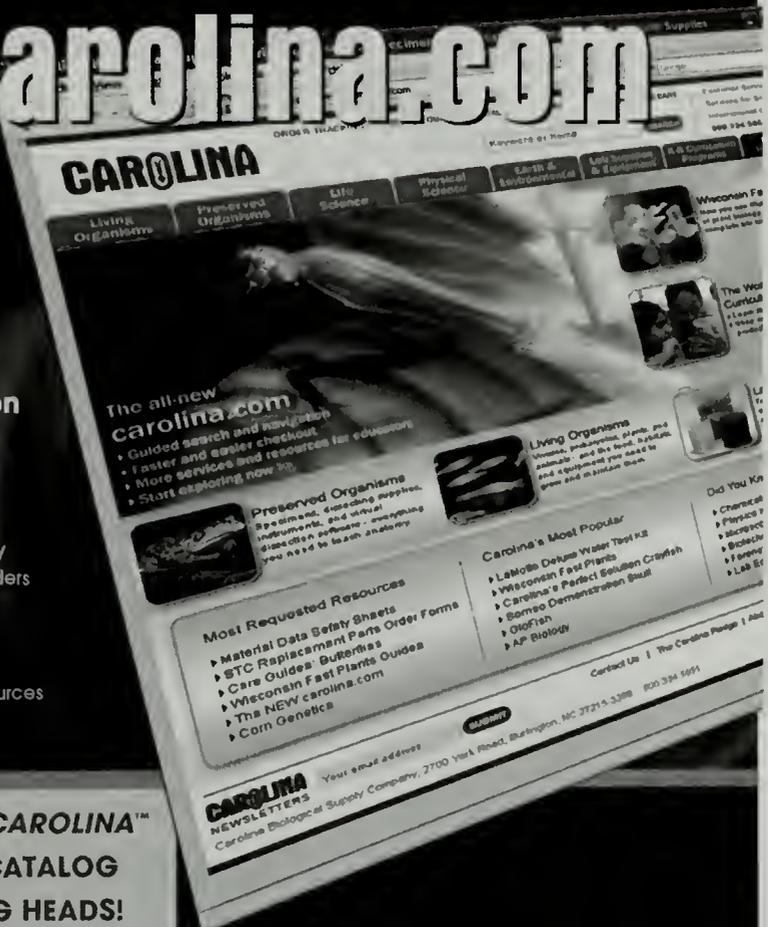


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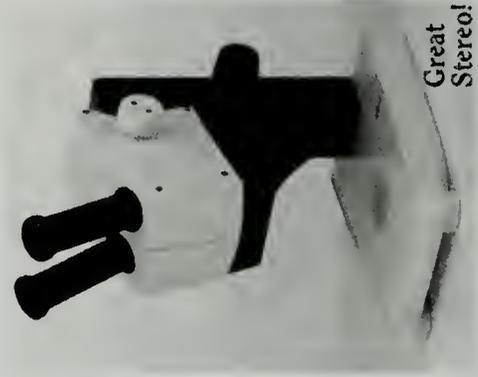
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