

SOUTHEASTERN BIOLOGY



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ASB 70TH ANNUAL MEETING

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Birmingham, Alabama, and
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Abstracts of Papers and Posters
Presented at the Annual Meeting

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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

2010 April 7-10: Co-hosted by Western Carolina University, Cullowhee, North Carolina, and its Southern Appalachian Biodiversity and Ecology Center, and the University of North Carolina, Asheville, North Carolina. Meeting site is the Crowne Plaza Hotel, Asheville, North Carolina.
2011 April 13-16: Hosted by the University of Alabama, Huntsville, Alabama. Meeting site is the Von Braun Convention Center adjacent to the Embassy Suites Hotel, Huntsville, Alabama.

**ASSOCIATION OF SOUTHEASTERN BIOLOGISTS
EXECUTIVE COMMITTEE MEETING
SATURDAY, 6 SEPTEMBER 2008
ASHEVILLE, NORTH CAROLINA**

ATTENDANCE: 21 individuals attended the meeting

NAME	CAPACITY
Tom Wentworth	President
Patricia Cox	President-Elect
Mike Dennis	Past President
Elaine Davis	Vice President
Nicole Turrill Welch	Secretary
Tim Atkinson	Treasurer
Don Roush	EC Member-at-Large
Doug Rayner	EC Member-at-Large
Katie Greenberg	EC Member-at-Large
Ron Dimock	EC Member-at-Large
Randy Small	EC Member-at-Large
James Caponetti	Print Editor
Dennis Haney	Web Editor
Terry Richardson	Membership Officer
Scott Jewell	Meetings Coordinator
Ginger Bayless	Assistant to Meetings Coordinator
George Cline	LAC 2009
Ken Marion	LAC 2009
Beverly Collins	LAC 2010
Anisha Campbell	Chair, Committee for Human Diversity
Danny Gustafson	Chair, Conservation Committee

President Tom Wentworth called the meeting to order at 8:10 am and welcomed everyone to Asheville, North Carolina, the site of the 2010 Annual Meeting. Tom thanked Katie Greenberg and her husband, Stan Crownover, for hosting a cookout last night and Scott Jewell for coordinating arrangements for today's meeting.

1. Approval of Minutes

Motion 1. It was moved that the 16 April 2008 and 19 April 2008 Executive Committee Meeting minutes be approved as edited. The motion was made by Don Roush and seconded by Ron Dimock. The motion passed.

2. Officer Reports

President – Since taking office, Tom Wentworth has appointed Chairs and members of standing committees, and he appointed Alexander Krings as our NCSA representative. The position of Book Review Editor remains vacant. Tom

extended many thanks to Dennis Haney, for becoming the Web Editor, and to Jim Caponetti, for editing items for *Southeastern Biology*.

President Elect – Pat Cox contacted Dr. Andrew Berry, renowned evolutionary biologist from Harvard University, and he graciously accepted her invitation to give the Plenary Address at the 2009 Annual Meeting in Birmingham, Alabama. Pat thanked Jim Costa of Highlands Biological Station for suggesting that Dr. Berry deliver the Plenary Address.

Vice President – Elaine Davis is organizing the Patrons Breakfast for the 2009 Meeting.

Past President – Mike Dennis wrote the Past President's Address for *Southeastern Biology*, and coordinated many activities with Tom Wentworth to ensure a smooth transition into Tom's Presidency. Mike contacted all Past Presidents of ASB to submit comments and questions for this meeting, but no pressing issues were received. He is organizing the Past President's Breakfast for the 2009 Annual Meeting. Lastly, Mike provided the Executive Committee DVDs of photos from the 2008 Annual Meeting in Spartanburg, South Carolina.

Secretary – Nicole Turrill Welch asked that changes to the Leadership Guide, Constitution, and Bylaws be submitted to her twice a year, at the times of the Annual and Interim Meetings of the Executive Committee. She requested that changes be sent as a Microsoft Word document containing *both* the original passage and the edited version.

Treasurer / Finance Committee – Tim Atkinson shared that the Association's current bank balance is good, and increasing, relative to past years. This is due to encouragement to pay dues on time and lack of large bills to pay in advance of the 2009 Annual Meeting.

3. Other Organizational Reports

Archivist – John Herr's report was read into the Minutes. He asked that all formal written reports for the Annual Meeting be sent to both himself and Nicole Turrill Welch via email attachments. John also has begun arrangements for the future transition to another Archivist.

Meeting Coordinator – Scott Jewell is busy organizing the 2009 Annual Meeting in Birmingham, Alabama, and future meetings. Scott will attend NABT in Memphis, Tennessee, in October 2008.

Membership Officer – Terry Richardson reported that he is collecting data from the membership.

Print Editor – Jim Caponetti reported that the October issue of *Southeastern Biology* has been mailed and should arrive later this month. This issue includes the call for papers and preliminary details of the 2009 Meeting. Jim invited "Dr. Myxo," Harold Keller, to submit an invited paper for the January 2009 issue of *Southeastern Biology*. Jim also shared that Ricky Fiorillo, News Editor, has

submitted several points of news and information which are published in the October, 2008 issue of *Southeastern Biology*.

Web Editor – Dennis is editing the website file structure and will be adding the 2009 Meeting information soon.

4. Affiliate Representative Reports

Beta Beta Beta – Don Roush, on behalf of Virginia Martin, reported that sessions and fieldtrips for the 2009 meeting in Birmingham are being organized. The announcement to Beta Beta Beta members will stress that they must pay the ASB Meeting Registration to attend and present in Beta Beta Beta sessions.

Ecological Society of America, Southeastern Chapter – Tom Wentworth shared ESA-SE's request for organized oral sessions at the Annual Meetings of ASB. This would require session organizers to work with the LAC Program Chair on abstract submission, and the Program Chair and Committee would have final say on accepting organized oral sessions. Scott Jewell stressed that finding rooms for these sessions should not be a problem. Terry Richardson emphasized that this could be a new means of attracting more members and attendees to the meeting.

The descriptions of the Eugene P. Odum and the Elsie Quarterman-Catherine Keever Awards, given at the Annual Meeting, have been rewritten and these committees are being restructured. The Chapter is excited about the 75th Annual Meeting of ASB, planned for Athens, Georgia, and will participate fully in that meeting. The Conservation Committee's list of ASB members who volunteered to serve as contacts for State and regional biological issues needs to be shared with ESA-SE so that it can become part of the ESA Knowledge Partnership.

Southern Appalachian Botanical Society – Pat Cox announced that Conley McMullen is the new contact for SABS.

5. Old Business

Clarification of duties of Membership Officer and Database Manager – Pat Cox, Scott Jewell and Terry Richardson discussed the duties of these new positions and wrote descriptions for the Leadership Guide.

Proposed change in dues structure – Finance Committee representative, Tim Atkinson, explained that the existing dues structure is not covering the cost of publishing and mailing *Southeastern Biology* as well as other business aspects of the Association. The Finance Committee proposed the following dues structure:

Category	Current Dues	Proposed Dues
Regular	\$35	\$50
Regular, 3 years	\$95	\$135
Family	\$40	\$55
Student	\$15	\$15
Emeritus	\$15	\$15

Contributing	\$70	\$100
Sustaining	\$140	\$200
Life	\$350	\$500
Patron	\$750	?
Library	\$40	\$55
Library, 3 years	\$100	\$145

Motion 2. It was moved by the Finance Committee that the proposed dues structure be accepted.

Discussion of this motion was lengthy, in-depth, and considerate of the membership. Randy Small and Katie Greenberg requested clarification of the publishing costs of *Southeastern Biology* and proposed online distribution as an alternative. Discussion of moving *Southeastern Biology* to an online format was tabled. Don Roush asked if the proposed increases are sufficient to cover multiple years, especially given the time lag for implementation created by Article 1, Section 1 of the Bylaws. Doug Rayner stressed that our Association's membership must increase and lessen the unpredictable, dramatic year-to-year fluctuations characteristic of recent years. Following explanation of what Patron Members receive for their membership, it was agreed that Patron Dues be raised to \$1000. Several Executive Committee members agreed that student dues should be raised to \$20. Dennis Haney reminded us that past proposed increases in student dues were met with much opposition from the membership. Nicole Turrill Welch and others explained that our student dues, even at \$20, are drastically lower than those of comparable associations and organizations. Don Roush suggested that the student membership category be split into undergraduate (\$15) and graduate (\$20) students. Mike Dennis negated Don's suggestion and stated that if the motion for proposed dues structure fails at the Business Meeting, an amendment can be made to keep student dues at \$15.

Amendment to Motion 2. Terry Richardson moved that the proposed dues structure be advertised in *Southeastern Biology* prior to the 2009 Annual Meeting. If approved by the Executive Committee, the proposed dues structure will be voted on by the membership at the 2009 Annual Meeting. If approved by the membership, the changes will take effect immediately (April 2009). Also, under "Proposed Dues," strike "\$15" by "Student" and insert "\$20." Strike "\$15" by Emeritus" and insert "\$20." Strike "?" by "Patron" and insert "\$1000." Dennis Haney seconded the motion. The question was called for this Amendment to Motion 2. The motion passed unanimously.

The Question was called on Motion 2. The motion passed unanimously.

6. New Business

Renewal of Amanda Myrick's contract – Dennis Haney conveyed that Amanda is willing to continue maintaining the Association's website, as defined in her past contract, with contract dates of August 1, 2008 to July 31, 2009 and a salary of \$600.

Motion 3. Mike Dennis moved that Amanda Myrick's contract be renewed. Pat Cox seconded the motion.

Amendment to Motion 3. Terry Richardson proposed that the contract dates run from August 1, 2008 to September 30, 2009. The prorated salary would be \$700 for this 14-month contract. Don Roush seconded the amendment. The question was called on this amendment. The amendment passed.

The question was called on Motion 3 and the motion carried.

Proposal for searchable member database – Dennis Haney conveyed Amanda Myrick's estimation that 4-8 hours of work would be necessary to establish a searchable membership database and cost \$200-\$400. Tim Atkinson shared that Avectra, the company who will, in the future, provide online registration, dues paying, etc., will create such a database as part of their contract. Avectra's system will be password protected and members will be able to access and update their own information. A link to this system will be added to the Association's website and search of the database would be public. Ron Dimock suggested that this database be promoted as a membership benefit. Tom Wentworth proposed that a standard statement for using the database be added to the website.

Motion 4. Dennis Haney moved that we encourage Avectra to develop this database given the provision that *only* Association of Southeastern Biologists members can access the database, members can opt for privacy, and a clause be added to the website defining appropriate use of the membership information. Doug Rayner seconded the motion. The motion carried unanimously.

Endorsement of Tennessee Exotic Pest Plant Council's (TN-EPPC) Invasive Weed Awareness Campaign and general discussion of Executive Committee's authority to make such endorsements – Pat Parr, Past President of our Association, is President of TN-EPPC and conveyed this request through Pat Cox. Mike Dennis explained that any Resolution of Support would have to be published, read, and voted on at the 2009 Business Meeting – too late for the February deadline requested by TN-EPPC. The Committee reviewed the Bylaws and this, indeed, is the case. Discussion followed regarding how the Association and its Executive Committee should handle such requests. Danny Gustafson, Chair of the Conservation Committee, questioned whether the Conservation Committee should have received the TN-EPPC request for review prior to its reaching the Executive Committee. Nicole Turrill Welch suggested that requests for endorsements, resolutions, etc. be funneled through the appropriate committees for review before they come to the Executive Committee. Mike Dennis expressed concern that this is the first time, in his recollection, that the Executive Committee has considered such an endorsement and our actions today could lead to *numerous*, similar requests. He suggested that Tom Wentworth write a letter to TN-EPPC saying that the Executive Committee wishes to draft a Resolution of Support and bring it for a vote at the April 2009 Business Meeting. Ron Dimock suggested that Mike Dennis draft a Resolution of Support and distribute it to the membership for a vote *via email*, with replies (votes) returned to Danny Gustafson.

Motion 5. Doug Rayner proposed that the Executive Committee endorse the request made by the TN-EPPC, as presented, and that the Resolutions Committee write a Resolution of Support to be distributed to the membership for a vote, with votes required within ten days of notice. Don Roush seconded the motion.

Terry Richardson made a motion to table this Motion 5. There was no second. Pat Cox called the question. The motion passed.

Nomination for John Herr Award – By email, Ken Shull nominated an Association member for the John Herr Lifetime Achievement Award. Dennis Haney asked if we should require some documentation from Ken Shull regarding the nominee's contribution to the Association. It was decided so and a request will be made.

Proposals for Workshops and Symposia at the 2009 Annual Meeting –

2009 ASB Darwin Bicentennial Symposium: Natural Selection – Past, Present and Future. Submitted by Robert George and James Costa with the request of \$1500 for honoraria for two invited speakers. Discussion followed regarding the publication of the symposium papers in *Southeastern Biology*, as doing so would add \$3500 to the cost of the January issue.

Motion 6. Mike Dennis moved that we accept this symposium proposal, provide \$1500 in funding, and discuss with the organizers how they will fund its publication in *Southeastern Biology*. The motion was seconded. Dennis Haney called the question and the motion passed unanimously.

Biodiversity Informatics: Progress and Potential in the Southeastern USA – The proposal was not entirely clear as to the need for the Association's contribution towards the requested \$4000 travel expenses for the speaker from Australia (representing the *Atlas of Living Australia*). There was also consensus that the symposium could accomplish its objectives without bringing a speaker from Australia at great expense.

Motion 7. Dennis Haney moved that the Executive Committee accept the symposium proposal but not offer any funding. Ron Dimock seconded. The motion carried.

SERNEC: Collaboration and Funding Opportunities Workshop – The organizers are not asking for monetary support for this Saturday workshop, similar to those they have held at recent Annual Meetings. Scott Jewell noted that he would need to negotiate to obtain space for this fairly large workshop because it falls after the period during which he had previously arranged for meeting rooms.

Motion 8. Pat Cox moved that we accept this workshop proposal. Elaine Davis seconded the motion. The motion passed unanimously.

Evolutionary Theory Workshop – This workshop, proposed by the Education Committee, will be a lunchtime session and the organizers are asking the Association to cover the expense of pizzas.

Motion 9. Doug Rayner moved to accept this workshop proposal and Pat Cox seconded. The motion passed.

Graduate School Preparation: The What?, Why?, Where?, and How? – The Human Diversity Committee proposed the workshop and Anisha Campbell, Chair, explained their requests. Discussion followed that refreshments would not be necessary, as the scheduled break for the workshop corresponds to the general program break, during which refreshments will be provided. The Executive Committee agreed that the Association would pay \$300 for distinguished guests and cost of flyers.

Motion 10. Pat Cox moved to accept this workshop as edited. Elaine Davis seconded and the motion carried.

Record-Keeping – John Herr suggested that useful, unofficial reports generated by Officers, Local Arrangements Committees, and other standing committees should be preserved and shared. Discussion followed and it was decided that this information be passed from one officer/committee chair to the next each year.

Changes to Workshop/Symposium Protocol – Tom Wentworth requested and received the Executive Committee's approval to make the following two changes:

1. Symposia can be half or full day.
2. The protocol will make it clear that workshop guidelines are specifically for those workshops organized by Association of Southeastern Biologists Committees or academic groups. They do not cover commercial workshops, which are arranged directly through the Meetings Coordinator.

Proposed Leadership Guide Updates – John Herr changed the description of the Archivist's entry in the Bylaws to add a provision for obtaining archives from his office, or future Archivists' offices, in the event that he/they are no longer able to perform his/their duties.

7. Committee Chair Reports

AIBS – Gerry Twitty submitted a very detailed report on the 2008 AIBS Meeting to Tom Wentworth.

Conservation Committee – Danny Gustafson asked how to share the list of experts assembled by the Committee. Pat Cox suggested publishing the list in *Southeastern Biology* as well as on the website. Danny and the committee will work to recruit a greater diversity of expertise to that list.

Education Committee – Chairperson Dennis Haney announced that the committee would host a workshop at the annual meeting.

Finance Committee – Tim Atkinson, Chair, explained that the committee is looking into establishing a line of credit that could be called upon to pay bills in the event that funds are insufficient.

Graduate Student Support Committee – Wayne Morris, Chair, reported that requests for support have varied greatly over the years. The Committee asked that \$5000-7000 be available to support graduate student expenses for the 2009 Annual Meeting.

Membership Benefits Committee – This new committee is looking into perceived and actual benefits of ASB membership and what future membership benefits should include. Chair Terry Richardson asked for our ideas to improve the stature of the Association in order to attract nonparticipating institutions.

Meritorious Teaching Award – Ron Dimock, Chair, stated that the description of the award has been updated to reflect the 10-year membership requirement of nominees.

Nominating Committee – Chairperson Mike Dennis announced that nominees will be needed for Vice President and two Members-At-Large.

Past-President's Council (Mike Dennis) – Mike Dennis, Chair, said that the Past-President's Council will organize and host a one-hour session on how to become active in ASB (officers, committee members and chairs). The Past-President's Council will organize this session.

Place of Meeting Committee – Chairperson Pat Cox reported that members of the committee had visited potential sites for the 2011 (Huntsville, Alabama) and 2012 (Athens, Georgia) Annual Meetings. The Committee shared their concerns about increased travel costs and how meetings at cities near the center of the Association's traditional region may improve meeting attendance.

Poster Committee – Ray Williams, Chair, reported via email that this committee is prepared for the 2009 Annual Meeting.

Publications Committee – Don Roush is recruiting a Book Review Editor. Also, Don and Jim Caponetti are reviewing the procedure for obtaining books and reviews.

Research Awards – Microbiology Committee – The committee reported that the submission of abstracts has increased since the inception of the award.

Local Arrangements Committee (LAC) 2009 – Ken Marion and George Cline shared several details regarding online abstract and PowerPoint presentation submission for the 2009 Annual Meeting in Birmingham, Alabama. Ken and George announced that they are sending the breakdown of the number of papers, posters, sessions by topic, etc., to regional Universities and Colleges to recruit their participation. They also reported that registration and lodging expenses are higher than last year. Five half-day or longer field trips are planned,

and Beta Beta Beta will host a field trip, too. The Thursday Night Social will have The Midnighters as the entertainment and will take place on site at the Sheraton.

LAC 2010 – Beverly Collins shared that the Program, Field Trips, and Social Committees, among others, are being staffed for the 2010 Annual Meeting in Asheville, North Carolina. Ideas for the Thursday Night Social venue include the North Carolina Arboretum and the Biltmore House.

8. Announcements

Jim Caponetti asked whether or not we should charge for Position Announcements for printing in *Southeastern Biology*. Scott Jewell and Dennis Haney clarified that all Position Announcements should be posted on the website and not printed in *Southeastern Biology*.

Don Roush graciously covered the loss on t-shirt sales from the 2008 Annual Meeting so that the Furman Beta Beta Beta group would not have to bear this expense.

There being no further business, President Tom Wentworth thanked everyone for coming and adjourned the meeting at 4:10 pm.

Respectfully submitted,

Nicole Turrill Welch, Secretary
19 September 2008

Past President's Enrichment Fund Challenge Report from W. Michael Dennis, Past President

The ASB Past President's Council initiated a special ASB Enrichment Fund campaign prior to the 2009 Annual Meeting. The Enrichment Fund is a special fund supported by volunteered contributions to "support long and short range objectives to advance biology and education through teaching and research". The initial goal was to have 100% participation by the Past Presidents through contributions to the Enrichment Fund by the end of the 2009 Annual Meeting. A sponsor was solicited to match dollar for dollar all contributions of the Past Presidents during the fund raiser. At the Annual Meeting this challenge was expanded and all Past Presidents were encouraged to solicit contributions from other ASB Members and any other outside contributors wanting to support ASB. All contributions were to be matched. Well, the results are in and a total of \$5,245 was raised which was matched by another \$5,245 from the anonymous matching fund sponsor for a total of \$10,490! Thanks to all the Past Presidents for their contributions and support and to all others that so generously contributed.

**ASSOCIATION OF SOUTHEASTERN BIOLOGISTS
70th ANNUAL BUSINESS MEETING
FRIDAY, 3 APRIL 2009
SHERATON-BIRMINGHAM, ROOM M
BIRMINGHAM, ALABAMA**

1. **Call to Order and Welcome** – President Tom Wentworth called the meeting to order at 11:18 a.m. Approximately 105 people attended the meeting.
2. **Approval of the Minutes** – On behalf of Secretary Nicole Turrill Welch, President Tom Wentworth presented the minutes of the 2008 Business Meeting as published in the July 2008 issue of *Southeastern Biology* [55(3):199-200]. A motion to accept the minutes as published was made by George Cline, seconded by Bonnie Kelley, and approved.
3. **Election of Officers** – Mike Dennis, Chair of the Nominating Committee, presented the 2009 candidates. Nominees for Vice President were A. Floyd Scott and David Whetstone. Members-at-Large had four nominees, and the membership voted for two. The nominees were George Cline, Beverly Collins, Danny Gustafson and Joey Shaw. There was a call for further nominations from the floor and, being none, it was moved that the nominations close. Tellers distributed the ballots and the members voted. Tom Wentworth asked the tellers to retire, count the ballots, and announce the results at the Banquet.
4. **Recognition of Members Who Passed Away in 2008-2009** – President Tom Wentworth shared the news that William Ray Bowen, James Dent, Walter Herndon, Perry Holt, Mark MacKenzie, Larry Wimer, Carroll Wood, and Cyrus Wymer Wiser passed away this past year, and asked for a moment of silence to pay our respects to them.
5. **Treasurer Report** – Tim Atkinson, Treasurer, shared that in 2008 the Association took in, and spent, more money than ever before. *Southeastern Biology* lost a small amount of money, and the Enrichment Fund value was down due to the downturn in the stock market, yet revenues from the 2008 Annual Meeting were up. A question regarding the \$7000 Office Expenses was received from the floor. Tim explained that the majority of these monies covered the expenses incurred by the Officers while conducting the business of the Association. It was moved and seconded to receive the Treasurer's Report and the motion carried.
6. **Enrichment Fund Report** – Tim Atkinson, Treasurer, reported that this year the Association received the greatest amount of donations, but also showed the first loss (19.4%) in the Enrichment Fund's history. Tim explained that the Enrichment Fund stabilizes the Association's budget when accounts received become low. This fund also supplements the Graduate Student Support Awards and the recognition of the Outstanding Biology Teacher of the state hosting the Annual Meeting.

7. Members Requesting Emeritus Status – President Tom Wentworth announced, as conveyed to him by the Membership Officer, Terry Richardson, that Les Brown, Carolyn Dial, Steve Dial, John P. Harley, Dennis D. Horn, Francis E. Nussbaum, Ellen W. McLaughlin, Henry W. Robison and Janice Swab seek Emeritus Status. The name of Mike Baranski was added from the floor. A motion to grant these members Emeritus status was made and seconded. The motion carried.

8. Resolutions – Mike Dennis, Chair of the Resolutions Committee, read the Resolution of Appreciation to The University of Alabama at Birmingham and Jacksonville State University. It was moved and seconded to accept the resolution. The motion passed. It was then moved and seconded to accept the Resolution by acclamation. Let these minutes show that the Resolution of Appreciation to The University of Alabama at Birmingham and Jacksonville State University passed by acclamation.

Tom Wentworth thanked Danny Gustafson, Chair of the Conservation Committee, and Mike Dennis, Chair of the Resolutions Committee, for coordinating the October 10, 2008, effort that obtained the membership's vote on the Resolution of Support for the Tennessee Exotic Pest Plant Council's (TN-EPPC) call for awareness and action regarding invasive plants in Tennessee. The membership voted 164 for and 2 against the Resolution of Support. Tom Wentworth then encouraged discussion on Article VI, Section 1 of the Bylaws that states "the Executive Committee shall be in charge of the affairs of the Association and shall direct the expenditure of the Association's funds." The Executive Committee interprets this as it has the right to respond quickly to requests for support. However, endorsements requiring Resolutions, such as that from TN-EPPC, would go through the set Resolution process. A comment from the floor requested that such actions be conveyed to the membership via email, website and/or publication in Southeastern Biology.

9. New Business

Proposed Changes to the Bylaws.

Article VII, Section 2C – The [Education] committee shall have the responsibility for identifying an outstanding teacher to receive the Enrichment Fund Award.

Dwayne Wise raised concern about the name "Enrichment Fund Award" and proposed the following friendly amendment to the motion –

Article VII, Section 2C – The [Education] committee shall have the responsibility for identifying an outstanding teacher to receive the Outstanding Biology Teacher Award.

The motion carried.

Article VII, Section 2K – The Place of Meeting Committee shall recommend to the Executive Committee the locations for each Annual Meeting and shall actively seek potential host institutions throughout the southeastern States. The committee shall consist of four members. Three members shall be appointed for terms of 3 years, with a member appointed annually and serving as Chair in the third year. The Meetings Coordinator shall serve as the fourth member ex officio.

Howie Neufeld called the motion to question. The motion was seconded and approved.

Article IX, Section 8 – The Enrichment Fund shall assign funds to specific projects and causes mandated by the Executive Committee and those designated by donors.

A friendly amendment was received from Bonnie Kelley to insert the word “Board” to read the following

Article IX, Section 8 – The Enrichment Fund Board shall assign funds to specific projects and causes mandated by the Executive Committee and those designated by donors.

The motion carried.

Proposed Changes to the Dues Structure

President Tom Wentworth shared the proposed dues structure as published in the April 2009 issue of *Southeastern Biology* 56(2):116. Past President Mike Dennis conveyed that the Past President’s Council supported the change in dues structure. The motion carried unanimously.

Honoring E. O. Wilson as an Honorary Lifetime Member of the Association of Southeastern Biologists.

The Past Presidents unanimously passed a motion on April 2, 2009, to make E. O. Wilson of Harvard University an Honorary Lifetime Member of the Association of Southeastern Biologists. The Past Presidents seek support, by acclamation, of the membership for this motion. Support by acclamation was received. Therefore, let these minutes reflect that the Past Presidents motion to make E. O. Wilson of Harvard University an Honorary Lifetime Member of the Association of Southeastern Biologists passed by acclamation.

10. Announcements – Local Arrangements Committee Co-Chairs, Ken Marion and George Cline, reported that 730 people registered for the 2009 Annual Meeting and that there were 203 papers and 160 posters delivered at the Meeting, not including the Beta Beta Beta presentations.

Membership Officer, Terry Richardson, announced that a membership survey will be distributed this summer, and encouraged everyone to complete that survey.

11. Adjournment – Tom Wentworth thanked everyone for attending and the meeting was adjourned at 12:15 p.m.

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

Vice President	A. Floyd Scott
Members-at-Large	George Cline and Joey Shaw

Respectfully submitted,
Nicole Turrill Welch, Secretary
22 April 2009

**CALL FOR NON-COMMERCIAL WORKSHOP AND
SYMPOSIUM PROPOSALS FOR THE
2010 ANNUAL MEETING OF THE
ASSOCIATION OF SOUTHEASTERN BIOLOGISTS**

Deadline for Receipt of Proposals: September 4, 2009

Proposals for non-commercial Workshops (hereafter referred to as 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. **Commercial workshops are arranged through the Meetings Coordinator, and they are subject to separate guidelines that can be obtained from the Meetings Coordinator.** 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 or a full 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:** Workshop and Symposium proposers must certify that they have sufficient funding available to cover all costs of the program as proposed,

including expenses (travel, meals, lodging, honoraria) for all invited speakers. If additional funds are needed beyond those available to the proposers, such funds must be identified and may be requested from the ASB Executive Committee (EC), which has some funding available for Symposium proposals, usually reserved for proposals that come from ASB standing committees. If requesting funds from the EC, the Symposium proposers must specify an amount and justify that amount. If the EC provides funds requested by the Symposium proposers, it is assumed that the Symposium is fully funded as described. If partial funding is offered by the EC, the Symposium proposers must subsequently secure the additional funds required to cover all costs.

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. **Requests for additional funding will not be considered by the ASB Executive Committee.**

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.

03



The Central Administration Building on the campus of the University of Alabama, Birmingham, for the undergraduate, graduate, medical, and hospital units.

Non-Commercial Workshop/Symposium Proposal Submission Form

Title:

Submitters' Contact Information (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.

Funding: Explain how the Workshop or Symposium as proposed is to be funded. Symposium proposers may request needed funds from the ASB Executive Committee.

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 September 4, 2009).

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ASB

Paper and Poster Abstracts

From the 70th Annual Meeting

Co-Hosted by

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and

Jacksonville State University

Birmingham, Alabama

April 1-4, 2009

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ASB PAPER ABSTRACTS

- T1 IAN M. COHEN¹ AND JOEY SHAW¹. University of Tennessee at Chattanooga¹. University of Tennessee at Chattanooga¹. Testing the utility of three noncoding chloroplast DNA regions for DNA barcoding using *Prunus* (Rosaceae).

DNA Barcoding is the use of short DNA sequences (~700bp) to positively identify taxa to the species level. The goal is to make biodiversity inventories more efficient since researchers would only need a tissue sample instead of a suite of morphological characters that may or may not be present at the time of collection. Unlike animals, where the mitochondrial gene *cytochrome oxidase I* has proven to work across the taxonomic ranks, the process of identifying a particular gene region has been more difficult for plants. Both coding and noncoding regions of the chloroplast genome have been proposed, but to date none have been widely accepted by the DNA barcoding community. Our study uses the genus *Prunus* as a model to assess the efficacy of three noncoding chloroplast regions (*trnS-trnG-trnG*, *trnL-trnF*, and *psbA-trnH*). *Prunus* is a large genus of ~200 species found primarily in the northern hemisphere. It is a good taxon for this study because there are both closely related species (e.g., the North American plum species), distantly related species (e.g., once considered separate genera, *Pygeum africanum* and *Maddenia hypoleuca* are nested within *Prunus*), and wide-ranging species with numerous varieties (e.g., *P. serotina*). We tested the three noncoding cpDNA regions listed above on 192 accessions from 104 species of *Prunus* to assess how well these regions perform as DNA barcode regions.

- T2 ASHLEY B. MORRIS¹. University of South Alabama¹. *Illicium* systematics: current knowledge and future directions.

Illicium is a relatively small (~30-40 spp.), monophyletic group of basal angiosperms best known for its distinctive star-shaped woody fruits and aromatic leaves and flowers. Recent molecular studies have shown that classical taxonomic treatment of *Illicium* does not accurately reflect evolutionary relationships in this monophyletic group of basal angiosperms. Strong support exists for separate Old and New World clades, negating previous sectional classifications based solely on floral morphology. Fossil-based divergence time estimates suggest that extant taxa are relatively young (i.e., Oligocene/Miocene), while the genus itself likely dates to the Cretaceous. DNA sequence data have yet to resolve relationships within these two clades, making hypotheses regarding biogeography and floral evolution difficult to test. Most taxonomic work in this genus has been based on herbarium specimens, which typically do not preserve well. Based on recent morphological work of fresh material from Cuba, it is reasonable to suggest that cryptic species remain to be identified in the New World and beyond. Future directions include screening of additional chloroplast and nuclear loci, morphological and anatomical studies of fresh material from field collections, and development of both nuclear and chloroplast microsatellite loci for population-level surveys of species boundaries in New World taxa.

- T3 University of Georgia¹. University of Georgia¹. Vascular Plant Flora of the Remnant Blackland Prairies in Oaky Woods Wildlife Management Area, Houston County, Georgia.

Blackland prairies are a globally imperiled, rare plant community only recently discovered in central Georgia. A floristic inventory was conducted from February 2005 to November 2006 on six remnant blackland prairie sites within Oaky Woods Wildlife Management Area, 12 km southeast of Warner Robins. The 43 ha site complex yielded 352 species in 219 genera and 89 families. Four species new to Georgia were documented: *Cyperus acuminatus*, *Draba cuneifolia*, *Galium virgatum*, and *Scutellaria drummondii*. Eight rare

species, including one candidate for federal listing (*Symphyotrichum georgianum*) and one federally endangered species (*Silene catesbaei*), were reported as new records for the Oak Woods Wildlife Management Area vicinity. Within the study area, twelve community types were recognized under five general categories: woodland, shrubland (shrub thicket), pine-hardwood forest, mesic forest, and open prairie.

- T4 Bruce K. Kirchoff¹, Snehal Pawar², Pinaz Kale², David Remington¹ and Fereidoon Sadri². Department of Biology, University of North Carolina at Greensboro¹ Department of Computer Science, University of North Carolina at Greensboro². A New Type of Visual Key Based on Bayesian Principles.

Keys are character-based tools for organismal identification. Keys to plant species are based on the decomposition of the plant into atomistic parts, which are described with the technical and often arcane terminology of plant taxonomy. Even the best electronic keys (Lucid) make use of this terminology. Keys are not based on pattern recognition, the forte of visual experts. Instead they demand that the user look at the plant as if it consisted of a series of isolated parts that are classified by name. Keys would be more effective if they were visually based. They would be easier to use for visual experts because accurate perception is their province. They would also be easier to use for novices because they would not depend on knowledge of arcane terminology. This paper presents a new method of constructing Bayesian, visual keys and illustrates this method with a prototype key to the Fagaceae of the Southeastern US.

- T5 RAYMOND O. FLAGG¹ AND GERALD L. SMITH². Carolina Biological Supply Company¹ High Point University². Distinguishing characters of *Habranthus* species of Mexico and Southwestern United States.

Eleven known species of *Habranthus* (Amaryllidaceae) are native to Mexico and the Southwestern United States: *H. arenicolus* (Brandege) Flagg, G. Lom. Sm. & Meerow; *H. chichimecus* (T. M. Howard & S. Ogden) Flagg, G. Lom. Sm. & Meerow; *H. concolor* Lindl., *H. conzattii* (Greenm.) Flagg, G. Lom. Sm. & Meerow; *H. howardii* (Traub) T. M. Howard; *H. immaculatus* Traub & Clint; *H. longifolius* (Hemsl.) Flagg, G. Lom. Sm. & Meerow; *H. mexicanus* T. M. Howard; *H. tepicensis* Greenm. ex Flagg & G. Lom. Sm.; *H. tubispathus* (L'Her.) Traub; and *H. vittatus* T. M. Howard. They are distinguished from *Zephyranthes* by the mature anthers being arcuate and horizontal rather than non-arcuate and vertical. Specific distinguishing characters include: (1) stigma exserted at least 5 mm beyond the mature anthers vs. stigma among or near (exserted less than 4 mm) the mature anthers; (2) mature anthers in two sets at least 1 cm apart vs. not; (3) stigmatic lobe length 5 mm or more vs. less than 4 mm; (4) perianth length under 4.5 cm vs. over 4.5 cm; (5) ovary at least 1 cm beyond spathe tip vs. below spathe tip or less than 1 cm beyond; (6) leaf width over 5 mm vs. under 5 mm; and (7) perianth color.

- T6 Patricia B. Cox¹. Tennessee Valley Authority, Natural Heritage Program¹. Global Climate Change and the Endangered Species Act.

Thousands of species have become extinct over past millennia due to natural climate changes brought about by geologic events. Today, organisms are becoming extinct at an alarming rate due to destruction of critical habitat caused mainly by past and present human disturbances. The Endangered Species Act, created in 1973, was designed to protect critically imperiled species from extinction as a "consequence of economic growth and development untempered by adequate concern and conservation" (Section 2). In May, 2008, the polar bear was listed as Threatened based on "scientific evidence of loss of sea ice habitat, continued losses projected into the foreseeable future, and consequences to polar bear populations." As a result, the Department of Interior feared

that this will give environmental groups an avenue to use Section 7 of the ESA to force the government to take action against GHG emissions. To avoid these potential problems, the Department of Interior proposed changes to Section 7 of the ESA in October 2008. Based on public comments, the Dept. of Interior modified the changes to the ESA and they will take effect in Jan 2009. In the meantime, Industrial Corporations and the State of Alaska have filed suit to remove the polar bear from the ESA, stating that there was not enough scientific evidence proving the polar bear is threatened with extinction or that its habitat is being destroyed by global climate change. How will these changes to the ESA impact conservation efforts for other rare species?

- T7 AMANDA C. SAVILLE¹, ROSE GRINNAN¹ AND ALEXANDER KRINGS¹. North Carolina State University¹. From despair to hope? Delimiting species boundaries in the *Dichanthelium dichotomum* complex (Poaceae).

Dichanthelium dichotomum (L.) Gould (Poaceae) is a complex of diploid grasses, all found within the eastern United States. This widely encountered species complex is an important component of the eastern North American flora, but our current understanding of it is chaotic at best. Taxonomic difficulties in this group are exemplified by Godfrey and Wooten's apology: "We admit that our failure to distinguish the several named taxa...was born of despair!" The objective of this study is to analyze taxonomic limits in the *D. dichotomum* complex, using, for the first time, multivariate analyses of morphological characters. Morphological data comprised of 12 quantitative and 24 qualitative characters were captured from 138 herbarium specimens spanning the complex's range. Preliminary results from cluster and principal coordinate analyses (PCoA) show two distinct groups: One referable to *Dichanthelium annulum* (Ashe) LeBlond--which, historically, has not been uniformly accepted--and the other including all other OTUs sampled. Structure was evident in the clustering of remaining OTUs, although these varied in overlap, suggesting that names have either been based on various extremes of a morphological cline, or that the characters analyzed are insufficient to completely discern underlying relationships. Ongoing morphological and molecular work seeks to resolve remaining issues in the complex.

- T8 CHARLES N. HORN¹. Newberry College¹. Floral evidence for a new hybrid within the genus *Asimina* (Annonaceae).

Previous work during 2007 concentrating on leaf characteristics and ecological data revealed potential hybridization between two species of pawpaw in the piedmont of South Carolina, *Asimina triloba* and *Asimina parviflora*. Additional research during 2008 concentrated on documenting potential population differences based on floral characteristics. Measured characteristics included peduncle length, number of sepals, sepal length, sepal width, number of petals, petal length, and petal width. The number of sepals and petals were relatively constant within and between all three taxa. All other characteristics showed clear difference between taxa, typically with *Asimina parviflora* having the smallest and *Asimina triloba* having the largest measurements. The data fully support the presence of a hybrid between the two species within the piedmont of South Carolina.

- T9 T. W. BARGER¹ AND BRIAN D. HOLT¹. State Lands Division, AL-DCNR¹. Preliminary Survey of the Vascular Flora of the Perdido Forever Wild Tract, Baldwin County, AL.

The Perdido Forever Wild Tract is a relatively large (7,365 ha), contiguous tract that was purchased by the State of Alabama's Forever Wild Program. The tract is bordered by the Perdido River to the east and is approximately 55 km east of Mobile, AL. The tract is

managed by the Alabama Department of Conservation and Natural Resources with an emphasis on hiking/recreational uses, habitat management and hunting. Due to a lack of botanical surveys in the Perdido River region, little is known of the biodiversity of the tract. For this study, the vascular flora of the Perdido tract was surveyed intensively beginning June 2006. As of the deadline for this abstract, 561 plant species had been collected, identified, verified and repositied in the herbarium at the Anniston Museum of Natural History. Thus far, 302 genera from 102 families have been collected from the tract. Asteraceae was found to be the largest family with 103 species collected. Poaceae and Fabaceae were the next largest families with 57 and 34 species respectively. Eupatorium and Quercus were the largest genera represented with 11 taxa each.

- T10 T. W. BARGER¹ AND BRIAN D. HOLT¹. State Lands Division, AL-DCNR¹. An Update on the Status of *Cypripedium candidum* Muhl. ex Willd. in Alabama.

Historically known from two small populations in Alabama, *Cypripedium candidum* (Small White Lady's-slipper Orchid) is considered rare throughout its range. In 1986, the state record for *C. candidum* was discovered near Selma (Dallas County, AL) with a second population being subsequently discovered south of Tusculmbia (Colbert County, AL) in 1993. The aforementioned populations are highly disjunct, with the southernmost population prior to 1986 occurring in northern Kentucky. Widespread destruction of habitat through forestry and agricultural practices, coupled with typically low seed set has resulted in less than 300 extant populations. *C. candidum* is currently considered imperiled or threatened in every state and Canadian province of the plant's range. Alabama populations are assessed for population size and habitat comparisons in the present study.

- T11 CATHERINE M. BUSH¹, DOLLIE L. ROLLINS² AND GERALD L. SMITH². Wake Forest University¹ High Point University². Phylogeny of the southeastern U.S. species of *Hymenocallis*.

The phylogeny of the southeastern US species of *Hymenocallis* was investigated using 23 ISSR presence/absence characters and 10 qualitative and quantitative morphological characters. Maximum Parsimony (MP) and Neighbor Joining NJ analyses with bootstrap replicates were performed in PAUP. The total combined data NJ analysis showed several supported clades with morphological synapomorphies. *Hymenocallis coronaria* is sister to *H. liriosome* (63% bootstrap support) and they share the morphological feature of a prominent yellow "eye" at the center of their staminal cups. *Hymenocallis godfreyi* + *H. rotata* + *H. tridentata* form a clade (99% bt) with the morphological synapomorphy of $2n = 48$. *Hymenocallis henryae* is sister to *H. palmeri* (82% bt) with several morphological synapomorphies including semicircular scapes, hyaline leaf margins, scape bracts which do not enclose the flowers in bud, and tepals which are green. Finally, *H. puntagordensis* and *H. latifolia* are sister taxa (84% bt) with the synapomorphy of persistent (versus deciduous) leaves and green free filaments. Rhizomes appear to have evolved twice within the southeastern US species of *Hymenocallis*: once in the *H. franklinesis* + *H. choctawensis* + *H. gholsonii* + *H. pygmaea* + *H. crassifolia* + *H. duvalensis* clade and once in the clade containing *H. godfreyi*, *H. rotata* and *H. tridentata*.

- T12 Channing Richardson¹, Allen C. Risk¹ and Paul G. Davison². Morehead State University¹ University of North Alabama². Epiphyllous liverworts in the Cumberland Plateau of Kentucky and Tennessee.

Epiphyllous liverworts have previously been documented from numerous localities in the Coastal Plain (Florida, Georgia, Alabama, and Louisiana); numerous sites in the Blue Ridge (South Carolina, North Carolina, and Tennessee); and from one locality (one taxon

only, *Cololejeunea biddlecomiae*) in the Cumberland Plateau (Tennessee). This paper reports eight additional taxa (*Frullania* sp., *Frullania asagrayana*, *Lejeunea ruthii*, *L. ulicina* subsp. *ulicina*, *L. ulicina* subsp. *bullata*, *Leucolejeunea conchifolia*, *Metzgeria* sp., and *Radula obconica*) as epiphylls from two gorges in the Cumberland Plateau. All epiphylls were growing on *Rhododendron maximum* leaves produced at least one growing season prior to that of collection. Pogue Creek Gorge in Fentress County, Tennessee, had six epiphyllous taxa and Spaws Creek Gorge in Menifee County, Kentucky, had four epiphyllous taxa. The latter locality represents the northernmost known occurrence for epiphyllous hepatics in eastern North America.

- T13 ALLEN C. RISK¹. Morehead State University¹. *Sphagnum* (Section *Sphagnum*) in the Cumberlands: taxonomy, ecology, and distribution.

The Cumberlands (Cumberland Plateau and Cumberland Mountains collectively) is a rugged, heavily forested region in Kentucky, Tennessee, Virginia, Alabama, and Georgia. Members of Section *Sphagnum* are distinguished by cucullate branch leaves and a fibrillose branch and stem cortex. Field work and examination of specimens from numerous herbaria revealed that four species of the section are present in the Cumberlands. Three of these, *S. palustre*, *S. affine*, and *S. magellanicum*, occur in natural habitats, and one, *S. portoricense*, was found on an unreclaimed strip mine in eastern Kentucky. *Sphagnum palustre* and *S. affine* are among the most common species of peat mosses in the study area whereas *S. portoricense* and *S. magellanicum* are two of the rarest peat moss species in the Cumberlands.

- T14 DIANE M. FERGUSON¹, STEPHANIE GUNN-ZUMO² AND LOWELL E. URBATSCH¹. Louisiana State University¹ LA Dept. of Natural Resources². Vascular plant inventory of Jean Lafitte National Park, Louisiana.

A vascular plant inventory and community characterization of the Barataria Preserve of Jean Lafitte National Historical Park and Preserve, Jefferson Parish, Louisiana, was conducted from 2005-2008. Barataria Preserve is located about 12 miles south of New Orleans and is approximately 21,000 acres of wetland habitat in the upper freshwater zone of the Barataria Basin. Voucher specimens for each taxon encountered in the field were collected, pressed, dried, and mounted. Additionally, over 350 preexisting voucher specimens deposited at LSU and the Tulane University Herbarium (NO) were examined to verify earlier taxon reports found in the literature and in the National Park Service database (NPSpecies). The vascular plant flora of Barataria Preserve included 524 taxa in 115 families and 324 genera. Of these taxa, 17.7% were non-native. Relative to data reported in the literature and NPSpecies, 14 new families, 61 new genera, and 153 new specific and infraspecific taxa (non-synonymous) were found, increasing the number of known taxa by 41%. Eleven unconfirmed reports, 84 false reports, and 88 synonyms were found in NPSpecies. The largest family was Poaceae, followed by Cyperaceae, Asteraceae, and Fabaceae. One species was state listed as rare for Louisiana, *Ceratopteris pteridoides* (Hook.) Hieron. (floating antlerfern). Natural communities occurring within Barataria Preserve are bottomland hardwood forest, cypress-tupelo swamp, scrub/shrub swamp, fresh marsh (including floatant marsh), intermediate marsh, and submerged/floating vegetation. Human-influenced, disturbed areas were spoil banks, shell midden mounds and shell beaches, trailsides and roadsides, old homesites, power line right-of-ways, and parking lots.

- T15 ALBERT B. PITTMAN¹ AND JOHN B. NELSON². South Carolina Heritage Trust Program¹ University of South Carolina². A summary of eighteen years of floristic studies at Fort Jackson, South Carolina.

Of considerable importance to conservation biology in the Southeastern U. S. is the documentation of high levels of species diversity and rarity indigenous to various longleaf pine- dominated communities. For these reasons the Department of Defense, The Nature Conservancy, the South Carolina Department of Natural Resources, and the U.S. Fish and Wildlife Service undertook a series of studies beginning in 1990 to document the vascular plant flora of Fort Jackson. The Fort Jackson reservation contains 52,301 acres within the City of Columbia and Richland County and is totally contained in the Sandhills physiographic region of the state. While the highly developed and impacted Cantonment Area occupies approximately 4,600 acres in the southeast corner of the reservation, the remainder of the reservation is mostly undeveloped. The primary sources of biological and landscape data used to predict vegetation patterns, rare plant species habitats, and thereby guide the collection efforts were: (1) quantitative vegetation composition and structure analyses based upon the Land Condition-Trend Analysis Program, (2) a series of low level flights at 500-1000 ft. conducted during the growing season and the winter dormancy period, (3) spectral differences across the landscape as revealed by high-resolution aerial photography, and (4) soil and topographic maps. Noteworthy collections include *Lilium pyrophilum*, *Lysimachia asperulifolia*, *Pteroglossaspis ecristata*, *Symphyotrichum novi-belgii* var. *elodes*, and an undescribed species of *Lobelia*. Specimens from the potential sites were then systematically collected and curated at the A. C. Moore Herbarium with collection statistics generated using the database Specify.

- T16 RONALD L. JONES¹, C. T. WITSELL² AND GUY L. NESOM³. Department of Biological Sciences, Eastern Kentucky University, Richmond, KY 40475¹ Arkansas Natural Heritage Commission, 323 Center St., Little Rock, AR 72201² Fort Worth, TX 76109³. The status of the barrens silky aster (*Symphyotrichum pratense*) in the southeastern United States.

The western silver aster (*Symphyotrichum sericeum*) and the barrens silky aster (*S. pratense*), both known for their silky pubescence and large involucral bracts, are closely related taxa, mostly treated as distinct species, but still considered by some to be conspecific. *S. sericeum* has long been known as a midwestern species, from southern Canada to Texas to Indiana, and the scattered populations of silky aster in the southeastern U.S. have been variously treated as *S. sericeum*, or *S. pratense* (formerly as *Aster phyllolepis*), or *S. sericeum* var. *microphyllum*. A recent study has examined the geographic distribution, morphological variation, and chromosome numbers of these taxa. The study concludes that the taxa are distinct species, largely allopatric (occurring together only in Texas and Arkansas), and that all the known populations in Louisiana, Mississippi, Alabama, Georgia, Florida, Tennessee, Kentucky, and Virginia, are *S. pratense*. In all these states except Florida it is considered as a state-rarity. *S. pratense* occurs in a variety of physiographic settings, mostly in calcareous barrens or similar habitats, and includes both diploid and tetraploid populations. This study also revealed that *Aster montanus* Nutt., described by Thomas Nuttall in 1818 from plants collected in North Carolina and Tennessee, can be placed into the synonymy of *S. pratense*, and that this species once occurred in Buncombe County, North Carolina, a state in which no current populations are known to occur.

- T17 JAMES R. ALLISON¹. DeKalb County [Georgia] Parks & Rec. Dept.¹. A new species of *Clinopodium* L. (Lamiaceae) from the western Piedmont of Georgia (USA).

The taxa of *Clinopodium* generally accepted as both valid and native to the Southeastern U.S.A. include four woody species (shrubs): *Clinopodium ashei*, *C. coccineum*, *C. dentatum*, and *C. georgianum*. On July 21, 2003 the author discovered the first of several anomalous populations of *Clinopodium* growing in shallow soils over quartzite in Upson and Pike Counties, Georgia, within the range of *C. georgianum*, but differing from the

latter in numerous characters. Compared to *C. georgianum*, these plants are lower in stature and more procumbent; stem vestiture a mix of long as well as short hairs; leaves persistently pubescent (not glabrate) and smaller, the largest less than 0.9 cm wide and less than 2 cm wide, sharply (not sweetly) aromatic when crushed; peak anthesis in late July through early August (before sympatric *C. georgianum*); calyces with stipitate glands on the body and lobes; and corollas smaller and more slender, the tube proportionally longer and lacking stipitate-glandular hairs. Many of these differences suggest as close an affinity with the distantly allopatric *C. dentatum* (endemic to the Panhandle of Florida) as with the sympatric (but rarely syntopic) *C. georgianum*. No populations of the newly recognized species currently enjoy formal protection. They are threatened by residential development and by excessive competition resulting from fire-suppression: besides various drought-tolerant oaks and hickories (most notably *Quercus georgiana*), dominant trees include the fire-dependant *Pinus palustris*.

- T18 KEVIN S. BURGESS¹, ARON J. FAZEKAS², PRASAD R. KESANAKURTI², SEAN W. GRAHAM³, STEVEN G. NEWMASER², BRIAN C. HUSBAND², DIANA M. PERCY³, MEHRDAD HAJIBABAE² AND SPENCER C. BARRETT⁴. Columbus State University¹ University of Guelph² University of British Columbia³ University of Toronto⁴. Discriminating plant species using DNA Barcodes.

A universal barcode system for land plants would be a valuable resource, with potential utility in ecology, floristics, law enforcement and industry. However, the application of plant barcoding has been constrained by a lack of consensus regarding the most variable and practical DNA region(s). We compared eight plant barcoding regions from the plastome and one from the mitochondrial genome for how well they discriminated the monophyly of 92 species in 32 diverse genera of land plants (N = 251 samples). The plastid markers comprise portions of five coding (rpoB, rpoC1, rbcL, matK and 23S rDNA) and three non-coding (trnH-psbA, atpF-atpH, and psbK-psbI) loci. The regions differed in their ability to discriminate species, and in ease of retrieval, in terms of amplification and sequencing success. Single locus resolution ranged from 7% (23S rDNA) to 59% (trnH-psbA) of species with well-supported monophyly. Sequence recovery rates were related primarily to amplification success (85–100% for plastid loci), with matK requiring the greatest effort to achieve reasonable recovery (88% using 10 primer pairs). Combining the more variable plastid markers provided clear benefits for resolving species, although with diminishing returns, as all combinations assessed using four to seven regions had marginally different success rates (69–71%; values that were approached by several two- and three-region combinations). This performance plateau may indicate fundamental upper limits on the precision of species discrimination that is possible with DNA barcoding systems in plants compared to higher species discrimination rates typically found in animals using Col.

- T19 EMILY L. GILLESPIE¹ AND KATHLEEN A. KRON¹. Wake Forest University¹. Phylogenetic relationships and historical biogeography of *Cassiope* (Ericaceae).

The genus *Cassiope* (Ericaceae) includes as many as 17 species of small evergreen shrubs that inhabit alpine and subalpine areas at high latitude and elevation in the northern hemisphere. Superficially, members of the genus are morphologically similar. All *Cassiope* have very small leaves that are decussate and appressed to the stem. Flowers in this group tend to be small, solitary and bell-shaped, and are most commonly light pink to white. Several *Cassiope* have been discovered and named in just the last two decades, particularly in remote areas of mountainous China, and therefore little is known about the evolution of these plants. The current study represents the first attempt to determine phylogenetic relationships within *Cassiope*. Thirteen of the 17 recognized species of *Cassiope* were included in the study, representing all major elements of the distribution. Two nuclear DNA regions (nrITS and GBSS-1/waxy) and one chloroplast region (trnS-G intergenic spacer) were examined. Bayesian analysis of the three DNA regions resolve

nearly all relationships with strong support. One clade was resolved with five Asian species (e.g. *C. myosuroides*, *C. nana*, *C. pectinata*). Another clade is comprised with several Asian species (e.g. *C. fastigiata*, *C. dendrotricha*) along with Russian (*C. ericoides*) and northwestern North American species (*C. lycopodioides*). A basal grade is comprised of North American taxa (*C. mertensiana* and *C. tetragona*). Dispersal-Vicariance (DIVA) analysis suggests that the ancestral distribution of the genus may be northwestern North America and/or northeastern Asia.

- T20 EMILY L. GILLESPIE¹ AND ZACK E. MURRELL². Wake Forest University¹ Appalachian State University². Utility of GIS (Geographical Information Systems) For Examining Morphological Variation Across a Geographic Landscape in a North American Sedge, *Carex eburnea* (Cyperaceae).

Carex eburnea (Cyperaceae) is a widely distributed North American sedge species, occurring across the northern part of the continent and southward into the Southern Appalachians, northwestern Texas and the eastern Sierra Madres in Mexico. Previous molecular work demonstrated phylogenetic structure at the population level, but without strong support. Multivariate analysis of morphometric data revealed a moderate amount of variation, but without a discernable geographic pattern. The objective of this study was to determine if GIS could be used as an additional tool to detect and describe morphological variation where more traditional statistical tools have failed. Twenty-nine morphological characters were measured for 90 herbarium specimens. Using ArcMap 9.3, each specimen location was projected, generating a distribution of the specimens included. Then, the size value for each character and each specimen was 'classified.' This strategy revealed that the largest values for all characters tend to occur in the Southern Appalachians and in the Great Lakes region, whereas the smallest values tend to occur in the northwestern part of the range. ArcMap 9.3 was also used to attempt to predict character measurements for locations not included in the morphometric study, using a process called 'kriging'. Predictions generated by kriging were similar to the observed patterns revealed by character measurement classification, with large values predicted to occur in the Southeast and Great Lakes regions and the smallest values predicted in the Northwest. These results suggest that GIS is a valuable tool to reveal patterns and make predictions about morphological variation on a geographic landscape.

- T21 SUNNY A. HART¹ AND DWAYNE ESTES¹. Austin Peay State University¹. *Vitis rupestris* (Vitaceae) rediscovered in Tennessee.

Vitis rupestris Scheele (Vitaceae), rock or sand grape, is a globally uncommon species discontinuously distributed from Texas and Oklahoma east to Virginia and Pennsylvania. It is most common in the Interior Highlands of Missouri where it is ranked as vulnerable. In the other eleven states from which it has been reported, the species is considered to be imperiled and is generally known from only a few sites. *Vitis rupestris* inhabits flood-scoured limestone or cherty stream beds and riverbanks, cobble bars, outcrops and bluffs. Rock grape was first collected in Tennessee by Augustine Gattinger in 1880 from an island in the Cumberland River near Nashville, Davidson County. During the 1960s-1980s, the species was reported from Hickman, Maury, and Wilson counties in Tennessee; however, these specimens were later determined to represent misidentified collections of other grape species. In September 2008, we discovered a single population of *V. rupestris* in Montgomery County, Tennessee approximately 50 river miles downstream from the original Gattinger location. The newly discovered population was found on a limestone ledge on a barren-like slope above the Cumberland River. Numerous other rare or uncommon species also occur at this site including *Amsonia tabernaemontana* var. *gattingeri*, *Cornus obliqua*, *Physaria globosa*, *Solidago rupestris*, and *Symphotrichum priceae*. *Vitis rupestris* is currently tracked by the Tennessee Department of Environment

and Conservation as state-endangered. Our find represents the first confirmed report for rock grape in Tennessee in 128 years.

- T22 DWAYNE ESTES¹, JOEY SHAW², EDWARD W. CHESTER¹, B. E. WOFFORD³ AND CLAUDE J. BAILEY, JR.⁴. Austin Peay State University¹ University of Tennessee, Chattanooga² University of Tennessee, Knoxville³ Jackson State Community College⁴. The Vascular Flora of Tennessee Project.

Tennessee is the most floristically diverse landlocked state in the U.S. east of the Mississippi River. Tennessee has been explored and studied by botanists since the late 1700s and since then much has been written about its flora. There have been four major checklists of the vascular plants of Tennessee, and a fifth list is in press. The county-level distribution of the state's flora has been mapped. Books have been published concerning the ferns and woody plants of Tennessee and the flora of the Blue Ridge Mountains. In 2007, we began working on producing the first complete guide to the vascular flora of the state. This book will include an overview of Tennessee botany, both past and present, as well as dichotomous keys and notes on habitat, distribution, abundance, and phenology for the state's 2,866 species and infraspecific taxa. We anticipate having the first draft completed by the end of 2010.

- T23 ANNA K. BECKER¹ AND RANDALL L. SMALL¹. University of Tennessee¹. Preliminary population genetics of *Penstemon tenuiflorus* and *P. hirsutus* (Plantaginaceae).

Penstemon tenuiflorus and *P. hirsutus* (Plantaginaceae) are two closely related species with different distributions. In addition, these species have a high degree of morphological resemblance, which has led to debate over whether they are conspecific. *P. tenuiflorus* has a narrow distribution largely localized to central Tennessee. *P. hirsutus* is much more widely distributed, with a range that extends from northern Kentucky to southeastern Canada. Despite a small amount of overlap, these species have never been observed growing together or hybridizing in nature. Nuclear genes and non-coding chloroplast DNA regions are being sequenced in order to assess genetic variation within and between species. We hypothesize that the more narrowly distributed *P. tenuiflorus* will contain lower levels of genetic variation than the more widely distributed *P. hirsutus*. Preliminary data have been collected from one population of each species. Sequencing of a nuclear gene (GBSSI) has revealed low levels of genetic variation in *P. hirsutus* and no variation in *P. tenuiflorus*. Sequencing of seven different chloroplast regions has also indicated that there is little to no variation within and between the species. These findings suggest that genetic divergence between *P. tenuiflorus* and *P. hirsutus* may be limited. Phylogenetic analyses are being performed in order to investigate the relationship of the species to each other and other species within *Penstemon*. Preliminary phylogenetic analysis has indicated that *P. tenuiflorus* and *P. hirsutus* are closely related. However, it is not yet known whether they are conspecific or sister species to one another, or whether they are more distantly related.

- T24 M. STEVEN FURCHES¹ AND RANDY SMALL¹. University of Tennessee¹. The role of hybridization in structuring species- and population-level variation in *Sarracenia*.

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 all 9 species in 28 populations using three non-coding chloroplast regions. While no discernible taxonomic pattern exists among the chloroplast haplotypes, all haplotypes are found among geographically contiguous populations. Further statistical analyses show that chloroplast variation is better explained geographically than taxonomically. Future work using AFLPs and nuclear genes may help clarify relationships within this fascinating group.

- T25 MATT S. BRUTON¹ AND DR. DWAYNE ESTES¹. Austin Peay State University¹. *Baccharis halimifolia* L. (ASTERACEAE) is reported as new for the state of Kentucky.

Baccharis halimifolia L. (ASTERACEAE), common groundseltree, is most common on the southeastern Coastal Plain, growing as far inland as central Arkansas, southern Tennessee, and the central Piedmont Plateau. Historically, this species was mostly limited to coastal salt marshes, hammocks, and beach dunes, only recently expanding inland to disturbed habitats such as old fields, forest margins, and roadsides. *Baccharis* was first discovered in Tennessee in 2004 from two counties in the south-central portion of the state. During the next couple of years, the species was collected from several counties across the southern half of the state. In November 2008, we collected *B. halimifolia* from the Clarks River National Wildlife Refuge in Marshall County, Kentucky. This represents the first report of the species from the state and the northernmost interior population in North America.

- T26 DWAYNE ESTES¹. Austin Peay State University¹. A new species of *Carex* section *Phacocystis* (Cyperaceae) from the Southern Appalachians.

Carex section *Phacocystis* includes 70-90 species of worldwide distribution with 31 species occurring in North America north of Mexico. One of the most distinctive groups within the section is the *Carex crinita* complex which includes three closely-related species and one nonautonymic variety: *C. crinita* var. *brevicrinis*, *C. crinita* var. *crinita*, *C. gynandra*, and *C. mitchelliana*. The members of this complex are characterized by three-veined, scabrous-awned pistillate scales, relatively wide (> 2 mm) non-involute leaf blades, veinless perigynia (weakly veined in *C. mitchelliana*), relatively thick (3-8.5 mm) pendent spikes, ladder-fibrillose proximal sheaths, and frequently constricted achenes. Recent field and herbarium studies have revealed the presence of a fourth species that is heretofore undescribed. This «Smoky Mountain sedge» differs from the closely related and sympatric *C. gynandra* in its dark reddish-brown pistillate scales that are strongly retuse apically, shorter spikes, narrower leaves, and red-scabrous proximal sheath faces. It is presently known only from high-elevation (>5,000 ft) clearings in spruce-fir forest in Great Smoky Mountains National Park, North Carolina and Tennessee, and is often one of the dominant graminoid taxa where it occurs. Additional information concerning its taxonomy, collection history, ecology, and distribution will be presented.

- T27 DWAYNE ESTES¹. Austin Peay State University¹. *Viburnum bracteatum* (Adoxaceae) expanded to include *V. ozarkense*.

Viburnum ozarkense (Adoxaceae) was recently resurrected as a distinct species after having been synonymized with the related and partially sympatric *V. molle* for much of the latter half of the 20th century. Presently, *V. ozarkense* is considered to be endemic to the Interior Highlands physiographic region of western Arkansas, southern Missouri, and eastern Oklahoma. However, this research suggests that although *V. ozarkense* is morphologically distinct from *V. molle*, it cannot be distinguished from *V. bracteatum*, a species found more than 500 km away in south-central Tennessee, northeastern Alabama, and northwestern Georgia. Based on morphological and phylogeographical evidence, *V. ozarkense* is here considered to be conspecific with *V. bracteatum*. An overview of the expanded taxonomic concept, distribution, ecology and rarity of *V. bracteatum* is provided.

- T28 JAMES B. BECK¹, JAMES R. ALLISON², MICHAEL D. WINDHAM¹ AND KATHLEEN M. PRYER¹. Duke University¹ DeKalb County Georgia Parks and Recreation Department². Phylogeography of the allopolyploid *Astrolepis integerrima* (Pteridaceae), including a long-range disjunct population in the Ketona Glades of Alabama.

Astrolepis D.M. Benham & Windham (Pteridaceae) is a genus of xeric adapted ferns found primarily in the southwestern U.S., Mexico, and Central America. The group includes at least five diploid species and a complex array of auto- and allopolyploid lineages. The most widespread allopolyploid, *Astrolepis integerrima* (Hooker) D.M. Benham & Windham, was long viewed as restricted to the southwestern U.S. and Mexico, but in 1992 a disjunct population was discovered in Bibb Co., Alabama. This approximately 900 km disjunction is part of a larger biogeographic pattern comprising taxa common in western North America but with outlying populations on glades and xeric habitats east of the Mississippi Embayment. The age of this once continuous xeric flora is controversial, and the genetic distinctiveness of the Alabama population could suggest the timing of the overall disjunction. However, genetic comparisons with main range *A. integerrima* populations are complicated by the potential for multiple, independent origins of this hybrid polyploid. Data from both the chloroplast and nuclear genomes will be presented which provide insights into the number of independent origins of *A. integerrima* and the genetic distinctiveness of the Alabama population.

- T29 RANDALL L. SMALL¹ AND ANDREA D. WOLFE². University of Tennessee¹ Ohio State University². Phylogenetic studies in *Penstemon* (Plantaginaceae) using multiple nuclear gene sequences.

Penstemon (Plantaginaceae) is a North American genus of approximately 270 species. The majority of *Penstemon* species are found in western North America with a smaller number found in the east. The genus displays remarkable morphological diversity in both floral and vegetative traits, as well as pollination biology. *Penstemon* is a model system for studying the evolution of pollination syndromes, particularly shifts between insect and hummingbird pollination. To facilitate ecological and evolutionary studies in *Penstemon* a well-resolved and robustly supported phylogenetic hypothesis is required. Previous studies using nuclear ribosomal DNA internal transcribed spacer (ITS) sequences and chloroplast DNA (cpDNA) sequences have provided some resolution of relationships among major clades within *Penstemon*, but lack sufficient variation to resolve relationships among all species. To facilitate this work we have isolated and sequenced several low-copy number nuclear genes from a group of species representative of major clades to assess their relative utilities in resolving the phylogeny of *Penstemon*. These nuclear genes display a considerably higher level of variation than either ITS or cpDNA sequences, and result in a better resolved and supported phylogenetic hypothesis. Strategies for identifying and isolating nuclear genes will be discussed, along with issues associated with analyzing multi-locus data sets.

- T30 CALLIE MONTGOMERY¹ AND JOEY SHAW¹. University of Tennessee at Chattanooga¹. Phylogeography of *Clematis fremontii* S. Wats. (Ranunculaceae) in eastern North America.

Clematis fremontii S. Wats. (Ranunculaceae) is a diploid perennial forb with strict habitat requirements that occurs in an island-like system of isolated populations in the cedar glades of Missouri and the mixed-grass prairies of Kansas and Nebraska. Based on geographical isolation and morphological differences, this species was formerly subdivided into two varieties, the autonymic prairie variety and the glade variety, *C. fremontii* var. *riehlii* Erickson. Interestingly, two disjunct populations of *C. fremontii* inhabit cedar glades located in Rome, GA and Chattanooga, TN. To illuminate relationships between these four areas of occurrence we are using nrDNA internal transcribed spacer (ITS) sequence data. Specifically, we hope to gain insight into whether the two eastern populations are recent introductions or disjunct relict populations. To examine the phylogeography of *C. fremontii*, we are expanding our ITS dataset to include all eastern species of subgenus *Viorna* displaying erect growth habit and morphology similar to *C. fremontii* (e.g., *C. albicoma* Wherry, *C. ochroleuca* Aiton, *C. socialis* Kral, and *C. viticaulis* Steele). Curiously, the cloning process has revealed rare alleles that were not observed with the initial direct sequencing of PCR products. We are currently involved in a large cloning effort to investigate the extent of this phenomenon.

- T31 WAYNE J. ELISENS¹. University of Oklahoma¹. Ethnobotany of the southern plains: Plant usage among the Kiowa, Comanche, and Plains Apache.

The Kiowa, Comanche, and Plains Apache (KCA) were nomadic hunting and gathering tribes that have been associated historically and geographically in the southern Plains since the 17th century. Events since EuroAmerican contact included forced settlement, dramatic shifts in subsistence/survival strategies, and political confederation in 1867. The KCA shared a reservation from 1867 to 1901 in an 8-county area in southwestern Oklahoma where most tribal members reside today. Because each tribe has been the focus of ethnobotanical investigations, the KCA provide the best window for generating a regional ethnobotany of the southern plains. Collectively, the KCA utilized 157 vascular plant species native to North America representing 122 genera in 60 families. Lists of vascular plants obtained from field studies in the 1930s and 1960s number 89 for the Kiowa, 68 for the Comanche, and 105 for the Plains Apache. Plants used by the KCA as a group are organized in four use categories and include edible plants (82 species), ritual and medicinal plants (76 species), plants used for material culture (68 species), and species used for personal care and adornment (14). Many plants used by the KCA have a long history of usage based on the presence of at least 44 species that appear in the midcontinent archaeobotanical record. The KCA have a rich ethnobotanical heritage, although traditional knowledge is disappearing rapidly.

- T42 JENNIFER R. ELLIS¹. Vanderbilt University¹. Extent of clonality in populations of a rare sunflower: EST-SSRs reveal small population size.

Knowledge of population size is an important first step for identifying populations of immediate conservation concern. However, this task may be difficult in plant species that exhibit clonal growth since a simple "head count" may not be appropriate. Here, I determine the genetic population size and the extent of clonality in the four known populations of a rare sunflower, *Helianthus verticillatus*, using simple sequence repeats. Populations exhibited high clonal diversity, but consisted of far fewer genetic individuals than previously reported. Moreover, the clonal structure of populations was clumped, in that genotypes were highly clustered, which may promote selfing among genets. The results of this study are related to previously examined levels of genetic diversity and

fitness and suggest an association between population size and fitness. Findings are also discussed in the context of the ecological and biological dynamics in clonal plant populations. Finally, the results of this study led to an upgrade in the priority status of this species for the Endangered Species List.

- T43 RALPH L. THOMPSON AND KATRINA RIVERS THOMPSON. Berea College—Garlic pennycress (*Thlaspi alliaceum*, Brassicaceae): an invasive exotic plant in Kentucky.

Garlic or Roadside Pennycress (*Thlaspi alliaceum* L.) is a naturalized, European fast-growing annual in the Brassicaceae. Its first name is derived from the garlic-like odor of the foliage. It typically inhabits ruderal highway roadsides and other disturbed corridors, hence, its other name. Seeds are dispersed in ruderal corridors through high traffic volumes, extensive mowing programs, and construction and maintenance projects. Garlic Pennycress was reported as a new state record for Kentucky in 1982 by John W. Thieret. It was documented in six counties during the 1980s, 26 counties in the 1990s, and 40 counties from 2000-2006. In 2007-2008, we collected it in 76 more counties for the current total of 116/120 counties. It was not found in the remaining four western counties. Roadside Pennycress has 78 associated species recorded among the 116 counties. Fifty-nine are naturalized (75.64%) of which 24 are state-listed invasive species (40.68%). The 11 major associates are *Festuca arundinacea*, *Taraxacum officinale*, *Lamium purpureum*, *Coronilla varia*, *Trifolium pratense*, *Poa pratensis*, *Plantago lanceolata*, *Cardamine hirsute*, *Dactylis glomerata*, *Daucus carota*, and *Cerastium glomeratum*. In the last three decades, it has become widespread along many eastern United States interstates, parkways, and main highways in DE, IN, KY, MD, MO, NC, NJ, OH, PA, TN, VA, and WV. Garlic Pennycress should be monitored as an invasive pest plant in the southeastern and mid-Atlantic states based on its rapid spread into fallow and cultivated fields, pastures, and woodlands.

- T44 RALPH L. THOMPSON¹ AND RONALD L. JONES². Berea College¹ and Eastern Kentucky University²—A floristic survey of Old Mulkey Meeting House State Historic Site, Monroe County, Kentucky.

In 2008, a floristic survey was undertaken of Old Mulkey Meeting House State Historic Site, a 32.0 hectare tract of mostly forested land near Tomkinsville in Monroe County, Kentucky. Old Mulkey has historic significance because it is the oldest meeting house in Kentucky and the oldest wooden building of its kind west of the Appalachians. The site also contains a cemetery of several Revolutionary War soldiers and early pioneer settlers. Old Mulkey was constructed in 1804 during the first "Great Awakening" religious movement. Designated as a state historic site in 1931, it lies in the Eastern Highland Rim of the Interior Low Plateau. Elevation ranges from 232 m at Mill Creek to 274 m on an upland ridge. Bedrock is Mississippian shaly calcareous siltstones and shales, siltstones, and limestones. Residual soils are deep, well-drained, acidic silty loams. Mixed Mesophytic Forest is found in narrow ravines and on lower side slopes and Oak-Hickory Forest predominates on higher uplands. Culturally disturbed habitats include a picnic area, roadsides, and mowed ground. The known vascular flora comprises 365 specific and infraspecific taxa in 248 genera from 101 families. Taxonomic distribution is nine Polypodiophyta, four Pinophyta, and 352 Magnoliophyta (Liliopsida 83 and Magnoliopsida 269). Asteraceae (47), Poaceae (41), Fabaceae (23), Cyperaceae (18), and Rosaceae (15) are the largest families. Seventy (19.2%) are naturalized taxa which includes 37 Kentucky invasive species.

- T45 DAVID A. FRANCKO¹. The University of Alabama¹. A novel foliar/floral spray to improve cold tolerance in plants.

A novel foliar/floral spray was developed to increase plant resistance to both cold damage and cold mortality. Application of the spray (FreezePruf™) to foliage or flowers of both monocot and dicot plants immediately lowers the environmental temperatures associated with the first onset of both cold injury and cold mortality by 1.2 to 5.2 C (2.2 to 9.4 F), compared with controls sprayed with tap water, over an effective temperature range (depending on species) of ca. 0 to -18 C. Plants examined under both laboratory and field conditions include a variety of palms, citrus, bananas, annual ornamentals, and roses. The spray is comprised of ingredients that are non-toxic to plants, humans and other animals, and beneficial effects persist for at least several weeks after spraying. Evidence suggests that the spray ingredients synergistically improve both freeze avoidance and freeze tolerance mechanisms in plants, including supercooling potential, membrane integrity (both plasma membrane and thylakoid membranes), and cell wall strength. Improvements in cold tolerance resulting from spray application augment rather than replace environmentally-induced cold acclimation pathways already present in plants.

- T46 TIANITA D. DUKE¹ AND LARRY D. ESTES¹. Austin Peay State University¹. Taxonomy, ecology, and distribution of unusual populations of *Lysimachia hybrida* (Myrsinaceae) from Tennessee and Alabama.

The genus *Lysimachia* (Myrsinaceae) is a large genus of cosmopolitan distribution, with 13 species in eastern North America. There are seven species within the subgenus *Seleucia* including *L. ciliata* L., *L. graminea* (Greene) Hand.-Maz., *L. hybrida* Michx., *L. lanceolata* Walt., *L. quadriflora* Sims, *L. radicans* Hook., and *L. tonsa* (Wood) Wood ex Path & R. Knuth. Within this group of related species the *L. lanceolata* - *L. hybrida* complex is perhaps the least understood taxonomically. Botanists working in south-central Tennessee and northern Alabama have discovered several populations of an anomalous *Lysimachia* which have been difficult to identify. These unusual *Lysimachia* exhibit some characteristics suggestive of *L. hybrida* and other features indicative of *L. lanceolata* or *L. tonsa*, but also possess unique features not found in any other species of subgenus *Seleucia*. The primary goal of this study was to determine the taxonomic identity of these unusual populations by carefully comparing their morphological features, geographic distribution, and ecological requirements to other species of *Lysimachia* subgenus *Seleucia*. Preliminary field observations, herbarium work, and morphological analyses indicate that these populations are distinct from any other known member of subgenus *Seleucia* and may possibly represent an undescribed species.

- T47 DAVID M. PONDER¹ AND SAFAA AL-HAMDANI¹. Jacksonville State University¹. Comparison of antioxidant concentrations between Kudzu and selected common food sources.

This study was designed to compare antioxidant concentration in Kudzu (*Pueraria lobata*) versus common food sources such as shiitake mushrooms (*Lentinula edodes*), spinach (*Spinacia oleracea*), and nori seaweed (*P. yezoensis*). The preliminary results indicated that Kudzu showed significantly higher concentrations of polyphenolic and Anthocyanin. Followed by in decreasing order Spinach, Seaweed, and Shiitake mushroom. In addition, separate study was carried out to evaluate different growth media on Shiitake mushroom growth and protein concentration. The preliminary results showing a media with 20% crushed soybean (*Glycine max*) had significantly influenced the growth of the mushrooms.

- T48 MAX DULIN¹ AND BRUCE K. KIRCHOFF¹. Department of Biology, University of North Carolina at Greensboro¹. Paedomorphic Secondary Xylem and Secondary Woodiness in *Xanthorhiza simplicissima*, *Coreopsis gigantea*, and *Mahonia bealei*.

We tested Carlquist's theory of paedomorphosis in the secondary xylem with reference to the wood of three Southeastern plants that have been hypothesized to be secondarily woody. Quantitative measurements and observations from sections and macerations were done using light and confocal microscopy. The secondary xylem of all three species has a degree of paedomorphosis, with *Coreopsis gigantea* possessing the greatest degree. *Coreopsis gigantea* possesses vessel elements whose length either decreases or remains the same across the xylem, vessels with pseudoscalariform lateral wall pitting and simple perforation plates, libriform fibers, and abundant xylary parenchyma. *Xanthorrhiza simplicissima* shows an intermediate degree of paedomorphosis, possesses decreasing vessel element lengths across the xylem, libriform fibers, and upright ray cells. *Mahonia bealei* has only the paedomorphic characteristics of stable vessel element lengths across the xylem, and libriform fibers. Phylogenetic analysis of literature data indicate that all three species are secondarily woody. The degree of paedomorphosis seems to reflect each species release from mechanical constraints on wood structure.

- T49 ROSS C. CLARK¹. Eastern Kentucky University¹. Report and Implications of Adventive Dawn Redwoods (*Metasequoia glyptostroboides* Hu & W.C. Cheng) at a Virginia Piedmont Location.

Even though the species is known to produce viable seed in North America, this may be the first formal report of *Metasequoia glyptostroboides* escaping from cultivation on this continent. For several years, an isolated Dawn Redwood tree in the southwestern Virginia Piedmont has been producing heavy seed crops which are producing seedlings at some distance from the parent tree. The parent tree is approximately 50 years old, among the early germplasm of the species imported to North America. Circumstances suggest that *Metasequoia* could become adventive at other sites in the Appalachian region, and raise questions about the reproductive biology of the species.

- T50 SUSAN JONES-HELD¹ AND MICHAEL E. HELD². Rutgers University¹ Saint Peter's College². Developmental Effects on Ascorbate Biosynthesis in *Arabidopsis*.

Ascorbate has long been recognized as an important antioxidant and enzyme cofactor in plants and animals. In recent years, there has been a renewed interest in elucidating the pathway(s) involved with ascorbate biosynthesis in plants. *Arabidopsis* mutants have been invaluable in unraveling the steps of ascorbate biosynthesis. Now that there is some understanding of ascorbate biosynthesis, a further objective would be to understand the regulation of biosynthesis and its effect on overall ascorbate levels. Toward this objective, we have used an *Arabidopsis* T-DNA insertional mutant of VTC2. VTC2 encodes what may be a key enzyme, GDP - L - galactose phosphorylase, in ascorbate biosynthesis. The total ascorbate level in two-week-old plants of a vtc2 insertional mutant was 60% lower than comparable wild type plants. At 4 weeks, the total ascorbate level in the vtc2 mutant plants was further reduced compared to the wild type plants. Correspondingly, qRT-PCR analysis revealed that the transcript levels of other enzymes involved with ascorbate biosynthesis were lower in 4-week-old vtc2 plants as compared to two-week-old plants. These results will be discussed in relation to what is known about ascorbate biosynthesis and its regulation in plants.

- T51 LISHA M. HEAD¹, CATHY H. BORER¹ AND RACHEL LESLIE¹. Berry College¹. Foliar Calcium Partitioning and its Role in Calcium Cycling by *Cornus florida*.

Flowering dogwoods (*Cornus florida*) are commonly admired for their aesthetic qualities. They are a beautiful part of our forest understory, but they also play important ecological roles. Dogwood trees may take up substantial amounts of calcium and make it readily

available for surrounding plants after decomposition of their leaves, but the partitioning of foliar calcium is not completely understood. This is significant because calcium is an essential macronutrient for both plants and animals. It is important for cellular messaging, plasma membrane stability, and cell wall structure. However, only certain portions of foliar calcium are available for physiological processes because much of the calcium in plants can be stored in highly immobilized crystalline pools. Our research investigates the uptake and sequestration of calcium in the foliage of two common southeastern forest tree species: dogwood and white oak (*Quercus alba*). Grab samples of tree foliage were collected at field sites located at Berry College in northwest Georgia. Samples were flash-frozen, ground into a fine powder, and tested for three different physiologically relevant pools of foliar calcium using sequential acidic extractions. Calcium in each extraction solution was assessed with an ion selective electrode. We found that dogwoods have a higher percentage of easily mobilized calcium than oaks which sequester a large portion of their calcium in an immobile crystalline form. This work demonstrates the importance of foliar calcium partitioning, and its role in calcium cycling by the flowering dogwood.

- T52 DONALD R. SMITH III¹, ALAN ALFANO¹ AND ROLAND P. ROBERTS¹. Towson University¹. Phylogeography of six North American populations of *Arabidopsis lyrata* ssp *lyrata*.

The goal of this study was to use two gene regions to examine the relatedness and phylogeography of six populations of *Arabidopsis lyrata* ssp. *lyrata* (L.) O'Kane & Al-Shehbaz (Brassicaceae) along the Northeastern seaboard. Prior analysis of the mustard family comprised limited sampling from among populations of the North American subspecies *A. l. ssp. lyrata*. Given the degree of variation observed among these wild populations an assessment of genetic variation and relatedness is warranted. Using sequences of nuclear internal transcribed spacer (*ITS*) and chloroplast *trnL* obtained from 60 individuals representing six populations occurring on three different substrate types in Maryland, New York and Virginia we explored population relatedness. Also, we assessed genetic diversity among the six populations compared to that reported for other species of *Arabidopsis*. Preliminary evidence supports the nesting of *A. lyrata* ssp. *lyrata* within the *Arabidopsis* clade closely aligned with *A. l. ssp. petraea* and *A. l. ssp. kamchatica*. Analysis of the *trnL* data indicates greatest haplotype diversity within the Soldiers Delight population. Of the six haplotypes identified, three were found only in the Soldiers Delight population and one in the Dover Plains population. The other two haplotypes (TU 3 and TU 4) were common to two and three populations, respectively. Over 90% of the *trnL* haplotypes identified in the populations sampled were unique compared to other species of *Arabidopsis*. These results suggest genetic structuring among the sampled populations and differentiation of the eastern US populations of *A. l. ssp. lyrata* from the European and Asian subspecies.

- T53 Shannon White¹, Josh Harris¹ and Charles Gowan¹. Randolph-Macon College¹. The role of transitive inference in development of search images in foraging brook trout.

Stream salmonids are drift feeders that position themselves in the current to capture prey as it floats downstream. When feeding, trout develop a search image for particular prey (selecting that prey type preferentially over others), but the process by which trout learn to recognize new prey types and form search images for them is unknown. We evaluated if transitive inference (learning by one individual based on observing other individuals) played a role in the development of search images by brook trout (*Salvelinus fontinalis*) in a 1,220-m-long study reach in second-order stream near Harrisonburg, VA. Our objective was to determine if the presence of a fish already trained on a novel prey species would reduce the time it took for untrained fish to develop a search image for the novel prey. To train fish on the novel prey, we introduced mealworms to two pools for 15 continuous days

using artificial feeders that released an average of 0.86 mealworms every 5 minutes. A total of seven fish were successfully trained to take the novel prey, and these fish were then transferred to two new pools that contained fish that had never seen the mealworm prey before. An additional eight pools were left as controls. Untrained fish in the control pools took substantially fewer mealworms (about 20% of those delivered) than did fish in the treatment pools (about 60% of those delivered), indicating that transitive inference played a strong role in development of search image.

T54 Russell A. Ligon¹. Auburn University¹. Plumage color of offspring influences parental feeding decisions in the eastern bluebird.

The quantity of resources provided to each offspring represents a strategy by parent birds that can have profound effects on reproductive success. We propose that plumage color may serve as a signal of quality in fledgling eastern bluebirds *Sialia sialis* and that parental feeding decisions are partially based on differences between offspring with respect to plumage color. Because parental feeding decisions based on offspring quality likely differ with respect to habitat quality, we also predicted that parental responses would differ in high and low quality territories. We tested these ideas by experimentally manipulating the plumage color of fledglings and measuring parental responses in feeding behavior. As predicted, relative increases in juvenal plumage brightness resulted in increased female feeding preferences in low quality habitats. No such relationship was found in high quality habitats. Male feeding rates were positively correlated with increases in juvenal plumage brightness across all habitat types. These results indicate that condition-dependence of plumage brightness in juvenile eastern bluebirds enables parents to use plumage as a signal to assess the relative quality of offspring after fledging and to adjust parental investment in a manner that maximizes reproductive success.

T55 Heather R. Cunningham¹ and Leslie J. Rissler¹. The University of Alabama¹. Friend or foe: behavioral interactions between an introduced and native salamander species.

Invasive species are frequently cited as being a leading cause of biodiversity loss. An often overlooked attribute in invasive research is behavior; studies generally focus on ecological, life-history, or genetic characteristics. However, studies have found that changes in levels of aggression and territoriality may strongly impact the fate of the introduced and native species. Unfortunately, the role of territorial behavior in invaded vertebrate systems is poorly understood. At Mountain Lake Biological Station (MLBS) in Virginia, *Plethodon montanus* (Northern Graycheek Salamander) was the introduced between 1935 and 1945. This species is ecologically similar to the native *Plethodon glutinosus* (Northern Slimy Salamander). As both species are known to exhibit aggressive territorial behavior the objective of this study was to determine if the non-native *P. montanus* influenced the territorial behavior of the native *P. glutinosus*. We found that individuals of *P. glutinosus* from both MLBS undisturbed populations discriminated between individuals of *P. montanus* from MLBS and Whitetop (source population for the introduced individuals). Overall individuals of *P. glutinosus* displayed more aggressive behavior towards individuals of *P. montanus* from MLBS versus those from Whitetop. The influence of competition on species in invaded communities remains poorly understood at this time. However, studies that examine behavioral interactions between invasive and native species can provide unique insights into factors affecting invasion dynamics.

T56 – Cancelled

T57 Jonathan A. Akin¹ and Jarrad Hollis¹. Northwestern State University of Louisiana¹. Behavior physiology in the ground skink.

Signaling theory states that honest signals should indicate truly the condition and/or intention of an actor in a behavioral interaction. In the ground skink, *Scincella lateralis*, some males engage in an apparent endurance contest, called parallel writhing, in which males that perform the behavior longer win the contest. In this study, we use respirometry to measure physiological changes associated between writhing lizards in engaged in contests. The effects of tail length and regeneration status on respiration rate were also examined. While parallel writhing did increase respiration rate, this did not end in a lizard's exhaustion, suggesting that additional parameters associated with this behavior may be involved in signal assessment.

T58 Lynn M. Siefferman¹. Appalachian State University¹. Plumage coloration correlates with personality in male and female eastern bluebirds.

Male eastern bluebirds *Sialia sialis* have brilliant, structural blue-ultraviolet coloration on their heads, backs, and wings, females display more subdued coloration. This coloration correlates with pairing date and reproductive effort and thus is likely a sexually selected trait. I correlated plumage coloration with behavioral measures of mating and parental effort. During two consecutive breeding seasons, I tested aggressive response to a same-sex conspecific simulated territorial intrusion, nest defense to a simulator predator, and nestling feeding. Repeated measures of these behaviors within and between breeding seasons suggests the behaviors are consistent within individuals. Duller blue males and females displayed more aggressive behavior towards conspecific territorial intruders. Plumage coloration also predicted boldness to simulated predators, however the relationship between plumage color and nest defense differed between males and females. Duller males and brighter females were more likely to aggressively approach and dive at potential nest predators. Both brighter males and females tended to feed offspring more often. These data suggest that plumage coloration is a reliable indicator of personality and that potential competitors and mates should be able to predict the outcome of interactions with an individual by assessing ornamentation.

T59 Andrew T. Coleman¹, Thane Wibbels¹, Ken Marion¹ and John Dindo². University of Alabama at Birmingham¹ Dauphin Island Sea Lab². To sea or not to sea? That is the question.

After nest emergence, several cues, ranging from brightness and color of ambient light to presence or absence of shapes and silhouettes, influence the orientation behavior of sea turtle hatchlings as they crawl toward the sea. Hatchlings use these cues to determine the position of the open horizon and move in that direction. Orientation behavior of another turtle, the diamondback terrapin (*Malaclemys terrapin pileata*), has not been as thoroughly examined. Hatchlings of this species encounter nesting habitat similar to sea turtles but seemingly choose to venture in the opposite direction to the safety of salt marshes. The current study utilized newly hatched diamondback terrapins to perform orientation trials so the strength of this innate behavior could be investigated and quantified. A six meter wide orientation ring was constructed on the hatchlings' native nesting beach, which had been greatly scoured of its vegetation by a recent storm. A hatchling was placed in the middle of the ring in a random direction and was given ten minutes to pass through one of twelve available gates. The chosen gate and time were recorded. Of the sixty terrapin hatchlings tested, six remained in the ring after the ten minutes expired. Of the remaining fifty-four, only one chose a seaward gate while the other fifty-three hatchlings chose a gate facing the salt marsh. The results supported the hypothesis that terrapin hatchlings use similar visual cues that influence sea turtle orientation behavior but respond to them quite differently. The evolution of this intriguing dichotomy will be discussed.

- T60 MATT PARDUE¹ AND KIM M. TOLSON². Department of Biology, College of Arts and Sciences, The University of Louisiana at Monroe, Monroe, LA 71209¹ The University of Louisiana at Monroe, Monroe, LA 71209². Preliminary results of dickcissel (*Spiza americana*) nesting success in northeast Louisiana.

Grassland birds have experienced some of the sharpest declines of any birds in North America. One grassland species, the dickcissel, is listed as a species of concern by the Cornell Lab of Ornithology, Partners In Flight, and has been placed on the Audobon Watch List. The dickcissel is a neotropical migratory bird that once utilized vast grasslands. With the loss of prairie habitat, dickcissels are now found in a wide range of habitats, particularly in lands enrolled in federal programs. These programs provide early successional habitat for the first few years until succession takes place, allowing for larger trees to take over. Thick ground cover is preferred by nesting dickcissels for visual isolation from predators and brown-headed cowbirds. Systematic nest searches were performed from the beginning of May 2008 through early August 2008. Nests were marked with flagging tape at least 5 m away, a GPS coordinate taken, and data were collected on height to rim, plant species harboring nest, vegetation data surrounding nest, overhead obstruction(s), clutch size, and presence of female/male dickcissels. Once the fate of the nest was determined, visual obstruction measurements were taken in each of the cardinal directions from a distance of 4 m, using a Robel pole. A total of 125 dickcissels nests were located on two fields in Ouachita Parish and one field in Richland Parish. Nests were monitored every 4-5 days to observe nesting success. Preliminary results nesting success of ~25 percent, as defined by the fledging of at least one young, was observed.

- T61 MARVIN V. MORALES JACINTO¹. Guilford College¹. Microhabitat and dietary preferences of the white-breasted wood-wren (*Henicorhina leucosticta*).

Species exhibiting strong specialization or selectivity for certain habitats, prey types, or foraging strategies are more susceptible to habitat perturbation, fragmentation, or loss, whereas generalists are better able to adapt. Due to its increasing population, we predicted that white-breasted wood wren *Henicorhina leucosticta* would exhibit minimal selectivity for microhabitat, microclimate, and prey types. I followed *H. leucosticta* to determine specific location of foraging sites within territories in both old growth and disturbed forest (selectively logged, abandoned agro-forestry plots, and secondary forest) at La Selva Biological Station, Costa Rica. Individual birds were captured to obtain stomach samples through regurgitation, which then we analyzed for diet composition and preference. Foraging sites were surveyed for twenty microhabitat variables, arthropod prey availability to determine selectivity or non-discriminatory selection for territories. *Henicorhina leucosticta* did not show discriminatory selection for territories based on arthropod prey availability. Stomach samples revealed that *H. leucosticta*'s diet is broader than previously recorded, including plant seeds and foliar material from bryophytes. Variables such as higher tree density, greater percentage of ground covered by vegetation in territory sites, suggest discriminatory selectivity for microhabitat types. Future work on *H. leucosticta* should investigate differences regarding habitat utilization, territory size, and nest success in forests at different levels of succession in order to categorize *H. leucosticta*'s habitat quality.

- T62 BRIAN W. ROLEK¹. Auburn University¹. Habitat preferences of wintering bottomland birds.

Several studies have previously characterized the habitat of wintering birds in the southeast. Current occupancy methods allow us to incorporate the probability of detection in our occupancy estimates, resulting in more accurate and less biased estimates. The goal of our study was to test previously proposed habitat influences on the occupancy of

bird species in the Choctawhatchee River in Northwestern Florida. We included the probability of detection and hypothesized and measured variables that might affect the probability of detection when surveying birds. Habitat variables were hypothesized *a priori* for each species. Differences in observers and the date of the survey were the most frequent variables influencing the probability of detection. Northern Flickers, *Colaptes auratus*, had the most heterogeneous occupancy and detection probability, while American Goldfinch, *Carduelis tristis*, occupancy was affected by the most covariates. Surprisingly, woodpecker occupancy was not affected by the quantity of dead wood. The lack of a relationship may be due to the scale of our study, but is consistent with previous research in bottomlands. This research provides vital information for researchers surveying birds and can be used for management purposes.

T63 RANI MENON¹ AND MARJORIE M. HOLLAND¹. Department of Biology, The University of Mississippi, University, MS 38677.. Phosphorus retention by *Juncus effusus*, *Carex lurida* and *Dichantherium acuminatum* var.*acuminatum* in agricultural drainage ditches.

Agricultural drainage ditches are wetland units that act as conduits to carry agricultural runoff. These wetland units can be used as buffer strips to retain pollutants like nutrients and pesticides from agricultural runoff. *Juncus effusus*, *Carex lurida* and *Dichantherium acuminatum* var. *acuminatum* are common wetland plants in the South - Central United States. A greenhouse experiment was conducted to investigate the retention of phosphorus by *Juncus effusus*, *Carex lurida* and *Dichantherium acuminatum* var. *acuminatum*. Monocultures as well as mixed culture treatments and mesocosms with no vegetation were established. The experimental design was a factorial design with four replicates. The units were dosed with 2.5mg/l of phosphorus and the retention time was six hours. Water, sediment and plant samples were collected monthly and analyzed for total orthophosphate, filtered orthophosphate and total phosphorus. Mesocosms with monoculture treatment of *Juncus effusus* were found to be the most effective in retaining soluble reactive phosphorus (68 %), followed by mesocosms with mixed culture (63 %) and *Carex lurida* (62 %). Mesocosms with *Dichantherium acuminatum* var. *acuminatum* retained the least amount of soluble reactive phosphorus (56 %). Mesocosms with no vegetation had low retention capacity (40 %). The results indicate that vegetated mesocosms had higher phosphorus removal efficiency compared to mesocosms with no vegetation. Thus, the study indicates that nutrient removal efficiency could be enhanced by using vegetated buffer strips with *Juncus effusus*.

T64 Todd A. Egerton¹ and Harold G. Marshall¹. Dept. Biological Sciences, Old Dominion University¹. Algal diversity and productivity interactions along estuarine gradients; a comparison of three tidal tributaries in Virginia.

Remane (1934) described the change in community composition of benthic invertebrates along an estuarine gradient and the accompanying change in species richness. He observed the greatest numbers of species in the freshwater and marine portions, and the lowest in the brackish mesohaline region. The same pattern has since been observed in multiple taxonomic groups in several estuary systems. This study examines the long term diversity of phytoplankton species along the Rappahannock, York/Pamunkey, and James rivers, tidal tributaries to Chesapeake Bay. These three rivers have varying levels of algal productivity and diversity, with the general pattern of reduced species richness in the mesohaline observed in the Rappahannock and James Rivers. The York/Pamunkey river though, has the lowest diversity in the freshwater section, with increasing levels of richness seen in more saline waters. This difference may be due to certain environmental characteristics of the watersheds, and the specifics of the freshwater Pamunkey river site. However, there are significant positive correlations between productivity and diversity

found in all three systems, supporting the theory of a more general role of biodiversity on ecosystem function.

- T65 MATTHEW T. MULLER¹, TODD A. EGERTON¹, HAROLD G. MARSHALL¹, ANDREW S. GORDON¹, PATRICK HATCHER², MATTHEW R. SEMCHESKI¹, NATHAN A. BOWMAN¹ AND RICHARD HUBBARD². Dept. Biological Sciences, Old Dominion University¹ Dept. Chemistry and Biochemistry, Old Dominion University². Ongoing results of algal biomass production for biodiesel production in Southeastern Virginia; a VCERC component.

Due in part to the increasing global energy demand and the environmental impact of fossil fuels, there has been renewed interest in the application of alternative energy sources, including biofuels. In 2006, the Virginia Coastal Energy Research Consortium was established, with the purpose of researching and developing renewable energy resources. A major component of this program is the use of algal biomass as source of biodiesel. An initial survey of fresh and brackish waters in southeastern Virginia during 2007 indicated that there are several indigenous algal species present that are considered promising for biofuels. In particular, certain local diatom and chlorophyte populations appear to show good potential for high lipid yields and therefore well suited for biodiesel production. Using the results of the survey, several algal cultures have been developed, including large scale batches utilizing effluent from a water treatment plant. In 2008, a one acre raceway system was opened as a large scale pilot program. The composition and density of the algal populations are being monitored on an ongoing basis, with chlorophytes being the dominant taxonomic group. Continued work involves the optimization of nutrient uptake and biomass production, as well as examining the effect of heterotrophic taxa, and investigating potentially higher yield producing species.

- T66 NATHAN A. BOWMAN¹ AND HAROLD G. MARSHALL¹. Old Dominion University¹. Phytoplankton Spatial and Temporal Dynamics in Back Bay, Virginia.

Back Bay is a, flat-bottomed, shallow water ecosystem separated from the Atlantic Ocean by a narrow zone of marshlands, dunes, and residential development. Water depth in the Bay is influenced by the prevailing northeast winds, which may alter the depth in near shore regions by as much as 1.0 m. Presently, the only salt water entry to Back Bay is wind forced, passing into the Bay through a narrow channel from a large sound to the south. Back Bay is presently classified as a temperate, oligohaline estuary containing salinity ranges from 1.0 - 1.9 and has gained regional interest and concern by state and federal agencies regarding changes to its ecological status. A specific objective of the Back Bay National Wildlife Refuge is to reduce the impact of various environmental factors such as nutrient loading and high turbidity levels that would deteriorate its natural setting. One of the most sensitive components within this habitat to environmental changes is the phytoplankton, which may be used as an ecological indicator of Back Bays eutrophic status. During the course of one year, the freshwater reaches of the Back Bay oligohaline estuary were sampled bimonthly at a series of six stations comprising the entirety of the bay. To date, 110 species have been identified, with the seasonal composition dominated by cyanobacteria, including the taxa *Planktolyngbya limnetica*, *Planktolyngbya contorta*, *Chroococcus dispersus*, *Microcystis incerta* and *Merismopedia tenuissima*.

- T67 PUJA SHRESTHA¹, M. W. MORRIS¹ AND NEIL BILLINGTON¹. Troy University¹. Genetic variation in bald cypress populations from southeastern Alabama.

Bald cypress *Taxodium distichum* is a long-lived, deciduous, wetland species that is frequently dominant in alluvial swamp forests of the southeastern United States. Genetic

variation was surveyed in nine southeastern Alabama bald cypress populations. Leaf samples were collected from 16-24 trees from each population. Plant grinding buffer was used to extract proteins from these leaf samples and genetic variation was screened by protein electrophoresis on cellulose acetate gels. Two buffer systems were used: tris-glycine, pH 8.5, and citric acid-aminopropyl morpholine, pH 7.0. Eight of eleven loci screened revealed polymorphisms: aspartate aminotransferase, isocitrate dehydrogenase, leucine aminopeptidase, malate dehydrogenase 2, phosphoglucomutase 1, 6-phosphogluconate dehydrogenase, phosphoglucose isomerase 2, and shikimate dehydrogenase 1. The bald cypress populations examined were quite polymorphic with multiple alleles at some loci. Mean heterozygosity was 0.160. Information on the population genetic structure of bald cypress should be useful for the conservation and management of this species.

T68 SAMIKSHA RAUT¹ AND ROBERT ANGUS¹. The University of Alabama at Birmingham¹. Effects of Triclosan on vitellogenin induction and sperm production in western male mosquitofish, *Gambusia affinis*.

Triclosan (TCS) is an antibacterial agent used in a variety of personal care and industrial products such as soap, shampoo, and textile goods. TCS and its environmentally transformed derivative, methyl-TCS has been detected in waters receiving effluent from wastewater treatment plants. The molecular structure of TCS resembles that of other non-steroidal estrogens. Furthermore, it has been shown to displace [3H]-estradiol from estrogen receptors in human breast cancer cell lines, indicating the potential to interfere with normal endocrine functions. Despite reasons for concern, the endocrine disrupting potential of TCS has not been well studied in aquatic organisms. We tested the hypothesis that TCS acts as an endocrine disrupting agent in fish. Mature male western mosquitofish, *Gambusia affinis* were exposed to TCS concentrations of 100, 250, and 350 nM for five weeks by the static renewal method. Induction of the normally female-limited vitellogenin gene expression and changes in sperm counts were quantified as biomarkers of endocrine disruption. Vitellogenin mRNA expression, determined by real time-PCR analysis, was found to be significantly higher in the 350 nM TCS treatment group than the control group. Additionally, sperm counts in the 350 nM TCS treatment group were significantly lower than in the control group. The present study shows that TCS has the potential to act as an endocrine disruptor in male mosquitofish. These results also suggest the use of the Vtg induction and sperm counts as reliable biomarkers of endocrine disruption in male mosquitofish.

T69 SUMAN CHITRAKAR¹, NEIL BILLINGTON¹, PAUL M. STEWART¹, PATRICK L. WITMER² AND CHRISTOPHER K. METCALF³. Troy University¹ Three Rivers RC & D Council, Inc.² U.S. Fish and Wildlife Service³. Use of a sedimentation risk index (SRI) to assess unpaved road-stream crossings in the upper Choctawhatchee River watershed.

Unpaved road crossings are a dominant source of sedimentation in streams of southeastern Alabama. However, studies on sedimentation risk at unpaved road crossings in this region are limited. A sedimentation risk index (SRI) for unpaved road-stream crossings was developed at Troy University in 2007 to rank unpaved road-stream crossings based on sedimentation qualities. This SRI prioritized unpaved road-stream crossings at different sub-watersheds in the Choctawhatchee River basin. In this index, stream crossings were evaluated for 12 risk metrics; for each metric, high risk was assigned a 1, medium risk a 3, and low risk a 5. These scores were then summed for each site. Sites with the lowest SRI scores were at the highest risk of sedimentation. This study used the SRI to survey additional sub-watersheds in the upper Choctawhatchee River basin and create a priority listing of unpaved road-stream crossings in these sub-

watersheds. This inventory will assist in the development of an effective watershed management strategy to maintain stream habitat in this watershed

- T70 ERIN E. SINGER¹ AND MICHAEL M. GANGLOFF¹. Appalachian State University¹. Mill dams enhance mussel growth rates in Alabama streams.

Although the effects of large dams on stream ecosystems are well-known, the effects of more ubiquitous smaller dams on stream biota remain understudied. We investigated differences in *Elliptio* spp. density and body size near mill dams in 3 East-central Alabama Piedmont streams. *Elliptio arca* populations in Sandy Creek (Tallapoosa River Drainage) immediately downstream of the mill dam (mill reach) occurred at significantly higher densities (ANOVA $F_{2,262}=12.45$, $P<0.0001$) and were significantly larger than individuals collected up-or downstream (ANOVA, $F_{2,391}=26.02$, $P<0.0001$). We observed similar length difference patterns in *E. arctata* in Loblockee Creek (Tallapoosa River Drainage) (ANOVA $F_{2,335}=18.74$, $P<0.0001$). *Elliptio pullata* in Halawakee Creek (Chattahoochee Drainage) were significantly larger in the mill reach than individuals upstream (ANOVA $F_{2,125}=6.56$, $P<0.02$). We thin sectioned *E. arca* shells from Sandy Creek, obtained internal age estimates, and observed significant growth rate differences between mill, up- and downstream reaches (ANOVA $F_{2,24}=7.14$, $P<0.004$). Moreover, LSD Post hoc analysis showed that mussel growth rates in the mill reach are significantly greater than both up- and downstream reaches ($P<0.0001$ and $P=0.05$, respectively). We are conducting annual ring validation studies to verify that mussels are producing a growth band every year in Sandy Creek. We hypothesize that shell growth rates may be greater below mill dams because impoundments increase downstream temperatures and possibly mussel food quality and/or abundance.

- T71 Robert J. Krenz¹ and Charles L. Pederson¹. Eastern Illinois University¹. Photopigments characterize phytoplankton assemblages: a step toward bioassessment of Illinois reservoirs.

In conjunction with routine assessment of environmental conditions, bioassessment may prove useful for quantitatively monitoring the ecological health of Illinois reservoirs. Because phytoplankton are readily sampled, are directly sensitive to environmental variability, and do not represent artificial species distributions, they may prove more useful than fish or macroinvertebrates as potential biocriteria. Traditional identification and enumeration techniques are time consuming, subject to analyst expertise, and costly. Alternatively, high-performance liquid chromatography (HPLC) allows for molecular separation and detection of concentrations of various photopigments, yielding spatially and temporally distinct 'photopigment signatures' that characterize assemblage structure objectively and rapidly. Analysis of historical enumeration data, provided by the Illinois Environmental Protection Agency (IEPA) Ambient Lakes Monitoring Program (ALMP), indicates that regional distinction of lakes and reservoirs in Illinois is apparent, that specific genera respond to environmental gradients, and that temporal variation of assemblage structure must be considered when sampling. These results were confirmed by analysis of environmental and photopigment data from 49 lakes across Illinois during summer, 2007. The dataset was augmented in summer, 2008 with 76 lakes sampled and 121 temporally random observations. With respect to relevant environmental variables, stressed reference sites (highly impaired) and minimally impacted reference sites (relatively unimpaired) will be identified from this dataset; moreover, analysis of this dataset should elucidate the photopigment metrics which differentiate reference sites.

- T72 SHANNON E. PITTMAN¹, TIMOTHY L. KING² AND MICHAEL E. DORCAS¹. Davidson College¹ USGS². Genetic and demographic status of a bog turtle population: implications for conservation and management.

Population declines and anthropogenic habitat destruction have led to federal and state protection of the bog turtle (*Glyptemys muhlenbergii*), an elusive freshwater species found in the eastern United States. In this study, we sought to integrate demographic and genetic analyses to characterize the decline and conservation status of one isolated population of bog turtles in the Piedmont of North Carolina. Using historical capture-recapture data, we modeled adult survivorship and population growth rate from 1992 to 2007 to evaluate how the demography of this population has changed over time. We found a negative, constant population growth rate of 0.933 (SE = 0.017, 95% confidence interval, 0.900- 0.967) and a constant adult survivorship of 0.889 (SE = 0.017, 95% confidence interval, 0.848-0.918). Using 17 microsatellite markers, we compared the genetic status of this population with 5 other "healthy" bog turtle populations occurring in NC, VA, and TN. Genetic analyses showed high levels of heterozygosity within all populations (H_o ranging from 0.71-0.59), including our study population (H_o = 0.63), despite the documented decline in population size. We attribute the high genetic diversity to the presence of multiple generations of old turtles and possible historical immigration as fragmentation increased in the region. This study illustrates that the demographic status of populations of long-lived species may not be reflected genetically if a decline occurred recently. Consequently, the genetic integrity of populations experiencing demographic bottlenecks may be preserved through conservation efforts effective in addressing demographic problems.

T73 ANGELA M. MOJICA¹. Old Dominion University¹. Effect of the herbivorous West Indian Spider Crab (*Mithrax spinosissimus*) on patch reefs in the Florida Keys (USA).

Many coral reefs worldwide have shown a dramatic phase shift from coral to macro algae dominance, primarily due to water pollution and the decline of herbivorous fish and echinoderm grazers. However, the effect of other grazers, such as crabs, is virtually unknown. Therefore we studied the effect and potential contribution removing macroalgae from coral reef environments of the herbivorous West Indian spider crab (*Mithrax spinosissimus*) on the Florida Key reefs. Crabs were held individually for 24 hrs and fed either four naturally-occurring algae (*Ulva* sp., *Laurencia* sp., *Dyctiota* sp., and *Halimeda* sp.), or clumps of mixed macro-algae (*Halimeda* sp. + *Dyctiota* sp.) from the reef to determine diet preferences and consumption of crabs by size and sex. Analysis of these results showed that fleshy macro algae are preferred by *M. spinosissimus* over calcareous algae. *Mithrax* macroalgae consumption rates obtained under laboratory conditions were compared with those obtained in the field, by encaging a single crab of different sizes in cages that excluded all herbivores greater than 2cm in diameter. Additionally, we also estimated fish consumption rates to compare the actual grazer contribution from both crabs and herbivorous fishes. Our results indicate *M. spinosissimus* as potential important consumers of macroalgae on reefs, with a high per-capita effect consuming; however, their ability to regulate reef macro-algal abundance or composition is diminished by their low natural density, low mobility, and perhaps lower mobility in predator-rich environments such as reefs.

T74 MICHAEL M. GANGLOFF¹. Appalachian State University¹. Effects of Small Dams on Alabama Stream Habitats and Biota.

Although the impacts of large dams to fluvial ecosystems are frequently dramatic and have been well documented, impacts of smaller structures remain under-studied. A comprehensive understanding of the impacts of low-head dams (i.e., those <5 m height) is critical to imperiled species management because 1) low-heads greatly outnumber larger dams and 2) dam removal is increasingly part of stream restoration projects. Between 2006 and 2008 we quantified responses of invertebrate and fish assemblages at 22 small Alabama dams. We categorized dam status as intact, breached, or relict. Preliminary data

indicate that responses ranged widely between taxa and appeared related to dam status. For example, crayfish were less abundant downstream from 18 of the 22 dams but differences were most dramatic immediately downstream of intact dams. In contrast, we measured greater mussel densities immediately downstream from 6 of 11 intact dams and we found that mussel extirpations were greatest near breached or relict dams. These data suggest that the response of invertebrate populations to small dams and changes in physicochemical conditions varies widely between taxa with different life histories. Further, they suggest that extensive case-by-case studies are needed to weigh consequences of dam removal for at-risk freshwater taxa

T75 IN K. CHO¹, CHRISTI MAGRATH¹, ROBERT LI² AND ALICIA WHATLEY¹. Troy University¹ USDA². Induction of the cytochrome P450 enzyme in channel catfish (*Ictalurus punctatus*) following exposure to wastewater treatment plant effluent.

Induction of the cytochrome P450 enzyme in aquatic organisms is an important biomarker of exposure to pollutants that can be measured as ethoxyresorufin-O-deethylase (EROD) activity. The focus of this study was to assess changes in induction of cytochrome P450 enzyme in channel catfish (*Ictalurus punctatus*) following exposure to water from the Troy (Alabama) Wastewater Treatment Plant (TWWTP) effluent compared to upstream samples from Walnut Creek. Additionally, EROD activity in populations maintained in laboratory and field settings were compared. All catfish were subjected to 13 days exposure, and liver samples were collected every 3 days. Induction of EROD activity peaked on day 9 in both field and laboratory exposed catfish; however field exposure generally showed more robust enzyme induction. Overall mean field effluent EROD was significantly higher ($p=0.004$) with a 5-fold increase over field upstream exposed catfish, whereas mean laboratory effluent exposed catfish EROD showed only a minimal insignificant increase over laboratory upstream exposed catfish. Real-Time PCR of day 9 samples confirmed both transcription of mRNA for cytochrome P4501A1 enzyme and higher induction in field exposed catfish. Results suggest that induction of cytochrome P450 can be used as an early biomarker of pollutant exposure in *in situ* and *ex situ* settings.

T76 ANA C. VALLEJO¹, BRETT A. MACEK¹, CHRISTOPHER K. EDMONDSON¹ AND FRANK A. ROMANO, III¹. Jacksonville State University¹. Water quality and habitat assessment of Houck Creek, Cleburne County, Alabama.

Houck Creek, located in the Shoal Creek district of the Talladega National Forest in Cleburne County, is part of the Coosa River watersheds. Houck Creek is located in the Ridge and Valley physiographic province of the Appalachian Mountains. Choccolocco Creek headwaters were used as a reference stream in this analysis. The assessment of Houck Creek included basin, habitat and water quality assessments, which include analyses of benthic macro-invertebrates, basin and stream physical characteristics, chemical characteristics, and riparian zone analysis following the EPA, USGS, and Alabama Water Watch protocols. Taxon level assessment of benthic macroinvertebrates (SOS) index was 25.5 scoring into the excellent range. The family level index (FBI) was 2.63, rating the water quality as excellent (0.00-3.75). Chemical analysis suggests water cleanliness. The dissolved oxygen levels were normal (9.73 ppm), pH was near neutral (6.58), alkalinity and hardness were low (27.33 ppm, 43.33 ppm CaCO₃ respectively), and turbidity was low (5 JTU). Our reference site had comparable water chemistry, however, the benthic invertebrate assessment was considerably richer but had a lower FBI index. Habitat assessment included embeddedness (suboptimal), bank stability (suboptimal), canopy angles (180o), sediment type (sand-gravel, boulder-bedrock), bank vegetative protection (optimal), riparian zone and flood zone assessments, geomorphic unit assessment, and channel assessments. The reference site had different assessment parameters, however, the results were either optimal/suboptimal which was similar to

Houck Creek. Basin characteristics included drainage area (2.98 km²), stream length (5.15 km), drainage density (3.16) and shape (1.76), basin relief (118.9 m), channel sinuosity (1.34), and side-slope gradients (44.7 m).

T77 – Cancelled

T78 ALICIA L. KINDRED¹, ANTHONY SICCARDI III¹, HEATH GARRIS¹, WAREN JONES¹, DOROTHY MOSELEY¹, LOU D'ABRAMO², TIM NAGY¹ AND STEPHEN A. WATTS¹. University of Alabama-Birmingham¹ University of Mississippi². Caffeine and Bone Development in the Zebrafish (*Danio rerio*).

Caffeine (1,3,7-trimethylxanthine) is a weak diuretic, and caffeine-induced diuresis increases urinary calcium loss acutely. Based on these reports, caffeine is being evaluated as a risk factor for osteoporosis. Anecdotal observations suggest an association between caffeine-containing beverage consumption, reduced bone mass, and increased fracture risk. Recent studies on Wistar-rat calvaria suggest the potential deleterious effects of caffeine on osteoblast viability. Longitudinal studies demonstrated that caffeine consumption of more than 300 mg/d accelerates spinal bone loss in elderly, postmenopausal women. Osteoporosis has been studied extensively in human and other mammalian models, and recent studies have used the zebrafish (*Danio rerio*) to model bone mineralization. In this study, we evaluated the effect of dietary caffeine on weight gain, growth (length), survival, condition factor, and bone mineral density for reproductively-intact male and female zebrafish at 112 post-fertilization. Treatment groups (n = 30 juveniles, ca. 15 mm length) were fed semi-purified feeds containing caffeine ranging from 0 to 10.9 mg/g feed for 12 weeks. Survival ranged from 80 to 90% and did not differ with treatment. Female zebrafish trended to have reduced length and weight when fed diets containing caffeine; however, these differences were not significant (ANOVA, Dunnett's p = 0.08 for length). No significant effects on growth of male zebrafish were observed. Bone mineral density (as determined by microCT) did not differ with caffeine exposure. These data suggest that caffeine does not affect bone mineralization at this life stage. However, basic growth demographics suggest further evaluation of dietary caffeine in females should be considered.

T79 GLENN A. MARVIN¹ AND KAITLIN E. CURL¹. UNIVERSITY OF NORTH ALABAMA¹. Aquatic and Terrestrial Burst Speeds in a Semi-aquatic Plethodontid Salamander (*Desmognathus quadramaculatus*).

We examined the maximal running and swimming abilities of the salamander *Desmognathus quadramaculatus*. Individuals were collected from Macon Co., North Carolina and acclimated to 16°C and a 12:12 photoperiod for 6 weeks prior to experiments. Snout-vent length (SVL) of 40 individuals ranged from 42 to 106 mm (mean = 78 mm). We determined burst speed at 16°C by measuring the shortest time required to traverse a continuous 0.2 m portion of a racetrack. For aquatic tests, the racetrack was filled with an adequate amount of water to immerse the entire body. For terrestrial tests, the floor of the racetrack was lined with a layer of moist paper towels. Aquatic burst speeds of individuals (mean = 0.85 m/sec) were significantly greater than terrestrial burst speeds (0.75 m/sec; paired t-test, t = 4.4, P < 0.001). To examine possible effects of body size (SVL) on speed, we performed linear and polynomial regressions of log₁₀-transformed data. Second-order polynomial (quadratic) regression provided the best fit for the relationship between body size and burst speed (r² = 0.239, P = 0.006 for aquatic; r² = 0.169, P = 0.033 for terrestrial). Burst speeds of intermediate-size individuals (about 65 to 85 mm SVL) were greater than those of small or large individuals. This study is part of a larger project to examine the effect of tail autotomy on maximal swimming and running speeds of both terrestrial and semi-aquatic species of *Desmognathus*.

T80 – Cancelled

T81 SCOTT M. BESSLER¹ AND STEPHEN M. SECOR¹. University of Alabama¹. To Regulate or Not to Regulate; Gastric Acid Production in Amphibians and Reptiles.

For amphibians and reptiles there is an adaptive link between feeding habits and the capacity to regulate gastrointestinal performance. Frequently feeding species maintain stable intestinal performance between feeding bouts, whereas infrequently feeding species widely regulate intestinal performance with each meal. Given the apparent high cost of gastric acid production, we predicted a similar pattern; frequently feeding species maintain acid production between meals and infrequently feeding species shut down acid production during their long periods of fasting. To explore this hypothesis, we measure gastric pH from fasted and digesting individuals for 12 frequently feeding species (anurans, lizards, snakes, turtles and alligator) and 8 infrequently feeding species (sunbeam snake, boas, and pythons). All frequently feeding species, with the exception of the snakes and a turtle, maintained an acidic pH (pH = 1.1-2.5) within their stomachs while fasting and thus experience no significant change in gastric pH with feeding (pH = 1.0-3.0). In contrast, all snakes, frequent or infrequently feeding, and the red-eared slider greatly reduced acid production while fasting (pH = 5.0-7.7) and thereby had to rapidly increase acid production after feeding (pH = 1.5-2.5). Regardless of their feeding habits, snakes and potentially turtles regulate gastric acid production as an apparent mechanism to reduce energy expenditure between feeding bouts. For frequently feeding amphibians, lizards, and the alligator, as well as for fishes and mammals, the selected strategy is to maintain constant acid production between meals.

T82 Laura E. Wright¹, Victoria K. Gibbs¹, Mickie L. Powell¹, Addison L. Lawrence², John M. Lawrence³ and Stephen A. Watts¹. University of Alabama at Birmingham¹ Texas A & M University System² University of South Florida³. Effect of dietary protein and carbohydrate levels on weight gain and organ production in the sea urchin *Lytechinus variegatus*.

Determination of nutrient requirements is important in developing a feed that will maximize production while minimizing cost, waste, and pollution. *Lytechinus variegatus* (20 g wet weight) were fed formulated feeds with nine different protein (ranging from 12 to 36%) and carbohydrate (ranging from 21 to 39%) levels, with P:E ratios ranging from 39 to 96 mg P/Kcal. For each sea urchin (n = 8 per treatment), a ration of 1.5% of the average body weight was proffered daily. Survival was 100% in all treatments. After 9 weeks, weight gain of individuals was directly related to P:E ratio. Maximal weight gain was ca. 300% in individuals consuming the feed containing 36% protein, 3.8 Kcal/gm energy, 96 mg P/kcal, and 21% carbohydrate; minimal weight gain was ca. 220% in individuals consuming the feed containing 12% protein, 2.4 Kcal/gm energy, 50 mg P/kcal, and 21% carbohydrate. Gut weights were not affected by dietary protein, energy, P:E ratios, or carbohydrate levels. Dry Aristotle's lantern index was inversely correlated with protein level (r² = 0.96) and P:E ratios (r² = 0.87), with less relation to energy level (r² = 0.82) and no relation to carbohydrate level (r² = 0.08), suggesting protein is a primary determinant of lantern size under the conditions of this study. Gonad dry matter production was lowest in individuals fed low protein (12%) feeds, regardless of energy, P:E ratio, or carbohydrate level. These data suggest that organs respond differentially to changes in protein, carbohydrate, and energy at this life history stage.

- T83 VICTORIA K. GIBBS¹, ADELE W. CUNNINGHAM¹ AND STEPHEN A. WATTS¹. University of Alabama at Birmingham¹. Annual cycle of gut size and proximate composition of the sea urchin *Lytechinus variegatus* from the Northern Gulf of Mexico.

Lytechinus variegatus (n = 30, ca. 45 mm diameter) were collected every 4 to 6 wk from April 2001 to September 2003 at Eagle Harbor in St. Joseph Bay, Florida, USA. Sea urchins were transported to the University of Alabama at Birmingham for measurement and dissection. Wet weight indices for the gut and gonad were determined by [wet weight of the organ (g) / total wet weight of the individual (g)] x 100%. Over the 2.5 yr sampling period, gut indices ranged from 0.72% to 1.80% and 0.79% to 2.24% for males and females. Maxima in gut indices persisted from late fall through early spring (periods of low seawater temperature) and began to decline during spring to minimum levels during summer and early fall (periods of high seawater temperature). Maxima in gut indices for males and females directly preceded maxima in gonad indices; whereas, in early fall, minima for gut indices coincided with minima for gonad indices. Levels of carbohydrate (mg/g) in the gut increased during summer and early fall whereas levels of protein in the gut were correlated with the gonad cycle. These data support the role of the gut as a short-term nutrient storage organ, the size and composition of which is dependent in part on gonad size and maturity as well as seawater temperature. Supported by Mississippi-Alabama Sea Grant Consortium.

- T84 LEIGH A. NORRIS¹, STYLIANOS CHATZIMANOLIS¹ AND MICHAEL S. CATERINO². University of Tennessee at Chattanooga¹, Santa Barbara Museum of Natural History². Phylogeography of *Coelus pacificus* on the California Channel islands.

Previous studies concerning island systems have been a huge contribution to the science of evolution and biodiversity. The disappearing dunes of the California Channel Islands are the home for several species including over 100 endemic insects. In this study we examined the phylogeography and genetic diversity of the darkling beetle (Coleoptera: Tenebrionidae), *Coelus pacificus*, to ascertain how the populations of the islands are related to each other as well as to the main land. This allowed us to explore the historical and ecological associations of the islands with the mainland in a sensitive and threatened environment. During the summers of 2007 and 2008, specimens were collected from five of the eight Channel Islands. We analyzed fifteen specimens from each island using the cytochrome oxidase I (COI) region of the mitochondrial DNA. We used Parsimony and Bayesian phylogenetic analyses as well as several population genetic approaches, including coalescent population expansion, AMOVA, isolation by distance and Fst to assess the genetic relationships within and among the populations. Results indicated that Santa Cruz Santa Rosa and Santa Catalina had a low genetic diversity in terms of haplotype numbers, whereas San Nicolas and San Clemente were extremely diverse. Haplotypes from Santa Catalina and San Clemente formed a monophyletic clade, whereas haplotypes from the remainder islands formed a separate clade. These results demonstrate the significance of the California Channel Islands in terms of evolutionary and conservation biology.

- T85 MARC A. MILNE¹ AND DEBORAH A. WALLER¹. Old Dominion University¹. The effectiveness of the attraction mechanisms of the purple pitcher plant, *Sarracenia purpurea*, at attracting prey and residents.

The effectiveness of each of the attraction mechanisms of the purple pitcher plant, *Sarracenia purpurea*, has long been debated. In addition to luring prey, these attraction mechanisms have also been implicated in luring spider residents. By excluding nectar,

pigment, and trapped insects from various *S. purpurea* variants in a two-month field study, we were able to assess the effectiveness of each attractant in luring and capturing different prey and residents. Spider residents were hand-collected from plants every other day for one month and then once a week for the second month. Captured prey was removed from plants weekly. There was no difference in the diversity indices or density of spider residents across various treatments. However, models underperformed all plant varieties and treatments in the capture of insects and spiders. Nectar-excluded plants captured surprisingly higher amounts of arthropods than expected, throwing into question the supposed attracting role of the nectar lip. Interestingly, the newer pitchers of all plant treatments captured more insects and spiders than older pitchers; while this concept has been previously noted for insects it is a new discovery concerning spiders. Significant correlations existed between total captured insect and spider density and total captured spider density and spider resident density. This study suggests that although spiders' ecological role may be one of predator to the insects' role of prey, they may act similarly in their interaction with carnivorous plants.

T86 DANIEL N. PROUD¹ AND BRUCE E. FELGENHAUER¹. University of Louisiana at Lafayette¹. Morphology and ultrastructure of the sexually dimorphic leg I in manaosbiid harvestmen (Opiliones: Laniatores).

In arthropods, sexual dimorphisms are often attributed to contests between males and/or mate choice. Most of what is known regarding reproductive biology and morphology of harvestmen is based upon examinations of mainly temperate taxa. The most diverse lineage of Opiliones, the suborder Laniatores, consists of 26 families and displays an enormous diversity in types of sexual dimorphism. Surprisingly little is known about the microanatomy and ultrastructure of these structures and their functional significance. In the family Manaosbiidae, the males of most species possess a spindled basitarsus of leg I which is not exhibited by females. Using scanning and transmission electron microscopy the legs of male and female manaosbiid harvestmen (*Rhopalocraneus albilineatus* and *Cranellus montgomeryi*) collected from Trinidad W.I. were examined and compared. Serial sections of leg I reveal a larger, well-developed gland exhibited by males. Interspecific and intersexual variation in setae on the leg segments was also assessed to determine possible functions and how these structures may be perceived in intersexual and intrasexual encounters. Results from this study provide insight into the morphology and functional significance of this sexually dimorphic character and will contribute to the understanding of general harvestmen biology.

T87 MAGHAN WOODS¹. Shorter College¹. Correlation of macroinvertebrate abundance and species richness of southeastern caves and total organic matter (TOM) in cave soil.

Macroinvertebrate biodiversity is poorly known from the majority of cave systems. Most research in the southeastern United States has centered on developing simple species lists, whereas others focus their research only on chemistry of cave systems. Very few studies have attempted to make connections between chemistry and biodiversity observed in cave systems. Georgia and Alabama are cave-rich states which offer many opportunities for cave faunal research. Human activities in and around caves have been shown to influence organic matter and other pollutants entering cave systems. We wanted to determine if the amount of organic matter in cave systems can influence species richness and abundance of macroinvertebrates in Southeastern cave systems. We trapped invertebrates and took soil samples from 7 caves within north Alabama and northwest Georgia. We captured 22,223 invertebrates in all 7 caves comprising 53 different species. Overall, we saw a trend of species richness, abundance, and biomass decreasing the further along distance transects of caves. Total organic matter ranged from 4% to 20%, and also decreased further along our distance transects.

- T88 MEGAN P. WHITE¹, ERIK C. JOHNSON¹ AND RONALD V. DIMOCK, JR.¹. Wake Forest University¹. Cellular and organismal physiological responses of *Utterbackia imbecillis* (Bivalvia: Unionidae) to acute, sub-lethal copper exposure.

Environmental perturbations occurring in terrestrial ecosystems are often amplified in the included aquatic environments that serve somewhat as contaminant catchalls. Thus, the health of an aquatic ecosystem may be reflective of a much larger area surrounding the water body. Freshwater mussels, by virtue of being abundant, sedentary filter-feeders, are excellent biological indicators of aquatic ecosystem health. This study evaluates physiological responses—both at cellular and organismal scales—of the freshwater mussel, *Utterbackia imbecillis*, to copper. Copper is an ecologically relevant stressor that is toxic to many molluscs, and a sub-lethal dosage of 100 ppb CuCl₂, as determined by preliminary experiments, was used in all exposures. We examined organismal physiological responses including active period (percentage of time valves are open), oxygen consumption, and filtration rate under normal and copper stress conditions using standard techniques. A significant decrease in active period and oxygen consumption after copper exposure was observed. At the cellular level, we evaluated relative transcript abundance of the stress-responsive molecular chaperone, HSP70, in both copper-treated and control animals. Total RNA was extracted from adductor muscle tissue, and HSP70 expression was quantified and normalized to that of actin using previously developed gene-specific primers for *U. imbecillis* HSP70 and actin. Consistent with expectations, a significant increase in HSP70 expression after 24-hour copper exposure relative to controls was seen. These results exemplify the sensitivity of freshwater mussels to copper, even at sub-lethal levels, and further support their use as bio-indicators.

- T89 WARREN T. JONES¹, HUGH S. HAMMER², MICKIE L. POWELL¹, VICTORIA K. GIBBS¹, ADDISON L. LAWRENCE³, JOHN L. LAWRENCE⁴ AND STEPHEN A. WATTS¹. UAB¹ Gadsden State Community College² Texas A&M University³ University of South Florida⁴. Are vitamins required in formulated feeds for the sea urchin, *Lytechinus variegatus*?

Development of formulated feeds will promote culture of sea urchins for aquaculture, medical science, and toxicological studies. Vitamins are essential in animal feeds, but requirements are unknown for most invertebrates. Juvenile *Lytechinus variegatus* (ca. 28 mm diameter) were collected from Saint Joseph Bay, Florida and transported to the laboratory. Urchins were held in the laboratory (32 ppt salinity, 22 C, 12:12 photoperiod) for 3 weeks, and then placed into individual plastic mesh cages (n = 16 per diet treatment). At the beginning of the experiment, 16 urchins were randomly selected and dissected to obtain initial weights of organs (gut, gonad, test). Groups of 16 urchins each were fed one of five semipurified diets supplemented with various levels of a vitamin premix (commonly used in shrimp feeds). Treatments were 0, 33, 66, 100 and 150% vitamin premix (100% levels based on published shrimp vitamin requirements). At 16 weeks, survival was 100% in all treatments. Urchins fed 0% vitamin premix exhibited no noticeable pathologies but had significantly less weight gain than those fed the 100% vitamin premix; highest weight gain and test weight was observed in those fed the 100% vitamin premix. Ovary, testis, and gut weights did not vary significantly among treatments (ANOVA p<0.05). Based on weight gain, *Lytechinus variegatus* exhibited a requirement for supplemental vitamins; however, the specific vitamins required have not been determined. These data provide the basis for determination of the dietary requirements for individual vitamins. Supported by Mississippi-Alabama Sea Grant Consortium, Texas Sea Grant, and NSF.

- T90 NICHOLAS S. SEKORA¹, KATHY S. LAWRENCE¹, PAULA AGUDELO², EDZARD VAN SANTEN¹ AND JOHN A. MCINROY¹. Auburn University¹ Clemson University². Identifying selected nematode species based on fatty acid profiles using FAME analysis.

The Sherlock Analysis gas chromatography system was developed to quickly and accurately identify bacteria based on their fatty acid compositions. We have adapted this system for identification of plant-parasitic nematodes. Fatty acid profiles of 12 separate plant-parasitic nematode species have been determined using this system. Additionally, separate profiles have been developed for *Rotylenchulus reniformis* and *Meloidogyne incognita* based on their host plant and also population mixtures of the two species, four species and three races within the *Meloidogyne* genus, and for three life stages of *Heterodera glycines*. Statistically, all but two of these profiles are completely delimited from one another at $P < 0.05$; only the cyst and vermiform stages of *H. glycines* cannot be segregated. By incorporating these profiles into the Sherlock Analysis Software, 16 library entries can be created. While there is some similarity among profiles, all of these entries correctly identify to the proper organism to genus species and race at greater than 78% accuracy. The remaining 22% are correctly identified to genus, although species and race may not be accurate usually due to the underlying variables of life stage, host, or mixture of organisms. We have even been able to determine differences in soil samples that either do or do not contain *R. reniformis* within them. These results are very promising and indicate that this library could be used for diagnostics labs to increase response time.

- T91 SUSAN M. SEWELL¹ AND FRANK A. ROMANO¹. Jacksonville State University¹. Structure of a natural population of *Dactylobiotus ambiguus*.

The tardigrade, *Dactylobiotus ambiguus*, is characterized by large claws, with short to extremely short secondary branches and bases connected to each other. *D. ambiguus* (Murray, 1907) has a smooth cuticle, normally colorless, eyes in the posterior position, and a pharynx with two macroplacoids (1st is up to twice as long as the 2nd and may appear to be divided into two by a narrow constriction) and no microplacoids. Free eggs are spherical with pointed tubercle projections that have contacting polygonal bases. An almost pure population of this species was found among algae growing on sandstone rocks at Cold Water Falls in Tuscumbia, Al. Sampling began on 12 Feb. 2008 and continued every two weeks until 27 Mar. 2008. Three replicate samples (10.75 cm²) using a 3.7 cm (ID) PVC cylinder and pipette were taken during each collection period. All samples were returned to the laboratory for processing the same day. After processing the samples, tardigrades and eggs were removed, mounted in Hoyer's on glass slides, and were measured (length and width where possible and egg dia.). A total of 2,116 tardigrades, 69 free eggs and 62 pregnant females were captured. Mean length is $336.41 + 92.14 \mu\text{m}$ (range = 135.5-601.8), mean width is $107.82 + 49.15 \mu\text{m}$ (range = 35.55-216.2). Mean egg diameter is $73.38 + 15.74 \mu\text{m}$ (range = 35.04-122.7). Mean clutch size is $5.45 + 2.09$. Mean free egg diameter is $72.89 + 13.46 \mu\text{m}$ (range = 46.35 – 93.79 μm).

- T92 ROBERT C. DAFOE¹ AND FRANK A. ROMANO¹. Jacksonville State University¹. Spatial and temporal analysis of tardigrade communities on Dauphin Island Alabama.

Dauphin Island is a barrier island in the Gulf of Mexico just south of Mobile Bay, AL. Four transects (east to west) across the island, from Bay to Gulf, were established through the eastern forested areas of the island to survey tardigrade communities. Quarterly (seasonal) samples each transect samples of leaf litter were collected from October 1999 through January 2001 and from July 2006 through January 2007. A total of 1,011 specimens were found in the 1st sample period (6 genera, 16 species) and 720 from the

2nd collection (5 genera, 8 species). Most tardigrades were in the genus *Macrobiotus* (84.5 % in the 1st and 85% in the 2nd). Others genera found were *Hypsibius*, *Milnesium*, *Minibiotus*, *Diphascon* and *Calcarobiotus* with the exception of *Minibiotus* in the 2nd collection. Species diversity declined between the 2 collections (Simpson's Index = 0.68 – 0.58). In addition, the 1st collection the greatest species diversity was found on the either the Gulf or Bay exterior portions of the island. The 2nd collection the greatest species diversity was shifter from the periphery towards the inner (more protected) part of the island. Community similarity indices (Stander's and Jaccard's) suggest that there are differences in tardigrade communities between transects and between collection years.

T93 JOEL A. MORRIS¹ AND ROBERT J. NOVAK¹. University of Alabama @ Birmingham¹. Interactions between *Culex restuans* and *Cx. pipiens* mosquito larvae: Reinterpretation of asymmetric competition.

Competitive interactions between sympatric West Nile virus vectors, *Culex restuans* and *Culex pipiens*, were evaluated in Champaign-Urbana, IL in 2007 using a replacement series in which mosquito larvae were placed in rearing pans with different ratios of each species (100%:0%, 75%:25%, 50%:50%, 25%:75%, and 0%:100%). Each larval combination was repeated at biologically relevant temperatures (22°C, 26°C, and 30°C) and densities (50, 100, 200, or 400 larvae). Results suggest that overall survival of *Cx. restuans* (46.2%) was greater than *Cx. pipiens* (32.9%). However, each species responded to survival and fitness tradeoffs quite differently. Survival of both species was primarily limited by increasing density, but survival of *Cx. restuans* benefited from increasing competition with *Cx. pipiens*, while survival of *Cx. pipiens* benefited from increasing temperatures. Since *Cx. restuans* developed significantly faster by more than one day, the negative correlation between *Cx. pipiens* survival and development time (-0.50) likely related to exploitative competition stressors. Thus, *Cx. restuans* reduced the survival of *Cx. pipiens*, but not visa-versa. Response of body mass to increasing competition contrasted with the results of survival. While body mass of both species primarily decreased with increasing densities, only *Cx. pipiens* mass benefited from increasing competition with *Cx. restuans*. Since mass and development time of *Cx. restuans* were positively correlated (+0.52) but survival and mass were negatively correlated (-0.62), then survival and development time were competitively advantageous, but at the expense of fitness (body mass). In contrast, *Cx. pipiens* placed emphasis on fitness, at the expense of survival rate.

T94 – Cancelled

T95 ERIC A. BLACKWELL¹ AND YASUHIRO KOBAYASHI¹. Delta State University¹. Integrating Research into the Undergraduate Curriculum as a Means of Engaging Students.

The ability to apply scientific methods to answer questions is an essential component of scholarly development as a student pursues a degree in biology at Delta State University. Furthermore, developing skills such as independent learning, critical thinking, and problem solving, is critical for students' success not only during pursuit of a degree at Delta State, but also after entrance into the workforce or post-baccalaureate education. Validation-based laboratory exercises are often inadequate for students to develop the skills to apply scientific methods to derive desired outcomes. To address those needs, research-based exercises were implemented as course requirements for Ecology during the fall 2006 semester. Students enrolled in this class are divided into small groups and are assigned to a semester long project that is designed to integrate reading, writing, mathematical, and critical thinking skills through written reports and oral presentations. A written report in the form of a scientific manuscript reinforces writing skills, and the use of statistical methods

provides experience in data analysis and interpretation. Oral presentations provide experience in public speaking and data presentation. Formal course evaluations, informal surveys, and casual conversations with students indicate that a large proportion of students had a positive research experience, and that incorporation of research encouraged student-to-student engagement and development of critical thinking ability. Many students believe that the research projects should remain a part of the curriculum. We believe that incorporating research projects as a class requirement is an effective method for developing critical skills necessary for students' success.

T96 DEAN COCKING¹. James Madison University¹. Collection of landscape level environmental data using inexpensive passive air samplers.

Geospatially locating ecosystem properties within complex landscapes can be a useful student research and teaching tool. A technique was developed using plastic Petri plates poured with Tangle Trap™ (a sticky gel that traps insects) which were attached to existing vertical poles for the purpose of collecting particulate, dissolved and misc. biotic materials including insects from the air at each location. They were left exposed for a defined period of time. In the case of our studies, they were used to measure patterns of airborne mercury deposition. Data from these inexpensive samplers provide an index of relative concentration/time at different geospatially referenced locations. Because of the low cost, they can provide more replications of data than is economically feasible with active air samplers, or even sophisticated passive devices. In our laboratory, several of my undergraduate students have used this technique for their research projects on airborne mercury associated with an industrial point source of contamination. Others have studied the landscape in a portion of Rockingham Co VA., In that work, we are testing the hypothesis that that distribution of airborne mercury may be related to its use as a fungicide in apple orchards in the 1900's. Results are presented which illustrate the technique. Replicated sampling data provide information that can be entered into a GIS database. It is then possible to identify locations suitable for more extensive investigation. This inexpensive sampling method can also be used in student projects examining of a wide variety of other airborne contaminants, nutrients, particulates, etc.

T97 BENJIE G. BLAIR¹. Jacksonville State University¹. Examination of accelerating voltage effects on biological structures under both secondary electron and backscattered electron detection with scanning electron microscopy.

Recent studies suggest that using various accelerating voltages with scanning electron microscopy can reveal minute structural differences on some biological specimens. This is especially true of low-density specimens which necessitate extreme care when selecting the accelerating voltage for the best results. This phenomenon has not been reported with backscattered electron detection. The purpose of this study was to (1) compare a variety of specimens under secondary electron detection with multiple kv conditions and (2) to determine if backscattered electron microscopy under low vacuum conditions would also benefit from low accelerating voltages being applied to low-density specimens. A wide range of specimens were selected and examined using the JEOL 5500 series electron microscope at 1, 5, 10 and 20 kv with secondary electrons while low vacuum conditions used 5, 10 and 20 kv. The results confirmed that secondary electron microscopy could reveal details under low voltage conditions but only with the extremely low-density specimens such as cellulose-based plant materials. Backscattered or low-vacuum environmental SEM was less definitive and although very useful for rapid examination of samples it does not appear to require extensive changes in accelerating voltages to obtain good results.

- T 98 ROGER SAUTERER¹. Jacksonville State University (AL). Basic Enzymology using Tyrosinase and DOPA substrate: Potential and pitfalls.¹

Instructional labs in basic enzymology, using a variety of enzymes and substrates, are common in cell biology and biochemistry labs. The use of the enzyme tyrosinase (polyphenol oxidase) with Dihydroxyphenylalanine (DOPA) as a substrate is an especially good choice for this type of lab. The enzymatic reaction produces a brownish product that is easily measured at 475 nm. Lyophilized tyrosinase is stable for 1-3 years in a freezer, the enzyme is relatively inexpensive, the DOPA substrate is both inexpensive and safe, and the reaction assay is rapid. Students can generate pH and salt sensitivity curves, perform the Lineweaver-Burk double reciprocal plot (or other methods) to obtain the kinetic parameters K_m and V_{max} , and test the effects of inhibitors of the reaction on two lab sessions. However, there are several potential problems involving this lab exercise. Students vary widely in ability to understand and calculate enzyme specific activity, and many have problems understanding and performing the double-reciprocal plot. Additionally, individual lots of Sigma DOPA vary widely in properties. Many lots oxidize and turn color at high or low pH, substantially skewing pH curves, while others do not. The same lot of DOPA must be used for all the experiments. Additionally, recent lots of Sigma tyrosinase have a different appearance and very different kinetic parameters than previous lots. This is likely due to changes in source mushroom species or in purification of the enzyme. We will discuss these and other practical aspects for performance of this lab in a classroom setting.

- T99 BRUCE K. KIRCHOFF¹. Department of Biology, University of North Carolina at Greensboro¹. Woody Plants of the Southeastern United States: A Field Botany Course on CD.

□Woody Plants of the Southeastern United States: A Field Botany Course on CD□ is a cross-platform (Windows & Mac) program designed to efficiently teach plant identification. It does this by helping users become visual experts in species recognition. Unlike novices, experts are able to quickly recognize patterns. This allows chess masters to recognize chess configurations, and botanists to identify species from a glimpse out the window of a moving vehicle. The program helps students rapidly achieve this mastery by adapting techniques from cognitive psychology to the task of species recognition. It is designed to promote holistic processing, the visual processing mode used by experts. It is the only program that allows the student to learn in the same visual mode used by experts. Most programs require students to learn characters analytically. This analytical training must be overcome as the student becomes an expert at identifying plants in the field. Although initially only available for Windows, a new Mac version has just been produced. Other new developments in the program allow instructors to define study sessions for students, and to track student progress by way of output files that record students' grades on the various quiz and test routines. These enhancements make the program even more useful in a classroom setting.

- T100 NICOLE T. WELCH¹. Mississippi University for Women¹. General Ecology students' misconceptions about carbon cycling and energy transfer as revealed by diagnostic question clusters.

An understanding of the ecological measures used to study global climate change requires comprehension of the Laws of Thermodynamics and the ability to scale the cellular processes of photosynthesis and cellular respiration to the ecosystem level. As part of a national project, this research used diagnostic question clusters to identify student understanding of, and misconceptions concerning, the transfer of matter and energy. Twenty-two students enrolled in a 300-level General Ecology course voluntarily

completed pre- and post-test diagnostic question clusters during the Fall 2008 semester. Pre-tests were administered prior to, and post-tests following, lectures on photosynthesis, cellular respiration, ecosystem ecology or global climate change. Pre-tests revealed that most students believed carbon incorporated by plants comes from the soil. Likewise, most incorrectly traced carbon released during decomposition back to the soil. More than 30% of the students retained these misconceptions following the lectures on ecosystems dynamics. The vast majority of students believed that both matter and energy can be recycled prior to instruction, whereas > 75% of students corrected this mistake following instruction. Finally, >80% of the students thought that nutrients, water and carbon dioxide, in addition to sunlight, are sources of energy for plants and this mistake persisted following instruction for >50% of the students. It is clear that students struggle to comprehend and apply the Laws of Thermodynamics to biological systems. Introductory biology textbooks and courses should broaden the biochemical, cellular approach to teaching photosynthesis and cellular respiration to include their roles in larger-scale concepts.

T101 – Cancelled

T102 JO A. LEWIS¹. Alabama Department of Conservation and Natural Resources¹. Forever Wild: Alabama's Conservation Land Acquisition Program, a Brief Overview and Progress Report.

The Forever Wild Program is Alabama's conservation land acquisition program established in 1992 with the Constitutional amendment 543. This amendment was supported by 83% positive votes. This program is supported by a percentage of the interest income developed on the Alabama trust fund which is built on natural gas royalties from State lands. The program has acquired fee simple title to 67 tracts totaling about 140,000 acres of undeveloped land in Alabama. These lands are managed with multiple use philosophy, encouraging natural resource protection, outdoor recreation, hunting, and State Parks. Project area of particular note are; the Mobile Tensaw Delta, The Walls of Jericho, The State Cattle Ranch, and the Perdido River.

T103 DIANE R. NELSON¹, LISA M. JONES² AND JEANNE ZAVADA³. East Tennessee State University¹ National Marine Fisheries Service² ETSU Natural History Museum³. "Shark School" and "Shark Pup School" at the ETSU Natural History Museum.

The ETSU Natural History Museum provides exceptional opportunities for education for all age groups. The museum, located off I-26 between Johnson City and Kingsport, TN, offers tours, permanent and traveling exhibits, outreach programs, resources for teachers, and other educational programs. See the website for more details: www.grayfossilmuseum.com. As part of the educational program in conjunction with the "Ocean Gems" exhibit of underwater marine photographs by Diane Nelson, "Shark School" and "Shark Pup School" were offered in September 2008. "Shark School," designed for children ages 8-12, was held on three Saturday afternoons with three sessions per day, 10 children per session. One session of "Shark Pup School" was offered as an "after school" program for 15 kids ages 5-7. Students participated in a Q&A session based on the Florida Museum of Natural History's "Shark Awareness" program, and they observed real shark jaws, fossil teeth, skeletons, brains, and embryos and egg cases. The highlight of "Shark School" was participation in the dissection of a frozen shark, provided by Lisa Jones, NMFS. "Shark Pup School" students "dissected" a 6' stuffed animal shark. A zipper along the ventral side allowed the removal of "organs," including a "stomach" with a Velcro opening to reveal the "food." Both programs were highly successful and involved a total of over 100 students.

- T104 C. BRIAN ODOM¹. Wingate University¹. Teaching using Free and Open Source software for the undergraduate laboratory.

In sharp contrast to the old adage that "you always get what you pay for", many free and open source software (FOSS) titles exhibit excellent suitability and usability for laboratory instruction (and even many research applications) by providing equivalent, if not superior, alternatives to more costly "commercial" software packages. From generalized office suites, to statistical analysis packages to the most exacting DNA analysis packages, FOSS applications enable the instructor to equip entire laboratory sections with identical software at no cost to the school or to individual students. This presentation gives an overview covering areas from laboratory-helpful general applications to more specialized statistical and genetic analysis packages as well as their potential uses in the teaching laboratory.

- T105 JENNIFER E. LAYTON¹ AND THANE WIBBELS¹. UAB¹. A Teaching Module in Sea Turtle Genetics: Sea Turtle CSI.

This teaching module was developed for high school and college level students based on sea turtle conservation and genetics. The module is targeted to teach concepts of wildlife conservation management through the application of genetic techniques and is designed as a portable experiment that can be conducted in the classroom. Students are initially given a series of multimedia presentations that provide background in sea turtle biology, conservation, and molecular genetics. Students take part in a scenario in which they are wildlife conservation agents and must identify sea turtle tissue samples that have been confiscated by customs officials. Students are assigned unknown samples of loggerhead sea turtle DNA. Their goal is to identify the haplotype (and origin) of the sample via PCR, gel electrophoresis, and DNA sequencing analysis. The protocol teaches pipetting skills and the students amplify a fragment of the mtDNA d-loop using PCR. Students make their own gel and conduct gel electrophoresis. During the final portion of the module, the students use a sequence alignment program to analyze the unknown sequence and determine the haplotype of their turtle DNA. Based on previous data that examined the distribution of various loggerhead haplotypes, students infer the location that the confiscated tissue originated. The goal of the module is to give a basic understanding of molecular biology and its applications to conservation. This module is currently being implemented at Birmingham area high schools, the UAB Center for Community Outreach and Development (CORD), and to college students at Dauphin Island Sea Lab.

- T106 DAVID A. EAKIN¹. Eastern Kentucky University¹. Revealing the principles of scientific inquiry through use of a single topic course: Water - The Matrix of Life.

The presenter will address the advantages of using Water as the unifying topic for introducing students to the principles of science and the scientific method. This approach allows both the physical and biological sciences to be introduced within the same course - using one of the most important topics facing our world. Headlines like "Water Shortage Worsening in Georgia" serve as a reality check that our United States will not be exempt from water scarcity and shortages commonplace around the world. "With water supplies rapidly shrinking during a drought of historic proportions, Gov. Sonny Perdue declared a state of emergency. . . and asked President Bush to declare it a major disaster area". These words reflect worldwide water problems. No longer can we dismiss such reports as exceptional or unusual. They foreshadow a global crisis that will touch every life and political jurisdiction. Can this be solved by tightening our water "belts" - or do the words of Georgia's Lt. Governor fire a warning 'shot heard round the world'? "This is not something we can conserve our way out of". Water equals life and water is scarce. Water - not oil - is becoming the new currency of power on the "blue planet". Is it possible that history will

mark Earth itself as a "major disaster area"? The time has come to challenge students to explore our own planet as a new frontier; one in which - regardless of race, religion, culture or politics - present and future water shortages challenge life on earth. The author's experience in creating and developing such a course will be presented.

T107 DAVID A. EAKIN¹. Eastern Kentucky University¹. Are biology departments missing a golden opportunity to spearhead the teaching of aging and wellness to our undergraduates?

This presentation will focus on the addition of a Biology of Aging course to our curriculum. This has been in place since the fall semester of 2000. Ultimately it has resulted in our department playing a major role – in both the Gerontology Minor, and the Wellness courses available at our university. It was originally developed as one of four core courses in our Gerontology Minor following the recommendations of the Association for Gerontology in Higher Education [AGHE]. Our presenter both created and has been the sole instructor for this course. In addition, as a member of the General Education Committee, he contributed to the restructuring of General Education courses at Eastern Kentucky University. He advocated and won approval for the selection of this course [slightly modified] as one of only four Wellness courses available to students. His experience has convinced him that biology departments are missing a golden opportunity to spearhead the teaching of wellness and aging to non-majors and majors.

T108 CHRISTOPHER G. BROWN¹. Vanderbilt University¹. Unorthodox tastes: active appropriation of an anti-herbivore defense by trichome-seeking *Neochlamisus* leaf beetles.

We show a rare example of an herbivore that not only bypasses its host's physical defenses, but actually seeks out more heavily defended leaves, steals the defense, and manipulates it for its own benefit. Many plant species possess cellular hairs on the leaf cuticle (trichomes) that entangle, obstruct, and repel arthropod herbivores. Most insects prefer to feed, rest, and oviposit on leaves from which the hairs have been removed. Using field collecting and an array of varied experiments, we show that larval *Neochlamisus platani*, a small leaf beetle that lives only on the rather hairy leaves of American sycamore *Platanus occidentalis*, are not only willing and able to feed equally on leaves with different trichome densities, but prefer to spend time on leaves with denser trichomes. In a series of laboratory choice tests, larval *N. platani*, unlike other insects, sought out pubescent leaves when tested with leaf discs, cuttings, and whole leaves attached to branches. In the field, larvae were also found on much more pubescent leaves than eggs, indicating that females oviposit on leaves without regard to trichome density, but that larvae later settle only on fuzzy foliage. Behavioral observations found that young larvae may be slowed by trichomes, but all ages can clip and remove trichomes before feeding and older larvae often eat the trichomes. *N. platani* are casebearers, meaning that larvae carry and maintain a case of fecal material which protects them from arthropod predators. More than any other casebearer, *N. platani* larvae incorporate trichomes from their host into and onto their case material. Although we found no evidence that trichomes embedded in cases provide extra strength, trichomes incorporated into cases have been shown to lower threat from predators. Truly an unorthodox plant-insect and prey-predator interaction with unique ecological and evolutionary consequences for the plant, herbivore, and its predators.

T109 ROBERT W. THACKER¹, JULIE B. OLSON² AND DEBORAH J. GOCHFELD³. University of Alabama at Birmingham¹ University of Alabama² University of Mississippi³. *Aplysina* Red Band Syndrome: An infectious disease of coral reef sponges.

Disease is often implicated as a major factor contributing to continuing declines in the health of Caribbean coral reef communities. Most studies of coral reef diseases have focused on scleractinian corals, whereas sponge diseases have been less frequently documented. We are currently investigating *Aplysina* Red Band Syndrome (ARBS), which affects Caribbean rope sponges. Visible signs of disease presence include one or more rust-colored leading edges, with a trailing area of necrotic tissue, such that the lesion forms a contiguous band around a portion of or the entire sponge. Microscopic examination of the leading edge of the lesion indicates that filamentous cyanobacteria are responsible for its coloration. Although the presence of this distinctive coloration is used to characterize the diseased state, it is not yet known whether this cyanobacterium is the causative agent of this disease. ARBS is present throughout the Caribbean; studies in Belize and the Bahamas revealed that up to 10% of *Aplysina cauliformis* sponge populations are infected. Transmission studies in the lab and field demonstrated that contact with an active lesion's leading edge was sufficient to spread ARBS to healthy sponges, suggesting that the etiologic agent is contagious. Population studies indicate clumping of diseased individuals on the reef, but the presence of affected individuals in isolation suggests that waterborne transmission is also likely. Studies to elucidate the etiologic agent of ARBS are ongoing. Sponges are an essential component of coral reef communities and emerging sponge diseases have the potential to impact benthic diversity and community structure on coral reefs.

- T110 DANYELLE N. DEHNER¹, ROBERT U. FISCHER¹, SCOTT J. MEINERS² AND KEN R. MARION¹. University of Alabama at Birmingham¹ Eastern Illinois University². The effects of agricultural disturbance on life history of the central stoneroller (*Campostoma anomalum*).

In Illinois, a large portion of the terrestrial landscape associated with streams has been modified for agricultural activity. Stream channel modifications such as channelization and removal of riparian zones have been implemented to alleviate flooding and drainage problems and to improve land accessibility. These disturbances have resulted in a loss of habitat heterogeneity and have created unstable environmental conditions which may have an effect on the life history strategies of fish. However, little research has been conducted on life history changes associated with stream fish populations affected by agricultural disturbance. Polecat Creek in east-central Illinois provided the opportunity to test life history theory across a variety of disturbance regimes. Six 150 m reaches on Polecat Creek were evaluated for habitat quality using the Illinois EPA 10-transect method. Once habitat quality was shown to differ among sites, central stonerollers were collected from these sites approximately biweekly from April 2008 to July 2008 in order to determine if differences in habitat quality may have resulted in differences in life history. Life history characters including gonad weight, age at first reproduction, longevity, and growth rates were different among sites. These results suggest that agricultural disturbance has affected the life history strategies of central stonerollers living in different segments of Polecat Creek. Information obtained from this study will provide researchers with a better understanding of how stream populations respond to environmental disturbance and provide evidence of habitat variables that are essential for maintaining viable populations.

- T111 CHRIS L. RICE¹ AND KIM M. TOLSON¹. The University of Louisiana at Monroe, Monroe, LA 71209¹. Cavity temperature of water tupelo (*Nyssa aquatica*) trees as a possible effect on roost site selection by *Corynorhinus rafinesquii* (Rafinesque's big-eared bat).

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". Throughout its range, this species is known to roost in water tupelo (*Nyssa*

aquatica) tree cavities. Tree cavities of 59 potential roost sites (water tupelo; bald cypress, *Taxodium distichum*; willow oak, *Quercus phellos*; and water oak, *Quercus nigra*) were searched for eighty-two days from May 2007 to January 2009. During the winter of 2007, twelve individuals were radio-tracked for 52 days to determine winter roost site preference. The data revealed that *C. rafinesquii* might select different "types" of water tupelo tree cavities during the summer than in the winter. The tree types have been 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). Research efforts were initiated at the Upper Ouachita National Wildlife Refuge in northeast Louisiana to determine if the internal cavity temperatures of the three tree types differ from one another during both the summer and winter. One temperature data logger was placed at a randomly selected height within thirty-six water tupelo trees (12 of each tree type) that were confirmed roosting sites, while two other data loggers were used to record the ambient temperature. Approximately seven months (July 2008 - January 2009) of data will be analyzed to determine the internal cavity temperature for all three tree types.

- T112 Justin L. Martin¹ and Kim M. Tolson¹. Department of Biology, College of Arts and Sciences, University of Louisiana at Monroe, Monroe, LA. 71209-0520¹. Utilizing geospatial analysis and vegetation patterns for more effective wood duck nest box placement.

Artificial nest-boxes were first used in 1937 to provide alternative nesting sites for wood ducks (*Aix sponsa*). The Louisiana Department of Wildlife and Fisheries began its nest box monitoring program in 1990. During this study, 141 boxes were surveyed. Out of the 141 boxes, 67 were located in and around Wetlands Reserve Program land, 36 were located in/around bottomland hardwood forests, and 38 were located in/around a mature mixed bald cypress and water tupelo brake. Nest-boxes were checked bi-weekly beginning on 19 Feb 2008 and continued until 1 August 2008. Variations in clutch size, nest initiation, nest success, and nest-box utilization were recorded. The average clutch size of WRP was 13.81 ± 3.67 . The average clutch size for BLH was 13.8 ± 2.95 . CWT had an average clutch size of 14.1 ± 3.18 eggs. The first nest initiation in this study was 11 Feb 2008 while the last nest was initiated on 28 June 2008. WRP had the greatest amount of nest success. Average nest box utilization for WRP was 42.2%, BLH 30.2%, and CWT 23.1% during the study. Nest predators were also documented. Other animals that utilized the boxes were also documented. A base map of the study areas were constructed using ARCMAP GIS. Additionally a land use/land cover map of the study areas was created to diagram the current nest-box placement of the study areas. Nest-box data along with the mapping data will be combined to develop a strategic plan for wood duck nest-box management in Louisiana.

- T113 LINDSAY L. DREVLLOW¹ AND CARLOS D. CAMP¹. Piedmont College¹. Production of chitinase by potential gut-dwelling fungi in lungless salamanders.

Mutualisms are important to the organization of many communities. Certain lungless salamanders (family Plethodontidae), for example, possess a cutaneous microflora, some components of which produce antifungal metabolites. Plethodontid salamanders brood their eggs, which invariably succumb to fungal attack in the absence of the mother, raising the question as to the source of the attacking fungus. If it lives in the salamander's gut, she may infect the eggs upon oviposition. Because some fungi produce chitinase, this raises the possibility that the fungus provides a digestive benefit to the salamander, which, as an insectivore, consumes large quantities of chitin. We tested the hypothesis that potential gut-dwelling fungi produce chitinase. We first examined skin of the Ocoee Salamander (*Desmognathus ocoee*) for fungi-inhibiting bacteria. We collected hyphae from infected eggs as well as additional fungi from salamander feces. We also collected

fungi from the feces of the Chattahoochee Slimy Salamander (*Plethodon chattahoochee*) and the Southern Two-lined Salamander (*Eurycea cirrigera*). We tested for both endochitinase and exochitinase activity with a Chitinase Assay Kit (Sigma-Aldrich®). We found three morphologically distinct bacterial isolates that showed significant antifungal properties. The fecal fungus from *P. chattahoochee* demonstrated significant exochitinase activity; the egg-killing fungus showed significant activity for both endochitinase and exochitinase. Although we do not know the source of the egg-killing fungus, our results raise the possibility of a three-way mutualism: the fungus increases digestive efficiency of the salamander but simultaneously threatens egg development, which in turn is protected by components of the cutaneous microflora.

T114 CLAUDIA E. HAGAN¹, LESLEY A. MOBLEY¹ AND RENEE E. CARLETON¹. Berry College¹. Severe drought conditions in fall and winter negatively affects eastern bluebird reproduction.

Eastern bluebird, *Sialia sialis*, reproduction in northwestern Georgia was monitored over four breeding seasons (March through August of 2004, 2005, 2006, and 2008) under conditions of moderate (2003-2006) to exceptional (2007-2008) drought. The amount of precipitation recorded during the period encompassing one year prior to the study through August of 2008 was lowest in 2007 (28.71 inches per year) and highest in 2003 (59.59 inches per year). The number of eggs produced was 22%, 11%, and 17.5% less in 2008 than in 2004, 2005, and 2006 respectively. The percentage of eggs hatching per number of eggs produced and date of first egg production was not affected by amount of precipitation in any year. Amount of precipitation during pre-breeding season months (September through February) appeared to be more influential on egg production than amount of precipitation during breeding season months. Less rainfall was recorded between September 2007 through February 2008 (14.93 inches) than for the same pre-breeding periods of 2004, 2005, or 2006 (18.36, 28.02, and 20.46 inches respectively) while amount of precipitation during the breeding season of 2008 (26.14 inches) was not less than that recorded in 2004, 2005, or 2006 (27.89, 28.75, and 18.79 inches respectively). Additionally, September of 2007 was one of the driest on record according to the National Weather Service. Survival and territory fidelity of older bluebirds may have been negatively affected by the drought conditions of 2007 as few birds banded in previous years were recaptured in 2008. Decreased rainfall likely reduced food resources such as insect prey populations and soft mast.

T115 CHARLOTTE K. STEELMAN¹ AND MICHAEL E. DORCAS¹. Davidson College¹. The effects of airplane noise on anuran calling.

Declines in amphibian populations have increased the need for understanding the effects of human activity on amphibians. Recently, animal behaviorists and conservation biologists have become concerned with the effect of anthropogenic noise on wildlife. For species such as anurans that rely on acoustic communication, anthropogenic noise can have profound effects on their populations by interfering with their ability to communicate. In an effort to understand how anthropogenic noise affects anuran calling activity, we measured anuran calling activity and airplane noise at two ephemeral wetlands in the western Piedmont of North Carolina using automated recording systems. Recordings were listened to in the lab, and both anuran calling activity and airplane noise were evaluated using ordinal scales. Using the cumulative odds model of ordinal logistic regression, we determined if airplane noise significantly affected the calling behavior of *Acris crepitans*, *Bufo fowleri*, *Gastrophryne carolinensis*, *Hyla chrysoscelis*, *Pseudacris crucifer*, *Pseudacris feriarum* and *Rana sphenoccephala*. Results showed that *A. crepitans*, *H. chrysoscelis*, *G. carolinensis* and *R. sphenoccephala* called significantly less when airplane noise levels were high than when airplane noise levels were low. Thus, our results

suggest that anthropogenic noise may negatively influence the calling activity and, ultimately, the reproductive success of many anuran species.

- T116 PAUL E. SUPER¹, KEITH LANGDON², BECKY J. NICHOLS² AND BENJAMIN ZANK². Appalachian Highlands Science Learning Center, NPS¹ Great Smoky Mountains National Park, NPS². Research in Great Smoky Mountains National Park—Taking the All Taxa Biodiversity Inventory to the Next Level.

The All Taxa Biodiversity Inventory (ATBI) in Great Smoky Mountains National Park, launched in late 1997, has completed its first eleven 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, 2008, the effort has documented 890 species previously unknown to science and over 6,000 additional new park records for a total park species count of 16,762. Similar ATBIs have been initiated or planned in protected areas across the country and in Europe. A new structured sampling program will be launched in 2010 based on a biostatistical review to be completed in early 2009. In addition, researchers and park managers are already using this dataset in a variety of new directions, including probability mapping of species distributions, using DNA barcoding to identify prey items in stomach contents, ecological studies of potential pathogens, and how diversity changes across the park with elevation and habitat. Additional research interests and opportunities within the park are further discussed.

- T117 NABIL A. NASSERI¹, LANCE D. MCBRAYER¹, THOMAS E. GOODWIN² AND BRUCE A. SCHULTE¹. Georgia Southern University¹ Hendrix College². The impact of African elephants (*Loxodonta africana*) on herpetofauna species diversity and richness in savanna woodlands of northern Tanzania.

African elephants (*Loxodonta africana*) are a major contributor to natural habitat alteration, but this can result in degradation, especially where elephants are limited in their movements. Elephants transform dense woodlands into open grasslands, by encouraging succession and controlling bush encroachment. Indicator species provide a metric for determining the extent of habitat alteration because they are sensitive to subtle ecosystem changes. In the present study, herpetofauna were used as indicator species to evaluate the impact of elephants on a savanna woodland habitat. Specifically, herpetofauna diversity and richness were compared in areas that varied in the degree of elephant impact on the woody vegetation (*Acacia* spp.). Our study was conducted at Ndarakwai Ranch in northeastern Tanzania. Elephants moving between three National Parks in Kenya and Tanzania visit this property. In 2007-08, we erected drift fences and pitfall traps to sample herpetofaunal diversity and species richness within the damaged areas and in an exclusion plot. We captured 142 individuals comprising 14 species of reptiles and nine species of amphibians. Areas of heavy damage yielded higher species richness than the exclusion plot. Species diversity did not differ between the damaged areas and the exclusion plot. Non-bufonid species were more abundant in areas of high damage; in contrast, bufonid species were found in greater abundance in medium damage areas and the exclusion plot. The results support the idea that elephants are not causing habitat degradation, but may in fact have a positive influence on herpetofaunal species by promoting habitat heterogeneity.

- T118 JOSEPH R. BURGER¹, ADRIAN S. CHESH², RODRIGO A. CASTRO³, LILIANA ORTIZ TOLHUYSEN³, PAMELA MUÑOZ⁴, FERNANDO FREDES⁴, LUIS A. EBENSPERGER³ AND LOREN D. HAYES¹. Department of Biology, The University of Louisiana at Monroe¹ Department of Zoology, Miami University² Centro de Estudios Avanzados en Ecología & Biodiversidad & Pontificia Universidad Católica de Chile³ Facultad de Ciencias Veterinarias y Pecuarias, Universidad de Chile⁴. Parasitism and fitness in the social South American rodent, *Octodon degus*.

Group-living may increase contact between individuals infected with parasites and those that are susceptible. High levels of parasitism may be linked to a decrease in reproductive fitness in social animals. We test these two hypotheses regarding the interactions between sociality, parasitism and fitness. We predict that there is a positive relationship between social group size and parasite load, and a negative relationship between parasite load and per capita fitness (PCF) of social groups. We test these predictions using field data from the social, semi-fossorial rodent, *Octodon degus*. We quantified degu social groups using a combination of live-trapping and radio-telemetry in a semi-arid habitat in central Chile. We determined parasite loads by sampling ectoparasites through combing and endoparasites via egg counts from feces. We calculated PCF based on the emergence of pups from the burrow systems each social group was known to use. We found that endoparasite prevalence and intensity appear to increase with *O. degus* social group size while ectoparasites do not. We also found a negative relationship between PCF and ectoparasite intensity of females during lactation. The intensity of the flea *Leptopsylla* was less than that of *Xenopsylla*, however only *Lyptopsylla* intensity had a negative impact on PCF. Although endoparasitism increases with group size, it does not appear to have an affect on PCF. Ectoparasitism decreases PCF in *O. degus* but is not a cost of sociality. Degu social groups may provide "biological islands" for endoparasites. Benefits of social living, such as allogrooming, may control ectoparasites.

- T119 JON M. DAVENPORT¹ AND DAVID R. CHALCRAFT¹. East Carolina University¹. Larval dragonflies scare the shape out of larval salamanders.

Intermediate predators frequently persist with top predators in nature despite both consumptive and competitive pressure by top predators. One mechanism that may promote persistence of top and intermediate predators is the ability of the intermediate predator to alter their behavior and/or morphology in such a manner as to decrease their susceptibility to predation or increase their competitive ability. Traits that enhance competitive ability, however, may conflict with traits that reduce susceptibility to predation. We conducted an experiment in which we measured the behavioral and morphological responses of an intermediate predator (*Ambystoma opacum*) to the presence of a nonlethal top predator (*Anax* spp.) at three densities of an intermediate predator during different stages of ontological development. The nonlethal presence of *Anax* caused *A. opacum* to develop shorter tails during intermediate stages of development when *A. opacum* was present in low abundance but not high abundance and the effects disappeared just prior to metamorphosis. *A. opacum* also developed a shorter torso and were less active in the presence of non-lethal *Anax* regardless of *A. opacum* abundance during early developmental stages but the effects disappeared just prior to metamorphosis. Our results indicate that intermediate predators alter their larval phenotypes in response to top predators and future efforts need to evaluate whether these changes reduce intermediate predator susceptibility to top predators. A high abundance of conspecifics, however, may impose conflicting demands on intermediate predators that prevent the expression of an entire suite of morphological defenses to top predators.

- T120 ANNE MARIE LEBLANC¹, THANE WIBBELS¹, MARCO ANTONIO-P², GLORIA TAVERA³, DIANA J. LIRA-R.², HECTOR J. MARTINEZ-O.², JAIME PENA-V.², PATRICK M. BURCHFIELD², EARL POSSARDT⁴ AND BARBARA SCHROEDER⁵. UAB¹ Gladys Porter Zoo² CONANP³ U.S. Fish and Wildlife Service⁴ NMFS, NOAA⁵. Ecological Implications of the Arribada Phenomenon in the Kemp's Ridley Sea Turtle.

The Kemp's ridley was near extinction in the mid 1980's and has since been the subject of an intense international conservation effort. On the primary nesting beach near Rancho Nuevo, Mexico, nests have historically been relocated to protected egg corrals. Because of this and other conservation measures, the number of nesting females has steadily increased for over the past two decades. The gradual increase in the number of nests has necessitated many nests being left in situ during recent years. During the 2005-2008 nesting seasons, temporal and spatial aspects of predation on in situ nests were examined. The overall nesting pattern varied between years. The extremes were represented by 2007, when a relatively large and geographically concentrated arribada occurred, as opposed to 2008, when the overall number of nests was similar however, the nests were not spatially concentrated. Each season, subsets of in situ nests were examined twice daily near the time of hatch for predator tracks. Predators were also observed nightly via wildlife cameras and night vision equipment. The results indicate that the main nocturnal predators are coyotes, raccoons, and skunks. Also, ghost crabs, birds, flies and ants impacted egg/hatchling survival. In 2007, temporally and spatially concentrated nesting may have allowed for predator satiation and therefore, depredation did not appear as severe as 2008. During 2008, the nests were not spatially concentrated and as such, given the same number of predators in an area, nest depredation appeared heavier.

- T121 EVAN A. ESKEW¹, STEVEN J. PRICE¹ AND MICHAEL E. DORCAS¹. Davidson College¹. Survivorship and Recruitment of Painted Turtles (*Chrysemys picta*) in Complex Suburban Landscapes.

Populations of long-lived animals, such as semi-aquatic turtles, that depend on high survivorship of reproductive adults are particularly susceptible to the negative effects associated with anthropogenic habitat modification. Survivorship and recruitment of turtle populations in suburban landscapes may be reduced as a result of a number of factors including the elimination of appropriate nesting habitat, the introduction of human subsidized predators, and reduced connectivity between aquatic habitats. We studied eastern painted turtle (*Chrysemys picta*) populations at five ponds in the Charlotte-metropolitan area: two ponds underwent development after the first year of study, one was on a golf course, and two were farm ponds. We used Program MARK with AIC model selection methods to generate open population models examining the effects of location, sex, and size (plastron length and mass) on survivorship and recruitment. Our results showed relatively stable population sizes across all ponds, with the largest population (approximately 110 turtles) occurring at a developed site. Model comparisons showed support for variable, site-specific adult survivorship (approximately 70-90%). Males had lower survivorship than females, possibly as a result of increased male emigration. Recruitment estimates were highest (approximately 20% and 40%) at our two developed ponds suggesting that movement at these sites has not yet been severely affected. Our results emphasize the importance of landscape-scale factors (e.g. forest cover) that may influence population demography in turtles and indicate that long-term studies of turtle populations in suburban habitats are needed in order to fully evaluate the effects of anthropogenic modification on these animals.

- T122 KATHERINE J. BURCHETT¹, WANDA S. MORRIS¹ AND MAYNARD H. SCHAUS¹. Virginia Wesleyan College¹. Role of semiaquatic turtles in lake nutrient cycling.

Consumers such as fish and zooplankton have been shown to contribute substantially to aquatic nutrient cycles. Despite the abundance of freshwater turtles, our review of the literature found no studies quantifying the degree to which turtles contribute to lake nutrient cycles. We conducted a mesocosm experiment which examined the effect of semiaquatic turtles on nutrient cycling and aquatic community composition. Ten turtles of three species, *Trachemys scripta elegans* (N=5), *Pseudemys rubriventris* (N=3), and *Chrysemys picta picta* (N=2), were randomly assigned to one of 15 tanks which contained 1000L of lake water, lake sediments, untreated lumber (a basking spot) and 280 g of *Hydrocotyle umbellata*, a floating plant typical of nearby ponds. The remaining 5 tanks were designated as control tanks. Over a 3-week period, total suspended solids (TSS), turbidity, total phosphorus, total nitrogen, chlorophyll-a, and zooplankton abundance were measured among tanks and controls. Additional *H. umbellata* was also added weekly, as turtles typically consumed much of this during the week. At the conclusion of the experiment, the final plant biomass and insect abundance was quantified and measurement of nutrient excretion by turtles was conducted. Control tanks were dominated by floating vegetation, whereas consumption of vegetation by turtles (especially *C. picta picta*) and subsequent nutrient excretion led to phytoplankton dominance. Phosphorus levels were also higher in tanks with turtles, especially *C. picta picta*. These results indicate that turtles may have important effects on pond communities, especially where their biomass is high.

- T123 YONG WANG¹, JILL WICK¹ AND CALLIE SCHWEITZER². Alabama A&M University¹ USDA Forest Service, Southern Research Station². Avian community response to prescribed burning and logging at Bankhead National Forest of northern Alabama.

We evaluated the changes in the bird community in relation to six silviculture treatments in the Bankhead National Forest, AL. The study design is randomized complete block with a factorial arrangement of three thinning levels (no thin, 11 m²/ha residual basal area [BA], and 17 m²/ha residual BA) and two burn treatments (burn and no burn), with three replications. Data were collected from pre- and post-treatment avian line-transect and microhabitat surveys. Canonical correspondence analysis (CCA) was used to evaluate relationships between bird community and microhabitat characteristics. Multivariate analysis of variance was used to test effects of treatment and change over time. Abundance of bird species and nesting guilds of birds were associated with ground cover and canopy cover. Abundance of tree and cavity nesting birds increased in burned plots and decreased in control and thinned plots. Abundance of foliage foraging birds and interior/edge habitat dwelling birds decreased in plots that were thinned and burned. Abundance of edge/open habitat dwelling birds increased in thinned plots. Abundance of Prairie warblers (*Dendroica discolor*), a species of high concern in Alabama, increased in number of detections on treated plots. Tree thinning had more impact on the bird community than prescribed burning.

- T124 LISA M. GARDNER BARILLAS¹ AND YONG WANG¹. Alabama A&M University¹. Age-related stopover ecology of songbird species during fall migration at an inland site of the Cumberland Plateau of northern Alabama.

Bird migrants are adapted to the annual movement between their breeding and wintering grounds. During fall migration, a majority of the individuals captured at stopover sites are often hatching year birds. It is expected that these young birds are less experience in

dealing with migration or stopover contingencies such as orientation, migration timing, acquiring food and avoiding predation. We tested this hypothesis by examining age-related variations in stopover parameters of migrating songbirds at the Walls of Jericho Management Area of the mid-Cumberland Plateau in northeastern Alabama during fall 2006 and 2007. We compared differences in arrival time, body mass, fat scores, stopover length, and rates of mass gain between adults and hatching year birds of American Goldfinch, Indigo Bunting, Ovenbird, and Northern Waterthrush. These species were abundant at the study site during the study period and represented a range of species with different migration distance. We also examined the age related habitat association by comparing the stopover parameters of the birds associated with two types of habitats in the area: wetland and forest. Because of their inexperience, we expect that hatching year birds arrive later, having lower body mass upon arrival and a slower rate of mass gain during stopover, and stopped for a longer period than adult birds. Management implications for the conservation stopover migrants and inland stopover sites will be discussed.

T125 THOMAS S. WRIGHT¹. University of Alabama at Tuscaloosa¹. Time and depth-related interstitial food webs in a third-order Alabama coastal plain stream.

Interstitial habitats are lightless habitats consisting of water filled pores within a solid or sedimentary substrate. The absence of photosynthesis usually necessitates a detritally - based ecosystem consisting of invertebrate meiofauna--organisms between 45 and 500 micrometers in length. These ecosystems usually support a basal trophic level consisting of detritus or microbes, intermediate trophic levels consisting of detritivores, and upper trophic levels consisting of predatory invertebrates. This study concerned the benthic sediments of Mayfield Creek, a third-order sandy bottom stream located in the Talladega National Forest, Bibb County, Alabama. The purpose of the study was to ascertain the species making up the basal, intermediate, and top trophic levels of the food web, as well as linkage patterns and density. Collection of organisms was carried out by insertion of a 30 x 7 cm PVC push core, with the cores separated in situ into three 10 cm sections representing the upper, middle, and deeper portions of the sediments. Organisms were removed from the sediment, mounted on slides and identified to the lowest possible taxonomic grouping; gut contents, if present, were also analyzed with the aid of an oil-immersion light microscope. Interaction webs for all depths and months of the study were constructed using the index of relative importance (IRI) and quantitative differences between time- and depth-related webs were analyzed via nonparametric multivariate statistics.

T126 Nathan V. Whelan¹, Jon C. Gering², Dean R. DeCock², Tracey Blasingmae² and Bryan Hartwig². University of Alabama¹ Truman State University². Advances in the statistical methodologies of phylogenetic community ecology.

The emerging subdiscipline of phylogenetic community ecology (or community phylogenetics) advocates the use of phylogenies to understand the coexistence of species in a community. However, current methods for the statistical determination of phylogenetic clustering and overdispersion lack consistencies across studies, with both parametric and non-parametric tests being utilized. We analyzed the distributions of the Net Relatedness Index (NRI) and Nearest Taxon Index (NTI) for a variety of realistic phylogenetic and community scenarios to determine if parametric or non-parametric tests were more appropriate for calculating statistical significance. We then sought to improve upon these widely utilized statistics by incorporating a metric that accounts for abundance figures in the calculation of phylogenetic clustering and overdispersion. We introduce WPD, a new statistic for testing the relative abundance structure of communities in a phylogenetic context. To illustrate the function and importance of WPD, we manipulated local (i.e., sample) and regional (i.e., phylogenetic) species pools and their relative abundance

structures. As WPD is based on abundance rather than species richness, we propose it be used complementarily with other abundance-free statistics such as NRI and NTI. The statistical advances presented herein should further advance this expanding subdiscipline.

- T127 LIVIA R. CARA¹, KRISTEN B. KING¹, LINDSAY M. KIRKLAND¹, JAMES R. RAYBURN¹ AND FRANK A. ROMANO III¹. Jacksonville State University¹. Comparison of abundance of marine life species at St. Andrews State Park and the Dry Tortugas National Park.

As part of the tropical biology class offered by Jacksonville State University, the class stressed identification species emphasizing coral reef fishes and invertebrates. The class visited sites along the Florida Gulf Coast from the panhandle (St. Andrews Bay) to the Florida Keys and the Dry Tortugas. One of the main goals of this course was to identify marine species in several coral reefs and collect the data on abundance of different marine species. This course exposed us to over one hundred different species of animals in a ten day period. The purpose of this talk is to compare two sites from 2004 and 2008. We utilized Reef Fish Survey method available from Reef Environmental Education Foundation as a model for all surveys conducted. We snorkel in these two sites and used the visual scoring system which is based upon the Roving Diver Technique used by the Foundation. The abundance was scored as follows: Abundant = 100 individuals seen, Many = between 11 and 100 individuals seen, Few = between 2 and 10 individuals seen, Single = only one individual seen. There were more species identified from the Dry Tortugas than found at St. Andrews Bay for both 2004 and 2008 trips. The number of specific species abundance was different between the two years. Overall this class introduced students to the importance of coral reefs and the diversity of life that live there.

- T128 DENNIS C. HANEY¹, ANDRE MEDINA², MEIGHAN DIXON¹ AND MELISSA ARD³. Furman University¹ Universidad Metropolitano² Valdosta State University³. Effects of golf courses on fish abundance and biodiversity in the South Carolina piedmont

Golf courses are numerous in the piedmont region near Greenville, South Carolina, and have the potential to alter conditions in streams flowing through the courses. However, as of yet no study has examined the impact of golf courses on fish community structure in this region. We selected seven courses for study, and collected water and fish samples at sites upstream and downstream of each course. At each site pH, temperature, conductivity, and dissolved oxygen were measured in the field, with turbidity and major cation and anion concentrations later determined in the laboratory. Fish were collected by electrofishing for approximately 480 seconds at each site, preserved on site, and later identified to species. Standard length and mass were also measured on all individuals to obtain life history data. Water chemistry was similar at upstream and downstream sites. However, fish abundance was generally higher and Simpson's diversity was significantly ($p < 0.05$; Paired t-test) lower at upstream sites as compared to sites downstream of the courses. There were significantly lower ($p < 0.05$; Paired t-test) numbers of benthic species and intolerant or moderately tolerant fishes at downstream sites. Finally, fish community composition differed significantly between upstream and downstream sites ($p < 0.05$; Chi square tests for association) at all seven courses, with upstream sites ranging from 22% to 67% similar in their species composition (Jaccard's similarity index) as compared to their downstream counterparts. Thus, courses do seem to be affecting fish community structure despite the minor changes observed in water chemistry.

- T129 MEIGHAN L. DIXON¹ AND DENNIS HANEY¹. Furman University¹. The effects of golf courses: bioindicators of fish health.

Golf courses are a controversial form of land use, with some arguing their positive effects amidst an urban landscape and others arguing their negative effects due to land transformation and course management practices. This study examined the effects of golf courses on bluehead chubs collected from upstream and downstream sites of six golf courses located in Greenville and Pickens Counties, South Carolina. We hypothesized that because golf courses represent an extensive change in land use, there would be biological effects on the fish living in the streams running through these courses, detectable through the use of a variety of bioindicators. When comparing all upstream and downstream sites using a Wilcoxon signed-ranks test, the liver somatic index (LSI) and condition factor (CF) were significantly higher in fish collected downstream of the golf courses, while mean corpuscular volume (MCV) was significantly higher in fish collected upstream. The LSI and CF results could indicate increased food supply or increased contaminant load downstream of courses, while MCV results could be a reflection of contaminant concentration or impaired oxygen uptake or delivery at downstream sites. Although there was no distinct pattern observed for other tested bioindicators, a large number of significantly different bioindicators within each course supported our hypothesis. However, the lack of a clear pattern and opposing results among the individual golf courses leads to the conclusion that each course must be evaluated individually and the unique characteristics of the courses should be analyzed to determine the exact cause of the results observed.

T130 ANTHONY W. EILER¹, MICHAEL MENTZ¹ AND HENRY G. SPRATT¹. University of Tennessee at Chattanooga¹. A comparison of sulfate reducing bacterial activities in sediments of southeast Tennessee wetlands having different histories of contamination.

Bacterial sulfate reduction in two Chattanooga, Tennessee wetlands known to have different histories of human disturbance was studied. One wetland was located at the former Volunteer Army Ammunition Plant (VAAP), and the other wetland located on Williams Island (WI) in the Tennessee River. The VAAP wetland was the recipient of atmospheric deposition from a sulfuric acid plant associated with TNT production for nearly 30 years. The WI site is adjacent to farmed fields, but should not have received any industrial contaminants. Sediment samples (0-2.5 cm) were collected from both wetlands four times between July 2007 and February 2009. Bacterial sulfate reduction activity was determined using a radioisotope tracer study (³⁵S). Elemental analysis was used to determine total C, N, and S. DNA was extracted from wetland sediments for molecular analyses. Rates of sulfate reduction, although not significantly different, tended to be greater in VAAP than WI sediments (5.82 vs., 0.33 micromol/g/da, p= 0.064, T-test). Total S was found to be significantly greater in VAAP sediments compared with WI sediments (54.32 vs. 15.18 micromol/g, p= 0.042, T-test). DNA has been extracted from sediments from the two wetlands, however pcr work is not yet complete. Our data suggest that VAAP activities contributed to the higher levels of sulfur found in those sediments. The likelihood of there being a more diverse and higher population of SRB's in VAAP sediments would be suggested due to the higher sulfur levels. This hypothesis will be considered when pcr data collection is complete.

T131 Raj Boopathy¹. Nicholls State University¹. Bioremediation of Explosive Chemicals by Sulfate Reducing Bacteria.

Soil and water in most U.S. Military facilities are contaminated with explosive chemicals, mainly because of the manufacture, loading, and disposal of explosives and propellants. This contamination problem may increase in future because of demilitarization and disposal of unwanted weapon systems. Disposal of obsolete explosives is a problem for the military and the associated industries because of the polluting effect of explosives in the environment. TNT is the major contaminant in many U.S Army Ammunition facilities.

TNT represents an environmental hazard because it has toxicological effects on number of organisms and it is mutagenic. The disposal of large quantities of TNT in an environmentally acceptable manner poses serious difficulties. The present approach to the remediation of TNT contamination is incineration of soil, a very costly and destructive process. Bioremediation would be a safe and cost-effective method for treating TNT contamination. In our lab, we isolated a well-defined sulfate-reducing consortium consists of *Desulfovibrio* spp., namely, *D. desulfuricans* strain A, *D. desulfuricans*, strain B, *D. gigas*, and *D. vulgaris* from a TNT-contaminated soil. The ability of this consortium to degrade and remediate TNT was explored. The consortium was grown in anaerobic serum bottles under various growth conditions including TNT as the sole carbon source, co-metabolic condition with pyruvate (30 mM) as co-substrate, and heat inactivated control. Growth was observed in all conditions except in the killed control. The maximum growth was observed under co-metabolic conditions and bacteria also grew under the conditions where TNT served as the sole carbon source. In all the cultures, the initial TNT concentration was 100 mg/L. In the killed control, the TNT concentration remained constant throughout the experiment, indicating that no physical or chemical removal of TNT occurred. TNT removal was fastest in the co-metabolic condition, where 100% of TNT was removed within 10 days of incubation. TNT removal in the culture condition where TNT served as the sole carbon source was very slow, but 100% of the TNT was still removed within 25 days. The results show that the consortium can remove TNT faster in the presence of an additional carbon source like pyruvate. This could be due to an increase in the bacterial cell numbers in the pyruvate-containing cultures.

T132 RAJ BOOPATHY¹ AND LETHA DAWSON¹. Nicholls State University¹. Fuel grade ethanol production from post-harvest sugarcane residue.

Agricultural residues are produced in large quantities throughout the world. Approximately, one kg of residue is produced for each kilogram of grains harvested. This ratio of grain/residue translates into an excess of 40 billion ton of crop residue produced each year in the USA. These residues are renewable resources that could be used to produce ethanol and many other value added products. In this study, we demonstrate that the post-harvest sugar cane residue could be used to produce fuel grade ethanol. A chemical pre-treatment process using alkaline peroxide or acid hydrolysis was applied to remove lignin, which acts as physical barrier to cellulolytic enzymes. Yeast *Saccharomyces cerevisiae* ATCC strain 765 was used in the experiment. The pre-treatment process effectively removed lignin. Ethanol production in the culture sample was monitored using high performance liquid chromatography. The results indicate that ethanol can be made from the sugarcane residue. The fermentation system needs to be optimized further to scale up the process for large-scale production of ethanol from sugar cane residue.

T133 MEREDITH G. FINCH¹. Guilford College¹. Pigs, Poop, & Pathogens: Evaluation of the winter treatment of pathogens found in hog waste using an anaerobic waste lagoon system.

Since the industrialization and specialization of hog production in the 1980s management and treatment of hog waste has proved to be an environmental issue. A popular tool for treatment and storage of the liquid swine waste has been holding in a series of lagoons for primary treatment, followed by land application. Using this process is the cheapest option for farmers, but when mismanaged lagoons and land application can cause contamination of surface and ground water with many pollutants, including pathogenic bacteria. While pollutants like nitrogen and phosphorous have been extensively researched, pathogen bacteria has been seen as a secondary concern in the efficiency of the treatment process. Fecal bacteria, which include commonly known *E. coli*, can lead to health problems for humans through ingestion of tainted water and other means. In this study, conducted at the NC A&T University Farm from December 2008 to March 2009, samples were taken

from the influent and two treatment lagoons to test for total and fecal coliform levels. The purpose of the study is to examine the affect that lagoon treatment has on pathogenic bacteria when temperatures are colder in order to better understand the levels that are being applied to land in the winter. The mortality of bacteria in lagoon treatment is important to understand due to the fact that lagoon and land application is a popular method used in North Carolina and without proper knowledge mismanagement of the waste leading to contamination is more likely.

T134 ANNA WATSON¹. Shorter College¹. Abundance and Species Richness of Coliform and Environmental Bacteria in Water Pools From Six Caves in North Alabama and Northwest Georgia, USA.

Escherichia coli and other bacteria can be used as ecosystem health indicators of cave waters. However, bacteria species within caves have not been thoroughly documented, especially in the southeastern United States. The impact of bacteria on cave food webs and how humans impact bacterial abundance and species richness in cave ecosystems is unknown. Water from isolated pools was gathered along transects from 6 caves in north Alabama and northwest Georgia. Abundance and species richness of *E. coli*, other coliforms and environmental genera were determined for each cave. Distance (from the entrance) in most caves did not correlate with abundance or species richness of bacteria. Overall, abundance and species richness was higher in caves that receive a large number of human visitors or bats. A total of 50 bacteria species and one fungal species was isolated from the 6 caves, with over half of these species considered pathogenic in humans. Some genera that were isolated, such as *Vibrio*, are considered marine and are not expected isolates of cave waters. Most of the species that were isolated have never been documented from limestone cave ecosystems.

T135 HENRY G. SPRATT¹, ANTHONY W. EILER¹, JUDSON BATES¹, LYNNE KOBY¹, CLAIRE TERNEY¹, ARCHANAA JOHN¹, BEVERLY SWITTER¹ AND CURTIS COLE¹. University of Tennessee at Chattanooga¹. Impacts of human activities on microbial activities of two natural southeast Tennessee ponds.

The impact of human disturbance on microbial activity in sediment or water of two natural southeast Tennessee ponds was addressed. Natural ponds are rare in this region. The ponds studied included Montlake (ML) just west of Soddy Daisy, Tennessee, which represents a collapsed section of Cumberland Plateau sandstone cap, and Council Spring (CS), a blue hole located at Red Clay State Park just south of Cleveland, Tennessee. ML is fed via a stream draining a housing subdivision and a golf course. CS is well isolated from local development and agricultural areas. Sediment and water samples were collected from each site in Sep. and Oct. 2008. Microbial activities investigated included heterotrophic activity (U, ¹⁴C-Glucose mineralization) and oxygenase activity associated with herbicide degradation (U, ¹⁴C-Simazine mineralization). Sediments were added to microcosms along with one of the two radiolabeled compounds. ¹⁴C-CO₂ generated was quantified using liquid scintillation. Heterotrophic activity (glucose mineralization) was not significantly different in sediments from the two ponds (CS 0.66 vs. ML 0.8, mg/g/da, p=0.380, T-test). Planktonic microbial communities mineralized glucose at greatly reduced rates compared with sediments, but not at significantly different rates between the two sample sites (CS 0.85 vs. ML 0.63 microg/ml/da). Microbial mineralization of the herbicide simazine in sediments and water from the ponds was greater for ML than CS. These results suggest an important linkage between upstream development at the ML pond and microbial oxygenase activity in the pond's sediments and water. The principal of prior exposure to aromatic organic compounds is supported by this work.

- T136 UNNATI P. PATEL¹ AND PREMILA N. ACHAR¹. Kennesaw State University¹.
Molecular Characterization of *Aspergillus parasiticus* in Georgia peanuts.

Aspergillus species are known to produce aflatoxin in peanuts under favorable environmental conditions during harvest, transportation and storage. Aflatoxin is a very potent carcinogen produced by different species of *Aspergillus*. In certain years significant contamination of peanuts with aflatoxin occurs, which results in a large diversion of peanuts from the edible supply and threatens the economic viability of the entire U.S. peanut industry. The aim of this study was to use polymerase chain reaction (PCR) to selectively distinguish non-toxin from toxin producing form of *A. parasiticus* in contaminated peanuts from commercial outlets in Georgia. Ribosomal DNA (rDNA) was amplified using PCR with universal primers, internal transcribed spacer (ITS) 1 and (ITS) 4 for non-producing form. While Nor-1 & Nor-2, and Ver-1 & Ver-2 were used to amplify toxin producing form (Shapira et al., 1996 & Rashid et al., 2008). PCR amplification of all samples tested with ITS primers ranged from 550-600 bp while Nor primers amplified at 400 bp. Ver primers did not show any amplification for all samples tested. Therefore, we conclude that the edible peanuts samples tested in our investigation are contaminated by both toxin and non-toxin strains of *A. parasiticus*. It appears that these peanuts might have been poorly stored at the commercial outlets. It is also known that fluctuation in temperature and moisture content promote growth and toxin production by *Aspergillus* spp. These peanuts could pose a public health hazards since aflatoxin is a potential carcinogen. Our further study will focus on testing more samples from other selling points.

- T137 Nazia Mojib¹, Richard Hoover², Dale Andersen³, Asim K. Bej¹. Dept. of Biology, University of Alabama at Birmingham, Birmingham, AL¹, National Space Science and Technology Center, NASA, Huntsville, AL², Carl Sagan Center for the Study of Life in the Universe, Mountain View, CA³. The expression of the CspD and EPS and their adaptive role in *Janthinobacterium* sp. isolated from a pro-glacial lake P9 located at the Schirmacher Oasis of East Antarctica

Microorganisms isolated from Antarctic continent are suitable candidates to study the cellular adaptive mechanisms in extreme cold and dry conditions. In this study, we have isolated and characterized a psychrotolerant bacterium, **Janthinobacterium** sp. from lake P9 in Schirmacher Oasis during 2008 Tawani Foundation sponsored Antarctic expedition. The 16S rRNA gene sequence and a panel of biochemical tests revealed this microorganism to be a previously undescribed species. Growth profile showed that it can tolerate a wide range of temperature between 37 °C and -1 °C. Unlike **E. coli**, **Janthinobacterium** sp. consists of only one cold shock protein, CspD, which was cloned and analyzed. Constitutive expression of CspD at 22 °C, 4 °C and -1 °C suggests that this protein may not be cold inducible in **Janthinobacterium** sp. However, the continued and prolonged expression of CspD in this bacterium at -1 °C and 4 °C does not rule out the possibility of its role in cold adaptation. Moreover, this organism produces copious amount of extracellular polymeric substances (EPS), the synthesis and expression of which has been linked to the cold adaptation in other Antarctic bacteria. Enzyme-linked lectinosorbent assay (ELLA) showed that **Janthinobacterium** sp. produced EPS at low (4 °C, 15 °C), room (22 °C) and high (37 °C) temperatures. An increased survival of **E. coli** cultures upon freeze-thaw challenges was observed when incubated with crude EPS from **Janthinobacterium** sp. This result indicates the cryoprotective role of EPS in **Janthinobacterium** sp. under freezing conditions. Further studies are being conducted to better understand the role of the expression of CspD and EPS as adaptive mechanisms in Antarctic microorganisms.

- T138 JONATHAN HUANG¹, NAZIA MOJIB¹, TAHSEEN H. NASTI¹, NABIHA YUSUF¹, MICHAEL NIEDERWEIS¹, RACHEL PHILPOTT¹, RICHARD HOOVER², ASIM K BEJ¹. UAB¹, NASA². The Chemotherapeutic and Antimicrobial Potentials of Pigments Isolated from Antarctic Bacteria

The lakes in Schirmacher Oasis located in the East Antarctic Droning Maud Land present unique microbial ecosystems, most of which are yet to be explored. The diverse microbial communities in these lakes possess unique adaptive features, which enable them to cope with extremely cold and dry conditions, constant high doses of solar UV radiation during Antarctic summer months, and cellular damage due to annual freeze-thaw cycles. We are interested in studying certain adaptive mechanisms found in microorganisms collected from a 2008 Tawani Foundation sponsored Antarctic expedition. Bacterial pigments may be one of many different adaptive characteristics that protect them from the harsh environment and the perpetual UV exposure during summer months. Spectrophotometer analysis of several purified bacterial pigments showed absorbance at UV and visible light ranges. These results suggest that although these pigments may be involved in protecting these microorganisms from UV-damage, they may be applied towards human health benefits. We have studied the chemotherapeutic potential of some of these pigments *in vitro* on B16-F10 melanoma (skin) cancer cells. The preliminary results showed that another pigment caused noticeable cellular apoptosis. In addition, the antimicrobial activity of a yellow pigment from *Flavobacterium* sp. on *Mycobacterium smegmatis* showed significant cell death. Further studies are being conducted to determine antimicrobial activity of this pigment on *Mycobacterium tuberculosis* and other enteric pathogens. Hence these pigments from the Antarctic microorganisms have the potential to be utilized as the precursors for compounds that may have significant chemotherapeutic and antimicrobial benefits.

- T139 JAMEEL S. AL-DUJAILI¹ AND MALCOLM VIDRINE¹. Louisiana State University at Eunice¹. Antimicrobial Activity of Cajun Prairie Herbs on the Growth of *Listeria monocytogenes*.

Studies show that the essential oil fraction in herbs can inhibit the growth of bacteria. With the rising request for all natural food products, it has become important to have a better understanding of the capability of herbs in preserving food. Scientific experiments since the late 19th century have documented the antimicrobial properties of some herbs and their components. The antimicrobial compounds in herbs are found mostly in their essential oil fraction. Five different species of Cajun prairie herbs collected in Eunice, Louisiana were used in this study. This study investigates the effects of the essential oil of these herbs on the growth of *Listeria monocytogenes*, a bacterium typically found in salad bars causing the food borne disease called listeriosis. This task was carried out using the Agar Diffusion Method and a viable plate count. The essential oil components were also analyzed using gas chromatographic methods. We found that all of the five herbs showed inhibitory effects on the growth of *L. monocytogenes*; however, *Monarda fistulosa* (Wild Bergamont) and *Nothoscordium bivalve* (False Garlic) showed the highest inhibitory effects. The inclusion of essential oils to control food borne pathogens in foods that are normally consumed raw may be one practical application of these finds.

- T140 HANNAH E. MENEFFEE¹ AND COLIN R. JACKSON¹. University of Mississippi¹. Prevalence of antibiotic resistant bacteria in the Mississippi River near Memphis.

Increases in the prevalence of antibiotic resistant infections over the last few decades suggest that antibiotic resistant bacteria are likely to be found in natural environments. This may be particularly true for freshwater systems around cities, which may be impacted by urban effluent and wastewater. We collected water from three sites along the Mississippi River, which differed in their distance downstream from a wastewater

treatment facility serving the city of Memphis. Samples were collected during the spring high water period and the summer low water period in 2008. The prevalence of culturable antibiotic resistant bacteria in each sample was determined by plating onto R2A and MacConkey agar amended with ampicillin, erythromycin, streptomycin, or tetracycline (antibiotic free agar served as a reference). Fewer antibiotic resistant bacteria were found during lower water summer sample compared to the spring sample, although in both cases antibiotic resistant counts were at least 10^4 or 10^5 bacteria per liter, with the lowest numbers typically being on the most downstream site. Counts on ampicillin or erythromycin amended agar were greater than counts on streptomycin or tetracycline agar, and counts on R2A agar, a general purpose growth medium, were typically at least an order of magnitude greater than those on MacConkey agar. Approximately 50% of the isolates obtained showed resistance to more than one antibiotic, suggesting that many were multi-drug resistant strains. 16S rRNA sequencing of isolates showed that they included the known antibiotic resistant genera *Aeromonas* and *Pseudomonas*, and the antibiotic resistant pathogen *Acinetobacter baumannii*.

- T141 NAZLI DOKUZOGLU¹, CHRISTOPHER HEALEY¹, JOE HSIAO¹, BRUCE K. KIRCHOFF² AND DAVID REMINGTON². Department of Computer Science, North Carolina State University¹ Department of Biology, University of North Carolina at Greensboro². A new, cross-platform DNA alignment tool.

The DNA Alignment visualization tool DNA-Align is designed to help improve the alignment of multiple DNA sequences by providing a cross-platform tool that incorporates new ways of visualizing sequences. Initial alignments can be done with tools like ClustlW2 or Muscle. These intermediate alignments are then brought into DNA-Align for final adjustment. DNA-Align currently reads FASTA files and displays the sequences as either nucleotides or amino acids. Additional information is supplied in each type of view. For example, measures of alignment (consistency) for each column of elements (nucleotides or amino acids), summaries of the nucleotides present in a column of amino acids, locations where identical amino acids are produced by different codons, and representations of an amino acid's polarity and acidity. Heat maps and global views of the alignment are also provided, as are overall scores for the quality of the alignment (GLOCSA - GLOBAL Criterion for Sequence Alignment - scores). Users can modify, delete, and rearrange the sequences to improve the various alignments, either manually, or with the assistance tools built into DNA-Align (eg., query gaps). Aligned sequences can be output as a FASTA file.

- T142 JOHN G. GIBBONS¹, ERIC M. JANSON¹, PATRICK ABBOT¹ AND ANTONIS ROKAS¹. Vanderbilt University¹. Next-generation Sequencing of Non-Model Species.

Next-generation sequencing technologies allow the accessibility of high throughput genomic and transcriptomic data to a broad range of biologists. Resequencing genomes to a reference sequence has proven to be a viable and reliable option, but what potential do these technologies possess in the sequencing of non-model species? Here, we present the *de novo* transcriptome assemblies of the disease vector mosquitoes, *Aedes aegypti* and *Anopheles gambiae*. By treating these assemblies as non-model species, we then compared them to their publicly available sequences in order to assess the quality and functional information yielded from the data. To gain insight into the types of genes acquired, we compared the functional categories to their references. Findings indicated that transcriptome data were preferentially overrepresented in the functional processes of transport, energy, and metabolism while being disassociated in organ and tissue differentiation as well as in proteins with binding function. The potential to quantitatively measure gene expression was also investigated. The findings supported a positive relationship between coverage and expression. In summary, next-generation sequencing

provides biologists an abundance of reliable and information rich data, which is useful in addressing important ecological and evolutionary questions.

- T143 NAZIA MOJIB¹, TAHSEEN H. NASTI², NABIHA YUSUF, RICHARD HOOVER³, ASIM K. BEJ⁴. Dept. of Biology, University of Alabama at Birmingham, Birmingham, AL, Dept. of Dermatology and Skin Diseases Research Center, University of Alabama at Birmingham, Birmingham, AL¹, Dept. of Dermatology and Skin Diseases Research Center, University of Alabama at Birmingham, Birmingham, AL², National Space Science and Technology Center, NASA, Huntsville, AL³, Dept. of Biology, University of Alabama at Birmingham, Birmingham, AL⁴. Violacein, a pigment isolated from an Antarctic bacterium, *Janthinobacterium* sp., induces apoptosis in murine skin cancer cells

The dry and cold environment of Antarctic continent offers extreme challenges to all life forms including microorganisms inhabiting lakes and rest of the pedosphere. During the Antarctic summer, these microorganisms are exposed to long hours of solar light and UV radiation. Protection against such conditions often requires special metabolic conditions that include production of metabolites that can absorb UV and visible light. In this study, a violet pigment, violacein, produced by an Antarctic bacterium, **Janthinobacterium** sp. was isolated and characterized from 2008 Tawani Foundation sponsored Antarctic expedition samples. Skin cancer is the most common form of cancer in the United States with more than one million cases being diagnosed annually. It has been estimated that one in five Americans will develop skin cancer in the course of a lifetime of which 90% of the cases is associated with exposure to solar UV radiation. It was observed that in vitro treatment of UV-2237 fibrosarcoma and B16-F10 melanoma murine skin cancer cell lines with 2 μM violacein resulted into 99% cell death within 72 h. A significant increase in apoptosis of these cells from 19% to 86% upon treatment with violacein was observed by staining the cells with a Hoechst 33342 fluorescent dye. This observation was further confirmed by assessing the percentage of apoptotic cells by flow cytometry method using the Annexin V-conjugated Alexafluor488 Apoptotic Detection Kit (Invitrogen). Further investigation of the understanding of the anti-carcinogenic mechanism and cellular targets of violacein in skin carcinogenesis will help elucidate its chemotherapeutic potential.

- T144 ROSEMARY N. PLAGENS¹ AND ELI V. HESTERMANN¹. Furman University¹. Inhibition of estrogen activity in breast cancer cells.

The majority of human breast tumors require the hormone estrogen for growth. At the molecular level, estrogen activates the estrogen receptor (ER), which increases the expression of genes such as c-myc and cyclin D1, resulting in tumor cell proliferation. The aryl hydrocarbon receptor (AhR) mediates responses to environmental pollutants such as 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), which has anti-estrogenic effects in breast cancer and other toxic effects in many tissues. The focus of the current study was to determine whether AhR ligands can reduce the ability of estrogen to increase c-myc and cyclin D1 expression. Real-time RT-PCR showed that the presence of TCDD or CH-223191, a less toxic ligand of the AhR, in MCF-7 breast cancer cells does reduce the level of mRNA for these genes produced by estrogen. Chromatin immunoprecipitation revealed that, in the presence of TCDD or CH-223191, the ability of ER to form a complex with DNA adjacent to its target genes was reduced. Further experimentation showed that following treatment with TCDD, protein:DNA complexes with AhR did not include ER in the same promoter regions, suggesting that AhR prevents ER from binding to DNA. Taken together our data indicate that CH-223191 has anti-estrogenic properties similar to those of TCDD, offering hope in the pursuit of developing therapies that do not have the toxicity associated with TCDD. Future studies should determine whether CH-223191 allows

recruitment of AhR and ER to the same promoter regions and its effect on the proliferation of breast cancer cells.

T145 IN K. CHO¹ AND ALICIA WHATLEY¹. Troy University¹. Mutagenicity of Walnut Creek and Troy (Alabama) wastewater treatment plant influent and effluent.

Water resources that receive discharges from various domestic and industrial sources may contain mutagenic and other genotoxic compounds. Samples from Walnut Creek, upstream of the Troy Wastewater Treatment Plant (TWWTP), and influents to and effluents from the TWWTP were assayed for mutagenicity using the fluctuation test. Samples were prepared without and with biological activation (catfish and rat S9) using TA100 and TA98 strains of *Salmonella*. Results indicated that catfish enzymes were more capable of metabolizing compounds to mutagens in upstream samples than rat enzymes. A significant reduction ($p < 0.001$) due to base pair mutagens and no change due to frame shift mutagens were observed in effluent compared to influent samples when fish S9 was used for assays. Conversely, no change due to base pair mutagens and a significant reduction ($p < 0.001$) due to frameshift mutagens were observed in effluent compared to influent samples when rat S9 was used. For direct acting compounds (without enzymatic activation), a significant increase ($p = 0.05$) from frame shift mutations was found in effluent compared to influent, while no significant changes were found to result from compounds that cause base pair substitutions. These results suggest that Walnut Creek contains both mutagenic and pro-mutagenic compounds and influents to TWWTF exhibit mutagenicity which may be refractory to or created by treatment processes. Current water quality requirements may be inadequate to assess the hazards of water resources that receive municipal wastewater treatment discharges which may be habitat to both fish and mammalian wildlife and which may eventually become sources for human exposures.

T146 SAMUAL BARRON¹, BENJIE BLAIR¹, MARK MEADE¹ AND CHRIS MURDOCK¹. Jacksonville State University¹. Bacterial diversity in cave soils from Blowing Spring Cave (Lauderdale County, Alabama).

Bacterial communities are complex in organization and can vary greatly from one environment to another, as well as from location to location in a single environment. Subterranean environments (e.g., caves) have been shown to display relatively simple microbial communities. Due to this property, caves make an ideal model to study microbial communities. Cave environments are also unique in many aspects such as light penetration and nutrient influx. Further, due to the limited availability of nutrition and the subsequent competition for these resources, these areas could potentially reveal interesting community structures and microbial interactions. The site utilized in the reported study was Blowing Spring Cave (Lauderdale County, Alabama), notable due to its function as a maternity habitat for the federally listed endangered grey bat, *Myotis grisescens*. DNA samples were isolated from soil samples taken from Blowing Spring Cave. These soil DNA samples were utilized in the amplification of a highly conserved region of within the 16S rDNA gene of bacteria. Amplified samples were cloned in order to construct 16S rDNA libraries representative of the soil community. Sequences from these clones were compared to other 16S rDNA sequences available from the NCBI database (Genbank). Sequence analyses were used to generate an overview of the various bacterial genera present from these samples. These data are providing an increased understanding of the bacterial communities within this specific cave ecosystem.

T147 ELIZABETH B. EVANS¹ AND DWAYNE A. WISE¹. Mississippi State University¹. Control of chromosome separation in human-rodent hybrid cells.

We have used Chinese hamster ovary (CHO) - human hybrid cells containing chromosomes 16, 18, X, and 21 to test the ability of human kinetochores to successfully bind to spindle microtubules and to be distributed to the daughter cells. We have established baseline data for the rate of non-disjunction among human chromosomes noted above and compared these rates with those in cells presented with mitotic challenges such as taxol or nocodazole. Cells were grown on culture slides, fixed and processed for immunofluorescence and fluorescence in situ hybridization (FISH). Daughter pairs were identified by staining with anti- α -tubulin to identify midbodies. Human centromere DNA probes were used for FISH in order to test for the successful passage of human kinetochores to daughter cells during anaphase. Our data indicate that different human kinetochores vary in their ability to properly engage the spindle and to be successfully distributed. In addition, mitotic challenges have been shown to affect the rate of non-disjunction. The mechanism of this effect is not yet known.

T148 ANNA KLESHAYEVA¹ AND CHRIS R. GISSENDANNER¹. University of Louisiana at Monroe¹. Nuclear receptor regulation of organ patterning in *C. elegans*.

Elucidating the cellular mechanisms that regulate the patterning of animal organs and tissues continues to be an important area of research for developmental biologists. We are investigating the genetic mechanisms of organ patterning using the nematode model organism *Caenorhabditis elegans*. The organ that is the focus of our study is the spermatheca, a functionally complex organ that regulates ovulation and fertilization. The spermatheca exhibits a distinct distal to proximal morphological pattern. The distal spermatheca consists of 8 cells that form a constricted tube. This tube regulates entry of the oocytes into the spermatheca. The proximal spermatheca consists of 16 cells that form a large sac that expands to accommodate the oocyte. The sac also stores sperm that fertilize the ovulated oocytes. We have determined that a nuclear receptor transcription factor, NHR-6, genetically interacts with an Eph receptor tyrosine kinase during spermatheca development. Using cell markers, we have demonstrated that loss of function of the genes encoding these signaling proteins abolishes the formation of the distal to proximal morphological pattern, rendering the spermatheca non-functional. We hypothesize that NHR-6 and the Eph receptor signaling cascade function in a common pathway to generate a distal/proximal border during spermatheca development. Preliminary data also suggest that the Eph receptor and an ephrin ligand are expressed in non-overlapping proximal and distal domains of the developing organ. We further propose that Eph receptor/ephrin signaling is bidirectional in the developing spermatheca, and that this bidirectional signaling is important in generating the morphological pattern of the spermatheca.

T149 MELISSA HEARD¹ AND CHRIS R. GISSENDANNER¹. University of Louisiana at Monroe¹. Functional analysis of the NHR-6 nuclear receptor DNA-binding domain in the nematode *C. elegans*.

Nuclear receptors are a superfamily of transcription factors that regulate a wide variety of physiological and developmental processes of metazoans. One group of nuclear receptors, the NR4A group, is emerging as a critical regulator of cell proliferation, differentiation, and survival. We are studying the NR4A nuclear receptor in the nematode model organism *C. elegans*. Previous work has demonstrated that NHR-6 regulates cell proliferation and cell differentiation during organogenesis in *C. elegans*, indicating that the cellular functions of NHR-6 are conserved. Therefore, *C. elegans* can be utilized to genetically dissect the activities of NR4A in an organismal context. In mammalian cell culture studies, NR4A has been shown to have both genomic and non-genomic functions. However, the functional significance of these activities has not been addressed by in vivo studies. We have undertaken a study to determine the biological significance of DNA

binding by the NHR-6 protein. The experimental approaches include analysis of sub-cellular localization of the protein and site directed mutagenesis of the DNA-binding domain (DBD). A transgene encoding a GFP-tagged NHR-6 protein was demonstrated to be fully functional in *C. elegans* mutant rescue assays. Analysis of transgenic animals determined that NHR-6 is tightly localized to the cell nucleus, suggesting a genomic function. To functionally assess DNA binding we mutated a conserved cysteine residue in the first zinc finger of the NHR-6 DBD. This mutation abolished NHR-6 mediated transactivation in cell culture studies. We are currently assessing the functional consequences of the mutated DNA-binding domain in vivo using genetic rescue assays.

T150 – Cancelled

T151 T.J. HOLLINGSWORTH¹, SUZANNE D. MCALEAR¹ AND ALECIA K. GROSS¹.
University of Alabama at Birmingham¹. Rhodopsin mutant Ter349Glu mislocalizes in primary ciliated cells.

Background: The G-protein coupled receptor rhodopsin is found in the outer segment of the rod cells of the retina and is responsible for dim-light photoreception. Mutations of the rhodopsin gene contribute to various retinopathies such as retinitis pigmentosa and night blindness. Mutations found at the carboxyl terminus of rhodopsin result in the most severe forms of autosomal dominant retinitis pigmentosa (ADRP). The most rapidly degenerating form of ADRP caused by a mutation in the rhodopsin gene is caused by a single nucleotide change in the gene's termination codon. The resulting protein, Ter349Glu rhodopsin, contains 51 additional amino acids. Objective: The purpose of this work is to investigate the biochemical properties of Ter349Glu rhodopsin and its role in ADRP. Methods: Both COS cells and mouse inner medullary collecting duct (IMCD) cells were transfected with either wildtype (WT) or Ter349Glu rhodopsin. These transfected COS and IMCD cells were analyzed using fluorescent immunocytochemistry to examine receptor trafficking to the plasma membrane in both non-ciliated and primary ciliated cells. Results: The protein was found to localize improperly in both cell types, remaining primarily in the perinuclear region. Conclusion: Since the mutant protein is mislocalized in cultured cells, this is a potential cause of the pathophysiology seen in the ADRP patients. Further study with Ter349Glu rhodopsin expressed as a transgene in *Xenopus laevis*, as well as Ter349Glu rhodopsin knock-in mice will be used to better understand the role of the protein in rod cells.

T152 JENNEL M. TALLEY¹ AND KATHERINE L. FRIEDMAN¹. Vanderbilt University¹
Understanding the assembly requirements for the *Saccharomyces cerevisiae* telomerase component Est3p.

Telomeres are protein-DNA complexes located at the ends of most eukaryotic chromosomes. They protect the end of the chromosome from nucleolytic degradation and distinguish broken DNA ends from the natural end thus preventing end-to-end fusion events. Telomerase is the ribonucleoprotein complex that extends telomeres to ensure complete chromosomal replication each cell cycle. In *Saccharomyces cerevisiae*, telomerase is composed, minimally, of four components: Est1p, Est2p, Est3p and TLC1. TLC1-RNA, the RNA template, and Est2p, the reverse transcriptase, comprise the catalytic core of telomerase. Est1p and Est3p are accessory proteins. Est1p recruits the telomerase complex to the end of the telomere and is necessary and sufficient to recruit Est3p to the complex. Est3p's function is unknown. Since Est3p is the last known component to associate before telomerase is active, understanding Est3p function(s) is of interest in the telomerase field. At a fundamental level, 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. We have designed an *in vitro*

assay to assess direct binding between His tagged-Est3p and Mbp tagged-Est2 Region I and have also utilized an *in vivo* assay to try and determine which regions of Est3p and Est2p are important for Est3p assembly.

- T153 CATHERINE E. NEWMAN¹ AND LESLIE J. RISSLER¹. University of Alabama¹. Integrating genetics, ecological niche modeling, and morphology to reconstruct the evolutionary history of *Rana sphenocephala*.

Phylogeographic studies have shown that species with broad geographic ranges are often composed of multiple genetic lineages. *Rana sphenocephala* is widely distributed in the United States and has a complicated taxonomic history. Two subspecies are currently recognized: *R. s. sphenocephala*, found only in peninsular Florida, and *R. s. utricularia*. We aim to reconstruct the evolutionary history of *R. sphenocephala* and resolve controversy over the taxonomic status of *R. s. sphenocephala* by employing an integrative approach that includes genetic and morphological analyses and ecological niche modeling. Preliminary results show little genetic differentiation between *R. s. sphenocephala* and *R. s. utricularia*. Instead, phylogenetic analyses of the ND1 mitochondrial gene reveal an eastern lineage and a western lineage with a 4.36% sequence divergence, and statistical analyses of the niche models indicate that the two lineages inhabit significantly different environments. Niche modeling results also suggest lineage divergence may have been driven by postglacial expansion from refugia, and preliminary results from PhyloMapper--a new likelihood-based program that statistically tests hypotheses of ancestor geographic locations--support this hypothesis. More extensive analyses are currently being conducted to further elucidate the evolutionary history of *R. sphenocephala* and to determine the appropriate taxonomic status of the two lineages.

- T154 SEAN P. GRAHAM¹. Auburn University¹. A Test of the Ecomorph Hypothesis: the Phylogeny and Biogeography of *Eurycea aquatica*.

The Appalachian Mountains of eastern North America are characterized by high faunal diversity and many endemic species; especially in the unglaciated southern latitudes where lineages have been accumulating for tens of millions of years. The brownback salamander, *Eurycea aquatica*, is an enigmatic species that dwells in unique springs in isolated locations in southeastern North America. Brownback salamanders have often been dismissed as simply a robust spring-adapted ecomorph of the widespread and more gracile species *Eurycea cirrigera*. We sequenced mitochondrial and nuclear genes from *E. aquatica* across their presumed distribution and compare them to *E. cirrigera* from nearby populations. We explicitly tested if *E. aquatica* is simply a local spring-adapted ecomorph of *E. cirrigera* or a single lineage that resulted from fragmentation of (or dispersal to) isolated spring habitats. We discovered that brownback salamanders are a well-supported monophyletic group that is nested amongst *Eurycea cirrigera*, *E. wilderae*, and *E. junaluska*. Furthermore, we uncovered three very divergent lineages of brownback salamanders that we estimate have been diverged for several million years and may represent distinct species. The first clade, centered in springs in the Birmingham Valley, includes the type locality of *Eurycea aquatica*. Clade two extends from northeastern Alabama through northwest Georgia into Tennessee. Finally, clade three occurs in northern Alabama and includes the "cole springs" morph described in early taxonomic treatments. Springs checker the sedimentary regions of the southern Appalachians and may represent relictual habitat for an unexpected diversity of unrecognized endemic species that are currently threatened by development.

T155 - Cancelled

- T156 H R. DOWNER¹, JAYME L. WALDRON² AND THOMAS K. PAULEY¹. Marshall University¹ Marshall University². Distribution and Habitat Preferences of Salamanders of the Genus *Plethodon* in the Valley and Ridge Physiographic Province in West Virginia.

Two woodland salamanders, *Plethodon punctatus* and *Plethodon virginia*, are endemic to the Valley and Ridge Physiographic Province in West Virginia and Virginia. The status of these salamanders is of particular conservation interest due to their small ranges. Two common and widespread species, *Plethodon cylindraceus* and *Plethodon cinereus*, also inhabit this region. Habitat preferences of these terrestrial salamanders were investigated by analyzing relatively invariable geologic and topographic environmental variables as they coincide with the presence of particular species. Surveys for salamanders consisted of daytime cover object searches and nocturnal visual encounter surveys. Geographic locations were recorded with a GPS receiver. Environmental data, including substrate type, slope, aspect and elevation, were also recorded. We recorded 307 woodland salamanders at 91 sites, including 74 *P. punctatus* at 23 sites, 48 *P. virginia* at 33 sites, 112 *P. cinereus* at 22 sites and 73 *P. cylindraceus* at 38 sites. Results suggest that *P. punctatus* is associated with rocky substrates, primarily among or in the vicinity of talus at high elevations. *Plethodon virginia* appears to inhabit relatively dry ridges and slopes with deeper soil at all elevations. *Plethodon cylindraceus* is widely spread throughout habitat types within the region while *P. cinereus* tends to occur throughout the range in relatively mesic habitats. Current and historical presence locations will be mapped with GIS software. A GIS model will be developed with Maxent software to classify habitat where species are known to occur and to model potential habitat within the range of the salamanders.

- T157 CASEY J. BARTKUS¹, JAYME L. WALDRON¹ AND THOMAS K. PAULEY¹. Marshall University¹. The occurrence of *Batrachochytrium dendrobatidis* in amphibian populations of West Virginia.

Batrachochytrium dendrobatidis (*Bd*), otherwise known as the amphibian chytrid fungus, has been linked to the declines of amphibian populations worldwide. While chytrid has been found in other states across the country, little is known of its occurrence in West Virginia. Chytrid is highly associated with amphibians in montane habitats; because West Virginia has the highest mean elevation of any state east of the Mississippi River, amphibians in the state are at high risk of an outbreak. The goal of this study is to determine the status of chytrid in amphibian species of concern in West Virginia. For each species, I sampled three sites. When an individual was captured, I swabbed the ventral surface using sterile cotton and stored the sample in a vial of 70% ethanol until analysis. Because chytrid zoospores are dormant in water temperatures above 26°C, soil, water, and air temperature were recorded at each site. To date, 211 samples have been taken from 7 species at 18 sites. I sent samples to Washington State University where real-time Taqman Polymerase Chain Reaction (PCR) assays were used to detect the presence of chytrid zoospores. Sites testing positive for chytrid occurrence will be mapped to show the distribution of the disease, which is essential for development of protocols that will aid managers in reducing the spread of chytrid.

- T158 KAYLA J. SMITH AND GEORGE CLINE. Jacksonville State University. Preliminary Analysis of leech load on aquatic turtles in Northeastern Alabama.

Leeches are common ectoparasites on many species of aquatic turtles. Occurrence of leeches on Alabama turtles is poorly studied. Turtles were collected from June 27-October 29, 2008 in Cane Creek in Calhoun County, in northeast Alabama. Turtles were checked for the presence of leeches, leeches were removed and placed in glass vials for further

identification. Leech location was recorded at the time of removal. There were 424 leeches, representing 10 species of leeches found on 5 species of aquatic turtles. Overall leeches infested 77.8% of turtles captured. There is no apparent difference in leech load between males and females. Turtle leech loads tended to be dense, with greater than 1 leech occurring on most infested individuals. The occurrence of infested turtles having greater than 1 leech by species was 100% for *Sternotherus odoratus*, 68.75% for *Trachemys scripta*, 86.9% for *Chelydra serpentina*, 100% for *Apalone spinifera*, and 100% for *Sternotherus minor*. Infestations ranged from 1 to 48 leeches per individual turtle. Typical leech loads included 1 large individual and many small individuals of the same species. This suggests leeches are reproducing on the turtles. The occurrence of *Batracobdella phalera*, *Glossiphonia heteroclita*, *Helobdella stagnalis*, *Placobdella multilineata*, *Placobdella ornata*, and *Placobdella parasitica* were the first we could find in Alabama and the occurrence of *Batracobdella paludosa*, *Batracobdella picta*, *Helobdella punctatolineata*, and *Placobdella papillifera* were the first that we could find recorded in the southeast. This suggests leech home ranges and distributions may need to be further reviewed and updated.

T159 JUSTIN A. WEISS¹, JAYME WALDRON¹ AND THOMAS K. PAULEY¹. Marshall University¹. Morphometrics of Eastern Box Turtles (*Terrapene c. carolina*) in West Virginia.

Little is known about the morphometrics of box turtles in West Virginia. Previous literature suggests that males have larger carapace lengths and carapace widths, but females show greater shell depths. One hundred and fifty-six turtles (72 females and 84 males) were measured for morphometrics. Twenty-eight turtles were museum specimens from throughout West Virginia provided by the West Virginia Biological Survey and 128 live turtles were captured at Beech Fork Lake Wildlife Management Area and Beech Fork State Park shared by Wayne and Cabell Counties. Data on carapace length, carapace width, shell depth, plastron length, plastron width, and weight were collected. For statistical analysis, two-sample t-tests were used to test for differences in sizes between sexes and capture sites (live specimens only). Carapace length, carapace width, and shell depth were significant between males and females and carapace width and shell depth were significant between the two capture sites (all $P < 0.05$). There were no differences between the weights of males to females, but there were between sites ($P < 0.05$). Males were longer in carapace length and width, but females had greater shell depth. Differences in morphometrics due to sex agreed with reports in the literature. Turtles at the wildlife management area exhibited greater carapace width and shell depth. Differences in morphometrics and weights between sites can probably be explained by the stronger male biased sex ratio in the management area (1.51:1) versus the state park (1.19:1).

T160 WALTER H. SMITH¹ AND LESLIE J. RISSLER¹. University of Alabama¹. Amphibian suture zones in North America.

A major goal of evolutionary biology is to understand how local-scale microevolutionary processes interact to form broad geographic patterns in the evolutionary histories of disparate taxa. Suture zones, defined as geographic regions where hybrid zones, contact zones, and phylogeographic breaks overlap, are one type of broad pattern that has historically received much focus in evolutionary theory. Recent advances in geospatial technology and phylogeographic analyses, however, are providing unprecedented tools with which to delineate suture zones across taxa which, until recently, did not have much reliable data available. We used species range maps and published phylogeographic studies to delineate suture zones for amphibians across North America – a group of organisms for which suture zones have yet to be analyzed. Our analyses indicate a broad, overlapping region of contact zones and phylogeographic breaks across the southeastern

United States, particularly in Alabama, that highlights the region as an important "engine" for past speciation events. We propose that this pattern is driven by a complex interaction of major river drainages, physiographic provinces, and hypothesized postglacial expansion routes that overlap throughout the Southeast. We also highlight several other amphibian suture zones across the continental United States and discuss implications of these areas for future evolutionary studies.

T161 BRETT A. MACEK¹, GEORGE R. CLINE¹ AND ROBERT E. CARTER¹. Jacksonville State University¹. Analysis of Southeastern Herpetological Communities: Salamanders.

In this study, we examine the salamander communities of 32 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. Fifty-five species were recorded from these sites. Species richness ranged from 1-31 species present. Three sites (9.4%) had very high species richness (16, 16, and 31 species). Eleven sites (34.4%) had high species richness (8-13 species). But over half of the sites (56.3%) had low species richness (1-7 species). Most of the species had very narrow distributions; 25 species were only found at one of the sites and 46 species were found at 8 or fewer of the sites. Only 9 species were found at more than 8 sites (9-20 sites). This is similar to patterns seen in southeastern frogs, but salamanders appear to be more restricted to specific sites/habitats than frogs. Distribution patterns were analyzed using cluster analysis, principal components analysis, and detrended correspondence analysis.

T162 DIANE E. MASSEY¹ AND VINCENT A. COBB¹. Middle TN State University¹. Temperature Influences Prey Preference in Kingsnakes.

Effectively distinguishing appropriate prey is a basic yet vital ability of all animals. For snakes, prey differentiation is primarily conducted by chemoreception, when prey odors are transferred from the tongue to the vomeronasal organ. Snake physiological and behavioral functions vary with temperature and received considerable attention however the effect of temperature on prey discrimination and preference in snakes is relatively unknown. We tested 17 *Lampropeltis getula* for these capabilities between 15 and 35°C. Each snake was tested on the following odors: rodent, reptile, fish, and distilled water. Odors were presented to individuals on sterile cotton swabs and tongue flicks, strikes, and latency to strike were scored for 60 seconds. Few tongue flicks were observed for fish and distilled water over all temperature treatments while tongue flick scores for rodent and reptile odors were significantly higher. While no differences were observed between rodent and reptile odors at 25, 30, and 35°C, at 15 and 20°C, snakes preferred rodent odor over reptile odor. These findings suggest that prey preference in snakes may be influenced by temperature.

T163 ERAN S. KILPATRICK¹. University of South Carolina Salkehatchie¹. The North American Amphibian Monitoring Program: Preliminary Results from the South Carolina Component.

The North American Amphibian Monitoring Program (NAAMP) was developed to monitor populations of anurans across the United States. NAAMP was developed in 1996 by the United States Geological Survey (USGS) and participation is volunteer-based. NAAMP protocol outlines a unified methodology across states so that amphibian data can be analyzed statistically at multiple levels. Current protocol allows trends in vocal amphibian diversity and relative abundance to be detected at multiple scales, including state,

ecoregion, and continent levels. There are currently 26 states participating in this long-term program nationwide. NAAMP was initiated in South Carolina in 2007, and sampling began in January 2008. This effort constitutes the first statewide unified inventory of anurans in South Carolina. Three sampling windows were created to target the peak vocalization times for early (January - February), mid (March - April) and late-season (May - June) breeding anurans. Thirty-six of 43 routes were sampled in South Carolina in 2008 and 22 species of anurans were detected. Twenty species were recorded for the Coastal Plain, 11 for the Piedmont, and 8 for the Blue Ridge region. The spring peeper (*Pseudacris crucifer*) was the most commonly detected species followed by the gray treefrog (*Hyla chrysoscelis/versicolor*), green treefrog (*Hyla cinerea*), southern toad (*Bufo terrestris*), and southern leopard frog (*Rana sphenocephala*). NAAMP sampling for 2009 is underway in South Carolina and will continue in subsequent years.

- 164 Daniel B. Estabrooks¹ and Brian T. Miller¹. Middle Tennessee State University¹. A study of population density and preferred breeding habitat in Tennessee populations of the streamside salamander (*Ambystoma barbouri*).

The streamside salamander (*Ambystoma barbouri*) is a stream-breeding Ambystomatid. The bulk of its range covers north-central Kentucky, southwestern Ohio, and extreme southeastern Indiana, with isolated populations in southwestern West Virginia and central Tennessee. Populations in Tennessee are known primarily from Rutherford County, with older records from possibly extirpated populations in Davidson and Jackson Counties. Searches for eggs were conducted in known breeding streams in the Stones River watershed in Rutherford County, as well as potential breeding streams in Rutherford and surrounding counties in an effort to ascertain population density and the full extent of the streamside salamander's Tennessee range. Over the course of the study, new breeding streams were discovered in the Duck River watershed in Bedford County, as well as adult individuals in Marshall County. Egg densities in seven stream tracts surveyed ranged from 0.73 to 13 eggs/meter. Characterization of habitat surrounding breeding streams was performed using satellite images, and preliminary data shows breeding occurring in habitats ranging from extensive forest to merely a thin "buffer zone" of trees alongside the breeding stream. This information will be combined with population density data to determine the effect of habitat modification (pasture, cropland, residential, etc.) on the salamander populations.

- T165 DREW COOMBS¹ AND JONATHAN AKIN¹. Northwestern State University of Louisiana¹. Fates of Ambystomatid Eggs and Larvae in Louisiana Vernal Pools.

Ambystomatid salamanders, such as *Ambystoma maculatum* and *A. talpoideum* share use of vernal pools for depositing egg masses. In this study, we isolated egg masses from each species in situ and quantified both time to hatching and hatching success. We then compared developmental rates and hatching success among masses within the same pond to the same measures from egg masses from different ponds. Both abiotic factors, such as turbidity and depth, plus biotic factors, such as predator and symbiont presence, affected hatching and, subsequently, larval survival. These findings from the field suggest potential ecological tradeoffs for *Ambystoma* that may be important in determining when and where to lay eggs.

T166 – Cancelled

- T167 VINCENT A. COBB¹. Middle Tennessee State University¹. Population Structure of Two Turtle Species at Reelfoot Lake.

Historically, Reelfoot Lake is well-known for its freshwater turtle diversity and density but this acclaim has made it attractive to turtle harvesting as well. Because turtle harvesters using nets bias their catch toward adults, the potential for negative impacts on reproduction and population structure exists. To address this issue, a three year mark-recapture study of turtles was conducted at five sites in Reelfoot Lake using hoop nets. A total of 2771 individuals representing eight species were captured. Of these, 736 were *Trachemys scripta* and 673 were *Chrysemys dorsalis*. Sex ratios (number of males/number of females) for both species were similar and biased toward females (0.73 and 0.75 respectively). Both species differed in abundance by trapping site which was likely related to attributes of the lake. Population structure varied much more between sites for *T. scripta* than for *C. dorsalis*. This appears to correspond to sites commonly trapped by turtle harvesters. For one of the trapped sites, it appears road mortality may be altering the population structure of reproductively mature females. Comparison to a prior study at Reelfoot Lake conducted twelve years earlier indicates some loss of adult female *T. scripta* from the population. However, Reelfoot Lake is immense in size and local perturbations in population structure are more noticeable than overall lake affects. Because turtle harvesting at Reelfoot Lake has been conducted for several decades, comparisons between studies in adjacent decades may not fully illustrate its impact on turtle populations.

- T168 TIMOTHY E. BALDWIN¹, FLORENCE W. CHAN¹ AND YONG WANG¹. Alabama A&M University¹. Methods for predicting the occurrence of amphibians in oak hickory forests along an environmental gradient in the Mid Cumberland Plateau.

We investigated the relationship between landscape, habitat features, and amphibian community occurrence at the James D. Martin Skyline Wildlife Management Area, the Walls of Jericho, and Forever Wild Land Trust in the Cumberland Plateau of northern Alabama between 2005 and 2006. The objectives of this study were to determine the relationship between moisture related habitat variables and amphibian community occurrence, and to determine the habitat variables that are satisfactory predictors of amphibian community occurrence. We hypothesized that there would be a difference between habitat variables where amphibian community points and random points. A total of 216 points were randomly selected. Line transect surveys were used to detect the amphibian communities. Habitat variables were collected by the collaborators from Auburn University and the Land Division of Alabama Department of Conservation and Natural Resources. Landscape variables at each survey point were generated using remote sensing images, digital elevation models, and other spatial reference databases. In this study, habitat variables were fifty percent accurate in predicting amphibian community occurrence. We also found that amphibian communities were detected along moisture gradients that were characterized by distance to the nearest vernal pool, elevation, and soil pH. Moisture related habitats variables can potentially be used to detect the occurrence of different amphibian communities.

- T169 KEVIN R. MESSENGER¹, JAYME L. WALDRON¹ AND THOMAS K. PAULEY¹. Marshall University¹. Growth and age at reproductive maturity of the Carolina pigmy rattlesnake (*Sistrurus miliarius miliarius*).

Growth and age at reproductive maturity are two life history attributes that play an important role in the development of proper management protocols. The Carolina pigmy rattlesnake, *Sistrurus miliarius miliarius*, is one of three species of dwarf rattlesnake. It is highly susceptible to predation and commercial collection due to its small size. In NC, where the species is listed as threatened, most of its historical range has been destroyed by fragmentation and land development. In SC, there are some threatened populations, but overall the species is still stable throughout most of the state. The Carolina pigmy rattlesnake is difficult to study due to its elusive behavior; thus little is known about its life

history. We modeled growth and age at reproductive maturity for a population of pigmy rattlesnakes in a wildlife refuge in north central SC. This population is stable and hence we felt it was an appropriate representation of a healthy population. We fit growth intervals (snout to vent length) measured from captured rattlesnakes during a six-year mark-recapture study to the von Bertalanffy and logistic growth interval models. The results of this study have the potential to affect management protocols, understanding these aspects of the life history are essential to a sound management plan.

T170 AMANDA N. SPRIGGS¹, JAYME L. WALDRON¹ AND THOMAS K. PAULEY¹. Marshall University¹. Detection Probability of Northern Leopard Frogs, *Rana pipiens* Using Frog Loggers.

Amphibians have existed on earth for over 300 million years, yet in just the last two decades, there have been an alarming number of extinctions. To date, nearly 168 species are believed to have gone extinct. Even common species are beginning to experience declines in some parts of the world. In order to better understand and possibly manage the problem of amphibian declines, protocols are needed that can be successfully implemented to monitor populations across geographic regions. The Northern Leopard Frog, *Rana pipiens*, is listed as a species of concern by the West Virginia Division of Natural Resources. Because this species is uncommon in West Virginia, information is needed to better understand its distribution and conservation needs. I visited historic *R. pipiens* locations and searched for new populations throughout West Virginia from March 2008 through March 2009. During this time, the presence and absence of *R. pipiens* were confirmed in several locations. However, our surveys failed to detect *R. pipiens* at several locations that contained ideal habitats for this species. Because we only applied one survey technique, we suspect that our results may have been biased by our survey techniques. Thus, we will resurvey a subsample of our 2008 study sites in March 2009 using a portable automatic recording system (i.e., frog logger), which records intervals of animal vocalizations in the field. We will compare *R. pipiens* detection probability across survey methods, to develop an effective monitoring protocol for this species.

T171 ROBERT U. FISCHER¹. University of Alabama at Birmingham¹. Changes in Bluegill Life History in Response to 35 Years of Thermal Extremes.

Extreme environments provide the opportunity to evaluate population divergence in life history evolution in response to environmental perturbation. Bluegill were sampled over a ten year period from both a thermally impacted pond (Pond C) and an ambient habitat (Par Pond) located on the Savannah River Site near Aiken, South Carolina to determine the influence of 35 years of thermal extremes on life history patterns. Fish were collected using an electroshocking boat and then frozen and returned to the lab for later analysis. Sagittal otoliths were also removed from each bluegill and stored dry for determination of growth rate and age at first reproduction. Gonads from spawning females were removed and stored in Gilson fluid for later analyses of the reproductive parameters of egg size and egg number. Bluegills from Par Pond (normothermic site) exhibited increased growth rates and delayed maturity compared to bluegill from the heated site (Pond C). The increase in growth rates and delayed sexual maturity may be a response to the increased juvenile bluegill mortality caused by the relatively large bass population occupying Par Pond. Fish from the heated site had a higher reproductive investment (increased egg number), and shorter life span than did bluegill from the ambient environment which may be a response to the unpredictable food resources and the relatively high mortality rate from thermal death. Thus, bluegill from both the heated (Pond C) and normothermic (Par Pond) sites have altered their life histories in response to site specific environmental factors

- T172 BRUCE STALLSMITH¹, ANDREW ADRIAN¹, BRITTANY HOLMES¹, LOREN MARINO¹ AND LINDSAY WHITINGTON¹. University of Alabama in Huntsville¹. Reproductive Biology of the Telescope Shiner, *Notropis telescopus*, in Alabama.

Gonadal condition of the cyprinid stream fish *Notropis telescopus* (telescope shiner) was monitored over the course of a likely breeding season to determine reproductive schedule. The study site was at the southern limit of species range in the upper Paint Rock River valley of northeastern Alabama. *Notropis* species are multiple spawners with strong seasonality to gonadal size and condition. The number of maturing oocytes observed in ovaries peaked in April and May. Ripe and fully mature ovaries were found in fish collected in April, May and June. A pronounced peak in the gonadal somatic index (GSI) was found in June for both males and females. Females were found to be significantly larger than males. The average standard length of both sexes peaked in September. The evidence points to an Alabama spawning season from April to June, peaking at the end of this season.

- T173 MATTHEW R. SEMCHESKI¹ AND KENT E. CARPENTER¹. Old Dominion University¹. Molecules Vs Morphology: An Effort to Elucidate Snapper (Lutjanidae; Percoidae) Phylogeny.

The Lutjanidae are the economically and ecologically important fishes commonly known as snappers. Early morphological studies of Lutjanidae concluded that it contained four subfamilies. Together with the family Caesionidae, the lutjanids formed the Superfamily Lutjanoidea. Although this view was supported elsewhere in the literature, it was later contradicted, treating the caesionids as members of the Lutjanidae. Further investigations revealed complications within the subfamily Lutjaninae. In order to infer a phylogeny of genera within Lutjanidae, the complete cytochrome b gene (1140bp) of 21 lutjanid taxa was sequenced and analyzed along with 19 sequences obtained from GenBank. Analyses included base composition, saturation analysis, maximum parsimony (MP), maximum likelihood (ML), and Bayesian inference (BI). Substitutions increased linearly with sequence divergence. MP analysis failed to resolve relationships at the subfamily level. ML and BI analyses resolved monophyletic Etelinae, Apsilinae, and Paradicichthyinae subfamilies within Lutjanidae. MP, ML, and BI analyses grouped the caesionids within the subfamily Lutjaninae, most closely related to *Macolor niger*. Results illustrate a close relationship between caesionid and lutjanid taxa. However, the placement of caesionids in the Lutjanidae remains unresolved as they fall out within Lutjaninae, rendering this subfamily paraphyletic. While MP and ML produce unresolved complete phylogenies at the subfamily level, BI results contradict the currently accepted sequence of divergence events. BI renders Paradicichthyinae as basal followed by Lutjaninae containing the caesionids and a strongly supported clade containing monophyletic subfamilies Etelinae and Apsilinae. Relationships among genera within Lutjaninae remain unresolved, with the genus *Lutjanus* paraphyletic.

- T174 SONIA D. LYLE¹, MAHMOUD H. ALAMI¹, JANET GASTON¹, RACHAEL N. KOIGI¹, AMY M. WOTAWA¹ AND NEIL BILLINGTON¹. Troy University¹. Management implications of genetic variation in walleye populations.

Walleye (*Sander vitreus*) is a large predaceous fish species in the family Percidae that is common in the mid-west and Great Plains regions of the U.S., and in Canada. Walleye are popular with anglers so their populations are regulated by fisheries management agencies. Therefore, information on walleye population genetic structure will be important to fisheries managers. Genetic variation was screened by cellulose acetate gel electrophoresis in 1270 walleye from nine U.S. and four Canadian populations. All fish were screened for two polymorphic protein-coding muscle loci: general muscle protein

(PROT-3) and malate dehydrogenase (sMDH-3). Many populations were also screened for an additional polymorphic locus esterase (EST). Several populations showed significant Hardy-Weinberg deviations at PROT-3 and sMDH-3 that were due to heterozygote deficits. These deviations likely resulted from the Wahlund effect because they were found in samples that were collected during the summer and fall, a period when walleye are highly mobile, rather than during the spring when walleye segregate into discrete spawning populations. Among population heterogeneity was found to be highly significant for walleye at both sMDH-3 and PROT-3, suggesting a high degree of differentiation among walleye populations. Managers are encouraged to manage walleye populations that are genetically distinct separately, because these populations may exhibit local adaptations.

T175 JOSHUA A. TURNER¹, MARK MEADE¹ AND GREG SCULL¹. Jacksonville State University¹. Status of the holiday darter in Shoal Creek, Talladega National Forest, Alabama.

The holiday darter, *Etheostoma brevirostrum*, is a recently described imperiled fish endemic to the Coosa River Basin. In Alabama, the holiday darter is limited to Shoal Creek in the Talladega National Forest. It is state listed as a greatest conservation need (GCN) species of highest conservation concern (P1) and is protected under Alabama state nongame regulations. Shoal creek runs along the mountainous Ridge and Valley physiographic region of Alabama and is fragmented by several small impoundments. We hypothesize that gene flow and distribution of the holiday darter in Shoal Creek is limited by these impoundments. Ichthyofaunal surveys using standard electroshocking techniques were conducted to determine the current distribution of the holiday darter. Underwater photography and video were used to identify and record key habitats for breeding holiday darters. Considering Shoal Creek is also habitat for the state threatened coldwater darter, *Etheostoma ditrema*, and the federally listed blue shiner, *Cyprinella caerulea*, surveys of ichthyofaunal inhabitants are inherently worthwhile. The results of this study directly benefit the conservation actions listed by the Alabama Comprehensive Wildlife Conservation Strategy as those needed to help manage the GCN species.

T176 MICHAEL SANDEL¹. University of Alabama¹. Plight of the pygmies: Coastal Plain vicariance and comparative phylogeography of Ellassomatidae.

Recent phylogeographic investigations of Gulf-Atlantic Coastal Plain taxa have revealed extensive population structure, especially within small-bodied freshwater fishes. The general model for Coastal Plain species, described in the early 1980's, predicts reciprocally monophyletic "eastern" and "western" clades which occupy primarily Atlantic or Gulf watersheds, respectively. A longitudinal zone of contact is present between the two clades, though this zone may vary in area and position along the Gulf Slope. The goal of this study is to further develop the model with high-resolution markers and low-dispersal species, in order to reveal the process(es) that accounts for concordant patterns of divergence in the Coastal Plain. Small-bodied, short-lived freshwater fishes, such as *Ellassoma*, exhibit a predictably complex population structure. Only such high-resolution patterns allow inference of the mechanism that drives and maintains intraspecific variation in this system. This study compares intraspecific microsatellite polymorphism and cytochrome-b sequence variation among three widespread *Ellassoma* species. These data are analyzed using traditional phylogenetic and population genetic methods in order to test regional vicariance hypotheses. Results of this study support the general model of Coastal Plain phylogeography, but higher-resolution patterns elucidate a vicariance mechanism, explaining how the physiographic history of the region has shaped the evolutionary history of species.

T177 – Cancelled

T178 BEVERLY COLLINS¹ AND DAN PITTILLO¹. Western Carolina University¹. Does native plant flowering phenology indicate climate warming?

Phenology of temperate forest plants often tracks temperature and can indicate climate change. We examined trends in flowering phenology in a suite of transplanted or site-native understory herbs and one shrub (*Lindera benzoin*) in a common garden that has been monitored since 1976. For all species, there was considerable year-to-year variation in flowering date, with definite early (e.g., 1976) and late (e.g., 2001) years. Regression of flowering date against time and comparison of 1976-1980 with 2004-2008 average flowering dates revealed a significant trend toward earlier flowering dates over time in some species, including the early-flowering *Carex plataginea* and later-flowering *Trillium luteum*. However, most species showed no detectable trend in flowering date over time, and *Lindera* showed a weak trend toward later flowering in recent years. We conclude there is weak evidence of earlier flowering over time, particularly in the group of herbs that flower in early to mid spring. For most species, however, strong year-to-year variation overpowers longer-term trends during the 32-year observation period.

T179 SARAH E. GALLIHER AND DAVID VANDERMAST. Elon University¹. Effects of beech bark disease on regeneration of high elevation beech forests in Great Smoky Mountains National Park.

For the past fifteen years, American beech (*Fagus grandifolia*) in the high-elevation forests of Great Smoky Mountains National Park have experienced much mortality from the insect-fungus infection beech bark disease (BBD). Beech are found in monodominant "beech gaps" that are surrounded by codominant spruce-fir forests. It is also clonal, meaning that new trees sprout from the roots of existing trees, creating low genetic diversity subsequently allowing new trees to also be affected by BBD. The purpose of this study was to determine how prevalent new beech sprouts are in these dying beech gaps of GRSM and if they are still the dominant species of the forests. During August 2008, tree stems in 7 GRSM plots were categorized into one of four size classes (< 1 cm in DBH (diameter breast height), 1 to 2.5 cm, 2.5 to 5 cm, and 5 to 10 cm). Extent of beech mortality and plants of the understory were also noted. Results showed that beech was the most common regenerative species, followed by red spruce (*Picea rubens*) and sugar maple (*Acer saccharum*). Negative correlations between total stems and basal area of all living stems suggest that increasing basal area is related to a decrease in stem regeneration. There were significant differences between various plots and because amount of mortality affects the abundance of the overstory, density of regenerating stems is one factor that affects these differences. Overall, results suggest that beech will dominate and continue a cycle of regrowth until another species becomes dominant.

T180 CLINT L. HELMS¹ AND MAJORIE M. HOLLAND¹. University of Mississippi¹. The effects of competition on the nitrogen uptake ability of *Juncus effusus*; an *in-situ* field experiment at the University Of Mississippi Field Station.

The purpose of this research is to understand how interspecific competition affects *Juncus effusus*, a dominant wetland emergent macrophyte, with regard to assimilating nitrogen (N) runoff from the water column. A simulated wetland built out of 2.5 cm X 30.5 cm X 40.6 cm shelving was constructed around eight stands of *J. effusus* in each of two constructed wetlands at the University of Mississippi Field Station (UMFS). Four stands consist of *J. effusus* growing with its natural competitors. Two of these stands have a documented number of competitors removed while the other two have been left intact. Another four stands consist of a monoculture of *J. effusus*. Two of these stands have been

left intact while the other two had a documented number of *J. effusus* individuals removed. Thus, removal of the same number of individuals was accomplished in four experimental plots. Each stand was filled to a water level of 20 cm with eight of the sixteen stands receiving a 5 ppm dose of sodium nitrate and ammonium sulfate, with the other stands receiving groundwater. Water and tissue samples were taken every hour for six hours and analyzed for ammonium and nitrate concentrations. A repeated measures ANOVA revealed that stands consisting of *J. effusus* and competitors assimilated a greater amount of N from the water column than *J. effusus* monocultures. Simple digestion showed greater amounts of N in above-ground biomass in the monocultures than in the mixtures. These preliminary results seem to suggest that a dominant emergent macrophyte like *J. effusus* is more effective at mitigating N runoff in the presence of competitors than a similar number of *J. effusus* individuals in a monoculture because of the increased amount of N stored in the below-ground biomass of the mixtures.

T181 CAITLIN E. ELAM¹. Florida Natural Areas Inventory¹. Mapping Current and Historical Vegetation on Florida Managed Lands.

The mission of the Florida Natural Areas Inventory (FNAI) is to collect, interpret, and disseminate ecological information critical to the conservation of Florida's biological diversity. FNAI's database and expertise facilitate environmentally sound planning and natural resource management to protect the plants, animals, and communities that represent Florida's natural heritage. Natural community mapping is one of the ways FNAI facilitates other organizations as well as its own conservation mission. Detailed vegetation maps can help guide many land management decisions such as prescribed burning, recreation planning, and rare species protection. Since 2003 the Florida Natural Areas Inventory has conducted detailed vegetation mapping on approximately 2,000,000 acres of managed lands in Florida. The work has resulted in 38,000 ground-truthed GPS locations of natural communities with a large percentage of those points containing data on structure and composition of the community. In addition, FNAI has delineated 30,000 natural community polygons corresponding to these GPS locations, creating detailed current vegetation maps for these lands. On 560,000 acres of those lands FNAI has created historic vegetation maps from georeferenced historic images from the 1940s and 50s. In addition to being useful for land managers these data could also be useful in other be useful to other scientists interested in large or small scale mapping and survey projects.

T182 ALLEN P. MICHOT III¹ AND CHRISTOPHER A. ADAMS². Yale University¹ King College². Seed germination ecology of *Xanthium strumarium* in a vernal pond habitat: the effects of cold stratification and dry storage.

Xanthium strumarium is a weedy species that produces dimorphic seeds, which differ only by their weights. It has been asserted that plant species produce dimorphic seeds with different germination requirements in order to maximize survivorship. The purpose of this study was to determine the differences in the germination requirements of the dimorphic seeds of *X. strumarium*. In August 2005, November 2006, and October 2007, fruits were collected from a population found in a dry seasonal pond in Marshall Forest located in Rome (Floyd County), Georgia. In the first, second, and third years, approximately 200, 500, and 1800 fruits were weighed; then had their seeds extracted, separated into their perspective phenotypes, and weighed to the nearest milligram. Then in the first, second, and third years 210, 300, and 900 seeds were subjected to extended cold stratification and dry storage studies. The germination phenology of all seeds each year was monitored. We present data on germination rates for all three years.

- T183 ALLEN P. MICHOT III¹ AND CHRISTOPHER A. ADAMS². Yale University¹ King College². Seed germination ecology of *Xanthium strumarium* in a vernal pond habitat: the effects of natural priming and submergence.

Xanthium strumarium is a weedy species that produces dimorphic seeds, which differ only by their weights. It has been asserted that plant species produce dimorphic seeds with different germination requirements in order to maximize survivorship. The purpose of this study was to determine the differences in the germination requirements of the dimorphic seeds of *X. strumarium*. In October 2007, fruits were collected from a population found in a dry seasonal pond in Marshall Forest located in Rome (Floyd County), Georgia. Approximately 1800 fruits were weighed; then had their seeds extracted, separated into their perspective phenotypes, and weighed to the nearest milligram. Then 180 seeds from each phenotype were subjected to a natural priming treatment consisting of several series of wet-dry cycles. After two months of treatment, the seeds were placed on moist sand in Petri dishes and moved to an incubator at 25°C. Also, 480 seeds from each phenotype were subjected to complete submergence, with 240 seeds placed in a refrigerator at 5°C and 240 seeds placed in an incubator at 25°C for 1, 2, 3, and 4 weeks. After receiving their respective treatment, all seeds were placed on moist sand in Petri dishes and moved to an incubator at 25°C. The germination phenology of all seeds was monitored. We present data on germination rates.

- T184 CONLEY K. MCMULLEN¹. James Madison University¹. Pollination biology of the rare Galápagos endemic, *Clerodendrum molle* var. *glabrescens* (Verbenaceae).

Pollination experiments, visitor observations, nectar sampling, pollen transfer studies, pollen-ovule ratio, and pollen size were components of this investigation to determine the pollination biology of *Clerodendrum molle* var. *glabrescens* (Verbenaceae), a rare Galápagos endemic. Flowers produced fruit and seed via open pollination, autonomous autogamy, facilitated autogamy, cross-pollination, diurnal pollination, and nocturnal pollination. There was no significant difference in fruit set. Cross-pollinated flowers showed a significant increase in seed set over all treatments except facilitated autogamy. Nocturnal and diurnal seed set did not differ significantly. Nocturnal visitors included ants, spiders, and hawk moths; the main diurnal visitor was a species of carpenter bee. Most visitors were attracted to flowers for their nectar reward. However, flower visitation did not translate into effective pollen transfer between plants. *Clerodendrum molle* var. *glabrescens* exhibits incomplete protandry and sets fruit via autonomous autogamy as a result of natural selection in an environment with few faithful pollinators.

- T185 JULIA E. ROBERTS¹ AND DAVID VANDERMAST¹. Elon University¹. The composition and structure of beech gaps in Great Smoky Mountains National Park 15 years after beech bark disease infestation.

Beech gaps are relatively small patches of deciduous forest dominated by American beech (*Fagus grandifolia*) that are surrounded by spruce-fir forests at elevations above 1,400 m in eastern Great Smoky Mountains National Park (GRSM). In 1993 beech bark disease (BBD), an insect-fungal pathogen complex, was discovered in GRSM. As of 2000, BBD was found in all beech gaps and had caused up to 90% mortality of canopy beech stems in these unique forests. In order to examine how BBD is continuing to alter the composition of beech gap communities, we analyzed changes in the structure and composition of trees in 11 permanent plots from 2000-2008. We hypothesized that 1) BBD would continue to cause a loss of basal area (BA) and tree-sized (dbh ≥ 10 cm) stems as canopy beech trees continued to die and 2) beech gaps with the highest mortality in 2000 would show evidence of the formation of "aftermath" forests dominated by beech sprouts and a greater abundance of opportunistic non-beech tree species. Our data indicate that

across all plots BA declined by 10% and stem numbers declined by 14% though neither change was statistically significant. However, closer analysis revealed that roughly half of all plots gained BA and stems. Furthermore, the losses in BA and stems sustained by declining plots were statistically significant as were the gains realized by the plots with increases. As predicted, plots with increasing stem numbers demonstrated the structural and compositional characteristics expected of aftermath forests

- T186 KEITH E. GILLAND¹ AND BRIAN C. MCCARTHY¹. Ohio University, Dept. of Plant and Environmental Biology¹. Performance of American chestnut (*Castanea dentata* (Marsh.) Borkh) hybrids on reclaimed mine sites in Ohio

American chestnut once accounted for a large portion of the Eastern Deciduous Forest canopy before the accidental introduction of the chestnut blight *Cryphonectria parasitica* (Murrill) Barr. By the 1940's, chestnut was effectively removed from canopy dominance throughout its range. Through a traditional backcross breeding program using Chinese chestnut, the American Chestnut Foundation generated a blight-resistant hybrid tree. Characteristics of the American chestnut may make it an ideal candidate for use on coal-mine lands being reclaimed employing the newly developed Forestry Reclamation Approach (FRA). Our study was conducted at the Jockey Hollow Wildlife Area in Belmont County, Ohio. The site was reclaimed using FRA methods where the upper strata is loosely dumped into mounds roughly 10 m diameter and 5 m high to provide loose rooting medium. Six hundred sixty seeds were planted on a freshly reclaimed mine site (bare soil) in March 2008. The seeds are pure American, Chinese, and three hybrid lines. Seeds were planted in 132 complete experimental blocks of five seeds each, one individual of each genetic type. Blocks were established in a 2 x 2 factorial design where the fixed effects were aspect (North, South) and mound position (upper, lower). After one season, total germination was 89% and survival was 82%. Mean height growth of all individuals was 22.3 cm (\square 0.306 SE). These relatively high germination and survival rates indicate that American chestnut will be a viable candidate for mine reclamation projects and that the substrate is appropriate for tree growth.

- T187 NICHOLAS S. ADAMS¹ AND JOHNNY RANDALL¹. University of North Carolina at Chapel Hill¹. The use of remnant sites to determine target conditions for the restoration of an open oak-hickory woodland in the North Carolina Piedmont.

There are several historical accounts of open savannas in the Piedmont of the southeastern U.S. Although most of these accounts allude to more prairie-like conditions, there are also indications of vast open woodlands. It is widely accepted that Native Americans used fire to maintain more open conditions in the southeastern U.S. Open woodlands and their associated vegetation are generally restricted to sites that have undergone continued anthropogenic disturbance. These remnant sites include roadsides, power line cuts, and other utility rights-of-way. The vegetation associated with these sites are increasingly threatened by habitat loss because of the active planting of exotics, herbicide use, and other poor management techniques. Our project quantitatively characterized these remnant plant communities with the ultimate goal of establishing a restoration prescription for local conservation managers by using a multi-scale Carolina Vegetation Survey style inventory of rural roadside, power line, and gap communities in Chatham, Durham, and Orange Counties, NC.

- T188 GREENBERG¹, CATHRYN H., AND SCOTT WALTER². USDA Forest Service, Upland Hardwood Ecology and Management Research Work Unit¹; Louisiana State University². Fleshy fruit removal and nutritional composition of winter-fruiting plants: A comparison of native and non-native invasive species in the southern Appalachians.

Seed dispersal is critical for successful invasion. Winter fruit availability, when other resources such as arthropods and fruit are in scarce supply, might enhance the chance of fruit consumption and seed dispersal by birds and mammals and could be key in the invasion strategy of invasive plants. We compared fruit consumption levels and rates, and nutritional content of fruits among several invasive, non-native (*Ligustrum japonicum*, *Lonicera japonica*, *Celastrus orbiculatus*, *Hedera helix*, *Rosa multiflora*) and native (*Smilax rotundifolia*, *Ilex opaca*) plant species that retain fruit during winter months. Most (83%-93%) of invasive, non-indigenous species' fruit was consumed. Ninety-one percent of *L. americana* fruits were consumed, but only 55% of *S. rotundifolia* fruits. Seeds of *C. orbiculatus* and *R. multiflora* were most common study species in bird droppings collected from fecal traps. Nutritional analysis indicated that among non-native species tested *H. helix* had the highest fat content (27%), followed by *L. japonicum* (11%); others were $\leq 5\%$. Lipid content of both native species tested was about 3%. *H. helix* had the lowest total sugar content (14%); all other tested species' total sugar was $\leq 20\%$. Protein content for all tested species was 4%-9%. Our results indicate most non-native exotic plant fruits are consumed, and seeds are dispersed. In the southern Appalachians, few native plant species produce or retain fleshy fruit during winter. Therefore, winter fruit availability by non-native invasive plants offers an important dispersal opportunity.

T189 RYAN B. HOMSHER¹ AND BRIAN C. MCCARTHY¹. Ohio University¹. Seed production of oaks in southeastern Ohio.

The decline of oak dominance in eastern North American forests has drawn the attention of numerous researchers and is well documented. While many hypotheses have been posed to explain this decline, modifying silvicultural practices most likely offers the best solution for encouraging oak regeneration in eastern hardwood forests. Increased light and lowered competition in the overstory could increase acorn production. We measured oak seed production in two experimental forests in southeastern Ohio. Each forest was divided into three, 20-ha silvicultural treatments: Thinning, prescribed fire and thinning, and prescribed burning. An untreated control is also included resulting in a 2x2 factorial design. Within each treatment in each forest (eight stands in all), we chose nine mature Black oaks (*Quercus velutina*) and nine mature Chestnut oaks (*Quercus prinus*). Under each tree canopy, two, 0.25 m² seed traps were placed 1.5 m above the ground. Traps were set up from August to December and contents were collected every month. Acorn collection for the 288 traps has been ongoing from 2001 through 2008. Acorns collected were tested for soundness and recorded. Masting, the intermittent production of large seed crops, was apparent in both oak species and across treatments, but expressed primarily at the tree (genotype) level as opposed to the species (population) level. Black oaks exhibited a stronger cycle of masting at both forests. Silvicultural treatment had little effect on overall seed production. However, Chestnut oaks did have a somewhat greater number of seeds produced in the combined thinning and prescribed burning treatments.

T190 STEVE PADGETT-VASQUEZ¹ AND SARAH H. PARCAK¹. University of Alabama at Birmingham¹. Land Use Land Cover Change in Ometepe Island, Nicaragua (1978-2000) Using Multispectral Satellite Image Data and a Digital Elevation Model.

Ometepe Island, found in Lake Nicaragua, is one of Nicaragua's biodiversity hotspots and is made up of two volcanoes, Concepcion and Maderas. Despite its ecological value, there have been no long term environmental studies done on Ometepe Island. Land use and land cover change (LUCC) is vital for proper land assessment and management. This project used multispectral satellite remote sensing to track LUCC between 1978 and 2000 and attempted supervised and unsupervised classification, remote sensing modeling techniques, to classify land regions and determine changes over time. By using Landsat images dating to 1978, 1986, and 2000, the project determined the spatial (2-dimensional)

distribution of different land regions. The next step involved colordrapping the classified images over a Digital Elevation Model (DEM) to determine the elevation (3-dimensional) distribution of the regions. Both classification techniques showed a decrease in agricultural/urban land and an increase in both cloud forest (10% supervised/52% unsupervised) and dry tropical forest areas (33% supervised/37% unsupervised) between 1986 and 2000. Spatially, agricultural/urban and dry tropical forest regions are more abundant in Concepcion and along shore areas, while cloud forest is more common in Maderas. Elevation distribution revealed that both agricultural/urban and dry tropical forest regions were most prevalent in lower elevations, while cloud forest regions were only found in higher elevations. Findings suggest that agriculture and urban sprawl have had greater effects on dry tropical forests than on cloud forests, especially between 1978 and 1986 and, consequently, environmental policies and resources should be focused on dry tropical forest areas.

- T191 RACHEL E. SCHROEDER¹, FRANK P. DAY¹, DANIEL B. STOVER², ALISHA L. BROWN¹, JOHN R. BUTNOR³, TROY J. SILER⁴, PAUL DIJKSTRA⁵, BRUCE A. HUNGATE⁵, C. R. HINKLE⁶ AND BERT G. DRAKE⁴. Old Dominion University¹ Earthwatch Institute² U.S. Forest Service³ Smithsonian Environmental Research Center⁴ Northern Arizona University⁵ University of Central Florida⁶. The long-term effect of elevated atmospheric CO₂ on plant biomass in a Florida scrub-oak ecosystem

In 1996, a long-term CO₂ enrichment study was initiated at Kennedy Space Center, Florida. The experimental design involved 16 open-top chambers that continuously received either ambient or elevated (ambient + 350 ppm) CO₂ concentrations. After CO₂ enrichment was terminated in May 2007, the treatment chambers were removed and all aboveground biomass in the experimental plots was harvested and weighed. Total aboveground biomass was greater in plots exposed to elevated CO₂ (2186 ± 161 g m⁻²) than in ambient CO₂ plots (1313 ± 111 g m⁻²). Fine root abundance, measured using minirhizotrons, showed stimulation under elevated CO₂ during the early years of the experiment but no effect by the end. Ground-penetrating radar (GPR) was used to measure coarse root biomass immediately after the aboveground vegetation had been removed. Coarse root biomass estimates were 6040 ± 507 g m⁻² for the elevated CO₂ plots and 5105 ± 418 g m⁻² for the ambient CO₂ plots. After 11 years of exposure to elevated atmospheric CO₂, production of plant biomass, both above and belowground, was stimulated. For belowground biomass, large structures were more important than fine roots in this response.

- T192 BRIAN C. MCCARTHY¹, CHAD D. KIRSCHBAUM² AND GERALD R. SCOTT¹. Ohio University¹ USDA Forest Service². Bringing Science and Management Together: Effective Strategies for Dealing With Invasive Plants.

Non-native invasive plant species have expanded into almost every ecosystem in North America and are presently altering most natural system processes. The alteration of these biological systems is forcing a concomitant high cost to human society. Managers are faced with a variety of difficult decisions with respect to prioritizing their activities and are usually restricted to certain agency level boundaries. One solution to this problem has been the formation of cooperative weed management areas (CWMAs) which rely on the cooperation of adjacent landowners (private, state, and federal) to document and manage invasive plant species. We will discuss the formation of Ohio's only CWMA through the integration of many partnerships and activities such as education, mapping, and control research. The Iron Furnace Cooperative Weed Management Area (IFCWMA) is 241,000 ha in size where 20% is federal land (national forest), 4% is state land (state forest), and 76% is private land. Numerous education and control projects were established to link the partners. Researchers mapped the distribution and abundance of invasive species in

specific watersheds and experimented with differing control methods. The final product was a detailed understanding of non-native invasive plant species across the many partnership boundaries and how species needed to be managed at a landscape level if meaningful control is ever to be achieved. We hope that the formation of this CWMA and the example of management-scientist collaboration can serve as an example for the formation of other CWMA's in the central and southern Appalachian region.

T193 CHASE C. ROSENBERG¹, BRIAN C. MCCARTHY¹ AND JARED L. DEFOREST¹. Ohio University¹. Chemical analysis and foliar nutrient resorption in *Castanea dentata*, *C. mollissima*, and chestnut hybrid.

The American chestnut, *Castanea dentata*, was a dominant species in hardwood forests in eastern North America, having accounted for 40-45% of the mature trees in Southern Appalachia. The Asian root-borne pathogen *Cryphonectria parasitica* was introduced to America's east coast in 1904, killing the majority of mature chestnuts throughout the range. Recent work has produced a new, pathogen-resistant hybrid variety. The possibility exists of large-scale reintroduction to eastern American forests, but preliminary information on the composition of the chestnut hybrid and the potential effects on the forests it would inhabit is needed. It is predicted that the *Castanea* species will have higher tannin levels than other eastern forest species and will subsequently hold relatively more nutrients in an organic form, unavailable to other plants. During the summer and fall of 2008, green and brown leaves were removed from chestnut hybrid (4 different crosses), *Castanea dentata* (American chestnut), and *C. mollissima* (Chinese chestnut) trees. Green leaves were also removed from *Quercus alba* (White oak), and *Acer rubrum* (Red maple) trees. Leaf extracts have been tested for tannins, Ca, Fe, K, Mg, P, Na, Al, S, C, and N. Tannins were extracted using Hagerman's radial diffusion method. Macro-nutrients were extracted in an ammonium acetate solution and analyzed on an ICP-OES. Carbon and nitrogen will be measured on a Varian Spectraa 220 C:N Analyzer. Nutrient resorption is assessed by comparing green and brown leaf chemistry from identical trees. This data will help forward the effort to return one of North America's most historically significant, economically important, and intrinsically valuable species to its native habitat.

T194 MICHAEL W. DENSLOW¹, MICHAEL W. PALMER² AND ZACK E. MURRELL¹. Department of Biology, Appalachian State University, Boone, North Carolina 28608¹ Department of Botany, Oklahoma State University, Stillwater, Oklahoma 74078². Patterns of native and exotic plant richness along an elevational gradient from sea level to the summit of the Appalachian Mountains, U.S.A.

Species richness generally decreases from low to high elevations. Explanations for this trend fall into four categories: historical, climatic, biotic and spatial. Its shape varies from humped to monotonic, and may reflect the length of the sampled gradient, indicating a sampling effect. Previous studies have focused on total species richness, and relatively few have investigated how patterns of native and exotic species richness differ. We used floristic studies (floras) to test and compare the patterns of total, native and exotic plant species richness from sea level (Atlantic coast) to the summit of the Appalachian Mountains. The use of floras enabled us to investigate elevational patterns of richness over a large gradient. We modeled the effects of size of study area, year of study, and elevation on species richness using a dataset of 68 floristic studies. Native and exotic species responded similarly along the area gradient (similar slopes of the species area relationship). Both groups were positively related to year of study, though the overall strength of richness by year was weak. After accounting for area and year, native and exotic species had contrasting richness patterns along the elevational gradient. These results suggest that different processes may govern native and exotic plant richness patterns. In addition, these findings could indicate that contemporary factors are important

in shaping exotic species assemblages. Lastly, we propose that human influences should be considered when interpreting diversity patterns at large spatial scales.

- T195 CHARLES MAJOR¹, DEWITT JONES¹, AVEL FERNANDEZ¹ AND DANNY J. GUSTAFSON¹. The Citadel¹. Dominant species genotypes influence subordinate species genetic structure in restored grasslands.

There is a long running debate between the appropriateness of using grass cultivars that have been developed as forage / soil erosion control crops when restoring or augmenting native grasslands. A field study was established in March 2006 to test whether differences within multiple dominant species widely used in community re-assembly acts as a filter on community assembly and scales to affect ecosystem function. This experimental design is unique as it provides replicated experimental community assemblages that differ in source (cultivar vs. wild collected) of the dominant grasses. We are using this experiment to determine how population source of the dominant grasses affects the genetic structure of the subordinate species. The Citadel Plant Ecology Laboratory (CPEL) is using inter-simple sequence repeats (ISSR) DNA markers to characterize differences in population genetic structure of one of the dominant planted grasses (*Sorghastrum nutans*) in this experiment and two subordinate forbs (*Chamaecrista fasciculata*, *Silphium laciniatum*) growing in the matrix of wild collected and cultivar dominant grass. Preliminary analysis indicate significant differences (T=-3.131, A=0.053, P =0.011) between *Chamaecrista fasciculata* growing in plots planted with cultivar grasses versus this same species growing in plots planted with native collected grasses. UPGMA cluster analysis based on Jaccard's similarity also showed that *Chamaecrista fasciculata* growing in the native grass communities were more genetically similar to each other than they were to *Chamaecrista fasciculata* growing in the cultivar grass communities.

- T196 DAVID T. LAKE¹, JOEL M. GRAMLING¹ AND DANNY J. GUSTAFSON¹. The Citadel¹. Deadly duo: Ecological impacts of the Red Bay ambrosia beetle.

In 2002, laurel wilt disease (LWD) was first reported near Port Wentworth, Georgia. Since the first observations, LWD has been attributed to a fungus (*Raffaelea lauricola*) vectored by the exotic red bay ambrosia beetle (*Xyleborus glabratus*). The red bay ambrosia beetle is a wood boring species native to Southeast Asia and presumed to have been transported to the Southeastern United States in contaminated wood from its native region. The red bay ambrosia beetle has been documented inoculating several Lauraceae species, including red bay (*Persea bourbonia*), swamp bay (*P. palustris*), and to a lesser affinity, the endangered pond berry (*Lindera melissifolia*), sassafras (*Sassafras albidum*), avocado (*P. americana*) and sweet gum (*Liquidambar tyraceflora*). There are presently thirty-one counties that have been infected from central South Carolina to central Florida. In January 2008, seven 0.1 ha plots were established to monitor the effects of LWD on *P. palustris* individuals and the plant community overall. Preliminary results indicate that larger individuals of *P. palustris* are more vulnerable to LWD than smaller individuals. Individuals with a DBH <6 cm exhibited a mortality rate of 25.0% after six months and 35.7% after nine months, while *P. palustris* stems with a DBH ≥6 cm exhibited a mortality rate of 37.0% after six months and 55.6% after nine months. Further work is being conducted to investigate the possibility of physiological changes in the cambium of infected trees rather than a mere mechanical blockage of cambium circulation and how this may relate to individuals of different sizes.

- T197 ALAN W. HARVEY¹. Georgia Southern University¹. Conditional dispersal in duckweed.

Conditional dispersal is the subject of an enormous literature focused almost entirely on animals. This bias is hardly surprising, as plants have no obvious means of either actively selecting appropriate habitats or leaving suboptimal or deteriorating habitats. Here I test the hypothesis that duckweeds (family Lemnaceae) are able to modify their dispersal potential in direct response to short-term changes in the overall quality of their local environment. Duckweeds are thought to use birds and other animals as their primary dispersing agent, by sticking to animals that swim or wade through one pond and then move to another. Thus, to assess the effect of habitat quality on dispersal potential in the duckweed *Lemna minor*, I counted the number of fronds that were removed by a mechanical dispersing agent from small "ponds" containing varying densities of duckweed cultivated under low-nutrient or high-nutrient conditions. Significantly more fronds were removed by the dispersal agent from low nutrient ponds than from high nutrient ponds across a broad range of duckweed densities; the magnitude of the difference increase with density. Differential root growth was the proximal basis for this response: root growth was significantly greater under low nutrient conditions, and longer roots enabled long tangled chains of plants to be dragged out of the pond by the dispersal agent. These results help explain some curious aspects of duckweed biology, and suggest that sometimes plants can respond directly to suboptimal environmental conditions by leaving.

T198 LISSA M. LEEGE¹. Georgia Southern University¹. Response of an endangered coastal plain legume (*Baptisia arachnifera*) to prescribed fire.

Baptisia arachnifera (Hairy rattleweed) is a federally endangered, Georgia endemic herbaceous legume, found in only two counties in the state (Wayne and Brantley). It occurs primarily on privately owned forestry land, and its populations have declined > 80% in the past 25 years. The response of *Baptisia arachnifera* to fire has never been examined in its native range, though it occurs in a region that was presumably historically subject to frequent fires. The objective of this research was to determine the population response of *Baptisia arachnifera* populations to prescribed burning. Three 50 m x 50 m managed pine stands of similar age and encompassing healthy *Baptisia* populations were identified on Rayonier property, and individuals were tagged and censused in Summer 2007. In April 2008, a prescribed burn was conducted in half of each of the sites, with the other half serving as an unburned control. The sites were re-censused in Summer 2008 and life stage transitions and reproductive data recorded. The prescribed fire generally had either no effect or a positive effect on *Baptisia* populations and individuals, with the exception of higher pyralid moth herbivory in burn sites. No measure of *Baptisia* reproduction was impacted by the burn, including # flowers, # fruits or % pod set. In addition, litter depth decreased by approximately 2.5 cm in burn plots in two sites. While additional monitoring will be needed to further evaluate prescribed burning as a management tool, initial results suggest that it has good potential.

T199 JOHN, JR. J. WILEY¹ AND BRIAN C. MCCARTHY¹. Ohio University¹. Bryophyte community response to prescribed fire and thinning in mixed-oak forests of the unglaciated Allegheny Plateau.

Silvicultural treatments are applied to forests to meet a variety of management objectives including timber production and wildlife habitat management. However, such methods may also profoundly affect other non-timber forest resources and negatively impact biodiversity. Modern forest science has largely neglected the role of forest management activities on bryophytes; thus, we have little insight as to how bryophyte communities might respond. The goal of this investigation was to explore changes in mix-oak forest bryophyte communities associated with the common silvicultural methods of prescribed fire and thinning. Study sites were within the design of the USDA Forest Service Fire and Fire Surrogate (FFS) Research Program located in three southeastern Ohio forests. Each of these forests contain four treatments: untreated control, prescribed fire only, thinning

only, and combined prescribed fire and thinning. Total bryophyte cover and associated environmental variables were estimated in five 2 × 5 m quadrats along nine linear transects stratified by an integrated moisture index (IMI) in each treatment. We found a total of 124 bryophyte taxa (102 mosses, 22 liverworts). Of these, only 65 were found in more than 5% of the transects. Burning clearly altered bryophyte community richness and composition, and this effect was largely driven by dry, upland sites with highly scarified soil and increased canopy openness. Thinning appears to have only a limited effect, and increasing macro-scale moisture conditions also appear to mitigate community change and species loss. The use of fire on xeric sites may have a profound long-term negative impact on bryophyte diversity.

T200 MARGARET C. CIRTAIN¹, SCOTT B. FRANKLIN² AND S. R. PEZASHKI³.
University of South Carolina¹ University of Northern Colorado² University of
Memphis³. Competition and nutrient supplementation effects on *Arundinaria*
gigantea (Walt.) transplants.

The once dominant *Arundinaria gigantea* canebrake ecosystems have been reduced to fragmented populations less than 2% of their former extent, resulting in a critically endangered ecosystem. Restoration of canebrakes is thus necessary for maintaining and enhancing biodiversity in the southeastern United States. For successful reintroduction of *A. gigantea*, an understanding of the effects of critical environmental parameters on plant survival and growth is necessary. The goal of this study was to gain a better understanding of the impact of competition and nutrient supplementation on *A. gigantea* growth in field studies and thereby potentially enhance restoration success. Two field sites were established and composed of plots of sixteen transplants in a four by four array. Percent survival, number of new shoots and new shoot diameter and height were measured annually. The competition study consisted of plots with and without landscape fabric application around the plants to minimize competition. Results indicated little difference between control and treatment, implying competition may not be a critical factor. The nutrient study also consisted of plots of sixteen transplants in a four by four array (control, Osmacote, Ammonium nitrate, and Super phosphate). Results indicate that *A. gigantea* growth is enhanced with increased application of Osmacote and Super Phosphate. While competition had no apparent effect, nutrient supplementation, particularly phosphate, may be a potential management practice for enhancing survival and growth of existing populations.

T201 C. T. WITSELL¹. Arkansas Natural Heritage Commission¹. Floristic Inventory and
ecological classification of isolated upland depression wetlands in the Interior
Highlands of Arkansas.

Research to locate, map, inventory, and classify isolated upland depression wetlands in the Interior Highlands (Ozark Plateau, Arkansas Valley, and Ouachita Mountains Ecoregions) of Arkansas was conducted from 2005 to present. Wetlands were located and mapped using GIS software and representative sites were inventoried during the growing season. Three distinct types of depression wetlands were found to occur in the Interior Highlands: (1) upland karst sinkhole ponds, (2) upland sandstone depression ponds, and (3) abandoned stream terrace channel scar wetlands. Both forested and open (shrub/graminoid) subtypes of all three types were observed. These natural depression wetlands support a diverse flora rich in species of conservation concern and disjunct species, especially those typically found in the Gulf Coastal Plain and Mississippi Alluvial Plain Ecoregions. Eighteen plant species of state conservation concern were found: *Carex decomposita*, *Carex gigantea*, *Carex lupuliformis*, *Carex stricta*, *Didiplis diandra*, *Dulichium arundinaceum*, *Eleocharis microcarpa*, *Eleocharis wolfii*, *Glyceria acutiflora*, *Gratiola brevifolia*, *Hypericum adpressum*, *Leitneria floridana*, *Lysimachia hybrida*, *Pilularia americana*, *Platanthera flava*, *Potamogeton pulcher*, *Stenanthium gramineum*,

and *Tradescantia paludosa*. An overview of the flora, geographic range, geomorphology, and ecology of each type of upland depression wetland will be presented.

- T202 THOMAS WENTWORTH¹, NORMAN DOUGLAS¹, JANET GRAY², WILLIAM HOFFMANN¹, MATTHEW HOHMANN³, KRISTEN KOSTELNIK¹, RENEE MARCHIN¹, WADE WALL¹ AND JENNY XIANG¹. NC State University¹ Fort Bragg² US Army Corps of Engineers ERDC - CERL³. Ecological and genetic studies of rare species at Fort Bragg and Camp Mackall, North Carolina.

Habitat loss, fragmentation, and altered disturbance regimes are among the greatest threats to biodiversity and species conservation. These situations can be ameliorated with appropriate management, but only when there is sufficient information on which to base this management. In the United States, efforts to gather such information often focus on species listed as threatened or endangered under the Endangered Species Act (ESA). Less attention is focused on other rare species (referred to here as species at risk or SAR) that are "official candidates for ESA listing, classified by NatureServe as critically imperiled or imperiled on a global scale, and/or a concern for ESA listing in the foreseeable future" (Department of the Army). In particular, the Department of Defense in 2004 identified 31 candidate species and over 200 other SAR on or near Army installations. Efforts to implement management strategies based on better understanding of the population genetics, demography, and natural history of these species would benefit the species and reduce the likelihood of future ESA listings. We have been conducting genetic, population, and community studies to provide much-needed information relevant to management of five rare plant species, *Amorpha georgiana* var. *georgiana*, *Astragalus michauxii*, *Lilium pyrophilum*, *Pyxidantha barbulata* var. *brevifolia*, and *Stylisma pickeringii* at Fort Bragg and Camp Mackall military installations. This research has been undertaken as a cooperative agreement with the Construction Engineering Research Laboratory of the U.S. Army Corps of Engineers Engineer Research and Development Center (ERDC - CERL). We report on preliminary results of these research efforts.

- T203 RACHEL L. JOLLEY¹, BRIAN S. BALDWIN¹ AND DIANA M. NEAL¹. Mississippi State University¹. Optimizing rhizomal propagation of rivercane (*Arundinaria gigantea* (Walter) Muhl.).

Since the colonization of North America by Europeans, there has been a 98 % decline in large areas of rivercane (*Arundinaria gigantea*), known as canebrakes. Canebrakes provide exceptional wildlife habitat, promote streambank stabilization, and can improve water quality, making it an ideal species for riparian restoration projects. However, with infrequent flowering events, low seed viability, and the recalcitrant nature of seeds, it is difficult to find a reliable source of plant materials. The purpose of this study is to refine methods for vegetative propagation, using bare rhizome segments, in order to increase the production of rivercane material available for restoration projects. This study investigates which factors lead to the highest success rate in bare rhizome propagation, specifically: timing of rhizome harvest, diameter of rhizome segment, and location of rhizome segment. Rhizome segments consisting of 2-3 nodes (approximately 5 cm in length) were collected from approximately 30 genotypes of *A. gigantea* ssp. *gigantea* during fall/winter 2008-2009 on the campus of Mississippi State University. Segments were divided by diameter size and location in relation to the parent plant (proximal, middle, and distal). New culm emergence was tracked on a weekly basis throughout the study period. Data revealed that emergence rates did not differ by rhizome diameter, but did differ by segment location. Rhizome segments most proximal to the parent plant had significantly higher emergence rates than more distal segments. As this study progresses, we hope to show how nutrient storage in the rhizome affects propagation success across location and seasons.

- T204 JESSICA M. WAKEFIELD¹ AND JOYDEEP BHATTACHARJEE¹. University of Louisiana at Monroe¹. Lichens: Bioindicators of air quality.

Different volatile organic compounds present in the atmosphere in high concentrations have been shown to have damaging effects on the surrounding environment and human health. This project is designed to use lichens as a "passive" monitor to identify areas that are at risk for pollution damage. This research compares air pollution levels at different sites by using lichen disc transplants. Lichens were transplanted from an area of known low pollution (control site) to areas of potentially higher pollution levels and monitored over time to evaluate the use of lichens as bioindicators of air quality. Five sites surrounding Monroe, Louisiana were selected which include: one city park (Restoration Park in West Monroe), one wildlife management area (Russell Sage), and three national wildlife refuges (D'Arbonne, Upper Ouachita and Black Bayou Lake). Two stations were delineated within each site. One station represented an outer edge of the site close to a highway with predicted higher pollution levels while the other station represented a more secluded and pristine area within the site. Air quality samples were taken using SUMMA air canisters. At each station there were three 1ft sq boards containing six lichen bark discs and three suspended twigs. The lichen transplants were taken from Russell Sage WMA (control site) where the levels of pollution are low. Monitoring of the lichens will include photographic comparisons over time, chlorophyll analysis using a spectrophotometer, and morphological changes in the lichen thallus. This study will continue through 2009. Preliminary monitoring results will be presented.

- T205 ALEXANDRA KAY¹ AND DAVID VANDERMAST¹. Elon University¹. 30 years of European wild boar (*Sus scrofa*) rooting on herbaceous plant diversity in beech gap forests of Great Smoky Mountains national park.

The European Wild Boar (*Sus scrofa*) is an invasive species that causes significant ecological damage in high elevation beech gap forests of the Great Smoky Mountains National Park (GRSM). In GRSM and elsewhere these omnivorous hogs aggressively forage for food, and their feeding behaviors lead to the destruction of wildflowers, tree roots, and tree seedlings. In order to more clearly understand the impacts of the boar, fenced exclosures and associated control modules were constructed in the late 1970s. This study used 6 of these exclosures to examine differences in herbaceous richness and cover between areas where boars have been excluded for 30 years and areas where they continue to have access. Herbaceous richness was sampled at five spatial scales (from 0.01m² to 100m²) and cover was recorded at 100m² using standard Carolina Vegetation Survey protocol. Our results indicated that, across all exclosures, hogs significantly ($p < 0.05$) reduced herbaceous species richness at both the smallest and largest scales. In addition, cover was significantly reduced at the 100m² scale. However, these results were driven by dramatic differences noted in plots in which rooting had occurred recently; in plots without obvious rooting, there were no differences in diversity or cover. Our data and observations suggest that ecological changes brought about by the death of beech in these forests from Beech Bark Disease can overwhelm the effect of hog rooting and may result in reduced rooting frequency and intensity.

- T206 MATT S. BRUTON¹ and DWAYNE ESTES¹. Austin Peay State University¹. *Baccharis halimifolia* L. (ASTERACEAE) is reported as new for the state of Kentucky.

Baccharis halimifolia L. (ASTERACEAE), common groundseltree, is most common on the southeastern Coastal Plain, growing as far inland as central Arkansas, southern Tennessee, and the central Piedmont Plateau. Historically, this species was mostly limited to coastal salt marshes, hammocks, and beach dunes, only recently expanding inland to

disturbed habitats such as old fields, forest margins, and roadsides. *Baccharis* was first discovered in Tennessee in 2004 from two counties in the south-central portion of the state. During the next couple of years, the species was collected from several counties across the southern half of the state. In November 2008, we collected *B. halimifolia* from the Clarks River National Wildlife Refuge in Marshall County, Kentucky. This represents the first report of the species from the state and the northernmost interior population in North America.

T207 IVAN R. SHOEMAKER¹. Columbus State University¹. Pollination syndromes and their role in plant conservation genetics.

Gene flow can counter the effects of genetic drift that are inherent to small and isolated populations, and in plants, pollen is the main contributor to gene flow. In light of recent reports of pollinator decline, the role of plant pollination strategies in facilitating gene flow is of particular interest to plant conservation. Pollinators vary extensively in their foraging behaviors, and they may vary accordingly in their value and function regarding the reproduction of endangered species. I reviewed the literature for genetic diversity (A_p), heterozygosity (H_o , H_e), fixation indices (F_{ST} , G_{ST}) and migration rates (N_m) in federally threatened and endangered angiosperms. I then determined the pollinators of these species, in order to identify the effects of pollinators on gene flow. Evidence suggests that pollinator type likely plays a significant role determining rates of gene flow among rare plant species. Common agricultural pollinators, such as honeybees and bumblebees, may be of limited importance to endangered species and in some cases, may even represent a threat. Other less-studied, native pollinators are likely much more important in maintaining natural gene flow between isolated populations. Beetles, for example, are widely ignored as important pollinators; yet they exhibit significant floral constancy and facilitate high levels of outcrossing. In addition, mixed pollination may be a common strategy that ensures both high seed set and infrequent long-distance dispersal. Consideration of these trends is vital to the long-term conservation of rare taxa.

T208 HEATHER P. GRISCOM¹, BRONSON W. GRISCOM², LEIGH SIDERHURST¹ AND MARK P. ASHTON³. Spatial James Madison University¹ The Nature Conservancy² Yale University³. Dynamics of canopy trees in an old growth hemlock forest in the Central Appalachian Highlands.

Understanding the shifting spatial distribution of trees with age and size is central to our knowledge of forest dynamics. We studied the spatial distribution of canopy trees (greater than 75 cm dbh) of *Tsuga canadensis* as a function of age and size in a 20 hectare forest stand that has no record of human clearing (Cathedral State Park, West Virginia). We found a continuous recruitment of trees and a significant correlation between age and dbh ($r = 0.71$). Canopy hemlocks shifted from being aggregated away from the riparian zone when younger to being aggregated near the riparian zone when older. Thus, the spatial distribution of this species fundamentally shifted within the mature canopy size class over an age span of 220 years. Trees greater than 102 cm dbh and less than 240 years old were on average closer to the stream than trees less than 102 cm dbh (Mann-Whitney U, $Z = -4.016$, $p < 0.0001$). Trees greater than 241+ years old were also on average significantly closer to the stream than trees younger than 240 years old (Mann-Whitney U, $Z = -5.359$, $p < 0.0001$). Clustering with respect to riparian areas was more strongly displayed by age than by dbh. We suspect that the oldest individuals are concentrated near the stream because they are sheltered from wind disturbance. It is imperative that we have a solid understanding of long-term forest successional dynamics demonstrated by late-successional *Tsuga canadensis* forests of the region, before the remaining old growth stands are eliminated by the woolly adelgid (*Adelges tsugae*).

T209 Cancelled

- T210 BRENDA L. WICHMANN¹ AND MICHAEL T. LEE². North Carolina State University¹ University of North Carolina at Chapel Hill². Floristic diversity of Southern Appalachian bogs.

Southern Appalachian bogs are small and uncommon montane wetlands known for their floristic diversity, including rare, disjunct, and endemic taxa. These characteristics have attracted botanists for generations. However, a comprehensive flora of these wetlands does not exist. Using North Carolina Natural Heritage Program data, Carolina Vegetation Survey data, the U.S. Southeast flora atlas, and A.S. Weakley's 2008 Draft flora, we've compiled a complete list of plant taxa that have been documented as occurring in the southern Appalachian bogs of North Carolina. We've determined how many of these taxa are rare, and evaluated how many are likely to depend primarily on southern Appalachian bogs for survival. We found that 9 taxa are globally imperiled, and 92 taxa are state imperiled. North Carolina lists 17 of these imperiled taxa as endangered or threatened, including the federally endangered *Sagittaria fasciculata* and the federally threatened *Helonias bullata*. We estimate that more than 25% of the rare plants occurring in southern Appalachian bogs are likely to depend primarily on these uncommon habitats for survival. The total number of imperiled plant taxa found in southern Appalachian bogs represents approximately 10% of North Carolina's imperiled flora.

- T211 Jared A. Woolsey¹. Appalachian State University¹. Changes in the structure and composition of transitional forests bordering the low-elevation granitic dome communities at Carl Sandburg Home National Historic Park.

The structure of transitional forests surrounding low-elevation granitic domes at Carl Sandburg National Historic Site was examined using a series of 100 m² fixed-area plots. Trees were accounted for by size category and assessed for: relative age, soil development, and species composition. For each stratum, relative-basal-area per hectare, density per hectare, and frequency were calculated. From these data: frequency, density and dominance were calculated to derive importance values. Stand basal area was relatively high (G=47.71 m²/ha) but within the common range for mixed-hardwood forests. Transitional forests were mature and vertically diverse. Forest structure was uneven-aged and indicated a lack of wide-scale disturbance. The understory was heavily dominated by fire intolerant species such as white pine (*Pinus strobus*) and red maple (*Acer rubrum*). The dominant-overstory species were clearly white pine and oaks (*Quercus* spp.), which accounted for over 67% of the importance values. However, there were observable differences in the age and size-class distributions of these species groups. Pitch pine (*Pinus rigida*) was also important in the overstory, but declined in the understory and regeneration layers. There was an inverse relationship between the importance and relative density of pitch pine and red maple across vegetation layers. Further changes in forest structure should be expected as fire-intolerant species reach the canopy. Fire creates open woodland conditions on xeric sites, rather than continuous closed-canopy forest. Active management may be necessary to maintain the structure of these communities and prevent the senescence of shade intolerant and fire-dependent species.

- T212 JULIE P. TUTTLE¹, ALBERT J. PARKER² AND PETER S. WHITE¹. University of North Carolina at Chapel Hill¹ University of Georgia². Ecotonal change in high-elevation forests of the Great Smoky Mountains, 1930s-2004.

Recent theory asserts that montane vegetation ecotones may be good locations for observing vegetation change because of their association with steep environmental and climatic gradients. In the Southern Appalachians, the ecotone between spruce-fir forests and lower-elevation deciduous forests is considered a major climatic marker and provides an opportunity to study forest dynamics in the context of multiple anthropogenic impacts.

Recent and potential threats to these forests include exotic pest introduction, atmospheric deposition, altered disturbance regimes, and climate change. In 2004, one of us (Tuttle) sampled the Great Smoky Mountains spruce-fir ecotone using 0.08 ha plots for comparison to similar data from Frank Miller's 1930s vegetation survey. We asked whether ecotone composition and structure had changed over this 70-year period. Basal area was similar in the two periods, but density was 60 percent higher in 2004; this difference was concentrated in the smallest size class (10-30 cm dbh). Species with much higher densities in this size class in 2004 included *Picea rubens*, *Betula alleghaniensis*, four *Acer* spp., *Tsuga canadensis*, and *Halesia tetraptera*; differences for these species overwhelmed 50 percent lower densities for *Abies fraseri* and *Fagus grandifolia*. At higher elevations in the ecotone, dominance by *Picea rubens* and *Betula alleghaniensis* is more pronounced in 2004 than in the 1930s. While multiple impacts may be important, observed changes in the ecotone reflect primarily the targeted decimation of *Abies fraseri* and *Fagus grandifolia* by introduced exotic pests.

T213 GEORGE V. PINCHUK¹, JOHN V. STOKES², SANG-RIUL LEE², BINDU NANDURI², CATLYN M. JOHNSON¹, MARY B. SHELTON¹, ALEXEJ N. VERKHRATSKY³ AND LESYA M. PINCHUK². Mississippi University for Women, Columbus, MS, USA¹ Mississippi State University, Mississippi State, MS, USA² University of Manchester, Manchester, UK³. Proteomic analysis reveals altered expression of protein kinases and transport-related proteins in bovine monocytes infected with a cytopathic virus.

Recent advances in proteomics allow investigators to assess the expression of numerous proteins in a cell and to trace the alterations of their expression associated with viral infections. In this work, we report the results of analysis of the expression of 9911 proteins isolated from bovine monocytes infected with NADL, a cytopathic strain of the bovine viral diarrhea virus, and identified by high-output liquid chromatography and electrospray ionization tandem mass spectrometry. We found that the expression of eighteen protein kinases and related proteins (particularly the urokinase-type plasminogen activator, the myristoylated alanine-rich C kinase substrate, the nucleoside diphosphate kinase, the hexokinase and other) was significantly altered compared to controls. Further, the expression of fourteen integral transmembrane proteins that function in the mitochondria, endoplasmic reticulum and plasma membrane as transporters of ions and metabolites (particularly the voltage-dependent anion channel 1, the mitochondrial electron transfer protein, the sodium-dependent phosphate transporter and other) was also significantly altered. Notably, all 32 of the above-mentioned proteins have been implicated in the regulation of cell survival and apoptosis, and some were also shown by other investigators to play an important role in the functions of monocytes. Based on our findings, we propose a new molecular model of the cytopathic effect of NADL and of the impairment of immunity by this virus.

ASB POSTER ABSTRACTS

- P1 LAURA B. TACKETT¹, JAMES B. MCCLINTOCK², SAMUEL S. BOWSER³, CHARLES D. AMSLER² AND BILL J. BAKER⁴. University of Alabama at Birmingham¹ University of Alabama at Birmingham, Dept. of Biology² Wadsworth Center, New York State Dept. of Health and University of Albany³ University of South Florida, Dept. of Chemistry⁴. A field study of the incidence of valve-clapping behavior in an Antarctic scallop

Antarctic marine soft-bottom habitats often harbor dense populations of bivalves whose burrowing, filter feeding, and in the case of scallops, shell clapping behaviors, may cause bioturbation. The scallop *Adamussium colbecki* occurs in high densities in glacial till benthos of New Harbor, McMurdo Sound, Antarctica (77 ° 34'S, 163 ° 36'E). The present study examined whether shell clapping is always associated with swimming behavior, or if not, whether it may play a role in the resuspension of organics to supplement nutrition in a plankton-limited environment. Using SCUBA, a video camera was placed on the sea floor (depth = 33m) and populations of adult scallops filmed using time lapse videography over a period of several weeks in November 1993. The direction of the camera was periodically shifted. Three 20-22 hr segments of video (2 of the same view, one of another) were analyzed. Each scallop was individually marked on a transparency placed over the monitor to follow clap counts. Also recorded was whether each clap was initiated by a disturbance. We found similar mean \pm 1 SE claps/scallop/hr of 3.74 \pm 0.26 (n= 16 scallops), 3.83 \pm 0.28 (n= 17 scallops), and 4.15 \pm 0.21 (n= 15 scallops) for each video segment. Thus, in general, adult scallops clap approximately 4 times per hr. Only 25% of the total claps observed were initiated by disturbance (e.g. contact with fish, another scallop, etc.). Thus, 75% of scallop clapping may be a mechanism to resuspend organic seston to facilitate filter feeding in a plankton-depauperate environment.

- P2 MALLORY J. OFFNER¹ AND SORAYA M. BARTOL¹. Virginia Wesleyan College¹. Electrical and olfactory detection of prey by the yellow-spotted stingray, *Urobatis jamaicensis*.

There have been several studies conducted investigating the use of electroreception in elasmobranchs, particularly concerning prey capture. However, research involving the comparison of multiple senses is lacking. The behavioral responses of the yellow-spotted stingray, *Urobatis jamaicensis*, to odor and electrical stimuli were compared using a variety of food sources. The stingray's response time was recorded during four sets of trials using live prey (both odor and electric), dead prey (odor only), electrodes (electric only), and dead prey combined with electrodes (odor and electric). When response times are compared between the odor and electrode trials, the stingray exhibited a stronger response towards the odor. If the trials using both the odor and electrical stimuli are included, the stingray reacted more strongly when it could utilize both senses. From these data, it appears that the animal is capable of using either stimulus for prey finding behavior; however, further research needs to be conducted on multiple specimens to determine statistically if one stimulus is preferential over the other. There is potential for this research to have practical applications, as humans and elasmobranchs often interact, especially regarding fisheries (to attract or repel certain species) and animal husbandry in aquarium settings.

- P3 CAROLYN S. VANZWOLL¹. Georgia Southern University¹. Fright reaction in *Gambusia holbrooki* in response to skin extract from conspecifics.

Risk assessment in fishes can range from individual detection of a predator to complex alarm signaling systems in larger groups. Fishes of the super order Ostariophysi exhibit a

fright reaction when exposed to chemicals released from the damaged skin cells of conspecifics (known as Schreckstoff). Other groups of fishes, including livebearers (Poeciliidae) also exhibit similar, though not homologous, alarm systems. However, studies of the alarm system in livebearers has been historically limited to guppies (*Poecilia reticulata*) and western mosquitofish (*Gambusia affinis*). Eastern mosquitofish (*Gambusia holbrooki*) are similar in biology, and closely related to *G. affinis*. The objective of this study was to determine if a fright reaction system exists in *G. holbrooki*. Mosquitofish were collected in September 2008 from a pond on campus at Georgia Southern University, and maintained in aquaria in small schools. Fish behavior was videotaped prior to any experimental procedure ("baseline"), and during the introduction of treatments. Skin extract derived from injured conspecifics served as the chemical treatment, and distilled water served as a control. Nordell's (1998) index of cohesion was used to measure closeness of the school. Individuals in schools receiving skin extract remained significantly closer to one another than controls ($p = 0.020$, $n = 6$). Further work is underway to assess the effects of long-term exposure to skin extract for *G. holbrooki* and least killifish (*Heterandria formosa*). Changes in nutrient provisioning to offspring (and associated transgenerational effects) due to increased predation risk are currently being assessed.

P4 KATHERINE L. PITTMAN¹, LYNN SIEFFERMAN¹, MARK LIU² AND GEOFFREY E. HILL². Appalachian State University¹ Auburn University². Effects of personality on reproductive fitness in male Eastern Bluebirds *Sialia sialis*.

Eastern Bluebirds *Sialia sialis* are socially monogamous, and males vary in brilliance of their ultraviolet (UV)-blue plumage coloration, and their levels of territorial aggression, and parental care behaviors. In our Alabama population, duller males are more aggressive but feed offspring less often while brighter males are less aggressive and are better parents. Although brighter males have been shown to fledge more offspring, this measure of reproductive success ignores extra-pair copulations, a behavior that accounts for 30 percent of the offspring in this population. Duller males guard their fertile mates more closely and are more aggressive to intruding males. We hypothesize that male mating strategy may be closely tied to both plumage coloration and personality. We predict that duller males may gain extra-pair paternity and prevent their mates from cuckolding them, which could result in similar total reproductive success between dull and bright males. We captured wild bluebirds and measured plumage color of rump and tail feathers using an UV-Vis spectrometer. We quantified aggression by presenting a caged live male bluebird in the focal male's territory and observing the focal male's response to this simulated territorial intrusion. When offspring were 10 days old, we quantified parental care by measuring feeding rate (feedings per hour), using video cameras. We are currently assigning paternity of offspring of 75 families using 5 variable microsatellite loci (mobl47, mobl49, mobl53, mobl87b, eabl129). The results of this study can shed light on sexual selection theory; specifically how variation in ornamental traits is maintained through evolutionary time.

P5 CAITLIN M. GUSSENHOVEN¹, THERESA A. WETZEL¹ AND H. D. WILKINS¹. University of Tennessee at Martin¹. Niche partitioning and overlap between red-headed and red-bellied woodpeckers during the winter in a bottomland hardwood forest.

The competitive exclusion principle states that no two species can have exactly the same niche. Red-headed Woodpeckers (*Melanerpes erythrocephalus*) are irruptive migrants that occasionally winter in the same forests as Red-bellied Woodpeckers (*Melanerpes carolinus*). Our goals were to determine if niche partitioning was occurring and to determine the niche breadth and overlap between the two species. This study took place in a bottomland hardwood forest over the course of four winters. Behavioral observations were made every thirty seconds for fifteen minutes. Red-headed woodpeckers spent

much of their time on main branches where they were vigilant and foraging, possibly protecting their acorn caches and looking for flying insects. Red-bellied woodpeckers spent much of their time on the trunk and main branches where they were foraging and communicating possibly in preparation for the upcoming breeding season. Several aggressive encounters and some niche partitioning were observed suggesting that these two species may be competing for resources during the winter. Future work will contrast Red-bellied woodpecker niche use in the presence and absence of Red-headed woodpeckers.

- P6 CHARLES W. BELIN, JR.¹, R. DEFFENDALL¹ AND A. STORIE¹. Armstrong Atlantic State University¹. White-tail deer carrying capacity at Skidaway Island State Park, Savannah, Georgia.

The native white-tail deer (*Odocoileus virginianus*) populations of several islands along the Georgia coast have appeared to be declining in health over the past 10 years. Several explanations for this phenomenon are evident; however, several researchers have alluded to the over-population of the species. We have determined the carrying capacity of the Skidaway Island State Park, a portion of Skidaway Island located near the coastal City of Savannah. By determining the amount of biomass produced by several habitats located within the park, and knowing the hectares of these habitats, the total amount of biomass has been determined. Using the caloric requirements of the white-tail deer found at other regions of the continental United States, we have been able to determine the number of healthy deer that could be found within the park and manage the herd accordingly.

- P7 CHRIS L. RICE¹ AND KIM M. TOLSON¹. Department of Biology, College of Arts and Sciences, The University of Louisiana at Monroe, Monroe, LA 71209¹. The use of tree cavities and surrounding habitat by *Corynorhinus rafinesquii* and *Myotis austroriparius* in a bottomland hardwood forest streambed.

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 National Wildlife Refuge. Cavities have been monitored since 24 May 2007. Eighty-one cavity searches revealed that thirty-six cavities (water tupelo and cypress)(61%) have been utilized as roosts by one or both species. *C. rafinesquii* inhabited thirty-five cavities (water tupelo and cypress)(59%) and switched roosts frequently. Eight trees were occupied >50% of the time by this species. *M. austroriparius* established roosts in only eight cavities (water tupelo)(14%), while one roost was occupied 80% of the time. 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 were 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.

- P8 DAVID A. STEEN¹. Auburn University¹. Spatial requirements of nesting freshwater turtles: designation of core terrestrial habitat.

Freshwater turtles require upland, terrestrial habitats to fulfill life cycle requirements associated with nesting. Nesting migrations expose female turtles to road mortality and development of terrestrial areas may eliminate nesting sites. As turtles are of conservation concern, it is imperative to identify the extent of upland habitat required by this group. I examined the literature and contacted turtle researchers for data related to the distance females travel to nest. Based on 3,809 nests of 22 species, turtles traveled on average 170 meters from the nearest wetland. Land managers are challenged to preserve considerable upland areas sufficient to protect areas required by nesting turtles. Data collection for this project and I encourage those with relevant data to consider collaborating.

P9 JONATHAN ADAMS¹, ROBERT CARTER¹, CHRIS MURDOCK¹ AND BENJI BLAIR¹. Jacksonville State University¹. Effects of prescribed burning regimes on small mammal populations on the Talladega National Forest, AL.

Prescribed burning is used by forest managers to control vegetation patterns and growth. A study of the relationship between prescribed burning and mammal populations was conducted on the Shoal Creek District of the Talladega National Forest in east central Alabama. The study area was twelve sites ranging from the control (15+ years since last burn) to sites burned within the previous year. Small mammal trapping was carried out in each of the sites using Sherman live traps. A total of 66 individuals and 5 species were captured over 2160 trap nights. *Peromyscus leucopus* was the most common species captured with 48 captures and was captured on all treatment types. One-way ANOVA analysis was used to compare *Peromyscus leucopus* populations between treatment types. Due to small sample size an index of population size was used instead of a statistical population estimator. One-way ANOVA showed a significant difference in *Peromyscus leucopus* populations when comparing treatment years 15 and 5, 15 and 2, and 15 and 1. Combined species density was highest in plots that were burned within the previous year (6.11 individuals/100 trap nights). Species density was lowest in plots that were burned 15 years ago (0.56 individuals/100 trap nights).

P10 RUSSELL L. MINTON¹ AND KATHRYN E. PEREZ². University of Louisiana at Monroe¹ University of Wisconsin at La Crosse². Analysis of museum records highlights unprotected land snail diversity in Alabama.

In order to address the conservation status and needs of Alabama's land snail species, we examined their diversity and distribution using 11,816 museum records representing 226 land snail species. Using estimated richness values and information on the state's protected areas, we hoped to determine if certain parts of the state harbor highly diverse areas and to what extent federally and state protected lands offered the snails protection.

P11 JOHN G. RAE¹. Francis Marion University¹. Community structure of riverine larval midges (Diptera: Chironomidae).

The structure of a community of aquatic larval chironomid (Diptera) larvae was studied for one-year in a sand-gravel point-bar in the Lynches River, South Carolina. Random replicate sediment core samples (9.6 sq cm), that were subdivided vertically into 1-cm intervals for the top 4 cm, were taken each month. Fauna were extracted, mounted permanently on microscope slides, counted and identified to species or type. A total of 38 species of fly larvae were identified. Thirteen species were from the subfamily Orthoclaadiinae, 20 from the Chironominae, and 5 from the predatory Tanypodinae. There was a significant difference in abundances over the year (ANOVA: $F(11,60 \text{ df}) = 7.07$; $p < 0.001$). The average abundance was 28.8 midges per 10 sq cm (28,800 per sq m) of sediment bottom with a range from 7.3 in February 2004 to 65.6 in May 2004. Additionally,

there was a significant difference in species richness over the year (ANOVA: $F(11,60 \text{ df}) = 5.65$; $p < 0.001$). There were significant differences in abundance for midges at different depths in the sediment ($F(3,284 \text{ df}) = 63.1$; $p < 0.001$) with the midges found predominately in the top cm of sediment. There were no significant differences in distribution of midges along the shoreline coordinate ($p=0.63$) or in distance from the shore ($p=0.47$).

- P12 SUELLEN JACOB¹ AND TRAVIS PERRY¹. Furman University¹. Creation of a georeferenced database and summary of South Carolina mammal natural history specimens.

We summarized the temporal, geographic, and taxonomic distribution of mammal specimens from South Carolina to facilitate use of this resource and to direct future collecting to the locations and taxa of greatest import. We gathered 11772 records from 35 institutions for mammal specimens collected in the state, combining them into a single database. We georeferenced the records and mapped them in ArcGIS against county and physiographic province layers and summarized the records by date, location, and taxonomy. We identify historical trends in collecting and suggest that future collection efforts focus on the central and northern piedmont, the northern and central coastal plain, and on species represented by few specimens which describe only a small proportion of the species' range in the state.

- P13 JAMES A. GAETA¹, WILLIAM ENSIGN¹ AND THOMAS MCELROY¹. Kennesaw State University¹. The Effect of Water Control Structures on the Gene Flow in *Campostoma oligolepis* in the Etowah River Basin.

The Largescale Stoneroller, *Campostoma oligolepis*, is a robust minnow that is distributed throughout the Etowah River and its tributaries. Because of its high abundance and wide distribution it can be used to assess the conservation implications of severing the connectivity of a water system that is home to many species. The Etowah River is located in several counties in North Georgia and currently has more than 2,000 man made dams. These anthropogenic structures results in a loss in connectivity, habitat fragmentation, and restricted gene flow. Previous studies have indicated that populations above and below water impoundment structures are genetically distinct. These conclusions were based on surveys of only two polymorphic microsatellite loci. We will test the hypothesis that water control structures strongly influence genetic population structure causing the magnitude of genetic difference between pairs of sites to be related to hydrological disturbance patterns rather than the geographic river distance between sites. In order to investigate this hypothesis we will examine four additional microsatellite loci in *C. oligolepis* collected from 23 different locations in the Etowah River. The increased number of polymorphic loci analyzed will help to support or refute the previous conclusions that there are genetically distinct populations of *C. oligolepis* in the Etowah River Basin.

- P14 TYLER HARGROVE¹, RYAN JOHNSTON¹, JOSH TOMPKINS¹, CORY WORKMAN¹ AND TOM BLANCHARD¹. University of Tennessee at Martin¹. The effects of stream restoration on the community structure of aquatic benthic macroinvertebrates in the North Fork Obion River.

In 2001, the West Tennessee River Basin Authority completed the North Fork Obion River Restoration Project in Henry County, Tennessee. This project restored approximately 1200 meters of river channel to a more naturally meandering pattern. In our study, we compared community structure of benthic aquatic macroinvertebrates at this location to that of another section of the river that remains in a channelized condition. We sampled aquatic macroinvertebrates from a variety of microhabitats at both locations to assess the

effects of stream restoration on taxa richness, diversity, and the relative abundance of the different invertebrate groups. In the restored section of the river, taxa richness and diversity were substantially higher than in the channelized section. The composition of taxa and their relative abundance also varied greatly between the two sites. The results of this study suggest that stream restoration may have a considerable impact on aquatic communities.

- P15 ROBERT W. VAN DEVENDER¹ AND AMY S. VAN DEVNEDER². Appalachian State University¹ 797 Little Laurel Rd. Ext., Boone, NC 28607². Biogeography of Land Snails in Nine North Carolina State Parks.

Land snail surveys in nine NC State parks between 2007 and 2008 produced 2246 snails provisionally allocated to 119 species level taxa. Individual "species" occurred in 1 (n=72) to 8 (n=3) parks. There were too many single park occurrences for linear or log transformed fit of species and park frequency. Morrow Mountain SP was most diverse with 637 snails, 51 species, $H'=3.22$, and $J'=0.82$. Mount Mitchell SP had lowest diversity with 132 snails, 11 species, $H'=1.88$, and $J'=0.78$. Number of species (S) and diversity (H') increased significantly with number of snails. Samples from Mount Mitchell SP and Jones Lake SP included few snails (132 and 87, respectively), fewest species, and lowest diversity. Pairs of parks shared from 0 to 19 species and Jacard similarities from 0 to 0.37. Mount Mitchell SP shared 1 or 2 species with only two parks and was least similar to each other parks. Mt. Jefferson SP and New River SP in the Blue Ridge Province were most similar to each other. Crowder's Mt. SP, Pilot Mt. SP, Morrow Mt. SP, and William B. Umstead SP represented the Piedmont Province despite the higher elevations of some parks. Jones Lake SP in the Sandhills was most similar to the low elevation Piedmont site at William B. Umstead SP. One new state occurrence record, two second state records, and numerous county records were recorded. Despite several daunting identification and taxonomic problems land snails are sufficiently abundant and diverse to be useful for biogeographic analyses at several scales.

- P16 JANELLE L. BOWCOCK¹ AND C. BRIAN ODOM¹. Wingate University¹. Disruption of raccoon feeding at baited stations by the introduction of predator urine.

Bobcats have been an established predatory species in the Union county, North Carolina area, while coyotes are a relatively recent addition to the local ecosystem. An experiment was designed to determine the comparative deterrent effect urine from these predators on raccoon feeding. Three feeding stations were established using commercial dog food as bait. The presence of feeding raccoons was established by automatic cameras. Once established, feeding groups were challenged by the addition of predator urine (bobcat or coyote) to the feeding station environs. The disruptive effects of the urine on the feeding groups were again determined by automatic cameras. Upon habituation to the initial urine challenge, the urine sources (bobcat or coyote) were switched and the effect of the second habituation period was compared to the first.

- P17 LACY N. DANIKAS¹ AND VINCE COBB¹. Middle Tennessee State University¹. Investigations into the thermal physiology of a latitudinally widespread species, *Nerodia sipedon*.

Locomotor performance in animals is arguably one of the most important physiological mechanisms for capturing prey and avoiding predation, and, is thereby generally subject to pressures of natural selection. For ectothermic animals, temperature is perhaps the most important abiotic variable influencing locomotor performance. Locomotor performance typically increases with temperature, reaching an "optimal" or maximal efficiency level before declining as the critical thermal maxima is approached. Therefore, it

is expected that the thermal physiology of ectothermic species with broad geographic ranges would vary in a predictable pattern, exhibiting adaptations to regional conditions. The northern watersnake (*Nerodia sipedon*) is one of the most wide ranging snake species in North America, and is exposed to a wide range of environmental conditions, making it a good model species to test latitudinal gradients. We examined the effect of temperature on neonate locomotor performance (maximal crawling and swimming speeds) from two latitudes representing the northern and southern extremes for this species. Maximal crawling and swimming speed for both populations occurred at 35°C. Swimming speeds were twice as fast as crawling speed. Based on preliminary data, performance curves did not differ between populations indicating that potentially selection pressure for shaping thermal adaptations has not been strong enough to differentiate their thermal physiology associated with neonate locomotion. One possible explanation for this is that adjustments in snake thermoregulatory behavior have dampened the need for adaptation.

- P18 Mary C. Mills¹, Rachel L. Jolley¹, Diana M. Neal¹, Brian S. Baldwin¹ and Gary N. Ervin¹. . Mississippi State University¹ Response of giant cane (*Arundinaria gigantea*) to native and exotic grass competition and site preparation techniques for canebrake restoration.

Canebrakes are dense stands of *Arundinaria gigantea* (Walt.) Muhl. that were once prominent in the Southeastern United States. Cane still occurs as an understory component of bottomland hardwood forests, but with intense agricultural development over the past 200 years, canebrakes are now a critically endangered ecosystem. There is increasing interest in the use of *A. gigantea* in riparian restoration and soil stabilization. Additionally, *A. gigantea* possesses cultural significance to American Indians as a major component of construction, basketry, and weapon making. Our study assesses both competitiveness of *A. gigantea* and its response to site preparation techniques, when planted with native grasses (Big Bluestem, *Andropogon gerardii*, and Indiangrass, *Sorghastrum nutans*) and exotic grasses (Johnsongrass, *Sorghum halepense*, and Bermudagrass, *Cynodon dactylon*). We are looking for the site preparation technique (soil tilling, herbicide, and a combination of tilling and herbicide) that facilitates the most vigorous growth response in *A. gigantea*. Treatment effectiveness and competition will be determined by measuring culm height, diameter, density, production of new culms, cane spread and cane biomass. Ecophysiological measurements also will be taken on *A. gigantea* to further understand its competitive response to native and exotic grasses. This research should contribute to improving the success of future canebrake restoration projects by determining the interaction of cane with other grasses, as well as its response to frequently used site preparation techniques with and without weedy competitors.

- P19 MARGARIT GRAY¹. Anderson University¹. Fish diversity survey of Four Hole Swamp, South Carolina.

The Four Hole Swamp watershed occupies approximately 72,553 acres and is located in the Francis Beidler Forest, which is managed by the National Audubon Society. This swamp contains 1700 acres of virgin, old growth tupelo/cypress trees, some of which are in excess of 1000 years. This makes it the largest tupelo/swamp in the world. The Four Hole Swamp watershed flows into the Edisto River, the longest black water river in the United States (400 km). A fish survey was completed for parts of the Edisto River Basin in 1995, but a survey to determine species diversity has never been conducted for the actual Four Hole Swamp watershed. With help from the South Carolina Department of Natural Resources (DNR), 41 fish species were positively identified in a Four Hole Swamp fish survey completed in the summer of 2006. Electrofishing equipment and manpower were furnished by the DNR. Two lakes or "holes" in the swamp were sampled with an electrofishing capable boat and smaller streams and were sampled using backpack

electrofishing equipment. Of the 1331 fish sampled, the dominant family represented was Centrarchidae and the most common fish species were *Lepomis auritus* (redbreast sunfish), *Lepomis punctatus* (spotted sunfish), *Aphredoderus sayanus* (pirate perch) and *Lepomis macrochirus* (bluegill). The Shannon Diversity Index was 2.7 and the evenness of the sampled population according to Shannon's equitability is 0.373.

- P20 ASHLEY L. STEELE¹. Elon University¹. The effect of disturbance on the spread of invasive plant species in the Haw River corridor.

The purpose of this study is to examine the effects of past land use and soil on the distribution of the invasive plants *Elaeagnus umbellata* and *Ligustrum sinense* in the Har River corridor in North Carolina. Past land use was determined using aerial photographs, and current distributions of the invasives were mapped with GIS software using data collected from 43 field sites measuring from 10m by 10m to 10m by 50 m using standard Carolina Vegetation Survey techniques in Alamance and Chatham counties. A cluster analysis was performed to determine if the sites were randomly distributed. Soil samples were analyzed for a correlation between past disturbance levels, current plant distribution, and current soil nutrients.

- P21 JOSHUA B. SMITH¹ AND MARK S. SCHORR¹. University of Tennessee at Chattanooga¹. Effects of Urbanization on Instream Habitat and Fish Assemblages in the Chattanooga Metropolitan Area, Tennessee-Georgia.

Twenty-one stream sites in the Ridge and Valley ecoregion of Tennessee and Georgia were studied in 2008 to evaluate the effects of watershed urbanization on instream environmental parameters and fish assemblages. We also investigated changes in urbanization and stream conditions at 11 sites over a 10-year period (1998-2008). Electrofishing yielded 12,329 fish, composed of 38 species from 8 families. Urbanization in the study watersheds was measured (using ArcGIS 9.3) by calculating the housing density, commercial building density, and percent urban land use. Correlation analysis revealed that more urbanized watersheds were characterized by increased proportions of fine sediments and pool areas, coupled with reduced variation in channel complexity. Urbanized watersheds exhibited declines in biotic integrity, species diversity, richness and evenness. Watershed urbanization was also correlated with declines of the proportions of cyprinids and percids, as well as an increase in centrarchid proportions. Although urbanization increased from 1998 to 2008 in the study watersheds, the rate of urban growth varied considerably across the sites. Correlations between percent urban growth and changes in stream conditions revealed that less urbanized sites are more susceptible to deterioration of channel complexity, species richness, diversity, and evenness. Findings from this study suggest that urban development has induced adverse transformations in both habitat quality and biotic health in Chattanooga area streams; moreover, degradation rates were highest in the early stages of watershed development. Percent urban land use was found to be a better correlate of stream conditions than housing and building densities.

- P22 DAVID J. ROSEN¹, DIANE DE STEVEN² AND MICHAEL L. LANGE³. Lee College, Baytown, TX¹ U.S. Forest Service Southern Research Station, Stoneville, MS² U.S. Fish & Wildlife Service, Angleton, TX³. The Texas Columbia Bottomlands: conservation strategies and vegetation characterization.

The "Columbia Bottomlands", located along the lower Brazos, Colorado, and San Bernard Rivers on the Texas Gulf Coast, represent an under-recognized westward extension of Southern floodplain forest. The existing bottomland hardwood forests represent only 25% of a former pre-settlement extent of >280,000 ha, and they face continued threats from

agricultural and urban expansion. The importance of these remaining forests as critical stopover habitat for Nearctic-Neotropical migratory landbirds gave rise to the Columbia Bottomlands Conservation Plan, a multi-partner land acquisition and protection program. We summarize the Plan's key features, and we describe the plant composition of a typical protected tract, the Dance Bayou Unit. This 263-ha mature forest remnant contains at least 356 vascular plant species (302 native) in 83 families and 237 genera. Vegetation sampling and ordination analysis revealed a mosaic of species composition across habitats varying in microtopography, soil type, and flooding pattern. Seasonally flooded sloughs and stream channels were characterized by an overstory assemblage of green ash, American elm, and water hickory, with swamp-privet and buttonbush in the understory. Sugarberry, cedar elm, water oak, and yaupon characterized less frequently flooded backflats and ridges. Ground-layer vegetation also differed across habitats. Where possible, land conservation should encompass these upland-wetland mosaics to maximize biodiversity protection. Controlling invasive plants such as Chinese tallowtree is also a potential challenge. As threats from urban development accelerate, intensified efforts may be needed to reach the Conservation Plan goal of protecting 10% of original ecosystem extent.

P23 JESSICA DAVENPORT¹, RICHARD PIRKLE¹, JOSH CAMPBELL¹ AND MATTHEW WATERS¹. Shorter College¹. The use of photosynthetic pigment analysis to determine the resilience of a north Georgia reservoir to eutrophication.

The northern areas of Georgia and Alabama contain numerous reservoirs used for water storage, energy production and recreational activities. Given that these aquatic ecosystems are monitored and managed for excessive nutrient inputs and negative impacts, many remain oligotrophic. Nevertheless, increasing land-use changes, precipitation variability and management practices can cause nutrient inputs to increase during certain years and seasons. Here, we collected water from an oligotrophic reservoir in north Georgia and conducted a nutrient bioassay to determine nutrient concentrations capable of altering the phytoplankton community. Nutrients (High-N, Low-N, High-P, Low-P and all possible combinations) were added to flasks of lake water and phytoplankton community structure was monitored for several days by measuring chlorophylls and carotenoids using a High Performance Liquid Chromatography system. This method of photosynthetic pigment analysis enabled us to determine changes in community composition (diatoms, cyanobacteria, cryptophytes, chlorophytes) as well as primary producer abundance (chlorophyll-a). Results will be shown to demonstrate the utility of photosynthetic pigment analysis in monitoring fresh waters as well as the resilience of these oligotrophic systems to eutrophication.

P24 DANIEL T. HUSER¹ AND MARK S. SCHORR¹. University of Tennessee at Chattanooga¹. Local Effects of Culverts on Habitat Features and Fish Assemblages in Blue Ridge Streams.

We studied environmental conditions, fish assemblages, and culvert features in 10 headwater streams (Tennessee and Conasauga river drainages) in Cherokee National Forest (Blue Ridge ecoregion), Tennessee, May-August 2008. Five study streams contained road crossings characterized as pipe or box culverts (four had vertical drops at the culvert outlet), and five sites contained culverts with natural substrates. On each stream, paired sites (reach length ~35 times mean reach width, drainage area <11 km²) were established 50 m upstream and 50 m downstream of the culvert. Reaches downstream of pipe/box culverts (compared to upstream reaches; paired t test) exhibited greater water depths, lower gravel/sediment depths, and higher percentages of bedrock and boulder substrates ($P < 0.10$). Reaches downstream of natural substrate culverts (compared to upstream reaches) exhibited lower levels of substrate diversity and faster

current velocities ($P < 0.10$). Fish abundance (predominantly western blacknose dace *Rhinichthys obtusus*) was consistently higher downstream than upstream ($P < 0.10$), regardless of the culvert type. Downstream declines in habitat complexity and fish diversity and increases in western blacknose dace abundance were correlated with increased vertical drop at the culvert outlet and/or increased current velocity within the culvert (Spearman's test; $P < 0.10$). Mark-recapture experiments on two streams documented fish movements through a natural substrate culvert (similar to those in reference areas); however, movements through a pipe culvert were not detected. Our data suggest that culverts had localized effects on instream habitat and fish assemblages, and that certain types of culverts may impede fish dispersal.

P25 KATHERINE E. VANDEVEN¹, KELLY M. MAJOR¹ AND CLINTON S. MAJOR¹.
University of South Alabama¹. Interactions between native and non-native aquatic plants in the Mobile-Tensaw Delta.

The project is designed to investigate competitive interactions between native and non-native plants relative to human-influenced and/or natural environmental variation along the Mobile-Tensaw Delta. A bimonthly sampling regime is being implemented to collect data from 9 sites representing native and "mixed" (native + non-native) plant assemblages, along a gradient from south of I-65 to Mobile Bay. Sampling transects will be established, running parallel to the shore and outward into the river to a depth of 2 m, for determination of percent cover per plant species. At the end of the first field season, 1.5 m x 1.5 m control and removal plots (12 each; total = 24) were set up; granular herbicide (Navigate) was applied to the removal plots. During the second year of the study, granular herbicide (Navigate) will be applied to six removal plots to measure recruitment and/or competition between native and non-native plants. In situ measurements of pH, salinity, light attenuation, temperature, and water column depth are being recorded, and water column samples are being collected to determine chlorophyll, dissolved inorganic nitrogen ($\text{NO}_2^- + \text{NO}_3^-$), and ammonium concentrations per sampling date. Additionally, plant tissue samples will be collected for CHN analysis and used as an integrated measure of plant nutrient status. To our knowledge, this will be the first study of its kind to be conducted in the Mobile-Tensaw Delta and will provide baseline data for future assessments of impacts of disturbance and invasion on Alabama's native aquatic plant communities.

P26 LIVIA R. CARA¹ AND ROGER SAUTERER¹. Jacksonville State University¹.
Preliminary analysis of developing frog embryos to PCB-contaminated snow creek water (Anniston, Al) 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. Previous data using the standard FETAX assay shows slight but significant growth inhibition of the embryos, but no increases in either mortality or malformations. To determine the major proteins in control and experimental embryos we used 2-D gel electrophoresis using pH 4-7 IPG strips and the Phoretix 2-D software. 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 responses to toxic exposure. The preliminary results show a number of spots in the frog sample, but with poor resolution and vertical and horizontal streaks. To improve resolution and ensuring accuracy we are using a cleanup kit to remove detergents, salts, peptides, lipids, and phenolic compounds which interfere with IEF. In addition, we are testing different sample extraction procedures, run parameters equilibration procedures, and staining protocols.

- P27 RICARDO F. TAPILATU¹. Biology Dept of UAB¹. Western Pacific Leatherback at Bird's Head Peninsula, Indonesia.

The Pacific leatherback is critically endangered and currently threatened with extinction. The western Pacific leatherback turtle stock is one of the most important populations of leatherback turtles in the Pacific region. Jamursba-Medi and Wermon in Papua, Indonesia, are the two most important nesting beaches and they comprise a seasonally disjunct metapopulation. Adult leatherback turtles from this stock migrate to multiple foraging grounds in California, Japan, South-China, Australia, Indonesia, and PNG waters. They migrate every few years to nest at the regional rookeries on the north coast of Bird's Head peninsula at Jamursba-Medi and Wermon. A study was undertaken to quantify hatching success and evaluate factors impacting hatching success at these beaches. Results indicate that overall hatching success is relatively low at both beaches, but particularly at Jamursba-Medi. Various factors such as extreme sand temperatures, predation, and erosion appear to play significant roles in lowering hatching success. These results highlight the need for a serious and committed long-term research and management program to ensure high hatchling production for the western Pacific leatherback population. Such a program is a prerequisite for ensuring the survival of the Pacific leatherback.

- P28 JONATHAN M. WILLIS¹, ROBERT P. GAMBRELL² AND MARK W. HESTER³. University of Louisiana at Lafayette, Louisiana State University¹ Louisiana State University² University of Louisiana at Lafayette³. An investigation of mercury uptake by *Pontedaria cordata*, *Sagittaria lancifolia*, and *Polygonum punctatum* in a greenhouse setting.

Research pertaining to the cycling and bioaccumulation of mercury in wetland systems has become increasingly important as the threat of mercury to general environmental and human health has become elucidated. In this study, research was undertaken in a greenhouse setting to determine the fate of moderately elevated levels of inorganic mercury added directly to the surface water of wetland mesocosms, particularly in regard to potential phytoaccumulation. Specifically, *Pontedaria cordata*, *Sagittaria lancifolia*, and *Polygonum punctatum* were subjected to surficial loadings of 100 mg/m² and 200 mg/m² at 0 and 3 ppt salinity levels in a cross classified factorial design. The impacts of these elevated inorganic mercury levels on plant photosynthetic status were also evaluated. Soil characteristics (surficial pH and Eh) were monitored during the study, and indicate that soils were generally neutral and slightly reduced. Preliminary results indicate that aboveground plant tissue accumulated very little mercury regardless of surficial water mercury level or plant species. However, all three plant species demonstrated significantly greater concentrations of total mercury in their belowground tissues under elevated mercury loadings. None of the three plant species examined appeared to sustain serious impairment to their photosynthetic apparatus as revealed by net CO₂ assimilation and chlorophyll fluorescence measurements. Little effect of salinity level was discerned in either plant photosynthetic status or plant uptake of mercury. A five component sequential extraction of these soils has been undertaken and multivariate analyses are currently underway to investigate potential relationships among these operationally defined soil fractions of mercury and plant uptake.

- P29 MATT T. KEMP¹, MAGGIE A. SPEARS¹ AND KRISTIN A. BAKKEGARD¹. Samford University¹. Abandoned mine drainage and iron-oxidizing bacteria in Black Creek, Jefferson Co. Alabama.

Black Creek, a tributary of Five Mile Creek which flows into the Black Warrior River, receives water discharge from an abandoned mine. This discharge, acid or abandoned

mine drainage (AMD), is normally characterized by low pH and heavy metal leaching. We measured pH, turbidity, dissolved oxygen, and the concentration of Fe, Al, Zn, and S at 3 points; above, at and below the mine discharge entry point into Black Creek. We also used selective agar plates (with/without bisulfate ion) to tentatively identify the species of iron oxidizing bacteria at the site. *Leptospirillum ferrooxidans* (inhibited by bisulfate ion) and *Thiobacillus ferrooxidans* (not inhibited) are the most common bacteria found at AMD sites. Only iron, aluminum, and turbidity differed significantly between the three sites. (ANOVA; $P < 0.01$; $P < 0.01$; $P < 0.01$ respectively). Iron concentration was highest at the discharge point into the creek. Aluminum concentration and turbidity were highest below the discharge point. Surprisingly, the creek was not acidic with pH ranging from 7.08 at the discharge entry point to 7.30 above stream. Water samples containing visible bacterial colonies incubated over 7 days without the addition of bisulfite ion averaged 25 times more bacterial growth than those with the ion. Samples incubated with bisulfite ion had no bacterial growth. Therefore, we tentatively identify the iron oxidizing bacteria present at this site as *L. ferrooxidans*. The neutral pH could be attributed to the presence of limestone in the region which has increased pH and alkalinity in other AMD systems.

P30 MAYUR FAGWANI¹ AND CHRIS R. GISSENDANNER¹. University of Louisiana at Monroe¹. Identification of the cell cycle functions of the NHR-6 nuclear receptor transcription factor in *C. elegans*.

The vertebrate NR4A nuclear receptors regulate cell proliferation and cell differentiation during normal development and in several human diseases, including cancer. We are studying the NR4A homolog, NHR-6, in the genetic model organism *C. elegans*. NHR-6 has previously been shown to be required for cell proliferation during organogenesis in *C. elegans*. However, it is not well understood how NR4A nuclear receptors promote cell proliferation during development. We are addressing this problem by determining the cell proliferation functions of NHR-6 during development of the spermatheca, a *C. elegans* organ that functions during oocyte ovulation and fertilization. The cell cycle consists of four phases: G1, S, G2 and M. We hypothesize that NHR-6 directly promotes G1/S phase progression by positively regulating the expression or activity G1/S regulators. To test the G1/S progression hypothesis, we are analyzing the expression of the G1/S marker *rnr::GFP* in a cell lineage analysis of spermatheca precursor cells (SPCs). We predict that loss of *nhr-6* function results in a block or delay in the progression to S-phase; thus causing decreased cell number in the spermatheca organ. We are currently determining the precise location of SPCs in the somatic gonad primordium using several cell specific markers. Cell lineage analysis will then be performed through observation of *rnr::GFP* in the SPCs in wild-type and in *nhr-6* mutant nematodes. Results of these studies will be presented.

P31 NICOLE L. RICHARDSON¹. University of Arkansas¹. Mutagenesis of Cytochrome f Y160, R156, Y1, and Y9: Effects on Redox Properties.

Cytochrome f, a c-type cytochrome involved in the photosynthetic electron transport chain, has a significantly higher redox potential than most other c-type cytochromes ranging +370-380 mV. Site-directed mutagenesis studies were used to investigate the reason for the higher potential and its pH dependence. Residues Y160 and R156 interact with one of two the propionate groups of the heme. The interaction with Y160 is a hydrogen bond with the heme propionate, and the interaction with R156 is an electrostatic interaction. Residues Y1 and Y9, as indicated by M. Gunner, may also influence the redox potential and its dependence on pH because of their ability to be ionizable. Because of their proximity to the heme, these residues may influence the heme environment and therefore the redox potential and its dependence on pH. The mutant Y160L from a previous study shifted the redox potential by -20-30 mV. This indicates that the hydrogen bonding to the heme or the aromaticity of Y160 affects the potential. However the potential of a Y160F

mutant was identical to the wild-type indicating that the loss of aromaticity at position 160 and not the loss of a hydrogen bond to the heme propionate is responsible for the redox potential change in the Y160L mutant. The R156L mutant, however, is highly susceptible to air oxidation, suggesting that the loss of the electrostatic interaction between R156 and the heme significantly alters the protein's redox properties. The potentials of the Y1F and the Y9F mutants were similar to that of the wild-type.

P32 – Cancelled

P33 Kris Traver¹, Whitney Seabolt¹, Christa Lese Martin² and Xueya Hauge¹. Dept Biology & Physics, Kennesaw State University¹ Dept Human Genetics, Emory University School of Medicine². Searching for Cis-regulatory Elements Involved in 9p Deletion Syndrome by Identification of Highly Conserved Non-coding Sequences Across Species on Human Chromosome 9.

The genetic disorder known as 9p deletion syndrome is caused by a heterozygous deletion of the short arm of chromosome 9 (9p-). The clinical phenotype includes trigonocephaly, severe retardation, and dysmorphic facial features. The deletion of cerberus 1 (CER1) gene located at 14.7 Mb of 9p has been suggested as the cause of trigonocephaly. However, Hauge et al. reported recently that 9 patients, whose phenotype is consistent with the 9p deletion syndrome, possess smaller than 12.4 Mb terminal deletions. Therefore, the CER1 gene is intact in these patients. It raises the possibility that cis-regulatory elements for CER1 gene could be located in the first 12.4 Mb of 9p. An effective way of identifying potential cis-regulatory elements is to search for highly conserved non-coding sequences (CNSs) across species. In this study we systematically searched for CNSs between 10 and 12.4 Mb of 9p in 500 bp increments using the UCSC Genome Browser. All known genes and expressed sequences were excluded prior to the search. To date, we have identified 268 CNSs between human and mouse and 15 sequences between human and zebrafish. On an average, we found 11 sequences conserved between human and mouse in every 100,000 bp. The most CNSs-rich region is located between 10.6 and 10.7 Mb of 9p (100,000 bp), it contains 32 sequences. The CNSs-poorest region is located between 10 and 10.6 Mb of 9p (600,000 bp), containing zero sequences. Knowledge of these CNSs will be helpful in identifying regulatory elements of candidate genes for 9p- syndrome.

P34 MARIANN DINGMAN¹ AND ANISHA CAMPBELL¹. Bowie State University¹. Development of a Bacteriophage-Containing Nasal Spray to Protect Soldiers and Civilians Against Bioterrorism Agents.

Bacillus anthracis has been on the list of high-priority biological agents that terrorists could use to launch an attack on civilians. The organism has been a concern because it poses a threat to national security due to its ease of transmission, high rate death/illness, causing public panic, and requires special public health measures. This was demonstrated in 2001 when lethal anthrax was spread through the U.S. mail resulting in illnesses and deaths. The proposed project would seek to develop a quick, non-invasive method to dispense an antitoxin to combat the deadly bacterium. The project would focus on the development of a bacteriophage that could be incorporated into a nasal mist to destroy *B. anthracis*. Once the bacteriophage has infected the bacterium, it would degrade the proteins in the spore coat that have been associated with production and toxin activity. This action could deem the organism ineffective. Phase I of the project would be to create a recombinant DNA bacteriophage that would carry enzymes that would degrade the protein in the bacterium's spore coat. The product would be cost effective, easily self-administered, side effects would be minimal, and humanity would not be terrorized by the threat of this lethal

biological agent. The development of a successful product could advance military agendas throughout the world. (Supported by NCI/NIH P20CA119192)

- P35 JUSTINE MURRAY¹, SARAH WOOD², STEFANI THOMAS² AND AUSTIN YANG². Bowie State University¹ University of Maryland School of Medicine². Development of a proteomic method to identify mitochondrial protein biomarkers in diseased vs. healthy human brain tissue.

Mitochondrial proteins have integral roles in cell death pathways, the de-regulation of which contributes to the pathology of cancer, neurodegeneration, and age-related disorders. In order to diagnose pathogenicity, physiological alterations of proteins that are indicative of healthy and diseased states need to be determined. Optimization of a preparative free-flow electrophoresis (FFE) method that will be used to purify various populations of mitochondria from crude mitochondrial pellets containing contaminating organelles such as lysosomes and peroxisomes, was the primary objective of the research. Effective separation of mitochondria from other organelles was critical for the successful proteomic analysis of mitochondrial protein biomarkers. An electric field perpendicular to the laminar flow assisted in the migration of the charged sample components, which were separated into 96 fractions at the outlet of the separation chamber. The zone electrophoresis (ZE) mode of FFE creates optimal conditions in a matrix-free environment allowing for analytes to be differentially deflected based on their net surface charge. Following ZE-FFE separation, the distribution of mitochondria among the 96 fractions is monitored by spectrophotometric absorbance at 405 nm – the wavelength at which the heme group of cytochrome c, an abundant soluble mitochondrial protein, displays maximum absorbance. ZE-FFE analysis of mitochondria isolated from the brain of one diseased patient indicated a heterogeneous population of mitochondria, whereas a more homogeneous population of mitochondria was observed from the ZE-FFE analysis of the mitochondria isolated from a healthy control patient. Thus, preliminary studies suggested that ZE-FFE is an effective semi-preparative method to isolate various populations of mitochondria. (Supported in part by NCI/NIH P20CA119192 and NIH grants MH59786 and AG25323; Maryland Cigarette Restitution Fund.)

P36 – Cancelled

- P37 DARAH L. NEWELL¹ AND ASHLEY B. MORRIS¹. University of South Alabama¹. Using molecular techniques to assess population genetic structure of *Illicium parviflorum*, a rare Florida endemic shrub.

Illicium parviflorum, a small, rare evergreen shrub endemic to Central Florida, is considered endangered by the Florida Department of Agriculture and Consumer Services. Previous studies have suggested clonal growth is the primary form of reproduction in this species, resulting in implications of limited genetic diversity occurring both within and among populations. Our objective was to use molecular techniques to assess clonal structure and genetic variation within and among different populations of *I. parviflorum*. Six sites were sampled across the geographic range of *I. parviflorum*. A PCR-based assay using inter-simple sequence repeats (ISSRs) was used to assess genetic structure. Results based on 85 ISSR loci suggest that genetic diversity in this species is high, with most populations being predominately sexual. The largest documented genet included only four sampled individuals, and no genotypes were found in more than one population. These results help to provide a better understanding of the reproductive ecology of *I. parviflorum*, countering the assumption that the species is primarily clonal. Further analyses using microsatellites are planned to confirm these results. Continuing work on the species not only aids in conservation efforts, but serves as a foundation for work in other rare *Illicium* species.

- P38 KAYLA WIETGREFE¹, FRANK PALADINO² AND MOURAD GEORGE². University of Alabama at Birmingham¹ Indiana-Purdue University Fort Wayne². Expression analysis of *Lhx9* during gonadal sex differentiation in the red-eared slider turtle.

Many reptiles, including the red-eared slider turtle (*Trachemys scripta*), possess a temperature-dependent sex determination (TSD) mechanism where the temperature at which the developing embryos are incubated dictates the eventual gonadal sex of the animal. A cascade of regulatory genes controlling sex determination has been identified in some mammals and reptiles. Some orthologous genes of this cascade show a high degree of homology among mammals, reptiles, and birds. One such gene, *Lhx9*, controls the proliferation of gonadal cells in mice and its absence drastically reduces the expression of other genes in the gonad developmental pathway. In addition, in vitro studies using mouse models have shown that *Lhx9* binds to and activates SF-1 (steroidogenic factor 1), a central gene that regulates the expression of steroidogenic enzymes in the bipotential gonad. The role of *Lhx9* in *T. scripta* gonadal differentiation was studied. Using degenerate oligonucleotide primers, *Lhx9* was PCR-amplified and sequenced producing a 706 bp fragment from *T. scripta* genomic DNA. DNA and amino acid sequence alignment revealed high homology with orthologs from chicken and mouse. Expression patterns of *Lhx9* during embryogenesis revealed similar expression levels in both male and female adrenal-kidney-gonad complexes during the thermosensitive period with a significant decrease in expression after the thermosensitive period in females. The high degree of sequence homology as well as the high level of expression during the thermosensitive period in both sexes indicates that *Lhx9* of the red-eared slider turtle may have a similar function in initiating transcription of SF-1 as in mice.

- P39 BENJAMIN T. HINKLE¹. Troy University¹. The effect of HSP90 and ubiquitin-proteasome degradation on the androgen receptor.

With emerging reports on Hsp90 and the ubiquitin-proteasome system being linked to various cancers, establishing the roles of these proteins in prostate cancer via androgen receptor signal transduction is of importance. HeLa AR1c-PSALuc (human cervical cancer) cells stably expressing the androgen receptor (AR) and an AR-responsive luciferase reporter plasmid were used in this study. The luciferase assay system was used to assess the functionality of the AR after treatment with Hsp90 and proteasome inhibitors. Western blots were also used to assess the amount of AR expressed after treatment with the inhibitors. Preliminary data suggests that blocking Hsp90 interactions with the androgen receptor results in a decrease in DHT-induced luciferase activity. The decreased function is correlated with a loss in AR expression in the cells likely due to rapid degradation of AR protein following treatment. The results from this study may help explain the roles of heat shock proteins and ubiquitin-proteasome interactions with the AR and ultimately why prostate cancers that have progressed to an androgen-independent state (advanced disease) are still being stimulated by the androgen receptor even in the absence of natural hormone.

- P40 MICHAEL A. ALCORN¹, JENNIFER DEITLOFF¹ AND SEAN GRAHAM¹. Auburn University¹. Geometric morphometrics role in phylogenetic classification of *Eurycea aquatica* and *Eurycea cirrigera* and sexual dimorphism analysis.

Many species of southeastern salamanders exhibit extensive crypsis and morphological conservatism making species classification a difficult task. Understanding the relationships between closely related species and their life histories can provide evidence of geological events on a macroscale, as well as evidence of molecular modifications, behavioral changes, and physical changes within organisms. Sexual dimorphism also reveals

significant information about a species' natural history and is essential to understanding certain physical and behavioral characteristics of an organism. The species status of *Eurycea aquatica* has been a topic of debate since it was first described in 1963. Several studies have suggested that *E. aquatica* is a specialized "spring ecotype" resulting from isolation and subsequent divergence from *E. cirrigera*. *Eurycea cirrigera* is found throughout the southeastern United States and the males possess cirri (fleshy downward protuberances from the upper lip). *Eurycea aquatica* is a salamander found in stream habitats in Alabama and neighboring states. We suggest that previous measurements suggesting conspecificity between *E. aquatica* and *E. cirrigera* were too macroscopic in scale and recent studies have provided evidence that these two groups form separate clades using DNA analysis. In this study, we used geometric morphometric analysis to more rigorously compare the morphologies of species. We also used the morphometric data to compare shapes of males and females to determine if sexual dimorphism occurs within each species and between *E. aquatica* and *E. cirrigera*. Results of this work lay the ground work for behavioral studies and novel research on the breeding habits of *E. aquatica*.

P41 CHRISTINE M. FLEET¹ AND ANGAZA N. THOM¹. Emory & Henry College¹.
Transcriptional regulation of gibberellin biosynthesis in *Arabidopsis thaliana*.

Gibberellin is a plant growth regulator important for processes including seed germination, stem elongation, flowering and fruit development. While the gibberellin biosynthetic pathway is well-understood, less is known about how that pathway is regulated. Previous studies have identified a role for several homeobox transcription factors in down-regulating gibberellin biosynthetic gene expression, and our work seeks to identify additional genes in the regulatory pathway important for the control of gibberellin biosynthesis in the model plant *Arabidopsis thaliana*. Candidate regulators have been identified using a combination of bioinformatics analysis, promoter-reporter assays, and reverse-transcription polymerase chain reaction (RT-PCR). Candidates to be discussed include polycomb group genes important for seed development, as well as a homeobox gene implicated in trichome development. Previous studies in animals have defined an important role for polycomb group genes in regulating key developmental pathways, so this work may ultimately help elucidate parallels between control of developmental processes in plants and animals.

P42 THUY T. PHAM¹, ROSEMARY N. PLAGENS¹ AND ELI V. HESTERMANN¹.
Furman University¹. The aryl hydrocarbon receptor differentially regulates its repressor and Slug in normal and cancerous breast cells.

The aryl hydrocarbon receptor (AhR) is a cytosolic transcription factor in the basic-helix-loop-helix family. Upon activation by chemical ligands, the AhR protein translocates into the nucleus, binds DNA and effects changes in gene transcription. AhR is activated by the synthetic ligand TCDD and inhibited by CH-223191. Previous studies indicate overexpression of AhR may contribute to the development of breast cancer, and we are studying the set of genes regulated by AhR to better understand this process. AhR increases expression of the aryl hydrocarbon receptor repressor protein (AhRR), which in turn inhibits AhR activity. AhR may also regulate transcription of the Slug gene, which has been found to be a component of an aggressive phenotype of breast cancer cells and result in metastatic dispersal of the tumor. Treatment of either pre-cancerous MCF-10F breast cells or BP-1 invasive breast tumor cells with TCDD increased AhRR expression by more than four fold, and CH significantly decreased AhRR mRNA expression. In contrast, the expression of Slug mRNA was significantly increased in the presence of CH, suggesting that AhR constitutively inhibits Slug expression. Regulation of Slug by AhR is direct; chromatin immunoprecipitation revealed specific binding of AhR to DNA adjacent to the Slug gene. These results indicate a complex mechanism of gene regulation in which

activation of the AhR results in both its own repression by AhRR and decreased expression of the metastatic factor Slug. Continuing work will reveal the consequences of these interactions in the development and progression of breast cancer.

- P43 CHERYL L. SESLER¹, LAWRENCE K. NELSON¹, BENJIE BLAIR¹, MARK MEADE¹, CHRIS MURDOCK¹, STEVE WATTS² AND ADDISON LAWRENCE³. Jacksonville State University¹ University of Alabama at Birmingham² Texas A&M University³. Molecular Analysis of Gut Microflora from Sea Urchins Grown in Open-System Environments versus Closed-System Environments.

Sea urchin roe is considered a delicacy in many countries. Due to an increase in demand, natural populations have dramatically decreased in North America. This decline has resulted in development of aquaculture techniques for commercially important species of sea urchins. The two systems for cultivation of sea urchins include (1) closed-system environments with artificial sea water or (2) open-system environments with natural sea water. The diet of sea urchins affects the quality of roe produced. Few naturally-occurring digestive enzymes have been identified in the sea urchin gut, but their digestion is very efficient at assimilating large amounts of consumed biomass. Bacteria in the digestive tract of sea urchins are critical for this digestion. The objectives of this project were to compare the bacteria present in the gut of sea urchins grown in an open-system with the bacteria present in sea urchins grown in closed-system. Digestive tracts of five individuals were pooled and DNA was extracted. 16S rDNA was amplified using universal eubacterial primers, amplified fragments were cloned, and 16S clones were sequenced. Sequences were compared to published sequences in the NCBI database for identification. Primary genera found from the open-system sea urchins included Pseudomonads and *Vibrio* spp., which are also the two predominant genera found in sea urchins grown in closed-system environments. Further testing will be required to illustrate specific differences and predominance of individual species of bacteria within these groups. The makeup of these groups may account for reported differences in growth and production within these two culture systems.

- P44 CHRIS A. MURDOCK¹ AND SALOUA LAHLOU¹. Jacksonville State University¹. Cloning and characterization of gonadotropin receptors from a snake, *Agkistrodon contortrix*. Department of Biology,

Interactions within the hypothalamus-pituitary-gonad axis regulate both reproduction and steroidogenesis in vertebrates. Two pituitary gonadotropic hormones, follicle stimulating hormone (FSH) and luteinizing hormone (LH) are key regulators within this reproductive axis. These gonadotropic hormones elicit their effects on the gonads through binding to specific cell membrane receptors. Specifically, follicle stimulating hormone receptor (FSHR) and luteinizing hormone receptor (LHR) belong to the super family of G protein-coupled cell surface receptors. While the presence of FSH and LH, along with their respective receptors, has been verified in many non-mammalian vertebrates (e.g., amphibians, birds, reptiles, and fish), data pertaining to these gonadotropins and their receptors is limited in reference to snakes. An initial fragment of the FSHR gene has been identified from copperhead (*Agkistrodon contortrix*) ovarian tissue. Specifically, sequence analysis of a putative FSHR amplicon from an ovarian tissue cDNA library revealed a 288 base pair fragment that was highly conserved when compared to other published FSHR sequences (e.g., 83% homology to that of another squamate, *Podarcis siculus* FSHR). Current research is focusing on sequencing the remainder of the FSHR cDNA and developing gene expression analysis methodology for characterizing FSHR expression patterns in *A. contortrix*. Further, the elucidation of LHR from *A. contortrix* is currently being addressed as well.

- P45 RONALD C. STEPHENSON¹ AND SEAD SABANADZOVIC¹. Mississippi State University¹. Study on population of Bean pod mottle virus in Mississippi.

Bean pod mottle virus (BPMV; genus Comovirus, family Comoviridae) is a major problem in soybean production in the Southeast United States, resulting in yield loss and decline in seed quality. Its genome is made up of two molecules of monocistronic single stranded RNA, separately encapsidated in isometric particles of ca 30 nm. Because of an apparent increase in disease severity and the emergence of severe strains of this virus reported in other regions of the USA, this study was initiated in 2007 in order to characterize the population of BPMV in Mississippi. Symptomatic soybean samples were collected from production and research fields throughout Mississippi. Four sets of specific primers were designed in order to amplify regions of the viral genome coding for the putative helicase, RNA-dependent RNA polymerase (RNA-1), movement protein and coat protein (RNA-2). Generated sequences were analyzed and compared using proper softwares. Phylogenetic trees were generated for all four genome regions. The overall data indicate that RNA-dependent RNA polymerase was the most variable region in the genome of studied BPMV isolates, while helicase appeared to be the most conserved one. The helicase domain, together with the protease cofactor reported to be involved in symptom severity, was further studied. Helicase sequences obtained from MS isolates showed similarity to isolates inducing mild or moderate symptoms. From the pool of molecular data, several representative isolates (isolates showing the greatest diversity in certain genomic regions) were mechanically inoculated onto a range of healthy indicator plants to determine their exact biological/pathological behavior.

- P46 AMANDA M. SCHOONOVER¹. Western Carolina University¹. Development of bacterial oxidative stress assays utilizing the LIVE/DEAD BacLight viability kit.

The LIVE/DEAD BacLight Bacterial viability assay that utilizes two fluorescent nucleic acids stains has been shown to be an effective assay for determining viability of many different species including *Escherichia coli*. The two nucleic acids dyes differentially stain live and dead cells. The fluorescent intensity of each of the stains can easily be measured to determine the ratio of live and dead cells present. This study develops bacterial oxidative stress assays utilizing the LIVE/DEAD BacLight assay as the viability measurement tool. Recent research has shown that bacterial cell death as a result of protein mistranslation, DNA damage and cell-wall synthesis interference are caused by an increase in radical oxygen species. The enzyme superoxide dismutase catalyzes the reaction that converts radical oxygen species (O₂⁻) to hydrogen peroxide and oxygen. Cu/Zn-SODs are located in the periplasm and are thought to protect against host derived radical oxygen species. Cu/Zn-SODs are found in many gram-negative and gram-positive bacteria including *E. coli*. Xanthine and xanthine oxidase was used to produce extracellular O₂⁻. Quercetin was used as a Cu/Zn-SOD inhibitor. These tools were used to develop effective strategies to measure oxidative stress using the LIVE/DEAD BacLight viability assay. The assays developed by this study can be utilized in further studies of oxidative stress, superoxide dismutase, superoxide dismutase inhibition, antibiotics and antibiotic resistance.

- P47 TIM A. MORRIS¹ AND ROLAND P. ROBERTS¹. Towson University¹. Assessing amplification success in cross-species microsatellite markers in the python *Morelia*.

Microsatellites have been a very popular marker used in numerous studies over the past decade. They are popular because their high mutation rates can provide high resolution for addressing population level questions. The utilization of microsatellites has been further expanded by the ability of the primers to amplify across species. A high percentage

of papers published in journals such as Molecular Ecology Resources introduce new primers that have been developed for a wide range of organisms. In a study involving the python genus *Morelia*, I used a set of 27 primers that were developed for *Morelia spilota* (the Carpet Python). These primers were reported to amplify across other species of *Morelia* as well as other closely related genera. Following the published protocol I experienced inconsistency in amplification success even with the species for which the primers were developed. Moreover, many modifications to the protocol aimed at optimizing amplification conditions to a large extent proved futile. Here we present an assessment of the fidelity of these primers across several species of *Morelia*. These results suggest that some microsatellite markers may not provide "universal" success for the species for which they were designed. This implies a need for thorough screening of potential primers for consistent performance prior to publication.

P48 Cancelled

P49 MICHAEL A. ALCORN¹, JENNIFER DEITLOFF¹ AND SEAN GRAHAM¹. Auburn University¹. Geometric morphometrics role in phylogenetic classification of *Eurycea aquatica* and *Eurycea cirrigera* and sexual dimorphism analysis.

Many species of southeastern salamanders exhibit extensive crypsis and morphological conservatism making species classification a difficult task. Understanding the relationships between closely related species and their life histories can provide evidence of geological events on a macroscale, as well as evidence of molecular modifications, behavioral changes, and physical changes within organisms. Sexual dimorphism also reveals significant information about a species' natural history and is essential to understanding certain physical and behavioral characteristics of an organism. The species status of *Eurycea aquatica* has been a topic of debate since it was first described in 1963. Several studies have suggested that *E. aquatica* is a specialized "spring ecotype" resulting from isolation and subsequent divergence from *E. cirrigera*. *Eurycea cirrigera* is found throughout the southeastern United States and the males possess cirri (fleshy downward protuberances from the upper lip). *Eurycea aquatica* is a salamander found in stream habitats in Alabama and neighboring states. We suggest that previous measurements suggesting conspecificity between *E. aquatica* and *E. cirrigera* were too macroscopic in scale and recent studies have provided evidence that these two groups form separate clades using DNA analysis. In this study, we used geometric morphometric analysis to more rigorously compare the morphologies of species. We also used the morphometric data to compare shapes of males and females to determine if sexual dimorphism occurs within each species and between *E. aquatica* and *E. cirrigera*. Results of this work lay the ground work for behavioral studies and novel research on the breeding habits of *E. aquatica*.

P50 JUSTIN A. WEISS¹, JAYME WALDRON¹ AND THOMAS K. PAULEY¹. Marshall University¹. Digital Photography as a Means of Future Recognition in the Eastern Box Turtle.

The mark-recapture technique is one of the most common methods of formulating population size estimates and observing life history in wildlife biology. Mark-recapture consists of marking an animal in a way that it can be differentiated from others in the same population without interrupting daily activities. Photography is a useful technique for species that display individual colors or patterns on their external surface, but this method has been limited to large mammals. Traditionally box turtle identification has been done by shell notching or painting numbers on the carapace. With the variation in carapace and plastron colors and patterns of turtles, digital photography can successfully differentiate between two similar individuals. Turtles were photographed from the carapace, plastron, and side angles and photos were uploaded into a computer for analysis. Photos were then compared with each other to find any matches, thus representing the same specimen. One hundred and thirty-six individual turtles were captured with 20 recaptures at Beech

Fork Wildlife Management Area, Wayne County, WV in the summer of 2008. This method proved useful as a noninvasive technique for future recognition because notching can cause open wounds leading to infection. Infectious diseases can also be spread by failure to clean equipment between notchings. Painting numbers wears off with rain and objects brushing up against the shell. Box turtle populations are declining over their range and the use of digital photography should be used as a non-invasive means for future recognition.

P51 MATTEW S. TIPTON¹, ZACHARY I. FELIX¹, YONG WANG² AND CALLIE J. SCWEITZER³. Reinhardt College¹ Alabama A&M University² USDA Forest Service³. Natural history of the northern zig zag salamander on the Cumberland Plateau of northeastern Alabama.

The northern zigzag salamander (*Plethodon dorsalis*) is a small lungless salamander that can reach high abundances on wooded hillsides, and is likely an important part of these ecosystems. We studied the natural history of this species at two sites on the escarpment of the Cumberland Plateau in northeastern Alabama. Using data from 635 individuals captured from under artificial cover objects between 2003 and 2006, we describe body size relationships, color pattern variation, and surface activity of this species. We compared the following among juveniles, non-gravid females, gravid females, and males: mass, snout-vent length, and color phase (red-striped, gray-striped, or unstriped). Soil temperatures were recorded during surveys. Though size ranges largely overlapped among groups, average body mass and snout-vent length of gravid females were greater than for males, and male mass and length were greater than for non-gravid females. Fewer juveniles exhibited the unstriped color phase than adults, and adult groups did not differ in terms of color phases. Surface activity was greatest between January and March and was related to soil temperature. These data provide important baseline information on this species for the southern Cumberland Plateau.

P52 CHRIS EDMONDSON¹, ROBERT CARTER¹, CHRIS MURDOCK¹ AND GEORGE CLINE¹. Jacksonville State University¹. Effects of prescribed burning on herpetofaunal populations of Talladega National Forest, Alabama.

Prescribed burning is a frequently used management tool to reduce wildfire fuel, control plant species composition, or maintain suitable habitats for animal species. While existing research suggest that prescribed burns influence herp populations, such research has not been conducted in the mountain longleaf pine region of Talladega National Forest in Alabama. Herps were collected in approximate four day intervals from four sample sites, each with a unique burn history. Species composition of populations captured from most recently burned habitats was found to be significantly different from other habitats, according to Kruskal-Wallis one-way analysis of variance. Fire was shown to have an immediate negative effect on species diversity, but this appeared to be short lived. When comparing sites according to time since last burn treatment, results suggest that fire may also play a role in the long-term maintenance of species diversity by regulating long-term competition.

P53 KIMBERLY P. FARRIS¹ AND MEGAN E. GIBBONS¹. Birmingham-Southern College¹. The trade-off of egg size versus number in the red-eyed tree frog, *Agalychnis callidryas*.

Parental investment is a major force in the evolution of life-history traits. Unpredictable habitats and multiple life stages experienced by amphibians often result in a population with varying investment strategies. The trade-off between greater maternal provisioning of a few eggs versus lesser provisioning of a greater number of eggs is well cited in literature. Typically, larger females make a greater maternal investment (either in number

of eggs or size of eggs) than smaller females. We investigated these trade-offs in the red-eyed tree frog, *Agalychnis callidryas*. For 13 females, we recorded their mass, the total number of eggs they laid, mean egg diameter of each clutch, and total egg volume output. We conducted linear regressions to investigate the relationship between female mass and these egg traits. A nonsignificant negative trend was found between egg size and mean egg diameter and there was no relationship between female mass and total number of eggs laid. Female mass was found to have a positive significant relationship with both mean egg diameter and total egg volume output. Thus, our data suggest that *A. callidryas* females invest more heavily in provisioning individual eggs than in increasing egg number. This maternal investment strategy may enhance the survival of tadpoles in their predator-rich aquatic habitat.

P54 ASHLEY O'NEILL¹, BEN CASH² AND THOMAS MCELROY³. Kennesaw State Univeristy¹ Maryville College² Kennesaw State University³. Genetic characterization of the wood frog, *Lithobates sylvaticus*, in tundra and boreal forest habitats of Churchill, Manitoba

We investigated the genetic population structure of wood frogs (*Lithobates sylvaticus*) from collections sites in boreal and tundra habitats near Churchill, Manitoba, Canada, which approaches the northern edge of this species distribution. Previous studies in the Northern Great Plains (USA) region on this species have revealed strong subdivision among populations at large (20 km) scales and high gene flow within 5 km. We surveyed a set of 5 microsatellite loci used in the previous study for 160 specimens collected for this study. The previous study indicated these loci had observed heterozygosities that ranged from 0.16 to 0.60. Our study revealed no genetic diversity among all of the samples for any of the loci surveyed. This comparison supports significantly reduced gene diversity compared to core populations. This may be attributed to bottlenecks, founding events or selection resulting in a very low effective population size. Understanding the genetic composition and ecology of edge populations can provide key information on the environmental and demographic factors shaping species' geographic ranges.

P55 LYNEA R. WITCZAK¹ AND MICHAEL E. DORCAS¹. Davidson College¹. The Economic Value of Reptiles and Amphibians Inhabiting the Charlotte-Metropolitan Area of North Carolina.

Anthropogenic habitat modification often detrimentally impacts reptile and amphibian populations. Determining the economic loss suffered from herpetofaunal extirpations is an important first step in understanding the value of natural resources and the mitigation process. Assigning a commercial value is difficult for amphibians and reptiles because knowledge of their population status is unknown. Additionally, if commercial values are available, it is debatable whether this is equivalent to a species' ecological value. This study was undertaken to determine the economic value of reptiles and amphibians within the Charlotte-Metropolitan area of North Carolina. Evaluations were based on species known to occur in this region, as well as those that potentially inhabit the area. We used current commercial values and available densities to estimate the economic value of amphibians and reptiles inhabiting various habitats in the region. Internet searches were conducted to determine commercial values and densities were obtained from the literature and unpublished data. Densities were multiplied by the area of the habitat likely inhabited by the species to determine the number of individuals within particular areas. The calculated number of animals was then multiplied by the commercial cost of the species to determine each species economic value. The total commercial value of all reptiles and amphibians inhabiting and potentially inhabiting various habitats in the Charlotte-Metropolitan area was determined by adding all individual species' values. These results provide a mechanism for placing a quantitative economic value on an important natural resource that can be used to mitigate for anthropogenic impacts.

- P56 JENNIFER L. JACKSON¹. Shorter College¹. Heavy Metal Accumulation in American Alligators From South Carolina.

In recent years, heavy metals (lead, mercury, cadmium, selenium, etc) have become a concern in aquatic ecosystems. Numerous organisms, such as several species of fish, frogs, and snakes, have shown high levels of various heavy metals. Heavy metals are considered an environmental hazard and can be used as an indicator for ecosystem health. The American alligator *Alligator mississippiensis* is an apex predator and potentially could be used as a proxy for aquatic ecosystem health. Alligators in South Carolina have not been thoroughly tested for various heavy metals that have been found in other predators and alligators in other states. Most researchers have also been unable to obtain a large number of wild alligators for heavy metal testing. We collected 32 liver samples from wild alligators of various sizes/ages from the Charleston, South Carolina area and analyzed them for arsenic, mercury, selenium, cobalt, chromium, nickel, lead, and cadmium.

- P57 JUSTIN L. JOHNSON¹, YASUHIRO KOBAYASHI¹ AND ERIC A. BLACKWELL¹. Delta State University¹. Preliminary Assessment of Population Parameters of Two Aquatic Salamanders; *Amphiuma tridactylum* and *Siren intermedia*

As the human population increases, many wetlands in the Mississippi Delta are being drained for human use impacting the habitat for aquatic salamanders such as *Amphiuma tridactylum* and *Siren intermedia*. Little information is available on population sizes, survivorship, habitat use, and reproductive behavior of these salamanders. During the spring of 2007 a mark/recapture study was implemented on five ponds located at Delta State University's Center for Science and Environmental Education. The objective of this study was to develop a method of capturing aquatic salamanders and to tag them in order to monitor changes in their population parameters. Trapping was accomplished by using modified minnow traps with bacon as the bait. Initially, a Visible Implant Elastomer was used to mark the salamanders for identification, but we began to use Passive Integrated Transponders (PIT tags) during September 2008. Through December 2008, 17 *S. intermedia* and 13 *A. tridactylum* have been captured, tagged with PIT tags, and released. We have validated our trapping method and found that rainfall and changes in barometric pressure are important climatic variables for inducing movement by the salamanders. By monitoring the activity and population parameters of these salamanders over time, an assessment of their life history may be compiled. This study can be used as a starting point for comparison to other *A. tridactylum* and *S. intermedia* populations throughout the Mississippi River Delta. Such comparisons may be useful for resource managers when planning wetland restoration or mitigation projects within the Mississippi River Delta.

- P58 SARAH GARDNER¹, JOSHUA CAMPBELL¹ AND RICHARD PIRKLE¹. Shorter College¹. The Effect of Over-the-Counter Drugs on *Xenopus laevis* Tadpole.

Over-the-counter medications are widely used in the United States as well as in various countries world wide. As a result, a variety of different pharmaceuticals have been detected in aquatic systems. The purpose of this experiment was to try and determine whether or not aquatic organisms could be affected by over-the-counter medications in the water. In this experiment, we tested the effects of 4 common over-the-counter medications (acetaminophen, diphenhydramine, naproxen sodium, and ibuprofen) on developing *Xenopus laevis* tadpoles. Data collected reflects mortality and developmental abnormalities due to varied concentrations of the studied drugs.

- P59 TRICIA LADD¹ AND TOM BLANCHARD¹. University of Tennessee at Martin¹. Egg deposition, larval growth rates, and metamorphosis in the mole salamander, *Ambystoma talpoideum*, in a west Tennessee wetland.

The reproductive activity and ecology of early life stages of the mole salamander *Ambystoma talpoideum* are known to vary geographically and in response to environmental conditions. The purpose of our study was to examine the aquatic ecology of a population of *A. talpoideum* in a northwest Tennessee floodplain forest environment. In this study, we regularly monitored a temporary breeding pond to investigate the timing of oviposition, egg deposition site selection, larval growth rates, and size at metamorphosis. Egg masses were first observed in February and females preferred to deposit eggs in certain locations within the pond. Hatchlings were first collected in March and larvae were present in the pond until June. Average growth rate was 0.63 mm per day over the entire larval period and the average total length of metamorphs was 58.7 mm. Our results were similar to other published accounts of this species.

- P60 CHARLES B. DELANCEY¹ AND WADE B. WORTHEN¹. Furman University¹. Characteristics of rock refugia used by three species of desmognathine salamanders.

Several different species of desmognathine salamanders coexist in the mountains and foothills of the Southern Appalachians. We characterized rock refugia used by 'adult' (gill-less) *Desmognathus fuscus*, *D. quadramaculatus*, and *D. ochrophaeus* in several drainages at The Furman Forest—a 1500 acre tract northwest of Landrum, South Carolina. Salamanders found beneath rocks were identified to species and snout-vent length was measured. We also measured the following characteristics of the refuge: distance from open water, distance to emergent sediment, the depth of the refuge from the sediment surface (depression depth), and the depth of the refuge from the surface of the water (water depth). These characteristics were compared across species with Student's t-tests. *D. ochrophaeus* were found in refuges with significantly deeper depressions than *D. fuscus*. The depression depth of *D. quadramaculatus* refuges was intermediate and not significantly different from the other species. *D. ochrophaeus* refuges were significantly farther from water than those of *D. fuscus* and *D. quadramaculatus*, which did not differ from one another. The water depth of refuges used by *D. quadramaculatus* was significantly greater than the water depth in refuges used by the other two species. There were no significant differences in the distance from refugia to emergent sediment among the species. Previous studies with horizontal transects have also found that *D. ochrophaeus* uses refuges farther from water than the other two species.

- P61 PATRICK SPENCER¹, NINA BAGHAI-RIDING¹ AND ERIC A. BLACKWELL¹. Delta State University¹. Food Intake and Growth of Juvenile *Siren intermedia*.

The lesser siren, *Siren intermedia*, is an aquatic salamander indigenous to the Southeastern United States ranging from the east coast to Texas and appearing sometimes as far north as Michigan. The body is long and eel like with small front legs, no rear legs, and large frilly external gills. These salamanders are seasonal bottom feeders and are considered to be a valuable components of freshwater wetland ecosystems; possibly serving as a keystone predator. Small populations have been found to inhabit several water bodies around Merigold, MS. Several hatchlings were captured from a pond at Delta State University's Center for Science and Environmental Education in June 2008. The juvenile salamanders are being kept in a laboratory setting and are supplied with a measured food supply of meal worms. The objectives of this study are to establish the rate of food assimilation and to estimate an artificial growth rate. The growth rate will be

determined using the von Bertalanffy growth equation using bi-weekly measurements as the growth interval. This study provides an opportunity to analyze and document previously unreported characteristics of juvenile *S. intermedia*. As such, this study provides much needed life history information crucial to the conservation of the lesser siren.

P62 JONATHAN A. AKIN¹. Northwestern State University of Louisiana¹. Demography and Habitat Use in a Louisiana Population of Southern Redbacked Salamander.

The Southern Red-backer Salamander, *Plethodon serratus*, has a distribution divided among four distinct regions of the U.S.: central Louisiana, eastern Arkansas/western Oklahoma, Missouri, and parts of the Blue Ridge/Piedmont of the southeastern U.S. In central Louisiana, *P. serratus* is not widely distributed and only a few isolated populations are known, none of them well-described. In this study, initial demographic and habitat use data were collected for a population living on rocky slopes in the Longleaf Vista Complex in the Kisatchie Ranger District of the Kisatchie National Forest. These data represent preliminary efforts into what is planned to be a long-term study for this endemic state species.

P63 – Cancelled

P64 DAVID M. MILLICAN¹. Davidson College¹. Range Expansion of Green Treefrogs (*Hyla cinerea*) in the Western Piedmont of North Carolina.

Amphibians are declining and going extinct globally at alarming rates. However, in some cases amphibians appear to be expanding their range. Green Treefrogs (*Hyla cinerea*), a species native to the Coastal Plain of the southeastern U.S., have recently been detected at several locations in the Piedmont ecoregion. Using calling survey data, our objective was to determine if Green Treefrogs have expanded their range in the Charlotte-Metropolitan area of North Carolina. During 2008, we conducted anuran calling surveys at 59 sites in the western Piedmont of North Carolina, 22 of which were surveyed previously in 2004. We detected Green Treefrogs at 15 of the 59 sites, including 6 sites where they were not detected in 2004. Data from 20 additional sites were obtained for 2006-2007. In 2006, Green Treefrogs were detected at four of these sites, and in 2007 they were detected at five of these sites. Altogether, we detected Green Treefrogs at 21 of 79 sites in the Charlotte-Metropolitan area of North Carolina, and they appear to be expanding their range northwestward into the Piedmont of North Carolina. Future studies should monitor the spread of Green Treefrogs and examine factors contributing to their range expansion.

P65 DEVYNN A. BIRX-RAYBUCK¹, STEVEN J. PRICE¹ AND MICHAEL E. DORCAS¹. Davidson College¹. Landscape-scale Factors Influence Use of Urban Retention Ponds by Breeding Anurans.

Urbanization is widespread throughout the southeastern United States and often negatively affects wildlife populations. However, certain urban features, such as retention ponds, may provide habitat for amphibians. Using anuran calling surveys, we monitored 25 urban retention ponds within the Charlotte, NC region from February through July of 2008. To examine the influence of landscape variables on anuran occupancy, we estimated the age of the retention ponds and used a geographic information system to determine the distance to the nearest riparian zone and percentage of forested area within a 183 m radius buffer of the pond. We found that the best models of occupancy varied among species and included distance to the nearest riparian zone, (*Bufo fowleri*, $w = 0.31$), retention pond age (*Rana palustris*, $w = 0.34$; *Rana catesbeiana*, $w = 0.26$), and a

combination of age and distance to riparian zone (*Hyla chrysoscelis*, $w = 0.60$; *Pseudacris crucifer*, $w = 0.50$). Pond age was most often positively associated with occupancy, whereas distance to the nearest riparian zone was negatively related to occupancy. Percentage of forested area was not a significant predictor of occupancy. Although the results of this study demonstrate the potential value of retention ponds to anurans, it is important to be conservative in estimating the ability of these ponds to sustain persistent amphibian populations in urbanized regions.

- P66 JESSICA N. CAVIN¹, MICHAEL K. MOORE² AND DAVID P. AIELLO¹. Department of Biology, Mercer University¹ Department of Earth and Environmental Science, Mercer University². A novel PCR approach used to identify chytrid fungi in water samples from phytotelmata.

Phyllodytes auratus, the golden tree frog, is a bromeliad-dwelling species endemic to the two highest mountain peaks on the island of Trinidad—El Cerro Del Aripo and El Tucuche. These frogs are habitat specialists, living and reproducing exclusively in the giant bromeliad, *Glomeropitcairnia erectiflora*. Recent field surveys on Tucuche and Aripo have revealed a significant decline in the populations of *P. auratus* throughout its limited range. Using a double rope technique (DRT) to access the canopy, 119 tank bromeliads were sampled for frogs during two consecutive summers ('08 and '09); only two golden tree frogs were observed. The nondestructive sampling method used in this study leaves the habitat of these increasingly rare frogs intact, preventing further habitat, and thus population, loss. Water samples were collected from the plants in order to investigate whether the presence of *Batrachochytrium dendrobatidis* (Bd), the chytrid fungus involved in amphibian declines worldwide, may also be correlated with the decline of *P. auratus*. Water samples were collected and processed using protocols established by Kirshtein et al. (2007) with some modifications. Whole genomic DNA was extracted from filtered samples using Quiagen® Puregene® Core Kit A. The status of the development of a PCR-based assay for Bd detection will be presented. This assay will be useful in retrospective studies of water samples that have been collected from Trinidad over the past five years.

- P67 MITCHELL J. RAY¹ AND JOHN L. CARR¹. University of Louisiana at Monroe¹. Home range and movements of adult alligator snapping turtles (*Macrochelys temminckii*) in northern Louisiana.

The Alligator Snapping Turtle (*Macrochelys temminckii*) is a secretive aquatic turtle found in swamps, rivers, and lakes of Gulf Coast drainages in the southeastern United States. We are conducting a radio-telemetry study of adult *M. temminckii* at Black Bayou Lake National Wildlife Refuge in Ouachita Parish, Louisiana. We have attached external ATS radio-transmitters to 14 adult *M. temminckii* (10 male, 4 female) captured in Black Bayou Lake. Relocations have been recorded since April 13, 2008 and are on-going. Temperature was measured at each relocation site; however, habitat measurements are difficult because the margins of the lake where the turtles spend the majority of their time are covered in floating vegetation mats, comprised primarily of *Egeria* sp., *Eichornia* sp., and *Ceratophyllum demersum*. As a consequence, relocations were triangulated using Locate III software in the field. Currently, 305 position fixes have been recorded. Data will be presented on the seasonal pattern of movement for males and females. In addition, we hypothesize that adult turtles occupy certain core areas and that male and female home ranges differ in size.

- P68 YOGI PATEL¹, JESSICA N. CAVIN¹, MICHAEL K. MOORE² AND ALLAN RENE DE COTRET². Department of Biology, Mercer University¹ Earth and Environmental Sciences, Mercer University². Morphological anomalies as indicators of chytrid infection in tadpoles of *Bufo marinus* from Trinidad, W. I.

Many amphibian species worldwide have exhibited significant population declines due to exposure to the emerging infectious disease (EID), *Batrachochytrium dendrobatidis*. Recent PCR analyses have revealed the presence of this fungus in species of *Mannophryne* sampled in Trinidad and Tobago in 2007 (Hailey et al., 2008). We sampled tadpoles of *Bufo marinus* collected in 2003 for the presence of chytrid infection. In all, we examined 645 tadpoles of 13 Gosner stages (30-42) for morphological anomalies commonly associated with chytrid infection. Oral deformities were common in this sample. The number of deformities ranged from 0 (in Gosner 30 and 42) up to 83 percent (in Gosner 37), with most stages showing greater than 50% with abnormalities. Histological examinations of oral tissues confirmed the presence of chytrid infection in this sample. We are continuing the histological work to determine the proportional relationship between infection and the presence of external anomalies. This work pushes the time of appearance of the chytrid fungus on Trinidad back to at least 2003.

- P69 PAUL V. CUPP, JR.¹. Eastern Kentucky University¹. Aggressive behavior of female green salamanders, *Aneides aeneus*

Aggressive behavior of female green salamanders, *Aneides aeneus*, from SE Kentucky was studied during late spring and summer. Laboratory observations indicate that when male *A. aeneus*, are placed into chambers containing resident male-female pairs, males respond aggressively while females do not. In 12 trials, resident males won 11 encounters, while females showed little or no aggression. In 10 of 11 instances, "intruding" nongravid (NG) females retreated when released into containers with "resident" NG females. No "intruding" females exhibited any aggression. In experiments with gravid females, "intruding" gravid females fled from "resident" gravid females in 7 of 8 encounters. Overall, resident females won over 89% of the encounters. Often, aggressive behavior in the form of snout-pressing and biting was employed by the residents. While female *A. aeneus* appear to be less aggressive than males, they are aggressive to one another and usually occur individually in rock crevices. These observations suggest that while not excluding males, female *A. aeneus* defend sites (territories) from other females.

- P70 SMITH, NATHALIE AND A. FLOYD SCOTT. Austin Peay State University—Seasonal activity and movements of western cottonmouths (*Agkistrodon piscivorus leucostoma*) along the Cumberland River Bicentennial Trail, Ashland City, Tennessee.

The Cumberland River Bicentennial Trail (CRBT) near Ashland City, Tennessee is a popular recreational corridor that bisects the winter and summer habitats of a well established Western Cottonmouths (*Agkistrodon piscivorus leucostoma*) population. The purposes of this study are to determine the seasonal movements of these snakes and any actual or potential negative encounters with people as both traverse the area. To gather data on this question, manual searches are being conducted for snakes on and along the trail. All captured snakes are being measured, weighed, and marked for future identification. In addition, five individuals are being tracked using radio telemetry technology. After 12 months of study, 61 individuals have been encountered and their movements mapped with GIS software. Ingression into hibernacula began in early October at air temperatures around 17 °C, and appeared to be complete by late October. Two snakes were detected leaving their dens the first two weeks of March during an 8-day period when temperatures averaged 15 °C. Egression from hibernation and subsequent movement into summer quarters will be monitored through spring 2009. This project is

being supported by Austin Peay State University's Center for Field Biology and the Tennessee Wildlife Resources Agency.

- P71 MARK E. MEADE¹ AND JOSH TURNER¹. Jacksonville State University¹. Fish assemblages in urban streams near Talladega National Forest, AL.

Talladega National Forest (TNF) is home to many imperiled fish species. In the forest area, most land use is for farming and/or logging. Fish populations relatively near Talladega National Forest, however, may be impacted by urbanization. Particularly, tributaries of the Tallassahatchee Creek drainage, flowing west of the TNF, meander through and around an urban center, Jacksonville AL. Recently, fish assemblages were surveyed in Tallassahatchee Creek and its tributaries (Little Tallassahatchee Creek, Mill Creek/Frogtown Creek). In urban areas, fish assemblages are reduced, likely as a result of habitat loss and poor water quality. In rural areas, assemblages in Tallassahatchee Creek appear stable. As urbanization continues in areas near Talladega National Forest (i.e., Oxford AL, Heflin AL, Jacksonville AL), it is imperative that conservationists and the public are aware of such activities on our heritage of aquatic assemblages.

- P72 DYANNA M. FOUNTAIN¹ AND LEOS G. KRAL¹. University of West Georgia¹. Probing the adaptive variation of CENP-A in darters.

A centromeric histone H3 variant (CENP-A) is conserved in all eukaryotes and functions in the formation of centromeric chromatin structure. Analysis of CENP-A in several species of *Drosophila* and several species within the Brassicaceae family has detected adaptive evolution in both the N-terminal tail as well as loop I of the histone fold domain (HFD). It is thought that changes in the centromeric DNA sequence are selected in oogenesis if such changes are likely to lead to the preferential inclusion of that sequence in the egg. These DNA sequence changes are thought to negatively impact the disjunction of chromosomes in spermatogenesis and mutations in CENP-A are selected that counteract changes in the centromeric DNA sequence. To determine if such adaptive evolution of CENP-A also occurs in the darters (potentially causing reproductive isolation) we set out to characterize the CENP-A gene in *Etheostoma tallapoosae* and to design PCR primers that would enable us to PCR amplify the loop 1 region of the HFD and the N-terminal tail region. We were able to characterize the intron-exon structure of the portion of the CENP-A gene that codes for the HFD and we designed PCR primers that amplify the exon that codes for loop 1 of the HFD. We are examining the sequences of HFD loop 1 among several darter species. We were not yet successful in characterizing the portion of the gene that codes for the N-terminal tail.

- P73 JEFFERY M. RAY¹, JEREMY C. HUNN², BERNARD R. KUHAJDA³, RICHARD L. MAYDEN² AND ROBERT M. WOOD². University of North Alabama¹ Saint Louis University² University of Alabama³. Population genetic comparisons among the river sturgeons of Central Asia (*Pseudoscaphirhynchus*) and North America (*Scaphirhynchus*).

The river sturgeons (subfamily Scaphirhynchinae) are obligate freshwater species distributed in Central Asia and eastern North America and include some of the most endangered vertebrate species in the world. Of six recognized species, three *Scaphirhynchus* species occur in the Mississippi and Mobile river basins: pallid sturgeon, shovelnose sturgeon and Alabama sturgeon. In Central Asia, three *Pseudoscaphirhynchus* species occur within rivers of the Aral Sea Basin: Syr Dar shovelnose, small Amu Dayra shovelnose and large Amu Darya shovelnose. To compare the genetic diversity within and among species, 13 microsatellite loci were genotyped for all available tissues of *Pseudoscaphirhynchus* (n=44) and 208 *Scaphirhynchus*.

Population structuring was determined using pairwise F_{st} values and clustering analyses. Differentiation among species was low to moderate in most cases, but significant for all comparisons. Comparisons between genera recovered remarkably similar patterns of genetic variation. This study provides additional data to aid in the understanding and conservation of these ancient fishes.

P74 JEREMY K. BARRON¹ AND STEPHEN C. LANDERS¹. Troy University¹.
Priapulida and Loricifera from the Gulf of Mexico.

Meiofaunal animals are those found in the benthos with a size generally smaller than 1 mm. A multiyear, collaborative study of meiofauna from the Gulf of Mexico benthos is currently underway. The collecting sites are located on the continental shelf from Brownsville TX to the Florida Keys. Bottom substrate samples were collected using a Shipex grab sampler, with 10 cm-deep cores obtained from a 5 cm-diameter PVC pipe. After fixation in formalin, meiofauna were processed by sieving the sample, centrifugation in Ludox, storage in ethanol, and counting in the laboratory. Preliminary data from year 2007 samples include 19 specimens of priapulid larvae from 7 of our >20 sites. The larvae, all in the genus *Tubiluchus*, averaged 309 x 144 microns in size (lorica measurements). Additionally, we recovered a single specimen of a loriciferan tentatively identified as *Armorloricus*. This continuing survey will reveal new distribution data for these difficult to collect phyla, and may reveal new relationships between the meiofaunal assemblage in the benthos. The authors thank Dr. Frank Romano and his laboratory for help with this collaborative effort. Also, we thank Alonzo Hamilton, NOAA, and the NMFS, SEFSC Mississippi Laboratory for providing ship time and sample collection on the R/V Gordon Gunter.

P75 PETER A. VAN ZANDT¹, REBEKAH PINE¹ AND SCOTT SHASHY¹.
Birmingham-Southern College¹. Costs or benefits of shelter-sharing in tropical caterpillars?

Many species of caterpillars feed within shelters that they make by tying together leaf material with silk. While shelter-building may reduce predation by some enemies, caterpillars in shelters are still heavily attacked by parasitoids. Some caterpillars share their shelters with several conspecifics, which could lead to higher attraction rates of parasitoids to these shelters. Using a Costa Rican leaf rolling caterpillar (*Desmia* sp.), we tested the hypothesis that caterpillars at higher densities in shelters would be parasitized at a higher rate than those that occupy shelters alone. Contrary to our expectations, there was no consistent increase in parasitism rates among 216 field-collected caterpillars occurring in groups of 1, 2, or 3 per shelter. In fact, the lowest parasitism rate occurred in the middle density category of two caterpillars per shelter. We further tested the hypothesis with an experiment where we made artificial shelters on 82 plants and stocked them with either one (n = 43) or three (n = 39) caterpillars per shelter. Similar to the results of the field survey, we found no difference in parasitism rates between these two treatments. Therefore, these results did not support our prediction of a cost of shelter sharing in these caterpillars, and may even suggest an advantage of group feeding in this species.

P76 KRISTIN D. SHIREY¹, SUNDE M. JONES¹ AND JAMES R. RAYBURN¹.
Jacksonville State University¹. Toxicity of venom from two tarantula species (*Haplopelma lividum* and *Grammostola rosea*) on embryo/larvae of *Xenopus laevis*.

Tarantulas are the largest spiders in the world, belonging to the order Mygalomorph, which includes tarantulas, trapdoor spiders, and other less well-known groups. Tarantulas

belong to the family Theraphosidae. As tarantulas are becoming more common in the pet trade, questions about the effects and components of their venom have arisen. This project explores the toxicity of tarantula venom. To obtain the venom for the experiment, the tarantulas from the species *Haplopelma lividium* and *Grammostola rosea*, were anesthetized using carbon dioxide. Their fangs were placed into a vile and electric stimulation was used at their fang base to produce a venom flow. The venom was stored in a container on ice and frozen at 20°C until used. *Xenopus laevis* embryo/larvae up to 4 weeks old were used for the experiment. Embryos/larvae were placed 1 per well in 24 well plates with 0.5 mls of FETAX solution. At least four treatments were performed one control and three others with venom concentrations ranging from 0.1-1.92%. Their heart rates, blood flow, and gill movement were monitored throughout the experiment. We recorded the mortality and the data was analyzed with PROBIT analysis using Tox tools. The tarantula venom has a LC50 (1 hour) of approximately 0.775% venom. We also noted cardiovascular changes in blood flow and heart rates.

P77 TAYLOR ROBERTSON¹ AND ROBERT CARTER¹. Jacksonville State University¹. Arthropod populations of a mountain longleaf pine stand on the Talladega National Forest, AL.

Arthropods play an important role in the ecology and food webs of longleaf pine ecosystems. However, studies focusing on arthropod populations in longleaf pine ecosystems are negligible except for those related to the diet of the red-cockaded woodpecker. The arthropod population of a mountain longleaf pine stand was sampled on the Talladega National Forest. Thirty-six samples from a single stand yielded 965 individuals belonging to over 38 families, 49 genera, and 61 species. The most abundant species collected were *Xysticus trigutlatus*, Thrice-banded Crab Spider, and *Oecanthus niveus*, the Narrow-winged Tree Cricket.

P78 REBEKAH PINE¹, PETER S. SHASHY¹, VICTOR R. TOWNSEND² AND PETER A. VANZANDT¹. Birmingham-Southern College¹ Virginia Wesleyan College². Forest type and distribution of harvestmen at La Selva Biological Station, Costa Rica.

Opiliones (harvestmen) is one of the largest orders of arachnids; nevertheless, there are relatively few published studies on this group. These arthropods are extremely diverse, with over 6000 identified species worldwide. Therefore, they represent an excellent system for investigating species distribution and habitat preference. We conducted a survey at La Selva Biological Station, Costa Rica to measure the affects of forest age and disturbance on abundance, species richness, and diversity of harvestmen. Sampling of harvestmen occurred over 27 50-meter transects in seven different forest types: abandoned agroforestry, abandoned plantation, and 1-4 year old, 8-20 year old, 21-32 year old, 33-42 year old, and old growth forests. We attempted to measure understory openness in the different forest types by taking photos and using photo processing software to quantify near-ground foliage. We found 21 species in our study, and seven of them were found exclusively in one (although not the same) forest type. These unique species could be used as indicators for forest age or disturbance levels in future tropical field studies. There was a trend for understory openness to be positively related with harvestman diversity but there was no relationship between openness and species richness or abundance. There was no clear relationship between forest type and species richness, abundance or diversity. Furthering knowledge about distribution and diversity of harvestmen in tropical rainforests may provide the scientific community with tools to monitor rates of habitat degradation or forest regeneration in sensitive habitats.

- P79 PAUL G. DAVISON¹, EDWARD J. MONSON II¹ AND GLENN A. MARVIN¹. University of North Alabama¹. Prey choice and egg production in a bryophilous limnoterrestrial microturbellarian from northwest Alabama.

Microturbellarians are free-living flatworms generally less than 1 mm in length. Very little is known about limnoterrestrial microturbellarians. We investigated life history aspects of a previously undescribed microturbellarian from Florence, Alabama (Van Steenkiste et al. 2009, in review). Microturbellarians (worms) were extracted via Baermann pans from the mosses *Clasmatodon parvulus*, *Entodon seductrix*, and *Tortula pagorum* growing over a dry concrete block wall in an upland city park. Following extraction, worms (n=68) were transferred to spring water on glass slides and maintained in a moist chamber. After three days of starvation, each worm was offered a single prey individual. Thirty-four worms were offered a bdelloid rotifer (*Philodina roseola*) while the other 34 individuals were offered a nematode (*Panogrolaimus*). Worms either ingested prey whole or sucked out the body contents. Prey choice was evaluated based on establishment of sustained feeding within five minutes of prey introduction. A significantly greater proportion of worms fed on *P. roseola* (31 of 34) than on *Panogrolaimus* (16 of 34; two-tailed Fisher's Exact Test, $P < 0.001$), which indicates a preference for *P. roseola* as prey. Following the prey choice experiment worms were maintained in isolation in a moist chamber and fed *P. roseola* intermittently. For worms still active after 28 days (n=17), egg deposition was staggered over days, and the number of eggs ranged from one to five with a mode of two. One egg hatched after an incubation of ca. 18 days.

- P80 MELISSA E. ARD¹, DENNIS C. HANEY¹ AND JAMES A. NIENOW². Furman University¹ Valdosta State University². The effects of golf courses on associations of freshwater diatoms.

Streams flowing through golf courses typically have little riparian vegetation (lack of shading), and can receive inputs of fertilizers, herbicides, or pesticides as a result of course management practices. The effects of these habitat changes on stream biota have been debated for many years, with the question of whether such changes are harmful or beneficial remaining unanswered. The purpose of this study was to determine if there were any changes in the diatom communities in the downstream portion of the streams, after they flow through the golf course, compared to upstream reaches before the stream enters the golf course. Over a two-week period during July 2008, six streams flowing through six different golf courses located near Greenville, South Carolina, were sampled for diatoms. Ceramic tiles were placed in the stream both upstream and downstream of the courses studied. After two weeks the tiles were retrieved and the biofilms were preserved with 100% iodide. Aliquots of the preserved material were counted using a Sedgwick-Rafter counting cell. The remaining material was cleaned with sulfuric acid, mounted in Naphrax, identified to genus using light microscopy, and recounted to determine the relative abundance of each taxon. Total numbers and diversity, as indicated by diversity indices, of the upstream and downstream communities were compared. Preliminary data showed that the number of diatom species were significantly higher downstream of the courses than upstream. This increase could mean that the golf course management techniques are having an influence on the stream diatom communities.

- P81 DAMIEN WILLIS¹, ROBERT CARTER¹, CHRIS MURDOCK¹ AND BENJIE BLAIR¹. Jacksonville State University¹. Effects of prescribed burning regimes on tick populations in the Talladega National Forest, AL.

A study of the relationship between prescribed burning and tick populations was conducted in the Talladega National Forest in east-central Alabama. The study area consisted of twelve sites with burn treatments of 1 year, 2 year, 5 year and 15+ year

control sites. Ticks were collected using the drag sampling method. One-way ANOVA analysis showed significant differences in tick populations between burn treatments. Significant drops in tick populations were observed between sites with 1-year burn treatments and sites with 5 year burn treatments. There was also a significant difference in the populations at sites with 1 and 15 year burn treatments. There was little to no difference between populations at sites with 1 and 2 year burn treatments. There was also no significant difference in tick populations between the sites with 2 year burn treatments and sites with 5 or 15 year treatments.

P82 LINETTE URBINA¹. Shorter College¹. Accumulation of lead in earthworms (*Lumbricus terrestris*) from lead shot.

Earthworms have been shown to accumulate lead (Pb) and other heavy metals from soil. Many public and private dove fields have a great availability of spent lead shot from shotguns and rifles. Earthworms sampled from shooting ranges have been shown to have a much higher lead concentrations compared to controls. This could pose a threat to numerous bird and mammal species that primarily feed on earthworms. We tested how readily earthworms *Lumbricus terrestris* accumulate lead in their tissue over the course of 60 days when exposed to soil laced with lead shot. Earthworms were placed in 2 quart containers with soil that contained no lead (controls) and three treatments: 1/8 ounce, 1/4 ounce, and 1.0 ounce of 7.5 lead shot. We tested earthworms for lead content at 10, 20, 40, and 60 days.

P83 VICTOR R. TOWNSEND, JR.¹. Virginia Wesleyan College¹. Harvestmen (Arachnida, Opiliones) of El Cope, Panama.

Apart from field studies conducted on Barro Colorado Island and in the canal zone, relatively little is known about the natural history or geographic distribution of harvestmen in Panama. From 23-28 February 2007, an intensive survey of harvestmen was conducted in the forests of Parque Nacional GD. Omar Torrijos, near the village of El Cope, Coclé Province. Harvestmen were captured by hand after dark (2000-2400 hrs) from the surfaces of vegetation or from beneath logs. A total of 122 individuals representing 20 species and 7 families were collected. The most commonly found taxa were from the families Cosmetidae (7 species) and Sclerosomatidae (4 species), but individuals were also collected for the families Cranidae (2 species), Gonyleptidae (1 species), Manaosbiidae (4 species), Samoidae (1 species), and Zalmoxidae (1 species). Several species were not previously known for Panama and represent either new species or new records. These taxa include several cosmetids (3 species of *Paecilaema* and a new "*Eupaecilaema*"), a cranid (new *Santinezia* sp.), and the 3 species of manaosbiids (new species of *Barrona*, *Bugabitia* and *Zygopachylus*). Voucher specimens were deposited into the invertebrate collection at the University of Panama. I am presently in the process of formally describing the new manaosbiid species.

P84 HANNAH K. RING¹ AND VICTOR R. TOWNSEND, JR.¹. Virginia Wesleyan College¹. The Relationship between leg morphology and arboreal behavior in neotropical harvestmen (Arachnida, Opiliones).

In harvestmen, leg length, shape and armature may vary with ontogeny or between sexes. Leg morphology has also been observed to vary between species and has been used extensively in taxonomy to distinguish genera, subfamilies, families, and suborders. In the Gonyleptidae and temperate species of Sclerosomatidae, significant relationships between leg morphology and arboreal behavior have also been observed. In this study, we investigated the functional significance of leg morphology with respect to microhabitat selection for two different Neotropical assemblages. For each species examined in this

study (n = 6), we used an image capturing system to measure scutal length and the length of legs I-IV (from the proximal surface of the trochanter to the distal tip of the tarsus). With the aid of a stereomicroscope, we also counted tarsal segments (tarsomeres) for legs I-IV for each specimen. For harvestmen from the Caribbean island of Trinidad, we compared relative leg length and the number of tarsomeres to climbing ability (as determined through a simple experiment). Taxa examined in this study included species from the families Cosmetidae, Cranidae, Manaosbiidae, Sclerosomatidae, and Stygnidae. For harvestmen from La Selva, Costa Rica, we compared relative leg length and tarsomere numbers to field data regarding observations of vertical distributions and perch heights. Taxa examined in this study included species from the families Cosmetidae, Gonyleptidae, Sclerosomatidae and Zalmoxidae. Our results indicate that significant relationships exist between leg morphology (length as well as tarsomere number) and microhabitat selection for species occurring in each location.

P85 SAMANTHA HALL¹ AND JOHN MOELLER¹. Wofford College¹. The mechanics of stridulation in velvet ants (Family Mutillidae).

When physically disturbed, velvet ants (Family Mutillidae) rub fine edged scrapers against grooved files on abdominal segments, eliciting an audible stridulation that warns potential predators of their formidable defenses. Anatomical examination and dissection of the gaster revealed a dorsal patch thought to be important in sound production. To determine which segments and features are responsible for specific components of the stridulation, the movement of individual segments were restricted with cyanoacrylate glue. A Marantz recorder and Sennheiser microphone were used to document any changes in the stridulations and Raven software was used to analyze frequency and amplitude of sounds. Inhibiting movement of tergites 2 and 3 eliminated sound production, while inhibition of remaining terga did not affect overall production. Results suggest tergites 2 and 3 are sufficient and necessary for the vast majority of the auditory signal. Occasional loss of higher frequencies with the latter restrictions may indicate the importance of movement of the posterior segments during stridulation. Micrographs taken by scanning electron microscopy revealed a difference in ridge distance of tergite 3 patch compared to surrounding file structure and remaining tergites, further indicating the unique importance of tergite 3.

P86 DIANE R. NELSON¹ AND PAUL J. BARTELS². East Tennessee State University¹ Warren Wilson College². Tardigrade named in honor of Mr. Robert Martin, Martin Microscope Company.

As part of the All Taxa Biodiversity Inventory (<http://www.dlia.org>), we are conducting a large-scale multihabitat inventory of tardigrades in the Great Smoky Mountains National Park (GSMNP) in Tennessee and North Carolina, USA. Over 700 samples have been collected and 12,862 specimens of tardigrades have been examined as of June 2008. Over 5000 of these specimens are in the genus *Macrobiotus*. We have recently described two new species of *Macrobiotus* in the *hufelandi* group. One of these, *Macrobiotus martini* Bartels, Pilato, Nelson, & Lisi, 2009 differs from all other species of the *Macrobiotus hufelandi* group by having a very simple buccal armature without bands of teeth, very large elliptical cuticular pores, unique characteristics of the egg, and other morphometric characters. So far, all *M. martini* specimens have been found in mosses and lichens on trees and rocks, but none in samples from soil/leaf litter or in aquatic habitats. The name '*martini*' is in honor of Mr. Robert Martin, founder of Martin Microscope Company, in appreciation of his long-term support of tardigrade research through the loan of microscopes and in particular for his enthusiasm in displaying tardigrades in his microscopy exhibits at regional meetings, especially the Association of Southeastern Biologists. We are greatly indebted to Mr. Martin for his years of service to the academic

community, North American tardigradologists, and the Association of Southeastern Biologists.

- P87 LI-JU CHEN¹, SUSAN M. SEWELL¹, FRANK A. ROMANO¹ AND CHRISTOPHER A. MURDOCK¹. Jacksonville State University¹. 18s rRNA analysis from the tardigrade *Dactylobiotus ambiguus*.

The tardigrade, *Dactylobiotus ambiguus*, obtained from a live culture was starved for 2-4 days and placed in 10µl of molecular grade water. For DNA extraction, samples were incubated for 5 minutes at 95°C, followed by a single freeze/thaw at -70°C, before amplification. PCR was carried out using primers specific for a 1800 bp region on the 18S rRNA sequence, where two overlapping regions were amplified in separate reactions. PCR product was cloned into a TOPO TA vector and used to transform competent *E. coli** DH10 per manufactures instructions (Invitrogen). Plasmid extraction was performed by alkaline lysis, and putative transformants were confirmed by PCR with primers used in the cloning process. Three sequence replicates for the primers 18S1 and 18S2 and two sequence replicates for the 18S4 and 18S5 primers were obtained. The resulting data was compared to existing sequence of the Nucleotide Collection (nr/nt) database maintained by the National Center for Biotechnology Information (NCBI) using the Basic Local Alignment Search Tool (BLAST). Along with the 5 tardigrade sequences, 6 algal sequences, 1 yeast sequence and 1 human sequence were obtained due to contamination of the sample and probable gut content of the tardigrades.

- P88 BRIAN S. HELMS¹. Auburn University¹. Aquatic invertebrate collections at the Auburn University Natural History Museum.

The state of Alabama supports North America's most diverse aquatic invertebrate fauna, with 178 species of freshwater mussels, 102 species of aquatic snails, and 86 species of crayfish. The mission of the Auburn University Natural Museum Invertebrate Collection (AUMIC) is to serve as a research and teaching resource for scientists and students interested in this spectacular diversity of aquatic life. Beginning in 1999 we began to formally accumulate material from Alabama's populations of aquatic invertebrates. Presently, the Invertebrate Collection is the largest in the state and contains over 20,000 catalogued lots, with over 7,500 snail, 7,000 mussel, 3,000 insect, and 500 crayfish specimens. Our research collections serve as a resource for genetic, morphometric, life history and distributional information to agencies, private consulting firms, conservation groups and academic researchers. Collections are available as material loan or for perusal in a searchable web database. Museum staff, graduate students, and undergraduate students are active in multiple conservation and ecological research projects with regional aquatic invertebrates. Specifically, considerable effort is being put forth to catalog the distributional patterns of native mussels and crayfish, with an emphasis on local identification and conservation. Also, we are conducting predation, competition, and behavior experiments on several of the state's endemic crayfish species in an effort to better understand these understudied organisms. Preliminary results from these studies will be presented.

- P89 KRISTEN S. EVERTON¹, AMANDA SIMMONS¹ AND C. BRIAN ODOM¹. Wingate University¹. Dinucleotide polymorphisms represented in male alates from a single ploygyne mound of the red imported fire ant, *Solenopsis invicta* (Buren).

A Red Imported Fire Ant, *Solenopsis invicta* (Buren) colony is comprised of several adult forms; one or more reproductively viable queens, non-sexual workers, and virgin, winged sexual forms of both sexes (alates). The discovery during the summer of 2006 of a mound

immediately preceding a mating flight presented the opportunity of collecting a number of sibling alates as they emerged. The collected individuals were separated by sex and the males were subjected to microsatellite analysis at a single genetic loci to determine the extent of polymorphisms present at this locus among these reproductively capable male siblings.

P90 DANIEL M. ERICKSON¹, IAN BILLICK² AND PATRICK ABBOT¹. Vanderbilt University¹ Rocky Mountain Biological Laboratory². The role of secondary endosymbionts in insect community structure.

Understanding the role of microbiota in natural insect communities is an important step towards a more complete understanding of species interactions. Recent discoveries have described loosely associating “secondary” endosymbionts (SE) that shape interactions with host plants, parasitoids, and predators. Most studies to date have examined the functional basis of these interactions with lab-raised clonal lines of the pea aphid – a model organism in insect-plant interactions. However, almost nothing is known about the ecological basis of SE mutualisms with aphids. All aphids participate in complex trophic interactions in natural populations, and many engage in facultative “protective” mutualisms with ants. In order to better understand SE mutualisms in non-model aphid populations, we used a spatially explicit approach and evaluated the prevalence and distribution of SEs from natural populations of multiple aphid species from alternative host plants. We then measured the intensity of interactions with ants and the rate of parasitoid attack in relation to SE distributions. Because SEs are thought to incur physiological costs in aphids, we expected the prevalence of SEs to decrease in the presence of ants because ants decrease the selective advantage of anti-parasitoid bacteria. Instead, we found that the frequency of one SE increases in the presence of ants. Ongoing work is describing patterns of parasitoid prevalence in these same clonal lines. These results are discussed in light of our understanding of the interrelation between bacterial symbiosis and ecology of insect herbivores.

P91 JARED HUCKABY¹, MICHAEL K. MOORE² AND VICTOR R. TOWNSEND, JR.³. Department of Biology, Mercer University¹ Earth and Environmental Sciences, Mercer University² Department of Biology, Wesleyan University³. Habitat distribution and activity patterns in harvestmen (Opiliones) from Trinidad, W. I.

Previous studies of the harvestmen fauna of Trinidad, W. I. have revealed the occurrence of 24 species representing eight families, including the Agoristenidae (3 species), Cosmetidae (8 species), Cranidae (2 species), Manosbiidae (2 species), Samoidae (2 species), Sclerosomatidae (5 species), Stygnidae (1 species), and Zalmoxidae (1 species). Relatively little is known about the natural history or geographic distribution of most species on the island. In May 2009, we visited multiple, previously unsurveyed localities (Nariva Swamp, El Tucuche, and Matura Forest), to sample for harvestmen. During these trips, we collected nearly 1,000 individual harvestmen including specimens representing 9 known species. The most abundant taxa in our collections were cosmetids (4 species), manosbiids (1 species), and sclerosomatids (2 species). We also documented and will discuss patterns of male-female pair associations (e.g., under shared cover objects) and diurnal vs. nocturnal activity patterns in this set of species.

P92 JASON RYNDOCK. University of Mississippi. The Impact of Ecological Restoration on Spider Communities of an Upland, Deciduous Forest in Northern Mississippi.

Decades of fire suppression have radically altered upland forests of Northern Mississippi. Once covered in grassy, open oak woodlands, this region is now experiencing mesophytic

tree invasion, canopy closure, reduced oak regeneration, and herbaceous understory loss. In an attempt to restore historical conditions, experimental restoration has been initiated through tree thinning and prescribed burn treatments. Although many practitioners fail to adequately monitor the response of wildlife to restoration efforts, this phase is a critical step in the post-restoration evaluation process. The goal of our research is to determine the impact of woodland restoration on spider communities. Spiders are excellent candidates for monitoring efforts due to the relative ease in which they can be sampled and identified, their links to many food chains, and their sensitivity to changes in habitat structure. Our specific objectives are to identify how habitat structure is correlated with spider community composition and guild structure, and to ultimately determine how the restoration treatments have affected the spider community. We hypothesize that the spider community composition of the restored plots will be markedly diverse, and intermediate between that of forest and field ecosystems, reflecting an intermediary habitat structure. To test our hypotheses, habitat structure and spider community was sampled within four habitats located at the restoration site: fire-suppressed forest, intensely treated forest, moderately treated forest, and old field. Preliminary data collected during an October pilot study, as well as spider sampling techniques, will be the focal point of the poster. Even in this early stage of the monitoring process, species composition trends of restored plots appear congruent with our hypotheses.

P93 RAJ BOOPATHY¹ AND NICHOLAS WALKER¹. Nicholls State University¹. Bio-ethanol production from sugarcane bagasse.

Sugarcane processing generates a large volume of bagasse. Disposal of bagasse is critical for both agricultural profitability and environmental protection. Sugarcane bagasse is a renewable resource that can be used to produce ethanol and many other value added products. In this study, we demonstrate that cane processed bagasse could be used to produce fuel grade ethanol without saccharification. A chemical pre-treatment process using alkaline peroxide and acid hydrolysis was applied to remove lignin, which acts as physical barrier to cellulolytic enzymes. Yeast *Saccharomyces cerevisiae* ATCC strain 765 was used in the experiment. The pre-treatment process effectively removed lignin. Ethanol production in the culture sample was monitored using high performance liquid chromatography. The results indicate that acid hydrolysis produced the most ethanol from the residue. More ethanol was produced from bagasse treated with 0.8M H₂SO₄ for 18 days compared to alkaline pretreated residue at 2% H₂O₂ (pH 11.5) for 48 hours and fermented for 21 days. This preliminary study showed that ethanol production from post-harvest sugarcane residue such as bagasse is possible without the addition of cellulase enzyme. The ethanol yield in our study is eight times lower than the theoretical yield as per National Renewable Energy Laboratory (NREL) calculation (http://www1.eere.energy.gov/biomass/ethanol_yield_calculator.html). Lignin prevents the degradation of cellulose mainly by acting as a physical barrier between the cellulolytic enzyme and its substrate. Consequently, the rate and extent of enzymatic cellulose degradation in lignocellulosic materials is inversely related to the lignin content with maximum cellulose degradation occurring only after 50% or more of the lignin has been removed. In this study, we achieved a significant removal lignin from the bagasse, which resulted in higher production of ethanol. Further research is needed to optimize the conditions for maximum production of ethanol from bagasse.

P94 PRISCILLA C. BARGER¹ AND JOSEPH C. NEWTON¹. Auburn University College of Veterinary Medicine¹. Purification of an extracellular metalloprotease from the fish pathogen *Flavobacterium columnare*.

Flavobacterium columnare, the causative agent of columnaris disease in freshwater fish, is known to produce multiple extracellular proteases having gelatinolytic and caseinolytic activity. One extracellular protease, with an estimated molecular mass of 80 kDa, was

purified from the culture supernatant of *F. columnare* strain 143-94. The enzyme, FCM1 (*Flavobacterium columnare* metalloprotease 1), appears to be a calcium stabilized, zinc metalloprotease with an optimal pH of 7.6, and an optimal temperature for activity in the range of 30-45°C. *Flavobacterium columnare* metalloprotease 1 exhibited greater than 95% inhibition in the presence of 1, 10 phenanthroline, EDTA, and EGTA, and partial inhibition (50%) in the presence of DTT. Activity in the presence of 1, 10 phenanthroline was almost completely restored when 1.0 mM ZnCl₂ was added, suggesting that FCM1 is a zinc metalloprotease. Serine and cysteine protease inhibitors PMSF and E-64, respectively, had little effect on enzyme performance. Presence of calcium increased FCM1 heat stability and caused a shift in optimal activity temperature to 50°C. Presence of Ca²⁺ was also required for maximum production and activity. *Flavobacterium columnare* metalloprotease 1 displayed broad specificity to muscular and connective tissue proteins indicating the potential to play a role in the production of the cutaneous and branchial lesions observed in columnaris disease.

P95 KALEB J. PAGE¹, ANDREW Q. WEEKS¹ AND COLIN R. JACKSON¹. The University of Mississippi¹. Effects of particle size on the structure of bacterial biofilm communities.

Attached bacterial communities (biofilms) are diverse and can harbor many different bacterial groups. However, few studies have examined what factors control biofilm diversity and community structure. For biofilms associated with sediment particles in aquatic environments, the size of the particles themselves may be important. In a descriptive study, sediment particles were collected from a sandy bottomed stream in northern Mississippi and sorted into three size ranges, all below 1 mm diameter. Whole community DNA was extracted from each size range, and bacterial community structure examined through 16S rRNA gene approaches. Particle size significantly influenced bacterial community structure, with representation of lineages such as the Verrucomicrobia being reduced on coarser particles. To experimentally test the hypothesis of particle size as a determinant of biofilm community structure, additional stream sediment was collected and the natural bacterial populations used to inoculate artificial substrata (sterilized glass beads) representing sediment particles of various sizes. Biofilm communities were allowed to develop for 30 d, after which community DNA was extracted. Denaturing gradient gel electrophoresis of bacterial 16S rRNA gene fragments showed that different bacterial biofilm communities developed on different sizes of particles, even though those particles received the same initial inoculum. These studies show that the composition of biofilm communities is influenced by the absolute size of the surface that they are attached to, and that particle size is an important structuring force in aquatic bacteria assemblages.

P96 MALLORY L. WEST¹, KAREN R. HASTY¹ AND DAVID R. WESSNER¹. Davidson College¹. Ethanol-resistant reovirus strains do not exhibit altered replication kinetics in cell culture.

Mammalian reoviruses are non-enveloped viruses that have two icosahedral capsids encasing the double-stranded RNA genome. During viral replication, reoviruses enter cells through receptor-mediated endocytosis and subsequently undergo a two-step disassembly process that involves the sequential removal of the outer capsid proteins. Virions first disassemble into infectious subviral particles (ISVPs) as the viral outer-capsid protein σ 3 is degraded and μ 1/ μ 1c is cleaved into μ 1 δ / δ and ϕ . ISVPs then disassemble into transcriptionally active core particles after the complete degradation of the μ 1 fragments and the removal of all remaining outer-capsid proteins. In previous studies, we isolated mutants of reovirus type 3 Dearing (T3D) that exhibit increased resistance to ethanol. In the current experiments, we examined the disassembly and replication of these viruses. When treated with chymotrypsin *in vitro*, the mutant strains

demonstrate altered disassembly compared to wildtype T3D. However, cell culture studies did not show any differences between the replication kinetics of the wildtype and mutant strains. These results suggest that the observed in vitro disassembly defect in these viruses does not result in a concomitant delay in the replication kinetics of these viruses.

- P97 ROSHANAK GHOOCHAN¹, PAULA JACKSON¹, JOSE LUIS ANDRADE², JUAN MANUEL DUPUY² AND THOMAS MCELROY¹. Kennesaw State University¹ Centro De Investigacion Cientifica De Yucatan². Soil microbial diversity in different aged dry tropical deciduous forests of the Yucatan, Mexico.

Dry tropical deciduous forests found in the Yucatan Peninsula are some of the most threatened ecosystems in the world, yet very little is known about these systems. Local tree species distributions may be related to microbial associations that affect their ability to use ground water and soil nutrient pool resources. Therefore, it is important to understand the relationships between plant communities and associated microbes. This study is a preliminary investigation to describe soil microbial communities associated with three different aged forest stands (5, 15 and 60 years old; 3 plots within each age group). We used Terminal Restriction Fragment Length Polymorphism (TRFLP), a culture independent method, to assay soil microbial communities in each of the field sites. Twenty five soil samples were collected along 25 meter transects within each plot. Whole genomic DNA was extracted from the soil samples. The ITS region of the fungal genome and the 16S region of the bacterial genome was subjected to PCR amplification with fluorescently labeled primers. The amplicons were cut with Taq1 endonuclease restriction enzyme for fungi and HaeIII for bacteria. The forward terminal fragments were analyzed with an ABI 310 Genetic Analyzer. Differences in microbial community composition associated with different aged forests will be discussed.

- P98 Steve P. Palladino¹, Nazia Mojib¹, Jonathan Huang¹, Richard Hoover² (), Dale Andersen³, and Asim K. Bej¹. UAB¹, National Space Science and Technology Center, NASA², Carl Sagan Center for the Study of Life in the Universe, Mountain View, CA³. Isolation and characterization of pigmented bacteria from frozen ice of an ice-cave in Antarctic Schirmacher Oasis

Antarctica is the coldest and driest continent on this planet, which encompasses polar desert soils, freshwater lakes, coastal marine waters, mountains, ice-free dry valleys and vast regions of perennially frozen ice. The lakes of the Schirmacher Oasis and its surroundings in East Antarctica provide an unprecedented opportunity to unravel the diversity of microorganisms in extreme cold conditions. In this study, we isolated three psychrotolerant bacteria producing different pigments from the frozen ice samples of the ice-caves from the 2008 Tawani Foundation sponsored Antarctic expedition, by direct culturing on R2A agar medium. These organisms were identified by standard method of molecular taxonomy based on 16S rRNA gene analysis. The targeted 16S rRNA gene was amplified from the genomic DNA of these three bacteria, cloned and subjected to DNA sequencing. It was found that all three bacteria belong to genus *Sphingomonas* when analyzed by BLAST homology search. The phylogenetic trees were generated by neighbor joining method using CLUSTAL X and MEGA 4 software with the sequences that exhibited 95-97% sequence identity. Gram staining of these bacteria exhibited different morphology and it was observed that they produce pink, orange and yellow pigments. The biochemical characteristics and the nature of these pigments in these bacteria are currently being studied to further investigate whether these bacteria are previously undescribed species and the role of the pigments for their survival in high solar UV radiation. The phylogenetic analysis and diverse characteristics including cold adaptation of all these microorganisms give an insight into the diversity of the microbial communities thriving in the frozen continent

- P99 PREMILA N. ACHAR¹, ANIL CHOUDHARY² AND ANDREZ SANCHEZ¹. . Kennesaw State University¹ Research Fellow, Office of Vaccines Regulation and Research, USFDA². Effects of substrate, water activity and temperature on growth and aflatoxin production by *Aspergillus flavus* in edible peanuts

Production of aflatoxin by *Aspergillus* sps in peanuts is known to be influenced by environmental factors such as temperature, water stress, pH and nutritional conditions. Moreover, the interaction between water activity and temperature is most critical determinant for fungal growth and mycotoxin production . This study investigates the growth of *A. flavus* in edible peanuts and production of aflatoxin (AF) on different media, when exposed to combined effect of water activity (aw) and temperature at different incubation time. Statistical analysis showed that a combination of factors, water activity (aw), temperature and substrate affected mycelial growth and AF production in edible peanuts. Optimum growth was obtained at aw 0.99 - temperature 27^o C, after 25 days of incubation and growth rate was higher on YES (yeast extract sucrose) media than CYA (Czapek yeast autolysate). The highest AF concentration was obtained at aw of 0.99 - temperature 27^o C after 15 days of incubation at the rate of 0.39 $\mu\text{g m}^{-1}$ in YES and 0.30 $\mu\text{g m}^{-1}$ in CYA. No aflatoxin was produced at aw 0.85. Current study confirms the presence of *A. flavus* in edible peanuts and further proved that these peanuts when exposed to varying environmental conditions, produces different levels of aflatoxin. Present study provides strong evidence that *A. flavus* can escape detection in peanuts at buying and selling points . However, it remains a matter of speculation, as to the source of *A. flavus* in the peanuts under study since *A. flavus* spores are both soil-borne and air-borne.

- P100 JEREMY HARMSON¹, CHRIS R. GISSENDANNER¹ AND ANN M. Findley¹. University of Louisiana at Monroe¹. Isolation and Genomic Sequence Characterization of a Novel Mycobacteriophage From Soil Samples in Northeast Louisiana.

The University of Louisiana at Monroe was selected by the Howard Hughes Medical Institute's Science Education Alliance (SEA) as one of twelve colleges and universities from across the country to join the National Genomics Research Initiative (NGRI). During the fall 2008 semester, twenty-two ULM freshman Biology students successfully isolated fifteen distinct bacteriophages via conventional soil processing or enrichment regimes. Isolates were subjected to spot test analysis, repetitive phage purification plating, and an empirical testing protocol that led to a ten plate infection and harvesting of high titer lysates (10⁹-10¹⁰ pfu/ml) for each phage isolate. Lysates were processed for transmission electron microscopy with negative staining. DNA was isolated from phage isolates and characterized using restriction digestion analysis using the BamHI, ClaI, EcoRI, HaeIII, and HindIII endonucleases. One phage, Mycobacterium sp. Peaches was submitted for library construction and genome sequencing at the Department of Energy Joint Genome Institute-Los Alamos National Laboratory. The genome of Peaches is circular and the initial phase of sequencing generated 3 contigs and 1 scaffold. During the spring, 2009 semester, the SEA freshmen will annotate the genome of Peaches. This annotation will include a finishing analysis of the draft sequence, gene calling, and assignment of predicted gene functions. The annotated sequence will be submitted to GenBank and made available to the research community. This work was supported by the HHMI-SEA-NGRI phage genomics initiative.

- P101 KRISTEN KING¹, DAMIEN WILLIS¹, BENJIE BLAIR¹, ROBERT CARTER¹ AND CHRIS A. MURDOCK¹. Department of Biology, Jacksonville State University¹. Methodology for the rapid detection of the bacterium *Borelia lonestari* in *Amblyomma americanum* in east central Alabama.

Tick-borne illnesses are the most commonly reported vector-borne diseases in the United States. Most notably, Lyme disease (LD) has been linked to infection by the bacterium *Borrelia burgdorferi* via *Ixodes scapularis* bites. However, in the southeastern United States many patients presenting tick bite associated LD-like symptoms fail to display serological and/or culturable conformations of infection with this particular spirochete. Such cases typically receive the diagnosis of southern tick-associated rash illness (STARI). Furthermore, evidence suggests that STARI develops following the attachment of the Lone Star tick, *Amblyomma americanum*. *Borrelia lonestari*, an *A. americanum* associated spirochete, is the presumed causative agent of STARI. In order to assess the percentage of lone star ticks carrying *B. lonestari* in east central Alabama, a rapid PCR-based methodology for detecting the presence has been optimized. *A. americanum* samples were obtained from a local veterinary clinic. Ticks samples were pooled (n=10) and DNA was isolated. Primers specific for the *B. lonestari* glycerophosphodiester phosphodiesterase (glpQ) gene were utilized for the confirmation of *B. lonestari* in the sample pools. Verification of potential *B. lonestari* positive sample pools was confirmed via DNA sequencing. Sequencing of *B. lonestari* positive pools revealed 100% homologies with *B. lonestari* glpQ sequences in the NCBI database. Additionally, these sequence data have been used to optimize a real time PCR methodology (using a dual labeled glpQ specific probe). Such methods will allow for the rapid (< 30 min) and highly specific (above and beyond conventional PCR) detection of *B. lonestari* in tick samples.

- P102 JENNY R. CHANG¹, MICHAEL S. SPILMAN², CYNTHIA M. RODENBURG² AND TERJE DOKLAND². Department of Biology, University of Alabama at Birmingham¹ Department of Microbiology, University of Alabama at Birmingham². Functional domains of the bacteriophage P2 scaffolding protein: Identification of residues involved in assembly and protease activity.

Bacteriophage P2 encodes a scaffolding protein (gpO), which is required for correct assembly of P2 procapsids from the major capsid protein (gpN). The 284-residue gpO also acts as a protease, cleaving itself into an N-terminal fragment, O*, which remains in the capsid following maturation. We show that gpO is a classical serine protease, with a catalytic triad comprised of Asp 19, His 48 and Ser 107, located in its N-terminal domain. The C-terminal 90 amino acids of gpO are required and sufficient for capsid assembly. This fragment contains a predicted alpha-helical segment between residues 197 and 257 and exists as a multimer in solution, suggesting that oligomerization is required for scaffolding activity. Correct assembly requires the C-terminal cysteine residue, which is most likely involved in transient gpN interactions. Our results suggest a model for gpO scaffolding action in which the N-terminal half of gpO binds strongly to gpN, while oligomerization of the C-terminal alpha-helical domain of gpO and transient interactions between Cys 284 and gpN lead to capsid assembly. Bacteriophage HK97 lacks a gene for a scaffolding protein but encodes an N-terminal "delta" domain comprised of the N-terminal residues 2-103 of its capsid protein (gp5), forming a predominantly alpha-helical fold. Varying fragments of the C-terminal region of gpO were fused to gpN to test its functional similarity to the HK97 delta domain. The fusion of the gpO scaffolding domain to gpN promotes the assembly of small shells, suggesting that the conformational variability of gpN is restricted.

- P103 BHUMI A. PATEL¹, TRI DOAN¹ AND PREMILA N. ACHAR¹. Kennesaw State University¹. Molecular Relatedness in *Aspergillus flavus* in peanuts from Texas, Florida, and Georgia.

Aspergillus flavus is a common fungus found in peanut among many other crops that produces carcinogen aflatoxin. Peanut and other crops are vulnerable to contamination especially in stressful conditions such as high humidity and drought. Aflatoxin produces carcinoma, acute necrosis and cirrhosis in a number of animal species and in humans

exposure to aflatoxins can increase the risk of developing cancer. Detection of molecular relatedness in *A. flavus* is critical in exploring new biological methods to prevent aflatoxin production in peanut and other crops. The goal of this research project was to characterize in *A. flavus* strains from peanuts in Georgia, Texas, and Florida and establish molecular relatedness using polymerase chain reaction (PCR) and DNA sequencing methods. The growth of *A. flavus* was done by incubating peanuts on Potato Dextrose Agar (PDA) for 7 days at room temperature and identification of *A. flavus* colonies was done based on colony characterization and morphology. Sub-culturing of colonies was done to obtain pure cultures and using internal transcribed spacer (ITS) 1 and 2, PCR amplification of DNA was carried out. ITS primers revealed common banding pattern of 550-600 bp for all samples tested from different geographical location establishing minimal genetic variation. BLAST search of sequencing results of ITS primers confirms that the species isolated was *Aspergillus flavus* using ABI PRISM 310 Genetic Analyzer to mapped the intervening ITS 1 - 5.8S - ITS 2 regions of *A. flavus*. Future studies will focus on comparing more samples from other peanut growing States.

P104 JASMINE OLANDER¹, BENJIE BLAIR¹, MARK MEADE¹ AND CHRIS MURDOCK¹. Jacksonville State University¹. The effects of probiotic treatment on growth and intestinal microflora composition in Nile tilapia, *Oreochromis niloticus*.

Recent studies suggest that bacteria play important roles in the life histories of many vertebrates. For example, immune and digestive functions appear to be enhanced by the presence of certain bacteria. In the reported study, the effects of an anaerobic bacterium (*Eubacterium cellulosolvens*) as a potential probiotic in aquaculture were addressed. Nile tilapia (*Oreochromis niloticus*) fry were fed an initial ration of high protein (50%) commercial fish food supplemented with *E. cellulosolvens*. Control fry were fed an equal ration of the high protein fish food (no probiotic). Metabolic analyses indicated that the fry that received the anaerobic bacteria utilized nutrients more efficiently than untreated fry. Additionally, genetic analyses of intestinal microflora of treated and control groups were performed to determine if changes in microflora composition occurred between the two treatment groups. Specifically, DNA samples were isolated from *O. niloticus* intestinal tissue samples from both groups (60 days post-treatment). These DNA samples were subjected to PCR using primers specific for the amplification of a highly conserved region of within the 16S rDNA gene of bacteria. Amplified samples were cloned and 16S rDNA libraries for these tissues were constructed. Sequences from these clones were compared to other 16S rDNA sequences available from GenBank (NCBI database) in order to identify the various genera of bacteria (including *E. cellulosolvens*) present in the intestinal samples. These analyses revealed differences in the makeup of the microflora between the treated and control groups.

P105 LISA A. BLANKINSHIP¹. Troy University¹. Comparison of Methods for the Extraction of Genomic DNA from Aerobic Digest.

Aerobic digest represents a complex microbial community generated by the wastewater treatment process. The development of culture independent based methods such as PCR for the detection of microbial pathogens, population monitoring, and tracking of problematic species is dependent upon the isolation of genomic DNA that contains target sequences of sufficient quality and quantity and is free from organic contaminants. Aerobic digest, like soil, contains a concentrated amount of microbial cells in addition to organic pollutants. This study examined several genomic DNA extraction methods to determine which will provide a DNA product free from humic acid contamination and of sufficient quantity to be detected by gel electrophoresis and ethidium bromide staining. Of the seven methods tested, four (Wizard ® Genomic DNA purification, UltraClean™ Microbial DNA Isolation, UltraClean™ Fecal DNA, and UltraClean™ Mega Soil kits) yielded genomic DNA detectable by gel electrophoresis and ethidium bromide staining.

The UltraClean™ Mega Soil DNA kit providing genomic DNA with the least amount of shearing. All UltraClean™ methods yielded a genomic DNA free from humic acid contamination. Once a genomic DNA product of good quality and quantity is obtained, molecular monitoring of sludge for pathogens and other problematic (e.g., bulking and foaming) species will be possible.

P106 – Cancelled

P107 Danielle Lowhorn¹. Shorter College¹. Amount of Lead in Blood of Captive Rock Doves Exposed to Lead Pellets.

Lead poisoning from ingesting lead shot has been documented in numerous bird species. Lead shot is commonly found in high abundance on dove and agricultural fields where upland bird hunting occurs. However, how readily birds pick up and ingest lead shot is not well known. Rock pigeons *Columba livia* are easily captured and could be used as a model for how group foraging birds ingest spent lead shot from their environment. We captured 40 wild rock pigeons and placed them in control pens and pens laced with lead shot. Four blood samples were taken over a period of 24 days and tested for lead. No significant differences in blood lead levels were found for any of the treated pens compared to the pretreatment blood sample. Our results suggest that rock pigeons and possibly other group foraging birds may not readily ingest lead from their environment. Rock pigeons may be able to discern lead shot from food and grit prior to and after picking it up.

P108 ZACK BURKHALTER¹. Shorter College¹. Analysis of Mourning Dove Gizzards From Two Private Agricultural Fields.

Spent lead shot from shotguns has been found in great quantity on agricultural and game hunting fields. Lead shot has been implemented in the mortality of over 30 species of birds. However, the relationship between lead shot availability and ingestion by mourning doves *Zenaida macroura* remains uncertain. Incidence of lead shot in dove gizzards on public management areas have shown an ingestion rate of 1 to 6.5%. During the fall hunting seasons of 2007 and 2008, we gathered gizzards from hunter killed doves on two private agricultural fields that participate in fall dove hunts. An analysis of all grit found in the dove gizzards was performed.

P109 HALEY L. PILLARS¹ AND EDWARD D. MILLS¹. Wingate University¹. Effects of anthropogenic noise on song development and physical growth of blue-breasted quail (*Coturnix chinensis*).

Anthropogenic noise has the potential to disrupt the natural learning processes associated with avian song development by masking vital call frequencies. In addition, stress from auditory masking could hinder physical growth and development. Unmated male Blue-breasted Quail produce courtship calls that consist of a short (0.6 sec) one syllable note containing six distinct frequency bands. In order to examine the effects of noise on song development, we exposed a group of quail to partial signal masking (white noise at 75 dB) from the egg stage until adulthood, and compared their song development to a group of control quail that were not exposed to noise. At nine weeks of age, the unmated control males began to produce the normal one-syllable, six-frequency courtship calls. However, the experimental males responded to noise masking by producing courtship calls with significant alterations in the low frequency signals; this created five frequency bands instead of six. Two of their frequency bands overlapped, creating one large band with frequencies varying by an average of 400 Hz more than the controls. After examining several other call variables (low and high frequencies, note length, maximum power,

etc...), it appears that noise masking is responsible for slowing and altering the development of courtship calls in Blue-breasted Quail. In order to assess the effects of noise on the growth and development of quail chicks, we monitored chick weights during their rapid physical development and found no significant differences between the control and noise-exposed quail.

P110 NATHAN M. SOLEY¹ AND LYNN SIEFFERMAN¹. Appalachian State University¹.
Hatch order influences nestling growth and begging in Eastern bluebirds.

Hatching asynchrony can influence the morphology and behavior of nestling altricial birds. Asynchronous hatching can create within-brood size hierarchies. This hierarchy may lead to significant differences between offspring in terms of need and can result in begging behavior differences. We investigated the effects of hatching asynchrony on mass, begging behavior, and plumage coloration of nestlings Eastern Bluebirds, *Sialia sialis*. Moreover, we looked for relationships between hatching order and sex. Bluebirds at our Alabama study site laid clutches of 4-5 eggs and most nestlings hatched within 36hrs. Hatching order reflected the order that eggs were laid. Early-hatched nestlings were larger than late-hatched nestlings for the duration of the growth period, however this effect diminished as nestlings reached fledgling stage (age 14 days). Late-hatched nestlings begged more often and for a greater duration than early-hatched nestlings. We found no relationship between hatching order and sex nor did we find effects of hatch order or nestling size on plumage coloration. Our data suggest that begging behavior of bluebird nestlings is a reliable signal of need. Although we did not measure parental response to begging, because the size hierarchy became less pronounced as nestlings aged, parents may respond to variation in nestling begging.

P111 LAUREN M. SHOWALTER¹. University of Alabama/Dauphin Island Sea Lab¹.
Stable isotope and mercury analysis in the Mobile Bay, AL food web.

Use of ¹⁵N and ¹³C stable isotopes in combination with mercury analysis in the Mobile Bay ecosystem is useful in understanding complex trophic dynamics and the transfer of metals through organisms in the Bay. The relationship between biomagnification of mercury and stable isotope signatures will develop a model for transfer of this neurotoxic metal through food webs and ultimately into food for human consumption. Brown Pelicans (*Pelecanus occidentalis*) and Laughing Gulls (*Larus atricilla*) represent species at possible risk for neurological effects of accumulation of mercury due to their trophic position in the Mobile Bay food web. This study involves the collection of various members of the Mobile Bay food web (e.g. phytoplankton/zooplankton, invertebrates, fish and birds) for analysis of carbon and nitrogen stable isotopes and mercury in tissues. Analysis of mercury (cold vapor atomic absorption spectrophotometry) and stable isotope ratios (isotope ratio mass spectrometer) will be incorporated into a larger project being conducted by NOAA to develop a model of mercury risks in Mobile Bay.

P112 SARAH E. BRAUNE¹ AND STEPHEN C. LANDERS¹. . Troy University¹ Cross-infestation studies of apostome ciliated protozoa.

Most apostome ciliates are symbionts found on marine and freshwater crustaceans. These protozoans encyst on their host, and feed on exuvial fluid within the exoskeleton at molting. The species of ciliate varies by host and region. The marine ciliate, *Hyalophysa chattoni*, naturally infests the grass shrimp *Palaemonetes pugio*. *Hyalophysa bradburyae* is normally found on the freshwater shrimp *P. kadiakensis*. Cross-infestation studies of ciliates were performed between these two hosts in order to better understand the factors which limit ciliate distribution, such as salinity and host specificity. Our experiments (5 ppt.) demonstrated that *H. chattoni*, obtained from estuarine shrimp, was able to settle on

the freshwater shrimp, excyst, and feed within the new host's exoskeleton. Silver staining of feeding stages revealed normal ciliature as well as conjugant pairs of cells. These observations suggest a healthy host-symbiont relationship at this salinity. Though *H. chattoni* can tolerate near freshwater salinities, the reverse acclimation revealed that the freshwater ciliate *H. bradburyae* is fairly sensitive to salt. To date, attempts to infect the estuarine host with the freshwater ciliate have been unsuccessful. Our data suggest that the marine ciliate, *H. chattoni*, may naturally exist on freshwater hosts near the coastline, where such hosts could be found in close proximity to marine species.

P113 KODY CHASE¹ AND RICCARDO FIORILLO¹. University of Louisiana, Monroe¹. Hemogregarines of northeast Louisiana snakes.

Parasitemia in mammalian host is well documented, do in large part to the associated pathology of the infections. However, exothermic vertebrates are also hosts for a variety of hemoparasites. These include filarial worms, protozoans and prokaryotes. One group of parasitic protists, the hemogregarines (*Apicomplexa*), have been documented in Louisiana turtles and snakes, and, according to the literature, are the most common hemoparasite found in snakes. In Louisiana and throughout the southeast, winters are relatively mild compared to northern latitudes, and snakes are likely active during warm spells or sunny days. This year round activity may expose snakes to more potential vectors. In addition, because hemogregarines utilize different vectors, (ex. leeches, mosquitoes, ticks), the spatial distribution of snakes may also influence its hemoparasite community. Individuals that prefer more aquatic/semi-aquatic habitats, may be exposed to a different suite of vectors than more terrestrial snakes. We present data on the hemoparasites community structure and parasitemia of native Viperids and Colubrid snakes in Northeast Louisiana in relation to host taxa, host habitat type, sex, size, and life history.

P114 CHARLES D. BATTAGLIA¹ AND RICCARDO A. FIORILLO¹. University of Louisiana at Monroe¹. Seasonal dynamics of *Maritreminoides* sp. (Trematoda: Microphallidae) in its intermediate host, the grass shrimp *Palaemonetes kadiakensis*, in Black Bayou Lake NWR in Northeast Louisiana.

We examined the seasonal dynamics of the metacercaria of an undescribed species of *Maritreminoides* (Trematoda: Microphallidae) in its intermediate host, the grass shrimp *Palaemonetes kadiakensis*. Beginning in July 2008, we collected grass shrimp monthly from vegetated shallow areas of Black Bayou Lake in Ouachita Parish in Northeast Louisiana. Shrimp were found mostly associated with Brazilian waterweed, (*Egeria densa*) and Coon's tail (*Ceratophyllum demersum*) near bald cypress (*Taxodium distichum*) stands. Metacercaria were recovered mostly from the cephalothorax, and only rarely in the abdominal musculature. We report data on, seasonal parasite prevalence and abundance, infection site, and the relationship between parasitism and host size, sex, and reproductive condition.

P115 AMANDA ANTEE¹, CHARLES BATTAGLIA¹, LOREN HAYES¹ AND RICCARDO FIORILLO¹. University of Louisiana at Monroe¹. Effect of *Maritreminoides* sp. (Trematoda: Microphallidae) infection on the activity of its intermediate host, the grass shrimp *Palaemonetes kadiakensis*.

Parasites have been shown to influence host behavior and thus, can be an important evolutionary force. Multiple hypotheses explain the effect of parasitism on host behavior. In this study, we are testing two such hypotheses using grass shrimp, *Palaemonetes kadiakensis*, as a model species. The 'costs of parasitism' hypothesis predicts that total host activity decreases with increasing parasite intensity due the pathology from the parasite infection. The 'compensatory hypothesis' predicts that hosts compensate for the

physiological costs associated with parasite infection by increasing foraging behavior. These hypotheses can be tested by evaluating the relationship between overall behavioral activity, foraging behavior, and intensity of parasite infection. We collected shrimp from two populations, one in the main lake and another in a small pond ca. 50 m from the lake, at the Black Bayou National Wildlife Refuge (Monroe, LA). In the lab, we quantified the behavioral activities, including foraging behavior, of individuals from both sites during 60 min observational trials ($n = 50$). We then necropsied all shrimp and quantified the intensity of infection by helminth parasites. Individuals collected from Black Bayou Lake were infected with the metacercaria of an undescribed species of *Maritreminoides*. In contrast, individuals collected from the pond did not harbor the parasite. We will report data that examines the relationship between parasitism, total activity, and foraging behavior. By evaluating the variation in parasitism and behavior within and between local populations, our study has the potential to increase our understanding of the link between ecology, parasitism and behavior.

P116 JACQUELYN S. HOWELL¹ AND ASHLEY B. MORRIS¹. University of South Alabama¹. Using microsatellites and morphology to define species boundaries and hybridization in *Sarracenia* at Splinter Hill Bog.

Carnivorous plants are fascinating due to their ability to utilize insects for nutrition. Pitcher plants (*Sarracenia* spp.) are a special class of carnivorous plants that use pitfall traps to capture prey; enzymes within the pitcher then degrade the bodies of their prey for nutrients. These pitchers, which are modified leaves, exhibit a great deal of morphological plasticity. Previous work indicates that such variation may be the result of several factors, including hybridization and soil nutrient content. Our work will focus on the correlations between *Sarracenia* pitcher morphology, population genetic structure, and soil and plant tissue nutrient content as tools to define species boundaries and hybrid zones. This work will take place within the Splinter Hill Bog Preserve (TNC), where eight sites will be selected for surveying. Within each site, a CVS vegetation plot will be established to allow for estimates of species richness and diversity of associated plant communities. A maximum of 48 *Sarracenia* plants (regardless of species) will be sampled at regularly spaced intervals along parallel transects within each plot, for a total of 384 across all sites. All sampled plants will be photo-documented, genotyped using 12 microsatellite loci, and assessed for morphological variation following previously published literature. Soil and tissue samples will also be collected to allow for assessment of soil nutrient content relative to tissue nutrient content. Any documented correlations among these variables will allow us to better define species boundaries and the extent of hybridization among *Sarracenia* species.

P117 SARAH J. FORT¹ AND Elizabeth Dobbins. Samford University¹. Assessment of *Ficus carica* extracts as inhibitors of basal cell carcinoma.

Ethnomedical studies done on the historical and traditional uses of *Ficus carica* reveal its potential as an anticancer agent. Latex from the *Ficus carica* inhibits cellular proliferation in basal cell carcinoma. This has practical implications in the development of a treatment for skin cancer. The purpose of this study is to discern whether other segments of the fig plant, specifically the fruit, juice, stem, and leaves, also exhibit this effect on Basal Cell Carcinoma. Multiple MTT Assays were run to measure the effect of the various fig extracts on cell proliferation. The results show that juice, fruit and leaf extracts do inhibit cellular growth, fruit to a lesser extent. The stem extract was the least effective in inhibiting proliferation in Basal Cell Carcinoma, as expected based on its role in the fig plant. A concentration effect was observed between the different amounts of extract added. When comparing the addition of 5 μ L to 10 μ L of extract, the difference was generally significant ($P < 0.05$) for all extracts except the stem. It can therefore be concluded that compared to fig latex the fig fruit, juice, and leaves exhibit similar inhibitory properties and although the

stem somewhat inhibits cell proliferation, it is much less pronounced than in the other extracts.

P118 SALOUA LAHLOU¹ AND SAFAA AL-HAMADANI¹. Jacksonville State University¹. Influence of light on adventitious root formation of the oleander plant.

This study was designed to investigate the influence of light on adventitious roots formation of the oleander plant (*Nerium oleander*). Approximately 15 cm of stem cuttings were collected from one single plant and placed individually in twelve 250 ml flasks containing 150 ml of water. Six samples were randomly selected and the stem cuttings were exposed to the light. In the second treatment, equal number of plants was individually wrapped with aluminum foil to prevent light exposure. The plants were growing under the greenhouse condition for three months. The result showed that light inhibits the formation of the adventitious root. The stem cuttings grown in dark had developed the adventitious root with 83% success rate in comparison to null rate for the light treatment. The second experiment is in the progress to evaluate the influence of selected concentrations of auxin (10⁻⁴, 10⁻⁵, and 10⁻⁶ M) on the root formation of the oleander plant growing under light condition.

P119 JOHN R. EVANS¹ AND JOEY SHAW¹. The University of Tennessee at Chattanooga¹. A Preliminary Flora of Sequatchie Valley in Sequatchie County, Tennessee.

A survey of the vascular flora of the Sequatchie Valley and its eastern escarpment is currently being conducted within Sequatchie County, Tennessee. The Sequatchie Valley is generally considered to be part of the Cumberland Plateau physiographic province; however, a number of geological and ecological features distinguish the valley from the plateau proper. Formation of the Sequatchie Valley was initiated by a breach through the normally resistant sandstone cap rock that overlays the Cumberland Plateau. Extensive erosion of the underlying limestone has resulted in a long, narrow valley floor that is 400 m lower than the surrounding elevated plateau. In addition, the Sequatchie Valley is physically isolated from other low-lying areas to the east and west. Within Tennessee, nine separate floras have previously been conducted on the Cumberland Plateau, but very little attention has been given to the flora of the Sequatchie Valley. The isolation and unique physiography of the valley suggest that the floristic composition may be significantly different from the elevated plateau, as well as the neighboring Ridge and Valley and Eastern Highland Rim physiographic provinces. This study is now entering the second of three field seasons. As of January 2009, 487 specimens have been collected. Of these, 239 species, representing 177 genera in 84 families have been positively identified. Collection and analysis will continue through the summer of 2010.

P120 CLINTON S. MAJOR¹, KELLY M. MAJOR¹, KATHERINE E. VANDEVEN¹, MELANIE M. CALDWELL¹ AND AMANDA E. ECKER¹. University of South Alabama¹. Resurrecting the University of South Alabama Herbarium (USAM): an Update

Over the past decade or so, the scientific community has witnessed a precipitous decline in the upkeep and oversight of biological research collections nationwide. Prior to the start of this project, the University of South Alabama's herbarium (USAM) was no exception, and had not been actively managed in more than ten years. As we began to assess the condition of the collection, it became increasingly clear that we needed to improve upon the organization of and access to this important regional resource. To this end, our involvement with the Deep South Plant Imaging Project has enabled us to resurrect the USAM Herbarium; it is now a fully functional collection and has witnessed a welcome

resurgence in use. To date, following the format of the Flora of North America series and Wunderlin and Hansen (2005), the USAM curatorial staff has re-organized 16,500 mounted and labeled plant vouchers. Of these 16,500 specimens, all are bar-coded; 10,491 plants have been imaged and will be uploaded to the Florida State University server by summer 2009. The USAM houses one of the region's largest collections of grasses from the *Panicum* and *Dichanthelium* genera and has become a regional repository for non-native and/or invasive plant vouchers. It is our intention that this work serve to promote the preservation and interdisciplinary use of important herbaria, and increase public awareness of and support for such irreplaceable biological references.

P121 ERIN PENTECOST¹, SAMANTHA PESNELL¹, DAVID PONDER¹ AND MIJITABA HAMISSOU¹. Jacksonville State University¹. Investigating the effects of shiitake mushroom extract on the induction and growth of tobacco callus.

The shiitake (*Lentinula edodes*) is an edible mushroom native to East Asia. It is cultivated and consumed in many Asian countries and is also dried and exported around the world. The shiitake mushroom is believed to have medicinal benefits. Recent studies have shown that extract of shiitake mushroom induced a break-up of tumor caused by cancer cells in laboratory mice. Tumor-like mass of cells can be induced in plants on formulated Murashige and Skoog media, supplemented with the growth hormone auxin. When placed on these media, the explants dedifferentiate into mass of unorganized cells known as callus. Because of its effects on tumor cells, it is hypothesized that addition of shiitake mushroom extract in callus inducing formulated media will prevent callus formation and that when added to a callus supporting media it will cause the callus to degrade and cease growth. The objectives of this research is to investigate the effects of shiitake mushroom extract to tobacco callus induction and to determine its effects on pre-induced callus. The induction and growth of tobacco callus were compared on MS media supplemented with 2mg/L 2, 4-D with or without shiitake extract. Preliminary data indicated that tobacco explants failed to produce callus when cultured on media containing mushroom extract and that callus induced on 2MS transferred to 2MS supplemented with mushroom extract experience an abnormally excessive growth

P122 JASON BUNN¹, AUSTIN STOKES¹ AND HANAN L. EL-MAYAS¹. Georgia State University¹. Effect of Arbuscular Mycorrhizal Fungi on Root Architecture and Distribution and Concentration of Isoflavanoids in *Pueraria montana* (Kudzu).

Effect of Arbuscular Mycorrhizal Fungi on root architecture and Distribution and Concentration of Isoflavanoids in *Pueraria montana* (Kudzu). Jason Bunn, Austin Stokes, Hanan El-Mayas Georgia State University Department of Biology P.O. BOX 4010 Atlanta GA 30302-4010 *Pueraria montana*, known as kudzu, was introduced to the United States in 1876 for restoration purposes. Being a legume, *P. montana* forms a tripartite mutualistic association with arbuscular mycorrhizal fungi (AMF) for phosphorus uptake and nitrogen fixing rhizobia for a source of nitrogen. *Pueraria montana* produces many isoflavanoids such as Daidzein, Genistein, Daidzin, Genistin and Puerarin that are known to promote chemotaxis and nodulation by specific rhizobia while other soil bacteria are repelled by these isoflavanoids. This experiment was designed to test the effect of AMF on root architecture, nodulation, and the distribution of the five isoflavanoids mentioned above. To that purpose one set of plants were grown with AMF versus another set grown with benomyl, a fungicide known to kill or suppress activity of AMF. After two years of growth plants were harvested. The result of the experiment showed that roots of plants grown with AMF were significantly different from the plants grown with benomyl in that the latter formed a very large taproot with minimal branching and rootlets with very few nodulation. However, the plants grown with AMF had no taproot, increased branching with a twenty fold increase in nodulation. The distribution of isoflavanoids was analyzed using thin layer chromatography. The results indicated that, the roots of the plant grown with

benomyl contained puerarin and Daidzein and smaller concentrations of Daidzin. However, the roots of the plant grown with AMF contained Daidzein, Genistein, Daidzin, and Genistin. In conclusion, Puerarian in AMF treated plants does not seem to play a role in root architecture or chemotaxis for symbiotic rhizobia. As expected from previous publications the other four isoflavonoids were necessary for chemotaxis and increased nodulation.

- P123 KAJAL B. GHOSHROY¹, KATRINA D. KOZLIN¹, SOUMITRA GHOSHROY², ROBERT T. LARTEY³, KAVINSTON A. SZOKE¹ AND KRISTOPHER B. SZOKE¹. University of South Carolina at Sumter¹ University of South Carolina² 3USDA-ARS Northern Plains Agricultural Research Laboratory³. Investigation of Host Range, Infectivity, and Spread of Turnip Vein Clearing Virus and a Possible Mechanism for Non-Seed Transmission.

In this study we investigated the host range, transmission and symptom development of TVCV in several species of plants, as a step toward developing management strategy against seed transmissible viruses. While several species of plants failed to show symptoms of TVCV infection, we report that bush bean (*Phaseolus vulgaris*, var. provider and var. blue lake), soybean (*Glycine max*), fava bean (*Vicia faba*), and cucumber (*Cucumis sativus*), all served as hosts to the virus. TVCV was able to spread and multiply in these plants, as detected through electron microscopy and PAGE. We describe here the variation of symptoms observed among these newly found putative host plants. We also investigated viral movement patterns in reproductive parts of *Arabidopsis thaliana*, and found the virus to be located in all parts of the flower except the ovules and the pollen grains. The virus was excluded from entry into the ovule from its stalk and into the pollen from the anther tissue. The virus was also not transmitted into the seed. Subcellular localization of callose at the junction of ovule stalk and pollen exine indicated that callose may be involved in blockage of viral movement and thus result in non-seed transmission in *A. thaliana*. We are currently investigating seed transmission and infectivity in the putative hosts.

- P124 ADAM T. STROUD¹ AND DR. MALIA FINCHER¹. Samford University¹. The effects of light availability on photosynthetic capacity and light saturation point in the invasive shrub *Ligustrum*.

Invasive plant species are those plants that are able to cover a large geographical area or dominate a non-indigenous environment by either natural occurrence or introduced to a new environment. A plant is able to become an invader by overcoming competition between the native plants for resources such as light availability, space, or soil resources. One hundred *Ligustrum sinense*, which acts as an invasive species, individuals were tested throughout Birmingham, AL in order to measure the individual's photosynthetic capacity and light saturation point by using a LI-COR photosynthesizer gas analyzer on individual plants growing either in a sun environment or in a shade environment. We found that the maximum photosynthetic capacity was higher in plant individuals acclimated for the sun than for plant individuals acclimated in the shade. Also, we found that the light saturation point for the sun acclimated plants was higher than the shade acclimated plants. From this data, we can conclude that *Ligustrum* is able to tolerate a variety of light environments contributed by the plant's phenotypic plasticity. *Ligustrum's* phenotypic plasticity may allow *Ligustrum* to act as an invasive species as it is able to tolerate a wide variety of light environments opposed to a native plant that is not phenotypically plastic.

- P125 V. R. PERRY¹, HANAN L. EL-MAYAS¹, EIRIK J. KROGSTAD² AND SIGURDUR GREIPSSON³. Georgia State University, Department of Biology¹ Georgia State University, Department of Geosciences² Kennesaw State University, Biology and Physics Department³. Chemically Enhanced Phytoremediation by Ryegrass (*Lolium perenne*) of Lead-contaminated Soils.

Studies have shown that the suppression of arbuscular mycorrhizal fungi (AMF) by benomyl increases the uptake of lead (Pb) by plants harboring mycorrhizal symbionts. Likewise, the addition of chelating agents to soil, such as EDTA, has resulted in increased Pb uptake and root-to-shoot translocation. This study examines the effects of the combined treatments of benomyl and EDTA on Pb phytoextraction by ryegrass (*Lolium perenne*). Plants were analyzed for root and foliage Pb concentrations by isotope dilution (ID) inductively coupled plasma mass spectrometry (ICP-MS). The treatments combining benomyl and EDTA; both simultaneously and benomyl followed 14 days later by EDTA; resulted in foliage Pb concentrations of 145.04 ppm and 173.90 ppm respectively. Compared to foliage Pb concentrations of the control plants (14.5 ppm), benomyl-treated plants (17.4 ppm), and EDTA-treated plants (56.3 ppm), the combined applications of benomyl and EDTA significantly increased the uptake and root-to-leaf translocation of Pb. Therefore, combining benomyl and EDTA should be recommended for phytoremediation of Pb-contaminated soils

- P126 KIRK A. STOWE¹ AND DON CIPOLLINI². University of South Carolina, Columbia¹ Wright State University². External Costs of Defense: Correlated Response of Trypsin Inhibitor to Selection for Foliar Glucosinolate Production.

Costs of defense have typically been envisioned as being incurred as a decrease in fitness in the absence of herbivores. However, most studies designed to detect such costs have met with varying results. This has led to the idea that costs may be manifested in traits other than those that contribute to fitness in the absence of herbivores. Such costs have previously been termed, 'external' or 'ecological' costs. One such external cost may be manifested as a concurrent decrease in one defensive trait with an increase in another defensive trait. To this end, we examined the correlation between two putative defensive traits, foliar glucosinolate content (typically assumed to be a defense against generalists) and trypsin inhibitor content (typically assumed to be a defense against most herbivores) in *Brassica rapa*. Specifically, we examined the correlated response of trypsin inhibitor concentration to the direct artificial selection for foliar glucosinolate content. We found that there was no correlated response of trypsin inhibitor to selection for foliar glucosinolate content. Thus, there appears to be no external cost of foliar glucosinolate content with respect to trypsin inhibitor.

- P127 LEIGH A. SIDERHURST¹ AND HEATHER P. GRISCOM¹. James Madison University¹. Eastern hemlock (*Tsuga canadensis*) mortality and changes in light levels at a southern Appalachian brook trout stream.

Hemlock woolly adelgid (*Adelges tsugae* Annand) is an exotic insect pest of eastern hemlock (*Tsuga canadensis*) that is causing widespread decline of hemlocks in the eastern U.S. Eastern hemlock mortality is predicted to have major impacts on forest ecosystems. Loss of hemlocks in riparian areas, and subsequent increases in solar input to streams, could have pronounced effects by increasing stream temperature and threatening cold water species such as brook trout (*Salvelinus fontinalis*). The goal of this study is to quantify changes in light levels at a stream in George Washington National Forest, VA. Thirty-eight study plots were established in 2007 at 50m intervals along the stream. The site consists of 20 percent hemlock which is co-dominant with chestnut oak (*Quercus prinus*). Light levels were measured using hemispherical photography in the

spring and fall of 2008. Results indicate that light levels have increased with hemlock defoliation but standing hemlocks are still significantly increasing shade to the stream. A gap experiment, in which dying hemlocks are experimentally removed will help us predict changes in light as hemlocks fall into the stream. Aerial photographs and satellite images will be used to assess the overall change in canopy light transmission from pre-adelgid infestation to the present (2001-2008). Predictions will then be made as to whether changes in light levels are likely to pose a threat to brook trout at this site. Results will inform brook trout restoration projects.

P128 ROSS HINKLE¹, JIAHONG LI¹, UYEN NGUYEN¹ AND DAVID SUMNER². University of Central Florida¹ United States Geological Survey². Carbon, water, and energy flux dynamics in the Metropolitan Orlando area - Project overview and preliminary findings.

Driven by the ever increasing human population, urbanization is inevitable, with about 50% of people now living in urban areas, and this figure is projected to increase to 60% by 2030. Urbanization is responsible for many environmental and social changes and its effects are strongly related to global climate change issues. At current growth rates, population estimated for the seven-county Central Florida area is expected to grow from over 3M in 2000 to over 7M in 2050. This population growth will be associated with the conversion of over 809,371 ha of landscape from rural to urban. In this project, we have established an eddy flux sensor system to measure carbon, water, and energy fluxes on a study footprint of approximately 200 sq Km. Our initial measurements clearly demonstrate an urban-to-rural gradient from the west to the east within the study footprint. The atmospheric carbon dioxide concentration in the more urbanized western area of our study was about 10 ppm higher than that in the less urbanized eastern area measured at the height of our flux sensor system, in the well-mixed atmospheric sample, at 80 m above the ground. The average daily carbon dioxide emission to the atmosphere was 16.91 g m⁻² day⁻¹ on the western area while it was only 7.08 g m⁻² day⁻¹ on the more open eastern area. Both the atmospheric CO₂ concentration and flux were strongly influenced by the traffic volume. Initial conclusions reflect that our eddy flux method and sampling location are effective to quantify atmospheric carbon dioxide, water, and energy flux dynamics along an urban-to-rural gradient in metropolitan Orlando. Implications are that traffic patterns and green space are respectively key components in the emission and sequestering of urban carbon dioxide.

P129 JOHN A. BARONE¹ AND JOVONN G. HILL². Columbus State University¹ Mississippi State University². Inventory of remnant prairies along the Natchez Trace Parkway in the Black Belt of Mississippi.

Numerous prairies were found across the Black Belt region of Mississippi and Alabama before the development of widespread agriculture. According to government survey maps from the 19th century, 144,000 hectares of prairies occurred in the region. However, other data, such as eyewitness accounts, suggest that additional prairies were present but missed by the surveyors. This study inventoried remnant prairies along the Natchez Trace Parkway, one of the few protected regions in the Black Belt, to assess how accurate early survey maps were in locating prairies. The Parkway, a unit of the National Park Service, runs from Natchez, Mississippi to Nashville, Tennessee and consists of a two-lane highway and adjacent land. In July and August 2008, a 34-km stretch of the Parkway that crosses the Black Belt was surveyed for remnant prairies. All open habitats within the Parkway boundaries, as seen on aerial photos, were inspected. An area was considered prairie if it was predominately open and inhabited by typical prairie vegetation. A total of 38 prairie sites were found, only four of which were located within the boundaries of historic prairies as indicated on survey maps. Four other prairie sites were situated within 200 meters of historic prairies. The median size of these prairies was 248m², and most

had been invaded by eastern red cedar. This study, which is the first inventory of prairies in any part of the Black Belt, suggests that many more small prairies were present in the Black Belt than show up on early survey maps.

P130 MATT PARDUE¹ AND KIM M. TOLSON¹. Department of Biology, College of Arts and Sciences, University of Louisiana at Monroe, Monroe, LA 71209-0520¹. Prairie restoration efforts on Ouachita Wildlife Management Area.

Only about 600 acres of native prairie remain in Louisiana with most of the remnants located in the southern portion of the state. Coastal prairie once comprised between two and three million acres. However, prairies could also once be found throughout scattered localities in north Louisiana. These prairies were known as "pocket prairies" due to their small size and general isolation from similar biomes. Dominant grasses within these communities include *Andropogon gerardii*, *Schizacharium scoparius*, *Sorghastrum nutans*, and *Tripsacum dactyloides*. Many birds rely on these prairie ecosystems during their life cycle for feeding, cover, nesting, and brood-rearing. Grassland birds have seen some of the sharpest declines of bird species throughout North America. Partners in Flight along with the Cornell Lab of Ornithology have listed several species of grassland birds as species of concern, and have placed them on their Continental Watchlist. The Louisiana Department of Wildlife and Fisheries recognized a site of ~ 110 acres within Ouachita Wildlife Management Area that is thought to be of the Mississippi Terrace Prairie type which holds an S1 ranking by the Louisiana Natural Heritage Program. Restoration efforts were initiated in the fall of 2007 in a cooperative agreement between ULM and LDWF. Status of the restoration efforts will be presented during the meeting. This site is reclaimed agricultural land that was previously used for rice and corn production, and has seen multiple reforestation efforts fail. Preliminary results have identified over 100 species of plants on the site, as well as 82 species of birds.

P131 ROBERT CARTER¹ AND GRANT COBB¹. Jacksonville State University¹. Woody species composition following a wildfire in the Dugger Mountain Wilderness, AL.

A tree and sapling survey was conducted in the Dugger Mountain Wilderness, Talladega National Forest, AL one year after a wildfire. Dominant species in the sapling stratum included *Acer rubrum*, *Nyssa sylvatica*, and *Prunus alabamensis*. In the tree stratum, dominant species were *Quercus prinus*, *Pinus echinata*, *Pinus virginiana*, and *Oxydendrum arboreum*. The absence of the sapling species in the overstory can be attributed to differences in fire resistance. Species such as maples and cherries tend to have low fire resistance while oaks and many pines have greater resistance.

P132 LAURA M. LADWIG¹ AND SCOTT J. MEINERS¹. Eastern Illinois University¹. Liana impacts on tree growth in young temperate forests.

Although they are important components of forest communities, lianas (woody vines) are often overlooked in ecological studies. While lianas have been shown to damage mature tropical trees and reduce the growth of juvenile trees, the impact of lianas on mature tree growth in temperate systems is largely unknown. We examined growth of mature trees over a 9-year period within young forests in the Piedmont region of New Jersey, USA. Five lianas, *Celastrus orbiculatus*, *Lonicera japonica*, *Parthenocissus quinquefolia*, *Toxicodendron radicans* and *Vitis* spp., occurred throughout the forest. Total liana basal area and percent cover within host tree canopies was evaluated to assess liana infestation. These data were related to tree growth to assess liana impacts. In general, lianas in our system were fairly abundant, with 68% of the trees having at least one liana species present. On average, each tree had 9.7 cm² of liana stems associated with the trunk and 23% of the canopy covered with lianas. Significant results were found with liana

basal area, stem count, and canopy cover, but canopy cover showed a larger impact on growth. Although statistically trees with large amounts of liana canopy cover grew significantly less than trees with fewer lianas, this model explained little of the variation in tree growth. Based on this research, in a young, closed-canopy forest lianas may not be greatly detrimental to tree and overall temperate forest health. However, some liana species, *C. orbiculatus* and *Vitis* spp., are still increasing and may pose future risks to forest development.

P133 ANNA L. SITKO¹ AND JONATHAN L. HORTON¹. UNC-Asheville¹. Evaluating the Effectiveness of Eradication Treatments on Invasive Species in Urban Forests in Western North Carolina.

Exotic invasive plant species have become a threat to native forests in the southeastern United States. Eradication of invasive species often has strong positive effects on the natural biota. The removal of invasive exotic species, though beneficial in an ecological sense, is often costly in an economical sense. The objectives of this study were 1) To successfully remove invasive exotics, 2) To evaluate the effectiveness of each eradication method, 3) To determine economic costs of each method, and 4) To evaluate the recovery of native species after removal. Before implementation of treatments, we surveyed the vegetative community of the canopy, subcanopy, and herbaceous layers, and quantified the abundance of invasive exotics in each of these layers. In summer 2008 we removed the invasive exotic species with three methods: mechanical removal, chemical removal, or a combination of both. To test the effectiveness of each eradication method, we resampled vegetation in October 2008. The chemical treatment alone was not effective in reducing the amount of invasive exotics, however, the mechanical treatment was effective and the combination of both mechanical and chemical treatments showed to be the most effective in the tree, shrub and herbaceous layers. We will resample the vegetation in each treatment in spring 2009 to evaluate long-lasting impacts of the removal on the presence of invasive exotics and to monitor recovery of the native plant community.

P134 – Cancelled

P135 JENNA A. HAMLIN¹. University of North Carolina at Asheville¹. Site of Origin and Degree of Plasticity Affect Success of an Invasive Liana, *Celastrus orbiculatus*.

Many factors affect plants' invasibility, including features of the novel community and of the plant itself. Exotic plants with greater genetic diversity or phenotypic plasticity are likely to be more successful invaders, especially under shifting environmental conditions. *Celastrus orbiculatus*, oriental bittersweet, is a liana whose density has reached invasive proportions in western North Carolina. Recent studies have tested bittersweet's physiological responses to a range of light conditions. Using similar conditions to compare variation among both light levels and genotypes, site-specific plasticity was examined in this non-native liana. One prediction was that genotypes would respond differently to varying light conditions and that some populations would be more plastic than others. Shade cloth structures of varying light conditions were used to simulate light levels below mature, immature, or open tree canopies. Plants from three western North Carolina sites, 50 genotypes each, were cloned 8 times to allow multiple clones to be exposed to different light conditions. Clones were grown for 8 weeks with height, leaf number, and leaf area measured after 0, 4, and 8 weeks. At the experiment's conclusion, dry mass of leaves, stems, and roots was also assessed. Results showed different degrees of plasticity and patterns of resource allocation among populations. In addition, leaf response to light treatments varied among populations. These traits could facilitate increased invasiveness by oriental bittersweet, and a better understanding of the relationship between genotype and environment could be used to control this invasive's spread.

- P136 WILLIAM J. WATKINS¹, MARTIN L. CIPOLLINI¹ AND MATHEW SUMMERLIN¹. Berry College¹. Georgia's role in the rebirth of the American chestnut tree.

The American Chestnut Foundation (TACF) works to restore the American chestnut, *Castanea dentata*, which was nearly eradicated by a fungal blight, *Cryphonectria parasitica*. Georgia's location in the natural range of the American chestnut allows for special opportunities due to the large genetic variance of Georgian trees compared to American chestnuts in northern habitats. The Georgia Chapter of TACF (GATACF) focuses its volunteer efforts on incorporating regional diversity into the breeding program by finding living American chestnuts in Georgia and breeding them with hybrid chestnuts produced in TACF research farms. The past three summers, volunteers pollinated trees in Georgian forests and traveled to the TACF orchard in Virginia to pollinate hybrid trees with pollen collected in Georgia. Because of the ease of pollinating in a farm versus woodland setting, seven of the chapter's eight lines have resulted from pollinating hybrids with Georgian pollen. Nuts are harvested in October, overwintered in refrigerators, and raised in orchards. After 4-6 years they will be inoculated and selected for resistance to the blight and for American characteristics. Trees surviving the selection process will be interbred, and the process will be repeated. The GATACF plans to produce 20 lines of chestnuts that contain genes coding for survival in Georgian forests, from high elevation trees on Brasstown Bald to lower piedmont trees of South Georgia. GATACF work will ensure that genetic diversity is introduced so that the chestnut can ultimately survive and thrive as a reintroduced forest species: not only as a genetically engineered ornamental.

- P137 THOMAS D. BALDWIN¹, MARTIN L. CIPOLLINI¹, JOSHUA D. CULBERSON¹, KALIA B. MILLER¹ AND CADE C. STRIPPELHOFF¹. Berry College¹. Herbaceous plants and grasses of the Berry College Longleaf Management Area: a preliminary survey.

The Berry College Longleaf Pine Management Area consists of relict fire-suppressed montane longleaf pine (*Pinus palustris*) stands embedded within an encroaching matrix of mixed hardwood forest. Since 2001, portions of the management area have been subjected to restoration efforts involving clear and selective logging followed by burning and herbicide application. Once sites were prepared, planting, additional prescribed burning and herbicide application was used to suppress encroaching hardwoods. In this ecological restoration project, understanding the impact of such intensive management activities on understory plants and grasses is essential to evaluating the overall impact of management efforts. From May through October 2008, understory flowering plants were collected in managed and unmanaged areas with the goal of establishing species inventories for areas differing in recent management history. So far, more than 160 species in about 30 different families have been found; 10 species in an unmanaged old growth reference stand, 6 to 22 species in managed old growth stands, and 23 to 50 species in clear-cut and selective-cut areas. Based upon examination of historical records for Lavender Mountain and equivalent habitats, 56 species are not yet represented in our survey. Many missing species flower in the spring, so are likely to be found in censuses planned for spring 2009. Regardless, these preliminary results suggest that management of fire-suppressed old-growth montane longleaf stands can very quickly reestablish understory plant diversity. Our results further suggest that continued management may lead to a species composition similar to that which was present prior to wide-spread fire suppression.

- P138 COLIN R. JACKSON¹, ANTHONY J. RIETL¹, KAYLEIGH M. WIEGERS¹ AND J. S. BREWER¹. The University of Mississippi¹. Interactions between soil moisture and an invasive plant species on soil microbial enzyme activity.

Soil microbial enzyme activity is closely tied to rates of organic matter decomposition and nutrient cycling and can be used as a measure of those processes. However, the influence of abiotic (e.g. rain events and soil moisture) and biotic (e.g. specific plant species) factors on soil enzyme activity are not clearly understood. In this study, the activity of soil enzymes related to carbon (b-glucosidase), phosphorus (phosphatase), and nitrogen (n-acetylglucosaminidase) cycling were measured at 54 sites in a northern Mississippi woodland. Enzyme activity was measured on multiple days characterized by different precipitation conditions (no rain, prior to rain, and immediately following heavy rain). Soil moisture was determined on each sample date at each site, and sites were also characterized in terms of the abundance of an invasive species (*Microstegium vimineum*). The activities of all three enzymes tended to be correlated (R values typically 0.4-0.7), and were also generally related to soil moisture. Rainfall did not appreciably impact enzyme activity (i.e. there was no temporal effect of moisture) but wetter sites tended to show higher activity (i.e. there was a spatial effect of moisture). *M. vimineum* was also more abundant in wetter sites, but there did not appear to be a direct relationship between enzyme activity and *M. vimineum*, rather, both tended to be highest under moister conditions. These results suggest that soil moisture is a substantial driver of soil enzyme activity which may be closely linked to observed impacts of invasive species on belowground processes.

P139 KIMBERLY A. LANG¹ AND SCOTT J. MEINERS¹. Eastern Illinois University¹. Effects of forest edges on population dynamics in a successional system.

Though succession is typically thought of as a temporal process, it is also an inherently spatial one. My research examines the effect of an old growth forest edge on plant population dynamics within a successional system. I used long-term data collected from the Buell-Small Succession Study in New Jersey to analyze population growth patterns associated with the forest edge within the first 50 years of succession. By looking at individual species' edge responses I am working toward understanding the role that the forest edge plays in regulating successional patterns. Specifically, I will test, whether edge effects are driven by differential dispersal (plot colonization) or differential performance (increase within plots). Individual species have shown positive, negative, or neutral associations with the edge. This allowed me to relate species' edge responses to successional status, dispersal modes, and other traits of the species. Abandoned agricultural land is often bounded by remnant woodlands in the eastern United States. Through observing the population growth patterns and understanding the dynamics created by the forest edge, we can help project the future pathways of successional plant communities and generate management recommendations.

P140 LAUREN E. BROOKS¹ AND JEFFREY D. MAY¹. Marshall University¹. Effects of nitrogen (N) fertilization on soil N and diameter growth in forest trees.

Agricultural activities and the burning of fossil fuels release large amounts of biologically active N into the atmosphere, resulting in increased N deposition to many forest ecosystems. The mountains of West Virginia experience some of the highest N deposition rates in the country. Earlier research has shown that increased N has the potential to acidify the soil and to disrupt nutrient balances, leading to possible changes in the success of species in these ecosystems. A study conducted in 2000-2001 by May et al. took advantage of an ongoing experiment at the Fernow Experimental Forest near Parsons, WV, in which one watershed (WS3) has received annual N fertilization since 1989, and is a model for the potential long-term impacts of increasing N levels. While long-term N fertilization resulted in elevated soil nitrate concentrations in WS3, lab incubations showed no change in nitrification or mineralization rates relative to the control watershed (WS7). However, stem diameter growth was reduced in three important tree species (tulip poplar, red maple, black cherry) in WS3 compared to WS7. In the current

study—a continuation of the previous work—we found that although nitrification rates have declined, total mineralization has greatly increased in both watersheds. In addition, stem growth rates of trees in WS7 have declined in the past five years and now are nearer the growth rates of WS3. These findings may suggest that ambient N deposition is driving the control watershed toward N saturation, and functional convergence with the artificially fertilized watershed.

P141 ALAN W. HARVEY¹. Georgia Southern University¹. Extrafloral nectaries in kudzu, *Pueraria montana*, and groundnut, *Apios americana* (Fabaceae).

The inflorescences of kudzu, *Pueraria montana*, and the groundnut, *Apios americana*, have extrafloral nectaries (EFNs) at the base of each multiple-flowered fascicle. In *P. montana*, the EFNs lie under the lateral flowers and appear to become active and accessible only when the covering flower abscises and drops. In *A. americana*, there is one EFN per fascicle, representing an aborted secondary short-shoot. Five species of ants were observed visiting *P. montana* EFNs and six species at *A. americana* EFNs (four of which were found on both). EFN-related behaviors varied among ant species, but not within ant species between plants. The location and timing of these heretofore overlooked EFNs suggests a role in protecting early developing seeds, which may help explain the low seed set reported for *P. montana* in its introduced range on the one hand and for *A. americana* in cultivation on the other.

P142 KRISTINA CONNOR¹, GRETCHEN SCHAEFER², JILLIAN DONAHOO³, MARGARET DEVAL¹, EMILE GARDINER¹, DAN WILSON¹, NATHAN SCHIFF¹, PAUL HAMEL¹ AND TED LEININGER¹. U.S. Forest Service¹ Weyerhaeuser^{2 3}. Pondberry Seed Bank Study in a Bottomland Hardwood Forest.

Pondberry [*Lindera melissifolia* (Walt.) Blume: Lauraceae] is a federally listed endangered shrub that grows in the warm, humid bottomland hardwood forests of seven southeastern states. While this dioecious shrub is sparsely distributed within its territory and usually occurs in isolated clonal colonies that are the result of rhizomatous sprouting, female pondberry plants may produce large numbers of bright red drupes. However, there is little information available about the seeds of pondberry or their fate once shed from the plant. In order to determine what befalls seeds after dispersal and how long seeds remain viable in the field, 4 x 4 inch bags of plastic screen with 25 loosely enclosed pondberry seeds were either left on the soil surface or buried 5 cm beneath the soil surface. Half of the bags contained bare seeds, with the exocarp and mesocarp removed, and the other half contained seeds with the exocarp and mesocarp intact (entire drupes). At each sampling time, four replicates of each treatment were collected. Samples were collected after 1-2-4-6-7-9-12 months in the field. Seeds were tallied as either germinated, good but not germinated, rotten, or missing.

P143 VINCENT P. HUSTAD¹. University of Illinois¹. Discomycetes of the Great Smoky Mountains National Park.

Discomycetes are ecologically and economically important members of the ascomycetous fungi. Responsible for significant decomposition of forest waste and herbaceous material as well as symbiotic relationships with plants, they are nonetheless understudied due to their small size and incomplete taxonomy. The purpose of this study was to provide a preliminary assessment of the diversity of discomycetes in the Great Smoky Mountains National Park (GSMNP). During the summer of 2008, collections of discomycetes were made in several sections of the GSMNP, and over 40 species representing 14 genera of discomycetes were recorded as well as several species reported as new park records.

Because discomycetes are widely distributed but little studied, the results of this study will be used to expand the known range of distribution of several species as well as provide preliminary species lists for a more extensive analysis of discomycetes from the GSMNP in the future.

- P144 NIKKI L. PISULA¹ AND SCOTT J. MEINERS¹. Eastern Illinois University¹. Allelopathic Potential of Woody Exotics in a Successional System.

Exotic plant species have been known to be successful within introduced areas as opposed to their natural ranges. Allelopathy has been suggested as a mechanism for the success of exotic plants because they frequently establish monocultures and have separately evolved allelochemical composition. We conducted laboratory bioassays for eight exotic woody species to determine their allelopathic potential. Leaves of *Acer platanoides*, *Ailanthus altissima*, *Celastrus orbiculatus*, *Elaeagnus angustifolia*, *Ligustrum vulgare*, *Lonicera japonica*, *Rosa multiflora*, and *Rubus phoenocolasius* were collected from a young forest. We determined the germination responses of a target species to a gradient of leaf extract concentrations to assess allelopathic potential. At low allelopathic concentrations the species were similar, exhibiting minimal reduction in seedling germination. As concentration increased, germination proportions began to differentiate and separate among species. *Ailanthus altissima* exhibited the most allelopathic potential out of all eight species. *Celastrus orbiculatus* was also toxic whereas *A. platanoides*, *L. vulgare*, *L. japonica*, and *E. angustifolia* were less effective in the higher concentrations. In this system, we documented the potential for woody exotics to exhibit allelopathic interactions in a controlled situation. In the field, allelochemicals may have different effects on inhibiting growth. Follow-up analysis will compare this laboratory data to field data to determine if allelopathic potential is playing a role in this system.

- P145 KIMBERLY S. SPIEGEL¹ AND LISSA M. LEEGE¹. Georgia Southern University¹. The invasive redbay ambrosia beetle, *Xyleborus glabratus*, as a catalyst of disturbance and subsequent forest composition change in the southeastern U.S.

An Asian ambrosia beetle (*Xyleborus glabratus*) recently introduced into the southeastern U.S. vectors a fungus (*Raffaelea lauricola*) that causes a vascular wilt disease, laurel wilt disease (LWD), in the plant family Lauraceae. In Georgia, LWD causes rapid mortality of redbay (*Persea borbonia*), a native coastal plain species, potentially impacting forest communities. The purpose of this study was to determine the effects of redbay mortality on forest plant communities. We compared plant community composition and structure and the size structure of *P. borbonia* populations between beetle-infested sites (5) and uninfested sites (3) in several counties in southeastern Georgia during 2008-2009. Community structure and composition were determined in the tree, shrub, and herbaceous layers in randomly selected plots. Species richness was similar between infested and uninfested sites, ranging from 3.7 ± 0.5 in tree plots to 9.6 ± 1.5 in herbaceous layer plots. Diameter at ground height (DGH) of live *P. borbonia* trees was more than twice as much in control (19 ± 4.4 cm) versus infested sites (8.2 ± 1.9 cm). Control sites showed no *P. borbonia* mortality, but diseased trees with primary stem mortality in infested sites averaged 16.9 ± 1.3 cm. Only $3 \pm 0.7\%$ of *P. borbonia* trees were alive in infested sites. DGH of dead *P. borbonia* saplings was 2.5 times higher in control ($.59 \pm .10$ cm) versus infested ($1.56 \pm .18$ cm). Research is ongoing and conclusions will be drawn following completion of the work.

- P146 CHRISTIN NAUGHGLE¹, HAYLEY BARBATO¹, ANDREW WOMBLES¹, TIM GRIFFITH¹ AND HOMER WHITE¹. Georgetown College¹. Will northward range shifts alter photosynthetic capability? An examination of stomatal densities under extended day lengths in the common annual Cocklebur.

As global temperatures increase, the geographic ranges of plant species may shift to higher latitudes to remain within a similar climate. As this occurs, populations will encounter longer summer day lengths than those to which they are adapted. However, little is known about how different day lengths will affect important developmental characteristics related to photosynthetic rates. In this study, we evaluated how altered day lengths would change leaf stomatal density and the expression of genetic variation for this trait in the common annual Cocklebur (*Xanthium strumarium*). We grew five selfed-sib lines from each of two southern (Kentucky and Missouri) and one northern (Michigan) population under two day lengths (15 and 17 hrs.) corresponding to the midsummer day lengths of each latitude. For each day length, populations were grown at two temperatures (20 and 35.5°C) representing a range of mid-day summer temperatures they could experience. There was clear population differentiation in response to day length: the stomatal densities of both southern populations significantly increased under 17hr. days so that they exceeded those of the northern population at the same day length, in which it naturally occurs. Temperature had no effect on this interaction between population and day length. Within populations, genetic (between-line) variation in stomatal density was significant. Therefore, if Cocklebur's range shifts northward, longer day lengths might adversely alter stomatal densities, although the presence of genetic variation could facilitate local evolution over time. If similar alterations occur in other species, range shifts could have broad competitive and ecosystem consequences.

P147 SARAH J. PATE¹. Appalachian State University¹. Evolutionary history and habitat modeling in GIS for management of the threatened species *Spiraea virginiana*.

Since the creation of geographical information systems (GIS), the task of creating conservation management plans has become less daunting. Many studies have used GIS to map occurrence of plant and animal species, and more recent modeling techniques have led to the ability to delineate habitat boundaries and even predict species' occurrence. The multi-dimensional nature of spatial data has created innovative solutions for answering these questions necessary to the planning process. *Spiraea virginiana* Britton has been listed as threatened by the US Fish and Wildlife Service since 1990. Using data collected by previous genetic studies, the evolutionary distribution of the species was mapped by genotype. By exploring the methods used to examine habitat and other conservation measures, a rough cartographic model of the species habitat was created and analyzed. This model will provide a good starting point for evaluating site conditions, and has potential for providing necessary management criteria, as well as showing the progression of the species throughout the Appalachians.

P148 TROY EVANS¹, KACIE TACKETT¹ AND NEIL PEDERSON¹. Eastern Kentucky University¹. Impact of hemlock woolly adelgid on annual eastern hemlock growth rates in the Southern Appalachian Region.

Hemlock Woolly Adelgid (HWA), *Adelges tsugae*, is an invasive insect causing catastrophic mortality throughout much of Eastern hemlock's range. HWA attaches to the bases of needles on *Tsuga* trees and feeds on sap. Eastern hemlock (*Tsuga canadensis*) is especially susceptible; untreated trees can die within 3-7 years in the southern Appalachian region. Our study compares the impact of HWA on the radial growth and estimated aboveground carbon increment of eastern hemlock in a heavily-infested stand versus two stands where infestations levels were low or undetectable. Tree-ring analysis was used to reconstruct average annual radial and diameter increment. Annual aboveground carbon increment was calculated from reconstructed diameters plugged into an allometric equation. Results reveal an increase in locally-absent rings (LAR) from ca. 15% to 30% and ca. 55% over a 3-yr progression of HWA infestation. The highest rate of LAR in uninfested stands or prior to infestation was ca. 15% and only occurred twice since 1800. Interestingly, the recent high rates of LAR occurred even though needles were

present. Concurrently, above ground carbon increment dropped precipitously versus uninfested stands, which was a trend seen across all size and age classes of trees. Historically, natural tree mortality in other species was often preceded by slow, decadal-scale declines in growth. In contrast, the immediate failure to produce cambial growth in a significant portion of living trees and a rapid decline in biomass production suggests to us that HWA infestation causes a large loss of energy reserves, which accelerates mortality.

P149 DEWITT JONES¹, AVEL FERNANDEZ¹, CHARLES MAJOR¹ AND DANNY J. GUSTAFSON¹. The Citadel¹. *Silphium integrifolium* genetic structure as a function of the dominant grasses seed source.

When restoring a plant community, restoration professionals must determine what species to include and where to obtain the plant material. It is generally believed that using locally collected plant material will provide the 'local ecotype' and this will increase the likelihood of project success. Unfortunately, local remnant populations often do not exist or are too small to provide adequate material for the proposed project. For example, tallgrass prairie restoration projects are often faced with limited local sources. Commercially available warm season grasses that have been developed as forage and erosion control crops are typically available in large quantities and at a reasonable price. However, use of these cultivar grasses may have unintended consequences in a developing plant community. In this study we have replicated tallgrass prairie plots planted with either cultivar native grasses or wild collected native grass and we are looking at differences in genetic structure of *Silphium integrifolium* as a function of the dominant grasses source (cultivar vs. native). Based on our preliminary ISSR molecular marker results, *Silphium integrifolium* genetic structure is different between tallgrass prairie plots planted with native grasses vs. cultivar grasses. These results are similar to our *Chamaecrista fasciculata* research and indicate consistency in dominant species genetically based life history traits control over grassland community assembly.

P150 DAVID A. AUSTIN¹ AND JUSTIN HART². University of North Alabama¹ University of North Alabama². Species-specific responses to small canopy openings in a mature hardwood forest: a dendroecological approach.

All forest ecosystems are influenced by disturbance processes that modify species composition and stand structure. Recent research has highlighted the importance of small-scale disturbance events in mature secondary forests of the Central Hardwood Region. In this study, we analyzed the radial growth responses to small canopy disturbance events of sugar maple, red maple, and tulip-poplar growing in and around 40 canopy gaps in a mature secondary hardwood forest on the Cumberland Plateau in Tennessee. We compared intra- and inter-specific growth responses to document the influence of disturbances on productivity of these species. These three species were selected because they had the highest densities and dominated the basal area of canopy gap environments and were the most abundant species in intermediate crown classes in true canopy gaps in the studied forest. Thus, sugar maple, red maple, and tulip-poplar have the greatest potential to recruit in canopy gaps based on density, dominance, and crown class measures. Interestingly, these species have different ecological and life history characteristics and use different strategies to reach the main forest canopy. By quantifying the radial growth responses of these three species to small canopy openings, we can project which species is most likely to attain canopy dominance under the current disturbance regime. Our results provide information on the successional trajectory of the forest and the influence of small canopy disturbances on species composition and stand structure in mature secondary stands of the region.

- P151 DAVID A. AUSTIN¹ AND JUSTIN HART¹. University of North Alabama¹. Species-specific responses to small canopy openings in a mature hardwood forest: a dendroecological approach.

All forest ecosystems are influenced by disturbance processes that modify species composition and stand structure. Recent research has highlighted the importance of small-scale disturbance events in mature secondary forests of the Central Hardwood Region. In this study, we analyzed the radial growth responses to small canopy disturbance events of sugar maple, red maple, and tulip-poplar growing in and around 40 canopy gaps in a mature secondary hardwood forest on the Cumberland Plateau in Tennessee. We compared intra- and inter-specific growth responses to document the influence of disturbances on productivity of these species. These three species were selected because they had the highest densities and dominated the basal area of canopy gap environments and were the most abundant species in intermediate crown classes in true canopy gaps in the studied forest. Thus, sugar maple, red maple, and tulip-poplar have the greatest potential to recruit in canopy gaps based on density, dominance, and crown class measures. Interestingly, these species have different ecological and life history characteristics and use different strategies to reach the main forest canopy. By quantifying the radial growth responses of these three species to small canopy openings, we can project which species is most likely to attain canopy dominance under the current disturbance regime. Our results provide information on the successional trajectory of the forest and the influence of small canopy disturbances on species composition and stand structure in mature secondary stands of the region

- P152 PAULA C. JACKSON¹, JONICA GOBLE¹, JOSE L. ANDRADE², CASANDRA R. GARCIA², OLIVIA HERNANDEZ², THOMAS MCELROY¹ AND JUAN M. DUPUY². Kennesaw State University¹ Centro de Investigación Científica de Yucatán². Physiological differences among tree species in quadrats of different successional stage of a tropical dry forest, Yucatan, Mexico.

We determined physiological differences (photosynthetic rate and water potential) among three tree species growing in quadrats of different successional stage (15 and 50 years of secondary succession) of a semi-deciduous tropical dry forest (Biocultural Reserve Kaxil Kiuic, Yucatan, Mexico). We determined: light curve, maximum photosynthetic rate, and water potential for 5 individuals of each of the following tree species: *Piscidia piscipula* L.(Sarg.), *Bunchosia swartziana* Griseb. and *Psidium sartorianum* (Bergius) Nied. We found differences in maximum photosynthetic rate by species and plot. On average, *Piscidia piscipula* had the highest photosynthetic rate followed by *Bunchosia* and *Psidium*. For all species, average maximum photosynthetic rates were higher in the younger plot. *Piscidia piscipula*, the species with higher water potentials and photosynthetic rates (indicating more favorable water relations) was not the most abundant species. Our data suggest that physiological traits may not play as important a role as natural history traits (for example, reproductive success, and the capacity to regenerate) in the success of a species in this tropical forest

- P153 FLORENCE C. ANORUO¹ AND DAVID LINCOLN². Claflin University¹ University of South Carolina². Interaction between soil nitrogen availability, *Frankia* inoculation, and rate of nitrogen fixation.

Frankia species are nitrogen fixing filamentous bacteria belonging to the group referred to as actinomycetes. The actinomycetes form symbiotic relationships with actinorhizal plants including Bayberry, Alder, Sweet fern, and Casuarina. In this study, the seedlings of Bayberry, *Morella cerifera* (*Myricaceae*) was inoculated with *Frankia* to determine the rate of nitrogen. Germinated seedlings of *Morella cerifera* were planted into one gallon pots in

sand medium. Two groups of 12 plants each were inoculated with *Frankia* spores and fertilized with two levels of nitrogen (1/4 strength and full strength Hoagland). Two additional groups of 12 plants each were un-inoculated but received two levels of nitrogen fertilization (1/4 strength and full strength Hoagland). The uninoculated plants were separated from the inoculated group in a separate growth chamber. Both groups were maintained at 14/10 hour night/day photoperiod at daytime and nighttime temperatures of 27° and 22° respectively in the growth chambers. Acetylene reduction Assay method was used to evaluate the rate of nitrogen fixation within the four groups. A statistically significant difference was observed in the rate of nitrogen fixation between inoculated group fertilized with 1/4 strength and full strength Hoagland (P-Value = 0.0217). No statistically significant difference was observed between the two uninoculated groups.

P154 LINDSAY LEVERETT¹ AND MICHAEL WOODS¹. Troy University¹. The genus *Indigofera* (Fabaceae) in Alabama.

Indigofera, commonly known as indigo, is a member of the legume family Fabaceae (Leguminosae), subfamily Papilionoideae and the tribe Indigoferinae. In Alabama, *Indigofera* is a conspicuous taxon of pinelands, sandhills, roadsides, old fields, disturbed woodlands and urban waste areas. The genus consists of approximately 700 species worldwide. Twelve species and one infraspecific taxon have been reported from the United States. Of these, eight species have been reported from the southeastern United States. Based on the results of this study, four species and no infraspecific taxa of *Indigofera* occur in Alabama. The most common species of *Indigofera* in Alabama is *I. caroliniana* (14 counties). The least common species are *I. hirsuta* (three counties), *I. miniata* (one county) and *I. tinctoria* (one county). Both *I. miniata* and *I. tinctoria* are historical collections, September 1891 and October 1869 respectively, from ballast grounds in Mobile County. Dichotomous keys and descriptions 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), J. D. Freeman (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.

P155 MAX S. LANNING¹. Western Carolina University¹. Clarifying the status of *Micranthes careyana* and *M. caroliniana* based on morphological and molecular differences.

Recent molecular phylogenetic analyses have clearly shown the large, arctic and north-temperate genus *Saxifraga* (Saxifragaceae) sensu lato is polyphyletic with two distinct clades: *Saxifraga* sensu stricto and *Micranthes*. Six species belonging to *Micranthes* exist in the Southern Appalachians, including two questionably distinct species. Taxonomists have traditionally distinguished the very similar *M. careyana* and *M. caroliniana* primarily based on geographic locality and four morphological characters: sepal orientation (erect or reflexed), filament shape (filiform or clavate), petal coloration (none or 2 yellow spots), and fruit length (2.5-5 or 4-5 mm). The goal of this research was to examine these characters to clarify the taxonomy of these species and look for molecular differences in nuclear ITS (internal transcribed spacer) DNA regions. Several populations of *M. careyana* and *M. caroliniana* from the mountain counties of western North Carolina and South Carolina have been examined and material has been collected for molecular analyses. Populations in Ashe and Alleghany Counties (NC) displayed reflexed sepals and clavate stamen filaments, consistent with *M. caroliniana*. Populations examined in flower in all other counties displayed erect sepals and filiform stamen filaments, consistent with *M. careyana*. The other two characters were not useful in distinguishing these taxa. These

differences in floral characters are correlated with mutations in ITS sequences. In phylogenetic analyses, Ashe and Alleghany county populations appear in a distinct clade from the rest of the populations collected in Avery, Graham, Macon, Swain, and Transylvania Counties (NC), and Pickens County (SC), supporting the separation of these two taxa as species.

P156 ALEXANDER KRINGS¹, WADE WALL¹ AND ALICE WINES¹. North Carolina State University¹. Systematics of the *Parkinsonia texana* complex (Fabaceae).

Parkinsonia, including *Cercidium*, comprises eleven to twelve species, which occur in the Americas and Africa. Although recent work has contributed to our knowledge of generic limits, additional work is needed to resolve problems in several species complexes. Among these is the *P. texana* complex—comprised of two putative entities most recently treated as var. *texana* and var. *macra*. Disagreement regarding the utility of potentially distinguishing characters, such as ovary vestiture, caused us to reexamine the taxonomy and geography of the complex using multi- and univariate statistics. Borrowed specimens were measured or scored for six quantitative and four qualitative characters. Quantitative and qualitative data were studied jointly and separately using the statistics package R. Gower's dissimilarity coefficient for mixed data was used to quantify resemblances between OTUs. The relationships between OTUs were subsequently explored with both hierarchical agglomerative cluster analyses and Principal Coordinates Analysis using the complete set of characters. Quantitative characters were also analyzed separately using Principal Components Analysis. Collection localities were mapped and environmental gradients explored using DIVA-GIS. Results suggest two distinct taxa essentially restricted to two adjoining portions of the Tamaulipan thornscrub ecoregion. *Parkinsonia texana* occupies the harsher, drier portion of the region and is distinguished from *macra* by pubescent ovaries and reduced leaflet numbers.

P157 KRISTIAN D. JONES¹, WENDY B. ZOMLEFER¹ AND DAVID E. GIANNASI¹. University of Georgia¹. The state of herbaria in Georgia.

Herbaria are unique collections of dried and pressed plant specimens that record the natural history of a particular region. The future of these collections is in danger due to the paradigm shift at colleges from orgasmic/field studies to molecular research geared towards medicine. Ascertaining the state of herbaria in Georgia is essential for creating a comprehensive network between University of Georgia Herbarium [GA] and the nine others in the state: Agnes Scott College [DECA], Columbus State University [COLG], Emory University [GEO], Georgia Southern University [GAS], Georgia Southwestern State University [GSW], Shorter College [SHOR], University of West Georgia [WGC], USDA Forest Service [FSSR], and Valdosta State University [VSC]. The staff of GA Herbarium performed surveys across the state assessing activity, support, size, and condition of these herbaria. We found that more than half of the herbaria are in a critical state: inactive collections with no taxonomist or student workers involved in the collection, as well as large backlogs of unmounted specimens and severe insect damage in the collections. The results of the survey establish a base for improving the facilities at these institutions, creating collaboration amongst the herbaria within the state, and enhancing outreach to faculty, staff and students.

P158 ANDREW S. METHVEN¹, KAREN HUGHES² AND RON H. PETERSEN². Eastern Illinois University¹ University of Tennessee, Knoxville². Species complexes in Section *Dulces* of the Mushroom Genus *Lactarius*.

As part of a preliminary study of species in Section *Dulces* in the mushroom genus *Lactarius*, collections of *Lactarius volemus* from the Great Smoky Mountains National Park

were compared with each other and with collections from Europe using sequences of the ribosomal ITS region. Collections fell into two discrete clades: Clade 1 contained a collection from the Great Smoky Mountains National Park and an ectomycorrhizal sample from the Southern Appalachian Mountains. The collections in Clade 1 from North America were sister to two samples from Europe, one deposited as *Lactarius volemus* and one an environmental sample. Clade 2 included a collection from the Great Smoky Mountains National Park and a collection from France. Clade 1 and Clade 2 ITS sequences differ by approximately 12% which significantly exceeds the level of divergence (2-3%) suggested by several researchers to represent conspecificity. From these preliminary studies, it appears that morphological *L. volemus* is composed of more than one species and may actually represent a complex of morphologically similar species.

- P159 BRYAN A. NIEDENBERGER¹ AND ZACK E. MURRELL¹. Appalachian State University¹. Examination of evolutionary relationships and pollen morphology of *Hexastylis*.

Asarum, commonly known as wild ginger, heartleaves, or little brown jugs, is a genus belonging to the family Aristolochiaceae. *Asarum* exhibits a Laurasian distribution, with species in Europe, Asia, and North America. Of particular interest to this study is the genus *Hexastylis*. Recent studies showed that *Hexastylis* is nested within *Asarum* and should be treated as *Asarum*, but failed to adequately examine relationships within this southeastern United States complex of species. The genus, as currently understood, consists of nine species and four varieties. There is anecdotal information suggesting significant hybridization between species in these complexes and at least two undescribed taxa have been tentatively recognized. Pollen was examined for all currently recognized *Hexastylis* taxa. Although pollen analysis showed similar surface features for most taxa, some variation in morphology became visible under increased magnification. One species, *Hexastylis naniflora* lacked some surface features present in the other taxa. There is currently no robust molecular analysis of relationships within the genus. Multiple genes were sequenced to resolve the relationships. The matK gene, a rapidly evolving chloroplast gene, has been used extensively to resolve species level phylogenies. The LEAFY (lfy) low-copy nuclear gene has been shown to vary greatly in length in other groups of species. We have sequenced both genes for seventeen taxa including all ingroup taxa and representative outgroups. Genetic information was analyzed using Bayesian analysis. Due to a lack of substantial variation in sequences between species, we suggest that these species may have diverged recently or have undergone extensive hybridization.

- P160 JANET E. ROBERTS¹, BENJAMIN G. BLAIR¹, ROBERT E. CARTER¹, MIJITABA HAMISSOU¹ AND DAVID R. WHETSTONE¹. Jacksonville State University¹. Comparative surface anatomy of *Prunus alabamensis* and *Prunus serotina*.

The Rosaceae includes many plant members of ornamental and economic importance such as roses, apples, peaches, and cherries. Members of this family are characterized by alternate phyllotaxy, having simple or compound leaves. The genus *Prunus* includes the peaches, plums, and cherries. *Prunus alabamensis* (Mohr) Little (Alabama Black Cherry) has been considered as a variety of the species *Prunus serotina* Ehrhart (Black Cherry) by many taxonomists because each species exhibits unique characteristics. Those characteristics include an inability to hybridize due to distinctly separate flowering times and the occupation of different ecological habitats. The objective of this study is to use microscopic methods to elucidate differences and similarities between *P. alabamensis* and *P. serotina* by inventorying leaf surface anatomical features. Leaf samples were collected from several locations across Calhoun County, Alabama, and prepared for visible light and electron microscopic examinations. Preliminary data showed that *P. alabamensis* is

characterized by unicellular and uniseriate trichomes scattered along the abaxial dorsal surface of the midrib and at the point of its attachment to the rest of the blade, and that *P. serotina* exhibits trichomes only on the base of the midrib at the point of its attachment to the rest of the blade. There was a cuticular wax deposit in *P. alabamensis* thicker than in *P. serotina*. Furthermore, the epidermis of *P. alabamensis* appeared to be anomocytic while it was paracytic in *P. serotina*. Complex network of resin ducts were observed on the smooth midrib of *P. serotina* but not in *P. alabamensis*.

P161 BRITTANNI M. BERRY¹ AND JANET L. GASTON¹. Troy University¹. Graphic organizers used as tools to differentiate and enhance science instruction in the classroom.

Educational research strongly suggests that the use of graphic organizers can increase student knowledge and substantially improve scores on tests of comprehension and written expression. Graphic organizers are used to provide a visual representation of concepts, knowledge, and/or information that can incorporate both texts and pictures. With the ever-increasing drop-out rates and rising student failures of standardized exams, teachers are competing with the students' use of visual technology, i.e., Wii®, Playstation®, internet and television. Students in the SCI 4481 Methods & Materials for the Pre-Service Secondary Science Teacher course at Troy University-Troy are required to incorporate graphic organizers into the lesson plans developed for a teaching unit and to actively participate in classroom instruction through individual tutoring of "at-risk" students or helping students with course work. Graphic organizers were used as tools to increase student engagement and learning by breaking down the reading process into visible and manageable units. The Graphic organizers are found to enhance the organization of study materials, thus allowing for more enjoyable study sessions and creating more positive note-taking skills. Students targeted as "at-risk" and students considered as visual learners improved their organizational skills, increased their amount of retained knowledge, and improved their test scores more than other students.

P162 – Cancelled

P163 JENNEL M. TALLEY¹, ROBIN C. BAIRLEY¹, CHARLES SISSOM¹, KIMBERLY NORTON¹, CHRISTOPHER G. BROWN¹ AND STEVEN J. BASKAUF¹. Vanderbilt University¹. Designing, Implementing and Evaluating a Student-Designed, Research-Based, Introduction to Biology Lab.

One of the most important learning goals teachers have for their students in the sciences is to understand the scientific method and be able to implement it. A primary objective of many introductory science labs is to allow students to grapple with the scientific method. This is primarily accomplished by introducing students to a scientific topic and allowing them to work through an experiment with a known outcome. In many ways this does not adequately help or prepare students to understand the scientific method. Because the experiment is pre-designed or pre-determined, students often do not question what or why they are doing an experiment unless it fails. They then blame themselves or the equipment for the failure. They also do not formulate a hypothesis for the experiment, a critical process in the sciences. We designed an introductory biology lab that incorporated a student-designed research project into a traditional biology lab setting. Twenty-five students were self-selected into a separate section of introduction to biology lab. Four teaching assistant mentors were selected to oversee two groups of three to four students. The groups were responsible for designing, implementing, completing and presenting a project they selected under the supervision of their mentor. They also completed approximately half of the traditional lab. Designing and implementing this course was challenging, but with a few modifications during the semester, the students successfully completed their research projects.

- P164 GLENN M. COHEN¹. Troy University¹. The histology laoratory: Don't throw the microscopes away.

Although histology courses vary in formats and emphases at different colleges, universities, and professional schools, the microscope has traditionally served as the centerpiece for laboratories. Students look through microscopes at prepared slides to learn to identify cell types and tissue features. At present, many histology courses have embraced online imaging technologies to varying degrees. However, because of constraints of time and the costs of maintaining slide collections and microscopes, some histology courses in professional schools have abandoned microscopes altogether and have substituted images of slides for the slides themselves. Although online technologies offer unrivaled convenience and access, the question at issue is whether online technologies can successfully substitute for the microscope in histology courses without compromising learning quality. At their best, online technologies allow students to scan entire slides at different magnifications, though most current online courses deliver static images from textbooks, laboratory manuals, or the department's photographs. On the other hand, in the traditional laboratory, students learn to use the microscope, discover different regions of slides, choose a wider range of magnifications, and have access to more varied slide collections. At the undergraduate level, the microscope should remain as the mainstay of histology courses because of the skill sets that it imparts. Fortunately, the traditional histology laboratory with its emphasis on the microscope can be strengthened by the careful blending of online imaging technologies.

- P165 DARRELL L. RAY¹. The University of Tennessee at Martin¹. Helping Students Connect the Fundamentals of Logistic Population Growth with Sustainability Issues Using Spreadsheet Modeling.

One of the fundamental concepts of population ecology is the principle of resource-limited logistic growth. Students with only rudimentary computer spreadsheet skills can easily build a model of logistic growth that can be easily manipulated to demonstrate the effects of varying initial population size and growth rates on a population through any number of prescribed generations. Once the basic model has been built, harvest mortality factors are added to demonstrate the effects of harvest effort and catchability constants in addition to the native parameters. Manipulating the anthropogenic terms allows greater understanding of the effects of harvest pressure. Using spreadsheet modeling provides a fast, low cost way to explore both the underlying concepts of natural logistic population growth as well as the implications for conservation and sustainability while further reinforcing computer skills and confidence. This set of exercises is suitable for advanced high school through college-level introductory ecology courses.

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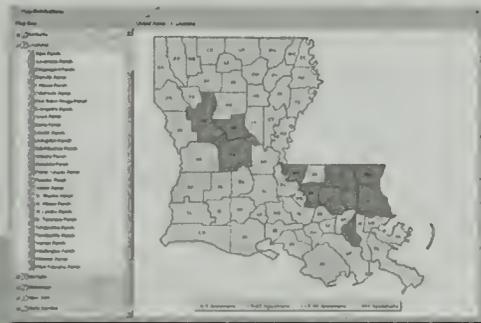
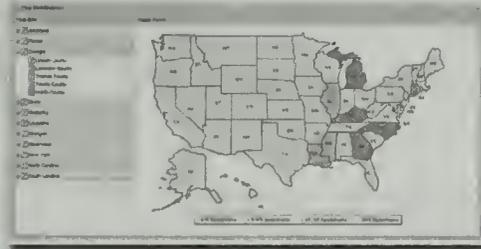
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Catalog #	Family	Genus	Species	State	Parish/County	Locality
17429	Asteraceae	Achillea	millefolium	Louisiana	Assumption Parish	Paincourtville
17430				Louisiana	Bienville Parish	unspecified
17431				Louisiana	East Baton Rouge Parish	Baton Rouge
17432				Louisiana	East Baton Rouge Parish	Plains
17433				Louisiana	East Feliciana Parish	Clinton
17434				Louisiana	Lincoln Parish	unspecified
17435				Louisiana	Morehouse Parish	Bonita
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	ellusima	Louisiana	Ascension Parish	New River

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Beta Beta Beta

Paper and Poster Abstracts

***From the 52nd
Tri-Beta Annual Meeting***

***Held with the 70th
Annual ASB Meeting***

Co-Hosted by

***The University of Alabama
and
Jacksonville State University***

Birmingham, Alabama

April 1-4, 2009

Paper Presentations Southeastern District I

Kale, Emily. Tau Xi, Meredith College. Cozaar Increases Endothelial Progenitor Cell Number in Patients With Peripheral Arterial Disease.

Dysfunction of the endothelium is one of the primary causes of atherosclerosis. Endothelial progenitor cells (EPCs) are crucial to the body's ability to repair the dysfunctional areas of the endothelium and prevent atherosclerosis. Angiotensin (Ang) II is known to cause EPC dysfunction. Thus, blocking the Ang II AT₁receptor can inhibit EPC dysfunction and increase plasma and tissue levels of angiotensin-(1-7). Ang-(1-7) binds to the *mas*-receptor on EPCs and positively affects their number and function. Late outgrowth endothelial cells (LOECs) were stimulated with Ang II or Ang-(1-7); the receptors were concurrently blocked with the chemical antagonists Cozaar (Ang II AT₁ receptor blocker) or d-alanine, respectively. Ang II inhibited LOEC proliferation, migration capacity, adhesion, and increased LOEC senescence. Ang-(1-7) had opposite effects in all cases; these actions were sensitive to blockade with d-ala. Additionally, western blots demonstrated that LOECs from PAD patients expressed *mas* protein at concentrations similar to vascular smooth muscle cell and Ea.hy926 hybrid endothelial cell controls expressing *mas*-receptor.

Huebner, Alyssa Rose and Joshua Samuel. Beta Eta, Florida Southern College. Identification of Genetic Markers for Classification of Rose Cultivars.

Historical accounts and physical characteristics of roses allow placement of cultivars into groupings (subgenera) such as Tea Roses, China Roses and Bourbon Roses. Placement based on phenotype may lead to incorrect classification, and hybrid varieties or plants of unknown parentage can be difficult to accurately categorize. If genetic markers could be found that would identify varieties at the subgenera level, then misidentification could be resolved and unknown or questionable classification could be delineated. We report here an attempt to locate such markers using RAPD PCR analysis. This technique allows for amplification of various regions of the DNA to produce a banding pattern that is unique to each species. If any bands are seen in common among all species in a subgenera, then these bands could potentially be used as a marker to classify all species in this grouping.

Gebo-Seaman, Tammy and Renee Powell. Beta Eta, Florida Southern College. Genetic Determination of Parentage in Open Pollinated Seedlings.

Morphological analysis of plant hybrids has been used to infer parentage in open pollinated seedlings, and rose hybrids are no exception. However, without molecular analysis, the exact parentage of many hybrids remains in question. DNA, extracted from young leaves, can be examined through the use of a polymerase chain reaction (PCR) technique known as randomly amplified polymorphic DNA (RAPD) analysis, whereby multiple regions of the DNA from various cultivars are examined for similarities and differences. We report here the use of RAPD PCR to investigate two seedlings of 'Dortmund' resulting from open pollination. The comparison of banding patterns obtained from RAPD PCR analysis from the female parent and each seedling reveals the likelihood the seedlings resulted from a single parent (self pollination) or from two parents (hybridization).

Thayer, Chivonne. Tau Xi, Meredith College. The Effects of Light Intensity on the Grouping Behavior of *Aedes albopictis* (Asian Tiger Mosquito) Larvae.

It is important to discover the adaptations that make *A. albopictis* a strong competitor for survival because it is a known vector of several viruses that cause human disease. *A. albopictis* larvae exhibit an aggregation behavior that may serve as a survival strategy against predation because the larvae only seem to group together when a threat is present. Furthermore, when the larvae do group together, it has been observed that they tend to group away from bright light. This investigation focused on discovering the role of light intensity as a parameter for larval aggregation. The larvae were placed in three different environments: a low, moderate, and high light intensity environment. The larvae were tested in each of the three environments to determine where the larvae would choose to group in reference to the light intensities. It was found that in each of the three environments the larvae chose to group where the light was approximately the lowest. Based on these results, it is suggested that the larvae may choose to aggregate where there is less light to avoid detection from predators.

Slutsky, Marissa A. Tau Xi, Meredith College. The Vitamin C Content of Organic and Conventionally Grown Lettuce.

Organic food is the fastest growing segments of the food supply increasing 80% from 1997 to 2006. Several benefits are associated with an organic food system including environmental, social, and economic advantages. One belief among consumers is that organic foods are more nutritious, and they contain more essential nutrients, than their conventionally grown counterparts. This research examines the vitamin c (ascorbic acid) content in Lettuce through methods consisted of several steps. The first part of the experiment is an extraction of the vitamin c (ascorbic acid) and the second part is an analysis of the vitamin c (ascorbic acid) using a spectrophotometer. Overall 3 independent trials are completed and analyzed. The experiment revealed that conventional lettuce samples contained nearly twice as much vitamin c (ascorbic acid) than organic lettuce samples. A two tailed t-test revealed that these results were statistically significant. The overall goal of this research is to successfully develop methods for analyzing the vitamin c content in lettuce leaves.

Congdon, Seth & Thomas Tucker. Sigma Phi, Guilford College. Using the Optokinetic Reflex to Quantify the Performance of Eye Movements in Developing Larval Zebrafish (*Danio rerio*).

Zebrafish exhibit several ecologically significant behaviors mediated by the visual system. Behaviors such as schooling, feeding, and predator avoidance rely on the ability to track visual objects with precisely coordinated eye movements, which develop rapidly within a few days post-fertilization (dpf) and can be studied experimentally by recording the optokinetic reflex (OKR). As the development of the zebrafish visual system may rely on both chemical and electrical cues for axon guidance and synaptogenesis, we are studying the OKR in zebrafish raised under both normal and aberrant illumination conditions. To probe the OKR's developmental time course, we are determining its gain in normal, stroboscopic-, and dark-reared zebrafish over the first month of development. Zebrafish are secured in methycellulose in a Petri dish mounted on a video microscope. Binocular visual stimuli are projected through lenses onto the eyes from two synchronized CRT monitors displaying drifting square-wave gratings over a range of temporal frequencies. Eye movements are recorded with a video camera, digitized, and stored on a computer for analysis. Preliminary results indicate that by 5 dpf the OKR can be elicited and is highly reproducible, and the gain of the OKR is significantly lower in stroboscopic-reared fish than in controls.

Stevens-Kittner, Norah. Sigma Phi, Guilford College. A Behavioral Study on the Effects of Whale-Watching Boats on Grey Whales (*Eschrichtius robustus*) in Bahía Magdalena, Mexico.

Whale-watching has become an increasingly popular tourist activity along the Baja California Peninsula of Mexico and in many coastal regions around the world. In recent years, some studies have reported that the increase in tourist boats has resulted in negative effects on various aspects of whale behavior. This study examines the effects of whale-watching boats on the behavior of Pacific grey whales (*Eschrichtius robustus*) during the months of February and March in Bahía Magdalena. A total of 107 observations were made, recording both numbers and types of whales and vessels within the study area. All boats or vessels were between 15 to 20 feet in length and were recorded as being either a tourist boat or a common fishing vessel. I determined that with an increase in vessel number, whales were negatively affected by boat presence, as revealed by a general increase in behaviors that indicated disturbance. Further research would be beneficial to determine long-term effects of boat presence on whale behavior and may assist in further defining whale watching regulations and efforts in whale conservation and protection around the world.

Johnson, Tonya. Sigma Phi, Guilford College. Instability of Fragile Site FRA16B Affected Through the Formation of DNA Secondary Structures.

Fragile sites are specific chromosomal loci that exhibit breaks under conditions of replication stress, and have been linked to various diseases and cancers. Fragile sites are late-replicating, and although DNA sequences at fragile sites reveal no sequence similarity, many fragile sites have high propensity to form stable secondary DNA structures. Studies of fragile sites propose that the breakage within fragile sites may be caused by the stalling of the replication fork due to the formation of secondary structures. We hypothesize that the instability observed at fragile site FRA16B is caused by the formation of secondary structures. To investigate this hypothesis, the SV40 replication system was used, and plasmids were constructed with the FRA16B sequence at varying distances and orientations relative to the SV40 origin. The instability of these constructs was examined through length changes caused by deletions or insertions during replication. The deletion mutants were sequenced, and the deleted regions were mapped to the secondary structures predicted by the MFOLD program. We found that the deleted regions correspond to the hairpin regions of the predicted secondary structures. Our results suggest that the instability of FRA16B during replication is generated by the formation of secondary structures that cause fork stalling during replication.

Zhu, Limin. Sigma Lambda, Wesleyan College. Effect of Estrogen on TGase1 Expression in Immature Mouse Vaginal Epithelium.

Keratinocyte transglutaminase, TGase1, is essential for the formation of the cornified layer of epidermis and is usually expressed during the latter stages of keratinocyte differentiation. While extensive research has been performed to assess the role of TGase1 in normal skin development, little is known concerning TGase1 expression in hormone-responsive epithelia such as vaginal tissue. Recent experiments demonstrated that TGase1 is expressed in vaginal epithelium of mature mice during all stages of the estrous cycle. However, vaginal epithelium in immature mice is negative for TGase1 protein. This study investigates if artificial exposure to estrogen in immature mice influences the expression of TGase1 protein in vaginal epithelium. Vaginal tissues from immature mice sacrificed at 0, 3, 6, 12, 18, 24, and 48 hours after injection of estrogen were excised and frozen. Cryostat sections of vaginal tissue were then analyzed for the presence of TGase1 protein by immunohistochemistry utilizing an anti-TGase1 monoclonal antibody. Our results indicate that after estrogen injection, vaginal epithelium of experimental mice becomes stratified and expresses TGase1 protein, while vaginal epithelium of control mice remains unstratified and is negative for TGase1. This study should provide valuable insight into vaginal differentiation in response to estrogen.

Baloescu, Cristiana. Sigma Lambda, Wesleyan College. Estrogen-Responsive Expression of Involucrin in Mouse Vaginal Epithelium.

Fluctuating estrogen levels in mice during the estrous cycle produce changes in vaginal epithelium. Epithelial morphology alternates between mucous secreting surface cells and keratinized stratified squamous epithelium, which reaches full thickness at estrus. Differentiation and cornification of vaginal epithelium in sexually immature female mice can be artificially induced by administering exogenous estradiol. Involucrin, a cytoplasmic protein synthesized in human and mouse stratified squamous epithelial cells, has been determined to be a marker of differentiation in human epidermis and cultured keratinocytes. In contrast to the vast experimental knowledge concerning involucrin expression in skin, involucrin expression in hormone-responsive epithelia, as a consequence of hormonal influence, has not been studied to date. Immature, non-estrogen producing female mice at 21 days post-birth were injected with estradiol and vaginal tissues were excised and frozen at -80°C . Cryostat sections of vaginal tissues at 0, 3, 6, 12, 18, 24, 48 and 72 hours post-hormone treatment were prepared and analyzed using immunohistochemistry with an anti-mouse involucrin antibody. Initial results indicate that in immature control mice, involucrin expression is absent and the vaginal cells remain unstratified. However, in litter mates with exogenously administered estrogen, the vaginal epithelium becomes stratified and involucrin protein expression is induced.

***Rahman, Nur-Taz. Sigma Lambda, Wesleyan College. Dose-dependent Anti-proliferative Effects of ATRA and TNF- α in Human Uterine Smooth Muscle Cells.**

The remarkable and rapid changes that human uterine smooth muscle cells undergo allow the uterus to efficiently perform its function of giving birth. During pregnancy, the layer of smooth muscle in the uterus thickens to accommodate the growing fetus. Soon after parturition, the smooth muscle cells return to their original morphology and number by a mechanism still under speculation. Previous studies have shown that proliferation of smooth muscle cells from the non-pregnant uterus is inhibited by all-trans retinoic acid (ATRA). Evidence also suggests that pregnant human myometrial cells have a higher ATRA sensitivity compared to their non-pregnant counterparts. This sensitivity could make pregnant myometrial cells more susceptible to cytokines such as tumor necrosis factors (TNFs), allowing their number to be reduced rapidly post-parturition. In order to study the dose-dependent effects of ATRA on proliferation, primary human uterine smooth muscle cells (UtSMC 4591) were treated with $10(-7)\text{M}$, $10(-9)\text{M}$, and $10(-11)\text{M}$ ATRA for 7 days. Data obtained from these studies suggests that ATRA has significant anti-proliferative effects on the cells. The same cells were treated with TNF- α in conjunction with the ATRA dosages in order to determine any possible synergistic effects of ATRA and TNF- α on cell proliferation.

Davis, Ryan. Sigma Phi, Guilford College. Genomic Analysis of the Ribosomal RNA Operon (*rrn*) of the Cyanobacteria *Arthrospira*.

The ribosomal operon (*rrn*), a series of linked genes that encode the functional RNA subunits of the ribosome, are highly conserved across species. In the last thirty years geneticists have been using sequence differences in the ribosomal RNA to determine the evolutionary relationship between species. Most species have multiple copies of the ribosomal operon, and this copy number may be related to lifestyle complexity, at least in bacteria. The copy number of the ribosomal operon of the cyanobacteria *Arthrospira* will be determined using the endonuclease *I-Ceu I* that specifically cuts within the 23S rRNA gene, and pulsed-field gel electrophoresis. The number of bands specifies the *rrn* copy number and relative placement in the genome. The sequence of the *rrn* will be determined from the polymerase chain reaction (PCR) products generated using 16S rRNA forward

and 5S rRNA reverse primers. The primers will be designed by identifying conserved regions in the 16S rRNA and 5S rRNA genes of related bacteria and the sequence determined by primer walk analysis. The secondary structure of the entire *rrn* operon will be elucidated from experimental sequence information and the rRNA, tRNA and processing signal secondary structure models already available.

***District I Brooks Award Winner Best Paper**

Paper Presentations Southeastern District II

Neville, Erin A. Mu Chi, Midway College, *Cryptosporidium* Species in Horses of Central Kentucky.

Cryptosporidium species are enteric parasites that have posed significant risks to immunocompromised patients. Several studies have found *Cryptosporidium* in cats and dogs of central Kentucky, but few studies have researched the prevalence of *Cryptosporidium* in horses of central Kentucky. Fecal specimens from 25 domestic horses were collected on 3 farms in the central Kentucky region. After collection the samples were placed in 10% formalin for preservation and concentrated using the formalin-ethyl acetate procedure. The specimens were stained using the Merifluor *Cryptosporidium/Giardia* Direct Immunofluorescent Detection Procedure. Of the 25 specimens tested 2 were positive for *Cryptosporidium* spp. Both of the positive specimens were taken from horses in the 1-9 year age range. There was no association between age, breed, and sex of the horse and the presence of *Cryptosporidium* according to the Chi Square Test for Independence with the Fisher's Exact Test option. Significance was set at $p < 0.05$.

Procter, Ayonna, Jared Worthington & Carlin Tighe. Beta Phi, University of West Alabama. Microhabitat Utilization by Darters in Sicolocca Creek, Sumter County, Alabama.

In nature, species distributions are often correlated with environmental conditions. To investigate how the environment shapes stream fish distributions, we examined darter utilization of different microhabitats in Sicolocca Creek, a small tributary of the Sucarnoochee River flowing primarily through pasturelands in central Sumter County Alabama. This study was part of a larger study comparing darter microhabitat distributions in different Sumter County streams. To distinguish between microhabitats, we measured substrate type, canopy cover, water depth, pH, temperature, current velocity, and dissolved oxygen concentrations. Distinct microhabitats were sampled 3 times weekly for 2 weeks using seine and dip nets. All captured darters were identified, recorded and released. Darter occurrence was then correlated to the environmental measurements taken within each microhabitat. Dominant darter species included the redbfin darter, *Etheostoma whipplei*, which was found in a variety of microhabitats.

Mosley, R. Brian & Tyler Earwood. Beta Phi, University of West Alabama. Darter Assemblages of Streams in Sumter County, Alabama.

Darters (Percidae) are abundant and diverse in the streams of Sumter County in western Alabama, in part because of the wide range of stream systems found in the region. As part of a larger-scale sampling program investigating factors controlling darter distribution in the county, we sampled various streams to determine the darter community they contained. Sampling was typically conducted at road crossings, and employed a variety of methods. Streams were sampled across the breadth of the county, and included those running through a variety of landforms. When possible, collected darters were field

identified and returned to the stream. In those cases where field identification was possible, specimens were returned to the laboratory for identification. A diverse group of darters was found to exist in Sumter County streams, with the most abundant species including the rock darter (*Etheostoma rupestre*), the redbfin darter (*E. whipplei*), the johnny darter (*E. nigrum*), and the blackbanded darter (*Percina nigrofasciata*). Large differences were found in darter assemblages between stream systems, with substrate playing a major role in determining the species composition.

Tighe, D. Carlin. Beta Phi, University of West Alabama. Occurrences of *Borrelia* spp. in Host-seeking Ticks in Western Alabama.

One-hundred and twenty host seeking-ticks were collected from white-tailed deer (*Odocoileus virginianus*) in Western Alabama during November and December of 2008. The ticks were identified as either *A. americanum* (lone star tick) or *Ixodes scapularis* (deer tick or black-legged tick). The tick specimens were tested for the presence of *Borrelia* species (spirochete) using PCR amplification. Infection rates of *Borrelia* among the ticks were low. Future investigations will involve collecting and testing host-seeking ticks at various intervals throughout the course of a year.

***Jackson, Sara. Mu Epsilon, Troy University. Heat Shock Protein Interactions with the Androgen Receptor.**

It is known that heat shock proteins play a pivotal role in the function of steroid receptors. They are essential to the receptor's ability to create a high-affinity binding site for hormone. It has been this project's goal to better understand the functional impact that heat shock proteins have on the androgen receptor, an area of study that has received little attention in the past. The model system is a mammalian cell line with an epitope-tagged androgen receptor protein and a luciferase reporter gene. Data from the lab has shown that the heat shock protein inhibitor 17-allylamino-17-demethoxygeldanamycin (17AAG) produces a dose-dependent inhibition of the ability of the androgen receptor to activate the luciferase reporter gene. Also, in the presence of 17AAG, the receptor content decreases leading to the conclusion that the loss of luciferase activity is due, at least in part, to degradation of the androgen receptor protein. When the cells are treated with a known proteasome inhibitor, MG132, androgen receptor expression is uninterrupted even in the presence of 17AAG. Luciferase activity on this "protected" pool of receptors will provide insight into the relationship between the androgen receptor and its associated proteins and may be relevant to the progression of prostate cancer.

Gilbert, Meredith L. Mu Omicron, Columbus State University. Effect of Increased Carbon Dioxide Levels on Urushiol Production in *Toxicodendron radicans* and *Toxicodendron toxicarium*.

It is hypothesized that global warming, at least partially, is due to increased greenhouse gases, one of which is carbon dioxide. An increase in atmospheric carbon dioxide has been shown to stimulate higher rates of plant productivity. Urushiol, a secondary plant compound produced in members of the Anacardiaceae family, causes dermatitis in sensitive individuals. An increase in urushiol production could increase the reactivity of certain individuals to plants like poison oak and poison ivy. To determine how elevated levels of atmospheric carbon dioxide would effect urushiol production, 16 samples of poison ivy and poison oak were grown in environmental chambers. One chamber was maintained at ambient carbon dioxide levels (0.037%) and the second was held at an increased level of 0.057%. Urushiol was extracted and analyzed through thin layer chromatography and ultraviolet spectroscopy to determine the amount present in each plant after eight weeks of exposure in the two growth chambers. The average urushiol production and the average weight of the leaves decreased as time elapsed in both

chambers. These decreases may be due to the lack of grow lights in the chambers. In addition, the presence of chlorophyll pigments in early extractions influenced the amount of ultraviolet light absorbed and compromised our results.

Cunningham, Dana. Mu Iota, Northern Kentucky University. Are Prions Vital to Your Immune System?

Through human immune cell assays and real-time polymerase chain reaction (RT-PCR) the prion gene, *PRNP*, was shown to be regulated as a housekeeping gene in many immune cell lineages. Silencing-RNA (siRNA) knock-down of *PRNP* expression in immune cells also decreased expression of cytokines like tumor necrosis factor- α in monocytes and T lymphocytes, suggesting a significant role of prion gene expression in immune cell responsiveness. The ability of human immune cells to distinguish between "self" and "non-self" variants of prion peptides will be quantitated using RT-PCR. Ongoing studies will compare cytokine gene expression following exposure to aberrant human prion peptides corresponding to inherited prion diseases, Fatal Familial Insomnia (FFI) and Gerstmann-Sträussler-Scheinker (GSS), to expression following exposure to non-aberrant versions of these peptides. Additionally, quantitation of cytokine gene expression by immune cells exposed to bovine and ovine prion peptide variants will be contrasted with that of cells exposed to peptides corresponding to conserved prion regions, such as the copper binding motifs. Immunomodulation by prion peptides will indicate that the immune system plays an active role in protection from, or pathogenesis of, prion-related diseases. These studies will lead to a better understanding of the function and regulation of *PRNP* in human immune cells.

Nichols, Christina. Mu Iota, Northern Kentucky University. Human B Cell Immunomodulation by *Uncaria tomentosa*: Application Toward Rheumatoid Arthritis.

The goal of this research is to provide a scientific basis for the diverse therapeutic uses of cat's claw extract. Rheumatoid arthritis (RA) is an autoimmune disease where immune cells attack and damage the affected person's joints. B cell activity, inflammatory cytokines, and cell surface markers such as CD5, have been shown to be significantly increased in RA patients. Our current hypothesis is that components of cat's claw extract are able to modulate human cell-based immune responses in ways that stimulate protective and suppress pathological responses, giving it potential medical value towards the treatment of RA. To test this, human B cells were grown in a 1% final concentration of cat's claw extract, and their steady state and induced cytokine expression levels compared to untreated cells by real-time polymerase chain reaction (RT-PCR) analysis. Treatment with cat's claw extract caused a general down-regulation of B cell activation, a significant decrease in the expression of T cell stimulatory factors, and a down-regulation of CD5 expression, all of which have been linked to the pathogenesis of RA. The effect of cat's claw extract on human B cells demonstrated dynamic alteration of adaptive immune processes that would be advantageous to persons suffering from RA.

Jones, Andrew. Mu Iota, Northern Kentucky University. Herpes Simplex Virus Virions Directly Modulate Innate Immune Responses.

The purpose of this work was to determine the capacity for viral particles to influence the innate immune response. Natural killer (NK) cells and macrophages are key members of the innate immune system and act as the first line of defense against pathogens. Herpes Simplex Viruses (HSV) -1 & -2 are DNA viruses capable of acute and latent infections. Often, when HSV -1 or -2 reactivates, there is a delayed inflammatory response as the virus replicates and destroys cells. This work examines what effect HSV virions have on inflammatory gene expression by innate immune cells. The human NK cell line NK-92 and human macrophage cell line U937 were established in cell culture. Expression of relevant

cytokines and chemokines by these cells was characterized by real-time polymerase chain reaction following two hour stimulation with either UV-inactivated HSV-1 or -2. Both viruses significantly stimulated caspase-1 inhibitor (*ICEBERG*) expression. *ICEBERG* functions by blocking caspase-1 from maturing interleukin-1-beta, a crucial inflammatory cytokine, and interferon-gamma. This and other inflammatory modulations give insight to viral-host interactions and may lead to the development of more effective treatments and vaccines for herpes infections. Further work will attempt to determine what HSV glycoprotein stimulates *ICEBERG* expression.

Rothaug, Michelle L. Mu Chi, Midway College. Effects of the Three Chemical Classes of Anthelmintics and Copper Oxide Wire Particles (COWP) in Young Goats.

Parasitic resistance in goats is increasing, as is the need for an effective, safe anthelmintic. Copper oxide wire particles have been used in many studies to determine anthelmintic properties. Work in Arkansas and Texas seems to have different results than work done in North Carolina. Comparison of COWP to albendazole, moxidectin, and levamisole hydrochloride in parasitic treatment of young Boer Cross meat does was carried out by fecal sample collection every seven days for 28 days. Fecal egg counts were completed using a modified McMaster's technique. Other parasitic infections and weight of each animal were also annotated. Effectiveness of de-wormers varied by age and treatment. COWP was more effective for Fall kids compared to Spring kids. The trend of COWP treatment had similarities to the other chemical de-wormers, but most closely resembled the graph of the control group. Levamisole and albendazole showed the greatest effectiveness and had significantly greater reduction in egg counts than COWP and moxidectin in this study. Best results for protection from re-infection over longer periods were with levamisole. High correlation between FAMACHA scores and FECs were observed. Continued studies using COWP with different variables are necessary to determine its full effectiveness as a de-wormer.

***District II Brooks Award Winner Best Paper**

Poster Presentations Southeastern District I

O'Dell, Casey, Vanessa Hilliard, Natalie Mattson, and Sarah Franco. Sigma Gamma, Erskine College. Effect of Fruit Extract on Bacterial Growth in UTI

About 8.3 million doctors visits each year are in relation to urinary tract infections (UTI), and one out of every five women will suffer from at least one UTI in her lifetime. A survey of 60 female Erskine College students was conducted in which occurrence of UTI was compared to several lifestyle factors. According to our study, 28% of college age women have contracted at least one UTI. Additionally, a correlation between consumption of carbonated beverages and occurrence of UTI was found. Cranberries and their juice are a common non-medical remedy for UTIs. The antibacterial properties of cranberries have been studied repeatedly and their effectiveness in treatment of UTI seems to be related to bacterial antiadhesion properties, such as those exhibited by proanthocyanidins. Other fruits, including blueberries and apples, have been shown to contain high levels of these antioxidants. We tested their extracts, along with cranberry juice, using a disk diffusion assay to determine their ability to inhibit the growth of *E. coli*, a major causative agent of UTIs. Effectiveness was rated by the ability to suppress bacterial growth on Mueller-Hinton Agar, and by the extent of suppression.

Farley, Autumn L and Kelly Dow. Tau Mu, University of South Carolina. Sex Ratio Variation Among Populations of Leaf Mining Beetles.

The buprestid beetle, *Brachys tessellatus*, is found in the Southeastern United States and feeds on oak leaves, primarily those of the Turkey Oak (*Quercus laevis*). As larvae, these beetles mine the mesophyll of the leaves. *B. tessellatus* can have a skewed sex ratio with up to six females per male. Lawson *et al.* (1998) identified a new male-killing *Rickettsia* bacterium in this beetle species and found that infection rate was highly correlated with the observed sex ratio distortion in infected populations. In our study, beetle larvae were collected from eleven different populations in two consecutive years. Results of χ^2 tests for within-population variation indicated that sex ratios at nearly all populations differed significantly from 1:1. A random-effects logistic regression revealed that population, year, and population X year interactions were all significant determinants of the likelihood a beetle would be female, providing evidence of variation between populations in a year, within the same population across years, and between different population-years. This suggests that variation in *Rickettsia* infection rates exists between populations and years. We plan to develop simple infection determination methods using real-time polymerase chain reaction (real-time PCR) to examine this prediction.

Stowe, Monica. Sigma Phi, Guilford College. Osprey Behavior Patterns According to Nest Location

Ospreys (*Pandion haliaetus*) are known for their unique behaviors. This study aimed to determine the relationship of osprey behavior by pairs of birds based on the distance each pair nested from shore and based on the distance between nests. Behaviors monitored were aggression, being away from the nest, mating, feeding, and resting. Behavior changed the farther away from shore a nest was located. Behavior also differed when nests were built close together versus a long distance apart. Resting and spending time away from the nest were the prominent behaviors noted for all nests. This data agrees with previous studies done on osprey behavior.

Gardner, Susan and Diamond McClendon. Tau Xi, Meredith College. Genetic Variations in Gut Flora of *Apis mellifera* (Western honey bees).

In *Apis mellifera*, the Western honey bee, queens engage in polyandry, which can produce wide genetic variation within a single hive. Genetic variation via different fathers may lead to variation of the gut flora found in workers, which in turn may influence disease susceptibility. The work describes a molecular means to identify bacteria in the gut flora of *Apis* species. Bees were dissected to remove the GI tract. A modified DNA extraction protocol was developed using the Promega Wizard Genomic DNA Purification kit to maximally extract DNA from the GI tracts and the microbial symbionts. Extracted DNA was verified via electrophoresis and then used as template in a Polymerase Chain Reaction (PCR) setup, using primers that permit PCR products to form from bacterial DNA. PCR products from different bee DNA extracts were verified via gel electrophoresis. This fragment will subsequently be used to generate a library of cloned products. The cloned products will be isolated and sequenced to identify bacteria associated with the *Apis* gut microflora. Sequence data will allow for comparison of the gut flora of sisters in the same hive. This data will allow investigation into the role host genetics play in determining gut flora of *Apis* species.

Patel, Rica, Sheba Johnson, Justin Lewis, and Christina Calhoun. Beta Eta, Florida Southern College. Seasonal Variation on Limpkin Predation Among Invasive Channeled Apple Snails and Mussels in a Constructed Wetland.

The channeled apple snail (*Pomecea caniculata*) is native to South and Central America and is an invasive species. It is responsible for the dwindling number of native apple snails in the United States and it has a negative impact on rice production in Southeast Asia. The snail is found in large numbers in Florida due to its extensive diet and adaptability to subtropical climates. Seasonal effects on the invasive apple snail was recorded in a constructed wetland (Southern Landing, Lakeland, FL) by indirectly observing its predation by limpkins (*Aramus guarauna*), a local bird species in Florida. Freshwater mussels are a secondary food source for limpkins and were a contributing factor in the data distribution. To test the effects of temperature on apple snail predation, we completed periodic shell collections at the test site from September 2008 to March 2009. Shell volume, number of shells, number of mussels, and mean temperature was recorded and statistical analyses was used to determine significance. We found that shell volume and number of shells increased with temperature and mussel consumption increased with the onset of colder temperatures. The ecological interaction between limpkins and apple snails can provide further information on controlling this invasive species.

McDonald, Erin, and Megan McDonald. Beta Eta, Florida Southern College. The Effects of Aposematic Coloration on Prey Choice in *Anolis sagrei*.

In this study, we tested the lizard *Anolis sagrei* to determine whether aposematic coloration had an effect on prey choice. We used paint to either mask or enhance the warning color in either the golden raintree bug (*Jadera haematoloma*) or the milkweed bug (*Oncopeltus fasciatus*). In the first experiment, one group of lizards were simultaneously presented with one black-painted golden raintree bug and one red enhanced golden raintree bug each and the other group received two crickets simultaneously. The lizards showed a significant preference for crickets over golden raintree bugs, but no significant preference of black versus red painted golden raintree bugs. In the second experiment, a new set of lizards was tested with one black-painted milkweed bug and one red-enhanced milkweed bug given simultaneously. The milkweed bugs were raised on sunflower seeds and did not have the usual toxins found in this type of insect. There was no significant difference between the two paint colors, suggesting that lizards have no predisposition for avoiding aposematically colored prey based on color alone.

Loraamm, Rebecca, Ashlea Archer, and Alison Tamasi. Beta Eta, Florida Southern College. The Effect of Heavy Metals on *Rhizobium* and Legume Growth.

Lake Wire of Lakeland Florida was once the site of a tile factory. Records show that the factory dumped heavy metals into the lake from 1956-1986, contaminating the sediments. Heavy metals are high density elements and in improper proportions, they can be detrimental to human and plant life. We designed an experiment to test the effects of heavy metals on plant growth, with a particular interest in how heavy metals affect the *Rhizobium*-legume relationship. We tested the effect heavy metals had on the plant growth in the soil along with the use of rhizobia. We used sediments from the lake to grow soybeans either with nitrogen rich fertilizer or non-nitrogen fertilizer and *Rhizobium* bacteria. We also used standard potting mix to grow soybeans with either nitrogen fertilizer or *Rhizobium*. Half of each potting mix group was contaminated with heavy metals in roughly the same proportion as was found in the lake sediments. We then observed the growth of the plants for several weeks, documenting the presence of any visual abnormalities or deficiencies, to determine the effects and the severity of heavy metal contamination.

Georgieva, Maria. Sigma Lambda, Wesleyan College. Examination of Cell Line CRL 2616 as a Model for Vaginal Epithelial Differentiation.

Abnormal differentiation of epithelial cells plays a role in the development of cancer and other hyperproliferative diseases. Therefore, studies to determine normal differentiation in various epithelial cell types are crucial for understanding disease development. Cultured keratinocytes from epidermis are a well-established model for studying epidermal differentiation *in vitro*. Currently, however, there are no cell models for studying differentiation in hormone-responsive vaginal epithelium. Keratinocytes cultured in calcium concentrations between 0.02 mM and 0.1 mM calcium are phenotypically similar to basal cells *in vivo* and do not express differentiation-specific proteins. When cultured in calcium concentrations greater than 0.1 mM, however, keratinocytes begin to stratify and express terminal differentiation marker proteins such as keratinocyte transglutaminase (TGase 1). In this study, a normal human immortalized vaginal cell line was examined after growth in media with varying calcium concentrations (0.03 mM, 0.3 mM, and 1.2 mM) to determine the expression of TGase 1 by immunohistochemistry with an anti-TGase 1 monoclonal antibody. Preliminary results demonstrate that in calcium concentrations of 0.3 mM and 1.2 mM, CRL 2616 cells express TGase 1 protein similarly to cultured keratinocytes. Establishment of a differentiation model for vaginal epithelium is a crucial first step in understanding differentiation in hormone-responsive epithelia.

Dey, Moushumi R. Sigma Lambda, Wesleyan College. Effects of Dieldrin on Early Vertebrate Development.

Dieldrin is an organochlorine insecticide used to protect crops; it was also used by exterminators to kill termites. Partly because of its ability to mimic the actions of retinoic acid, a potent derivative of Vitamin A, dieldrin's use as a pesticide was deemed unsafe; however, this chemical still persists in the environment because it degrades very slowly in soil or water and is converted to a more potent form, photo-dieldrin, in UV light. Dieldrin is also a specific neurotoxin, blocking acetylcholinesterase at synapses. However, very little is known about its potential effects on the early stages of vertebrate development. Our research is designed to determine the toxicity and potential teratogenicity of dieldrin in the Japanese Killifish, *Oryzias latipes*. Embryos in the gastrula stage of development were treated with dieldrin at concentrations ranging from 0.1 μ M to 100 μ M. Dieldrin treated embryos were assessed for developmental abnormalities in comparison to control or vehicle treated embryos. The data indicate that Dieldrin affects vasculogenesis, cardiogenesis, and angiogenesis and influences nervous system function. The teratogenic effects of dieldrin on *Oryzias latipes* embryos may serve as a model for studying similar effects in mammals, including humans.

Winters, Madeline. Sigma Phi, Guilford College. The Contribution of a Putative Estrogen-like Receptor as a Target for the Estrogenic Endocrine Disrupting Chemical (EEDC) Bisphenol A in the Soil Nematode, *Caenorhabditis elegans*.

Bisphenol A is an organic compound commonly used in the synthesis of polycarbonate and polyester products. The estrogenic effects of this compound has become an increasing concern as higher amounts are recorded by the EPA in public and natural water sources. Numerous studies have identified the soil organism, *Caenorhabditis elegans*, as a valuable tool in the identification and characterization of EEDCs. BPA has been shown to interfere with reproduction and fecundity in these organisms; causing aberrations and impairment to the formation of reproductive organs and changes in sex ratios. The target receptor for BPA has yet to be defined. This study was designed to examine the contribution of a nuclear receptor, NHR-14, to the endocrine disrupting effects of BPA in *C. elegans*. An expression plasmid was constructed containing a short sequence of the NHR-14 gene, and transformed into *E. coli*. After verification of gene expression, these transformed bacteria were fed to *C. elegans* to assess the effects of RNA interference on how BPA affects fecundity, sex ratio and reproductive organs in multigenerational assays.

***Machlus, Shaina J. Sigma Phi, Guilford College. An Investigation of Visually-guided Swimming Behaviors in Normal and Visually-impaired Zebrafish.**

Zebrafish rely on their visual system to successfully navigate their environment. Their field of view extends more than 270 degrees around their head due to two laterally facing eyes, enabling them to accurately identify prey, follow schooling movements, and monitor their position within a flowing stream. We hypothesized that loss of binocular vision would impair their ability to perform normal visually-guided swimming behaviors. In the first part of our study, we performed a microsurgical operation to damage vision through one eye by unilateral optic nerve crush. To quantify and compare the swimming behaviors of fish with monocular and binocular vision, we have been studying the optomotor reflex, a stereotyped behavior in which zebrafish swim in the same direction as large-scale drifting visual stimuli. During the behavioral experiment, free-swimming fish are retained in a clear chamber resting on a computer monitor that displays full-field drifting square-wave gratings, while their movements are recorded with video camera. In the second part of our study, we are studying the recovery of normal behavior in visually-impaired fish. Because optic nerves regenerate over the course of a few months, we are also in the process of studying the behavioral transition as visually-impaired fish recover normal binocular vision.

Roberson, Sara. Tau Xi, Meredith College. The Effects of Forest Fragmentation on Ectoparasite Loads of Small Mammals on Meredith College Campus

A great problem facing the environment today is deforestation brought on by urbanization. This forest clearing creates small forest fragments on the edge of urban development. Forest fragmentation can affect the populations of animals living in the forest. Meredith College has a 1 hectare forest plot that contains 20 meters of forest edge. The most prevalent small mammal in the Meredith College forest plot is *Peromyscus leucopus*, or the White-footed mouse. Using live trapping, I investigated how forest fragmentation affects loads of ectoparasites on *P. leucopus* in relation to the edge of the forest. The project also investigates other factors that could affect parasite load, such as age or sex of the mouse. Over the course of two months, the parasites found on *P. leucopus* were recorded and identified. Initial results suggested that greater parasite loads were found on mice trapped at the edge of the forest plot. Initial research also suggested that more parasites were found on males than females and more adult mice than juveniles. Knowing the effect of fragmentation on parasite loads is valuable not only to mouse health, but to human health as well. Many of these parasites feed on humans, and can be vectors of such diseases as Lyme disease and Rocky Mountain Spotted Fever.

***District I Johnson Award Winner Best Poster**

Poster Presentations Southeastern District II

Muench, Brittany. Mu Iota, Northern Kentucky University. Nitrogen and the Hydrogen Economy: Roraima Sur Cave, Venezuela.

In starved cave environments, microorganisms must adapt to utilize available nutrients and sources of energy for growth and subsistence. We wanted to examine the role of nitrogen in these processes by studying microbial adaptations in a cave on the nitrogen-starved Guyana Shield Plateau, characterized by Roraima Tepui. Field studies demonstrated the existence of vast microbial communities within Roraima Sur Cave, with data suggesting that ammonia is accumulating within the silica rock, increasing the local

pH and leading to cave formation and silica deposition. The accumulation of ammonia and the presence of ammonia-, nitrite-, and nitrate oxidizing Bacterial and Archeal species in a nitrogen starved environment would suggest that nitrogen plays an important role in microbial ecosystem energetics within this cave. This important role of nitrogen is supported by the identification of abundant nitrogen fixing bacterial species. To support the large energy demands needed for nitrogen fixation, we believe that autotrophic hydrogen oxidation is providing the necessary energy, supported by the identification and cultivation of hydrogen-oxidizing *Epsilonproteobacteria* in the cave. Ultimately, hydrogen oxidation drives a secondary nitrogen cycle. Such findings would be the first of a hydrogen economy driving nitrogen energetics in such a starved system.

Gonzalez Ramos, Osniel. Mu Iota, Northern Kentucky University. Beta-site Amyloid Precursor Protein Cleaving Enzymes (BACE) 1 and 2 as Potential Targets for Alzheimer's Disease Therapies.

The activities of beta-site amyloid precursor protein (APP) cleaving enzymes (BACE) 1 and 2 are currently of interest as metabolic mediators of either pathology (for *BACE1* expression) or protection (for *BACE2* expression) due to the deposition of AB 1-42 in the brain of Alzheimer's disease (AD) patients. The key cell types potentially involved in AD pathology are neurons, astrocytes, and microglial. Our initial hypothesis is that all of these cells are involved in AB metabolism and express *BACE1* & 2, and that cellular aging and/or stress will alter expression of these genes, leading to AB plaque formation. Expression levels of *BACE1* and 2 in human astrocytes, neurons, and microglial cells were monitored by real-time polymerase chain reaction to determine baseline expression levels. Expression levels of *BACE1* and 2 were also measured in these cells when stressed by treatment with lipopolysaccharide (LPS). Ongoing experiments are evaluating other factors that may lead to the modulation of expression of these two genes (such as cellular aging). Results here will indicate which cell types are potentially important sources of AB 1-42 and which stresses may induce AB 1-42 production. These results will also establish valuable cell culture assay systems for testing Alzheimer's disease treatments.

***Patel, Dixita. Beta Chi, University of Southern Mississippi. A Simple Approach to Synthesize Unnatural Gamma Amino Acids.**

The purpose of this project is to develop a route to synthesize analogs of unnatural gamma amino acids. It has been shown in literature that peptides composed of unnatural amino acids have longer half-lives than their "natural" counterparts. This is done by introducing a carbon – carbon SP³ bond instead of an amide bond which is characterized by a presence of a carbonyl group (C=O) linked to a nitrogen atom. This configuration is then used to retard the action of protease enzymes involved in cleaving the "natural" peptides. The unnatural amino acid analogs can be substituted into peptides in the place of the natural amino acids. Therefore, the ultimate goal is to use these generated analogs of unnatural amino acids to potentially aid in cancer treatment as they tend to have longer half life. The approach made to achieve this goal was by using the Wittig reaction and generating a prochiral diester. One of the ester groups is then hydrolyzed to a carboxylic acid to generate a chiral acid/ester. The Curtius rearrangement is used to convert the acid/ester to the unnatural gamma amino acid.

Thompson, William. Beta Chi, The University of Southern Mississippi. Experimental Infection of *Litopenaeus vannamei*, *Palaemonetes pugio*, and *Farfantepenaeus aztecus* with Necrotizing Hepatopancreatitis bacterium (NHPB) per os exposure

Since its emergence in 1985, Necrotizing Hepatopancreatitis which is caused by Necrotizing Hepatopancreatitis Bacterium (NHPB) has affected domestic shrimp aquaculture in Texas. NHPB causes high mortality of farmed raised *Litopenaeus*

vannamei but the reservoirs in the Gulf of Mexico for NHPB are unknown. Two of the most common species that might serve as reservoirs are the grass shrimp, *Palaemonetes pugio*, and the brown shrimp, *Farfantepenaeus aztecus*. To evaluate their role as reservoirs as well as the effects of NHPB on them, the two native species, *P. pugio* and *F. aztecus*, were exposed to NHPB in controlled experiments. Sixty animals (20 from each species) were exposed orally to 0.05 g of NHPB-infected hepatopancreas. Four negatives of each species (12 total) were fed 0.05 g of Ziegler, 35/10 shrimp grow-out pellets. All specimens were kept in individual aquatic habitats at 30°C and 30 ppt salinity for 31 days. The presence or absence of NHPB was determined by PCR and histological examination. Pathogenicity and virulence were evaluated by comparing the death rates, and the percent infected of each wild shrimp species relevant to *L. vannamei*. *Farfantepenaeus aztecus* and *P. pugio* were found to be susceptible to infection with NHPB. In addition the two native shrimp exhibited higher mortality rates and higher rates of infection than *L. vannamei*. These results indicate that the two native species could serve as reservoirs for NHPB and that the effects of NHPB on native species may be greater than on cultured species.

Patel, Rupesh. Beta Chi, University of Southern Mississippi. Determine the Location of the Mold Specific M46 Protein in the Dimorphic Fungus *Histoplasma capsulatum*

Histoplasma capsulatum is a dimorphic fungus that causes histoplasmosis, a respiratory disease. The fungus grows as a multicellular saprophytic mold in soils with bird and bat excreta, at 25° C. Conversion to unicellular parasitic yeast takes place in the lungs, at 37° C. The yeast causes histoplasmosis; hence, the mold-to-yeast transition is required for the development of the disease. The *M46* gene was studied in this project to help determine the mechanism of this conversion. Though the function of *M46* is unknown, recent data states that *M46* is only expressed in the mold form. Therefore in aid to determine the function of *M46*, the location of *M46* in the cell will be determined. *GFP* (Green Fluorescent Protein) was fused to the c-terminus of *M46* from strains WU24 and G186AS. Calcofluor white was used as a control to stain the cell wall. The distribution of *GFP* as determined by fluorescence microscopy, throughout the hyphae indicates that *M46* localizes in the cytoplasm. We hypothesized that the *M46* protein is located in the cytoplasm. Cytoplasmic proteins generally function as signaling proteins, metabolic regulators, etc. To help determine the function of *M46*, future work includes the n-terminus construct and creation of a knockout.

Pourmorteza, Mehdi. Pi delta, East Tennessee State University. Incidence and Prevalence of Frog Virus 3 (FV 3) in Temporary Wetland Population of *Ambystoma maculatum* in Shady Valley

Ranaviruses in the family *Iridoviridae* are a global concern and an emerging infectious disease in amphibians worldwide. Poor water quality caused by cattle use may stress resident populations and hence, increase pathogen prevalence in amphibians. To better understand the dynamics of the ranaviruses, the incidence and prevalence of *Frog virus 3* (FV3) was measured in a *Ambystoma maculatum* population. We compared its prevalence in larval tissue in four different sites in a pond with cattle access in Shady Valley, Tennessee, USA. DNA from spotted salamanders was extracted using Qiagen DNeasy tissue kits. The isolated DNA was used in PCR reactions using hemi-nested primers targeting the major capsid protein gene.

Sanders, John K. Pi Zeta, Pikeville College. Small Mammal Community Response to Reclamation Following Mountaintop Removal in Eastern Kentucky.

Although mountaintop removal is a common, and controversial, practice in Eastern Kentucky, there have been few studies on the impact of such techniques, especially

concerning small mammal communities. In the Midwest United States, small mammal community compositions have shown change due to strip-mining. It is possible that the process of disturbance and reclamation could create new habitat for rare grassland species. The purpose of this study was to document small mammal communities in reclaimed mountaintop removal and valley-fill sites and to compare with small mammal communities in natural, unmined areas as well. We used a total of four different trap types per station in an attempt to maximize trapping success for different species. Mark-recapture methodology was used to estimate populations. Results were standardized per 100 trap-nights for comparison between sites. In comparing densities and community diversity, there were more individuals captured in natural areas, but the reclaimed sites had higher diversity. However, this result is slightly misleading because two of the three sampled mountaintop sites had only one species of *Peromyscus* present.

Williams, Kim and Jennifer L. Rose. Pi Zeta, Pikeville College. A Comparison of Cellulose Acetate Electrophoresis and Morphological Measurements for Identification of Deer Mice (*Peromyscus maniculatus*) and White-footed Mice (*P. leucopus*) in Eastern Kentucky and Northwestern Minnesota.

The white-footed mouse (*Peromyscus leucopus*) and deer mouse (*P. maniculatus*) are two of the most common small mammals in North America and occur sympatrically. It is especially difficult to differentiate between these two species in the field. Recent research in Michigan and Wisconsin has noted an apparent replacement of deer mice by white-footed mice. The morphological measurements normally used to distinguish these mice tend to be inconsistent even within an area. Reliable identification is possible through detection of different allozymes for salivary amylase from deer mice and white-footed mice. We used cellulose acetate electrophoresis to definitively identify these two species. During the course of this summer, we ran more 700 saliva samples from eastern Kentucky and northwestern Minnesota. Our initial analysis identified the first deer mice we have captured after several years of sampling from Pike County, and the data from Minnesota indicate that there, conversely, deer mice are apparently stable and abundant, at least in forest and prairie reserves.

Wooton, Christina Mu Chi, Midway College, Investigation of the Genetics of Tobiano Coat Pattern of Horses Using the Polymerase Chain Reaction (PCR).

Tobiano (*TO*) spotting is a very common and highly valued coat pattern of many breeds of horses. The object of this study is to test for the *TO* gene mutation in various patterned horses. Hair samples from several breeds of horses were screened for the *TO* inversion on Chromosome three using PCR. Horses that were *TO* positive produced a band at 209-bp. Tobiano PCR was successful however not all Tobiano horses carried the *TO* inversion mutation and some spotted non-tobiano and solid horses did have the *TO* inversion mutation.

McCoy, Domoneek. Beta Phi, University of West Alabama. Assessment of Parasitic Infection in Feral Cats (*Felis catus*) in Sumter County, Alabama.

Felis catus is a reservoir for several different types of parasites due in part to their diet, which includes infected rodents and polluted garbage. Twenty cats were captured in Sumter County, located in the West Central region of Alabama, and examined for the presence of internal parasites. Upon examination of the felids, 16 (80%) were found to be infected with the protozoan *Toxoplasma gondii*, the tapeworms, *Dipylidium caninum* and *Taenia taeniaeformis*, or the nematode *Toxocara cati*. More than 50% of those infected had multiple parasites located in the gastrointestinal system. Blood-borne parasites will also be evaluated from peripheral blood smears made from all of the feral cats examined.

Cupit, Stephen. Beta Phi, University of West Alabama. Sensitivity of *Staphylococcus aureus* to Penicillin and Ampicillin.

The microorganism *Staphylococcus aureus* is one of the more troublesome pathogens encountered in hospital surgical rooms and a leading cause of nosocomial infections. Such infections can be debilitating, and even lethal. *S. aureus*, however, is treatable with various antibiotics. This study examines the effectiveness of several antibiotics with regard to inhibition of *S. aureus* growth. After determining a growth rate of an uninhibited *S. aureus* culture, we observed the inhibition of *S. aureus* growth following inoculation with antibiotics. Upon the collection of all data, a series of statistical tests reveals any difference in *S. aureus* growth due to antibiotic treatments. Further statistical analysis shows which antibiotic works most efficiently if a particular antibiotic is more efficient than others tested.

Bryant, Mark A. Eta Mu, Southern University. Measuring the Transfer Function of the Charged Coupled Device for the Large Synoptic Survey Telescope.

The Large Survey Telescope (LSST) is a proposed ground-based 8.4-meter, 10 square-degree field-of-view telescope that will provide digital imaging of faint astronomical objects across the entire sky, night after night. The electronic detector that will be used on the LSST utilizes a charged coupled device (CCD). In order to know how sensitive the telescope will be, the modulation transfer function (MTF) of the CCD must be measured. The MTF of the sensor determines the smallest size image that can be resolved by the telescope. The method used to do this is to project an interference fringe pattern onto CCD. The fringe pattern line density must be adjustable so that the fringe spacing can be made to be less than the sensor pixel size, which is 10 microns. The fringe pattern is created by using an interferometer which splits a point source of light into two parts and recombines them at an angle in order to make the beams of light interfere. Changing the angle of one mirror on the interferometer will change the interference if the light therefore changing the fringe density. The mirror will be adjusted using motors controlled by a customized software program.

Holley, Amanda. Mu Omicron, Columbus State University. Mitigation of Urban Runoff for the Eastern Tributary of Roaring Branch, Muscogee County, Georgia.

To mitigate the effects of urban runoff for the eastern tributary of Roaring Branch Creek (the impacted tributary) in Muscogee County, Georgia, a before-after, control-impact (BACI) analysis was used to determine the benefits of developing a retention pond. A second tributary served as the control. Data were collected in November 2007, prior to the development of the retention pond, and November 2008, a year after the retention pond was completed. Analyses included determining Index of Biotic Integrity (IBI) scores, habitat assessment (HA) scores, and water chemistry. In 2007, the impacted tributary had a very poor IBI score of 18 and a HA score of 66/200, whereas the control tributary had an IBI score of 24 (very poor) and a HA score of 98/200. Data from 2008 showed that the scores did not change significantly, with the impacted tributary having an IBI score of 20 (very poor) and a HA score of 70/200, and the control tributary having an IBI score of 28 (poor) and a HA score of 131/200. Water chemistry did not change significantly besides turbidity, which was not affected by the retention pond. Therefore, the retention pond had no noticeable effect within one year of being built.

Mills, Melissa. Mu Omicron, Columbus State University. The Effect of Eicosapentaenoic Acid Has on Endothelial Nitric Oxide Synthase Expression in Endothelial Cells.

Diabetes is a common disease that affects the population worldwide. It has led to the deterioration of many organs including the heart. Eicosapentaenoic acid (EPA) is known to

place a protective role in hypertension, affecting the expression of eNOS in the cells. The hypothesis of this experiment was that EPA would increase eNOS protein levels present in human iliac artery endothelial cells (HIAEC) exposed to 22.2mmol/L of glucose. The human iliac artery cells were treated with 0.8mM of EPA for 24 and 48 hours. Total cell lysate was isolated, and Western blot analysis was performed using eNOS specific antibodies. The experiment was repeated two times. The average density of the chemiluminescent eNOS bands normalized to actin bands of cells treated with PBS, PBS and EPA 24hrs and 48hrs were 0.55 (+/-0.79), 1.96 (+/-3.01) and 0.78 (+/-1.25), respectively. For cells treated with glucose, glucose and EPA for 24hrs and for 48hrs the average eNOS band densities normalized to actin were 0.56 (+/-0.70), 0.64 (+/-0.58) and 0.54 (+/-0.50) respectively. Two-way ANOVA indicated no significant differences between or within the EPA and glucose treatments. Therefore, EPA has no effect on the protein levels of eNOS in the human iliac artery cells.

Biebinger, Barbara, and Kathryn Hobgood. Mu Epsilon, Troy University. The Survey of Antibiotic Resistance to Commonly Used Antibiotics in the Healthcare Setting.

Antibiotic resistance continues to be a growing problem in the medical community. Overuse and misuse of antibiotics by patients and physicians has contributed to this problem. Every year doctors and pharmaceutical companies work together to develop new drugs and treatment regimens that can overcome this resistance. At the same time, bacteria are mutating and surviving treatment with recently developed antibiotics. In this study, pure culture isolates were obtained from aerobic digested from the Five Mile Creek Wastewater Treatment Facility in Birmingham, Al were tested for antibiotic susceptibility by the Kirby-Bauer Method. Most of the species tested showed some form of antibiotic resistance. The older antibiotics showed more resistance than the newer antibiotics, however some resistance to the newer antibiotics was noted. The newer antibiotics include cefzolin and piperacillin and are some of the most recent drugs used to combat bacterial infections. Morbidity rates from antibiotic resistant strains of infections are on the rise. The information included in this research may be used to assist in the development of new medications and treatment plans to combat antibiotic resistance.

Dey, Indrani, and Carla Rasuck.. Mu Epsilon, Troy University. Assessing Transcription Termination Capacity of Autonomous Replication Sequences From Chromosome III in *S. cerevisiae*.

Many non-coding regulatory DNA sequences in the *Saccharomyces cerevisiae* genome reside close to each other, indicating that some of the same regulatory elements involved in one molecular process may be involved other processes. Replication and transcription termination are two such molecular processes where links are proposed. The plan to analyze the transcription termination abilities of the ARSs of Chromosome III from *Saccharomyces cerevisiae* will be detailed. Research has suggested that autonomous replication sequences (ARS) on Chromosome III in yeast have a role in the initiation of replication, promoting mitotic stability, and enhancing transcription termination. Primers specific for each intergenic region containing an ARS element from Chromosome III have been designed and PCR-generated ARS fragments will be inserted into transcription termination reporter constructs. β -galactosidase activity can be determined by quantitative assays that are used to assess the transcription termination abilities of specific ARS sequences. The hypothesis being tested is that the ARS with the least replication capacity will have the least transcription termination capacity. This study would be the first to determine the transcription termination capacities of all 19-20 ARS elements on Chromosome III.

Herring, Caroline. Mu Epsilon, Troy University. Survey of Oral Flora Among Traditional Age College Students, Ages 19-24.

Studies of the oral flora of humans indicate that specific microbial genera are normal to the oral cavity and inhabit various internal surfaces and the saliva. Microbial genera that are frequently isolated from the oral cavity include *Streptococcus*, *Actinomyces*, *Veillonella*, and *Bacteroides*. Other genera that have been isolated include *Enterococcus*, *Lactobacillus*, *Arachnia*, *Neisseria*, *Corynebacterium*, and *Rusobacteruim*. This study was conducted in order to asses the oral flora among traditional age (19-24 years) college students. Saliva samples were collected from 15 male and 15 female Troy University college students. Ten male and ten female saliva samples were chosen at random and plated onto sheep blood agar and grown at 37°C in a candle jar. Three to five microbial species from each of the 20 (10 male and 10 female) samples were isolated, Gram stained, and identified using biochemical tests. Seven unique species were identified from male samples and eleven unique species were identified from female samples. The identified species of the male and female test groups had few discrepancies with the expected normal oral flora. These findings confirm that specific microbial genera compose the oral flora of both male and female traditional age college students ages 19-24 at Troy University.

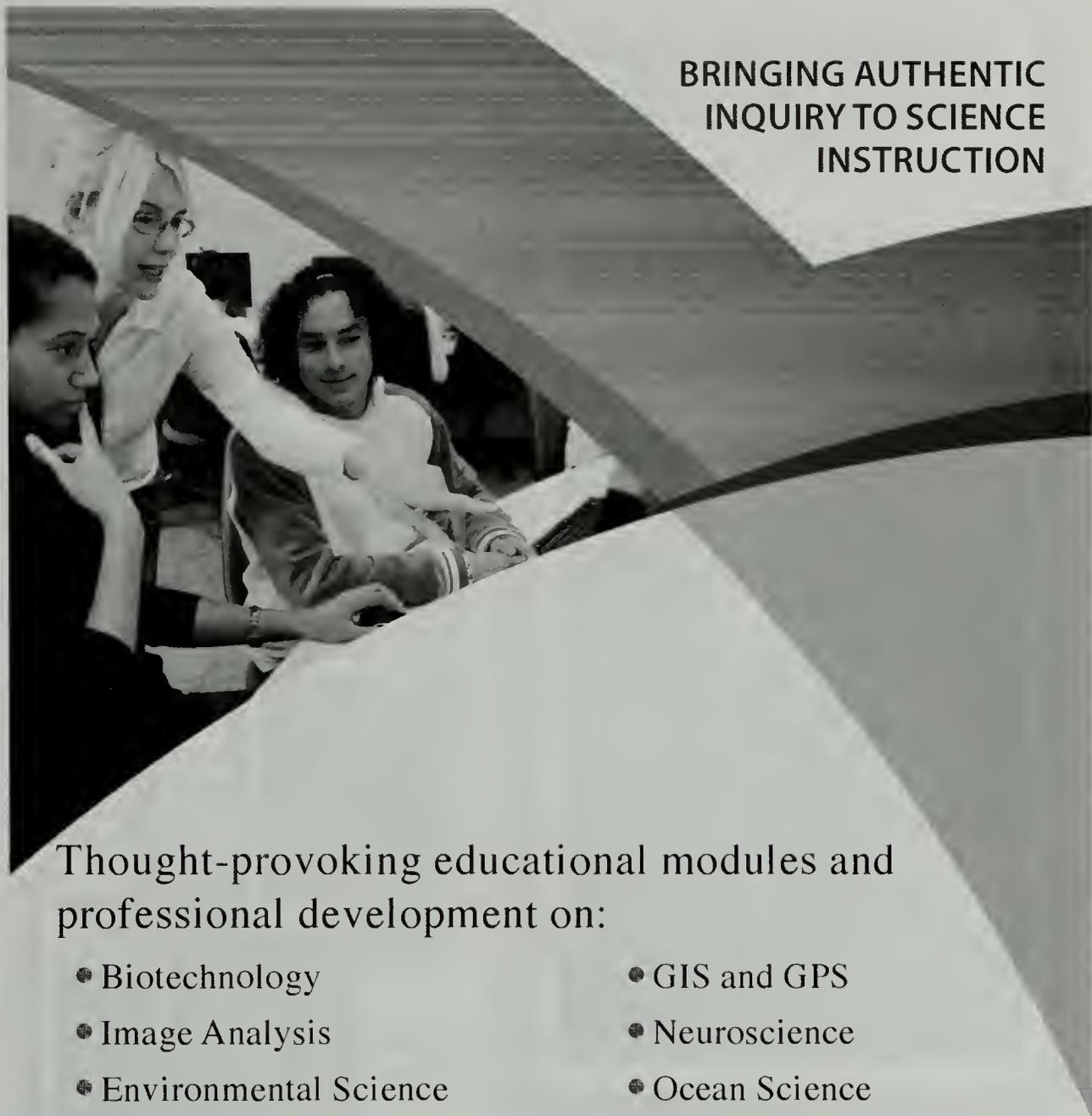
Jones, Vince. Mu Epsilon, Troy University. Survey of Air Microbes in Student Residences at Troy University.

Sick Building Syndrome is a complex health care concern caused by biological, chemical, physical, and psychological factors. Of particular concern are microbes such as bacteria and fungi that grow in heating and air conditioning ventilation systems. Bacterial respiratory pathogens may grow in areas where water collects and stagnates. Several species of fungi produce toxins that irritate the upper respiratory tract or cause respiratory infections. In this study, four air conditioner vents in different student housing buildings at Troy University were sampled using an air sampling device and various media to culture microbes. Organisms were grown at room temperature for one week. Several different species were isolated for further study. Isolates were classified as bacteria or fungi by microscopy. Several fungal species were identified using 18S genomic DNA. Of the species isolated, eight samples were bacteria and 36 samples were fungi as determined by microscopy.

Thoman, Jordann. Mu Omicron, Columbus State University. A Comparison of Genotypic Diversity Between Introduced and Native Plant Populations: Implications for Rare Taxa.

Comparing levels of genetic diversity between the invasive and native range of a species can provide insight into the genetic and ecological factors governing the persistence of rare taxa. Specifically, the potential magnitude of the loss of genetic variation due to bottleneck events in rare species can be elucidated from the loss of genetic diversity associated with founder events in invasive species. Furthermore, traits associated with the life history and mating system of invasive populations not only highlight successful strategies for establishment but may also serve as important predictors of the genetic and demographic ramifications associated with reductions in population size. We evaluated the literature to assess genetic structuring, life history traits and mating system among native and introduced and native populations. Life history was found to be an indicator of the magnitude of genetic diversity. Furthermore, populations with mixed mating strategies showed an increase in diversity while selfing populations decreased. Collectively these results suggest that life history, mating system, as well as the number of introductions influence the genetic structuring of invasive species, which in turn, are also likely to influence the persistence of small populations.

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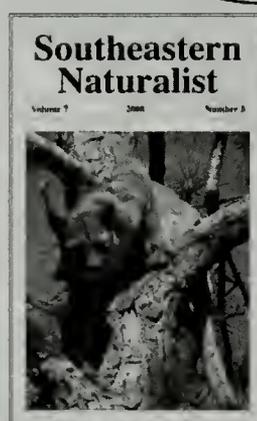
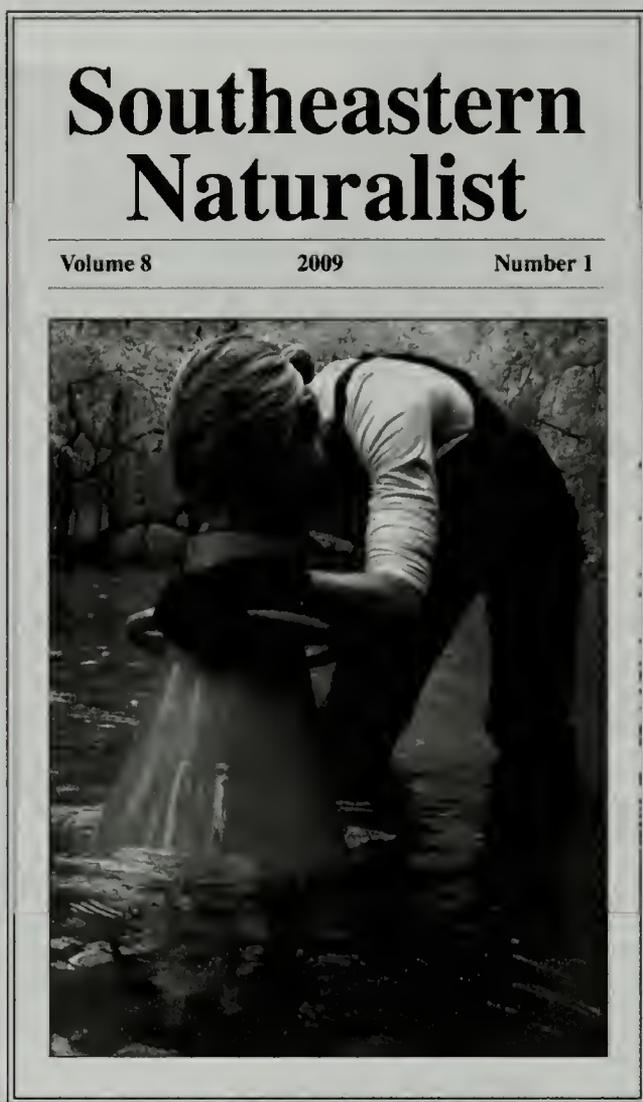
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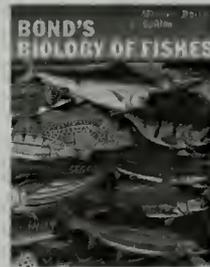


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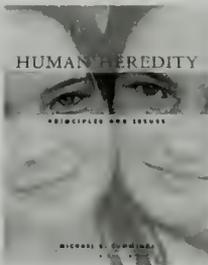


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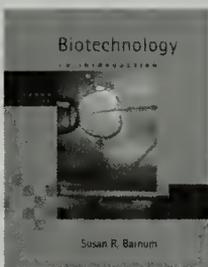
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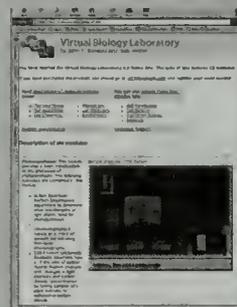


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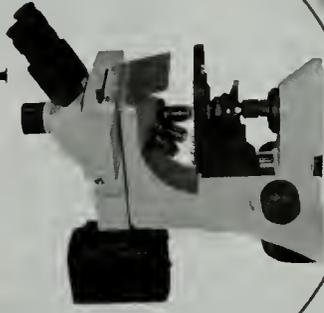
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