

# SOUTHEASTERN BIOLOGY



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*ASB*     **ASB 72<sup>ND</sup> ANNUAL MEETING**     *ASB*

*ASB*     **APRIL 13-16, 2011**     *ASB*

*ASB*     **University of Alabama  
Huntsville, Alabama**     *ASB*

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



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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**

2012 April 3-7: Hosted by the University of Georgia, Athens, Georgia. Meeting site is the Georgia Center on campus.  
2013 April 10-13: Hosted by Marshall University, Huntington, WV. Meeting site is the Charleston Convention Center, Charleston, WV.  
2014 April: Spartanburg, SC (TBA); 2015 April: Alabama (TBA); 2016 April: TBA; 2017 April: Spartanburg, SC (TBA).

**ASSOCIATION OF SOUTHEASTERN BIOLOGISTS  
INTERIM EXECUTIVE COMMITTEE MEETING  
SATURDAY, 11 SEPTEMBER 2010  
ATHENS, GEORGIA**

ATTENDANCE: 18 persons attended the meeting.

<b>NAME</b>	<b>CAPACITY</b>
Patricia Cox	President
Don Roush	President-Elect
Jennifer Davis	Vice President
Conley McMullen	Secretary
Tim Atkinson	Treasurer
Terry Richardson	Membership Officer
John Herr	Archivist
Ron Dimock	EC Member-at-Large
Randy Small	EC Member-at-Large
Joey Shaw	EC Member-at-Large
Ashley Morris	EC Member-at-Large
James Caponetti	Print Editor
Melissa Pilgrim	Book Review Editor
Scott Jewell	Meetings Coordinator
Stephanie Songer	AIBS Representative
Christi Magrath	BBB Southeastern Division II Representative
Zack Murrell	Committee on Bioinformatics
Joerg-Henner Lotze	Publisher, <i>Southeastern Naturalist</i>

### **I. Call to Order and Welcome**

Patricia Cox called the meeting to order at 8:10 A.M., welcomed the EC members and guests, and made introductions. Patricia Cox shared the rules of order with all in attendance.

### **II. Approval of Spring Executive Committee Minutes**

Motion 1. A motion was made that the minutes from the 7 April 2010 ASB business meeting be approved. The motion carried.

Regarding the minutes from the 10 April 2010 ASB EC meeting, it was pointed out that Christi Magrath's position on the EC should be corrected from Member-at-Large to BBB Southeastern Division II Representative.

Motion 2. A motion was made that the minutes from the 10 April 2010 ASB EC meeting be approved with the change. Don Roush seconded the motion. The motion, as amended, carried.

Patricia Cox suggested a change in the meeting agenda; that the EC hear committee reports first so that a greater number of individuals might be involved in discussions.

Motion 3. A motion was made to allow a change in the meeting agenda so that committee reports would be heard and discussion held before other business items. The motion carried.

### III. Committee Reports

**A. Membership Benefits Committee Report** – Terry Richardson mentioned that this committee had not been very active since the previous meeting. However, Terry took this opportunity to make his Membership Officer's Report. He commented on a new web tool that he and Tim Atkinson are using that would allow them to perform more efficient and effective electronic communication, recruitment, and surveys. He mentioned that this appears promising, and thanked Scott Jewell for initiating the development of this new tool. Details were presented in Terry's report. Ashley Morris asked if Facebook and Twitter have been considered to get out membership information. Patricia Cox concurred that this would be a good idea. Terry stated that he will coordinate with Ashley and start a Facebook page. Discussion followed.

**B. Local Arrangements Committee Report** – Patricia Cox reported to the EC that this year we will not have a local arrangements committee for our spring meeting. However, the Chair of the Department of Biological Sciences (University of Alabama at Huntsville) has volunteered to help in whatever way possible. The Department Chair will try to get the UAH President and/or Provost to welcome ASB to the UAH campus. The Department Chair also mentioned that they will try to help with audio visual needs, etc.

**C. Place of Meeting Committee** – Scott Jewell reported that, logistics-wise, everything is set and ready to go for the spring meeting in Huntsville. Embassy Suites will be the main hotel. There is also a Holiday Inn close by. Patricia Cox mentioned that Joey Shaw is seeing to the arrangement of field trips. Discussion followed. Scott solicited help with the silent auction. Everything else is covered, except for organizing student workers.

The 2012 meeting will be held in Athens, Georgia on the University of Georgia campus. There will be a free shuttle from the overflow hotel (Holiday Inn in downtown Athens) to campus. All contracts have been signed. The 2013 meeting will be held in Charleston, West Virginia. Contracts have been signed. The 2014 meeting is planned for Spartanburg, South Carolina. Spartanburg may be the 2017 host as well. The 2015 meeting is to be held in Mobile, Alabama. A site visit has already been done in Mobile. Discussion followed regarding the procedure for deciding on a particular site.

Scott Jewell mentioned that the 2010 meeting in Asheville had run smoothly, and that there were 1084 in attendance. This is a record number for an ASB meeting. Discussion followed. Some difficulties with local arrangements were reported, which resulted in less than \$2000 profit when approximately \$30,000 should

have been realized. Part of the problem was that the local arrangements committee did not listen to Scott's advice in certain areas. For example, there were problems with the band arrangements and shuttles. Terry Richardson questioned the overall charge of \$99,393? Scott explained some of the charges, which included a large tent and decorations. More discussion followed. Tim Atkinson mentioned that this was the single largest check that he has ever had to write. He suggested that the local arrangements committee simply would not listen to our more experienced persons, and that this experience accentuates the need for a move toward establishing a few venues where everything works smoothly. Discussion followed. It was suggested that perhaps we need to be more firm in our discussions with local arrangement committees. Patricia Cox mentioned that although there were problems, most of the ASB members in attendance were not aware of them and had a good experience. Terry Richardson expressed thanks to Scott, Tim, and Patricia. Terry also suggested that future local arrangements committee members be encouraged to just let Scott do his job!

**D. Publication Committee** – Randy Small began the committee's report by mentioning that one of the roles of the committee is to monitor the cost of publications. In other words, how do we disseminate information at the best cost to ASB? Discussion followed. Randy mentioned that the new internet tool mentioned by Terry Richardson and Tim Atkinson would be a great way to distribute some information. Randy stated that he was now looking for feedback from the EC on poll questions that will be sent to all ASB members. The EC walked through these questions with Randy. For example, how would most members like to receive the annual call for papers? Discussion followed. Randy asked the EC if the proposed questions were appropriate for such a poll. Terry Richardson stated that once the questions are approved, he can send them out to our members. More discussion followed. Jim Caponetti suggested that we take all news items out of *Southeastern Biology* (SEB) and put it online. A discussion of whether SEB should be published entirely online followed, as well as a discussion on the possibility of starting a new journal that would publish papers on cell biology, molecular biology, developmental biology, and microbiology. John Herr pointed out that this might increase interest in these areas in ASB. Don Roush mentioned that there are lots of high end journals publishing on these topics, but that a new ASB journal might be a good place to publish middle tier papers. Christi Magrath agreed with Don. Jennifer Davis mentioned that she has enjoyed bringing students to ASB for the research experience, and that a new journal might be a good venue for student papers. Ashley Morris stated that she has colleagues who don't come to our meeting because they go to specialty meetings since they think of ASB as an ecology group. A new journal dealing with the above-mentioned topics might change this. Randy asked if we have the resources to do this right (cost of editors, etc.). And, will we get enough papers submitted? Terry suggested that our survey can answer many of these questions. Jim stated that placing everything online could cause members to quit, but Randy feels that this won't be the case. Discussion followed. Randy – disagrees. Joerg-Henner Lotze stated that he feels a second journal along these lines is a good idea. Although tricky, it can be done. Terry Richardson stated that it would have to be carefully mapped out regarding finances. Currently, we have

no editors who are paid. It was decided that we will conduct the poll before making a final decision.

Motion 4. Randy Small made a motion that the EC approve the poll questionnaire with an amendment to add questions about changing SEB to a journal dealing with an emphasis on cell, molecular, developmental, and microbiology topics. The motion was seconded and carried.

**E. Book Editor's Report** – Melissa Pilgrim reported that there are currently three completed book reviews. An additional nine books are currently being reviewed. Melissa suggested that we may need to approach more members to help with reviews if books keep coming in. Patricia Cox congratulated Melissa on a good job, and mentioned that she was pleased that Melissa had taken on this responsibility.

**F. Tri-Beta Report** – Christi McGrath, BBB Southeastern District II Representative, thanked Scott Jewell for making this year's meeting at Asheville a great experience for Tri-Beta. Christi mentioned that the Southeastern District 1 leader will be Steve Coggin at Catawba College.

#### **IV. Old Business**

**A. Designation of Fellows** – John Herr proposed to the EC the question of whether or not Fellows should have a connection with ASB. Patricia Cox asked if a nomination procedure is in place. John stated that no formal procedures are as yet in place. Discussion followed. John stated that if persons not associated with the southeast are selected, that this simply acknowledges accomplishments of excellence in others. Ashley Morris, Joey Shaw, and Randy Small stated that the honor should not be used simply to try and raise the image of ASB. More discussion followed. John proposed that Patricia appoint an *ad hoc* committee that will put together criteria for selecting Fellows. Tim Atkinson, Joey Shaw, and Don Roush will comprise this committee.

**B. Bylaws and Leadership Guide** – John Herr circulated a list of proposed changes to the ASB Bylaws. He will review all of the proposed changes to the bylaws, as well as comment on the Leadership Guide, and make a report at the April meeting in Huntsville, Alabama. Conley McMullen will assist John as needed. Randy Small and Ron Dimock mentioned that Tom Wentworth may have been working on updating the Leadership Guide.

**C. Web Editor Report** – Before discussing the editor's report, the topic of renewing Amanda Myrick's contract was raised. Discussion followed. Patricia Cox mentioned that she had asked web editor Dennis Haney questions about information items not being updated on the web. Patricia pointed out that we are missing out on opportunities by not having a current web page. Tim Atkinson asked if we need to continue a two-step process that includes the web editor and another person who actually makes changes to the web site. Tim suggested that we send new information directly to the person in charge of putting things on the web. Ashley Morris agreed that a two-step process is not necessary. Ashley stated that she would be willing to volunteer to assist with this project. Tim

Atkinson mentioned that Dennis has communicated to him that he would not be insulted if he is replaced as web editor.

Motion 5. Terry Richardson made a motion that Ashley Morris be appointed web editor. The motion was seconded (Randy Small) and carried.

Motion 6. Terry Richardson made a motion that Amanda Myrick's contract not be renewed. The motion was seconded. Discussion followed. The motion carried.

## **V. New Business**

**A. Flora of Virginia Request** – Conley McMullen asked the EC to donate \$1000 toward the publication of the new Flora of Virginia, which is slated to appear in 2012. John Herr mentioned that we may not have the necessary funds, and that perhaps we could ask our members to assist with this. Terry Richardson pointed out that ASB has an enrichment fund that is available for this very type of project. Patricia Cox stated that we may have to use the enrichment fund for other purposes. Discussion followed. Tim Atkinson suggested that we could give a certain amount and also send a letter to members to support this as well. More discussion followed.

Motion 7. Patricia Cox made a motion that ASB support the Flora of Virginia project by including a box on our meeting registration forms that could be checked if a member would like to contribute \$3 toward this cause. The motion was seconded and carried.

**B. Patrons and Exhibitors Committee** – It was decided after discussion that this committee should be dropped.

**C. Changes to Bylaws** – John Herr circulated a list of proposed changes to the bylaws. John explained the changes and answered questions.

Motion 8. A motion was made to present these changes to the membership for a vote at the meeting in April. The motion was seconded and carried.

## **D. Proposals for Workshops and Symposia at the 2011 Meeting in Huntsville, Alabama**

- 1) Education Workshop/Luncheon – Stephanie Songer went over the handout describing the workshop with the EC.

Motion 9. Terry Richardson made a motion to accept the workshop. The motion was seconded and carried.

- 2) Committee on Human Diversity Workshop and Luncheon – Patricia Cox stated that the committee is asking for \$800 to cover the cost of a speaker honorarium and travel/housing. Discussion followed.

Motion 10. Terry Richardson made a motion to accept the workshop. The motion was seconded. Discussion followed. Tim Atkinson

pointed out that we do not yet know who will be the speaker. Jennifer Davis mentioned that this was the same situation last year, but that she was confident it would be done. The motion carried.

- 3) Bioinformatics Workshop – Zack Murrell described his plans for the workshop, and stated that no funds were requested.

Motion 11. Patricia Cox made a motion to approve the workshop. The motion was seconded and carried.

- 4) Southern Appalachian Botanical Society 75<sup>th</sup> Anniversary Symposium – A proposal for this symposium, submitted by Joe Winstead, was circulated and discussed. John Herr mentioned that the DVD “Who Will Weigh the Mountain” will be available at this symposium.

Motion 12. Terry Richardson made a motion to approve this symposium. Randy Small seconded the motion. The motion carried.

- 5) Gulf Oil Spill Symposium – Ashley Morris reported on this symposium (Deepwater Horizon Event) and discussed the format. Currently, there are several confirmed speakers. Others have not yet responded, and two are still to be asked.

Motion 13. Randy Small made a motion to approve this symposium. The motion was seconded and carried.

**E. Bioinformatics Committee** – Zack Murrell passed out a report on the activities of the committee, and discussed his proposed project to digitize herbarium collections of the southeast (SERNEC). Zack mentioned that this project will ultimately help animal collections become digitized as well, as he is hoping that the project will turn into an all-taxa group. Zack discussed ASB’s proposed roll in the project, for example, using the annual meeting to host workshops. Tim Atkinson suggested that this is an opportunity for ASB, as we could serve as a clearing house for the diffusion of information. This could energize ASB and expand our base, and increase our exposure to wider audiences. Zack stated that the way to mobilize people is to have organizational infrastructure, and that ASB might provide such infrastructure. Zack also suggested that perhaps ASB could help him understand where the leadership in the animal science communities is located. Patricia Cox stated that we could e-mail our members and ask for such information on public and private collections. More discussion followed. Joey Shaw pointed out that SERNEC has paid travel costs for members to attend ASB meetings.

Motion 14. Terry Richardson made a motion that ASB stand ready to assist SERNEC in any way possible. Tim Adkinson seconded the motion. The motion carried.

**F. Southeastern Biology (SEB) and Southeastern Naturalist (SEN)** – Joerg-Henner Lotze, publisher of SEN, along with members of the EC, discussed whether SEN should become the official journal of ASB. Joerg mentioned that he

is trying to land a special issue of SEN on the Gulf oil spill, and is looking for co-sponsors. He is also considering the possibility of an issue on restoration of the Everglades. Terry mentioned that if SEN becomes our official journal, then subscriptions should be allowed only to members of ASB. Discussion followed. Terry stated that we should definitely accept SEN as our official journal. We can discuss about converting SEB to a cell, molecular, developmental, microbiology, etc. journal later. More discussion followed. Patricia Cox asked Joerg if those receiving *Northeastern Naturalist* have to be members of the Association of Northeastern Biologists. Ashley Morris and Christi Magrath suggested that we should launch SEN and redo SEB at the same time. It was suggested that a survey should be sent out. Terry stated that we need to start something now, but Pat suggested that we need input from members first. Joerg stated that he likes the idea of two journals, but wanted to underscore how challenging it will be.

**G. Additional Help with Local Arrangements for Huntsville** – Patricia Cox mentioned again that Joey Shaw will be assisting with the planning of field trips. Scott Jewell mentioned the audio-visual needs. Pat asked if someone at UAH might handle this, and Scott replied to the affirmative. Scott mentioned that we will probably need 10-12 LCD projectors, 5 more laptops to go with ASB's 10, and persons to load the information. John Herr suggested that we could have a capital campaign to raise money to buy our own hardware and software for future meetings.

**H. Enrichment Fund** – Terry Richardson presented a resolution that the ASB Enrichment Fund be increased through a \$5 check box on the annual spring meeting registration form.

Motion 15. Terry Richardson made a motion that the resolution be passed. The motion was seconded and carried.

**I. Program Committee Report** – A report on ways to improve our annual meeting presentations, provided by Nicole Welsh and Howie Neufeld, was circulated and discussed. Terry Richardson suggested that ASB already does many of the items on the list. Discussion followed. Don Roush suggested that we probably want to drop item #11 (15 minute free period at the end of sessions) on the list. Don also suggested that we discuss this more at a later date.

## **VI. Officers and Executive Committee Reports**

**A. President** – Patricia Cox reported that some of her activities included assigning new members to each ASB committee and replacing those no longer willing to serve; writing "A View from Here" to be published in the October issue of SEB; hosting an ASB exhibit at the Botanical Society of America meeting in Providence, Rhode Island in August (she also provided information on the Southern Appalachian Botanical Society and the Society of Herbarium Curators); and accomplishing other miscellaneous business.

**B. Vice-President** – Jennifer Davis reported that she will be hosting and taking care of arrangements for the Patrons and Exhibitors breakfast at the annual meeting in April.

**C. President-Elect** – Don Roush reported that the plenary speaker at our April meeting will be Gary Machlis, who will be speaking on the effects of the Gulf oil spill.

**D. Secretary** – Conley McMullen requested that officer and committee reports be sent to him. John Herr clarified that this includes all reports that have been sent to him as archivist in the past.

**E. Treasurer** – Tim Atkinson passed out his report, which was briefly discussed. Tim mentioned that we will have new shirt designs for the annual meeting in April. Tim also described a new enrichment fund challenge directed to EC members. He also mentioned that ASB brochures have been distributed at various meetings over the past year. Scott Jewell and Tim suggested that perhaps it is time to switch our web site host from Appalachian State to “.org” status.

**F. Archivist** – John Herr brought the Book of Fellows to place in the library on the University of Georgia campus in Athens. John also placed a Past President pin in the archives. John mentioned that he and Jim Caponetti had visited the archives the previous day. John also stated that the library will be moved into a new building on Lumpkin Street, and that this is where the ASB archives will be kept. The new library building should be ready in January 2012. Tours of the new library and archives will be given at our annual meeting in April 2012.

**G. Print Editor** – Jim Caponetti reported that the next issue of SEB is in late press. Jim also mentioned that the front cover is in color, which will cost an extra \$452. John Herr has agreed to cover this extra cost.

**H. Web Editor** – Dennis Haney sent in his report.

**I. Meetings Coordinator** – Scott Jewell reported on “cvent”, the new email service that ASB will be using.

**J. Past-President’s Council** – Tom Wentworth’s report was discussed. The Council decided that it would like to have some type of entertainment at the closing banquet. It was pointed out that it is tough to make the banquet shorter and still do this. Patricia Cox noted the recommendation, but stated that it is not something we choose to do at this time.

## **VII. Adjournment**

Being no further business, Patricia Cox thanked everyone for attending and adjourned the meeting at 3:30 pm.

Respectfully submitted,

Conley K. McMullen  
6 November 2010

**ASSOCIATION OF SOUTHEASTERN BIOLOGISTS  
72<sup>nd</sup> ANNUAL BUSINESS MEETING  
FRIDAY, 15 APRIL 2011  
HUNTSVILLE, ALABAMA**

**1. Call to Order and Welcome** – President Patricia Cox called the meeting to order at 11:30 A.M. Approximately 63 persons attended.

**2. Approval of the Minutes** – On behalf of Secretary Nicole Turrill Welsh, President Patricia Cox presented the minutes of the 2010 Business Meeting as published in the July 2010 issue of *Southeastern Biology*. A motion to accept the minutes as published was made by Donald Roush, seconded, and approved.

**3. Election of Officers** – President Patricia Cox, Chair of the Nominating Committee, presented the 2011 candidates. Vice President – Zack Murrell and Randy Small; Treasurer – Tim Atkinson; and Member at Large – Chris Gissendanner, Irene Kokkala, Christi Magrath, and Roland Roberts. 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. Tellers were asked to count the ballots and announce the results at the Friday evening banquet.

**4. Recognition of Members Who Passed Away in 2009-2011** – President Patricia Cox shared with the members that Dave Orvos, Mark Brinson, and William (Willy) Koch passed away during the past two years. President Cox asked for a minute of silence to pay our respects to them.

**5. Treasurer's Report** – Tim Atkinson, Treasurer, reported that the Association had a record year in every way. *Southeastern Biology* receipts were over \$24,000, and Enrichment Fund receipts were over \$10,000. However, at the end of FY 2010 (31 December 2010), the Association showed a net decrease of \$29,603, with an ending balance of \$28,170. This net decrease was primarily due to the cost of the 2010 meeting in Asheville, North Carolina. Tim gave a brief report as to why the Asheville meeting was so costly. Kim Marie Tolson moved to accept the report, Don Roush seconded. Discussion followed. The motion to accept the Treasurer's Report as submitted passed.

**6. Proposed Changes to the Bylaws and Constitution** – President Patricia Cox outlined the proposed changes to the Bylaws and Constitution, which were published in *Southeastern Biology* 58(1). A motion to accept the changes as published was made, seconded, and passed.

**8. Members Requesting Emeritus Status** – President Patricia Cox announced, as conveyed to her by the Membership Officer, Terry Richardson, that Ken Dodd, Frances M. Garner, Jarvis Hudson, Floyd Scott, Clete Sellers, and Ralph L. Thompson seek emeritus status. A motion to grant these members emeritus status was made, seconded, and passed.

**9. Resolutions** – Don Roush, Chair of the Resolutions Committee, read the Resolution of Appreciation to the University of Alabama at Huntsville, the organizers of the 72<sup>nd</sup> meeting of the Association of Southeastern Biologists, and the City of Huntsville, Alabama. A motion by the Resolutions Committee to accept this resolution was passed.

**10. Enrichment Fund Report** – Mike Dennis, Chair of the Enrichment Fund, stated that the purpose of the fund is to promote the missions of the Society, and that it does exactly that. Mike mentioned that we were well on our way to our goal of \$100,000 until last year's meeting in Asheville. Mike encouraged everyone to contribute to the Fund, and said that we want to see everyone wearing an orange "Enrichment Fund Donor" tag. Mike stressed that contributions are necessary so that we can continue our activities even in the case of an emergency situation, although the Enrichment Fund is not set up to do this on a regular basis. Pat Parr reported that at the Past President's breakfast, Claudia Jolls made an Enrichment Fund matching contribution challenge that had been met.

**11. Announcements** – President Patricia Cox requested that the names of all award winners be given to her before the evening banquet.

**12. Adjournment** – President Patricia Cox thanked everyone for attending and the meeting was adjourned at 12:10 P.M.

**13. Election Results** – Announced at the Friday night awards banquet.

Vice President – Zack Murrell

Treasurer – Tim Atkinson

Members at Large – Irene Kokkala and Roland Roberts

Respectfully submitted,

Conley K. McMullen, Secretary

25 April 2011

**CALL FOR NON-COMMERCIAL WORKSHOP AND  
SYMPOSIUM PROPOSALS FOR THE  
2012 ANNUAL MEETING OF THE  
ASSOCIATION OF SOUTHEASTERN BIOLOGISTS**

**Deadline for Receipt of Proposals: August 26, 2011**

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 Program Committee, the ASB Meetings Coordinator, 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 Committee Chair 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 Committee Chair 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. 

## **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 August 26, 2011).

**ASB President**

Donald H. Roush, Ph.D.  
Department of Biology  
University of North Alabama  
Florence, AL 35632  
dhroush@una.edu

**ASB Meetings Coordinator**

Scott Jewell  
P. O. Box 1088  
Mebane, NC 27302  
A2zconvention@yahoo.com

**ASB Program Committee Chair**

Nicole Turrill Welch, Ph.D.  
Department of Sciences and Math  
Mississippi University for Women  
1100 College Street, MUW-100  
Columbus, MS 39701  
nwelch@as.muw.edu

**DR. EDWARD HORSEY IS SEEKING EMPLOYMENT**

Please see the below resume from Dr Edward Horsey:

**EDWARD W. HORSEY**

457 Monmouth Drive, Cranberry Township, PA 16066  
724-776-1671; [edward.horsey@gmail.com](mailto:edward.horsey@gmail.com)

**EDUCATION**

**Carnegie Mellon University**, Pittsburgh, PA  
Doctorate of Philosophy in Biology August 2003

**University of Maryland Baltimore County**, Baltimore, MD  
Baccalaureate of Science in Biology May 1996

**SUMMARY of QUALIFICATIONS**

Successful Project Management and Product Development Activities  
Critical Thinking and Analytical Abilities (Descriptive and Inferential Statistics and Grant Writing)  
Exemplary Communication Skills (Presentations and Technical Reports)  
Excelled in Team-Based Work Environments  
Proven Leadership Ability  
In-Depth and Broad Life Sciences Knowledge

**Research and Educational Experiences**

Instructed Introductory Biology Courses

- Coordinated and supervised learning activities and laboratory activities
- Analyzed student content retention through periodic evaluations

Characterized host-pathogen interactions in otitis media (middle ear infections)

- Developed genomic methods to simultaneously analyze the gene expression patterns (transcriptomes) of host and pathogen during infection utilizing next-generation high-throughput sequencing technology
- Statistical analysis of host responses to infection
- Molecular analysis of virulence factors

Developed a high specificity assay for detection of low level pathogens in environmental samples

- Project Management: Met milestones and presented deliverables (technical reports and prototypes) for a government contract (Biodefense Research)
- Product Development: Experimental design, implementation, and testing

Developed methods for sequence specific enrichment of DNA prior to pathogen detection

- Enrichment of rare genetic sequences from low biomass samples (environmental samples)
- Implemented chromatography and real-time quantitative PCR techniques

Isolated and characterized pre-ribosomal particles from the yeast, *Saccharomyces cerevisiae*

- Discovered novel protein and RNA interactions utilizing biochemical and genetic techniques
- Implemented HPLC, affinity chromatography, mass spectrometry techniques
- Collaborated with a multidisciplinary research team to characterize pre-ribosomes

Developed content for secondary level biological science education professional development initiatives

- Analyzed program effectiveness through statistical measurements
- Developed, coordinated, and supervised laboratory activities and workshop activities
- Mentored teachers with the incorporation of scientific content into lessons
- Evaluated teacher performance during classroom observations
- Analyzed teacher and student content retention through periodic evaluations
- Researched effective pedagogical strategies and learning environs

### **Leadership Activities**

Addressed issues relevant to graduate students as a member of the Mellon College of Science Graduate Student Advisory Committee.

- Organized and implemented career and social networking events for graduate students.
- Created a graduate ombudsperson policy.

Honored to be chosen as a participant in Proctor and Gamble's Research and Technical Careers in Industry Conference.

Led a multidisciplinary team competing in the Carnegie Challenge entrepreneurial competition.

### **Laboratory Competencies**

Biochemistry: Sedimentation Gradient Analysis, Affinity Chromatography, Protein Expression and Purification from Yeast and *E. coli*, UV/VIS Spectroscopy, HPLC, AKTA FPLC, Hydrophobic Interaction Chromatography, Size Exclusion Chromatography

Proteomics: Mass Spectrometry & Protein-Peptide Identification (Tryptic Digest Sequencing)

Genetics: Two-Hybrid Analysis, Three-Hybrid Analysis, Dominant Negative Screens

Molecular Biology: PCR, Real-Time Quantitative PCR, Cloning, Restriction Mapping, Library Construction, Northern Analysis, Pulse-Chase Kinetic Analysis, Phosphor Imaging Analysis, Western Analysis, Enzyme Unit Assays, High-Throughput Sequencing

Cell Culture, Microbiological Techniques, Small Animal Handling, Biosafety Level II

Solid Phase Peptide Synthesis (Peptide Nucleic Acid)

### Computer Skills

Analysis of data sets utilizing the statistical languages R and SPSS  
 Manipulation and analysis of large data sets utilizing scripting languages (Perl)  
 Adept utilizing sequence analysis tools and web base databases to analyze  
 genomic and proteomic data  
 Proficient in patent searches and analysis  
 Applications: Adobe Photoshop, Adobe Illustrator, Microsoft Office, MacVector,  
 Vector NTI  
 Applied Biosystem's Data Explorer, Molecular Dynamic's ImageQuant,  
 Pharmacia's Unicorn, BLAST

### HONORS

Director of Central Intelligence Postdoctoral Fellowship, Aug. 2003 – July 2005  
 National Institutes of Health's Ruth L. Kirschstein National Research Service  
 Award, Dec. 1998 – Aug. 2003  
 Carnegie Scholar (Carnegie Mellon University), Aug. 1996 – Aug. 2003  
 Meyerhoff Scholar (University of Maryland Baltimore County), Aug. 1992 – May  
 1996  
 Member of Sigma Xi, The Scientific Research Society

### WORK HISTORY

August 2010 - Present	Adjunct Professor Community College of Allegheny County, Pittsburgh, PA
August 2005- October 2008	Sr. Research Associate Center for Genomic Sciences Allegheny Singer Research Institute, Pittsburgh, PA
August 2003 – July 2005	Postdoctoral Fellow Dept of Chemical Engineering Carnegie Mellon Univ., Pittsburgh, PA
Summer 1996	Student Counselor Meyerhoff Summer Bridge Program, Baltimore, MD
June 1995 - May 1996	Student Research Assistant Dept. of Biology, Univ. of Maryland Baltimore County Baltimore, MD

### PUBLICATIONS, PRESENTATIONS, AND ABSTRACTS

Kerschner JE, **E. Horsey**, A. Ahmed, C. Erbe, P. Khampang, J. Cioffi, F.Z. Hu, J.C. Post, G.D. Ehrlich 2009. Gene expression differences in infected and noninfected middle ear complementary DNA libraries. **Arch Otolaryngol Head Neck Surg.** 135(1):33-39.  
 Forbes M. L., **E. Horsey**, J. D. Hayes, F. J. Buchinsky, N. L. Hiller, T. Hillman, J. M. Compliment, S. Ezzo, K. Shen, R. Keefe, K. Barbadora, F. Z. Hu, J. C. Post, and G. D. Ehrlich 2008. Strain-specific Virulence Phenotypes of *Streptococcus pneumoniae* Assessed Using the *Chinchilla laniger* Model of Otitis Media. **PLOS One.** 3(4): e1969.

- Horsey E.**, E. Kaufman, and J. Schneider. Specific inhibition of the polymerase chain reaction with a peptide nucleic acid amphiphile. **Journ. Intelligence Community Research and Development**. Submitted.
- Miles T., J. Jakovljevic, **E. Horsey**, Harnpicharnchai, P., and J. L. Woolford, Jr. 2005. Ytm1, Nop7, and Erb1 form a complex necessary for maturation of yeast 66S preribosomes. **Mol Cell Biol**. 25:10419-10432.
- Horsey E.**, J. Jakovljevic, T. Miles, Harnpicharnchai, P., and J. L. Woolford, Jr. 2004. Role of the yeast Rrp1 protein in the dynamics of pre-ribosome maturation. **RNA** 10:813-827.
- Harnpicharnchai, P., J. Jakovljevic, E. Horsey, T. Miles, J. Roman, M. Rout, D. Meagher, B. Imai, Y. Guo, C. J. Brame, J. Shabanowitz, D. F. Hunt, and J. L. Woolford, Jr. 2001. Composition and Functional Characterization of Yeast 66S Ribosome Assembly Intermediates. **Mol.Cell** 8:505-515.
- Jakovljevic, J., Harnpicharnchai, P., **E. Horsey**, T. Miles, and J. Woolford: Yeast Ribosome Assembly Intermediates, **RNA 2002: Seventh Annual Meeting of the RNA Society**. May 28 - June 2, 2002. Madison, Wisconsin USA
- Harnpicharnchai, P., **E. Horsey**, J. Jakovljevic, J. Roman, T. Miles, M. Rout, Y. Guo, D. Hunt, and J. Woolford; Isolation of yeast pre-ribosomal particles, **RNA 2001: Sixth Annual Meeting of the RNA Society**. May 29 - June 3, 2001. Banff, Alberta Canada.
- Harnpicharnchai, P., **E. Horsey**, J. Jakovljevic, J. Roman, M. Unlü and J. Woolford; Purification of putative ribosome assembly intermediates, **Ribosome Biogenesis & Nucleolar Function**. August 17 - 21 2000. Lake Tahoe, California USA.
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## AST Environmental

# AST

**Environmental** 98 Mark Selby Private Drive ~ Decatur, Alabama 35603

AST Environmental is accepting resumes for entry level and mid level environmental oversight positions. Potential projects include the Gulf Cleanup and Highway construction projects. Experience is a plus; however, specific training will be provided.

A **B.S. degree** in biology, wildlife or environmental science is **required**. *Please do not apply prior to receiving a degree.*

- The positions are expected to last from 6 months to 2 years.
- The scheduled rotations are 14 days on and 7 days off.
- Please send resumes to [selby@astenv.net](mailto:selby@astenv.net).

# ***ASB***

***Paper and Poster Abstracts***

***From the 72<sup>nd</sup> Annual Meeting***

***Hosted by***

***University of Alabama***

***Huntsville, Alabama***

***April 13-16, 2011***

**Author Index**  
**Abstracts available at**  
<http://alabamacademyofscience.org/asb/program.php>

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 Cusaac,Patrick W, Thursday 9:00 AM - Herpetology  
 Cushman,Ken, 183, Friday - Invertebrates poster session  
 Czako ,Mihaly, Friday 4:00 PM - Genetics - Cell & Molecular Biology  
 Czech,Helen, 139, Friday - Ecology poster session
- D**  
 D'Avanzo,Charlene, Thursday 2:30 PM - Scholarship of Teaching and Learning  
 Daigle,Melissa, 26, Thursday - Ecology poster session  
 Daily,Christiana M, Friday 2:15 PM - Genetics - Cell & Molecular Biology  
 Dalman,Nancy E, 192, Friday - Herpetology poster session  
 Damron,Michael, 26, Thursday - Ecology poster session  
 Daniel,Erickson M, Friday 3:00 PM - Animal Ecology  
 Daniel,Nathan A, Thursday 3:15 PM - Community Ecology  
 Darousse,Jaouhar, Friday 3:00 PM - Genetics - Cell & Molecular Biology  
 Darrel,Schmitz, Thursday 2:15 PM - Scholarship of Teaching and Learning  
 Darwin,Steven P, 12, Thursday - Plant Sciences poster session  
 Daugherty,Rachel, 78, Thursday - Genetics - Cell & Molecular Biology poster session  
 Davenport,Larry J, Thursday 10:00 AM - Ecosystem & Disturbance Ecology  
 Davenport,Lawrence J, 136, Friday - Ecology poster session  
 Davis,Erica Marie, 15, Thursday - Developmental Biology poster session  
 Davis,Jennifer J, Thursday 3:15 PM - Scholarship of Teaching and Learning  
 Davis,Katie, 119, Thursday - Parasitology poster session

- Davis, Mark S, 145, Friday - Ecology poster session  
 Davis, Mark S, 61, Thursday - Entomology poster session  
 Davison, Paul G., Friday 2:50 PM - SABS Symposium  
 DeLancey, Ben, 177, Friday - Herpetology poster session  
 DeZwaan, Diane C, Thursday 9:30 AM - Genetics - Cell & Molecular Biology  
 Debro, LaJoyce, Friday 2:30 PM - Scholarship of Teaching and Learning  
 Debro, LaJoyce H, Friday 8:30 AM - Microbiology  
 Debro, LaJoyce H, Friday 9:30 AM - Microbiology  
 Debro, LaJoyce H, 112, Thursday - Microbiology poster session  
 Dechne, Jennifer M, Thursday 10:45 AM - Evolutionary Biology  
 Dennison, George, 192, Friday - Herpetology poster session  
 Denslow, Michael B., Friday 2:00 PM - SABS Symposium  
 Desai, Kruti, 121, Thursday - Parasitology poster session  
 Dey, Indrani, Thursday 11:15 AM - Genetics - Cell & Molecular Biology  
 Dharmarajan, Lakshmi, 90, Thursday - Genetics - Cell & Molecular Biology poster session  
 Diamond, Alvin R., 13, Thursday - Plant Sciences poster session  
 Diehl, Robert, 5, Thursday - Animal Behavior poster session  
 Diehl, Walter J, Thursday 8:45 AM - Evolutionary Biology  
 Diggs, Elliott, Friday 9:30 AM - Herpetology  
 Dimov, Dr. Luben, Thursday 10:45 AM - Ecosystem & Disturbance Ecology  
 Dimov, Luben, 133, Friday - Ecology poster session  
 Dimov, Luben D, Thursday 8:45 AM - Ecosystem & Disturbance Ecology  
 Dimov, Luben D, Friday 9:45 AM - Community & Population Ecology  
 Dimov, Luben D, Thursday 10:30 AM - Ecosystem & Disturbance Ecology  
 Dischler, Carl, Friday 10:15 AM - Microbiology  
 Dixon, Brandon Joseph, 161, Friday - Genetics - Cell & Molecular Biology poster session  
 Dobbins, Betsy, 137, Friday - Ecology poster session  
 Dobbins, Dr. Elizabeth, 49, Thursday - Ecology poster session  
 Dobbins, Elizabeth G., 52, Thursday - Ecology poster session  
 Doe, John, 22, Thursday - Developmental Biology poster session  
 Domingue, Megan N., Friday 8:30 AM - Aquatic Ecology & Invasive Species  
 Donaldson, Eric, 191, Thursday - Microbiology poster session  
 Doornbos, Kathryn, 121, Thursday - Parasitology poster session  
 Dorcas, Michael E, Thursday 10:30 AM - Herpetology  
 Dorcas, Michael E, Thursday 8:30 AM - Herpetology  
 Dorcas, Michael E., 104, Thursday - Herpetology poster session  
 Douglas, Daniel A., Thursday 9:30 AM - Ecosystem & Disturbance Ecology  
 Duberstein, Jamie A, Thursday 2:30 PM - Community Ecology  
 Dubose, Christopher, Friday 1:45 PM - Genetics - Cell & Molecular Biology  
 Dudgeon, Steve R., Thursday 9:15 AM - Ecosystem & Disturbance Ecology  
 Duncan, Scot, Thursday 3:45 PM - Community Ecology  
 Duran, Juliet, 153, Friday - Genetics - Cell & Molecular Biology poster session  
 Durant, Juliet, 87, Thursday - Genetics - Cell & Molecular Biology poster session  
 Durscholz, Elaine, Thursday 4:00 PM - Plant Systematics  
 Durtsche, Richard D., 148, Friday - Ecology poster session  
 Dyer, James M, Thursday 3:15 PM - Community Ecology
- E**  
 Eakes, Thomas C, 79, Thursday - Genetics - Cell & Molecular Biology poster session  
 Eakin, David A, Thursday 1:45 PM - Scholarship of Teaching and Learning  
 Edwards, Taylor, 115, Thursday - Microbiology poster session  
 Edwards, Taylor, Friday 9:15 AM - Microbiology  
 Elizabeth, Wood A, Friday 3:00 PM - Animal Ecology  
 Elliston, Jesina, 192, Friday - Herpetology poster session  
 Emanuel, Ryan E, 48, Thursday - Ecology poster session  
 Engelthaler, Matthew B., Friday 1:45 PM - Animal Ecology  
 Engstrom, April L., 188, Friday - Microbiology poster session  
 Ensign, William E, Thursday 11:45 AM - Ecosystem & Disturbance Ecology  
 Ervin, Gary N., Friday 10:15 AM - Community & Population Ecology
- Eskew, Evan A, Thursday 8:30 AM - Herpetology  
 Eskew, Evan A., 104, Thursday - Herpetology poster session  
 Estes II, Norman Robert, 168, Friday - Genetics - Cell & Molecular Biology poster session  
 Estes, Dwayne, Thursday 8:30 AM - Floristics  
 Estes, Dwayne, Thursday 11:00 AM - Floristics  
 Estes, L. Dwayne, Thursday 9:30 AM - Floristics  
 Estes, L. Dwayne, Thursday 1:45 PM - Plant Systematics  
 Estes, L. Dwayne, Friday 10:15 AM - Aquatic Ecology & Invasive Species  
 Estes, L. Dwayne, Thursday 8:45 AM - Floristics
- F**  
 Fadroski, Karrie A, Thursday 2:15 PM - Animal Behavior & Conservation  
 Fairhurst, Rachael, 192, Friday - Herpetology poster session  
 Fant, Jeremie B., Friday 9:30 AM - Community & Population Ecology  
 Farhoomand, Amin, Friday 8:45 AM - Microbiology  
 Felix, Zach I, 174, Friday - Herpetology poster session  
 Fields II, Szymanski A., 133, Friday - Ecology poster session  
 Fincher, Rita M, Friday 3:00 PM - Scholarship of Teaching and Learning  
 Fincher, Rita M, Thursday 10:00 AM - Ecosystem & Disturbance Ecology  
 Fincher, Rita Malia, 59, Thursday - Ecology poster session  
 Fiorillo, Ricky, 118, Thursday - Parasitology poster session  
 Fiorillo, Ricky, 119, Thursday - Parasitology poster session  
 Fishburne, Tiffany E, 76, Thursday - Genetics - Cell & Molecular Biology poster session  
 Fisher, Priscilla D, 98, Thursday - Herpetology poster session  
 Flagg, Raymond O., Thursday 2:30 PM - Plant Systematics  
 Fleming, Chris, Friday 10:15 AM - Aquatic Ecology & Invasive Species  
 Floden, Aaron J, 14, Thursday - Plant Sciences poster session  
 Foley, Shawna M, Thursday 10:30 AM - Herpetology  
 Foltz II, David, 106, Thursday - Invertebrates poster session  
 Foltz II, David, 181, Friday - Invertebrates poster session  
 Foltz, David, 107, Thursday - Invertebrates poster session  
 Forman, Nicholas S, Friday 8:45 AM - Herpetology  
 Fotis, Alex T, Thursday 3:30 PM - Community Ecology  
 Fountain, Dyanna M, Friday 2:30 PM - Genetics - Cell & Molecular Biology  
 Fowler, Angelina D., Friday 10:15 AM - Aquatic Ecology & Invasive Species  
 Fralish, James, Friday 9:00 AM - Community & Population Ecology  
 Francis, Jacob Samuel, 37, Thursday - Ecology poster session  
 Freeman, Alastair, Friday 9:30 AM - Herpetology  
 Freeman, Brian C, Thursday 9:30 AM - Genetics - Cell & Molecular Biology  
 Freidman, Mendel, 18, Thursday - Developmental Biology poster session  
 Friedman, Katherine L, Thursday 9:30 AM - Genetics - Cell & Molecular Biology  
 Funderburk, Kelly, Friday 9:15 AM - Microbiology  
 Furniss, John Wells, Thursday 9:00 AM - Ecosystem & Disturbance Ecology
- G**  
 Gangloff, Michael, 93, Thursday - Herpetology poster session  
 Garbarino, Valentina R, 120, Thursday - Parasitology poster session  
 Gardner, Courtney Maye, Thursday 10:00 AM - Genetics - Cell & Molecular Biology  
 Gardner, Lisa M, Friday 2:15 PM - Animal Ecology  
 Gardner, Yo-Leigh, Thursday 11:45 AM - Genetics - Cell & Molecular Biology  
 Garrison, Nicole, 181, Friday - Invertebrates poster session  
 Garrison, Nicole, 106, Thursday - Invertebrates poster session  
 Gaston, Janet, Thursday 11:00 AM - Evolutionary Biology  
 Geissinger, Drew, 188, Friday - Microbiology poster session  
 Gentry, Grant, 64, Thursday - Entomology poster session  
 Ghazal, J. Jamil, Friday 3:30 PM - Animal Ecology  
 Ghoshroy, Soumitra, Friday 4:00 PM - Genetics - Cell & Molecular Biology  
 Gibbons, Megan E, 94, Thursday - Herpetology poster session  
 Gilland, Keith E, Thursday 4:00 PM - Community Ecology  
 Gillespie, Emily L, Thursday 4:00 PM - Plant Systematics

Gillespie, Emily L, Thursday 11:30 AM - Genetics - Cell & Molecular Biology  
 Gilman, PhD, Alex, 59, Thursday - Ecology poster session  
 Gissendanner, Chris R, Friday 2:00 PM - Genetics - Cell & Molecular Biology  
 Gissendanner, Chris R., 162, Friday - Genetics - Cell & Molecular Biology poster session  
 Gissendanner, Chris R., Friday 1:45 PM - Genetics - Cell & Molecular Biology  
 Glenn, Anthony, Friday 11:00 AM - Microbiology  
 Goertzen, Leslie R., 68, Thursday - Floristics poster session  
 Goines, Jillian C, 80, Thursday - Genetics - Cell & Molecular Biology poster session  
 Good, Leah M., 3, Thursday - Animal Behavior poster session  
 Gordon, Wayne, 187, Friday - Microbiology poster session  
 Gordon, Wayne, 115, Thursday - Microbiology poster session  
 Gorman, Courtney Ethel, Thursday 8:45 AM - Floristics  
 Gowan, Charles, Thursday 1:45 PM - Animal Behavior & Conservation  
 Greenberg, Cathryn, Thursday 8:45 AM - Herpetology  
 Grusz, Amanda L, Thursday 3:45 PM - Plant Systematics  
 Guidugli, Michelle L., 99, Thursday - Herpetology poster session  
 Gussenhoven, Caitlin M., 3, Thursday - Animal Behavior poster session

**H**

Halstead, Neal H, 117, Thursday - Parasitology poster session  
 Hamissou, Mijitaba, Friday 3:30 PM - Genetics - Cell & Molecular Biology  
 Hamissou, Mijitaba, 8, Thursday - Plant Sciences poster session  
 Hann, Claire T., Friday 4:00 PM - Genetics - Cell & Molecular Biology  
 Hansen, Curtis J., 68, Thursday - Floristics poster session  
 Harden, Joshua, Thursday 11:15 AM - Ecosystem & Disturbance Ecology  
 Harding, Lauren L, 108, Thursday - Invertebrates poster session  
 Hardman, Rebecca H., 173, Friday - Herpetology poster session  
 Harris, Amelia Harris P, Friday 9:30 AM - Plant Sciences  
 Hart, Sunny, Thursday 11:00 AM - Floristics  
 Haskell, David, Thursday 3:15 PM - Animal Behavior & Conservation  
 Haskell, David G, Thursday 10:30 AM - Evolutionary Biology  
 Havens, Kayri, Friday 9:30 AM - Community & Population Ecology  
 Havran, J. Christophe, 67, Thursday - Evolutionary Biology poster session  
 Havran, J. Christophe, Friday 1:45 PM - Scholarship of Teaching and Learning  
 Heck, Kimberly, 81, Thursday - Genetics - Cell & Molecular Biology poster session  
 Held, Michael E., Friday 3:30 PM - SABS Symposium  
 Henderson, Erica, 121, Thursday - Parasitology poster session  
 Henry, Kemardo, Thursday 3:30 PM - Plant Systematics  
 Herr, Jr., John M., Friday 4:00 PM - Genetics - Cell & Molecular Biology  
 Hestermann, Eli V, 76, Thursday - Genetics - Cell & Molecular Biology poster session  
 Hestermann, Eli V, 83, Thursday - Genetics - Cell & Molecular Biology poster session  
 Hieb, Elizabeth E, 178, Friday - Herpetology poster session  
 Hill, JoVonn G., 127, Friday - Ecology poster session  
 Hines, Kelly M., Thursday 10:45 AM - Floristics  
 Holifield, Joshua M., Friday 3:45 PM - Genetics - Cell & Molecular Biology  
 Holt, Brian, 73, Thursday - Floristics poster session  
 Holt, Brian D., 63, Thursday - Entomology poster session  
 Holzmueller, Eric, Friday 9:00 AM - Community & Population Ecology  
 Hopkins II, Robert L, 134, Friday - Ecology poster session  
 Hopkins, Robert L, 135, Friday - Ecology poster session  
 Horton, Jonathan, 40, Thursday - Ecology poster session  
 Horton, Jonathan, 34, Thursday - Ecology poster session  
 Horton, Jonathan L, 128, Friday - Ecology poster session  
 Horton, Jonathan Lamar, 37, Thursday - Ecology poster session  
 Hosch, Joanna L., 70, Thursday - Floristics poster session  
 Howell, Heather, 139, Friday - Ecology poster session  
 Howell, Heather, 38, Thursday - Ecology poster session

Howells, Jessica, 129, Friday - Ecology poster session  
 Huang, Jin, Thursday 11:15 AM - Ecosystem & Disturbance Ecology  
 Huang, Jonathan P, Friday 9:00 AM - Microbiology  
 Huang, Ryan M, 100, Thursday - Herpetology poster session  
 Hubler, PH.D., Tina R, Friday 2:15 PM - Genetics - Cell & Molecular Biology  
 Hubler, Tina R, 164, Friday - Genetics - Cell & Molecular Biology poster session  
 Hughes, Keaton E, 56, Thursday - Ecology poster session  
 Hughes, Nicole M, 54, Thursday - Ecology poster session  
 Huiet, Layne, Thursday 3:45 PM - Plant Systematics  
 Hulme, Philip, 46, Thursday - Ecology poster session  
 Hunt, Stephanie D., 104, Thursday - Herpetology poster session  
 Hurd, Caitlin E, 36, Thursday - Ecology poster session  
 Hutchens, John J, Thursday 2:00 PM - Community Ecology  
 Huyler, Ann, 45, Thursday - Ecology poster session

**I**

Ian, Billick, Friday 3:00 PM - Animal Ecology  
 Ingram, G Walter, Friday 3:30 PM - Animal Ecology  
 Israel, Kimberly Anne, Thursday 1:30 PM - Community Ecology

**J**

Jacob, Nitya, 189, Friday - Microbiology poster session  
 Janos, Gregg, Thursday 4:00 PM - Animal Behavior & Conservation  
 Jeng, Hueiwang Anna, Thursday 11:00 AM - Genetics - Cell & Molecular Biology  
 Jenkins, Andrew P., Thursday 10:00 AM - Floristics  
 Jeschofnig, Dr. Peter, Friday 2:15 PM - Scholarship of Teaching and Learning  
 Jeschofnig, Linda, Friday 2:15 PM - Scholarship of Teaching and Learning  
 Jiang, Michael, 33, Thursday - Ecology poster session  
 Johnson, Catherine M, Thursday 11:00 AM - Herpetology  
 Johnson, Erik C, Thursday 11:30 AM - Genetics - Cell & Molecular Biology  
 Johnson, Leslie, 16, Thursday - Developmental Biology poster session  
 Jolls, Claudia L., Friday 10:45 AM - Plant Sciences  
 Jolls, Claudia L., Friday 9:30 AM - Community & Population Ecology  
 Jones, Sunde M., 19, Thursday - Developmental Biology poster session  
 Jones, Alice L, 102, Thursday - Herpetology poster session  
 Jones, Ronald L., Friday 9:00 AM - Plant Sciences  
 Jones, Ronald L., Friday 8:45 AM - Plant Sciences  
 Jones, Ronald L, Friday 9:15 AM - Plant Sciences  
 Jones, Scott P, 101, Thursday - Herpetology poster session  
 Jordan, Amy N., Friday 1:45 PM - Animal Ecology

**K**

Kahn, Tracy, 71, Thursday - Floristics poster session  
 Kanak, Mazhar, 16, Thursday - Developmental Biology poster session  
 Kangisser, Tricia, 107, Thursday - Invertebrates poster session  
 Kangisser, Tricia, 181, Friday - Invertebrates poster session  
 Kangisser, Tricia, 106, Thursday - Invertebrates poster session  
 Keen, Karissa, 40, Thursday - Ecology poster session  
 Keen, Karissa D, 34, Thursday - Ecology poster session  
 Kellmann, Cailin R, Friday 9:00 AM - Aquatic Ecology & Invasive Species  
 Kelly, Lisa, Friday 3:15 PM - Animal Ecology  
 Kemp, Sharen C, Thursday 8:45 AM - Genetics - Cell & Molecular Biology  
 Kendrick, Dalisa, 141, Friday - Ecology poster session  
 Kennard, Jennifer, 113, Thursday - Microbiology poster session  
 Kennell, Timothy, Friday 11:15 AM - Plant Sciences  
 Kerry, Oliver, Friday 3:00 PM - Animal Ecology  
 Kilbourne, Kelly H., 144, Friday - Ecology poster session  
 Kile, H Mae, Friday 10:30 AM - Community & Population Ecology  
 Killeffer, Terri, 29, Thursday - Ecology poster session  
 Killion, Elizabeth Ann, 82, Thursday - Genetics - Cell & Molecular Biology poster session  
 Kilpatrick, Eran S, 175, Friday - Herpetology poster session

Kim,Yong-Hwan, 163, Friday - Genetics - Cell & Molecular Biology poster session  
 Kirkpatrick,Jacob A, 108, Thursday - Invertebrates poster session  
 Kitazono,Ana, Friday 3:15 PM - Genetics - Cell & Molecular Biology  
 Klagstad,Clea, Thursday 11:00 AM - Floristics  
 Kleiss,H. Joe, Thursday 10:30 AM - Floristics  
 Kloepfel,Brian D, 48, Thursday - Ecology poster session  
 Klukowski,Matthew, Thursday 11:45 AM - Herpetology  
 Klukowski,Matthew, 150, Friday - Ecology poster session  
 Klukowski,Matthew -, Friday 10:15 AM - Herpetology  
 Knouft,Jason H, 134, Friday - Ecology poster session  
 Koester,Ben O, 172, Friday - Herpetology poster session  
 Koester,Benjamin O, 170, Friday - Herpetology poster session  
 Kokkala,Irene, 125, Thursday - Scholarship of Teaching & Learning poster session  
 Kovach,Margaret J, 77, Thursday - Genetics - Cell & Molecular Biology poster session  
 Kovach,Margaret J., 159, Friday - Genetics - Cell & Molecular Biology poster session  
 Kral,Leos G, Friday 2:30 PM - Genetics - Cell & Molecular Biology  
 Kral,Leos G., Friday 10:45 AM - Microbiology  
 Kreps,Timothy A, 98, Thursday - Herpetology poster session  
 Kreza,Robbie G, 48, Thursday - Ecology poster session  
 Krings,Alexander, Thursday 10:30 AM - Floristics  
 Krings,Alexander, Thursday 3:15 PM - Plant Systematics  
 Krings,Alexander, Thursday 3:00 PM - Plant Systematics  
 Krings,Alexander, 71, Thursday - Floristics poster session  
 Kroschel,Whitney A, 172, Friday - Herpetology poster session  
 Krosnick,Shawn E, Thursday 10:00 AM - Evolutionary Biology  
 Kurdmongkoltham,Ploy, Friday 3:30 PM - Genetics - Cell & Molecular Biology  
 Kübler,Janet E., Thursday 9:15 AM - Ecosystem & Disturbance Ecology

**L**

Lamont,Eric E., Friday 8:30 AM - Plant Sciences  
 Land Ph.D.,Michael, Friday 10:15 AM - Microbiology  
 Landers,Stephen C., Friday 2:30 PM - Animal Ecology  
 Landers,Stephen C., 143, Friday - Ecology poster session  
 Landers,Stephen C, Friday 3:30 PM - Animal Ecology  
 Larsen,Peter E, 157, Friday - Genetics - Cell & Molecular Biology poster session  
 Larsen,Peter E, 154, Friday - Genetics - Cell & Molecular Biology poster session  
 Lasseigne,Alex, 12, Thursday - Plant Sciences poster session  
 Lau,Joann M, Thursday 8:45 AM - Genetics - Cell & Molecular Biology  
 Lau,Joann M, Thursday 9:00 AM - Genetics - Cell & Molecular Biology  
 Lau,Joann M, 80, Thursday - Genetics - Cell & Molecular Biology poster session  
 Laughlin,Andrew J., Thursday 2:00 PM - Animal Behavior & Conservation  
 Lavezzi,Tracey S, Thursday 1:30 PM - Plant Systematics  
 Lawson,Gavin R, 98, Thursday - Herpetology poster session  
 Lawson,Gavin R, 175, Friday - Herpetology poster session  
 Lawson,Sarah Page, Thursday 9:45 AM - Evolutionary Biology  
 Lawton,Dr. Robert, Thursday 10:45 AM - Ecosystem & Disturbance Ecology  
 Lee,Gyunghee, 21, Thursday - Developmental Biology poster session  
 Lee,Michael T., Friday 3:10 PM - SABS Symposium  
 Lee,Paul S, 83, Thursday - Genetics - Cell & Molecular Biology poster session  
 Lee-Brown,Melanie, 190, Friday - Microbiology poster session  
 Lee-Brown,Melanie, 81, Thursday - Genetics - Cell & Molecular Biology poster session  
 Leebens-Mack,James H., Friday 9:45 AM - Plant Sciences  
 Lemke,Dawn, 46, Thursday - Ecology poster session  
 Lemke,Dawn, Friday 10:45 AM - Aquatic Ecology & Invasive Species  
 Lemke,Dawn, 35, Thursday - Ecology poster session  
 Lemoine,Francene J, Thursday 10:45 AM - Genetics - Cell & Molecular Biology  
 Lemon,Laramie, Thursday 10:45 AM - Genetics - Cell & Molecular Biology  
 Lendemer,James C., Thursday 9:00 AM - Floristics  
 Lessman,Charles A., Friday 4:15 PM - Genetics - Cell & Molecular Biology

Leverett,Lindsay D, Friday 10:45 AM - Plant Sciences  
 Lewis,Greg, Friday 9:15 AM - Microbiology  
 Li,De-Zhu, Thursday 11:45 AM - Evolutionary Biology  
 Liao,Min-Ken, Friday 9:15 AM - Microbiology  
 Lickey,Edgar B, 10, Thursday - Plant Sciences poster session  
 Lickey,Edgar B, 11, Thursday - Plant Sciences poster session  
 Lincoln,David, 147, Friday - Ecology poster session  
 Loughman,Zachary, 183, Friday - Invertebrates poster session  
 Loughman,Zachary, 106, Thursday - Invertebrates poster session  
 Loughman,Zachary, 107, Thursday - Invertebrates poster session  
 Loughman,Zachary, Thursday 3:30 PM - Animal Behavior & Conservation  
 Loughman,Zachary, 181, Friday - Invertebrates poster session  
 Loughman,Zachary J, 105, Thursday - Invertebrates poster session  
 Luken,James O, Thursday 2:00 PM - Community Ecology  
 Luker,Jessica Corrine, 74, Thursday - Floristics poster session  
 Luvall,Jeff, Thursday 11:15 AM - Ecosystem & Disturbance Ecology

**M**

MacTavish,Rachel, Thursday 9:45 AM - Ecosystem & Disturbance Ecology  
 Macek,Brett A, Thursday 9:45 AM - Herpetology  
 Machen,Shannon M., 8, Thursday - Plant Sciences poster session  
 Madritch,Michael D, Thursday 8:30 AM - Ecosystem & Disturbance Ecology  
 Madritch,Mike, Thursday 2:15 PM - Community Ecology  
 Magrath,Christi, 186, Friday - Microbiology poster session

Magrath,Christi, Thursday 11:15 AM - Genetics - Cell & Molecular Biology  
 Major,Clinton S., Thursday 9:15 AM - Ecosystem & Disturbance Ecology  
 Major,Kelly M., Thursday 9:15 AM - Ecosystem & Disturbance Ecology  
 Makowske,J. E., 28, Thursday - Ecology poster session  
 Malotky,Michele, 190, Friday - Microbiology poster session  
 Mandel,Jennifer R, Thursday 10:45 AM - Evolutionary Biology  
 Maness,Leslie D, Thursday 9:30 AM - Genetics - Cell & Molecular Biology  
 Manis,Chris, 123, Thursday - Scholarship of Teaching & Learning poster session  
 Mann,Steven Alexander, 152, Friday - Genetics - Cell & Molecular Biology poster session  
 Marek,Laura F, Thursday 10:45 AM - Evolutionary Biology  
 Marik,Julie E, Friday 10:45 AM - Plant Sciences  
 Marik,Julie E., Friday 9:30 AM - Community & Population Ecology  
 Martin,Elizabeth, 29, Thursday - Ecology poster session  
 Marton,Laszlo, Friday 4:00 PM - Genetics - Cell & Molecular Biology  
 Marvin,Glenn A, Friday 10:30 AM - Herpetology  
 Matson,Stephanie, Friday 8:45 AM - Community & Population Ecology  
 McCarthy,Brian C, Thursday 3:15 PM - Community Ecology  
 McCarthy,Brian C, Thursday 4:15 PM - Community Ecology  
 McCarthy,Brian C, Thursday 4:00 PM - Community Ecology  
 McCarthy,Brian C., Friday 8:30 AM - Community & Population Ecology  
 McCarthy,Brian C., Friday 11:00 AM - Plant Sciences  
 McCauley,Steve, Friday 9:15 AM - Microbiology  
 McEachern ,A. Kathryn, Friday 9:30 AM - Community & Population Ecology  
 McGhee,Adam, Thursday 2:15 PM - Animal Behavior & Conservation  
 McGill,Kyle, 183, Friday - Invertebrates poster session  
 McGinnis,Lisa, 127, Friday - Ecology poster session  
 McGrath,Deborah A, Friday 9:30 AM - Aquatic Ecology & Invasive Species  
 McLaughlin,Ellen W., Thursday 3:00 PM - Scholarship of Teaching and Learning  
 McMullen,Conley K, Thursday 2:15 PM - Plant Systematics  
 Meade,Mark, Friday 8:45 AM - Aquatic Ecology & Invasive Species  
 Meadows,Benjamin, Thursday 10:00 AM - Ecosystem & Disturbance Ecology  
 Mellichamp,T. Lawrence, Thursday 2:00 PM - Plant Systematics  
 Mentzer,Marcus C, 48, Thursday - Ecology poster session  
 Menzel,Timothy O, 130, Friday - Ecology poster session  
 Menzel,Timothy O, 36, Thursday - Ecology poster session

Metallo, Steven J, 79, Thursday - Genetics - Cell & Molecular Biology poster session  
 Meyer, Harry A., Friday 8:30 AM - Aquatic Ecology & Invasive Species  
 Mikelson, Colleen, 155, Friday - Genetics - Cell & Molecular Biology poster session  
 Miles, Keila N., 17, Thursday - Developmental Biology poster session  
 Miller, Brain T, Thursday 9:30 AM - Herpetology  
 Miller, James, 46, Thursday - Ecology poster session  
 Miller, John, Friday 10:15 AM - Microbiology  
 Miller, Rick E, 12, Thursday - Plant Sciences poster session  
 Milleville, Lauren, Friday 4:15 PM - Genetics - Cell & Molecular Biology  
 Mills, Edward D, 4, Thursday - Animal Behavior poster session  
 Minton, Lindsey M, Friday 11:00 AM - Herpetology  
 Mitchell, Alicia, 114, Friday - Microbiology poster session  
 Mitchell, Chase M, 164, Friday - Genetics - Cell & Molecular Biology poster session  
 Mobley, Lesley, 132, Friday - Ecology poster session  
 Moffitt, Desiree Joy, 93, Thursday - Herpetology poster session  
 Mojb, Nazia, Friday 9:00 AM - Microbiology  
 Mojb, Nazia, Friday 8:45 AM - Microbiology  
 Montgomery, Suzanne, Thursday 3:00 PM - Scholarship of Teaching and Learning  
 Mooney, Amber Nicole, 57, Thursday - Ecology poster session  
 Moore, Casey, 59, Thursday - Ecology poster session  
 Moore, Clea J., 191, Thursday - Microbiology poster session  
 Moore, Frank R, 5, Thursday - Animal Behavior poster session  
 Moore, Michael K., 140, Friday - Ecology poster session  
 Moorer, Megan, 168, Friday - Genetics - Cell & Molecular Biology poster session  
 Moosbrugger, Joseph Charles, Thursday 9:15 AM - Floristics  
 Morris, Ashley B, Thursday 9:15 AM - Evolutionary Biology  
 Morris, Michael Wayne, 69, Thursday - Floristics poster session  
 Morris, Michael Wayne, 72, Thursday - Floristics poster session  
 Morris, Shaina S, 165, Friday - Genetics - Cell & Molecular Biology poster session  
 Moseley, Lynn, Friday 8:45 AM - Herpetology  
 Mowry, Christopher, 132, Friday - Ecology poster session  
 Mukherjee, Dipaloke, Thursday 8:45 AM - Evolutionary Biology  
 Mukhopadhyay, Biswarup, 90, Thursday - Genetics - Cell & Molecular Biology poster session  
 Murdock, Chris, 182, Friday - Invertebrates poster session  
 Murdock, Chris, Friday 2:30 PM - Scholarship of Teaching and Learning  
 Murdock, Christopher A, Friday 8:30 AM - Microbiology  
 Murdock, Christopher A, 112, Thursday - Microbiology poster session  
 Murdock, Christopher A, Friday 3:00 PM - Genetics - Cell & Molecular Biology  
 Murphy, Alexander David, Friday 11:00 AM - Plant Sciences  
 Murphy, Stephen J, Thursday 4:15 PM - Community Ecology  
 Murrell, Zack E., Friday 2:00 PM - SABS Symposium  
 Murrell, Zack E., Thursday 10:00 AM - Floristics  
 Mutchler, Troy, Thursday 9:45 AM - Ecosystem & Disturbance Ecology

**N**

Nair, Sudershana, 84, Thursday - Genetics - Cell & Molecular Biology poster session  
 Naka, Dr. Kozma, Thursday 10:45 AM - Ecosystem & Disturbance Ecology  
 Nammour, Colette, 49, Thursday - Ecology poster session  
 Napier, Zachery L, 94, Thursday - Herpetology poster session  
 Neal, Diana M., Friday 10:15 AM - Community & Population Ecology  
 Nelson, Diane R., Thursday 3:45 PM - Animal Behavior & Conservation  
 Nelson, Thomas, 26, Thursday - Ecology poster session  
 Nelson, Thomas A, Thursday 2:15 PM - Animal Behavior & Conservation  
 Neufeld, Howard S, Thursday 1:30 PM - Scholarship of Teaching and Learning  
 Newell, Darah, Thursday 9:15 AM - Evolutionary Biology  
 Nguyen, Viet, Thursday 9:45 AM - Ecosystem & Disturbance Ecology  
 Noble, Sarah Marie, Thursday 11:15 AM - Floristics  
 Nowell, Melissa C, 54, Thursday - Ecology poster session

**O**

O'Boyle, Lois A, 146, Friday - Ecology poster session  
 O'Boyle, Meghan L, 30, Thursday - Ecology poster session  
 O'Bryan, Christopher J., 95, Thursday - Herpetology poster session  
 O'Connor, Michael, 22, Thursday - Developmental Biology poster session  
 Obeng, Eric, 60, Thursday - Entomology poster session  
 Ogle, Carol, Thursday 3:00 PM - Scholarship of Teaching and Learning  
 Ojard, Connor A, 137, Friday - Ecology poster session  
 Ojha, Santosh K, Thursday 8:45 AM - Ecosystem & Disturbance Ecology  
 Olson, Joseph, Thursday 11:15 AM - Ecosystem & Disturbance Ecology  
 Oppenheimer, Hank, 67, Thursday - Evolutionary Biology poster session  
 Ouy, Leslie, 140, Friday - Ecology poster session

**P**

Padgett-Vasquez, Steve, Thursday 11:15 AM - Ecosystem & Disturbance Ecology  
 Paluso, Keith, 96, Thursday - Herpetology poster session  
 Pan, Jia W, Thursday 10:30 AM - Evolutionary Biology  
 Pancake, Dale, 68, Thursday - Floristics poster session  
 Park, Jae, 22, Thursday - Developmental Biology poster session  
 Park, Jae, 21, Thursday - Developmental Biology poster session  
 Park, Jae H, 160, Friday - Genetics - Cell & Molecular Biology poster session  
 Parker, Matthew, 137, Friday - Ecology poster session  
 Parker, Nathan, Thursday 11:00 AM - Floristics  
 Parker, Nathan, Friday 10:15 AM - Aquatic Ecology & Invasive Species  
 Patel, Vishal, 156, Friday - Genetics - Cell & Molecular Biology poster session  
 Patrick, Abbot, Friday 3:00 PM - Animal Ecology  
 Patrick, John, 123, Thursday - Scholarship of Teaching & Learning poster session  
 Patterson, Andrew, 161, Friday - Genetics - Cell & Molecular Biology poster session  
 Patterson, Clint T, Friday 9:45 AM - Community & Population Ecology  
 Pauley, Thomas K, Thursday 9:15 AM - Herpetology  
 Pauley, Thomas K, Friday 8:30 AM - Herpetology  
 Pauley, Thomas K, 92, Thursday - Herpetology poster session  
 Pauley, Thomas K, Thursday 11:00 AM - Herpetology  
 Pauley, Thomas K, 172, Friday - Herpetology poster session  
 Pauley, Thomas K, 101, Thursday - Herpetology poster session  
 Pauley, Thomas K, Thursday 11:30 AM - Herpetology  
 Pavlovic, Noel B., Friday 9:30 AM - Community & Population Ecology  
 Pawley, Melissa D, Thursday 9:00 AM - Genetics - Cell & Molecular Biology  
 Pearl, Stephanie Anne, 66, Thursday - Evolutionary Biology poster session  
 Pechmann, Joseph H.K., 173, Friday - Herpetology poster session  
 Pederson, Neil, Thursday 9:30 AM - Ecosystem & Disturbance Ecology  
 Peet, Robert, Thursday 1:30 PM - Community Ecology  
 Peet, Robert K., Friday 3:10 PM - SABS Symposium  
 Pendleton, Amanda R., 164, Friday - Microbiology poster session  
 Penland, Kelsey S, Thursday 9:45 AM - Genetics - Cell & Molecular Biology  
 Perry, Travis, 32, Thursday - Ecology poster session  
 Perry, Travis, 23, Thursday - Ecology poster session  
 Perry, Travis, 33, Thursday - Ecology poster session  
 Perry, Travis, 24, Thursday - Ecology poster session  
 Perry, Travis W, 41, Thursday - Ecology poster session  
 Peters, Danielle E, 172, Friday - Herpetology poster session  
 Peterson, Caitlin A, 149, Friday - Ecology poster session  
 Peterson, Paul M, Thursday 11:45 AM - Evolutionary Biology  
 Pham, Quyen Thi, Friday 9:45 AM - Microbiology  
 Piotrowski, Krystal T, 67, Thursday - Evolutionary Biology poster session  
 Pirkle, Richard, 108, Thursday - Invertebrates poster session

- Pisani, Michael, Thursday 8:45 AM - Genetics - Cell & Molecular Biology
- Pitman, Megan E, 41, Thursday - Ecology poster session
- Pitts, Steven, 96, Thursday - Herpetology poster session
- Plagens, Rosemary N, 76, Thursday - Genetics - Cell & Molecular Biology poster session
- Podila, Gopi K, 157, Friday - Genetics - Cell & Molecular Biology poster session
- Podila, Gopi K, 154, Friday - Genetics - Cell & Molecular Biology poster session
- Poindexter, Derick B., Thursday 2:15 PM - Community Ecology
- Poindexter, Derick W., Friday 2:00 PM - SABS Symposium
- Pollard, A Joseph, Thursday 11:00 AM - Ecosystem & Disturbance Ecology
- Pollard, A Joseph, 58, Thursday - Ecology poster session
- Powell, E. Ann, Thursday 4:00 PM - Plant Systematics
- Praslicka, Brandon, 162, Friday - Genetics - Cell & Molecular Biology poster session
- Presley, Daniel R, Friday 3:45 PM - Animal Ecology
- Price, Steven J, Thursday 8:30 AM - Herpetology
- Price, Steven J, Thursday 10:30 AM - Herpetology
- Price, Steven J., 104, Thursday - Herpetology poster session
- Primus, Antonia, 187, Friday - Microbiology poster session
- Prior, Stephen, 45, Thursday - Ecology poster session
- Pryer, Kathleen M, Thursday 3:45 PM - Plant Systematics
- Purcell, Matthew T., Friday 10:45 AM - Microbiology
- R**
- Radmard, Sara, 189, Friday - Microbiology poster session
- Rangaraj, Vittobai R, Friday 2:00 PM - Genetics - Cell & Molecular Biology
- Ray, Darrell L., Friday 3:30 PM - Scholarship of Teaching and Learning
- Ray, Jeffery M., Friday 1:45 PM - Animal Ecology
- Rayburn, James, Friday 11:00 AM - Herpetology
- Rayburn, James, 18, Thursday - Developmental Biology poster session
- Rayburn, James R, Friday 1:30 PM - Animal Ecology
- Rayburn, James R., Friday 10:45 AM - Herpetology
- Rayfield, Megan, 40, Thursday - Ecology poster session
- Rayfield, Megan H, 34, Thursday - Ecology poster session
- Reedus, Jasmine, 115, Thursday - Microbiology poster session
- Reichenbach, Norman, 170, Friday - Herpetology poster session
- Reid, Matthew L, 47, Thursday - Ecology poster session
- Renzaglia, Karen Sue, Friday 2:20 PM - SABS Symposium
- Reynolds, Bradley R., 124, Thursday - Scholarship of Teaching & Learning poster session
- Rhode Ward, Jennifer, 34, Thursday - Ecology poster session
- Rhode Ward, Jennifer, 9, Thursday - Plant Sciences poster session
- Rhode-Ward, Jennifer, 128, Friday - Ecology poster session
- Richardson, Terry D., 53, Thursday - Ecology poster session
- Richter, Stephen C, 102, Thursday - Herpetology poster session
- Richter, Stephen C., 99, Thursday - Herpetology poster session
- Rigsby, Courtney E, 103, Thursday - Herpetology poster session
- Rigsby, Jesse, 174, Friday - Herpetology poster session
- Riley, Zachary Long, 116, Thursday - Microbiology poster session
- Risk, Allen C., Friday 9:00 AM - Plant Sciences
- Risk, Allen C., Friday 8:45 AM - Plant Sciences
- Risk, Allen C., Friday 2:50 PM - SABS Symposium
- Risk, Allen C, Friday 9:15 AM - Plant Sciences
- Risk, Allen C., Thursday 11:30 AM - Ecosystem & Disturbance Ecology
- Roberson, Jacob, 51, Thursday - Ecology poster session
- Roberts, Roland P., Thursday 3:30 PM - Plant Systematics
- Roberts, Timothy M, 166, Friday - Genetics - Cell & Molecular Biology poster session
- Rodney, Beasley W, Thursday 2:15 PM - Scholarship of Teaching and Learning
- Rohr, Jason R, 117, Thursday - Parasitology poster session
- Romano III, Frank A., 143, Friday - Ecology poster session
- Romano, III, Frank A, Friday 3:30 PM - Animal Ecology
- Romano, III, Frank A, Friday 3:00 PM - Genetics - Cell & Molecular Biology
- Romano, Frank, Friday 8:45 AM - Aquatic Ecology & Invasive Species
- Rossell, Jr., C Reed, 128, Friday - Ecology poster session
- Rossell, Jr., C. Reed, 25, Thursday - Ecology poster session
- Roush, Jordan C, 135, Friday - Ecology poster session
- Rubino, Darrin L., Friday 8:30 AM - Community & Population Ecology
- Rushing, Lori, 85, Thursday - Genetics - Cell & Molecular Biology poster session
- S**
- Salpeter, Kara E, Friday 10:30 AM - Aquatic Ecology & Invasive Species
- Santoro, Irma M., 86, Thursday - Genetics - Cell & Molecular Biology poster session
- Santos, Alexandre Matte, Friday 9:45 AM - Plant Sciences
- Sapp, Sarah Grace, 55, Thursday - Ecology poster session
- Sasek, Thomas W, 12, Thursday - Plant Sciences poster session
- Satre, Danielle, 51, Thursday - Ecology poster session
- Satre, Danielle, 163, Friday - Genetics - Cell & Molecular Biology poster session
- Satre, Danielle, 86, Thursday - Genetics - Cell & Molecular Biology poster session
- Sauterer, Roger A, Thursday 2:00 PM - Scholarship of Teaching and Learning
- Saville, Amanda, 71, Thursday - Floristics poster session
- Schimmer, Craig A., 143, Friday - Ecology poster session
- Schmidt, Elizabeth J, 85, Thursday - Genetics - Cell & Molecular Biology poster session
- Schmidt, Londa L, 17, Thursday - Developmental Biology poster session
- Schroeder, Wanda T., Thursday 11:45 AM - Genetics - Cell & Molecular Biology
- Schuettpelz, Eric, Thursday 3:45 PM - Plant Systematics
- Schulteis, Alicia, 166, Friday - Genetics - Cell & Molecular Biology poster session
- Schultheis, Alicia, Thursday 10:00 AM - Genetics - Cell & Molecular Biology
- Schultheis, Alicia S, Friday 9:00 AM - Aquatic Ecology & Invasive Species
- Schwartz, Nathan, 132, Friday - Ecology poster session
- Schweitzer, Callie, Thursday 8:45 AM - Herpetology
- Schweitzer, Callie, 35, Thursday - Ecology poster session
- Schweitzer, Callie, 133, Friday - Ecology poster session
- Schweitzer, Callie J, Thursday 8:45 AM - Ecosystem & Disturbance Ecology
- Schweitzer, Callie J, Thursday 10:30 AM - Ecosystem & Disturbance Ecology
- Schweitzer, Callie Jo, 39, Thursday - Ecology poster session
- Scocco, Erika A, Friday 10:30 AM - Microbiology
- Scott, A. Floyd, 95, Thursday - Herpetology poster session
- Seals, David, 42, Thursday - Ecology poster session
- Seddon, Ryan, Thursday 11:45 AM - Herpetology
- Segura-Totten, Miriam, 85, Thursday - Genetics - Cell & Molecular Biology poster session
- Sehgal, Ritika, 21, Thursday - Developmental Biology poster session
- Selm, Kathryn Renee, 128, Friday - Ecology poster session
- Sewell, Susan M, Friday 8:45 AM - Aquatic Ecology & Invasive Species
- Seymour, Zackary L, 176, Friday - Herpetology poster session
- Sha, Kai, 160, Friday - Genetics - Cell & Molecular Biology poster session
- Shamsedin, Nadia M, 58, Thursday - Ecology poster session
- Shamsedin, Nadia M, Thursday 11:00 AM - Ecosystem & Disturbance Ecology
- Sharpe, Michka G., 184, Friday - Microbiology poster session
- Shaugnessey, John, Friday 10:15 AM - Microbiology
- Shaw, Joey, 28, Thursday - Ecology poster session
- Shaw, Joey, Thursday 11:00 AM - Floristics
- Shaw, Joey, Friday 10:30 AM - Community & Population Ecology
- Shaw, Joey, Thursday 9:45 AM - Floristics
- Shaw, Joey, Friday 10:30 AM - Plant Sciences
- Shaw, Joey, Thursday 9:30 AM - Floristics
- Sheehy, Amanda M., 53, Thursday - Ecology poster session
- Sheldon, Daniel R., Thursday 2:00 PM - Animal Behavior & Conservation
- Sheldon, Jennifer, 132, Friday - Ecology poster session
- Shelton, Amanda G, Friday 10:30 AM - Herpetology
- Shepard, Nathan A, Thursday 11:00 AM - Herpetology

- Shipley, Margaret C, Thursday 3:15 PM - Animal Behavior & Conservation  
 Shipman, Jerrod D, Thursday 11:15 AM - Herpetology  
 Shirey, Kristin D, Friday 1:30 PM - Animal Ecology  
 Shouse, Joshua, 148, Friday - Ecology poster session  
 Siefferman, Lynn, 93, Thursday - Herpetology poster session  
 Siefferman, Lynn M, Thursday 1:30 PM - Animal Behavior & Conservation  
 Sigmon, Lora L, Thursday 1:45 PM - Community Ecology  
 Simmons, Laura E, 130, Friday - Ecology poster session  
 Simpson, III, Joseph F., Thursday 10:15 AM - Herpetology  
 Sims, Kaleigh, 26, Thursday - Ecology poster session  
 Singh, GAGANPREET, Thursday 3:30 PM - Plant Systematics  
 Skinner, Briana, 49, Thursday - Parasitology poster session  
 Sloan, Phillip G, 36, Thursday - Ecology poster session  
 Small, Randall L., Thursday 1:45 PM - Plant Systematics  
 Smith, Alan F., 121, Thursday - Parasitology poster session  
 Smith, Alan F., 140, Friday - Ecology poster session  
 Smith, Gerald L., Thursday 2:30 PM - Plant Systematics  
 Smith, Ken C, Friday 9:30 AM - Aquatic Ecology & Invasive Species  
 Smith, Nora Lynn, 31, Thursday - Ecology poster session  
 Smith, Scott, 96, Thursday - Herpetology poster session  
 Somers, Greg, 45, Thursday - Ecology poster session  
 Songer, Stephanie R, 145, Thursday - Scholarship of Teaching & Learning poster session  
 Sorrie, Bruce A., Thursday 11:30 AM - Floristics  
 Souther, Tucker J, 48, Thursday - Ecology poster session  
 Sovyanhadi, Marta, 87, Thursday - Genetics - Cell & Molecular Biology poster session  
 Sovyanhadi, Marta, 88, Thursday - Genetics - Cell & Molecular Biology poster session  
 Sovyanhadi, Marta, 153, Friday - Genetics - Cell & Molecular Biology poster session  
 Sovyanhadi, Yoedono, 153, Friday - Genetics - Cell & Molecular Biology poster session  
 Sovyanhadi, Yoedono, 88, Thursday - Genetics - Cell & Molecular Biology poster session  
 Sovyanhadi, Yoedono, 87, Thursday - Genetics - Cell & Molecular Biology poster session  
 Speiler, Gabriel, 94, Thursday - Herpetology poster session  
 Spencer, Chris, Friday 3:15 PM - Animal Ecology  
 Spinner, Michael, 189, Friday - Microbiology poster session  
 Spratt, Henry G., Friday 3:15 PM - Scholarship of Teaching and Learning  
 Sreedasyam, Avinash, 154, Friday - Genetics - Cell & Molecular Biology poster session  
 Sreedasyam, Avinash, 157, Friday - Genetics - Cell & Molecular Biology poster session  
 Sreenivasa, MY, Friday 9:45 AM - Microbiology  
 Sreenivasa, MY, 185, Friday - Microbiology poster session  
 Stalter, Richard, Friday 8:30 AM - Plant Sciences  
 Stanton, Howard J, Thursday 11:30 AM - Herpetology  
 Stanton, Lee, 142, Friday - Ecology poster session  
 Stapleton, Elizabeth Lee, Friday 11:00 AM - Aquatic Ecology & Invasive Species  
 Stephens, Navia, 155, Friday - Genetics - Cell & Molecular Biology poster session  
 Stephenson, Steven L, 165, Friday - Genetics - Cell & Molecular Biology poster session  
 Stewart, James, 96, Thursday - Herpetology poster session  
 Stone, Catherine O, 58, Thursday - Ecology poster session  
 Stone, Catherine O, Thursday 11:00 AM - Ecosystem & Disturbance Ecology  
 Stone, William, 38, Thursday - Ecology poster session  
 Stone, William Edward, 131, Friday - Ecology poster session  
 Stringer, Brandie K, 39, Thursday - Ecology poster session  
 Stucky, Jon M., Thursday 10:30 AM - Floristics  
 Stutzman, Julia K, Thursday 2:15 PM - Plant Systematics  
 Sutherland, Elaine K., Friday 8:30 AM - Community & Population Ecology  
 Sutliff, Jennifer, 168, Friday - Genetics - Cell & Molecular Biology poster session  
 Sweat, Jaylen B., Friday 1:30 PM - Genetics - Cell & Molecular Biology  
**T**  
 Tadesse, Wubishet, 133, Friday - Ecology poster session  
 Tadesse, Wubishet, 138, Friday - Ecology poster session  
 Takahashi, Mizuki K, Thursday 11:30 AM - Herpetology  
 Talley, Jennell M, Thursday 9:30 AM - Genetics - Cell & Molecular Biology  
 Talley, Sharon M, 169, Friday - Genetics - Cell & Molecular Biology poster session  
 Talley, Sharon M, Thursday 1:30 PM - Plant Systematics  
 Talley, Sharon M, Thursday 10:30 AM - Genetics - Cell & Molecular Biology  
 Talwar, Brendan, 32, Thursday - Ecology poster session  
 Tariq, Arsalan, 168, Friday - Genetics - Cell & Molecular Biology poster session  
 Taylor, Caz M., Thursday 2:00 PM - Animal Behavior & Conservation  
 Taylor, Michael R., Friday 4:15 PM - Genetics - Cell & Molecular Biology  
 Taylor, Nate, 107, Thursday - Invertebrates poster session  
 Taylor, Nate, 181, Friday - Invertebrates poster session  
 Teasley, Erica R, Friday 9:30 AM - Aquatic Ecology & Invasive Species  
 Teplitski, Max, 189, Friday - Microbiology poster session  
 Terry, Randall G, Thursday 11:30 AM - Evolutionary Biology  
 Thacker, Derek, 169, Friday - Genetics - Cell & Molecular Biology poster session  
 Thomas, Michelle S., Friday 1:30 PM - Scholarship of Teaching and Learning  
 Tindall, Amanda J., 188, Friday - Microbiology poster session  
 Tolley-Jordan, Lori R, Friday 9:45 AM - Aquatic Ecology & Invasive Species  
 Tolson, Kim M, 30, Thursday - Ecology poster session  
 Tolson, Kim Marie, 31, Thursday - Ecology poster session  
 Tortorich, John-Paul, 64, Thursday - Entomology poster session  
 Triplett, Jimmy K, Thursday 11:45 AM - Evolutionary Biology  
 Tripp, Erin A., Thursday 9:00 AM - Floristics  
 Trivedi, Geetika, 154, Friday - Genetics - Cell & Molecular Biology poster session  
 Trivedi, Geetika, 157, Friday - Genetics - Cell & Molecular Biology poster session  
**U-V**  
 Upton, Brianna, 24, Thursday - Ecology poster session  
 Urbatsch, Lowell E, 12, Thursday - Plant Sciences poster session  
 Van Zandt, Peter A, 64, Thursday - Entomology poster session  
 Vandermast, David, Thursday 1:45 PM - Community Ecology  
 Vandermast, David, Friday 8:45 AM - Community & Population Ecology  
 Vandermast, David B, Friday 10:30 AM - Aquatic Ecology & Invasive Species  
 Vanterpool, Elaine, 115, Thursday - Microbiology poster session  
 Vanterpool, Elaine A, 187, Friday - Microbiology poster session  
 Vellacott-Ford, Karen, 78, Thursday - Genetics - Cell & Molecular Biology poster session  
 Vidd, Danielle N., 50, Thursday - Ecology poster session  
 Viere, Alex, 22, Thursday - Ecology poster session  
 Villarreal, Juan Carlos, Friday 2:20 PM - SABS Symposium  
 Virone, Dana, 35, Thursday - Ecology poster session  
 Virone, Dana A, Thursday 10:30 AM - Ecosystem & Disturbance Ecology  
 Vitt, Pati, Friday 9:30 AM - Community & Population Ecology  
 Voitk, Andrus, 11, Thursday - Plant Sciences poster session  
**W**  
 Waldron, Jayme L, Thursday 11:00 AM - Herpetology  
 Walker, Gary L., Thursday 2:15 PM - Community Ecology  
 Wallston, Margot AG, 25, Thursday - Ecology poster session  
 Wang, Dr. Yong, Thursday 10:45 AM - Ecosystem & Disturbance Ecology  
 Wang, Yong, 151, Friday - Ecology poster session

Wang, Yong, Friday 9:45 AM - Herpetology  
 Wang, Yong, Thursday 8:45 AM - Herpetology  
 Wang, Yong, 39, Thursday - Ecology poster session  
 Wang, Yong, Friday 10:45 AM - Aquatic Ecology & Invasive Species  
 Wang, Zixing, 22, Thursday - Developmental Biology poster session  
 Ward, Jennifer, 40, Thursday - Ecology poster session  
 Ward, Kenneth E, 60, Thursday - Entomology poster session  
 Ward, Rufina N, 38, Thursday - Ecology poster session  
 Ward, Rufina N, 60, Thursday - Entomology poster session  
 Waters, Matthew N, 126, Friday - Ecology poster session  
 Watkins, Richard, Friday 9:30 AM - Microbiology  
 Watson, Jennifer A, 2, Thursday - Animal Behavior poster session  
 Watson, Natassia P, 117, Thursday - Parasitology poster session  
 Wauford, Ryan, 86, Thursday - Genetics - Cell & Molecular Biology poster session  
 Wayman, Joseph, 169, Friday - Genetics - Cell & Molecular Biology poster session  
 Waymer, Paige J, 16, Thursday - Developmental Biology poster session  
 Weakley, Alan, Friday 1:40 PM - SABS Symposium  
 Weaver, Debora J., Friday 1:30 PM - Scholarship of Teaching and Learning  
 Weinkam, Todd J, Thursday 4:00 PM - Animal Behavior & Conservation  
 Welch, Nicole T, Thursday 2:30 PM - Scholarship of Teaching and Learning  
 Welsh, Kyle, 171, Friday - Herpetology poster session  
 Welsh, Stuart, 106, Thursday - Invertebrates poster session  
 Welsh, Stuart, Thursday 3:30 PM - Animal Behavior & Conservation  
 Wen, Jun, Thursday 11:45 AM - Evolutionary Biology  
 Wentworth, Thomas R., Friday 3:10 PM - SABS Symposium  
 West, Brian D, 61, Thursday - Entomology poster session  
 Whitaker, Stephanie Ann, 138, Friday - Ecology poster session  
 Whitby, Timothy G, Thursday 8:30 AM - Ecosystem & Disturbance Ecology  
 White, Danielle, 26, Thursday - Ecology poster session  
 White, Raley C., 65, Thursday - Evolutionary Biology poster session  
 White, Shannon L., Thursday 1:45 PM - Animal Behavior & Conservation  
 Whitley, Connor, Thursday 11:15 AM - Ecosystem & Disturbance Ecology  
 Whittier, Dean P., Friday 2:20 PM - SABS Symposium  
 Wichmann, Brenda L., 74, Thursday - Floristics poster session  
 Wichmann, Brenda L., 171, Friday - Herpetology poster session  
 Wichmann, Brenda L., 70, Thursday - Floristics poster session  
 Wichmann, Wichmann L, 43, Thursday - Ecology poster session  
 Wilkins, H. Dawn, 3, Thursday - Animal Behavior poster session  
 Williams, Jeanette R, Thursday 10:45 AM - Ecosystem & Disturbance Ecology  
 Williams, Jeffrey, 108, Thursday - Invertebrates poster session  
 Williams, Leonard, 87, Thursday - Genetics - Cell & Molecular Biology poster session  
 Williams, Leonard, 153, Friday - Genetics - Cell & Molecular Biology poster session  
 Williams, Mallory, Thursday 4:00 PM - Plant Systematics  
 Williams, Ray S., 129, Friday - Ecology poster session  
 Wilson, La'Tisha, 89, Thursday - Genetics - Cell & Molecular Biology poster session  
 Wilson, Lawrence A, 100, Thursday - Herpetology poster session  
 Wilson, Scott, 2, Thursday - Animal Behavior poster session  
 Wilson, Thomas P., Friday 9:15 AM - Herpetology  
 Wilson, Thomas P., Friday 11:15 AM - Herpetology  
 Wilson, Thomas P., 124, Thursday - Scholarship of Teaching & Learning poster session  
 Wilson, Thomas P., 123, Thursday - Scholarship of Teaching & Learning poster session  
 Wilson, Thomas P., Thursday 10:15 AM - Herpetology  
 Windham, Michael D, Thursday 3:45 PM - Plant Systematics  
 Winkler, David W., Thursday 2:00 PM - Animal Behavior & Conservation  
 Winsett, Katie, 165, Friday - Genetics - Cell & Molecular Biology poster session  
 Winstead, Joe E, Friday 1:30 PM - SABS Symposium  
 Wise, Jonathan D, 76, Thursday - Genetics - Cell & Molecular Biology poster session

Witcher, Todd P, Thursday 3:00 PM - Community Ecology  
 Wood, Zachary Harrison, 190, Friday - Microbiology poster session  
 Woods, Michael, 13, Thursday - Plant Sciences poster session  
 Wooten, Jessica A, 174, Friday - Herpetology poster session  
 Worthen, Wade, 177, Friday - Herpetology poster session  
 Wright, Daniel, Thursday 2:30 PM - Animal Behavior & Conservation  
 Wright, Raymond C, Thursday 9:00 AM - Herpetology

**X-Y**

Xhang, Li, 75, Thursday - Genetics - Cell & Molecular Biology poster session  
 Yatskievych, George, Thursday 3:45 PM - Plant Systematics  
 Yeiser, John M, 102, Thursday - Herpetology poster session  
 Young, Chelsea, 26, Thursday - Ecology poster session  
 Young, Rebekah, Friday 8:30 AM - Microbiology  
 Youssef, Mina Amir, 185, Friday - Microbiology poster session  
 Yu, Liang, Thursday 11:00 AM - Genetics - Cell & Molecular Biology

**Z**

Zaczek, Nick, Friday 9:00 AM - Community & Population Ecology  
 Zenzal, Theodore J, 5, Thursday - Animal Behavior poster session  
 Zhang, Lubo, 161, Friday - Genetics - Cell & Molecular Biology poster session  
 Zhu, Limin, Thursday 11:45 AM - Genetics - Cell & Molecular Biology  
 Zolj, Sanda, Thursday 9:00 AM - Genetics - Cell & Molecular Biology  
 Zomlefer, Wendy B., Friday 9:45 AM - Plant Sciences



## 2011 Annual Meeting, Huntsville, AL

Abstracts available at

<http://alabamaacademyofscience.org/asb/program.php>

### PAPER SESSIONS

**Thursday, April 14<sup>th</sup>**

Session Chair:

Room:

**Ecosystem & Disturbance Ecology**

Nicole Turrill Welch

North Hall Salon 3

- 8:30 **Timothy G. Whitby<sup>1</sup>** and Michael D. Madritch<sup>1</sup>. *Carbon loss from soils from multiple elevation gradients under simulated climate change.* Appalachian State University<sup>1</sup>
- 8:45 **Santosh K. Ojha<sup>1</sup>**, Luben D. Dimov<sup>1</sup> and Callie J. Schweitzer<sup>2</sup>. *The effects of partial harvest on growth, biomass and carbon stocks of hardwood forests in Southern Cumberland Plateau: a synthesis.* Department of Natural Resources and Environmental Sciences, Alabama A and M University<sup>1</sup> USDA Forest Service, Southern Research Station<sup>2</sup>
- 9:00 **John W. Furniss<sup>1</sup>**. *Atmospheric pollution and tree core chemistry in high-elevation forests of Great Smoky Mountains National Park.* Elon University<sup>1</sup>
- 9:15 **CANCELLED - Clinton S. Major<sup>1</sup>**, Steve R. Dudgeon<sup>2</sup>, Janet E. Kübler<sup>2</sup> and Kelly M. Major<sup>1</sup>. ~~*Effects of Chronic Anthropogenic Disturbance and Oil Spill Contaminant Exposure on Aquatic Plant Communities of the Mobile-Tensaw Delta.*~~ University of South Alabama<sup>1</sup> California State University<sup>2</sup>
- 9:30 **Daniel A. Douglas<sup>1</sup>**, David R. Brown<sup>1</sup> and Neil Pederson<sup>2</sup>. *Land snail species diversity and composition among different forest disturbance regimes in Central and Eastern Kentucky Forests.* Eastern Kentucky University<sup>1</sup> Lamont-Doherty Earth Observatory, Columbia University<sup>2</sup>
- 9:45 **Rachel MacTavish<sup>1</sup>**, Viet Nguyen<sup>1</sup> and Troy Mutchler<sup>1</sup>. *Interactive Effects of Grazing and Nutrient Enrichment on Seagrass (*Thalassia testudinum*) Condition.* Kennesaw State University<sup>1</sup>
- 10:00 **Benjamin Meadows<sup>1</sup>**, Rita M. Fincher<sup>1</sup> and Larry J. Davenport<sup>1</sup>. *Changes in deer browsing pressure on understory plants at Oak Mountain State Park.* Samford University<sup>1</sup>
- 10:15 **CONFERENCE BREAK**
- 10:30 **Luben D. Dimov<sup>1</sup>**, Dana A. Virone<sup>1</sup> and Callie J. Schweitzer<sup>2</sup>. *Effect of silvicultural treatments on the ground layer vegetation in pine-hardwood stands in North Alabama.* Alabama A&M University<sup>1</sup> USDA Forest Service<sup>2</sup>

- 10:45 **Jeanette R. Williams**<sup>1</sup>, Dr. Luben Dimov<sup>1</sup>, Dr. Robert Lawton<sup>2</sup>, Dr. Kozma Naka<sup>1</sup> and Dr. Yong Wang<sup>1</sup>. *Effect of High-Intensity Directed Fire in Different Seasons on Survival of Three Invasive Species: Paulownia tomentosa (royal paulownia), Ligustrum sinense (Chinese privet), and Lonicera spp (honeysuckle)*. Alabama A&M University<sup>1</sup> University of Alabama in Huntsville<sup>2</sup>
- 11:00 **Angelia R. Campbell**<sup>1</sup>, Catherine O. Stone<sup>1</sup>, Nadia M. Shamsedin<sup>1</sup> and A J. Pollard<sup>1</sup>. *Nickel hyperaccumulation in Psychotria grandis (Rubiaceae) from serpentine soils in Puerto Rico*. Furman University<sup>1</sup>
- 11:15 **Steve Padgett-Vasquez**<sup>1</sup>, Joshua Harden<sup>1</sup>, Joseph Olson<sup>1</sup>, Connor Whitley<sup>1</sup>, Jin Huang<sup>1</sup>, Donna Burnett<sup>1</sup> and Jeff Luvall<sup>1</sup>. *Characterization of Tick-borne Disease Risk in Alabama using NASA Earth Observation Systems*. NASA DEVELOP Marshall Space Flight Center/University of Alabama at Birmingham<sup>1</sup>
- 11:30 **Alexia L. Callihan**<sup>1</sup> and Allen C. Risk<sup>1</sup>. *Biodiversity surrogacy: Employing vascular plants as indicators for bryophyte richness at different spatial scales in Spaws Creek Gorge, Menifee County, Kentucky*. Morehead State University<sup>1</sup>
- 11:45 **William E. Ensign**<sup>1</sup>. *Ordination of fish communities using IBI metrics*. Kennesaw State University<sup>1</sup>

**Thursday, April 14<sup>th</sup>****Evolutionary Biology**

Session Chair:

Randall Terry

Room:

North Hall Salon 1a

- 8:30 **CANCELLED – John Gibbons et al.**, ~~*Evidence for structure and variable recombination rates among populations of the opportunistic human pathogen Aspergillus fumigatus.*~~
- 8:45 **Dipaloke Mukherjee**<sup>1</sup> and Walter J. Diehl<sup>1</sup>. *Natural Selection in Protein-Coding Genes Common to Species of Mycoplasmatales*. Mississippi State University<sup>1</sup>
- 9:00 **Cassidy Cobbs**<sup>1</sup> and Patrick Abbot<sup>1</sup>. *Characterization of the primary symbiont in Hoplopleura (Anoplura: Hoplopleuridae): support for polyphyletic origins*. Vanderbilt University<sup>1</sup>
- 9:15 **Darah Newell**<sup>1</sup> and Ashley B. Morris<sup>1</sup>. *Clonal structure in Illicium parviflorum as detected by ISSR markers*. University of South Alabama<sup>1</sup>
- 9:30 **CANCELLED – Leonidas Salichos**. ~~*A genome scale comparison of 4-graph based ortholog prediction algorithms in a yeast model clade.*~~

- 9:45 **Sarah P. Lawson**<sup>1</sup> and Patrick Abbot<sup>1</sup>. *Social immunity and the effects of conflict in a eusocial community*. Vanderbilt University<sup>1</sup>
- 10:00 **Shawn E. Krosnick**<sup>1</sup>. *What is a nectary? Passiflora as a model system for studying nectary evolution*. Southern Arkansas University<sup>1</sup>
- 10:15 **CONFERENCE BREAK**
- 10:30 **Jia W. Pan**<sup>1</sup> and David G. Haskell<sup>1</sup>. *Phylogeography of the land snail genus *Anguispira**. University of the South<sup>1</sup>
- 10:45 **Jennifer R. Mandel**<sup>1</sup>, Jennifer M. Dechine<sup>1</sup>, Laura F. Marek<sup>2</sup> and John M. Burke<sup>1</sup>. *Genetic diversity of the cultivated sunflower germplasm*. University of Georgia<sup>1</sup> Iowa State University<sup>2</sup>
- 11:00 **Aala A. Abulfaraj**<sup>1</sup>, Neil Billington<sup>1</sup>, Sirisha Bethala<sup>1</sup> and Janet Gaston<sup>1</sup>. *Use of allozyme markers to detect genetic heterogeneity in sauger populations*. Troy University<sup>1</sup>
- 11:15 **CANCELLED** – Ashley N. Egan<sup>1</sup> and Keith A. Crandall<sup>2</sup>. ~~*The Population History and Conservation Genetics of *Pediomelum pariense*, a Rare Plant Endemic to Utah (Leguminosae)*~~
- 11:30 **Randall G. Terry**<sup>1</sup>. *Phylogenetic relationships among the New World cypresses (*Hesperocyparis*: Cupressaceae): Evidence from chloroplast DNA sequences*. Lamar University<sup>1</sup>
- 11:45 **Jimmy K. Triplett**<sup>1</sup>, Jun Wen<sup>2</sup>, Lynn G. Clark<sup>3</sup>, Paul M. Peterson<sup>2</sup> and De-Zhu Li<sup>4</sup>. *Hybridization, polyploidy, and taxonomic confusion: lessons from the temperate bamboos*. Jacksonville State University, Smithsonian Institution National Museum Of Natural History, Iowa State University, Kunming Institute of Botany, Chinese Academy of Sciences, Key Laboratory of Biodiversity and Biogeography.

**Thursday, April 14<sup>th</sup>****Floristics**

Session Chair:

Ron Jones

Room:

North Hall Salon 1b

- 8:30 **Matt S. Bruton**<sup>1</sup> and Dwayne Estes<sup>1</sup>. *THE VASCULAR FLORA OF THE CLARKS RIVER NATIONAL WILDLIFE REFUGE, MARSHALL, MCCRACKEN, AND GRAVES COUNTIES, KENTUCKY*. Austin Peay State University<sup>1</sup>
- 8:45 **Courtney E. Gorman**<sup>1</sup>, Matt S. Bruton<sup>1</sup> and L. D. Estes<sup>1</sup>. *The status of *Elaeagnus multiflora* (Elaeagnaceae), a potentially invasive Asiatic shrub, in Tennessee*. Austin Peay State University<sup>1</sup>

- 9:00 **Erin A. Tripp**<sup>1</sup> and James C. Lendemer<sup>2</sup>. *How known is well-known? Progress in lichenology in Great Smoky Mountains National Park.* Rancho Santa Ana Botanic Garden<sup>1</sup> The New York Botanical Garden<sup>2</sup>
- 9:15 **Joseph C. Moosbrugger**<sup>1</sup>. *An Annotated Flora of Crane Hollow Preserve, Hocking County, Ohio.* Ohio University<sup>1</sup>
- 9:30 **L. D. Estes**<sup>1</sup>, Todd Crabtree<sup>2</sup> and Joey Shaw<sup>3</sup>. *Recent additions and noteworthy vascular plant records from Tennessee.* Austin Peay State University<sup>1</sup> Tennessee Natural Heritage Program<sup>2</sup> University of Tennessee at Chattanooga<sup>3</sup>
- 9:45 **Emily R. Blyveis**<sup>1</sup> and Joey Shaw<sup>1</sup>. *The Vascular Flora of the Tennessee River Gorge, Hamilton and Marion counties, Tennessee.* University of Tennessee at Chattanooga<sup>1</sup>
- 10:00 **Andrew P. Jenkins**<sup>1</sup> and Zack E. Murrell<sup>1</sup>. *Vascular Flora of Three Top Mountain Game Land Preserve, Ashe County, North Carolina.* Appalachian State University<sup>1</sup>
- 10:15 **CONFERENCE BREAK**
- 10:30 **Rachel K. Clark**<sup>1</sup>, Alexander Krings<sup>1</sup>, Jon M. Stucky<sup>1</sup> and H. J. Kleiss<sup>1</sup>. *Vascular Flora of Kitty Hawk Woods (Dare County, North Carolina).* North Carolina State University<sup>1</sup>
- 10:45 **Kelly M. Hines**<sup>1</sup>. *Manual of the Vascular Flora of Howell Woods.* North Carolina State University<sup>1</sup>
- 11:00 **Sunny Hart**<sup>1</sup>, Emily Blyveis<sup>1</sup>, Matt Bruton<sup>2</sup>, Clea Klagstad<sup>2</sup>, Nathan Parker<sup>2</sup>, Dwayne Estes<sup>2</sup> and Joey Shaw<sup>1</sup>. *AN IN-PROGRESS FLORISTIC SURVEY OF THE OCOEE RIVER GORGE, POLK CO., TN.* The University of Tennessee at Chattanooga<sup>1</sup> Austin Peay State University<sup>2</sup>
- 11:15 **Sarah M. Noble**<sup>1</sup> and Steven Carey<sup>1</sup>. *Initial floristic survey of bryophytes found in and around the mouths of limestone caves in south Alabama.* University of Mobile<sup>1</sup>
- 11:30 **Bruce A. Sorrie**<sup>1</sup>. *Realignments in Amsonia of the Southeastern United States.* University of North Carolina Herbarium<sup>1</sup>
- 11:45 **ADDED** - Eric E. Lamont<sup>1</sup> and **Richard Stalter**<sup>2</sup>. *Historical and extant rare, protected, and noteworthy plants of Plum Island, New York.* New York Botanic Garden<sup>1</sup> St. Johns University<sup>2</sup>

**Thursday, April 14<sup>th</sup>**

Session Chair:

Room:

**Genetics – Cell & Molecular Biology**

Emily Gillespie

North Hall Salon 2

- 8:30 **CANCELLED - Jessica E. Nash<sup>1</sup>** and Chris Otto<sup>1</sup>. ~~*Bacterial Diversity of an Indian Creek sample as revealed through 16S rRNA Sequencing.*~~ Athens State University<sup>4</sup>
- 8:45 **Sharen C. Kemp<sup>1</sup>**, Michael Pisani<sup>2</sup> and Joann M. Lau<sup>1</sup>. *Analysis of genetic polymorphisms in the Vitamin-D receptor gene in persons with disc herniation in the Caucasian population.* Bellarmine University<sup>1</sup> American Chiropractic<sup>2</sup>
- 9:00 **T'shura S. Ali<sup>1</sup>**, Melissa D. Pawley<sup>1</sup>, Sanda Zolj<sup>1</sup> and Joann M. Lau<sup>1</sup>. *The anti-cancerous effects of Reishi mushroom on lung cancer proliferation in the female cell line H1793.* Bellarmine University<sup>1</sup>
- 9:15 **CANCELLED – Wei Ren<sup>1</sup>** and Stephen J. Beebe<sup>2</sup>. ~~*Nanosecond Pulsed Electric Fields Induce Apoptosis in Jurkat cells through the Intrinsic Pathway.*~~
- 9:30 **Jennell M. Talley<sup>1</sup>**, Diane C. DeZwaan<sup>2</sup>, Leslie D. Maness<sup>1</sup>, Brian C. Freeman<sup>2</sup> and Katherine L. Friedman<sup>1</sup>. *The Est3 Subunit of Yeast Telomerase Interacts Directly with the Catalytic Subunit and Stimulates Telomerase Activity in vitro.* Vanderbilt University<sup>1</sup> University of Illinois<sup>2</sup>
- 9:45 **Kelsey S. Penland<sup>1</sup>**. *PCR mediated, site-directed mutagenesis of the FMN riboswitch of Photorhabdus luminescens and the effect on symbiosis with Caenorhabditis elegans.* Guilford College<sup>1</sup>
- 10:00 **Courtney M. Gardner<sup>1</sup>**, Cynthia Bennington<sup>1</sup> and Alicia Schultheis<sup>1</sup>. *Evaluation and characterization of polymorphic microsatellite loci for paternity analysis in Passiflora incarnata.* Stetson University<sup>1</sup>
- 10:15 **CONFERENCE BREAK**
- 10:30 **Leland J. Cseke<sup>1</sup>** and Sharon M. Talley<sup>2</sup>. *Educational Outreach for the Molecular Identification of Invasive Plants.* The University of Alabama in Huntsville<sup>1</sup>, USDA/APHIS, Fort Collins, CO<sup>2</sup>
- 10:45 **CANCELLED - Laramie Lemon<sup>1</sup>** and Francene J. Lemoine<sup>1</sup>. ~~*Characterization of Chromosome Fragile Sites in Yeast.*~~ Northwestern State University<sup>4</sup>
- 11:00 **Liang Yu<sup>1</sup>** and Hueiwang A. Jeng<sup>1</sup>. *Polycyclic Aromatic Hydrocarbons Induced Lipid Peroxidation in Relation to Lipid Alterations in Human Vascular Cells.* Old Dominion University<sup>1</sup>
- 11:15 **Indrani Dey<sup>1</sup>** and Christi Magrath<sup>1</sup>. *Induction of filamentous growth in yeast deletion strains.* Troy University<sup>1</sup>

- 11:30 **Emily L. Gillespie**<sup>1</sup> and Erik C. Johnson<sup>1</sup>. *Chimeric G-protein coupled receptors: Probing the structural-functional relationships of signaling pathways*. Wake Forest University<sup>1</sup>
- 11:45 **Wanda T. Schroeder**<sup>1</sup>, Limin Zhu<sup>1</sup>, Chistiana Baloesu<sup>1</sup> and Yo-Leigh Gardner<sup>1</sup>. *Transglutaminase 1 and Involucrin Are Expressed in Mouse Vaginal Epithelial Cells in Response to Estrogen*. Wesleyan College<sup>1</sup>

**Thursday, April 14<sup>th</sup>****Herpetology**

Session Chair:

Michael Dorcas

Room:

North Hall Salon 10

- 8:30 **Evan A. Eskew**<sup>1</sup>, Steven J. Price<sup>1</sup> and Michael E. Dorcas<sup>1</sup>. *Effects of Flow Regulation on Anuran Occupancy and Abundance in Riparian Zones*. Davidson College<sup>1</sup>
- 8:45 **Andrew W. Cantrell**<sup>1</sup>, Yong Wang<sup>1</sup>, Callie Schweitzer<sup>2</sup> and Cathryn Greenberg<sup>2</sup>. *Oak-Regenerating Silvicultural Treatments Impact on Herpetofauna on the Mid-Cumberland Plateau of Southern Tennessee*. Alabama A&M University<sup>1</sup> USDA Forest Service Southern Research Station<sup>2</sup>
- 9:00 **Patrick W. Cusaac**<sup>1</sup>, Raymond C. Wright<sup>1</sup> and Frank C. Bailey<sup>1</sup>. *Effects of Maternally Transferred Methylmercury Chloride on Stress Induced Corticosterone Levels in *Nerodia sipedon* Neonates*. Middle Tennessee State University<sup>1</sup>
- 9:15 **Thomas K. Pauley**<sup>1</sup>. *Forty-four years of herping in West Virginia*. Marshall University<sup>1</sup>
- 9:30 **Michael A. Anderson**<sup>1</sup> and Brain T. Miller<sup>1</sup>. *Iron Deposition in First-Generation Teeth of the Streamside Salamander, *Ambystoma barbouri**. Middle Tennessee State University<sup>1</sup>
- 9:45 **Brett A. Macek**<sup>1</sup>. *Preliminary analysis of call activity at an ephemeral pond in NE Alabama*. Jacksonville State University<sup>1</sup>
- 10:00 **Joseph F. Simpson, III**<sup>1</sup> and Thomas P. Wilson<sup>1</sup>. *Assessment of an Amphibian Community from a Fragmented Landscape: Prospects for the Future*. University of Tennessee at Chattanooga<sup>1</sup>
- 10:15 **CONFERENCE BREAK**
- 10:30 **Shawna M. Foley**<sup>1</sup>, Steven J. Price<sup>1</sup> and Michael E. Dorcas<sup>1</sup>. *Nest-site Selection and Nest Depredation of Semi-aquatic Turtles on Golf Courses*. Davidson College<sup>1</sup>
- 10:45 **CANCELLED – Peter King**<sup>1</sup> and John Ludlam<sup>1</sup>. ~~*Population Status of Diamondback Terrapins (*Malaclemys terrapin*) in North Inlet Winyah Bay NERR, South Carolina*~~

- 11:00 **Nathan A. Shepard**<sup>1</sup>, Jayme L. Waldron<sup>2</sup>, Catherine M. Johnson<sup>3</sup> and Thomas K. Pauley<sup>1</sup>. *Survivorship of Lungless Salamanders in Association with Edge Effects from Linear Fragmentation*. Marshall University<sup>1</sup> University of South Carolina<sup>2</sup> United States Forest Service - Monongahela National Forest<sup>3</sup>
- 11:15 **Jerrod D. Shipman**<sup>1</sup> and Vince A. Cobb<sup>2</sup>. *Thermal Ecology of Hibernation in *Nerodia sipedon**. Middle Tennessee State University<sup>1</sup> Middle Tennessee State University<sup>2</sup>
- 11:30 **Howard J. Stanton**<sup>1</sup>, Mizuki K. Takahashi<sup>2</sup> and Thomas K. Pauley<sup>1</sup>. *Examining the evolutionary influence of male-male competition on testes size in salamanders*. Marshall University<sup>1</sup> Bucknell University<sup>2</sup>
- 11:45 **Ryan Seddon**<sup>1</sup> and Matthew Klukowski<sup>1</sup>. *The effects of acute stress on corticosterone, leukocytes, and testosterone in male Southeastern Five-lined Skinks (*Plestiodon inexpectatus*)*. Middle Tennessee State University<sup>1</sup>

**Thursday, April 14<sup>th</sup>****Animal Behavior & Conservation**

Session Chair:

Diane Nelson

Room:

North Hall Salon 10

- 1:30 **Nicole L. Barrios**<sup>1</sup> and Lynn M. Siefferman<sup>1</sup>. *A Test of Parental Preferences for Offspring Sex and Ornamentation in Eastern Bluebirds (*Sialia sialis*)*. Appalachian State University<sup>1</sup>
- 1:45 **Shannon L. White**<sup>1</sup> and Charles Gowan<sup>1</sup>. *Brook trout use individual recognition and transitive inference to determine social rank*. Randolph-Macon College<sup>1</sup>
- 2:00 **Andrew J. Laughlin**<sup>1</sup>, Caz M. Taylor<sup>1</sup>, Daniel R. Sheldon<sup>2</sup> and David W. Winkler<sup>3</sup>. *Individual and roost movement of non-breeding Tree Swallows in an agricultural habitat*. Tulane University<sup>1</sup> Oregon State University<sup>2</sup> Cornell University<sup>3</sup>
- 2:15 **Lindsay Brotherton**<sup>1</sup>, Adam McGhee<sup>1</sup>, Karrie A. Fadroski<sup>1</sup> and Thomas A. Nelson<sup>1</sup>. *THE VALUE OF SMALL FOREST OPENINGS TO FORAGING BATS*. North Georgia University<sup>1</sup>
- 2:30 **Daniel Wright**<sup>1</sup> and Robert Carter<sup>1</sup>. *Population status of Bachman's sparrow in the Coleman Lake Region of the Talladega National Forest, AL*. Jacksonville State University<sup>1</sup>
- 2:45 **CONFERENCE BREAK**
- 3:00 **CANCELLED – Joseph D. Culin**<sup>1</sup>. ~~*Survey of Lepidoptera and Odonata in three Piedmont parks in SC and NC*~~. Clemson University<sup>1</sup>

- 3:15 **Keri L. Bryan**<sup>1</sup>, Margaret C. Shipley<sup>1</sup> and David Haskell<sup>1</sup>. *Effect of exurban development on land snail diversity and abundance in Sewanee, Tennessee*. University of the South<sup>1</sup>
- 3:30 **Zachary Loughman**<sup>1</sup> and Stuart Welsh<sup>2</sup>. *West Virginia Crayfishes: results to date from the second statewide census*. West Liberty University<sup>1</sup> US Geological Survey, West Virginia Cooperative Fish and Wildlife Research Unit, West Virginia University, West Virginia<sup>2</sup>
- 3:45 **Diane R. Nelson**<sup>1</sup> and Eugenie Clark<sup>2</sup>. *Swarming, diel movements, feeding, and cleaning behavior of juvenile venomous eeltail catfishes, *Plotosus lineatus* and *Plotosus japonicus* (Siluriformes: Plotosidae)*. East Tennessee State University<sup>1</sup> University of Maryland and Mote Marine Lab<sup>2</sup>
- 4:00 **Todd J. Weinkam**<sup>1</sup>, David R. Brown<sup>2</sup> and Gregg Janos<sup>2</sup>. *Winter weather influences foraging behaviors and habitat use of Eastern Bluebirds*. Eastern Kentucky University<sup>1</sup> Eastern Kentucky University<sup>2</sup>

**Thursday, April 14<sup>th</sup>****Community Ecology**

Session Chair:

Gary Walker

Room:

North Hall Salon 3

- 1:30 **Kimberly A. Israel**<sup>1</sup> and Robert Peet<sup>1</sup>. *Vegetation Change in a North Carolina Deciduous Forest, 1977-2010*. University of North Carolina, Chapel Hill<sup>1</sup>
- 1:45 **Lora L. Sigmon**<sup>1</sup> and David Vandermaast<sup>1</sup>. *Composition and structure of mature second growth riparian forests along the Haw River in central North Carolina*. Elon University<sup>1</sup>
- 2:00 **Julie E. Barker**<sup>1</sup>, James O. Luken<sup>1</sup> and John J. Hutchens<sup>1</sup>. *WATER HYACINTH ROOTS: WHO'S HANGING OUT IN THEM AND WHY?* Coastal Carolina University<sup>1</sup>
- 2:15 **Gary L. Walker**<sup>1</sup>, Mike Madritch<sup>1</sup> and Derick B. Poindexter<sup>1</sup>. *A Biological Survey of the Bull Bluff Cliff System at Oak Ridge, Tennessee*. Appalachian State University<sup>1</sup>
- 2:30 **Jamie A. Duberstein**<sup>1</sup> and William H. Conner<sup>2</sup>. *Freshwater tidal swamp communities of the southeastern United States*. Clemson University<sup>1</sup> Baruch Institute, Clemson University<sup>2</sup>
- 2:45 **CONFERENCE BREAK**
- 3:00 **Todd P. Witcher**<sup>1</sup>. *Great Smoky Mountains All Taxa Biodiversity Inventory*. Discover Life in America<sup>1</sup>

- 3:15 **Nathan A. Daniel**<sup>1</sup>, James M. Dyer<sup>1</sup> and Brian C. McCarthy<sup>1</sup>. *American chestnut restoration in eastern hemlock-dominated forests of southeast Ohio*. Ohio University<sup>1</sup>
- 3:30 **Alex T. Fotis**<sup>1</sup> and Joydeep Bhattacharjee<sup>1</sup>. *Living on the edge: trees promoting optimal conditions for woody seedling performance*. The University of Louisiana at Monroe<sup>1</sup>
- 3:45 **Conrad K. Blunck**<sup>1</sup> and Scot Duncan<sup>1</sup>. *Slope-dependent Longleaf Pine (*Pinus palustris*) Mortality During the Reintroduction of Fire in a Montane Ecosystem*. Birmingham-Southern College<sup>1</sup>
- 4:00 **Keith E. Gilland**<sup>1</sup> and Brian C. McCarthy<sup>1</sup>. *Effects of microsite and distance to forest edge on initial colonization of reclaimed mine lands in eastern Ohio*. Ohio University<sup>1</sup>
- 4:15 **Stephen J. Murphy**<sup>1</sup> and Brian C. McCarthy<sup>1</sup>. *The Effects of Slope Aspect on the Spatial Patterning of a Mixed Mesophytic Old-growth Forest*. Ohio University<sup>1</sup>

**Thursday, April 14<sup>th</sup>****Plant Systematics**

Session Chair:

Alexander Krings

Room:

North Hall Salon 1b

- 1:30 **CANCELLED - Tracey S. Lavezzi**<sup>1</sup>, Sharon M. Talley<sup>2</sup> and Leland J. Cseke<sup>1</sup>. ~~*Widespread Ornamental Cultivar Reverts to One of the World's Worst Weeds: The Reversion of Japanese Blood Grass to Cogongrass*~~. The University of Alabama in Huntsville,<sup>1</sup> USDA/APHIS, Fort Collins, CO<sup>2</sup>
- 1:45 **L. D. Estes**<sup>1</sup> and Randall L. Small<sup>2</sup>. *Systematics of *Sophronanthe* (Plantaginaceae; Tribe Gratioleae)*. Austin Peay State University<sup>1</sup> University of Tennessee<sup>2</sup>
- 2:00 **T. L. Mellichamp**<sup>1</sup>. *The *Sarracenia rubra* complex - biological and taxonomic lessons*. Biology & Gardens - UNC Charlotte<sup>1</sup>
- 2:15 **Julia K. Stutzman**<sup>1</sup> and Conley K. McMullen<sup>1</sup>. *Update on a taxonomic revision of the endemic members of *Cordia* L. (Boraginaceae) in the Galapagos Islands*. James Madison University<sup>1</sup>
- 2:30 **Raymond O. Flagg**<sup>1</sup> and Gerald L. Smith<sup>2</sup>. *Considerations on sessile to shortly pedicellate Mexican *Zephyranthes* (Amaryllidaceae) taxa with diverging anthers*. Carolina Biological Supply Co.<sup>1</sup> High Point University<sup>2</sup>
- 2:45 **CONFERENCE BREAK**
- 3:00 **Alexander Krings**<sup>1</sup>. *Taxonomy of *Cephalanthus* (Rubiaceae) in North America*. North Carolina State University<sup>1</sup>

- 3:15 **Alexander Krings**<sup>1</sup>. *Revision of Gonolobus and Matelea s.l. (Apocynaceae, Asclepiadoideae, Gonolobinae) in the West Indies.* North Carolina State University<sup>1</sup>
- 3:30 **Roland P. Roberts**<sup>1</sup>, Natalia Ceaicovscaia<sup>1</sup>, Kemardo Henry<sup>1</sup> and GAGANPREET Singh<sup>1</sup>. *The position and relationships of Lorandersonia within Solidagininae.* Towson University<sup>1</sup>
- 3:45 **Eric Schuettpelz**<sup>1</sup>, Amanda L. Grusz<sup>2</sup>, Layne Huiet<sup>2</sup>, Kathleen M. Pryer<sup>2</sup>, Michael D. Windham<sup>2</sup> and George Yatskievych<sup>3</sup>. *Biogeographic analyses reveal low levels of intercontinental dispersal in xeric-adapted ferns.* University of North Carolina Wilmington<sup>1</sup> Duke University<sup>2</sup> Missouri Botanical Garden<sup>3</sup>
- 4:00 **Emily L. Gillespie**<sup>1</sup>, E. A. Powell<sup>2</sup>, Elaine Durscholz<sup>2</sup> and Mallory Williams<sup>2</sup>. *An Updated Phylogeny and Biogeographic Analysis of the North American Blueberries (Vaccinium, Ericaceae).* Wake Forest University<sup>1</sup> University of Evansville<sup>2</sup>

**Thursday, April 14<sup>th</sup>****Scholarship of Teaching & Learning**

Session Chair:

Jennifer Davis

Room:

North Hall Salon 1a

- 1:30 **Howard S. Neufeld**<sup>1</sup>. *Myths Surrounding Darwinian Evolution and the Creation/Evolution Debates: Using History to Improve Our Understanding of Evolution.* Appalachian State University<sup>1</sup>
- 1:45 **David A. Eakin**<sup>1</sup>. *Advantages of Reversing Information Flow in Biology Labs and Lectures.* Eastern Kentucky University<sup>1</sup>
- 2:00 **Roger A. Sauterer**<sup>1</sup>. *Integration of astrobiology concepts across the life sciences curriculum.* Jacksonville State University<sup>1</sup>
- 2:15 **Beasley W. Rodney**<sup>1</sup> and Schmitz Darrel<sup>1</sup>. *An Experimental Exercise Used to Determine if Mississippi's Science Framework is Adequately Preparing High School Graduates to Make Informed Decisions About Ground Water.* Mississippi State University<sup>1</sup>
- 2:30 **Nicole T. Welch**<sup>1</sup> and Charlene D'Avanzo<sup>2</sup>. *Faculty comments on using diagnostic assessment and active teaching to transform biology courses.* Mississippi University for Women<sup>1</sup> Hampshire College<sup>2</sup>
- 2:45 **CONFERENCE BREAK**
- 3:00 **Ellen W. McLaughlin**<sup>1</sup>, Carol Ogle<sup>1</sup> and Suzanne Montgomery<sup>1</sup>. *Nature Education for Adults: Role of Biology Departments and University Continuing Education Programs.* Samford University<sup>1</sup>

- 3:15 **Jennifer J. Davis**<sup>1</sup>. *A General Biology Class Project: Costs and Consequences of the Chernobyl Nuclear Reactor Disaster (1986) and the Gulf BP Oil Spill (2010)*. Shorter University<sup>1</sup>
- 3:30 **Kefyn M. Catley**<sup>1</sup>. *College student challenges in acquiring 'tree-thinking' skills*. Western Carolina University<sup>1</sup>

**Friday, April 15<sup>th</sup>****Aquatic Ecology & Invasive Species**

Session Chair:

Lori Tolley-Jordan

Room:

North Hall Salon 1b

- 8:30 **Harry A. Meyer**<sup>1</sup> and Megan N. Domingue<sup>1</sup>. *New Species of Water Bear (Phylum Tardigrada) from the Gulf Coast States*. McNeese State University<sup>1</sup>
- 8:45 **Susan M. Sewell**<sup>1</sup>, Mark Meade<sup>2</sup> and Frank Romano<sup>2</sup>. *Metabolic rates of an aquatic tardigrade, Dactylobiotus parthenogeneticus*. Gadsden State Community College<sup>1</sup> Jacksonville State University<sup>2</sup>
- 9:00 **Cailin R. Kellmann**<sup>1</sup> and Alicia S. Schultheis<sup>1</sup>. *The Effect of Diet and Temperature on Growth and Development of the Springsnail *Floridobia floridana**. Stetson University<sup>1</sup>
- 9:15 **CANCELLED – Celestine A. Che**<sup>1</sup>, Joseph Culin<sup>1</sup>, Williams R. English<sup>2</sup> and Jeremy W. Pike<sup>1</sup>. ~~*Assessing the Influence of Hemlock Mortality on Streams due to Hemlock Woolly Adelgid Infestation*~~.
- 9:30 **Erica R. Teasley**<sup>1</sup>, Deborah A. McGrath<sup>1</sup>, Vanaja R. Bodeddula<sup>2</sup>, Jeffrey Boles<sup>3</sup> and Ken C. Smith<sup>1</sup>. *Pharmaceuticals from wastewater in streams draining a forested watershed on the Cumberland Plateau*. University of the South<sup>1</sup> Tennessee Tech University<sup>2</sup> Tennessee Tech University<sup>3</sup>
- 9:45 **Lori R. Tolley-Jordan**<sup>1</sup> and Michael A. Chadwick<sup>2</sup>. *Zoogeography of the invasive snail, *Melanoides tuberculata* (Muller, 1774) and its concomitant trematode pathogen, *Centrocestus formosanus* (Nishigori, 1924)*. Jacksonville State University<sup>1</sup> Kings College, London<sup>2</sup>
- 10:00 **CONFERENCE BREAK**
- 10:15 **CANCELLED - L. D. Estes**<sup>1</sup>, Chris Fleming<sup>2</sup>, Angelina D. Fowler<sup>1</sup> and Nathan Parker<sup>1</sup>. ~~*THE DISTRIBUTION, ABUNDANCE, AND HABITAT COLONIZATION OF THE INVASIVE SUBMERSED MACROPHYTE, HYDRILLA VERTICILLATA, IN A HIGH GRADIENT RIVERINE SYSTEM*~~. Austin Peay State University<sup>1</sup> BDY Environmental Inc.<sup>2</sup>
- 10:30 **Kara E. Salpeter**<sup>1</sup> and David B. Vandermaast<sup>1</sup>. *Evidence for biotic resistance to invasion across spatial scales in riparian forest vegetation*. Elon University<sup>1</sup>

10:45 **Dawn Lemke**<sup>1</sup>, Jennifer Brown<sup>2</sup> and Yong Wang<sup>1</sup>. *Application of adaptive sampling with a generalized random tessellation stratified design: A case study of invasive plants at reclaimed mines on the Southern Cumberland Plateau.* Alabama A&M University<sup>1</sup> Canterbury University<sup>2</sup>

11:00 **Elizabeth L. Stapleton**<sup>1</sup>. *Edges and exotic plant distribution in a suburban forest fragment.* Guilford College<sup>1</sup>

**Friday, April 15<sup>th</sup>**

**Community & Population Ecology**

Session Chair:

Claudia Jolls

Room:

North Hall Salon 10

8:30 **Alexander K. Anning**<sup>1</sup>, Darrin L. Rubino<sup>2</sup>, Elaine K. Sutherland<sup>3</sup> and Brian C. McCarthy<sup>1</sup>. *Dendrochronological analysis of white oak growth patterns across a topographic moisture gradient in southern Ohio.* Ohio University<sup>1</sup> Hanover College<sup>2</sup> U.S.D.A. Forest Service, Rocky Mountain Research Station<sup>3</sup>

8:45 **Stephanie Matson**<sup>1</sup> and David Vandermast<sup>1</sup>. *Effect of experimental shading on a wintergreen plant: the crane-fly orchid (*Tipularia discolor*).* Elon University<sup>1</sup>

9:00 **Nick Zaczek**<sup>1</sup>, James Fralish<sup>1</sup> and Eric Holzmüller<sup>1</sup>. *Impact of balsam fir *Abies balsamea* on soil, herbaceous plants, and regeneration in northern Wisconsin forest types.* SIUC<sup>1</sup>

9:15 **CANCELLED – Adam C. McGhee**<sup>1</sup>, Dr. Tom A. Nelson<sup>1</sup> and Karrie Ann Fadroski<sup>1</sup>. ~~*The effects of canopy cover, plant composition and riparian proximity on insect diversity.*~~ ~~North Georgia College & State University<sup>1</sup>~~

9:30 **Claudia L. Jolls**<sup>1</sup>, Julie E. Marik<sup>1</sup>, Kayri Havens<sup>2</sup>, Jeremie B. Fant<sup>2</sup>, Pati Vitt<sup>2</sup>, A. K. McEachern<sup>3</sup>, Noel B. Pavlovic<sup>4</sup>, Timothy J. Bell<sup>5</sup> and Marlin L. Bowles<sup>6</sup>. *Persistence of *Cirsium pitcher*, *Pitcher's thistle*, rare sand dune endemic of the upper Great Lakes.* East Carolina University, Greenville, NC<sup>1</sup> Chicago Botanic Garden, Glencoe, IL<sup>2</sup> US Geologic Survey, Western Ecological Research Center, Ventura, CA<sup>3</sup> US Geological Survey, Great Lakes Science Center, Porter, IN<sup>4</sup> Chicago State University, Chicago, IL<sup>5</sup> Morton Arboretum, Lisle, IL<sup>6</sup>

9:45 **Clint T. Patterson**<sup>1</sup> and Luben D. Dimov<sup>1</sup>. *Effect of Overstory Density and Fertilizer Supplement on American Chestnut Seedlings.* Alabama A&M University<sup>1</sup>

10:00 **CONFERENCE BREAK**

- 10:15 **Diana M. Neal**<sup>1</sup>, Brian S. Baldwin<sup>1</sup> and Gary N. Ervin<sup>1</sup>. *Growth responses and biomass allocation of rivercane (Arundinaria gigantea) across a gradient of light conditions*. Mississippi State University<sup>1</sup>
- 10:30 **H M. Kile**<sup>1</sup>, Joey Shaw<sup>1</sup> and Jennifer N. Boyd<sup>1</sup>. *The effects of canopy thinning and burning on transplantation of federally threatened Scutellaria montana Chapm. (Lamiaceae, large-flowered skullcap) in a southeastern deciduous forest*. University of Tennessee at Chattanooga<sup>1</sup>

**Friday, April 15<sup>th</sup>****Herpetology**

Session Chair:

Thomas Pauley

Room:

North Hall Salon 1a

- 8:30 **Nathalie C. Aall**<sup>1</sup> and Thomas K. Pauley<sup>1</sup>. *Influence of abiotic and biotic factors on movement and microhabitat selection in Terrapene c. carolina (Eastern Box Turtle)*. Marshall University<sup>1</sup>
- 8:45 **Nicholas S. Forman**<sup>1</sup> and Lynn Moseley<sup>1</sup>. *A Survey of Salamander Populations and Their Micro and Macro Habitat Affinities in Urban Piedmont North Carolina*. Guilford College<sup>1</sup>
- 9:00 ~~**CANCELLED – Jonathan A. Akin**<sup>1</sup>. *Effect of Caudal Automy on Locomotor Performance in the Ground Skink*. Northwestern State University of Louisiana<sup>4</sup>~~
- 9:15 **Daniel S. Armstrong**<sup>1</sup> and Thomas P. Wilson<sup>1</sup>. *Population genetics of an isolated spotted salamander population in southeastern Tennessee*. University of Tennessee at Chattanooga<sup>1</sup>
- 9:30 **Elliott Diggs**<sup>1</sup>, Timothy Curran<sup>2</sup> and Alastair Freeman<sup>3</sup>. *Examining Population Structure in Two Species of Australian Freshwater Turtles in the North Johnstone River, Queensland*. Guilford College<sup>1</sup> The School for Field Studies<sup>2</sup> Queensland Parks and Wildlife Services<sup>3</sup>
- 9:45 **Timothy E. Baldwin**<sup>1</sup> and Yong Wang<sup>1</sup>. *Survivorship and the Influence of Varying Spatial Environmental Factors on Spotted Salamander, Ambystoma maculatum, Egg Masses in Northern Alabama*. Alabama A&M University<sup>1</sup>
- 10:00 **CONFERENCE BREAK**
- 10:15 **Matthew Klukowski**<sup>1</sup>. *Influence of reproductive state on plasma corticosterone levels in free-living female fence lizards (Sceloporus undulatus)*. Middle Tennessee State University<sup>1</sup>
- 10:30 **Glenn A. Marvin**<sup>1</sup> and Amanda G. Shelton<sup>1</sup>. *Critical Tail Autotomy for Reduction of Maximal Swimming Performance in a Desmognathine Salamander*. University of North Alabama<sup>1</sup>

- 10:45 **James R. Rayburn**<sup>1</sup>. *Reduction of Acrylamide induced developmental toxicity to Xenopus laevis embryos by selected antioxidants.* Jacksonville State University<sup>1</sup>
- 11:00 **Lindsey M. Minton**<sup>1</sup> and James Rayburn<sup>1</sup>. *Does natural pine leachate cause feminization in frogs?: Evaluation of aqueous extract of Virginia Pine (Pinus virginiana) by examining time to metamorphosis, and gross & histological gonadal structure of African Clawed Frogs (Xenopus laevis).* Jacksonville State University, Biology Department<sup>1</sup>
- 11:15 **Thomas P. Wilson**<sup>1</sup>. *Analysis of Green Infrastructure for Use in Regional Planning of Metacommunities with Applications for the Conservation of Amphibians and Reptiles.* University of Tennessee at Chattanooga<sup>1</sup>

**Friday, April 15<sup>th</sup>****Microbiology**

Session Chair:

Michael Bodri

Room:

North Hall Salon 4

- 8:30 **Jessica L. Arighi**<sup>1</sup>, Rebekah Young<sup>1</sup>, LaJoyce H. Debro<sup>1</sup> and Christopher A. Murdock<sup>1</sup>. *Finding Momo and Flo: The Isolation and Characterization of Mycobacteriophage.* Jacksonville State University<sup>1</sup>
- 8:45 **Nazia Mojib**<sup>1</sup>, Amin Farhoomand<sup>1</sup> and Asim K. Bej<sup>1</sup>. *Evidence for the role of purple violet pigment in ultraviolet (UV) radiation resistance in Janthinobacterium sp. Ant5-2 from East Antarctica.* University of Alabama at Birmingham<sup>1</sup>
- 9:00 **Jonathan P. Huang**<sup>1</sup>, Nazia Mojib<sup>1</sup>, Dale Andersen<sup>2</sup> and Asim K. Bej<sup>1</sup>. *Microbial diversity in calcified mats from a perennially ice covered Lake Joyce in McMurdo Dry Valley, Antarctica.* The University of Alabama at Birmingham<sup>1</sup> Carl Sagan Center for the Study of Life in the Universe (SETI Institute)<sup>2</sup>
- 9:15 **Steve McCauley**<sup>1</sup>, Kelly Funderburk<sup>2</sup>, Taylor Edwards<sup>1</sup>, Greg Lewis<sup>1</sup> and Min-Ken Liao<sup>1</sup>. *Impact of a poultry processing plant on the concentration of antibiotic-resistant bacteria in a stream in northwestern South Carolina.* Furman University<sup>1</sup> Princeton University<sup>2</sup>
- 9:30 **Richard Watkins**<sup>1</sup> and LaJoyce H. Debro<sup>1</sup>. *The Link Between cry26 and the Exosporium Enclosed Inclusion of Bacillus thuringiensis.* Jacksonville State University<sup>1</sup>
- 9:45 **Quyen T. Pham**<sup>1</sup>, Premila N. Achar<sup>1</sup> and MY Sreenivasa<sup>2</sup>. *Histopathological Changes Due to Essential Oils, Antifungal Agents, Against Aspergillus flavus in Peanuts.* Kennesaw State University<sup>1</sup>, Universtiy of Mysore<sup>2</sup>
- 10:00 **CONFERENCE BREAK**

- 10:15 **Carl Dischler**<sup>1</sup>, John Miller<sup>1</sup>, John Shaugnessey<sup>1</sup> and Michael Land Ph.D.<sup>1</sup>. *Staphylococcus aureus* incidence in a college locker room setting. Northwestern State University<sup>1</sup>
- 10:30 **Erika A. Scocco**<sup>1</sup> and James W. Buck<sup>2</sup>. *Puccinia pelargonii-zonalis* urediniospore production and dispersal within a greenhouse. Wingate University<sup>1</sup> University of Georgia<sup>2</sup>
- 10:45 **Matthew T. Purcell**<sup>1</sup> and Leos G. Kral<sup>1</sup>. *Can bacterial community structures act as indicators of environmental differentiation?* University of West Georgia<sup>1</sup>
- 11:00 **Michael S. Bodri**<sup>1</sup> and Anthony Glenn<sup>2</sup>. *Fungal Endophyte Diversity in Sarracenia*. North Georgia College & State University<sup>1</sup> USDA, ARS, Russell Research Center<sup>2</sup>

**Friday, April 15<sup>th</sup>****Plant Sciences**

Session Chair:

Wendy Zomlefer

Room:

North Hall Salon 2

- 8:30 **MOVED** – Eric E. Lamont<sup>1</sup> and **Richard Stalter**<sup>2</sup>. ~~*Historical and extant rare, protected, and noteworthy plants of Plum Island, New York.*~~ New York Botanic Garden<sup>1</sup> St. Johns University<sup>2</sup>
- 8:45 **Ronald L. Jones**<sup>1</sup> and Allen C. Risk<sup>2</sup>. *Woody plant survey along the main trail in a small nature sanctuary in southern Costa Rica*. Eastern Kentucky University<sup>1</sup> Morehead State University<sup>2</sup>
- 9:00 **Ronald L. Jones**<sup>1</sup> and Allen C. Risk<sup>2</sup>. *A survey of the available resources for woody plant identification in Costa Rica*. Eastern Kentucky University<sup>1</sup> Morehead State University<sup>2</sup>
- 9:15 **Allen C. Risk**<sup>1</sup> and Ronald L. Jones<sup>2</sup>. *A ground-based, preliminary inventory of the ferns of Los Cusingos Bird Sanctuary, Costa Rica*. Morehead State University<sup>1</sup> Eastern Kentucky University<sup>2</sup>
- 9:30 **Amelia Harris**<sup>1</sup> and P. Harris<sup>1</sup>. *A FLORAL SURVEY AND CASTANEA DENTATA (FAGACEAE, AMERICAN CHESTNUT) CENSUS AT BENDABOUT FARM, BRADLEY COUNTY, TENNESSEE*. The University of Tennessee at Chattanooga<sup>1</sup>
- 9:45 **Wendy B. Zomlefer**<sup>1</sup>, Jason Comer<sup>1</sup>, Alexandre M. Santos<sup>1</sup>, James Allison<sup>1</sup> and James H. Leebens-Mack<sup>1</sup>. *Genetic diversity of isolated populations of Veratrum woodii (Liliales: Melanthiaceae) in Georgia and Florida: A preliminary study with AFLP fingerprint data*. University of Georgia<sup>1</sup>
- 10:00 **CONFERENCE BREAK**

- 10:15 **Kree Cameron**<sup>1</sup> and Mac H. Alford<sup>1</sup>. *DNA Evidence for the Recognition of Several Species of Cudweeds (Gamochaeta, Compositae) in the Eastern United States*. University of Southern Mississippi<sup>1</sup>
- 10:30 **Jennifer Boyd**<sup>1</sup> and Joey Shaw<sup>1</sup>. *Successful relocation of federally threatened *Scutellaria montana* (Lamiaceae, large-flowered skullcap)*. University of Tennessee at Chattanooga<sup>1</sup>
- 10:45 **Lindsay D. Leverett**<sup>1</sup>, Claudia L. Jolls<sup>1</sup> and Julie E. Marik<sup>1</sup>. *INITIAL INVESTIGATIONS OF PACKERA TOMENTOSA (ASTERACEAE) SEED ECOLOGY: MASS VARIATION AND HETEROMORPHISM*. East Carolina University<sup>1</sup>
- 11:00 **Alexander D. Murphy**<sup>1</sup> and Brian C. McCarthy<sup>1</sup>. *Germination Biology of *P. tomentosa* Seeds*. Ohio University<sup>1</sup>
- 11:15 **Timothy Kennell**<sup>1</sup> and Michael S. Bodri<sup>1</sup>. *A REVERSIBLE SMOKE-INDUCED SECONDARY DORMANCY IN VENUS FLYTRAP (DIONAEA MUSCIPULA) SEED*. North Georgia College & State University<sup>1</sup>

**Friday, April 15<sup>th</sup>**

Session Chair:

Room:

**Animal Ecology**

George Cline

North Hall Salon 1a

- 1:30 **Kristin D. Shirey**<sup>1</sup> and James R. Rayburn<sup>1</sup>. *Preliminary Comparison of the Developmental Toxicity of venom from two Tarantula Species, *Grammostola rosea* and *Haplopelma lividum*, using embryos of *Xenopus laevis*: Old World vs. New World*. Jacksonville State University<sup>1</sup>
- 1:45 **Matthew B. Engelthaler**<sup>1</sup>, Amy N. Jordan<sup>1</sup> and Jeffery M. Ray<sup>1</sup>. *Fish survey and bioassessment of Cox Creek in Lauderdale County, Alabama*. University of North Alabama<sup>1</sup>
- 2:00 **Tom Blanchard**<sup>1</sup>. *Initial response of a fish assemblage to stream restoration efforts along Crooked Creek, a tributary of the South Fork Obion River*. University of Tennessee at Martin<sup>1</sup>
- 2:15 **Lisa M. Gardner**<sup>1</sup>. *Stopover ecology of migrating songbirds at an inland site in northeastern Alabama*. Alabama A&M University<sup>1</sup>
- 2:30 **Jeremy S. Browning**<sup>1</sup> and Stephen C. Landers<sup>1</sup>. *Exuviotrophic apistome ciliates from freshwater decapods in Southern Alabama*. Troy University<sup>1</sup>
- 2:45 **CONFERENCE BREAK**

- 3:00 **Erickson M. Daniel**<sup>1</sup>, Wood A. Elizabeth<sup>1</sup>, Oliver Kerry<sup>2</sup>, Billick Ian<sup>3</sup> and Patrick Abbot<sup>1</sup>. *The potential influence of ant Formica obscuripes on the protective mutualism between bacteria Hamiltonella defensa and aphids.* Vanderbilt University<sup>1</sup> University of Georgia<sup>2</sup> Rocky Mountain Biological Laboratory<sup>3</sup>
- 3:15 **Lisa Kelly**<sup>1</sup>, Chris Spencer<sup>1</sup> and Matthew Bublitz<sup>1</sup>. *Solenopsis invicta (Red Imported Fire Ant): Colony Density and Distribution in Clay-based Carolina Bays.* University of North Carolina at Pembroke<sup>1</sup>
- 3:30 **J. J. Ghazal**<sup>1</sup>, Frank A. Romano, III<sup>1</sup>, Stephen C. Landers<sup>2</sup> and G W. Ingram<sup>3</sup>. *Meiofauna community structure in the northern Gulf of Mexico.* Jacksonville State University<sup>1</sup> Troy University<sup>2</sup> National Marine Fisheries Service, Pascagoula, MS<sup>3</sup>
- 3:45 **CANCELLED – Daniel R. Presley**<sup>1</sup>. ~~*A genetic assessment of Bottlenose Dolphins (Tursiops truncatus) stranded on Alabama and Mississippi beaches prior to the Deepwater Horizon oil spill.*~~

**Friday, April 15<sup>th</sup>****Genetics – Cell & Molecular Biology**

Session Chair:

Mijitaba Hamissou

Room:

North Hall Salon 1b

- 1:30 **Jaylen B. Sweat**<sup>1</sup> and Michael S. Bodri<sup>1</sup>. *ISOLATION OF PROTOPLASTS FROM NEPENTHES.* North Georgia College & State University<sup>1</sup>
- 1:45 **Christopher Dubose**<sup>1</sup> and Chris R. Gissendanner<sup>1</sup>. *A combinatorial RNAi-based screen to identify genes that genetically interact with the NR4A nuclear receptor gene nhr-6 in Caenorhabditis elegans.* University of Louisiana at Monroe<sup>1</sup>
- 2:00 **Vittobai R. Rangaraj**<sup>1</sup> and Chris R. Gissendanner<sup>1</sup>. *In vivo determination of NR4A nuclear receptor target genes in Caenorhabditis elegans.* University of Louisiana at Monroe<sup>1</sup>
- 2:15 **Christiana M. Daily**<sup>1</sup> and Tina R. Hubler<sup>1</sup>. *Isolation of the Chorionic Gonadotropin Beta Subunit Gene Promoter in the Owl Monkey, Aotus nancymaae.* University of North Alabama<sup>1</sup>
- 2:30 **Leos G. Kral**<sup>1</sup> and Dyanna M. Fountain<sup>1</sup>. *Isolation and Characterization of the Etheostoma tallapoosae CENP-A Gene.* University of West Georgia<sup>1</sup>
- 2:45 **CONFERENCE BREAK**
- 3:00 **CANCELLED – Jaouhar Darousse**<sup>1</sup>, Frank A. Romano, III<sup>1</sup> and Christopher A. Murdock<sup>1</sup>. ~~*Preliminary Phylogenetic analysis of mitochondrial cytochrome c oxidase subunit 1 gene (CO1), nuclear ribosomal internal transcribed spacer 2 (ITS2) regions and 18SrDNA*~~

~~regions of 3 tardigrade species.~~

- 3:15 **Ana Kitazono**<sup>1</sup>. *Regulation of the Cin5 transcription factor by the stress response in yeast.* University of Alabama in Huntsville<sup>1</sup>
- 3:30 **Mijitaba Hamissou**<sup>1</sup> and Ploy Kurdmongkoltham<sup>1</sup>. *An Investigation of Some Biologically Active Compounds in Pokeweed, Phytolacca Americana, Extracts and Their Effects on Prokaryotic and Eukaryotic Cells.* Jacksonville State University<sup>1</sup>
- 3:45 **Joshua M. Holifield**<sup>1</sup> and Elizabeth L. Brandon<sup>1</sup>. *The Role of Leptin in the Metastasis of Melanoma.* Mississippi College<sup>1</sup>
- 4:00 **Erika Balogh**<sup>1</sup>, Claire T. Hann<sup>1</sup>, Soumitra Ghoshroy<sup>1</sup>, John M. Herr, Jr.<sup>1</sup>, Mihaly Czako<sup>1</sup> and Laszlo Marton<sup>1</sup>. *Differential distribution of sodium, potassium and chloride ions in tissues of high-salinity and low salinity of Arundo donax using environmental scanning electron microscopy and energy-dispersive X-ray spectroscopy.* University of South Carolina<sup>1</sup>
- 4:15 **Lauren Milleville**<sup>1</sup>, Michael R. Taylor<sup>2</sup>, Charles A. Lessman<sup>3</sup> and Ethan A. Carver<sup>1</sup>. *Characterization of the dead elvis (DEL) mutation in zebrafish.* University of Tennessee at Chattanooga<sup>1</sup> St. Jude Reserach Hospital<sup>2</sup> University of Memphis<sup>3</sup>

#### Friday, April 15<sup>th</sup>

Session Chair:

Room:

#### Scholarship of Teaching & Learning

Henry Spratt

North Hall Salon 4

- 1:30 **Debora J. Weaver**<sup>1</sup> and Michelle S. Thomas<sup>1</sup>. *Teaching Cross-Cultural Awareness in Tanzanian Health-care Settings.* Campbell University<sup>1</sup>
- 1:45 **J. C. Havran**<sup>1</sup>. *Hawaiian Natural History and Ethnoecology.* Campbell University<sup>1</sup>
- 2:00 **CANCELLED – Rachel K. Algya**<sup>1</sup>. ~~*Save Your Science Department Money With Innovative Lab Solutions.*~~
- 2:15 **Linda Jeschofnig**<sup>1</sup> and Peter Jeschofnig<sup>2</sup>. *Teaching Lab Science Courses Online - Resources for Best Practices, Tools & Technology.* Hands-On Labs, Inc.<sup>1</sup> Colorado Mountain College<sup>2</sup>
- 2:30 **Chris Murdock**<sup>1</sup> and LaJoyce Debro<sup>1</sup>. *Bacteriophage Genomics as a Research Model in Introductory Biology Labs.* Jacksonville State University<sup>1</sup>
- 2:45 **CONFERENCE BREAK**

- 3:00 **Rita M. Fincher**<sup>1</sup>. *USDA Forest Inventory and Analysis in the undergraduate Ecology curriculum*. Samford University<sup>1</sup>
- 3:15 **Henry G. Spratt**<sup>1</sup>. *Development of bioremediation laboratory exercises for an upper-level environmental science course*. University of Tennessee at Chattanooga<sup>1</sup>
- 3:30 **Darrell L. Ray**<sup>1</sup>. *Spreadsheets in the Biology Classroom: Leveraging Common Technology to Teach Biological Principles*. University of Tennessee, Martin<sup>1</sup>

**Friday, April 15<sup>th</sup>****SABS Symposium**

Session Chair:

Joe Winstead

Room:

North Hall Salon 3

- 1:30 **Joe E. Winstead**<sup>1</sup>. *The Southern Appalachian Botanical Society and 75 Years of Plant Biology*. Southern Arkansas University<sup>1</sup>
- 1:40 **Alan Weakley**<sup>1</sup>. *We've Come a Long Way! -- Eight Decades of Progress in Understanding the Southeastern Flora*. UNC Herbarium / NC Botanical Garden / UNC-Chapel Hill<sup>1</sup>
- 2:00 **Zack E. Murrell**<sup>1</sup>, Michael B. Denslow<sup>1</sup> and Derick W. Poindexter<sup>1</sup>. *Where do we go from here? -- Challenges and Opportunities in Understanding the Southeastern Flora*. Appalachian State University<sup>1</sup>
- 2:20 **Karen S. Renzaglia**<sup>1</sup>, Juan C. Villarreal<sup>2</sup> and Dean P. Whittier<sup>3</sup>. *The hidden life of bryophytes and pteridophytes in the Southern Appalachians*. Southern Illinois University Cabondale<sup>1</sup> University of Connecticut<sup>2</sup> Vanderbilt University<sup>3</sup>
- 2:40 **CONFERENCE BREAK**
- 2:50 **Allen C. Risk**<sup>1</sup> and Paul G. Davison<sup>2</sup>. *Cryptogamic discoveries in the Southern Appalachians: progress in floristics and ecology*. Morehead State University<sup>1</sup> University of North Alabama<sup>2</sup>
- 3:10 **Thomas R. Wentworth**<sup>1</sup>, Michael T. Lee<sup>2</sup>, M. F. Boyle<sup>2</sup> and Robert K. Peet<sup>2</sup>. *Classification and Environmental Relationships of Plant Communities in the Southern Appalachian Mountains of North and South Carolina*. NC State University<sup>1</sup> University of North Carolina - Chapel Hill<sup>2</sup>
- 3:30 **Michael E. Held**<sup>1</sup> and William S. Bryant<sup>2</sup>. *The Blue Ash – Oak Savanna – Woodland of the Bluegrass Region of Kentucky: The Ecological History of an Extinct Ecosystem*. Saint Peter's College<sup>1</sup> Thomas More College<sup>2</sup>

Thursday, April 14<sup>th</sup>

## Poster Sessions

- 1 **Kimberly J. Bolyard**<sup>1</sup>. *Reproductive Behavior of the Potomac sculpin (Cottus girardi)*. Bridgewater College<sup>1</sup>
- 2 **Amber M. Cheatham**<sup>1</sup>, Jennifer A. Watson<sup>2</sup> and Scott Wilson<sup>2</sup>. *Ubiquitin Proteasome System Negatively and Positively Affects Memory and Learning in Mice*. Oakwood University<sup>1</sup> University of Alabama Birmingham<sup>2</sup>
- 3 **Leah M. Good**<sup>1</sup>, Caitlin M. Gussenhoven<sup>1</sup> and H. D. Wilkins<sup>1</sup>. *Response to alarm and non-alarm calls by Tufted Titmice (Baeolophus bicolor) and Carolina Chickadee (Poecile carolinensis) in northwest Tennessee*. University of Tennessee at Martin<sup>1</sup>
- 4 **Edward D. Mills**<sup>1</sup>. *The impact of noise on the frequency alteration of growl calls (courtship) in Blue-breasted Quail (Coturnix chinensis)*. Wingate University<sup>1</sup>
- 5 **Theodore J. Zenzal**<sup>1</sup>, Robert Diehl<sup>1</sup> and Frank R. Moore<sup>1</sup>. *The effect of radio telemetry devices on the flight behavior of Ruby-throated Hummingbirds (Archilochus colubris): a pilot study*. University of Southern Mississippi<sup>1</sup>
- 6 **CANCELLED - Molly A. Albecker**<sup>1</sup>. ~~*Prey risk assessment and behavioral choices in larval anurans*~~. East Carolina University<sup>1</sup>
- 7 **Paul V. Cupp, Jr.**<sup>1</sup>. *Responses of ground skinks, Scincella lateralis, and green anoles, Anolis carolinensis, to chemical deposits of eastern milk snakes, Lampropeltis triangulum*. Eastern Kentucky University<sup>1</sup>
- 8 **Shannon M. Machen**<sup>1</sup> and Mijitaba Hamissou<sup>1</sup>. *Molecular Investigation of Salt Stress Responses in Arabidopsis thaliana and Nicotiana tobacum callus tissues*. Jacksonville State University<sup>1</sup>
- 9 **Julie A. Clifford**<sup>1</sup> and Jennifer Rhode Ward<sup>1</sup>. *Adaptive Variation in Floral Morphology within a Distylous Plant Complex: Piriqueta Cistoides Caroliniana*. University of North Carolina at Asheville<sup>1</sup>
- 10 **Edgar B. Lickey**<sup>1</sup> and Sydney Bacchus<sup>2</sup>. *Non-coding chloroplast DNA sequences indicate limited gene flow between bald cypress and pond cypress*. Bridgewater College<sup>1</sup> Applied Environmental Services<sup>2</sup>
- 11 **Edgar B. Lickey**<sup>1</sup> and Andrus Voitk<sup>2</sup>. *Elucidating the Omphalina sphagnicola (Berk.) M.M. Moser species complex in Newfoundland*. Bridgewater College<sup>1</sup> Foray Newfoundland and Labrador<sup>2</sup>
- 12 **Thomas W. Sasek**<sup>1</sup>, Lowell E. Urbatsch<sup>2</sup>, Steven P. Darwin<sup>3</sup>, Alex Lasseigne<sup>4</sup> and Rick E. Miller<sup>5</sup>. *CyberFlora Louisiana: Building a virtual herbarium for the state*. University of Louisiana at Monroe<sup>1</sup> Louisiana State University - Baton Rouge<sup>2</sup> Tulane University<sup>3</sup> Nicholls State University<sup>4</sup> Southeastern Louisiana University<sup>5</sup>

- 13 **Michael Woods**<sup>1</sup> and Alvin R. Diamond<sup>1</sup>. *The genus Baptisia (Fabaceae) in Alabama*. Troy University<sup>1</sup>
- 14 **Aaron J. Floden**<sup>1</sup>. *Trautvetteria sp nov. – an endemic to northeast Tennessee*. University of Tennessee<sup>1</sup>
- 15 **Erica M. Davis**<sup>1</sup>. *The effect of ibuprofen on medaka (Oryzias latipes) embryos*. Shorter University<sup>1</sup>
- 16 **Paige J. Waymer**<sup>1</sup>, Dr. Omar Bagasra<sup>1</sup>, Krishna Addanki<sup>1</sup>, Leslie Johnson<sup>1</sup>, Jessica Abercrombie<sup>1</sup> and Mazhar Kanak<sup>1</sup>. *DNA Fingerprinting using a Single Cell by in situ PCR*. Claflin University<sup>1</sup>
- 17 **Keila N. Miles**<sup>1</sup> and Londa L. Schmidt<sup>2</sup>. *Effects of household laundry chemicals, detergents, and fabric softeners on Xenopus laevis development*. Oakwood University<sup>1</sup> Oakwood University<sup>2</sup>
- 18 **Brandon Blackburn**<sup>1</sup>, Mendel Freidman<sup>2</sup> and James Rayburn<sup>1</sup>. *Does Olive Pumice Extract Affect the Developmental Toxicity of Acrylamide to Embryos of Xenopus laevis?* Jacksonville State University<sup>1 2</sup>
- 19 **Sunde M. Jones**<sup>1</sup>. *The Preliminary Effects of Coumadin and Caffeine Mixtures on Xenopus laevis Embryos: Should They be Used Together?* Jacksonville State University<sup>1</sup>
- 20 **Jacqueline I. Clemmons**<sup>1</sup>. *Mapping the Protein-Protein Interaction of the Dynactin Shoulder/Sidearm*. Oakwood University<sup>1</sup>
- 21 **Ritika Sehgal**<sup>1</sup>, Gyunghee Lee<sup>1</sup> and Jae Park<sup>1</sup>. *EcR and USP mediated Programmed Cell Death in Drosophila melanogaster*. Department of Biochemistry and Cellular Molecular Biology University of Tennessee, Knoxville, TN 37996<sup>1</sup>
- 22 **Zixing Wang**<sup>1</sup>, John Doe<sup>2</sup>, Michael O'Connor<sup>2</sup> and Jae Park<sup>1</sup>. *Signaling involving Baboon receptor and its ligand Myoglianin is required for the programmed death of peptidergic neurons during metamorphosis*. University of Tennessee<sup>1</sup> University of Minnesota<sup>2</sup>
- 23 **Travis Perry**<sup>1</sup> and Alex Viere<sup>1</sup>. *Puma (Puma concolor) and Mesocarnivore Associations and Distributions in New Mexico*. Furman University<sup>1</sup>
- 24 **Travis Perry**<sup>1</sup> and Brianna Upton<sup>2</sup>. *Puma (Puma concolor) predation rates and prey selection in riparian and piedmont habitats in New Mexico*. Furman University<sup>1</sup> University of New Mexico<sup>2</sup>
- 25 **Margot A. Wallston**<sup>1</sup>, C. R. Rossell, Jr.<sup>2</sup> and H. D. Clarke<sup>3</sup>. *Habitat Attributes of Virginia spiraea (Spiraea virginiana Britton) along the Cheoah River, North Carolina*. UNC-Asheville<sup>1</sup> Dept. of Environmental Studies, UNC-Asheville<sup>2</sup> Dept. of Biology, UNC-Asheville<sup>3</sup>
- 26 **Michael Damron**<sup>1</sup>, Melissa Daigle<sup>1</sup>, Chelsea Young<sup>1</sup>, Danielle White<sup>1</sup>, Kaleigh Sims<sup>1</sup> and Thomas Nelson<sup>1</sup>. *DIVERSITY AND BIOTIC INTEGRITY OF*

STREAM FISH COMMUNITIES IN THE CHESTATEE RIVER HEADWATERS. North Georgia University<sup>1</sup>

- 27 **Kristina F. Connor**<sup>1</sup>. *Experiments with Pitcher Plant Seeds*. U.S. Forest Service, Southern Res. Lab.<sup>1</sup>
- 28 **J. E. Makowske**<sup>1</sup>, Joey Shaw<sup>1</sup> and Jennifer Boyd<sup>1</sup>. *Investigating large animal herbivory on Scutellaria montana in the Tennessee Army National Guard Volunteer Training Site, Catoosa County, GA*. University of Tennessee at Chattanooga<sup>1</sup>
- 29 **Elizabeth Martin**<sup>1</sup> and Terri Killeffer<sup>2</sup>. *Discoverability of Biodiversity Information & Resources*. USGS NBII<sup>1</sup> USGS NBII/IIa<sup>2</sup>
- 30 **Meghan L. O'Boyle**<sup>1</sup> and Kim M. Tolson<sup>1</sup>. *The Biological Potential of the Feral Pig (*Sus scrofa*) in Louisiana*. University of Louisiana at Monroe<sup>1</sup>
- 31 **Nora L. Smith**<sup>1</sup> and Kim M. Tolson<sup>1</sup>. *Morphometric analysis of select cranial measurements taken from Louisiana wild canids*. University of Louisiana at Monroe<sup>1</sup>
- 32 **Travis Perry**<sup>1</sup> and Brendan Talwar<sup>1</sup>. *Resident Puma (*Puma concolor*) Populations in Narrow Riparian Habitats in New Mexico*. Furman University<sup>1</sup>
- 33 **Travis Perry**<sup>1</sup> and Michael Jiang<sup>1</sup>. *Habitat selection of Puma (*Puma concolor*) and their principle prey species elk (*Cervus elaphus*) and mule deer (*odocoileus hemionus*) in southcentral New Mexico*. Furman University<sup>1</sup>
- 34 **Karissa D. Keen**<sup>1</sup>, Megan H. Rayfield<sup>1</sup>, Jonathan Horton<sup>1</sup>, Jennifer Rhode Ward<sup>1</sup> and David Clarke<sup>1</sup>. *Effects of Environmental Factors and Genetics on the Production of Bioactive Chemicals in *Panax quinquefolius**. University of North Carolina Asheville<sup>1</sup>
- 35 **Dana Virone**<sup>1</sup>, Shelley Baltar<sup>1</sup>, Dawn Lemke<sup>1</sup> and Callie Schweitzer<sup>2</sup>. *Relationship between invasive plants and forest communities on reclaimed surface mines of the Southern Cumberland Plateau*. Alabama A&M University<sup>1</sup> USDA Forest Service<sup>2</sup>
- 36 **Caitlin E. Hurd**<sup>1</sup>, Phillip G. Sloan<sup>1</sup> and Timothy O. Menzel<sup>1</sup>. *Microhabitat use by seed-eating animals in a recently restored wetland*. Piedmont College<sup>1</sup>
- 37 **Jacob S. Francis**<sup>1</sup> and Jonathan L. Horton<sup>1</sup>. *Using Dendroecology to Determine the Effect of *Celastrus orbiculatus* on *Liriodendron tulipifera* growth*. The University of North Carolina at Asheville<sup>1</sup>
- 38 **Rufina N. Ward**<sup>1</sup>, Heather Howell<sup>1</sup> and William Stone<sup>1</sup>. *Forest Management Practices in Bankhead National Forest: Impact on Benthic Macroinvertebrate Assemblages*. Department of Natural Resources and Environmental Sciences, Alabama A&M University<sup>1</sup>

- 39 **Brandie K. Stringer**<sup>1</sup>, Yong Wang<sup>1</sup> and Callie J. Schweitzer<sup>2</sup>. *Forest Disturbance and Songbird Reproductive Success: Temporal Response*. Alabama A&M University<sup>1</sup> USDA Forest Service<sup>2</sup>
- 40 **Megan Rayfield**<sup>1</sup>, Karissa Keen<sup>1</sup>, David Clarke<sup>1</sup>, Jonathan Horton<sup>2</sup> and Jennifer Ward<sup>1</sup>. *Genetic and Demographic Diversity of American Ginseng (*Panax quinquefolius*) in Western North Carolina*. UNC Asheville<sup>1</sup> UNC Asheville<sup>2</sup>
- 41 **Megan E. Pitman**<sup>1</sup> and Travis W. Perry<sup>2</sup>. *Developing a management tool to estimate unmarked puma populations with a remote camera array*. Clemson University<sup>1</sup> Furman University<sup>2</sup>
- 42 **David Seals**<sup>1</sup> and Robert Carter<sup>1</sup>. *A noninvasive method for monitoring American Black Bear activity on the Talladega National Forest in northeast Alabama*. Jacksonville State University<sup>1</sup>
- 43 **Wichmann L. Wichmann**<sup>1</sup>. *Digitization and Mobilization of Natural History Collections: Challenges of and Approaches to a Multi-Disciplined Project*. University of North Carolina Wilmington<sup>1</sup>
- 44 **Kathryn E. Becker**<sup>1</sup>. *EFFECTS OF FLORIDA FLATWOODS ECOSYSTEM RESTORATION AND MANAGEMENT ON CARBON STOCK*. University of Central Florida<sup>1</sup>
- 45 **Ann Huyler**<sup>1</sup>, Arthur Chappelka<sup>1</sup>, Stephen Prior<sup>2</sup> and Greg Somers<sup>1</sup>. *Potential drivers for soil carbon pools in residential areas in Auburn, Alabama*. Auburn University<sup>1</sup> USDA-ARS National Soil Dynamics Laboratory<sup>2</sup>
- 46 **Dawn Lemke**<sup>1</sup>, Philip Hulme<sup>2</sup>, Jennifer Brown<sup>3</sup>, James Miller<sup>4</sup> and John Coulston<sup>4</sup>. *Ensemble modeling of tallowtree in forest of the Southern USA*. Alabama A&M University<sup>1</sup> Lincoln University<sup>2</sup> Canterbury University<sup>3</sup> USDA/USFS SRS<sup>4</sup>
- 47 **Matthew L. Reid**<sup>1</sup> and Joydeep Bhattacharjee<sup>1</sup>. *Effects of Levee on Flood-Induced Mortality of Trees and Saplings in a Bottomland Hardwood Restoration Area*. University of Louisiana at Monroe<sup>1</sup>
- 48 **Brian D. Kloeppel**<sup>1</sup>, Robbie G. Kreza<sup>1</sup>, Marcus C. Mentzer<sup>1</sup>, Tucker J. Souther<sup>1</sup> and Ryan E. Emanuel<sup>2</sup>. *Analysis of secondary forest succession using LIDAR analysis in the southern Appalachians*. Western Carolina University<sup>1</sup> North Carolina State University<sup>2</sup>
- 49 **Colette Nammour**<sup>1</sup>, Briana Skinner<sup>1</sup>, Dr. Elizabeth Dobbins<sup>1</sup> and Dr. Kristin Bakkegard<sup>1</sup>. *The Impact of Local Bank Erosion on Water Quality Parameters in Shades Creek, Homewood, AL*. Samford University Department of Biology<sup>1</sup>
- 50 **Danielle N. Vidd**<sup>1</sup>. *The effects of aqueous copper and zinc on the reproduction and survivability of *Daphnia magna**. Piedmont College<sup>1</sup>

- 51 **Jacob Roberson**<sup>1</sup> and Danielle Satre<sup>1</sup>. *A survey of ethinyl estradiol contamination in water systems surrounding Reinhardt University*. Reinhardt University<sup>1</sup>
- 52 **Jon L. Boatwright**<sup>1</sup>, Virginia K. Carroll<sup>1</sup>, Kristin A. Bakkegard<sup>1</sup> and Elizabeth G. Dobbins<sup>1</sup>. *Effect of local bank erosion on macroinvertebrate assemblages in Shades Creek in Homewood, AL, USA*. Samford University<sup>1</sup>
- 53 **Amanda M. Sheehy**<sup>1</sup> and Terry D. Richardson<sup>1</sup>. *Abundance and Size Frequency Distributions of *Leptoxis praerosa* in Different Microhabitats*. University of North Alabama<sup>1</sup>
- 54 **Melissa C. Nowell**<sup>1</sup> and Nicole M. Hughes<sup>1</sup>. *Photosynthetic costs and benefits of light attenuation by anthocyanins in red-leaved evergreen species during winter*. High Point University<sup>1</sup>
- 55 **Sarah G. Sapp**<sup>1</sup> and Catherine H. Borer<sup>1</sup>. *Phenology of foliar calcium accretion and sequestration in *Cornus florida**. L. Berry College, Department of Biology<sup>1</sup>
- 56 **Keaton E. Hughes**<sup>1</sup>. *Determining the shade-tolerance of *Castanea dentata*, *Castanea mollissima*, and their hybrids*. University of Tennessee at Chattanooga<sup>1</sup>
- 57 **Amber N. Mooney**<sup>1</sup> and Catherine H. Borer<sup>1</sup>. *The influence of leaf litter composition on total body calcium of earthworms (*Lumbricus terrestris* L.)*. Berry College<sup>1</sup>
- 58 **Catherine O. Stone**<sup>1</sup>, Angelia R. Campbell<sup>1</sup>, Nadia M. Shamsedin<sup>1</sup> and A J. Pollard<sup>1</sup>. *Hyperaccumulation of manganese in *Phytolacca americana* from mangiferous soils in South Carolina*. Furman University<sup>1</sup>
- 59 **Casey Moore**<sup>1</sup>, Alex Gilman, PhD<sup>1</sup> and Rita M. Fincher<sup>1</sup>. *Photosynthetic performance of 8 native Costa Rican tree species in a reforestation experiment*. Samford University<sup>1</sup>
- 60 **Rufina N. Ward**<sup>1</sup>, Ernst Cebert<sup>1</sup>, Eric Obeng<sup>1</sup> and Kenneth E. Ward<sup>1</sup>. *Distribution of Major Pest and Beneficial Insects on Bioenergy Crops Under Evaluation in North Alabama*. Department of Natural Resources and Environmental Sciences, Alabama A&M University<sup>1</sup>
- 61 **Brian D. West**<sup>1</sup> and Mark S. Davis<sup>1</sup>. *A PRELIMINARY INVESTIGATION ON THE INFLUENCE OF GALLS ON REPRODUCTIVE EFFORT IN GOLDENRODS*. North Georgia College & State University<sup>1</sup>
- 62 **Vanessa R. Carey**<sup>1</sup>. *Biogeographical Survey of Arachnid Species in Subterranean Environments*. Shorter University<sup>1</sup>
- 63 **Brian D. Holt**<sup>1</sup>. *A Preliminary Checklist of the Cerambycidae of Alabama*. Natural Heritage Section, ALDCNR<sup>1</sup>

- 64 **Peter A. Van Zandt**<sup>1</sup>, Anna Bianchi<sup>1</sup>, John-Paul Tortorich<sup>1</sup>, Grace Balinda<sup>1</sup> and Grant Gentry<sup>2</sup>. *Preliminary survey of the moths of the Cahaba River National Wildlife Refuge, Bibb Co., Alabama*. Birmingham-Southern College<sup>1</sup> Samford University<sup>2</sup>
- 65 **Raley C. White**<sup>1</sup> and Carlos D. Camp<sup>1</sup>. TESTING THE EFFECTS OF GLACIATION ON ALLELIC RICHNESS IN LUNGLESS SALAMANDERS (FAMILY PLETHODONTIDAE). Piedmont College<sup>1</sup>
- 66 **Stephanie A. Pearl**<sup>1</sup>. *Using Carthamus tinctorius L. (safflower) as a model for genome and trait evolution in the Asteraceae*. University of Georgia<sup>1</sup>
- 67 **Krystal T. Piotrowski**<sup>1</sup>, Hank Oppenheimer<sup>2</sup> and J. C. Havran<sup>1</sup>. *Floral Morphometric Analysis of Viola trachelifolia*. Campbell University, Department of Biology<sup>1</sup> Plant Extinction Prevention Program, University of Hawaii, Department of Botany, Pacific Cooperative Studies Unit<sup>2</sup>
- 68 **Curtis J. Hansen**<sup>1</sup>, Leslie R. Goertzen<sup>1</sup> and Dale Pancake<sup>1</sup>. *A preliminary checklist of the vascular flora of the Auburn University Solon Dixon Forestry Education Center in south Alabama*. Auburn University<sup>1</sup>
- 69 **Michael W. Morris**<sup>1</sup>. *New reports of Stenanthium leimanthoides (A. Gray) Zomlefer & Judd and Nestronia umbellula Rafinesque in Alabama*. Troy University<sup>1</sup>
- 70 **Matney N. Casey**<sup>1</sup>, Brenda L. Wichmann<sup>1</sup> and Joanna L. Hosch<sup>1</sup>. *Evaluation and Digitization of the University of North Carolina Wilmington Herbarium (WNC): Plants Endemic to the Carolina Coastal Plain*. UNC Wilmington<sup>1</sup>
- 71 **Alexander Krings**<sup>1</sup>, Amanda Saville<sup>1</sup> and Tracy Kahn<sup>2</sup>. *Hosts and potential hosts of Citrus pests and disease in the United States: A new online diagnostic resource*. North Carolina State University<sup>1</sup> University of California, Riverside<sup>2</sup>
- 72 **Michael W. Morris**<sup>1</sup>. *The Genus Platanthera L. C. Richard in Mississippi*. Troy University<sup>1</sup>
- 73 **Wayne Barger**<sup>1</sup> and Brian Holt<sup>1</sup>. *An Overview of the Vascular Floras Conducted on Alabama's Forever Wild Tracts*. Natural Heritage Section, ALDCNR<sup>1</sup>
- 74 **Jessica C. Luker**<sup>1</sup> and Brenda L. Wichmann<sup>1</sup>. *Seaweed Biodiversity in the Gulf of Mexico: Collections of the University of North Carolina Wilmington Herbarium (WNC)*. UNC Wilmington<sup>1</sup>
- 75 **Joshua J. Asamoah**<sup>1</sup>, Daniel Culver<sup>2</sup>, Susamma Abraham<sup>2</sup> and Li Xhang<sup>2</sup>. *Replication of a Gene-Smoking interactions on Sarcoidosis Susceptibility*. Oakwood University<sup>1</sup> Cleveland Clinic Foundation<sup>2</sup>
- 76 **David B. Barton**<sup>1</sup>, Tiffany E. Fishburne<sup>1</sup>, Denae A. Buzzell<sup>1</sup>, Rosemary N. Plagens<sup>1</sup>, Jonathan D. Wise<sup>1</sup> and Eli V. Hestermann<sup>1</sup>. *Induction of gene expression continues after transcription factor degradation*. Furman University<sup>1</sup>

- 77 **George E. Campbell**<sup>1</sup> and Margaret J. Kovach<sup>1</sup>. *Investigating CpG Island Methylation, Microsatellite Polymorphisms, and Gene Expression in Colon Cancer*. The University of Tennessee at Chattanooga<sup>1</sup>
- 78 **Rachel Daugherty**<sup>1</sup>, Karen Vellacott-Ford<sup>1</sup>, Reannon Blackwell<sup>1</sup> and Leland J. Cseke<sup>1</sup>. *Metabolic Engineering of Oil Biosynthesis in *Jatropha curcas* for Improved Biodiesel*. The University of Alabama in Huntsville, Huntsville, AL<sup>1</sup>
- 79 **Thomas C. Eakes**<sup>1</sup> and Steven J. Metallo<sup>2</sup>. *Binding of Small Molecule Inhibitor Analogs to c-Myc Oncoprotein*. Guilford College<sup>1</sup> Georgetown University<sup>2</sup>
- 80 **Jillian C. Goines**<sup>1</sup> and Joann M. Lau<sup>1</sup>. *Chemopreventative properties of *Ganoderma lucidum* extract in a male lung cancer cell line H2342*. Bellarmine University<sup>1</sup>
- 81 **Kimberly Heck**<sup>1</sup>, James Brown<sup>2</sup> and Melanie Lee-Brown<sup>1</sup>. *Multilocus sequence typing and analysis of natural cave isolates of *Ensifer adhaerens**. Guilford College<sup>1</sup> North Carolina State University<sup>2</sup>
- 82 **Elizabeth A. Killion**<sup>1</sup>, Nicholette Allred<sup>2</sup> and Donald Bowden<sup>2</sup>. *Understanding Adiponectin Expression: Sequencing the ADIPOQ Gene in European Americans*. Guilford College<sup>1</sup> Wake Forest University<sup>2</sup>
- 83 **Paul S. Lee**<sup>1</sup> and Eli V. Hestermann<sup>1</sup>. *Binding of aryl hydrocarbon receptor and its repressor to DNA sequences*. Furman University<sup>1</sup>
- 84 **Sudershana Nair**<sup>1</sup>. *Regulation of Pigment dispersing factor in *Drosophila melanogaster**. University of Tennessee<sup>1</sup>
- 85 **Lori Rushing**<sup>1</sup>, Elizabeth J. Schmidt<sup>1</sup> and Miriam Segura-Totten<sup>1</sup>. *Mechanism for the Regulation of Barrier-to-Autointegration Factor (BAF) Function during Nuclear Assembly*. North Georgia College & State University<sup>1</sup>
- 86 **Irma M. Santoro**<sup>1</sup>, Danielle Satre<sup>1</sup> and Ryan Wauford<sup>1</sup>. *Using a mutagenicity assay and *Saccharomyces cerevisiae* to assess the mutagenic potential of aquatic pollutants*. Reinhardt University<sup>1</sup>
- 87 **Yoedono Sovyanhadi**<sup>1</sup>, Marta Sovyanhadi<sup>1</sup>, Leonard Williams<sup>2</sup> and Juliet Durant<sup>1</sup>. *IN-VITRO STUDY ON THE EFFECT OF WATER EXTRACT OF BITTER MELON CAPSULES (MOMORDICA CHARANTIA) ON THE INSULIN PRODUCTION OF HIT-T15 PANCREATIC BETA CELLS*. Oakwood University<sup>1</sup> North Carolina A & T State University<sup>2</sup>
- 88 **Yoedono Sovyanhadi**<sup>1</sup> and Marta Sovyanhadi<sup>1</sup>. *In-vitro study on the potency of vitamin C, vitamin E and peptide-YY as growth inhibitors in HEP-2 human larynx cancer cells*. Oakwood University<sup>1</sup>
- 89 **La'Tisha Wilson**<sup>1</sup> and Elizabeth Brandon<sup>1</sup>. *IGF-1 Stimulates Melanoma Cell Proliferation*. Mississippi College<sup>1</sup>
- 90 **Ryan O. Cephas**<sup>1</sup>, Lakshmi Dharmarajan<sup>2</sup> and Biswarup Mukhopadhyay<sup>2</sup>. *Aspartate binding and inhibition in *Clostridium perfringens* PepcA*. Oakwood University<sup>1</sup> Virginia Polytechnic Institute and State University<sup>2</sup>

- 91 **CANCELLED - Jonathan A. Akin<sup>1</sup>**. ~~*Factors Affecting Hatching Success of Spotted Salamanders in Vernal Pools.*~~ Northwestern State Univ of Louisiana<sup>4</sup>
- 92 **Derek A. Bozzell<sup>1</sup>** and Thomas K. Pauley<sup>1</sup>. *The Effect of Auditory Call Playback on Anuran Detectability, Catch Probability and Visual Encounter Survey Efficiency.* Marshall University<sup>1</sup>
- 93 **Desiree J. Moffitt<sup>1</sup>**, Michael Gangloff<sup>1</sup> and Lynn Siefferman<sup>1</sup>. THE INFLUENCE OF ELEVATION ON SALAMANDER ASSEMBLAGE COMPOSITION ON GRANDFATHER MOUNTAIN. Appalachian State University<sup>1</sup>
- 94 **Zachery L. Napier<sup>1</sup>**, Megan E. Gibbons<sup>1</sup> and Gabriel Speiler<sup>2</sup>. *The amphibian chytrid fungus *Batrachochytrium dendrobatidis* in north central Alabama.* Birmingham- Southern College<sup>1</sup> Alabama School of Fine Arts<sup>2</sup>
- 95 **Christopher J. O'Bryan<sup>1</sup>**, Chad Brooks<sup>2</sup> and A. F. Scott<sup>1</sup>. A COLD-BLOODED KILLER, PRESENCE OF RANAVIRUS IN SYNTOPIC AMPHIBIAN LARVAE IN WEST TENNESSEE, USA. Center of Excellence for Field Biology, Austin Peay State University<sup>1</sup> Department of Biology, Austin Peay State University<sup>2</sup>
- 96 **Keith Paluso<sup>1</sup>**, Scott Smith<sup>1</sup>, James Stewart<sup>1</sup>, Steven Pitts<sup>1</sup> and Tom Blanchard<sup>1</sup>. *Preliminary results of amphibian and reptile surveys at two National Wildlife Refuges in northwest Tennessee.* University of Tennessee at Martin<sup>1</sup>
- 97 **Lisa D. Brown<sup>1</sup>** and John L. Carr<sup>1</sup>. *Herpetofaunal Survey of Upper Ouachita National Wildlife Refuge in northern Louisiana.* University of Louisiana at Monroe<sup>1</sup>
- 98 **Priscilla D. Fisher<sup>1</sup>**, Gavin R. Lawson<sup>2</sup> and Timothy A. Kreps<sup>3</sup>. *Monitoring Amphibian Use of Constructed Wildlife Pools in the Shenandoah Valley.* Bridgewater College.
- 99 **Michelle L. Guidugli<sup>1</sup>** and Stephen C. Richter<sup>1</sup>. *Pattern of reproductive and post-metamorphic movements in relation to meteorological factors for two ephemeral pond-breeding amphibians (*Ambystoma jeffersonianum* and *A. maculatum*).* Eastern Kentucky University<sup>1</sup>
- 100 **Ryan M. Huang<sup>1</sup>** and Lawrence A. Wilson<sup>2</sup>. *Detecting the presence of *Batrachochytrium dendrobatidis* in amphibians in Piedmont vs Blue Ridge habitats in northern Georgia.* Emory University<sup>1</sup> Fernbank Science Center<sup>2</sup>
- 101 **Scott P. Jones<sup>1</sup>** and Thomas K. Pauley<sup>2</sup>. *Incorporating field techniques and ArcGIS to assess trends in reptile and amphibian diversity across varying levels of urbanization.* East Carolina University<sup>1</sup> Marshall University<sup>2</sup>
- 102 **John M. Yeiser<sup>1</sup>**, Alice L. Jones<sup>1</sup> and Stephen C. Richter<sup>1</sup>. *Salamanders are useful bioindicators of water quality and watershed health in eastern Kentucky.* Eastern Kentucky University<sup>1</sup>

- 103 **Courtney E. Rigsby**<sup>1</sup>. *Terrestrial Habitat Environmental Influence on Amphibian Larvae and Metamorphs within Temporary Wetlands*. Reinhardt University<sup>1</sup>
- 104 **Stephanie D. Hunt**<sup>1</sup>, Evan A. Eskew<sup>1</sup>, Steven J. Price<sup>1</sup> and Michael E. Dorcas<sup>1</sup>. *Assessing Detectability Of Herpetofauna Using Active Search-Based Methods*. Davidson College<sup>1</sup>
- 105 **Zachary J. Loughman**<sup>1</sup>. *Ecology of *Cambarus (J.) dubius* in north-central West Virginia*. West Liberty University<sup>1</sup>
- 106 **David Foltz II**<sup>1</sup>, Nicole Garrison<sup>1</sup>, Tricia Kangisser<sup>1</sup>, Stuart Welsh<sup>2</sup> and Zachary Loughman<sup>1</sup>. *Baited lines, a novel approach to collecting burrowing crayfishes*. West Liberty University<sup>1</sup> USGS Cooperative Office, Morgantown WV<sup>2</sup>
- 107 **Nate Taylor**<sup>1</sup>, David Foltz<sup>1</sup>, Tricia Kangisser<sup>1</sup> and Zachary Loughman<sup>1</sup>. *Conservation of West Virginia's Kanawha River bottomland burrowing crayfishes: species relationship to soil composition and compaction with an emphasis on *Fallicambarus fodiens**. West Liberty University<sup>1</sup>
- 108 **Lauren L. Harding**<sup>1</sup>, Joshua W. Campbell<sup>1</sup>, Richard Pirkle<sup>2</sup>, Jacob A. Kirkpatrick<sup>2</sup> and Jeffrey Williams<sup>2</sup>. *Creepy Cave Invertebrates and Their Attraction to Different Types of Leaves*. High Point University<sup>1</sup> Shorter University<sup>2</sup>
- 109 **Lisa A. Blankinship**<sup>1</sup>. *The Effects of Emu Oil on *E. coli*, *P. aeruginosa*, and *S. aureus**. University of North Alabama<sup>1</sup>
- 110 **Brian S. Burnes**<sup>1</sup>. *Identifying Sources of Pathogen Contamination in the Upper Fish River, Alabama*. University of West Alabama<sup>1</sup>
- 111 **Brian S. Burnes**<sup>1</sup>. *Antibiotic Resistance Patterns of *Escherichia coli* from the Gastrointestinal Tracts of Humans, Cattle, and Deer*. University of West Alabama<sup>1</sup>
- 112 **Kristen T. Carlisle**<sup>1</sup>, LaJoyce H. Debro<sup>1</sup> and Christopher A. Murdock<sup>1</sup>. *Discovering Mycobacteriophage Cryptkeeper*. Jacksonville State University<sup>1</sup>
- 113 **Jennifer Kennard**<sup>1</sup> and Brian Burnes<sup>1</sup>. *Antibiotic Resistance Among *Escherichia coli* from Human, Bovine, and Equine Samples*. University of West Alabama<sup>1</sup>
- 114 **Alicia Mitchell**<sup>1</sup> and Christopher Bates<sup>1</sup>. *The presence and frequency of *Escherichia coli* in beverages sold to the local public*. Augusta State University<sup>1</sup>
- 115 **Jasmine Reedus**<sup>1</sup>, Tamanda Chanza<sup>1</sup>, Taylor Edwards<sup>1</sup>, Wayne Gordon<sup>1</sup> and Elaine Vanterpool<sup>1</sup>. *Characterization of methicillin-resistant *Staphylococcus aureus* drug resistance and virulence factors*. Oakwood University<sup>1</sup>
- 116 **Zachary L. Riley**<sup>1</sup>. *Isolation of *Kurthia gibsonii* from Bottom of Shoe*. University of West Alabama<sup>1</sup>

- 117 **Natassia P. Watson**<sup>1</sup>, Jason R. Rohr<sup>1</sup> and Neal H. Halstead<sup>1</sup>. EXAMINING THE COST OF RESISTANCE AND TOLERANCE THROUGH DOSES RESPONSE AND RESOURCE RESTRICTION. University of South Florida<sup>1</sup>
- 118 **Lindsey Childress**<sup>1</sup> and Ricky Fiorillo<sup>1</sup>. *Trematode community of aquatic snails in Black Bayou Lake NWR in Northeast Louisiana*. University of Louisiana at Monroe<sup>1</sup>
- 119 **Katie Davis**<sup>1</sup> and Ricky Fiorillo<sup>1</sup>. *Parasites, host life-history, and rostrum characteristics of the grass shrimp Palaemonetes kadiakensis*. University of Louisiana at Monroe<sup>1</sup>
- 120 **Valentina R. Garbarino**<sup>1</sup> and Joshua W. Campbell<sup>1</sup>. *A Survey of Ectoparasites Across Twelve Waterfowl Species*. High Point University<sup>1</sup>
- 121 **Erica Henderson**<sup>1</sup>, Kruti Desai<sup>1</sup>, Kathryn Doornbos<sup>1</sup> and Alan F. Smith<sup>1</sup>. *A continuing study of the prevalence of the causative agent of Rocky Mountain Spotted Fever (Rickettsia rickettsii) in field-collected Dermacentor variabilis from the Great Smoky Mountains National Park, NC*. Biology Department, Mercer University<sup>1</sup>
- 122 **Crystie Baker**<sup>1</sup>. *A Mixed Methods Proposal to Measure the Effectiveness of Environmental Education Efforts*. MMNS & USM<sup>1</sup>
- 123 **Chris Manis**<sup>1</sup>, John Patrick<sup>1</sup> and Thomas P. Wilson<sup>2</sup>. *Developing an Environmental Awareness Program: The Mill Creek Project*. Dalton Middle School<sup>1</sup> University of Tennessee at Chattanooga<sup>2</sup>
- 124 **Bradley R. Reynolds**<sup>1</sup> and Thomas P. Wilson<sup>1</sup>. *Factors Leading to the Selection of an Undergraduate Environmental Science Major*. University of Tennessee at Chattanooga<sup>1</sup>
- 125 **Stephanie R. Songer**<sup>1</sup> and Irene Kokkala<sup>1</sup>. *Online Instruction in Undergraduate Microbiology: A Comparison of Hybrid vs. Fully Online Courses*. North Georgia College & State University<sup>1</sup>
- 126 **Christy Buckles**<sup>1</sup>, Joshua W. Campbell<sup>1</sup> and Matthew N. Waters<sup>2</sup>. *Paleoecology of a 64 cm Peat Core from Okefenokee Swamp*. High Point University<sup>1</sup> Valdosta State University<sup>2</sup>
- 127 **John A. Barone**<sup>1</sup>, JoVonn G. Hill<sup>2</sup> and Lisa McGinnis<sup>3</sup>. *Evaluation of Prairie Restoration Techniques in Blackbelt Prairies of Mississippi*. Columbus State University<sup>1</sup> Mississippi State University<sup>2</sup> National Park Service<sup>3</sup>
- 128 **Kathryn R. Selm**<sup>1</sup>, C R. Rossell, Jr.<sup>1</sup>, H D. Clarke<sup>1</sup>, Jennifer Rhode-Ward<sup>1</sup> and Jonathan L. Horton<sup>1</sup>. *Assessment of Browsing of the Federally-Threatened Virginia Spiraea (Spiraea virginiana) by Beaver along the Cheoah River, North Carolina*. University of North Carolina at Asheville<sup>1</sup>

- 129 **Megan A. Avakian**<sup>1</sup>, Jessica Howells<sup>1</sup> and Ray S. Williams<sup>1</sup>. *Effects of elevation and genotype on aphid infestation of Solidago altissima*. Appalachian State University<sup>1</sup>
- 130 **Laura E. Simmons**<sup>1</sup> and Timothy O. Menzel<sup>1</sup>. *The Influence of Management History and Interspecific Interactions on Ant Assembly at Topographically Similar Locations Within the Tugaloo Basin*. Piedmont College<sup>1</sup>
- 131 **William E. Stone**<sup>1</sup>. *Discovering the Diets of Bats through Analysis of Guano in northern Alabama*. Alabama A&M University<sup>1</sup>
- 132 **Christopher Mowry**<sup>1</sup>, Lesley Mobley<sup>1</sup>, Nathan Schwartz<sup>1</sup>, Thomas Baldvins<sup>1</sup>, Jennifer Sheldon<sup>2</sup> and Robert Crabtree<sup>2</sup>. *Coyote (Canis latrans) diets in Yellowstone National Park*. Berry College<sup>1</sup> Yellowstone Ecological Research Center<sup>2</sup>
- 133 **Szymanski A. Fields II**<sup>1</sup>, Wubishet Tadesse<sup>1</sup>, Luben Dimov<sup>1</sup> and Callie Schweitzer<sup>2</sup>. *LIDAR and Color Infrared Imagery to measure forest characteristics in the William B. Bankhead Forest, Alabama*. Alabama A&M University<sup>1</sup> USDA Forest Service, Southern Research Station<sup>2</sup>
- 134 **Robert L. Hopkins II**<sup>1</sup> and Jason H. Knouft<sup>2</sup>. *Niche conservatism or niche evolution? The use of broad scale climate data to infer factors regulating species distributions and niche diversification*. University of Rio Grande<sup>1</sup> Saint Louis University<sup>2</sup>
- 135 **Jordan C. Roush**<sup>1</sup> and Robert L. Hopkins<sup>1</sup>. *Effects of Surface Mining on Freshwater Fish Distributions: A Case Study of Contrasting Life Histories*. University of Rio Grande<sup>1</sup>
- 136 **Kristin A. Bakkegard**<sup>1</sup> and Lawrence J. Davenport<sup>1</sup>. *Nephila clavipes (Arachnida: Araneae): A Model Organism for Monitoring Climate Change in the Southeastern United States*. Samford University<sup>1</sup>
- 137 **Connor A. Ojard**<sup>1</sup>, Matthew Parker<sup>1</sup>, Betsy Dobbins<sup>1</sup> and Kristin Bakkegard<sup>1</sup>. *A Novel Method for Evaluating Local Sediment Deposition in a Third-Order Urban Stream in the Southeastern United States*. Samford University<sup>1</sup>
- 138 **Stephanie A. Whitaker**<sup>1</sup> and Wubishet Tadesse<sup>1</sup>. *Evaluating Hydrologic Response to Urbanization in the Flint River Watershed, North Alabama using Remote Sensing and GIS Technologies*. Alabama A&M University<sup>1</sup>
- 139 **Heather Howell**<sup>1</sup>, Allison Bohlman<sup>1</sup> and Helen Czech<sup>1</sup>. *Aquatic Community Responses to Urbanization in the Flint River Watershed: Correlation between In-Stream Habitat Characteristics and Macroinvertebrate Assemblages*. Alabama A&M University<sup>1</sup>
- 140 **Leslie Ouy**<sup>1</sup>, Michael K. Moore<sup>1</sup> and Alan F. Smith<sup>1</sup>. *Interaction of biotic and abiotic factors influencing the distribution of Bronze frog tadpoles along a water depth gradient*. Department of Biology, Mercer University<sup>1</sup>

- 141 **Dalisa Kendricks**<sup>1</sup>. *The Relationship of Water Quality to the Taxa Richness of Aquatic Macroinvertebrates in the Flint River, Alabama*. Alabama A&M University, Butler High School<sup>1</sup>
- 142 **Lee Stanton**<sup>1</sup>. *Measuring marsh plant productivity and micro-, meio-, and macrofaunal abundance and diversity in response to oiling in a Northern Gulf of Mexico salt marsh*. University of West Alabama<sup>1</sup>
- 143 **Stephen C. Landers**<sup>1</sup>, Frank A. Romano III<sup>2</sup> and Craig A. Schimmer<sup>1</sup>. *Analysis of the BP Deepwater Horizon oil spill impact using meiofauna*. Troy University<sup>1</sup> Jacksonville State University<sup>2</sup>
- 144 **Candice S. Canady**<sup>1</sup> and Kelly H. Kilbourne<sup>2</sup>. *Replicating Surprisingly Cool Coral Geochemistry-Based Paleotemperatures in the Caribbean at the End of the Little Ice Age*. Southern Arkansas University<sup>1</sup> Chesapeake Biological Laboratory<sup>2</sup>
- 145 **Sarah Cranston**<sup>1</sup> and Mark S. Davis<sup>1</sup>. LEAF CARBON:NITROGEN RATIOS AND CHEMICAL DEFENSE IN PLANTS. North Georgia College & State University<sup>1</sup>
- 146 **Lois A. O'Boyle**<sup>1</sup> and Wayne A. Bennett Jr.<sup>1</sup>. *Evaluating Thermal Ecology of Dusky Pipefish and Gulf Pipefish*. University of West Florida<sup>1</sup>
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- 149 **Caitlin A. Peterson**<sup>1</sup> and Cynthia C. Bennington<sup>1</sup>. *Ecotypic variation in stomatal characteristics of *Eriophorum vaginatum**. Stetson University<sup>1</sup>
- 150 **Alison N. Carey**<sup>1</sup> and Matthew Klukowski<sup>1</sup>. EFFECTS OF FOOD DEPRIVATION ON PLASMA CORTICOSTERONE AND NUTRIENT METABOLITE LEVELS IN WATER SNAKES, NERODIA SIPEDON. Middle Tennessee State University<sup>1</sup>
- 151 **Timothy E. Baldwin**<sup>1</sup> and Yong Wang<sup>1</sup>. *Use of Various Life Stages of Mole Salamanders, *Ambystoma talpoideum*, to Assess Local and Landscape Influences on Reproductive Fitness in Northern Alabama*. Alabama A&M University<sup>1</sup>
- 152 **Steven A. Mann**<sup>1</sup> and Elizabeth Brandon<sup>1</sup>. *Leptin's effect on the survival of melanoma cells*. Mississippi College<sup>1</sup>
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- 154 **Avinash Sreedasyam**<sup>1</sup>, Geetika Trivedi<sup>1</sup>, Peter E. Larsen<sup>2</sup>, Frank R. Collart<sup>2</sup>, Gopi K. Podila<sup>1</sup> and Leland J. Cseke<sup>1</sup>. *Defense and stress response regulation during Populus tremuloides - Laccaria bicolor ectomycorrhization*. University of Alabama in Huntsville, Huntsville, AL<sup>1</sup> Argonne National Laboratory, Lemont, AL<sup>2</sup>
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- 157 **Geetika Trivedi**<sup>1</sup>, Avinash Sreedasyam<sup>1</sup>, Peter E. Larsen<sup>2</sup>, Frank R. Collart<sup>2</sup>, Gopi K. Podila<sup>1</sup> and Leland J. Cseke<sup>1</sup>. *Transcriptome analysis of Populus tremuloides X Laccaria bicolor ectomycorrhiza to understand metabolic re-programming during ectomycorrhizal symbiosis*. University of Alabama in Huntsville<sup>1</sup> Argonne National Laboratory<sup>2</sup>
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- 163 **Danielle Satre**<sup>1</sup>, Yong-Hwan Kim<sup>2</sup> and Cynthia Corbitt<sup>3</sup>. *Androgen receptor location in the Dark-eyed Junco using a probe for in situ hybridization histochemistry generated from zebra finch cDNA*. Reinhardt University<sup>1</sup> Buck Institute for Age Research<sup>2</sup> University of Louisville<sup>3</sup>
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- 165 **Shaina S. Morris**<sup>1</sup>, Steven L. Stephenson<sup>1</sup> and Katie Winsett<sup>1</sup>. *Is Didymium pertusum a "good" species of myxomyete?* University of Arkansas<sup>1</sup>
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- 170 **Benjamin O. Koester**<sup>1</sup> and Norman Reichenbach<sup>2</sup>. *Winter environmental conditions and their influence on Eastern Box Turtle (*Terrapene carolina carolina*) overwintering behavior in Central Virginia*. Marshall University<sup>1</sup> Liberty University<sup>2</sup>
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- 173 **Rebecca H. Hardman**<sup>1</sup> and Joseph H. Pechmann<sup>1</sup>. *Predicting Occurrence of the Green Salamander, *Aneides aeneus*, in Western North Carolina*. Western Carolina University<sup>1</sup>
- 174 **Zach I. Felix**<sup>1</sup>, Jessica A. Wooten<sup>2</sup> and Jesse Rigsby<sup>1</sup>. *Taxonomic affinities of yellow-spotted isolates of the Wehrle's salamander (*Plethodon wehrlei*): preliminary data*. Reinhardt University<sup>1</sup> University of Findlay<sup>2</sup>
- 175 **Gavin R. Lawson**<sup>1</sup> and Eran S. Kilpatrick<sup>2</sup>. *Hybridization Among the Subspecies of Eastern Newts (*Notophthalmus viridescens*) in South Carolina*. Bridgewater College<sup>1</sup> University of South Carolina - Salkehatchie<sup>2</sup>
- 176 **Zackary L. Seymour**<sup>1</sup> and Carlos D. Camp<sup>1</sup>. *Morphological Divergence in an Isolated, Peripheral Population of Black-Bellied Salamander, *Desmognathus quadramaculatus*, in Northern Georgia*. Piedmont College<sup>1</sup>

- 177 **Ben DeLancey**<sup>1</sup> and Wade Worthen<sup>1</sup>. *Changes in microhabitat selection and head dimensions between three different age classes of *Desmognathus quadramaculatus**. Furman University<sup>1</sup>
- 178 **Elizabeth E. Hieb**<sup>1</sup>. *A population genetic analysis of the Alabama red-bellied turtle*. University of South Alabama<sup>1</sup>
- 179 **George R. Cline**<sup>1</sup>. *Societal impact of amphibians and reptiles and their economic value*. Jacksonville State University<sup>1</sup>
- 180 **Daniel S. Armstrong**<sup>1</sup>. *Conservation Genetics of a Spotted Salamander (*Ambystoma maculatum* (Shaw 1802), *Ambystomatidae*)*. Population in Hamilton County, Tennessee. <sup>1</sup>
- 181 **Tricia Kangisser**<sup>1</sup>, David Foltz II<sup>1</sup>, Nate Taylor<sup>1</sup>, Nicole Garrison<sup>1</sup> and Zachary Loughman<sup>1</sup>. *Creation of Reach-Scale Habitat Models to Determine Crayfish Abundance in Central Appalachia*. West Liberty University<sup>1</sup>
- 182 **Bryan Ayres**<sup>1</sup>, Robert Carter<sup>1</sup>, Chris Murdock<sup>1</sup> and Benjie Blair<sup>1</sup>. *A Technique for the Detection of *Borrelia burgdorferi*, *Amblyomma americanum* and *Ixodes scapularis* in Calhoun County, Alabama*. Jacksonville State University<sup>1</sup>
- 183 **Kyle McGill**<sup>1</sup>, Ken Cushman<sup>1</sup> and Zachary Loughman<sup>1</sup>. *Molecular systematics of *Cambarus carinirostris* and *Cambarus b. bartonii**. West Liberty University<sup>1</sup>
- 184 **Michka G. Sharpe**<sup>1</sup>, Susanna Brantley<sup>1</sup> and Amanda R. Pendleton<sup>1</sup>. **Rhodiola rosea* extracts enhance infectious bronchitis virus infection in vitro*. Oxford College of Emory University<sup>1</sup>
- 185 **Mina A. Youssef**<sup>1</sup>, Premila N. Achar<sup>1</sup> and MY Sreenivasa<sup>2</sup>. *Plant based Essential Oils as antifungal agents against *A.flavus* and *A. parasiticus* in peanuts*. Kennesaw State University<sup>1</sup> Universtiy of Mysore<sup>2</sup>
- 186 **Barbara Biebinger**<sup>1</sup> and Christi Magrath<sup>1</sup>. *Determining antibiotic resistance in wastewater exposed *Saccharomyces cerevisiae**. Troy University<sup>1</sup>
- 187 **Tamanda Chanza**<sup>1</sup>, Wayne Gordon<sup>1</sup>, Antonia Primus<sup>1</sup> and Elaine A. Vanterpool<sup>1</sup>. *Methicillin Resistant mechanisms of inducing cell death via ER signaling*. Oakwood University<sup>1</sup>
- 188 **April L. Engstrom**<sup>1</sup>, Amanda J. Tindall<sup>1</sup>, Sydney Clark<sup>1</sup>, Drew Geissinger<sup>1</sup> and Dinene L. Crater<sup>1</sup>. *College Friends You Do Not Want: The Prevalence of MRSA in High Point University Students*. High Point University<sup>1</sup>
- 189 **Sara Radmard**<sup>1</sup>, Michael Spinner<sup>1</sup>, Max Teplitski<sup>2</sup> and Nitya Jacob<sup>1</sup>. *The Effects of Quorum Sensing on Nodule-Expressed (*nex*) Genes in *Sinorhizobium meliloti**. Oxford College of Emory University<sup>1</sup> University of Florida<sup>2</sup>
- 190 **Zachary H. Wood**<sup>1</sup>, Melanie Lee-Brown<sup>1</sup> and Michele Malotky<sup>1</sup>. *Can *Caenorhabditis elegans* acquire antibiotic resistance by ingestion of resistant *Escherichia coli*?* Guilford college<sup>1</sup>

- 191 **Clea J. Moore**<sup>1</sup>, Eric Donaldson<sup>2</sup> and Ralph Baric<sup>2</sup>. *Characterizing Viral Genomes in North American Bats*. Oakwood University<sup>1</sup> UNC-Chapel Hill<sup>2</sup>
- 192 **Rachael Fairhurst**<sup>1</sup>, Jesina Elliston<sup>1</sup>, Caitlin Cole<sup>1</sup>, George Dennison<sup>1</sup> and Nancy E. Dalman<sup>1</sup>. ASSESSING TERATOGENIC EFFECTS OF TIRE CRUMB LEACHATES ON FROG EMBRYO DEVELOPMENT. North Georgia College and State University<sup>1</sup>

**Ecosystem & Disturbance Ecology****Oral Presentations****Thursday, April 14 08:30 AM****Timothy G. Whitby<sup>1</sup> and Michael D. Madritch<sup>1</sup>. Carbon loss from soils from multiple elevation gradients under simulated climate change. Appalachian State University<sup>1</sup>**

The role of soil microbial respiration in terrestrial carbon cycling is still uncertain in global climate change scenarios. Many studies have shown varying susceptibilities of soils to increased temperatures, but generally they predict that soils currently at low temperatures have a greater potential to release carbon than those currently at higher temperatures. We used elevation-induced temperature variation to choose soils that have become adapted to different temperature regimes. We collected soil cores from three elevations from three sites in the southern Appalachians. Cores from each elevation and site were incubated at 10, 13, and 16 °C. We tracked soil respiration and carbon and nitrogen flux over three months. Soil respiration responded to increased temperature in a site-dependent manner, but two of three sites may indicate a greater relative increase in soil respiration for cores originating from higher elevations. When incubated at 10 °C, all soils responded similarly, but at 16 °C there was greater difference among respiration from cores from different elevations. The observed trend was strongest within sites where the elevation plots were located on the same aspect and separated by shorter distances, perhaps because soils separated by more distance were more heterogeneous. Increased susceptibility to carbon loss may vary with elevation at relatively small scales in the Appalachians. As such, elevation alone may not be an accurate predictor of how soils will respond to increases in temperature. Site-specific factors, such as initial soil quality and spatial orientation may also have large influences on temperature-induced soil respiration.

**Thursday, April 14 08:45 AM****Santosh K. Ojha<sup>1</sup>, Luben D. Dimov<sup>1</sup> and Callie J. Schweitzer<sup>2</sup>. The effects of partial harvest on growth, biomass and carbon stocks of hardwood forests in Southern Cumberland Plateau: a synthesis. Department of Natural Resources and Environmental Sciences, Alabama A and M University<sup>1</sup> USDA Forest Service, Southern Research Station<sup>2</sup>**

The temperate forests of the Cumberland Plateau have high biodiversity and species richness. As a result of heavy cutting since settlement, the majority of the forests of this region consist of secondary stands at various stages of succession. In general *Quercus* – *Carya* species dominate many forests in the Cumberland Plateau. Silvicultural activities such as thinning or shelterwood harvests influence growth, biomass, and C sequestration over time. We review the effects of different partial harvest treatments on growth, biomass production and carbon (C) storage in mixed hardwood stands in Southern Cumberland Plateau. The amount of C sequestered by forests can change depending on the choice of management practice, as well as intensity and frequency of the cuts. While silvicultural treatments such as thinning can increase the growth and the regeneration recruitment, research shows that it has no long-term effect on aboveground carbon uptake. However, thinning has been found to have a transient impact on above ground net primary production (ANPP). Another intermediate stand treatment under review is prescribed burning, which is predominately practiced on federal lands in the Cumberland region. The effect of burning on C is not well documented in the forest ecosystems of the Southern Cumberland Plateau region. The net effects on C dynamics of many intermediate treatments in evenaged or unevenaged forests is not as extensively studied as the effect on other forest attributes. We explore research findings related to density management of *Quercus-Carya* stands for better growth, biomass production and atmospheric C sequestration and we identify research needs and directions.

Thursday, April 14 09:00 AM

**John W. Furniss<sup>1</sup>. Atmospheric pollution and tree core chemistry in high-elevation forests of Great Smoky Mountains National Park. Elon University<sup>1</sup>**

Atmospheric pollution from industrial activities and automobile exhausts deposit high levels of nitrogen in the high-elevation forests of Great Smoky Mountains National Park (GRSM). Although nitrogen is a nutrient for plant growth, it also acidifies soil and the effects of this acidification can cause forest decline. At pH values < 4.5, soil metals such as aluminum become mobile and can poison plant roots and clog vascular tissue. However, data indicate that high-elevation beech (*Fagus grandifolia*) forests in GRSM have been growing at an anomalously high rate since the mid-1970s. Our research attempts to link the high rates of nitrogen deposition to the anomalous growth through means of dendrochronological and dendrochemical analysis. We collected > 30 cores from high-elevation beech trees (and a few co-occurring species) in three plots in GRSM. In the lab, we measured the cores in 5-year increments to examine growth rates over the lifetime of the trees. This analysis indicates that the trees in this analysis grew significantly faster from the period 1950-80 than they have in the past 30 years ( $p < 0.05$ ). Currently we are using Flame Atomic Absorption Spectroscopy (FAA) on 5-year segments of each core to analyze changes in their aluminum, calcium, magnesium and lead concentrations. Correlations between the results of this analysis will and that of the tree growth analysis will be presented.

Thursday, April 14 09:30 AM

**Daniel A. Douglas<sup>1</sup>, David R. Brown<sup>1</sup> and Neil Pederson<sup>2</sup>. Land snail species diversity and composition among different forest disturbance regimes in Central and Eastern Kentucky Forests. Eastern Kentucky University<sup>1</sup> Lamont-Doherty Earth Observatory, Columbia University<sup>2</sup>**

Terrestrial mollusks are one of the cornerstone species that are responsible for a properly functioning ecosystem. Habitat loss and destruction have led to these organisms being one of the most imperiled groups on the planet. Due to their relatively sedentary nature, terrestrial snails can be susceptible to anthropogenic disturbance and habitat fragmentation. Because of this, old-growth forests have the potential for being premiere habitat for these species. This study compared land snail species diversity and community composition in old growth and second growth forests in the Cumberland Plateau and Inner Bluegrass regions of Kentucky. Study areas were selected in central and eastern Kentucky based on disturbance histories. In the Inner Bluegrass Region, snail diversity was uniformly high, but community composition differed across the disturbance gradients. In the Cumberland Plateau and Pine Mountain sites, species diversity and abundance was higher in the undisturbed forests when compared to the forests that have been disturbed. These findings highlight how land snails can be used as indicators of ecological conditions. Further analysis of this data may reveal individual species or assemblages of species that are indicators of old-growth forests in the eastern United States. Understanding the needs of these organisms will also help in constructing management plans that better protect ecologically sensitive areas.

Thursday, April 14 09:45 AM

**Rachel MacTavish<sup>1</sup>, Viet Nguyen<sup>1</sup> and Troy Mutchler<sup>1</sup>. Interactive Effects of Grazing and Nutrient Enrichment on Seagrass (*Thalassia testudinum*) Condition. Kennesaw State University<sup>1</sup>**

Eutrophication of coastal waters is a major concern because of its potential to impact commercial fisheries and alter community structure and function. As a result, early detection of nutrient loading is of primary importance. Seagrasses have been viewed as bioindicators because of their relatively rapid response to changes in nutrient regimes;

however, tissue nutrient contents and growth dynamics of primary producers are sensitive to other factors, like grazing, that may confound their interpretation. We conducted a three month study in Big Lagoon, FL to examine whether grazing and nutrient enrichment similarly impacted seagrass tissue nutrient concentrations and growth dynamics, thereby diminishing their use as indicators. Fertilizer additions were used to simulate eutrophication, and manual clipping of seagrass blades mimicked vertebrate grazing. Fertilizer additions successfully elevated water column concentrations of  $\text{NH}_4^+$ ,  $\text{NO}_3^-$ , and  $\text{PO}_4^{3-}$  in fertilized beds, although concentrations diminished over time. Initial leaf growth rates in both clipped and fertilized+clipped treatments averaged nearly 1 cm d<sup>-1</sup>, but growth rates in fertilized+clipped beds (-0.1 cm d<sup>-1</sup>) were lower than in clipped beds (0.1 cm d<sup>-1</sup>) after 40 d. The effects of fertilization and clipping on biomass varied among the treatments with fertilized beds experiencing increased biomass ( $170 \pm 320$  g); while biomasses in control ( $-280 \pm 390$  g), clipped ( $-26 \pm 250$  g), and fertilized+clipped ( $-480 \pm 290$  g) beds declined. These results suggest that the response of seagrass to eutrophication is contextually dependent and raise concerns about seagrass.

Thursday, April 14 10:00 AM

**Benjamin Meadows<sup>1</sup>, Rita M. Fincher<sup>1</sup> and Larry J. Davenport<sup>1</sup>. Changes in deer browsing pressure on understory plants at Oak Mountain State Park. Samford University<sup>1</sup>**

Since a survey completed by researchers from Auburn University in 1990 indicated heavy browsing pressure by deer on the understory of the park's forests, Oak Mountain State Park, Pelham, Alabama, has used annual hunting and occasional sharpshooters to manage the deer population. In 2010, a follow-up study was done to evaluate the impacts of deer herbivory in Oak Mountain State Park, Pelham, Alabama. Over the months of June, July, and August, 3445 plants were surveyed in 40 11.8ft radius plots throughout the park. Overall we found an increase in the relative abundance of *Acer* spp. and *Quercus* spp., while finding a decrease in the relative abundance of *Vaccinium* spp. (a key species in the 2001 studies). The plants surveyed also showed statistically significant decreases in herbivory rates from 2001, with rates falling from 99 percent to 81 percent, 54 percent to 25 percent, and 33 percent to 4 percent in key genera of *Vaccinium*, *Smilax*, and *Quercus*, respectively. These data indicate that deer management in Oak Mountain State Park is reducing the browsing pressure on understory plants and tree seedlings, which may allow regeneration of canopy tree species.

Thursday, April 14 10:30 AM

**Luben D. Dimov<sup>1</sup>, Dana A. Virone<sup>1</sup> and Callie J. Schweitzer<sup>2</sup>. Effect of silvicultural treatments on the ground layer vegetation in pine-hardwood stands in North Alabama. Alabama A&M University<sup>1</sup> USDA Forest Service<sup>2</sup>**

Ecosystem-based forest management and restoration require an understanding of the impact of silvicultural activities on a number of ecosystem attributes, including cover, richness, and diversity of the ground layer vegetation. Such knowledge allows an adequate selection of the silvicultural treatments needed to achieve particular desired future conditions. The effects of thinning and prescribed burning are studied often, but their combined effects are investigated only rarely and mostly for their impact on tree species. This study examines the response of the cover and composition of ground layer vegetation to six treatments: low intensity dormant season prescribed burning applied once, fire exclusion, heavy thin with residual basal area of 11 m<sup>2</sup>/ha, light thin with a residual basal area of 17 m<sup>2</sup>/ha, un-thinned control, and combinations of these burning and thinning regimes. The study was carried out in the William B. Bankhead National Forest, northwestern Alabama, in 20-50 year old pine-hardwood stands dominated by planted loblolly pine (*Pinus taeda*). Two growing seasons after treatment, species richness, overall plant cover, and cover of graminoids increased the most in the heavy thin alone and the two combination treatments. Stands treated with the burn alone had no

change in overall cover, richness, diversity, or cover of the individual life form groups. Three growing seasons after treatment, only the heavy thin plus burn had greater diversity than the control. The results were similar for richness. As a whole, the more intense treatments led to greater increase in plant cover, richness, and diversity.

Thursday, April 14 09:45 AM

**Rachel MacTavish<sup>1</sup>, Viet Nguyen<sup>1</sup> and Troy Mutchler<sup>1</sup>. Interactive Effects of Grazing and Nutrient Enrichment on Seagrass (*Thalassia testudinum*) Condition. Kennesaw State University<sup>1</sup>**

Eutrophication of coastal waters is a major concern because of its potential to impact commercial fisheries and alter community structure and function. As a result, early detection of nutrient loading is of primary importance. Seagrasses have been viewed as bioindicators because of their relatively rapid response to changes in nutrient regimes; however, tissue nutrient contents and growth dynamics of primary producers are sensitive to other factors, like grazing, that may confound their interpretation. We conducted a three month study in Big Lagoon, FL to examine whether grazing and nutrient enrichment similarly impacted seagrass tissue nutrient concentrations and growth dynamics, thereby diminishing their use as indicators. Fertilizer additions were used to simulate eutrophication, and manual clipping of seagrass blades mimicked vertebrate grazing. Fertilizer additions successfully elevated water column concentrations of NH<sub>4</sub><sup>+</sup>, NO<sub>3</sub><sup>-</sup>, and PO<sub>4</sub><sup>3-</sup> in fertilized beds, although concentrations diminished over time. Initial leaf growth rates in both clipped and fertilized+clipped treatments averaged nearly 1 cm d<sup>-1</sup>, but growth rates in fertilized+clipped beds (-0.1 cm d<sup>-1</sup>) were lower than in clipped beds (0.1 cm d<sup>-1</sup>) after 40 d. The effects of fertilization and clipping on biomass varied among the treatments with fertilized beds experiencing increased biomass (170 ± 320 g); while biomasses in control (-280 ± 390 g), clipped (-26 ± 250 g), and fertilized+clipped (-480 ± 290 g) beds declined. These results suggest that the response of seagrass to eutrophication is contextually dependent and raise concerns about seagrass growth as a bioindicator.

Thursday, April 14 10:45 AM

**Jeanette R. Williams<sup>1</sup>, Dr. Luben Dimov<sup>1</sup>, Dr. Robert Lawton<sup>2</sup>, Dr. Kozma Naka<sup>1</sup> and Dr. Yong Wang<sup>1</sup>. Effect of High-Intensity Directed Fire in Different Seasons on Survival of Three Invasive Species: *Paulownia tomentosa* (royal paulownia), *Ligustrum sinense* (Chinese privet), and *Lonicera* spp (honeysuckle). Alabama A&M University<sup>1</sup> University of Alabama in Huntsville<sup>2</sup>**

Abstract Non-indigenous species can cause a decline of native species populations and cause a reduction in biodiversity through modifications of the habitat and increased competition. Control measures currently used for invasive species frequently involve herbicides that are toxic to the environment and wildlife. Some of these toxic effects can cause reduction of available nutrients to non-target species, mortality in tadpoles, deformation of fish, and reduced fertility and sexual development in frogs, among many others. Less toxic control measures are expensive to apply and less effective. There is a need for new methods for removal of invasive species that do not use toxins but are similar in efficiency to herbicide-based methods. In the southern USA *Lonicera* spp (honeysuckle), *Ligustrum sinense* (Chinese privet), and *Paulownia tomentosa* (royal paulownia) are of great concern because of their fast growth and their great abundance in forest edges and understory. We tested the effectiveness of high-intensity fire from a propane powered torch as a more environmentally friendly method for control of these species. The flame was applied to the base of the stems for various lengths of time and during different seasons to test which treatment results in the greatest mortality and cause least subsequent stump sprouting. Preliminary data illustrates a significantly greater number of honeysuckle stem mortality after a spring burn than after a winter burn, greater

number of paulownia stump sprouts in large diameter trees than small diameters, and greater mortality for privet in the small diameter class than large.

**Thursday, April 14 11:00 AM**

**Angelia R. Campbell<sup>1</sup>, Catherine O. Stone<sup>1</sup>, Nadia M. Shamsedin<sup>1</sup> and A J. Pollard<sup>1</sup>. Nickel hyperaccumulation in *Psychotria grandis* (Rubiaceae) from serpentine soils in Puerto Rico. Furman University<sup>1</sup>**

Hyperaccumulation of heavy metals is a rare phenomenon in which plants take up and store metals in their leaves, at concentrations that would be toxic to most living organisms. Nickel hyperaccumulation is known in about 320 species worldwide, most of which are endemic to serpentine (ultramafic) soils, which typically have elevated nickel availability. *Psychotria grandis* (Rubiaceae) has been reported as a nickel hyperaccumulator on serpentine soils in Puerto Rico. This is unusual, because *P. grandis* is not a serpentine-endemic species, but instead is widely distributed throughout the Neotropics on limestone and other substrates. The purpose of this study was to compare the nickel content of *P. grandis* from serpentine and non-serpentine soils. Leaf samples were collected from field sites in Puerto Rico, and additional leaf fragments were obtained from herbarium specimens. Nickel concentrations were determined using atomic absorption spectrophotometry. Specimens from serpentine soils had foliar nickel concentrations ranging from 1800 to 8200 ppm nickel on a dry weight basis, confirming the status of this species as a hyperaccumulator. Leaves of the same species from limestone-derived soils in Puerto Rico contained only 95 to 125 ppm. Based on these results, *P. grandis* may be categorized as a facultative hyperaccumulator. A broader survey of herbarium material from nine other countries in the Caribbean, Central America, and South America has revealed that hyperaccumulation may be more common in this species than previously recognized.

**Thursday, April 14 11:15 AM**

**Steve Padgett-Vasquez<sup>1</sup>, Joshua Harden<sup>1</sup>, Joseph Olson<sup>1</sup>, Connor Whitley<sup>1</sup>, Jin Huang<sup>1</sup>, Donna Burnett<sup>1</sup> and Jeff Luvall<sup>1</sup>. Characterization of Tick-borne Disease Risk in Alabama using NASA Earth Observation Systems. NASA DEVELOP Marshall Space Flight Center/University of Alabama at Birmingham<sup>1</sup>**

The vectors for tick-borne illnesses (TBI) are found in Alabama; however, the extent of disease risk in the state remains largely uncharacterized. To address this issue, the NASA DEVELOP team at Marshall Space Flight Center-University of Alabama at Birmingham incorporated in situ tick population with Terra's Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) imagery to create an initial model of spatial risk. The team examined the ratio of the perimeter of a fragmented forest and its area (perimeter/area) as a likely indicator of tick habitats. Twelve collecting sites were selected with varying degrees of urban development and forest fragmentation in Anniston, Alabama. Over one thousand dog ticks (*Dermacentor variabilis*) and lone star ticks (*Amblyomma americanum*) were collected throughout biweekly sampling trips between May 27 and July 22 of 2010. A Poisson regression revealed a significant association between the perimeter/area ratio and high tick populated habitats ( $p < 0.0001$ ). Results suggest that high tick populations are more likely to be found at the edge between urban development and forested areas as opposed to within forests, as commonly believed. Similar results were shown through spatial analysis in the form of Ordinary Kriging and Inverse Distance Weighting. To test the entomological risk of Southern Tick-Associated Rash Illness (STARI), the team performed Real Time- Polymerase Chain Reaction (RT-PCR) on the collected ticks. The primers utilized in the RT-PCR analysis failed to discover the presence of *Borrelia lonestari*, the causative agent of STARI.

Thursday, April 14 11:30 AM

**Alexia L. Callihan<sup>1</sup> and Allen C. Risk<sup>1</sup>. Biodiversity surrogacy: Employing vascular plants as indicators for bryophyte richness at different spatial scales in Spaws Creek Gorge, Menifee County, Kentucky. Morehead State University<sup>1</sup>**

Bryophyte biodiversity is a rarely assessed topic in conservation biology because bryophyte species identification is time consuming and difficult. It may be helpful, therefore, to use other groups of plants to represent the diversity of bryophytes through known trends, a process called biodiversity surrogacy. Biodiversity trends may also be examined at different spatial scales in order to facilitate the biodiversity assessment process. Thirty 10x20 m permanent plots were established in Spaws Creek Gorge in Daniel Boone National Forest in Menifee County, KY. Fifteen of the plots were allocated to the north-facing slope and fifteen to the south-facing slope. Of the fifteen plots on each aspect there were 5 cliff-base, 5 mid-slope, and 5 creek-side plots. For the evaluation of bryophyte species richness at different spatial scales, the plots were assessed at the 1m<sup>2</sup> and 10m<sup>2</sup> scales in the NW and SE corners, as well as the entire 200m<sup>2</sup>. Specimens were collected from the plots, stored and identified in MDKY. The mean bryophyte richness for the eighteen plots evaluated thus far at 200m<sup>2</sup>, 10m<sup>2</sup>, and 1m<sup>2</sup> was 47.8, 19.4, and 6.8, respectively. At the 200m<sup>2</sup> scale the bryophyte richness decreased from creek to middle to cliff plots, but showed no significant difference on the north-facing slope (48.6) versus the south-facing slope (47.1). Correlation analysis indicated a significant positive relationship between bryophyte and all vascular plant richness ( $r=0.61$ ;  $p=0.007$ ) at 200m<sup>2</sup>, and showed positive correlations between bryophyte and pteridophyte richness at all scales (200m<sup>2</sup>:  $r=0.68$ ;  $p=0.001$ , 10m<sup>2</sup>:  $r=0.50$ ;  $p=0.033$ , 1m<sup>2</sup>:  $r=0.54$ ;  $p=0.021$ ).

Thursday, April 14 11:45 AM

**William E. Ensign<sup>1</sup>. Ordination of fish communities using IBI metrics. Kennesaw State University<sup>1</sup>**

Community-level attributes have become a key tool in environmental assessments. This study presents the results of an exploratory analysis using ordination (non-metric multidimensional scaling or NMS) of stream fish communities to recover local and regional patterns in fish community structure. Rather than using individual species, I used community-level metrics drawn from Karr's Index of Biotic Integrity (IBI) to perform the ordination. Data were drawn from 106 separate collections across 10 years taken from the Coosa and Chattahoochee River basins in the Ridge and Valley, Blue Ridge and Piedmont ecoregions of northwest Georgia. The resulting ordination produced interpretable patterns that were independent of both river basin and ecoregion, but showed evidence of the influence of watershed area. Individual sites were aligned with three IBI metric vectors, one loading heavily on the relative abundance of trophic generalists, a second loading heavily on the relative abundance of *Lepomis spp.*, and a third associated with increased richness of insectivorous cyprinids and benthic fluvial specialists. These patterns are consistent with anthropogenic impacts observed in sites aligned with each of the three vectors. Future work will entail compiling the land-use, water quality and physical habitat data to test the inferences drawn from the ordination.

**Evolutionary Biology**

**ORAL PRESENTATIONS**

Thursday, April 14 08:30 AM - 12:00 PM

Thursday, April 14 08:45 AM

**Dipaloke Mukherjee<sup>1</sup> and Walter J. Diehl<sup>1</sup>. Natural Selection in Protein-Coding Genes Common to Species of Mycoplasmatales. Mississippi State University<sup>1</sup>**

Identifying the parts of a genome that evolve by natural selection, particularly as species diverge during their evolutionary history, has been a matter of intrigue. To address the issue, genomes of 12 species in the eubacterial order Mycoplasmatales were compared. These organisms possess some of the smallest genomes known, and analyses were conducted on the set of protein-coding genes common to all species in the study. Information thereon should shed light on the evolution of some of the most critical genes in living organisms and test the hypothesis that natural selection targets different sets of genes by function and/or by node on a phylogenetic tree. Genes associated with cellular process functions showed greater evidence of natural selection than genes of unknown function or genes associated with metabolism or information processing & storage. Further, natural selection in this set of genes could only be detected at the deepest levels of the Mycoplasmatales phylogeny, including one node where a host shift to humans likely occurred. Many of the genes showing evidence of natural selection (e.g. SecA, SecY, FtsY, YidC, LepA, DnaK) encode proteins that are components of the Sec-dependent secretion pathway, which regulates the translocation of proteins extracellularly and is proposed to play a role in speciation of Mycoplasmatales during host shifts by affecting the type and amount of antigenic proteins that are secreted.

**Thursday, April 14 09:00 AM**

**Cassidy Cobbs<sup>1</sup> and Patrick Abbot<sup>1</sup>. Characterization of the primary symbiont in *Hoplopleura* (Anoplura: Hoplopleuridae): support for polyphyletic origins. Vanderbilt University<sup>1</sup>**

Some species of insects specialize on nutritionally inadequate diets, such as wood, blood, or plant sap. These species commonly harbor bacterial and fungal symbionts, which provide nutrients missing from the diet. The origins of these insect symbioses are often ancient, and patterns of divergence in the insect hosts are closely tracked by their symbionts. In sucking lice (Anoplura), however, which feed exclusively on blood, the primary symbionts of lice are of polyphyletic origin. Different families of sucking lice have symbionts that group with *Legionella*, while others are from the family Enterobacteriaceae. While these findings unequivocally point toward multiple origins of sucking louse symbionts, to date all known symbionts are in the class Gammaproteobacteria. However, little is known about the symbionts of a number of anopluran families. We are characterizing the primary symbiont of *Hoplopleura* spp. (Anoplura: Hoplopleuridae), which are parasites of rodents. Sequence data suggest that the symbiont of *Hoplopleura* is in the class Betaproteobacteria, and closely allied to the family Neisseriaceae. We confirmed the exclusive presence of the symbionts in the insect's mycetome using fluorescent microscopy, and supported both sequence and microscopy data with quantitative PCR. This discovery indicates that not only have sucking lice shown a capacity for replacing their symbionts throughout their life history, but that they may draw from a range of bacterial species much wider than originally thought.

**Thursday, April 14 09:15 AM**

**Darah Newell<sup>1</sup> and Ashley B. Morris<sup>1</sup>. Clonal structure in *Illicium parviflorum* as detected by ISSR markers. University of South Alabama<sup>1</sup>**

*Illicium parviflorum* is an evergreen shrub or small tree and is endemic to six counties in Central Florida. It is a state-listed species, having been designated as endangered by the Florida Department of Agriculture and Consumer Services, but it is a popular hedge plant in the southeastern horticultural trade. Previous field studies suggest that sexual reproduction is limited, and population maintenance occurs through clonal growth. Furthermore, it is suspected that the majority of horticultural specimens were vegetatively grown from a limited number of individuals collected from the field. For both of these reasons, genetic diversity in natural populations is assumed to be limited, and may potentially be further impacted by continued plantings of horticultural specimens. Our objectives were to 1) assess genetic diversity within and among natural populations of *I.*

*parviflorum*, and 2) genotype horticultural specimens to determine their natural populations of origin. Twenty-six inter-simple sequence repeat (ISSR) loci were used to genotype 110 individuals from six natural populations in Florida and six individuals from four horticultural nurseries from Alabama, Florida, and Georgia. These loci recovered 36 unique genotypes; all horticultural samples shared a single genotype and could be traced to one location in the Ocala National Forest. Clonal structure varied by site, but played a role in all populations sampled. Additional work using microsatellites is currently underway to confirm these results. Continuing work on this species not only aids in conservation efforts, but serves as a foundation for work in other rare *Illicium* species.

**Thursday, April 14 09:45 AM**

**Sarah P. Lawson<sup>1</sup> and Patrick Abbot<sup>1</sup>. Social immunity and the effects of conflict in a eusocial community. Vanderbilt University<sup>1</sup>**

The ecological success of many advanced eusocial insects affirms the benefits that accompany cooperative group-living. Nevertheless, eusocial organisms experience conflict within groups, but the ecological consequences of conflict remain poorly understood. Here, we compare the effects of conflict in the eusocial aphid, *Pemphigus obesinymphae* (*P.obes*). *P.obes* aphids live clonally within tumor-like plant galls. First instar larvae express altruistic acts of defense against predators. They also engage in other energetically expensive cooperative behaviors, such as hygienic maintenance of the gall, which presumably suppresses the growth of bacterial and fungal pathogens and may facilitate the success of social aphid groups. Previous work has shown that when unrelated aphids invade from neighboring galls, they monopolize resources and do not defend the galls against predators, at a cost to the natal aphids inhabiting the gall. However, it is unknown whether these 'cheater' aphids also contribute to mortality due to pathogen pressure. We hypothesize that because these invader aphids are not contributing to gall hygiene, there will be a positive association between the presence of unrelated aphids and the fungal diversity within galls. We have created a database of fungus found commonly within galls and are beginning experiments to manipulate the number of clones within a single gall in order to compare how relatedness is associated to the composition of fungus. These will be the first experiments to quantitatively describe the effects of cheating on disease in a eusocial aphid and may reveal insights into the common features of defense against pathogens across the social insects.

**Thursday, April 14 10:00 AM**

**Shawn E. Krosnick<sup>1</sup>. What is a nectary? *Passiflora* as a model system for studying nectary evolution. Southern Arkansas University<sup>1</sup>**

*Passiflora* is a diverse genus consisting of more than 520 species of vines, lianas and small trees. The group displays remarkable variation in floral and vegetative features, even among closely related species. A key characteristic of the genus is the presence of complex nectaries throughout the plant. These nectaries encourage pollination, deter herbivores, and attract bodyguards. Floral and extrafloral nectaries are present on all species of *Passiflora* within flowers, on floral bracts, stipules, petioles, on leaf margins, and abaxial leaf surfaces. In *Passiflora*, the position, shape, size, and arrangement of nectaries is so variable that homology assessment among the different nectary classes is difficult. As nectaries likely represent a key morphological innovation for the genus, the need for clear statements of homology among the different nectary classes is great. Examination of nectary form and function in *Passiflora* has yielded several important insights regarding the evolution of nectaries in the genus. First, initial hypotheses of homology between floral and extrafloral nectaries have been rejected based on molecular and morphological data. This is in contrast to the situation in other Eudicots, where the two types of nectary have been shown to share molecular similarities. Second, the use of nectar sugar profile data to assess variation among extrafloral nectary classes has not yet yielded informative differences in sucrose, glucose, or fructose. Amino acid content may

be of greater importance for extrafloral nectaries compared to floral nectaries. Nectar secretion occurs much earlier in development than originally expected and appears to be passive in the mode of release. This calls into question earlier accounts citing cuticle rupture as the primary mode of nectar release. Third, scanning electron microscopy has revealed a unique thinning pattern in the cuticle of petiolar nectaries. These thinning areas eventually develop into pore-like structures in the cuticle, a relatively uncommon mode of nectar release in angiosperms. Fourth, anatomical and developmental data collected thus far suggest similarities between glandular leaf teeth found on the margins of stipules and the lamina with those found on the petiole and abaxial surface. These data suggest that a similar developmental program is acting during leaf development to create diverse kinds of extrafloral nectaries. Thus, the final location and form of the nectaries may depend most on the maturity of the leaf tissue that this shared developmental program is active within. These data are considered with regard to the overall phylogenetic framework of *Passiflora*. The patterns of diversification in extrafloral nectaries are closely tied to the lineages in which they are found, supporting a preliminary hypothesis that nectaries do in fact represent a key innovation for the genus. Implications for homology assessment are considered not only for *Passiflora*, but for other relevant angiosperm lineages as well.

**Thursday, April 14 10:30 AM**

**Jia W. Pan<sup>1</sup> and David G. Haskell<sup>1</sup>. Phylogeography of the land snail genus *Anguispira*. University of the South<sup>1</sup>**

*Anguispira* is a genus of small pulmonate land snails found throughout the eastern United States. The genus consists of widely-distributed generalists species as well as specialist calciphilic species found only on limestone outcrops. A few of the calciphilic species are found on or near the Cumberland Plateau in close proximity to each other. This includes the endangered species *A. picta*, which is found only within a very restricted range in Sherwood, TN. The purpose of this study was to determine the genetic structure of *Anguispira* and compare this to the geographical distribution of *Anguispira* species. A secondary objective of this study was to determine the identity of a newly discovered population of snails resembling *A. picta* that was found in Sherwood. We collected tissue samples in a non-lethal manner from 139 individuals of 6 different *Anguispira* species from 19 different locations across the southeastern United States, and sequenced portions of the cytochrome oxidase b (Cob) and 16S mitochondrial genes. Phylogenetic analyses of the 16S sequence data show distinct clusters by species and location with fairly long divergence estimates. Our data thus supports the current identification of species and suggests that there is little gene flow between populations on different limestone outcrops. Also, both Cob and 16S sequence data indicate that the newly discovered *Anguispira* population is a genetically distinct population which appears to be a sister lineage to the *Cumberlandiana/Picta* clade. Our study provides insight into the phylogeography of land snails and also has significant implications for *A. picta* conservation.

**Thursday, April 14 10:45 AM**

**Jennifer R. Mandel<sup>1</sup>, Jennifer M. Dechine<sup>1</sup>, Laura F. Marek<sup>2</sup> and John M. Burke<sup>1</sup>; Genetic diversity of the cultivated sunflower germplasm. University of Georgia<sup>1</sup> Iowa State University<sup>2</sup>**

Crop germplasm collections are valuable resources for ongoing plant breeding efforts. To fully utilize such collections, however, researchers need detailed information about the amount and distribution of genetic diversity present within collections. Here, we report the results of a population genetic analysis of the primary gene pool of sunflower (*Helianthus annuus* L.) based on a broad sampling of 433 cultivated accessions from North America and Europe, as well as a range-wide collection of 24 wild sunflower populations. Gene diversity across the cultivars was 0.47, as compared to 0.70 in the wilds, indicating that cultivated sunflower retained roughly two-thirds of the total genetic diversity present in wild sunflower. Population structure analyses revealed that wild sunflower can be subdivided

into four genetically distinct groups, whereas the cultivated sunflower gene pool could be split into two main groups separating restorer oilseed lines from the balance of the gene pool. An assignment test placed the bulk of cultivated sunflower lines (68%) within a cluster that is primarily composed of wild sunflower individuals from the east-central United States, the general region in which sunflower domestication is believed to have occurred. We also identified a nested subset of lines that capture as much of the allelic diversity present within the sampled cultivated sunflower germplasm collection as possible. At the high end, a core set of 288 lines captured nearly 90% of the alleles present in the full set of 433, and a core set of just 12 lines was sufficient to capture nearly 50% of the total allelic diversity present within this sample of cultivated sunflower.

**Thursday, April 14 11:00 AM**

**Aala A. Abulfaraj<sup>1</sup>, Neil Billington<sup>1</sup>, Sirisha Bethala<sup>1</sup> and Janet Gaston<sup>1</sup>. Use of allozyme markers to detect genetic heterogeneity in sauger populations. Troy University<sup>1</sup>**

Sauger (*Sander ontanensis*) is a large predaceous percid fish species that are common in the west central region of North America. Allozyme markers were used to detect the level of protein genetic variation for 1023 sauger from 12 populations. Populations were collected by electrofishing and gillnets in the United States from Iowa, North Dakota, South Dakota, Montana and Wyoming, and from Alberta, and Saskatchewan, Canada. Liver and muscle samples were screened by cellulose acetate gel electrophoresis. Two loci were found to be polymorphic in sauger, esterase (EST\*) and super oxide dismutase (SOD-2\*). Six alleles at the EST\* locus were found: \*60, \*85, \*95, \*100, \*105, and \*125, while two alleles at the SOD-2\* locus were found: \*100 and \*130. Observed genotype frequencies deviate significantly from Hardy-Weinberg expectations in seven populations at EST\* and five populations at SOD-2\* due to heterozygote deficiencies. These deviations likely resulted from the Wahlund effect because samples were mostly collected during the summer and fall rather than during the spring, which is the spawning season for sauger. Results showed that there was highly significant among population heterogeneity for sauger at both loci ( $\chi^2 = 448.24$ ,  $df = 55$ ,  $p < 0.001$ ). Knowledge of genetic variation and population structure among sauger populations help fisheries management agencies to improve management of the species.

**Thursday, April 14 11:30 AM**

**Randall G. Terry<sup>1</sup>. Phylogenetic relationships among the New World cypresses (Hesperocyparis; Cupressaceae): Evidence from chloroplast DNA sequences. Lamar University<sup>1</sup>**

The New World cypresses (*Hesperocyparis*; Cupressaceae) are a group of 16 species characterized by poor morphological differentiation and narrow endemism. Many species are known from a single or only a few geographic localities and are listed as threatened or endangered. Previous studies of phylogenetic relationship within the genus have been plagued by lack of resolution, poor character support, and incomplete taxonomic sampling. Moreover, recent studies strongly place species from two other genera with *Hesperocyparis* in a clade having poor resolution at its base. Collectively, these findings reflect the uncertainty of relationships both within the genus as well as between *Hesperocyparis* and its closest relatives. In this study, 5699 base pairs (bp) of aligned sequence from noncoding regions of the chloroplast genome are combined with previously published sequences in recovering phylogenetic relationships within *Hesperocyparis*. Findings presented here are consistent with those of previous studies in supporting *H. bakeri* as sister to the remaining species. In addition, two well-supported clades are recovered, one containing several of the more geographically widespread taxa including *H. lusitanica*, *H. ontana*, and *H. arizonica* and its varieties *Sensu* Little (1970), and the other containing several endemic coastal species (e. g., *H. macrocarpa*, *H. abramsiana*, *H. pigmaea*, and *H. goveniana* and its relatives *Sensu* Wolf, 1948). Despite

the use of over 13,000 bp of aligned sequence in total evidence analyses, several clades within the genus as well as a previously suggested sister-group relationship between *Chamaecyparis nootkatensis* and *Hesperocyparis* remain unresolved or marginally supported.

**Thursday, April 14 11:45 AM**

**Jimmy K. Triplett<sup>1</sup>, Jun Wen<sup>2</sup>, Lynn G. Clark<sup>3</sup>, Paul M. Peterson<sup>2</sup> and De-Zhu Li<sup>4</sup>. Hybridization, polyploidy, and taxonomic confusion: lessons from the temperate bamboos. Jacksonville State University, Department of Biology, 700 Pelham Rd N, Jacksonville, AL 36265, USA<sup>1</sup> Smithsonian Institution, Department of Botany MRC 166, National Museum Of Natural History, Po Box 37012, Washington, DC, 2056<sup>2</sup> Iowa State University, Department of Ecology, Evolution & Organismal Biology, 253 Bessey Hall, Ames, Iowa, 50011-1020, USA<sup>3</sup> Kunming Institute of Botany, Chinese Academy of Sciences, Key Laboratory of Biodiversity and Biogeography, Kunming, Yunnan, 6<sup>4</sup>**

The temperate bamboos (Poaceae: Bambusoideae: Arundinarieae) include over 500 species in Asia, Africa, and North America and are among the most problematic groups from a taxonomic perspective. Recently, molecular evidence has implicated hybridization as a cause of taxonomic confusion while highlighting the fundamental role of polyploidy in the evolution of this group. For example, taxa currently assigned to *Hibanobambusa*, *Sasaella*, and *Semiarundinaria* appear to be the product of wild crosses among species in *Phyllostachys*, *Pleiolobatus*, and *Sasa*, while all taxa investigated to date appear to be tetraploids. In the current investigation, low-copy nuclear genes (including an endo-1,4- $\beta$  glucanase and a poly-A binding protein) were used to reconstruct phylogenetic relationships in the temperate bamboos of Asia and North America. Nuclear data revealed two distinct classes of sequences (genome A and B) for each gene, consistent with an allotetraploid origin for the clade of temperate bamboos. Four distinct sequence types (A1, A2, B1, B2) were recovered for some taxa in patterns consistent with more recent hybridization. This new evidence, combined with previous studies using cpDNA and AFLP data, indicates that the temperate bamboos are the product of reticulate evolution at the polyploid level.

#### **Floristics**

#### **ORAL PRESENTATIONS**

**Thursday, April 14 08:30 AM - 11:45 AM**

**Thursday, April 14 08:30 AM**

**Matt S. Bruton<sup>1</sup> and Dwayne Estes<sup>1</sup>. THE VASCULAR FLORA OF THE CLARKS RIVER NATIONAL WILDLIFE REFUGE, MARSHALL, MCCRACKEN, AND GRAVES COUNTIES, KENTUCKY. Austin Peay State University<sup>1</sup>**

Kentucky is one of only seven states in the U.S. to have lost more than 80% of its wetlands. Most of the 1,266,000 acres of wetlands lost occurred in western Kentucky, a region formerly covered by extensive swamps, bottomland hardwood forests, marshes, and wet prairie. The Clarks River National Wildlife Refuge is an 8,265-acre refuge in Graves, Marshall, and McCracken counties Kentucky established to protect remaining wetland habitat. The purpose of this study is to conduct an inventory of the vascular flora of the refuge and qualitatively characterize plant communities to help increase the knowledge of its botanical resources. Collections have been pressed in triplicate and prepared for deposition in the Austin Peay State University herbarium (APSC) as well as the herbaria at the Missouri Botanical Garden (MO) and the University of Tennessee

(TENN). Over 600 specimens have been vouchered during approximately 50 collection trips representing 92 families, 216 genera, and 460 species and intraspecific taxa. Among the species collected were 379 (82.4%) native species and 81 (17.6%) introduced species including 1 state record and 159 county records. The collection, to date, is comprised of 108 woody species, 243 herbaceous species, 102 graminoids, and 7 pteridophytes. These data represent collection efforts from May 2009 to November 2010. Additional work will be conducted through 2011 with focuses on consummation of common taxa, assessment of rare plant populations, and community type characterization

**Thursday, April 14 08:45 AM**

**Courtney E. Gorman<sup>1</sup>, Matt S. Bruton<sup>1</sup> and L. D. Estes<sup>1</sup>. The status of *Elaeagnus multiflora* (Elaeagnaceae), a potentially invasive Asiatic shrub, in Tennessee. Austin Peay State University<sup>1</sup>**

*Elaeagnus multiflora*, a native shrub of China and Japan, is cultivated in the eastern United States for its edible fruits and ability to tolerate poor conditions. Currently, this species is introduced at a number of scattered localities in eastern U.S., particularly in Midwestern and Northeastern states. In the Southeast, it has been reported from Alabama, Mississippi, North Carolina, Virginia, and West Virginia. Examination of herbarium specimens revealed that *E. multiflora* was first collected in Tennessee in 1983 from woods at Fort Donelson National Battlefield in Stewart County. According to recent floristic accounts, this species is considered a watch list taxon in Tennessee and is not currently considered part of the naturalized flora. The objectives of this study were to 1) assess the current distribution of *E. multiflora* in Tennessee, 2) determine if the species is actively naturalizing at known populations, and 3) characterize the ecology of each population. Preliminary results indicate that *E. multiflora* occurs in Lawrence, Maury, and Stewart counties in the Western Highland Rim region of middle Tennessee. The population in Stewart County consists of numerous subpopulations. The other county occurrences are located 127 km to the southeast, each consisting of a single population located 0.5 km apart. This species inhabits upland, cherty or gravelly, acid soils of mixed deciduous forests. It is capable of establishing in edge habitats and in mature forests; this coupled with the likelihood of dispersal by birds suggests that *E. multiflora* has the potential to become a serious pest.

**Thursday, April 14 09:00 AM**

**Erin A. Tripp<sup>1</sup> and James C. Lendemer<sup>2</sup>. How known is well-known? Progress in lichenology in Great Smoky Mountains National Park. Rancho Santa Ana Botanic Garden<sup>1</sup> The New York Botanical Garden<sup>2</sup>**

The southern Appalachians represent a diversity hotspot for many groups of organisms, including lichens. Although the region, like the rest of eastern North America, has been subjected to considerable anthropological change, a large portion of it has been protected at the federal, state, and local level resulting in contiguous areas of natural habitat that include the largest and most significant tracts of old-growth forest in eastern North America. Lichenological data from our previous studies in the southern Appalachians (e.g., Gorges State Park, NC) indicated that much is yet to be learned in an area of the world that is supposedly "well-known" biologically. As such, we initiated an inventory of the lichens of Great Smoky Mountains National Park (GSMNP) in 2007. Since then, over the course of only five collecting trips, we have added > 180 new lichen records to the Park's checklist (including several species and one genus new to science). These new reports collectively expand the known lichen biota of GSMNP to include between 603 and 779 taxa, an increase of ~30-39%, and rendering it the most lichenologically diverse National Park in the United States.

Thursday, April 14 09:15 AM

**Joseph C. Moosbrugger<sup>1</sup>. An Annotated Flora of Crane Hollow Preserve, Hocking County, Ohio. Ohio University<sup>1</sup>**

Crane Hollow Preserve is a 627 ha privately-owned state-dedicated nature preserve located in Hocking County, Ohio. The preserve, located in the Unglaciated Appalachian Plateau physiographic region of southeastern Ohio, is characterized by variable topography ranging from floodplains to steep sandstone cliffs. This variability in topography and differing past land use histories, has given rise to diverse plant community types. Habitats include: fields, riparian forest, Appalachian (hemlock)-northern hardwood forest, mixed and oak-hickory forest, and pine forests existing both on ridge tops and former plantations. During the field season of 2010, voucher specimens of all vascular plant species were collected, identified, and pressed. The specimens are being deposited into the Bartley Herbarium of Ohio University (BHO), and are being loaded into the Ohio University Botanical Research and Herbarium Management System (BRAHMS). Thus far, a total of 490 species in 296 genera and 106 families have been identified. Of special interest is *Aconitum columbianum* Nutt. subsp. *Columbianum* (northern monkshood) that represents one of just three known populations in the state. Previously, a flora was initiated in 1982-83, where 525 species were identified over the then 225 ha preserve. The 402 ha increase in size along with the threat of invasive species entering the preserve warranted the current study. Currently, 33 species have been confirmed that were not previously known to exist within the preserve, with twelve of those species being non-native. The annotated flora will continue through the field season of 2011.

Thursday, April 14 09:30 AM

**L. D. Estes<sup>1</sup>, Todd Crabtree<sup>2</sup> and Joey Shaw<sup>3</sup>. Recent additions and noteworthy vascular plant records from Tennessee. Austin Peay State University<sup>1</sup> Tennessee Natural Heritage Program<sup>2</sup> University of Tennessee at Chattanooga<sup>3</sup>**

The Fifth Checklist of Tennessee Vascular Plants published in 2007 documented 2,874 species and intraspecific vascular plant taxa from Tennessee, representing 860 genera and 182 families. Additional field and herbarium work conducted since 2007 have resulted in the discovery of several new vascular plant records. Of these, a few represent taxa that may be new-to-science including new types of *Carex*, *Glandularia*, *Helianthus*, *Lysimachia*, *Polymnia*, and *Symphytotrichum*. Three species were found which represent state records for native species including *Ceolorachis rugosa*, *Leptopus phyllanthoides*, and *Packera paupercula* var. *Pseudotomentosa*. Nine species were found which represent state records for non-native taxa including *Bidens pilosa*, *Cyrtomium fortunei*, *Hosta* sp. (specific identity to be determined), *Indigofera hirsuta*, *Kyllinga odorata*, *Lathyrus sylvestris*, *Malus prunifolia*, and *Vicia hirsuta*. The status of numerous other species in the state has been clarified during the past few years and these taxa are discussed further.

Thursday, April 14 09:45 AM

**Emily R. Blyveis<sup>1</sup> and Joey Shaw<sup>1</sup>. The Vascular Flora of the Tennessee River Gorge, Hamilton and Marion counties, Tennessee. University of Tennessee at Chattanooga<sup>1</sup>**

The Tennessee River Gorge (TRG) is a 41 km (24 mi) long river canyon within the Cumberland Plateau physiographic province in Hamilton and Marion counties, Tennessee. The gorge contains 18 vegetation types as described by Bridges et al. (1984) and is home to several rare species. This is an interesting area to study because it is where the Tennessee River flows from the Ridge and Valley physiographic province and cuts into the Cumberland Plateau physiographic province. The TRG is also close to the Tennessee-Georgia-Alabama state lines. As such, floristic elements of both physiographic provinces are expected as well as state records. The primary focus of this study was to

inventory the vascular flora of the southern half of the TRG and the adjacent Little Cedar Mountain (LCM), which combined make up 4,805 ha (11,877 acres). Secondary goals were to document rare species, non-native taxa and county records for Hamilton and Marion counties. During the 2009 and 2010 growing seasons, 42 collecting trips were made to the TRG, and 729 specimens were collected. Four hundred twenty species from 268 genera were documented representing 106 families of vascular plants in the TRG. Five rare species were identified including *Castanea dentata*, *Cotinus obovatus*, *Panax quinquefolius*, *Scutellaria montana* and *Polymnia Johnbeckii* sp. nov. Fifty-nine introduced species were documented, including *Albizia julibrissin*, *Lonicera japonica*, *Paulownia tomentosa*, and *Pueraria montana*.

**Thursday, April 14 10:00 AM**

**Andrew P. Jenkins<sup>1</sup> and Zack E. Murrell<sup>1</sup>. Vascular Flora of Three Top Mountain Game Land Preserve, Ashe County, North Carolina. Appalachian State University<sup>1</sup>**

Three Top Mountain is a 9.66 km long ridge in Ashe County, North Carolina within the Blue Ridge physiographic province and one of several high elevation peaks that encompass the Amphibolite Mountain Macrosite of northwestern NC. These peaks are underlain by rare mafic rock types that weather to a pH that is unusually high for the Blue Ridge Mountains. The site is protected as a North Carolina Game Lands and ranges in elevation from just below 914 m (3000ft) to 1530 m (5020ft). A qualitative floristic study was conducted through two growing seasons, from Spring 2009 through Fall 2011. To date 188 species and infraspecific taxa from 70 families have been identified by field documentation and vouchered specimen collection, using Weakley's (2008) taxonomy. Of the 188 taxa identified, 14 are state endangered (*Geum radiatum* and *Juncus trifidus*), threatened (*Liatris helleri*) or special concern (*Aconitum reclinatum*, *Allium allegheniensis*, *Campanula rotundifolia*, *Dicentra cucullaria*, *Huperzia appressa*, *Hypericum mitchellianum*, *Lysimachia quadrifolia*, *Panax quinquefolius*, *Trillium erectum*, *Trillium grandiflorum*, *Tsuga canadensis*, and *Tsuga caroliniana*), and three are federally endangered (*Geum radiatum* and *Juncus trifidus*) or threatened (*Liatris helleri*). The presence of nine plant communities originally documented by Oakley (1999) was confirmed. Comparisons of the Three Top flora with previous floristic studies of other high peaks in this area (Bluff Mountain, Mt. Jefferson and Phoenix Mountain) show significant overlap of floras, but also considerable differences due to the presence or absence of particular communities among these peaks and differences in the extent of human disturbance.

**Thursday, April 14 10:30 AM**

**Rachel K. Clark<sup>1</sup>, Alexander Krings<sup>1</sup>, Jon M. Stucky<sup>1</sup> and H. J. Kleiss<sup>1</sup>. Vascular Flora of Kitty Hawk Woods (Dare County, North Carolina). North Carolina State University<sup>1</sup>**

One of ten reserves in the North Carolina Coastal Reserve system, Kitty Hawk Woods (Dare County, NC) is a nationally significant natural area containing one of the last remaining examples of the rare Maritime Deciduous Forest (S1 G1) community type and the most extensive example of Maritime Swamp Forest (S1S2 G2) in North Carolina. Topographically, KHW is unique along North Carolina's Outer Banks by being situated on a series of north to south running, parallel, relict beach ridges, which provide the framework on which the plant communities have developed. In order to effectively manage and preserve the biodiversity of KHW, comprehensive resource inventory and monitoring were identified as top priority management goals in the KHW management plan. The objectives of the present work were to contribute to these goals by developing: (1) a checklist of the vascular flora of Kitty Hawk Woods based on a thorough floristic inventory and survey of historic collections and (2) an illustrated guide based on the checklist to facilitate monitoring, research, and precision management. Over 420 plant species in 110 families have been reported for the site, including two county records (*Psilotum nudum* S1

G5, W4; *Solidago villosicarpa* S1 G1, E). Keys are provided to all reported species and genera. Habitat, phenology, relative abundance, illustrations, and synonymy in Radford et al. (1968) are also provided. In addition, relevant herbarium vouchers from KHW and Bodie Island housed in the main depositories of Outer Banks collections are cited after each species.

**Thursday, April 14 10:45 AM**

**Kelly M. Hines<sup>1</sup>. Manual of the Vascular Flora of Howell Woods. North Carolina State University<sup>1</sup>**

Comprising 2,856 acres, Howell Woods is “the most significant terrestrial natural area” in Johnston Co., North Carolina, as designated by the NC Natural Heritage Program. The site hosts large areas of good quality Coastal Plain Bottomland Hardwood Forests (brownwater subtype); (S4 G5) and Mesic Mixed Hardwood Forest (Coastal Plain subtype); (S5 G5). Additional notable communities include examples of Streamhead Atlantic White Cedar Forest (S2 G3), Streamhead Pocosin (S3 G4), and Wet Pine Flatwoods (S3 G3G4). This study sought to provide requisite baseline documentation in the form of a flora to facilitate future management, monitoring, and research at the site. To date, over 500 species have been recorded based on 800+ collections. About eighty additional taxa are reported in the grey literature, but remain unvouchered. At least seven rare plant species occur on site including state threatened *Macbridea caroliniana* (Walter) S.F. Blake (S2 G2G3). Based on field collection and herbarium study, a taxonomic manual will be developed, complete with keys, synonymy, voucher citations, notes on abundance, notes on fruiting and flowering phenology, illustrations, and discussion of climate, soils, and plant communities.

**Thursday, April 14 11:00 AM**

**Sunny Hart<sup>1</sup>, Emily Blyveis<sup>1</sup>, Matt Bruton<sup>2</sup>, Clea Klagstad<sup>2</sup>, Nathan Parker<sup>2</sup>, Dwayne Estes<sup>2</sup> and Joey Shaw<sup>3</sup>. AN IN-PROGRESS FLORISTIC SURVEY OF THE OCOEE RIVER GORGE, POLK CO., TN. The University of Tennessee at Chattanooga<sup>1</sup> Austin Peay State University<sup>2</sup> he University of Tennessee at Chattanooga<sup>3</sup>**

The Ocoee River Gorge (ORG) of Polk County, Tennessee is one of the most scenic places in the state as well as the greater Southern Appalachian region. It is one of the longest of only four such gorges in the Tennessee portion of the Blue Ridge (along with the Hiwassee, Pigeon, and Nolichucky river gorges). Each year thousands of tourists visit the gorge for whitewater rafting, kayaking, camping, hiking, and boating. The ORG lies mostly within the Cherokee National Forest and is bisected by U.S. Hwy 64, which parallels the north side of the river. This is a much-traveled highway that serves as a major east-west corridor through the U.S. and it is one of only a few routes available for commercial traffic through the mountains. During winter of 2009-2010, rockslides occurred along this highway and these prompted discussions among decision-makers about the rare plant species and how efforts might be undertaken to conserve them during road maintenance. The primary goals of our research are to document the flora of the ORG and delineate vegetation types (according to NatureServe) to aid future road maintenance decisions. Thus far, we have made sixteen field trips, from mid-July until early November 2010, and collected 750 plant specimens. Several rare or significantly uncommon species were documented, including *Acer leucoderme*, *Agalinis plukenetii*, *Diervilla rivularis*, *Helianthus smithii*, *Lobelia amoena*, *Lysimachia fraseri*, *Pityopsis ruthii*, *Pycnanthemum curvipes*, *Sedum nevii*, *Symplocos tinctoria*, and *Trichomanes petersii*. Thirteen aggressive non-native plant species were documented, including one state record (*Lathyrus sylvatica*).

Thursday, April 14 11:15 AM

**Sarah M. Noble<sup>1</sup> and Steven Carey<sup>1</sup>. Initial floristic survey of bryophytes found in and around the mouths of limestone caves in south Alabama. University of Mobile<sup>1</sup>**

Bryophytes were collected and identified from four south Alabama limestone cave sites. Samples were collected from the cave mouths as far into the caves as bryophytes were found growing. Bryophytes were also collected from the, approximately two meter, zone around the outside of the cave opening. Environmental factors such as substrate, moisture level and light level were noted. The most intensively sampled area was at the mouth of each cave. Results of this floristic survey will serve as the initial baseline for further planned investigations of Alabama limestone cave

Thursday, April 14 11:30 AM

**Bruce A. Sorrie<sup>1</sup>. Realignments in *Amsonia* of the Southeastern United States. University of North Carolina herbarium<sup>1</sup>**

*Amsonia* is a genus of some 20 species of North America and Japan. Within the southeastern region of the United States, 13 taxa have been variously treated by previous authors; here I recognize 7 species and one variety: *Amsonia tabernaemontana* var. *tabernaemontana*, *A. tabernaemontana* var. *gattingeri*, *A. rigida*, *A. glaberrima*, *A. ludoviciana*, *A. ciliata*, *A. hubrichtii*, and *A. texana*. These taxa collectively range from southeastern Virginia to central Illinois and southeastern Kansas, south to central Florida and west-central Texas.

### Genetics - Cell & Molecular Biology

#### ORAL PRESENTATIONS

Thursday, April 14 08:30 AM - 12:00 PM

Thursday, April 14 08:45 AM

**Sharen C. Kemp<sup>1</sup>, Michael Pisani<sup>2</sup> and Joann M. Lau<sup>1</sup>. Analysis of genetic polymorphisms in the Vitamin-D receptor gene in persons with disc herniation in the Caucasian population. Bellarmine University<sup>1</sup> American Chiropractic<sup>2</sup>**

The term "back pain" has been coined to describe a broad range of problems, with the most common being lumbar disc herniations. Most lumbar disc herniations result from strenuous labor, injuries from sports or car accidents, or exposure to the daily vibrations from driving a car. In addition, environmental factors such as age, gender, and weight contribute to lumbar disc herniations. The Vitamin-D receptor (VDR) gene is integral to the genetic regulation of bone mineral density. Vitamin-D is a secosteroid necessary for the absorption of calcium from the intestines; therefore, when there is a decrease in Vitamin-D, there is a depletion of calcium resulting in a weakening of the bone and vertebral disc. VDR has been found to be associated with bone diseases such as osteoporosis and osteopenia. Previous studies in the Asian population have identified Apal and TaqI polymorphisms in the VDR gene in individuals with disc herniation. The purpose of this study was to investigate VDR gene polymorphisms and its correlation to disc herniation in the Caucasian population. Genomic DNA was extracted from buccal cells of individuals diagnosed with disc herniation, and from gender and age matched individuals with no back pain history. The VDR gene was amplified using polymerase chain reaction, digested with Apal and TaqI restriction enzymes, and analyzed by gel electrophoresis. Results suggest that a single nucleotide polymorphism in exon 9 of the VDR gene increase ones susceptibility to disc herniation in individuals of Caucasian descent.

Thursday, April 14 09:00 AM

**T'shura S. Ali<sup>1</sup>, Melissa D. Pawley<sup>1</sup>, Sanda Zolj<sup>1</sup> and Joann M. Lau<sup>1</sup>. The anti-cancerous effects of Reishi mushroom on lung cancer proliferation in the female cell line H1793. Bellarmine University<sup>1</sup>**

Lung cancer is one of the leading causes of deaths worldwide with a survival rate of 14% after 5 years of diagnosis. Hence, new treatment options are needed. *Ganoderma lucidum* (Curtis) P. Karst., is an ancient, medicinal mushroom traditionally used in Asian countries for the treatment of a wide range of diseases, including cancer. The biochemical mechanism of *G. lucidum* is unknown; however, its bioactive components (polysaccharides and triterpenoids) may have anti-cancer effects by inducing apoptosis. The objective of this study was to examine the effect of *G. lucidum* on the female lung cancer cell line (H1793). Results showed that whole *G. lucidum* extracts inhibited proliferation by 80% after 120 h post-treatment. This decrease was time and dose dependent. Furthermore, the triterpenoids appeared to have a greater decrease on cell proliferation compared to the polysaccharides, 80% vs. 10%, respectively. Immunoblot analysis showed an up-regulation in the pro-apoptotic protein Bax and a down-regulation in the anti-apoptotic protein Bcl-xL. Moreover, expression of cyclin D and cdk4 (which controls expression of G1/S regulatory proteins), and cdc2 (which controls the regulation of G2/M transition) was down-regulated in a dose and time dependent manner. DNA fragmentation was used to confirm that cells are undergoing the process of apoptosis. Thus, *G. lucidum* may have therapeutic potential for the treatment of lung cancer.

Thursday, April 14 09:30 AM

**Jennell M. Talley<sup>1</sup>, Diane C. DeZwaan<sup>2</sup>, Leslie D. Maness<sup>1</sup>, Brian C. Freeman<sup>2</sup> and Katherine L. Friedman<sup>1</sup>. The Est3 Subunit of Yeast Telomerase Interacts Directly with the Catalytic Subunit and Stimulates Telomerase Activity in vitro. Vanderbilt University<sup>1</sup> University of Illinois<sup>2</sup>**

Telomerase is a multi-subunit enzyme that maintains genome stability through its role in telomere replication. Although the Est3 protein is long recognized as an essential yeast telomerase component, how it associates with and functions in the telomerase complex has remained enigmatic. Here we provide the first evidence of a direct interaction between Est3p and the catalytic protein subunit (Est2p) by demonstrating that recombinant Est3p binds the purified Telomerase Essential N-terminal (TEN) domain of Est2p in vitro. Mutations in a small cluster of amino acids predicted to lie on the surface of Est3p disrupt this interaction with Est2p, reduce assembly of Est3p with telomerase in vivo, and cause telomere shortening and senescence. We also show that recombinant Est3p stimulates telomerase activity above basal levels in vitro in a manner dependent on the Est2p TEN domain interaction. Quantitative analysis of telomerase function from strains lacking EST3 shows a reproducible decrease in primer extension activity, consistent with a contribution by the Est3 protein to catalytic activity. Together these results are the first to define a direct binding interaction between Est3p and Est2p and to reconcile the effect of *Saccharomyces cerevisiae* Est3p with previous experiments showing that Est3p homologs in related yeast species influence telomerase activity. Additionally, it contributes functional support to the idea that Est3p is structurally related to the mammalian shelterin protein, TPP1, which also influences telomerase activity through interaction with the Est2p homolog, TERT.

Thursday, April 14 09:45 AM

**Kelsey S. Penland<sup>1</sup>. PCR mediated, site-directed mutagenesis of the FMN riboswitch of *Photobacterium luminescens* and the effect on symbiosis with *Caenorhabditis elegans*. Guilford College<sup>1</sup>**

Riboswitches are non-coding RNAs that regulate the expression of downstream genes through metabolite-binding induced secondary structures. Bacterial riboswitches to regulate key metabolic pathways, and so are a potential targets for the development of novel metabolite analogs antibiotics. This study uses PCR-mediated, site-directed, mutagenic recombination to deactivate the FMN riboswitch either in the “on” (constitutive expression) or “off” (suppression) position in *Photobacterium luminescens*. The FMN/FAD metabolic pathway is controlled by the binding of riboflavin to the FMN riboswitch upstream of the rib operon. *P. luminescens* is an insect predator, that has a complex symbiotic relationship with soil nematodes. Upon insect invasion by a nematode harboring *P. luminescens*, the bacteria are released, multiply and release virulence factors that kill the insect, and so provide nutrients for the host nematode. Using the *P. luminescens* and *Caenorhabditis elegans* model, this research will investigate the effect of FMN riboswitch activity on this symbiotic relationship. Site-directed mutagenic products have been assembled and preliminary virulence studies indicate the predation of *C. elegans* by *P. luminescens*, suggesting that the symbiosis of these organisms is more complex than has been recognised.

**Thursday, April 14 10:00 AM**

**Courtney M. Gardner<sup>1</sup>, Cynthia Bennington<sup>1</sup> and Alicia Schultheis<sup>1</sup>. Evaluation and characterization of polymorphic microsatellite loci for paternity analysis in *Passiflora incarnata*. Stetson University<sup>1</sup>**

Courtney Gardner, Cynthia Bennington & Alicia Schultheis Evaluation and characterization of polymorphic microsatellite loci for paternity analysis in *Passiflora incarnata* In response to herbivory, the andromonoecious floral vine *Passiflora incarnata* shifts from hermaphroditic to functional male flowers and ceases costly ovule production in favor of seed production. We hypothesized that this gender plasticity would increase fitness of plants with male flowers (measured as seed paternity). To develop markers for use in paternity analysis, fourteen putative parental genotypes were surveyed for polymorphism across ten microsatellite markers. Six of fourteen markers (C12, A4, G10, I5, G5, K13) were polymorphic and likely to be of use establishing seed parentage.

**Thursday, April 14 10:30 AM**

**Leland J. Cseke<sup>1</sup> and Sharon M. Talley<sup>2</sup>. Educational Outreach for the Molecular Identification of Invasive Plants. The University of Alabama in Huntsville, Huntsville, AL<sup>1</sup> USDA/APHIS, Fort Collins, CO<sup>2</sup>**

The primary goal of these guidelines is to provide education for the development of cost-effective and reliable plant diagnostic tools to identify plants or plant tissue that cannot be identified through visual means. Such outreach will help to accurately distinguish prohibited plants and plant materials at U.S. ports and in the field. Plant identification through molecular diagnostics technologies is critical to protect our plant resources against the unplanned and accidental introduction of invasive plant species and other prohibited plant taxa that are carriers of plant pests and disease. In these guidelines, we detail strategies, pitfalls, and case studies that provide the most up-to-date, accurate, reproducible, and cost-effective molecular methodologies to identify plants. Some strategies that are covered include what methods are best to provide the most reliable and cost-effective results; which nuclear and plastid DNA regions are best for fingerprinting and what are their limitations; how does one mine nucleotide databases and the literature for quality sequences; which plant tissues are best for DNA extraction; how does one avoid DNA contamination; and how to analyze the sequences derived from PCR products. Also included in these guidelines are cost-saving modifications for when large numbers of specimens require molecular approaches for high-throughput identification.

Thursday, April 14 11:00 AM

**Liang Yu<sup>1</sup> and Huiwang A. Jeng<sup>1</sup>. Polycyclic Aromatic Hydrocarbons Induced Lipid Peroxidation in Relation to Lipid Alterations in Human Vascular Cells. Old Dominion University<sup>1</sup>**

Oxidative stress induced by polycyclic aromatic hydrocarbons (PAHs) is well known to play a critical role in endothelial activation and potentially cause endothelial dysfunction. Oxidized phospholipids generated via reactive oxygen species (ROS) can initiate and modulate cellular events that attribute to atherosclerosis. This study aimed to assess lipid peroxidation induced by PAH as it alters the lipid profile and oxidizes lipids on cell membranes of human coronary artery endothelial cells. Fourier Transform Ion Cyclotron Resonance Mass Spectrometer (FTICR-MS) with 12 Tesla at Old Dominion University used for assessment. Human coronary artery endothelial cells (HCAEC) were exposed to PAH with various doses and treatment duration times. Then the level of ROS was measured using the fluorometric method by a flow cytometer. Lipid peroxidation was assessed based on the formation of malondialdehyde, measured using the thiobarbituric acid reactive substances assay. Lipids of HCAEC were extracted by chloroform and methanol and analyzed using 12T FTICR-MS to separate peaks and even the differentiation among molecules at less than one mass unit. After PAH exposure, cell morphology noticeably changed, MDA levels increased and correlated with ROS levels. Changes in cell lipid profiles were found based on the analysis of spectrum data from FTICR-MS. Thus, both ROS and lipid peroxidation were involved in PAH induced endothelial cell damage during short term exposure. This study has advanced the method to identify specifically oxidized phospholipids that could serve as biomarkers by assessing PAH-induced endothelial dysfunction and underlying mechanisms.

Thursday, April 14 11:15 AM

**Indrani Dey<sup>1</sup> and Christi Magrath<sup>1</sup>. Induction of filamentous growth in yeast deletion strains. Troy University<sup>1</sup>**

Filamentous growth in *Saccharomyces cerevisiae* is an unusual, though not rare, phenomenon and can be facilitated by nutrient starvation. The effects of different water samples in initiating filamentous growth in yeast strains harboring deletions in YPL203W (Tpk2), YHR111W (Uba4), and YMR307W (Gas1) was analyzed and compared to the wild strain (BY4741). Three different water samples were used: distilled water, water from the mixing zone at the Troy Wastewater Treatment Plant, AL, and water from a water body upstream of the wastewater treatment plant (Walnut Creek, AL). Nitrogen limited media supplemented with butanol was used to induce filamentation, and as a negative control, the same media without butanol was used for growth analysis. Upon exposure to the wastewater treatment effluent, upstream stream water, and distilled water, wild type filament formation was observed in the control water sample when both non-induced and induced by the addition of butanol. Both Uba4 and Tpk2 deletion strains displayed elevated filamentation levels when exposed to effluent or upstream water. BY4741 and Gas1 deletion strains did not display altered filamentation phenotypes. Determining the filamentation levels in yeast deletion strains may allow identification strains that can be utilized for identifying environmental stress responses based on an easily observable phenotypic trait

Thursday, April 14 11:30 AM

**Emily L. Gillespie<sup>1</sup> and Erik C. Johnson<sup>1</sup>. Chimeric G-protein coupled receptors: Probing the structural-functional relationships of signaling pathways. Wake Forest University<sup>1</sup>**

G-protein coupled receptors (GPCRs) are a superfamily of eukaryotic transmembrane receptors that function in a variety of physiologies and behaviors. These receptors

respond to a variety of cues or ligands, such as hormones, light-sensitive compounds, and neurotransmitters. Stimulation of the receptor by its specific ligand results in a conformational change of the GPCR, which is followed by activation of a heterotrimeric G-protein complex and subsequent cellular responses (i.e., a signaling cascade). Because of their diverse roles in multiple physiologies, GPCRs are targets for approximately 50% of all new drugs. However, the specific details of GPCR-ligand interactions remain unclear. To address these unknown details, we are constructing a set of chimeric *Drosophila melanogaster* GPCRs. Specifically, we are focusing on a set of GPCRs, which signal through different pathways, and have different neuropeptide ligands. A Polymerase Chain Reaction (PCR) strategy was employed to generate receptor chimeras, in which either the N- or C-terminus sequences were replaced for a specific GPCR with other GPCRs, known to signal through different pathways. Following cloning of the chimeric GPCRs into a mammalian expression vector, Human Embryonic Kidney (HEK-293) cells were transfected with the chimeric receptor cDNA. HEK cells were then subjected to a variety of signaling and desensitization assays in order to examine their responsiveness to a variety of ligands. These preliminary experiments will provide the basis for more detailed studies of these proteins that play significant roles in varied physiologies and behaviors.

Thursday, April 14 11:45 AM

**Wanda T. Schroeder<sup>1</sup>, Limin Zhu<sup>1</sup>, Chistiana Baloescu<sup>1</sup> and Yo-Leigh Gardner<sup>1</sup>.  
Transglutaminase 1 and Involucrin Are Expressed in Mouse Vaginal Epithelial Cells  
in Response to Estrogen. Wesleyan College<sup>1</sup>**

As stratified squamous epithelial cells differentiate, they go through a well-documented program of gene expression. Epidermal keratinocytes have been extensively studied and several protein markers are routinely used to demonstrate terminal differentiation. Whereas transglutaminase 1 and involucrin are demonstrated markers of terminal differentiation in keratinocytes, their involvement in the differentiation program of estrogen-responsive epithelial tissues, such as vaginal and uterine epithelia, is unclear. In this study, we analyze the expression of transglutaminase 1 in vaginal and uterine epithelial cells in intact, cycling mice at different stages of the estrous cycle including proestrus, estrus, metestrus, and diestrus. While transglutaminase 1 protein is not observed in immature mice, it is clearly expressed in the upper stratified layers of vaginal epithelium in mature mice during the stages of estrous when estrogen levels are high, namely estrus, metestrus, and diestrus. On the other hand, transglutaminase 1 is not expressed in mature mice uterine epithelial cells. In immature mice, vaginal epithelium is unstratified and is negative for transglutaminase 1 and involucrin expression. However, in litter mates given exogenous estrogen injections, transglutaminase 1 and involucrin are not expressed at 0, 3, and 6 hours post-estrogen exposure, but are clearly induced beginning at 12 hours post-injection. This is also the time point which coincides with epithelial stratification. The results of this study indicate that transglutaminase 1 and involucrin are expressed in response to estrogen in mouse vaginal epithelium and provides valuable information on differentiation pathways in estrogen-responsive epithelia.

**Herpetology****ORAL PRESENTATIONS****Thursday, April 14 08:30 AM - 12:00 PM****Thursday, April 14 08:30 AM****Evan A. Eskew<sup>1</sup>, Steven J. Price<sup>1</sup> and Michael E. Dorcas<sup>1</sup>. Effects of Flow Regulation on Anuran Occupancy and Abundance in Riparian Zones. Davidson College<sup>1</sup>**

The natural flow regimes of rivers worldwide have been heavily altered, and damming in particular represents a pervasive disturbance to riverine ecosystems. Flow regulation effects of dams are known to negatively impact a variety of aquatic animals, with abundance and species richness typically increasing downstream from dams. For this study, we conducted anuran calling surveys at 42 study locations along the Broad and Pacolet Rivers in South Carolina in order to address the potential effects of flow regulation through damming on anuran occupancy and abundance. Metrics were estimated using Program PRESENCE, and models incorporated distance upstream and downstream from nearest dam as covariates, with urbanization levels representing an alternative population stressor. Of the seven anuran species used in analyses, three species showed distance to dam effects on occupancy and four showed such an effect on abundance. For all but one of these anuran species, occupancy and abundance were positively correlated with distance downstream from nearest dam. This study is one of the first to show that damming may have a strong negative effect on semi-aquatic species, and we suspect that reduced occupancy and abundance of anurans in the river reaches just downstream from dams may be the result of alterations in flow regime resulting from damming which can lead to reduced riparian zone wetlands that serve as anuran breeding habitat. Future studies should more closely examine the specific mechanisms by which damming affects anuran populations.

**Thursday, April 14 08:45 AM****Andrew W. Cantrell<sup>1</sup>, Yong Wang<sup>1</sup>, Callie Schweitzer<sup>2</sup> and Cathryn Greenberg<sup>2</sup>. Oak-Regenerating Silvicultural Treatments Impact on Herpetofauna on the Mid-Cumberland Plateau of Southern Tennessee. Alabama A&M University<sup>1</sup> USDA Forest Service Southern Research Station<sup>2</sup>**

The USDA Forest Service Southern Research Station implemented a Regional Oak Study (ROS) to investigate the impact of oak-regenerating silviculture treatments on 3 separate sites of various quality across the southeastern United States beginning in late 2008. Such treatments have the capability to alter landscapes, which in turn can alter the abundance, composition, diversity, and richness of the species that live in these areas. My research focused on the response of herpetofauna to two of these treatment types. A completely randomized design with 5 replications was used to test three silviculture treatments: 1) shelterwood (30%-40% basal area (BA) retention), 2) oak shelterwood (partial removal of the mid-story by means of herbicide), and 3) prescribed fire, along with a control resulting in 20 experimental units (approx. 5 ha each). Modifications had to be made to the original experimental design resulting in 5 control, 5 oak shelterwood, 3 shelterwood, and 5 pre-prescribed fire (considered controls during analysis) units. From mid-May till the end of September in 2009 and 2010 herpetofauna was assessed by the use of drift fences equipped with pitfall and double ended funnel traps. During this time a total of individuals 5,769 (excluding recaptures) were caught comprising 33 different species. This research has identified several species to have significant differences among treatment types and has also identified some of the mechanisms responsible for influencing herpetofaunal diversity and population fluctuations.

Thursday, April 14 09:00 AM

**Patrick W. Cusaac<sup>1</sup>, Raymond C. Wright<sup>1</sup> and Frank C. Bailey<sup>1</sup>. Effects of Maternally Transferred Methylmercury Chloride on Stress Induced Corticosterone Levels in *Nerodia sipedon* Neonates. Middle Tennessee State University<sup>1</sup>**

Stress responses in ectothermic organisms play a crucial role in their ability to survive. Cause and response interactions of stressors are relatively well studied, however studies showing the effects of heavy metal toxicity on stress are lacking, particularly in squamate reptiles. The purpose of this study was to show the effects of maternally transferred methylmercury chloride on stress-induced plasma corticosterone (a hormone that normally increases in response to stress) levels in Northern Water Snake (*Nerodia sipedon*) neonates. The objective of this study was to determine if neonates from methylmercury-dosed females exhibit a diminished increase in corticosterone in response to confinement stress when compared to controls. Gravid females were dosed with 0, 10, or 10,000 ug/Kg methylmercury. We found no significant difference in corticosterone levels between dosing treatments (ANOVA; Fdf=2,8= 1.046; P=0.395). We therefore conclude that methylmercury chloride has no effect on stress induced corticosterone levels in neonate *N. sipedon*.

Thursday, April 14 09:15 AM

**Thomas K. Pauley<sup>1</sup>. Forty-four years of herping in West Virginia. Marshall University<sup>1</sup>**

I began studying amphibians and reptiles of West Virginia in 1966, and during this time, I have observed several changes in species occurrences and ranges. Ranges of some amphibian species have expanded (Cope's Gray Treefrogs, *Hyla chrysoscelis*) and some have contracted (Upland Chorus Frogs, *Pseudacris feriarum*). Some species have become less common (Northern Red Salamanders, *Pseudotriton r. ruber*), but occurrences of most have appeared to remain stable. The biggest threats to amphibians and reptiles in the Mountain State include habitat fragmentation such as rights-of-way, roads, and ski slopes; habitat degradation such as water pollution; and habitat destruction through developments. As examples of changes in species occurrences and ranges, I will discuss the status of Upland Chorus Frogs, Eastern Cricket Frogs (*Acris c. crepitans*), Eastern Spadefoots (*Scaphiopus holbrookii*), Cheat Mountain Salamanders (*Plethodon nettingi*), and Eastern Box Turtles (*Terrapene c. carolina*) in the state.

Thursday, April 14 09:30 AM

**Michael A. Anderson<sup>1</sup> and Brain T. Miller<sup>1</sup>. Iron Deposition in First-Generation Teeth of the Streamside Salamander, *Ambystoma barbouri*. Middle Tennessee State University<sup>1</sup>**

Iron-rich molecules are sequestered in the enamel and enameloid layers of teeth in some salamander species, as well as other vertebrates. Whereas the presence of iron in adult teeth is detected visually via orange-brown cusp coloration, embryonic and early-stage larval teeth are too small to be sufficiently visually analyzed. Consequently, the earliest ontogenetic stage during which iron is deposited in teeth remains unknown. We used scanning electron microscopy and energy dispersive X-ray spectroscopy to examine the teeth of embryonic and larval streamside salamanders, *Ambystoma barbouri*, to determine what developmental stage dental iron deposition begins. Additionally, we sought to quantify the relative iron concentration along a longitudinal axis. Iron was detected in first-generation teeth of embryos, suggesting that yolk, rather than an exogenous food supply, is the source of iron deposited in teeth of early-stage salamanders. Furthermore, similar to adult salamanders of other species, iron was most concentrated at the apex of the tooth crown, suggesting that the process of iron deposition may be similar throughout ontogeny.

Thursday, April 14 09:45 AM

**Brett A. Macek<sup>1</sup>. Preliminary analysis of call activity at an ephemeral pond in NE Alabama. Jacksonville State University<sup>1</sup>**

We studied calling activity over a 5-month period at Frog Pond, near White Plains in NE AL in 2010. Eight species, representing 3 Families, were recorded at the site. Hylid frogs dominated the site (5 sp.) followed by Ranids (2 sp.) and Microhylids (1 sp.). All species recorded were accounted for within the first 3 months of the study. Not all species called simultaneously. In this study, hylids dominated calling activity early in the season. *Pseudacris crucifer* called first, followed by *Hyla gratiosa*, *H. chrysoscelis*, *A. crepitans*, and *H. cinerea*. Ranid frogs called next, followed by Microhylids. Early in the study, only 1-4 species called. Daily calling activity peaked with 6-7 species calling in May. Calling activity dropped off in June as drought conditions progressed. A late-season spike in calling activity correlated with a rainfall event in July. Intensity of calling activity was measured using the Wisconsin Frog and Toad Survey (WFTS), which assigns calls to index values on a scale ranging from 1-3 for each species. When viewed over the entire breeding season, several calling patterns were observed. Some species jumped to level 3 calling immediately once calling commenced, and remained high throughout the season. Several species remained sporadic throughout the season, while others remained at moderate calling intensities throughout the calling season.

Thursday, April 14 10:15 AM

**Joseph F. Simpson, III<sup>1</sup> and Thomas P. Wilson<sup>1</sup>. Assessment of an Amphibian Community from a Fragmented Landscape: Prospects for the Future. University of Tennessee at Chattanooga<sup>1</sup>**

It is well known that amphibians worldwide are experiencing population declines. A leading hypothesis presented to describe the cause of these declines is habitat alteration. Forest-dwelling species are experiencing an especially rapid decline. However, many species are poorly studied and thus difficult to properly assess. Even the relatively common mole salamanders often lack estimates of basic community structure and dynamics, and other life history data in relation to land use. Few studies have adequately quantified the abundance of amphibians from isolated wetlands over a well-defined time frame. Thus, research creating population estimates and relative abundance data is vital because it can often be readily incorporated into adaptive conservation and management strategies, such as road closures during nights of mass amphibian movements. Further, these species also serve a larger ecological role as an important indicator to human impacts on wetland communities, and biodiversity on a regional and national scale is often measured in terms of species richness. Site-specific analyses are critical to producing an overall picture of species status locally as well from across the range. Information on large-scale habitat changes will be presented with directions for the future.

Thursday, April 14 10:30 AM

**Shawna M. Foley<sup>1</sup>, Steven J. Price<sup>1</sup> and Michael E. Dorcas<sup>1</sup>. Nest-site Selection and Nest Depredation of Semi-aquatic Turtles on Golf Courses. Davidson College<sup>1</sup>**

Anthropogenically altered landscapes present various challenges to semi-aquatic turtle reproduction. Semi-aquatic turtles require terrestrial habitat in which to deposit eggs. In addition to the mortality risks associated with locating suitable nesting sites and avoiding predation during the nesting process, nest depredation in urban areas can lower recruitment and lead to unsustainable population sizes. We explored nest site selection of female eastern painted turtles (*Chrysemys picta*) at a golf course in Davidson, NC, using radio-telemetry to follow females to nest sites. Radiotransmitters were attached to fourteen gravid females with epoxy, and tracking was conducted twice daily from 28 May through 30 June 2010. We modeled nest preference using Akaike Information Criterion

and found that the model with highest support consisted of “landscape” cover type, composed of mulched areas and mowed grass. Additionally, we evaluated nest depredation rates using simulated turtle nests at golf courses and compared them to depredation rates of nests installed at urban and farm ponds in the Davidson area. Artificial nests were constructed at near and far distances from the pond edge and monitored for 7 observational days. The model with the greatest support indicated that pond type was the most effective predictor of simulated nest survivorship. Our results provide a springboard for further research on nest-site selection and nest depredation of semi-aquatic turtles, and provide golf course managers and landscapers with recommendations to promote the persistence of semi-aquatic turtle populations on golf courses and in urban areas.

Thursday, April 14 11:00 AM

**Nathan A. Shepard<sup>1</sup>, Jayme L. Waldron<sup>2</sup>, Catherine M. Johnson<sup>3</sup> and Thomas K. Pauley<sup>1</sup>. Survivorship of Lungless Salamanders in Association with Edge Effects from Linear Fragmentation. Marshall University<sup>1</sup> University of South Carolina<sup>2</sup> United States Forest Service - Monongahela National Forest<sup>3</sup>**

Amphibian decline is a global epidemic in which multiple factors are involved, leaving many species of amphibians vulnerable to extinction. Habitat fragmentation is a global threat to amphibian populations, with localized implications for amphibian decline. In West Virginia, many lungless salamander populations are fragmented by various man-made edges that transect their habitats. These edges may act as barriers to salamander movement. Habitat fragmentation can indirectly affect lungless salamanders by altering plant diversity, soil moisture, and prey availability, limiting resources and strengthening the barrier to movement and distribution. Populations of the federally threatened Cheat Mountain Salamander (*Plethodon nettingi*) have become disjunct as a result of large-scale habitat loss and fragmentation. The goal of this study is to assess the effects of gated roads and recreational trails on *P. nettingi* survivorship. Mark-recapture data was collected using cover-board arrays at study sites that were constructed along the following treatments: gated roads, low-use hiking trails, high-use hiking trails, and experimental controls. We sampled our study sites (n=20) once a month for four months (May, June, July, August) in 2009 and 2010. We captured and marked 235 *P. nettingi* with a 23% recapture rate in 2009 which increased to 30% in 2010. We will present survivorship models developed using statistical program MARK. Results from this study will be used to recommend protocols for the United States Forest Service to minimize the impact of gated roads and recreational-use trails on *P. nettingi* populations.

Thursday, April 14 11:15 AM

**Jerrod D. Shipman<sup>1</sup> and Vince A. Cobb<sup>2</sup>. Thermal Ecology of Hibernation in Nerodia Sipedon. Middle Tennessee State University<sup>1</sup> Middle Tennessee State University<sup>2</sup>**

Hibernation is a thermally unique time for reptiles in which they must seek shelter to escape from potentially life threatening temperatures. Although hibernation at northern latitudes has been addressed in several snake species, little is known about the overwintering habits of reptiles in the southern U.S. In this study, we radiotracked Midland Watersnakes along a river in Middle Tennessee, surgically implanted with radio transmitters and temperature data loggers, to document ingress and egress patterns, potential winter activity, and body temperature variation during hibernation. Snakes chose to hibernate immediately adjacent to their area of activity in the river. Hibernation duration was  $113 \pm 6.5$  days. Snakes rarely emerged to bask mid-winter and mean body temperature during hibernation was 7.3°C Snake body temperatures tracked local air temperatures and water temperatures closely throughout hibernation indicating snakes did not see refuges deep enough to buffer them from daily temperature variation. Interestingly, while this is one of the first studies to examine body temperature variation in

southern species, hibernation body temperatures were only slightly warmer than what several studies have reported for northern latitude species.

**Thursday, April 14 11:30 AM**

**Howard J. Stanton<sup>1</sup>, Mizuki K. Takahashi<sup>2</sup> and Thomas K. Pauley<sup>1</sup>. Examining the evolutionary influence of male-male competition on testes size in salamanders. Marshall University<sup>1</sup> Bucknell University<sup>2</sup>**

Sperm competition theory predicts that relatively larger testes size will evolve in animals with polygamous mating systems compared to those in monogamous mating systems due to sperm competition. While intensity of sperm competition is the significant predictor of testes size in other taxa, in salamanders the intensity of male-male competition in the transfer of spermatophores to females is predicted to be a critical factor. This is because males have to deposit more spermatophores to secure a reproductive pay-off under higher intensity of male-male competition in spermatophore transfer. We hypothesized that salamander species that breed explosively as groups possess increased proportional testes mass compared to those breeding in less competitive environments. We measured snout-vent length, body mass, and testes mass of *Ambystoma maculatum* (n=15), *A. opacum* (n=14), *A. texanum* (n=15), *A. tigrinum* (n=12), and *Notophthalmus v. viridescens* (n=14). Species were chosen because they represented a variety of mating strategies and competitive intensities. Accordingly, we predicted that data would reveal a gradient of proportional testes sizes; with *A. maculatum* having the greatest proportional testes mass and *A. opacum* having the least. Testes were examined microscopically and classified by the stage of spermatogenesis to account for seasonal size variance of testes. Testes size was compared between species using analysis of covariance (ANCOVA). This data allowed us to draw conclusions about the relationship of testes size and mating systems in salamanders, helping us to understand the effects of male-male competition and spermatophore transfer on anatomical evolution.

**Thursday, April 14 11:45 AM**

**Ryan Seddon<sup>1</sup> and Matthew Klukowski<sup>1</sup>. The effects of acute stress on corticosterone, leukocytes, and testosterone in male Southeastern Five-lined Skinks (*Plestiodon inexpectatus*). Middle Tennessee State University<sup>1</sup>**

Increased glucocorticoid levels are an important component of the stress response. Corticosterone (CORT), the major glucocorticoid in reptiles, induces physiological and behavioral changes that are thought to help an individual overcome the immediate stressor and perhaps prepare for future stressors. While immunosuppressive effects of chronically elevated corticosterone are well known, acutely elevated CORT levels may actually enhance immunity. For example, acute stress has been reported to increase the heterophil:lymphocyte ratio in the blood. Testosterone levels are typically suppressed by stress and could also play a role in immunity. Here we tested whether male lizards subjected to an acute confinement stress had increased plasma CORT, altered leukocyte distributions in the blood, and decreased testosterone levels. Corticosterone levels and eosinophil:lymphocyte ratios were significantly elevated in confined lizards. The change in eosinophil:lymphocyte ratio could be used to prepare the immune system for potential effects of stressors, such as injury. Surprisingly confinement stress had no effect on plasma testosterone levels. This latter result may indicate that maintenance of high testosterone levels is especially important for reproductive success in this species.

**Animal Behavior & Conservation****ORAL PRESENTATIONS****Thursday, April 14 01:30 PM - 04:15 PM****Thursday, April 14 01:30 PM**

**Nicole L. Barrios<sup>1</sup> and Lynn M. Siefferman<sup>1</sup>. A Test of Parental Preferences for Offspring Sex and Ornamentation in Eastern Bluebirds (*Sialia sialis*). Appalachian State University<sup>1</sup>**

An important tenant of life-history theory is that parents face trade-offs in reproductive investment. One classical trade-off is that by investing energy in one offspring, there is less energy for other offspring. Protection of offspring from potential predators is an important parental care behavior. Because offspring characteristics like sex and ornamentation are expected to influence their future reproductive value, those traits may influence parental favoritism. Because sons exhibit greater variability in reproductive potential than daughters, parents in high-quality habitats are expected to preferentially defend sons and, in low quality habitats, to defend daughters. Further, ornamental traits in males influence reproductive value; the more-ornamented males tend to father more young. Thus parents should always favor the more-ornamented over the less-ornamented sons. Eastern Bluebirds, *Sialia sialis*, exhibit bi-parental care of young and aggressively defend fledglings from potential predators. Offspring exhibit bright blue plumage; males are more colorful than females, and the brighter males tend to experience higher reproductive success as adults. In the spring of 2010, we tested parental favoritism for fledgling-aged offspring by simultaneously presenting two offspring with the threat of predation and recording parental responses. First, parents chose between male versus female offspring. Second parents chose between male offspring manipulated bright versus dull. We found that, regardless of habitat quality, parents did not show preferences for offspring sex. Fathers, however, preferentially defended brighter over duller sons. These data suggest that ornamental plumage coloration in male juvenile bluebirds may function as a signal of offspring quality to elicit greater parental care.

**Thursday, April 14 01:45 PM**

**Shannon L. White<sup>1</sup> and Charles Gowan<sup>1</sup>. Brook trout use individual recognition and transitive inference to determine social rank. Environmental Studies Program, Randolph-Macon College, Ashland, VA 23005.<sup>1</sup>**

Individual recognition and transitive inference are two mechanisms used by some animal species to reduce the evolutionary costs of living in dominance hierarchies; however, the ability of salmonids to use such mechanisms is not well-documented in the literature. Using three training regimes followed by approach/avoidance tasks, we demonstrated that brook trout used both individual recognition and transitive inference when forming and maintaining dominance hierarchies. After directly interacting in groups of up to five fish, trout were able to recognize each other as individuals and knew the dominance rank of other members in the linear hierarchy. When physically isolated and only allowed to watch dyadic interactions between rivals, a bystander was unable to transitively infer dominance relationships. However, when the bystander interacted with two members of the hierarchy and subsequently watched interactions between a novel and familiar rival, it could transitively infer the dominance relationship of the novel rival. This study provides the first conclusive evidence that trout can use individual recognition and transitive inference when forming dominance hierarchies. Similar studies on transitive inference in cichlids produced dissimilar results, indicating different species of fish may use different cognitive processes when engaging in agonistic behavior.

Thursday, April 14 02:00 PM

**Andrew J. Laughlin<sup>1</sup>, Caz M. Taylor<sup>1</sup>, Daniel R. Sheldon<sup>2</sup> and David W. Winkler<sup>3</sup>. Individual and roost movement of non-breeding Tree Swallows in an agricultural habitat. Tulane University<sup>1</sup> Oregon State University<sup>2</sup> Cornell University<sup>3</sup>**

During the non-breeding season, Tree Swallows (*Tachycineta bicolor*) form nightly roosts of thousands to millions of birds, usually in wetland habitat. In southeastern Louisiana, however, roosts form in sugar cane fields that are harvested shortly after their arrival. We used NEXRAD weather radar to locate sugar cane roosts to understand how the harvesting of the cane affects roost persistence at each site, and to see if new roosts develop in wetlands after the cane is gone. We attached radio transmitters to 29 birds at one roost to understand inter-roost movement throughout the season, and verify their presence at potential post-harvest roosts. Using NEXRAD weather radar, we discovered the locations of two previously unknown sugar cane roosts. Roost locations stayed relatively stable throughout the cane harvesting, and persisted until the last of the cane was cut. One new roost in a Phragmites reed bed was discovered post-harvest using the weather radar, but was of a relatively smaller size than the sugar cane roosts. Twenty-three of the tagged birds were relocated at several different roosts throughout the season. 41% of all bird relocations were in a different roost than the bird was detected in previously, indicating a very high rate of individual inter-roost movement from night to night. One bird was relocated in the post-harvest wetlands roost. The surprising finding was that though the roost locations were stable throughout the season, individuals that use each roost change from night to night, thus challenging our understanding of how roosts develop in the same location each night.

Thursday, April 14 02:15 PM

**Lindsay Brotherton<sup>1</sup>, Adam McGhee<sup>1</sup>, Karrie A. Fadroski<sup>1</sup> and Thomas A. Nelson<sup>1</sup>. THE VALUE OF SMALL FOREST OPENINGS TO FORAGING BATS. North Georgia University<sup>1</sup>**

THE VALUE OF SMALL FOREST OPENINGS TO FORAGING BATS, Lindsay Brotherton, Adam McGhee, Karrie A. Fadroski, and Thomas A. Nelson, North Georgia College and State University, Dahlonega, GA 30597. Intensively managed pine forests are a primary land cover in the southeastern U.S., extending over 8 million ha. Current predictions indicate that these forests will expand as societal demand for wood products continues to grow. Common objectives in intensive forest management are to harvest trees sustainably while maintaining ecosystem functions and biodiversity. Bats comprise an important component of the faunal community because they are top predators and speciose. Only recently have biologists initiated studies to better understand the effects of forest management on bats, instigated in part because several bats are endangered and recent outbreaks of white-nose syndrome further imperil additional species. In this study, we used acoustical monitoring to quantify the relative abundance and species composition of bats in three habitat types: (1) mature pine stands, (2) forested riparian zones, and (3) small forest openings (<0.5 ha in size). We hypothesized that foraging activity would be highest in riparian habitats and that species composition would differ among habitats. However, we were most curious about the extent to which small forest openings provide foraging habitat. We measured the relative abundance of bats in each habitat as the number of passes/hr and identified individual species using Sonobat 3.0 software. During 27 nights of monitoring (June-Sept 2010), we recorded 10 species of bats in the 3 habitats. Across all habitats, big brown bats were most common (31%), followed by red bats (26%), evening bats (18%), and eastern pipistrelles (10%) Bats were most common in riparian zones (15.8 + 6.3 passes/hr), followed by forest openings (5.6 + 2.2 passes/hr) and pine plantations (0.5 + 0.2 passes/hr;  $P = 0.03$ ). Species richness and composition differed among habitats. Forest openings were used by all 10 species, whereas 8 and 4 species used the riparian zones and plantations, respectively. Openings were used most

heavily by northern long-eared and evening bats, whereas riparian zones were used heavily by big brown bats, red bats, and pipistrelles. Rafinesque's big-eared bat, a federally-endangered species, was recorded only in forest openings.

**Thursday, April 14 02:30 PM**

**Daniel Wright<sup>1</sup> and Robert Carter<sup>1</sup>. Population status of Bachman's sparrow in the Coleman Lake Region of the Talladega National Forest, AL. Jacksonville State University<sup>1</sup>**

The study area consisted of 24 sites with burn treatments of 1 year, 2 year, 5 year and 15+ year control sites. Point surveys for breeding birds were conducted at each site in late May when breeding males are most active. Species common in the 1 and 2 year burn areas were prairie warbler (*Dendroica discolor*), yellow-breasted chat (*Icteria virens*), and indigo bunting (*Passerina cyanea*). Present but uncommon was Bachman's sparrow (*Aimophila aestivalis*). In the 5 and 15+ treatment sites, common species included yellow-throated vireo (*Dendroica dominica*), summer tanager (*Piranga rubra*), and Eastern wood peewee (*Contopus sordidulus*). The open grassy habitat in the 1 and 2 year burn treatments should support larger populations of Bachman's sparrow. The study area is surrounded by closed canopy forest possibly reducing the likelihood of Bachman's sparrow recruitment.

**Thursday, April 14 03:15 PM**

**Keri L. Bryan<sup>1</sup>, Margaret C. Shipley<sup>1</sup> and David Haskell<sup>1</sup>. Effect of exurban development on land snail diversity and abundance in Sewanee, Tennessee. University of the South<sup>1</sup>**

Exurban development in Sewanee, Tennessee has been linked to increased bird diversity and abundance (Haskell et al. 2006). Birds may produce fewer defective shells in exurban areas than in forested areas because birds consume anthropogenic sources of calcium. Another explanation may be that snails, a preferable source of calcium for birds, are more abundant in developed areas. The purpose of this study is to determine the effect of exurban development on snail abundance and diversity in Sewanee, Tennessee. We tested the hypothesis that land snail abundance would differ between undeveloped forest and exurban areas on the uplands of the Cumberland Plateau. We also tested the hypothesis that snail communities in both of these areas would differ from communities in cove forests on the slopes. Timed snail searches were conducted in exurban areas, plateau forests, and upper cove forests in Sewanee, TN, and snails were identified to species and counted in the lab. Preliminary results indicate greater snail abundance and diversity in exurban areas than plateau forest sites. However, the cove forest has the greatest abundance and diversity of snails. Thus, snail diversity differs among these three habitats, and exurban habitats may increase snail diversity on top of the plateau. Possible mechanisms for the increased abundance of land snails in exurban areas include changed moisture conditions and increased calcium availability due to imported limestone for house- and road-building.

**Thursday, April 14 03:30 PM**

**Zachary Loughman<sup>1</sup> and Stuart Welsh<sup>2</sup>. West Virginia Crayfishes: results to date from the second statewide census. Department of Natural Sciences and Mathematics, West Liberty University, West Virginia and Biology Graduate Program, Departme<sup>1</sup> US Geological Survey, West Virginia Cooperative Fish and Wildlife Research Unit, West Virginia University, West Virginia<sup>2</sup>**

Zoogeographically, the diversity of crayfishes in West Virginia represents a transition between the species-rich southern Appalachian faunas and the depauperate crayfish diversity observed in the northeastern United States. Currently, 22 described species occur in the state, of which 6 are given S1 status, and 3 are introduced species. One

species, *Orconectes limosus* is considered extirpated within the past decade. Imperiled species include *Cambarus veteranus*, *Cambarus elkensis*, *Cambarus longulus*, and *Cambarus nerterius*. *Orconectes virilis*, *Orconectes rusticus*, and *Procambarus zonangulus* represent West Virginia's introduced taxa, with *O. virilis* and *O. rusticus* considered invasive. Beginning in 2007 a statewide survey was initiated utilizing probabilistic sampling design and a standardized collecting protocol. Results of this survey to date include the discovery of undescribed crayfishes, the addition of one native species, *Cambarus angularis*, and the addition of one introduced taxa, *P. zonangulus* to West Virginia's fauna. In addition to species additions, several conservation concerns have been identified including surface mining, stream channelization, and urbanization.

**Thursday, April 14 03:45 PM**

**Diane R. Nelson<sup>1</sup> and Eugenie Clark<sup>2</sup>. Swarming, diel movements, feeding, and cleaning behavior of juvenile venomous eeltail catfishes, *Plotosus lineatus* and *Plotosus japonicus* (Siluriformes: Plotosidae). East Tennessee State University<sup>1</sup> University of Maryland and Mote Marine Lab<sup>2</sup>**

Juveniles of the venomous striped eeltail catfishes, *Plotosus lineatus* and *Plotosus japonicus*, have been studied over several years by divers in Papua New Guinea, Indonesia, Mabul (Malaysia), Japan, and the Red Sea. In 2007 we concentrated our observations in Veve Bay, Lolobau Island, Papua New Guinea. During the day, swarms of juveniles fed on benthic invertebrates (crabs, snails, sea stars) as they moved across large stretches of sand in a steamroller-like movement. Over algal beds and coral reefs, the catfish swam in smaller and looser formations as they fed on small invertebrates (quill worms, polychaetes, brittle stars) on the substrate. Swarms were sometimes followed by other fishes, which entered and fed with the swarm. On Izu Peninsula, Japan, juvenile *P. japonicus* were observed cleaning other fish species, whereas the widely-distributed *P. lineatus* juveniles were photographed cleaning each other and other objects on the substrate. This facultative cleaning seems to result from accidental encounters, not at established cleaning stations. *Plotosus* juveniles were also observed forming "catfish balls," a non-feeding, slowly-moving, tightly-packed aggregation of individuals. Near sundown the juveniles retired for the night under a reef ledge or into an artifact (e.g. hollow log, abandoned car tire), but not necessarily to the same place on consecutive nights or into home burrows with adult fish. In appearance and swarming behavior, the juvenile convict fish, *Pholidichthys leucotaenia*, are Batesian mimics of the venomous *Plotosus* catfish. Adult catfish, which are also highly venomous, are solitary and nocturnal and bear no resemblance to adult convict fish.

**Thursday, April 14 04:00 PM**

**Todd J. Weinkam<sup>1</sup>, David R. Brown<sup>2</sup> and Gregg Janos<sup>2</sup>. Winter weather influences foraging behaviors and habitat use of Eastern Bluebirds. Eastern Kentucky University<sup>1</sup> Eastern Kentucky University<sup>2</sup>**

The ecology of birds during the winter (non-breeding) season has received less attention than that of the breeding season. To better understand how winter weather events affect individual behavior and population processes we studied the behaviors and habitat use of Eastern Bluebirds (*Sialia sialis*) during the winters of 2010 and 2011. We described winter group composition, home range size, habitat use, foraging behavior, and diet of bluebirds in relation to winter weather. Home range sizes (95% utilization distribution) ranged from 16.1 ha to 45.0 ha with a mean of 32.9 ha. Core home ranges (30% utilization distribution) ranged from 1.5 ha to 4.4 ha with mean core area of 3.0 ha. Group sizes of radio-tracked birds ranged from 2-13 bluebirds, but during cold weather, groups of much larger size (up to 60 individuals) were observed. Home ranges overlapped very little, and core areas among groups had no overlap. Foraging observations and habitat use patterns suggest that birds foraged more on the ground and in open habitats when temperatures were warm and there was no snow on the ground. When temperatures dropped below 0°C or

there was snow cover, bluebirds tended to congregate into larger flocks and moved to forested areas to forage on the fruits of trees and mistletoe. During periods of snow cover Bluebirds appeared more susceptible to predation, apparently by Sharp-shinned Hawks.

### Community Ecology

#### ORAL PRESENTATIONS

Thursday, April 14 01:30 PM - 04:15 PM

Thursday, April 14 01:30 PM

**Kimberly A. Israel<sup>1</sup> and Robert Peet<sup>1</sup>. Vegetation Change in a North Carolina Deciduous Forest, 1977-2010. University of North Carolina, Chapel Hill<sup>1</sup>**

Vegetation development on abandoned agricultural lands of the North Carolina Piedmont has served as perhaps the leading model system for study of secondary succession. Classic studies conducted on or near the Duke Forest were central to our traditional understandings, but were not based on long-term studies or complete floristic inventories. In 1977, Peet and Christensen (P&C) established permanent plots across a broad range of successional pine and mature hardwood stands in the Duke Forest to better document and evaluate the classic model. They found that the degree of predictability of the vegetation varied with age of the pine stands with a pronounced dip in stands undergoing a transition from pine to hardwood dominance. Taverna and Schwartz analyzed data from a 2000 resample of ~100 plots and found support for P&C's conclusions, but also found unexpected compositional changes. They hypothesized that increased deer populations and exotic invasions, along with climate change, may have been responsible. In 2010, I inventoried the plots a third time to assess recent rates and direction of compositional change, and its consistency with both the classic model and more recent predictions. DCA ordinations indicate that patterns of change vary among successional pine age classes, with the fastest and most consistent change found in stands that were 70 years old in 1977. Furthermore, species richness of the herb layer is decreasing, and abundance of exotics is increasing. The observed changes appear consistent with predictions of P&C and observations of Taverna, but additional, unanticipated changes are also taking place.

Thursday, April 14 01:45 PM

**Lora L. Sigmon<sup>1</sup> and David Vanderma<sup>1</sup>. Composition and structure of mature second growth riparian forests along the Haw River in central North Carolina. Elon University<sup>1</sup>**

The Haw River drains a watershed encompassing important central North Carolina cities within its > 1500 mi<sup>2</sup>. The river is historically important as a source of hydropower for numerous textile mills and demand for raw materials in the region means that virtually all of its riparian forests were harvested at some point in the past. There is much interest in maintaining a healthy riparian buffer along the river that can be used for recreational purposes and to enhance the quality of water that flows from the Haw into Everett B. Jordan reservoir. The purpose of our study was to document the composition and structure of Haw River riparian forests with special interest in invasive species in this highly modified landscape. We established 45 vegetation survey plots in areas containing mature forest. We found 49 woody species (including important shrubs and vines > 2.5 cm DBH) of which 4 were invasive: Chinese privet (*Ligustrum sinense*), Tree-of-heaven (*Ailanthus altissima*), Russian olive (*Elaeagnus umbellata*), and Japanese honeysuckle (*Lonicera japonica*). Five species represented over 53% of all woody stems: boxelder (*Acer negundo*), sweetgum (*Liquidambar styraciflua*), green ash (*Fraxinus pensylvanicum*), southern sugar maple (*Acer barbatum*), and yellow-poplar (*Liriodendron*

*tulipifera*). Despite representing 8% of all species found in Haw River riparian forests, invasive species represented only 0.75% of all woody stems by abundance. Our results suggest that, in the stratum of woody plants > 2.5 cm DBH, Haw River riparian forests have been resistant to invasion. Possible reasons for this will be presented.

**Thursday, April 14 02:00 PM**

**Julie E. Barker<sup>1</sup>, James O. Luken<sup>2</sup> and John J. Hutchens<sup>3</sup>. WATER HYACINTH ROOTS: WHO'S HANGING OUT IN THEM AND WHY? Coastal Carolina University, Coastal Marine and Wetland Studies Graduate Program<sup>1</sup> Coastal Carolina University, College of Science<sup>2</sup> Coastal Carolina University, Department of Biology<sup>3</sup>**

Invasive aquatic macrophytes can provide structure in ecosystems, possibly creating new areas of refuge, colonization, and feeding for invertebrate species. This study examined water hyacinth growing in the Waccamaw River, SC. Undisturbed water hyacinth, defaunated water hyacinth, and an artificial substrate were secured to frames placed around permanent water hyacinth mats. Plants and artificial substrates were collected and invertebrate assemblages were analyzed. The most common colonizing class was Insecta, which was dominated by the orders of Diptera, Odonata, and Trichoptera. Abundance of macroinvertebrates was greater on roots compared to the artificial substrate. Collector-gatherers were the dominant functional feeding group across all treatments, with the greatest mean percent abundance on the artificial substrate. Recolonization of defaunated roots occurred quickly. Invertebrate assemblages found on the artificial substrate did not mimic that of the water hyacinth roots. These data suggest that water hyacinth may provide an important habitat for aquatic macroinvertebrates in the Waccamaw River.

**Thursday, April 14 02:15 PM**

**Gary L. Walker<sup>1</sup>, Mike Madritch<sup>1</sup> and Derick B. Poindexter<sup>1</sup>. A Biological Survey of the Bull Bluff Cliff System at Oak Ridge, Tennessee. Appalachian State University<sup>1</sup>**

A dolomitic limestone cliff system on the Oak Ridge National Laboratory was surveyed in Summer 2009 and 2010 for vascular plants, bryophytes, lichens and gastropods. Soils at cliff edge and the cliff face below them were analyzed for nutrients using cation and anion nutrient traps. The plant community structure of this limestone cliff system and its adjoining forested edge is complex and composed of various common and noteworthy calciphiles, as well as rare taxa usually confined to rock outcrops. Characteristic plants include: *Carex Eburnea* Boott, *Cheilanthes Alabamensis* (Buckley) Kunze, *Diervilla Lonicera* Mill., *Fraxinus Quadrangulata* Michx., *Micranthes Careyana* (A. Gray) Small, and *Sideroxylon Lycioides* L." A survey of 420 gastropod specimens revealed a total of 29 different species including a couple of new county records.

**Thursday, April 14 02:30 PM**

**Jamie A. Duberstein<sup>1</sup> and William H. Conner<sup>2</sup>. Freshwater tidal swamp communities of the southeastern United States. Clemson University<sup>1</sup> Baruch Institute, Clemson University<sup>2</sup>**

There has been an increasing tendency by scientists to take landscape and regional approaches to understand various processes and ecosystem responses. Some wetland scientists are beginning to shift from specific wetland system analyses to those that encompass a broader landscape, allowing for the interpretation of more general trends in order to define broader implications to ecological processes. Global climate change is acting as a catalyst for this regional approach, demanding the extrapolation of basic principles (from local studies) to areas that have not been studied as intensely, if at all. The goal of this study was to take a regional approach in studying the community ecology of tidal freshwater swamps of the southeastern US so that potential effects of sea-level rise on this ecosystem type can be predicted more accurately. To accomplish this, an

extensive survey of trees and shrubs in freshwater tidal swamps was conducted to describe the general tree and shrub communities therein. A total of 128 plots were inventoried, distributed evenly over the Savannah and Altamaha rivers of the Atlantic coast, and the Suwannee and Apalachicola rivers of the Gulf coast. Plots were established both relatively near and distant to the major rivers. Multivariate statistics were used to help identify the number of communities and the significant indicator species in each. Four general communities were characterized, with the strongest individual indicator species for each being water tupelo (*Nyssa aquatica*), swamp tupelo (*Nyssa biflora*), dwarf palmetto (*Sabal minor*), and cabbage palm (*Sabal palmetto*).

**Thursday, April 14 03:00 PM**

**Todd P. Witcher<sup>1</sup>. Great Smoky Mountains All Taxa Biodiversity Inventory. Discover Life in America<sup>1</sup>**

Discover Life in America (DLIA) is involved in a quest to identify and understand all the species of life within an 800-square-mile ecosystem in the Great Smoky Mountains National Park. Researchers seek knowledge about the components, abundance, and diversity of life, from spiders in the soil to slime molds in the forest canopy. The primary tool of DLIA is the All Taxa Biodiversity Inventory (ATBI) which brings scientists from around the world to inventory the estimated 100,000 species of living organisms in Great Smoky Mountains National Park. To date DLIA, through the ATBI project, has documented over 900 new species to science and over 6,700 new species to the Park.

**Thursday, April 14 03:15 PM**

**Nathan A. Daniel<sup>1</sup>, James M. Dyer<sup>1</sup> and Brian C. McCarthy<sup>1</sup>. American chestnut restoration in eastern hemlock-dominated forests of southeast Ohio. Ohio University<sup>1</sup>**

The effort to restore American chestnut (*Castanea dentata*) using blight resistant seedlings is well underway. In order for this reintroduction to be successful, the tree's potential for growth in habitats within its pre-blight range must be better understood. American chestnut and eastern hemlock (*Tsuga canadensis*) trees are historically co-occurring species in eastern North American forests. Because eastern hemlock stands are in decline due to hemlock wooly adelgid (*Adelges tsugae*) infestation, this forest type may serve as a possible habitat for American chestnut reestablishment (i.e., underplanting in advance of overstory infestation). This study measured one-year survival and growth of 680 bare-root, pure American chestnut seedlings planted widely throughout healthy eastern hemlock-dominated forests in the Hocking Hills region of southeast Ohio. Plastic grow-tubes protected 340 of the seedlings from deer herbivory. The remaining 340 seedlings were unprotected. Overall seedling survival after one growing season was 12.5% and mean seedling growth was 11.0 cm ( $\pm 8.6$  sd, n = 86). Of the surviving seedlings, 14 (16%) were protected by grow-tubes and 72 (84%) were unprotected. Seedling survival varied by site (4-30%). One-year growth rate also varied by site (6.7-12.7 cm). Mean site survival and growth showed a positive association. These results suggest that site characteristics of healthy hemlock-dominated forests are generally unfavorable for chestnut restoration plantings. However, further study focusing on hemlock forests in decline due to hemlock wooly adelgid infestation may yield higher rates of chestnut survival as site characteristics change.

**Thursday, April 14 03:30 PM**

**Alex T. Fotis<sup>1</sup> and Joydeep Bhattacharjee<sup>1</sup>. Living on the edge: trees promoting optimal conditions for woody seedling performance. The University of Louisiana at Monroe<sup>1</sup>**

The mechanism by which trees and shrubs ameliorate microclimate and improve seedling performance under their canopies is not well understood. Further, little is known about

how tree-seedling interactions change in magnitude as a function of distance from a tree. We developed a model describing the change in interspecific (seedling-herbaceous interactions) and intraspecific (seedling-tree interactions) competition as a function of distance from the base of a tree. The model predicts that the sum of inter- and intraspecific competition is lowest at the canopy edge, creating optimal conditions for woody seedling recruitment and growth. We tested the model in a bottomland hardwood forest by investigating the performance of naturally established seedlings as a function of their distance from isolated adult trees and tested for interspecific competition by obtaining measurements of herbaceous biomass along a gradient of increasing distance from the tree. We found that herbaceous biomass increased asymptotically with distance from the tree, supporting the change in interspecific competition as predicted by the model. The average seedling size increased exponentially with distance from the tree until the canopy edge, after which the average seedling size decreased by three-fold. Seedling recruitment increased with distance from the tree reaching its highest density just before the canopy edge and maintaining the same density level until the edge of the plot, indicating a broader zone of optimal conditions for seedling establishment. Therefore, we conclude that the environmental factors responsible for promoting woody seedling growth are more restrictive than those that enhance recruitment.

Thursday, April 14 03:45 PM

**Conrad K. Blunck<sup>1</sup> and Scot Duncan<sup>1</sup>. Slope-dependent Longleaf Pine (*Pinus palustris*) Mortality During the Reintroduction of Fire in a Montane Ecosystem. Birmingham-Southern College<sup>1</sup>**

In montane regions, steep slopes affect longleaf pine (*Pinus palustris*) ecosystems and fire behavior differently than more level terrain. We hypothesize that steep slopes of long unburned montane regions allow longleaf pines to exist in greater densities than on more level terrain, leading to greater fuel accumulation, fire intensity, and longleaf pine mortality. To test this hypothesis, a survey was conducted of overall stand structure and individual trees in a recently burned montane longleaf pine ecosystem of Oak Mountain State Park in northern Alabama. Slope and longleaf density and mortality were recorded in 218 10m x 10m blocks of a recently burned hill. Individual measurements of diameter at breast height (dbh) for longleaf pine and hardwood trees were taken in 52 10m x 10m blocks on the burned hill. Longleaf pine frequency (live and dead) was positively related to slope and inversely related to hardwood frequency (multiple regression;  $F=8.37$ ,  $df=51$ ,  $R^2=0.224$ ,  $p<0.01$ ). The proportion of dead longleaf pines was inversely related to hardwood frequency and positively related to slope (multiple regression;  $F=7.18$ ,  $df=51$ ,  $R^2=.195$ ,  $p<0.01$ ). However, substituting total longleaf pine frequency for slope in the multiple regression yielded clearer results (multiple regression;  $F=11.976$ ,  $df=30$ ,  $R^2=.423$ ,  $p<0.001$ ), with the proportion of dead longleaf pines positively related to the frequency of longleaf pines. The best predictor of individual longleaf pine mortality near the ridge was slope (logistic regression;  $\beta = -0.467$ ,  $x^2 = 8.847$ ,  $p < 0.05$ ), and dbh on steeper slopes (logistic regression;  $\beta = 0.069$ ,  $x^2 = 12.011$ ,  $p < 0.05$ ).

Thursday, April 14 04:00 PM

**Keith E. Gilland<sup>1</sup> and Brian C. McCarthy<sup>1</sup>. Effects of microsite and distance to forest edge on initial colonization of reclaimed mine lands in eastern Ohio. Ohio University<sup>1</sup>**

Surface mining for coal represents one of the largest and most intense forms of disturbance in the Eastern Deciduous Forest in the central Appalachian region. Most of these sites remain in a state of arrested succession, never returning to forest cover. A new reclamation approach has been proposed, the Forestry Reclamation Approach (FRA) which attempts to enhance forest recovery through a reduction in soil compaction and the use of native tree species. When applied as loose end dumping, the FRA creates a hummocky surface reminiscent of the microtopography found in old-growth forests resulting

from treefall events (pit and mound topography). This research sought to determine if differences exist in colonization with respect to distance from remnant habitat and microtopographic position. To examine this question, ten 50 m transects were sampled on a reclaimed mine site at the Jockey Hollow Wildlife Management Area, Belmont County, OH. Each transect was sampled at 5, 20 and 50 m from remnant forest habitat. At each interval, eight 1 m<sup>2</sup> quadrats were sampled for species and percent cover and density of woody individuals at swale, side and top microtopographic positions of the mounds created by the FRA process. Species richness varied between mound positions with highest species richness at the intermediate mound position ( $P < 0.01$ ). Woody species density increased with distance from remnant forest habitat ( $P < 0.05$ ). These results indicate that species are preferentially colonizing microsites at different positions along a microtopographic gradient, possibly due to differing biotic and abiotic conditions at those microsites.

**Thursday, April 14 04:15 PM**

**Stephen J. Murphy<sup>1</sup> and Brian C. McCarthy<sup>1</sup>. The Effects of Slope Aspect on the Spatial Patterning of a Mixed Mesophytic Old-growth Forest. Ohio University<sup>1</sup>**

Understanding the spatial patterning of forest communities at a variety of scales is an important first step in determining the processes that shape those patterns. While forest community pattern has been extensively studied across the globe, spatial patterning of temperate deciduous old-growth forests has been underexplored. Here, we describe woody stem-mapped forest plots from Dysart Woods, an old-growth mixed mesophytic forest in southeastern Ohio. Four 50 × 70 m (0.35 ha) plots were set up at Dysart Woods and all stems ≥ 2.5 cm DBH were recorded and mapped on an X, Y coordinate system. To evaluate the potential influence of microclimate, two of the plots were established on north-facing slopes and two plots were placed on south-facing slopes. Ripley's K function was used to determine whether trees were clumped, overdispersed, or randomly arranged in the plots. Results suggest that there are marked differences in composition and spatial patterning between north and south-facing slopes and among species. Increased aggregation of trees occurred on the south-facing slope for all stems ≥ 2.5 cm DBH. Stems ≥ 10 cm DBH were slightly uniform on the north-facing slope and randomly arranged on the south-facing slope. Differences were also observed among species. Beech was highly aggregated on the north-facing plots and less so on the south-facing plots. Sugar maple was aggregated on the north-facing slope but random on the south-facing slope. Collectively, our results demonstrate that slope aspect and species-type have an important influence on the composition and spatial patterning of forest communities.

**Plant Systematics**

**ORAL PRESENTATIONS**

**Thursday, April 14 01:30 PM - 04:15 PM**

**Thursday, April 14 01:45 PM**

**L. D. Estes<sup>1</sup> and Randall L. Small<sup>2</sup>. Systematics of *Sophranthe* (Plantaginaceae; Tribe Gratioleae). Austin Peay State University<sup>1</sup> University of Tennessee<sup>2</sup>**

Since its description in 1836, the genus *Sophranthe* has had a complicated nomenclatural history. It has been considered a distinct genus by some and either treated as monotypic with the sole species *S. hispida* or bitypic with two species, *S. hispida* and *S. pilosa*. Others retained *S. hispida* within *Sophranthe* but placed *S. pilosa* in its own genus, *Tragiola* (as *T. pilosa*). Still, others considered *Sophranthe* and *Tragiola* to be

part of the larger genus *Gratiola*, where placed in section *Sophronanthe* as *G. hispida* and *G. pilosa*. These conflicting classifications were based largely on differences in taxonomic opinion and were not conceived in a phylogenetic context. The objectives of this study were to 1) employ DNA sequence data to determine the phylogenetic relationships among *Sophronanthe*, *Tragiola*, and *Gratiola*, 2) use the phylogeny to examine the evolution of morphological characters among these taxa, and 3) use the phylogeny to objectively evaluate their classification. Noncoding chloroplast DNA sequences were obtained from the *TrnS-trnG* intergenic spacer and *TrnG* intron and the *TrnQ-rps16* intergenic spacer for all three members of *Sophronanthe* sensu lato (s.l.) and 32 species of *Gratiola* sensu stricto (s.s.). Both maximum parsimony and Bayesian analysis revealed that *Sophronanthe* s.l. and *Gratiola* s.s. are sister to each other. The molecular divergence between the two groups combined with their numerous morphological differences provides support for recognizing these taxa as distinct genera. The taxonomy of *Sophronanthe* is discussed further with updated information concerning the nomenclature, morphology, distribution, and ecology of its two species.

**Thursday, April 14 02:00 PM**

**T. L. Mellichamp<sup>1</sup>. The *Sarracenia rubra* complex - biological and taxonomic lessons. Biology & Gardens - UNC Charlotte<sup>1</sup>**

All but one of the eleven species of *Sarracenia* (Sarraceniaceae) pitcher plants are endemic to the southeastern U.S. The majority are easily recognized. However, the controversial *Sarracenia rubra* complex consists of five taxa ranging from the extreme Southern Appalachians to the Atlantic and Gulf Coasts, west to eastern MS. They have been variously treated as 3 species (*S. alabamensis*, *S. jonesii*, *S. rubra*) with two subspecies (*S. alabamensis* ssp. *wherryi* and *S. rubra* ssp. *gulfensis*) to five parallel subspecies of *S. rubra*. These two views will be examined. While the origin of *Sarracenia* is unknown, it is not unreasonable to postulate that the complex arose in mountain bogs at the lower elevations of the Blue Ridge escarpment in southwestern NC and spread westward and eastward into the coastal plain where divergence occurred. The mountain plant, *S. jonesii*, represents perhaps the least specialized taxon. Within the complex, the details of their nearly identical flowers and fruits are evidence of their close relationship, but the critical fine points of the morphology of the all-important pitched leaves confirms their differences. Paradoxically, these leaves vary as influenced by the environmental factors of sunlight and moisture, and so must be evaluated carefully. Their modern distributions afford many questions about their past migrations, but illustrate the value of recognizing three separate species for biological, taxonomic and conservation purposes. This presentation is dedicated to the memory of Frederick W. Case (1928-2011), many of whose ideas about the complex are reflected in my *Flora North America* (2009) treatment.

**Thursday, April 14 02:15 PM**

**Julia K. Stutzman<sup>1</sup> and Conley K. McMullen<sup>1</sup>. Update on a taxonomic revision of the endemic members of *Cordia* L. (Boraginaceae) in the Galapagos Islands. James Madison University<sup>1</sup>**

The Galápagos Islands have long been an arena for biological diversity, scientific discovery, and conservation. Identification and documentation of the flora of the Galápagos specifically benefits conservation efforts on the Islands. This purpose of this study was to create an accurate taxonomic key for the four endemic members of *Cordia* on the Islands (*C. revoluta* Hook. f., *C. leucophlyctis* Hook. f., *C. anderssonii* (Kuntze) Gurke, *C. scouleri* Hook. f.). Taxonomic uncertainty between the species has resulted in the inability of several species to be evaluated for conservation status by the IUCN. The new taxonomic key provided by this study allows scientists and non-scientists alike to correctly identify these endemic species on the Islands. Proper identification will hopefully result in an evaluation of endemic *Cordia* populations on the Islands to determine the conservation status of each species.

Thursday, April 14 02:30 PM

**Raymond O. Flagg<sup>1</sup> and Gerald L. Smith<sup>2</sup>. Considerations on sessile to shortly pedicellate Mexican *Zephyranthes* (Amaryllidaceae) taxa with diverging anthers. Carolina Biological Supply Co.<sup>1</sup> High Point University<sup>2</sup>**

The taxonomy is poorly understood for sessile to shortly pedicellate Mexican *Zephyranthes* species with a cylindrical perianth tube and diverging anthers. We have identified the following taxa as belonging to this group: *Z. verecunda* Herb. (1825), *Z. grahamiana* Herb. (1837), *Z. fosteri* Traub (1941), *Z. latissimifolia* L.B.Spencer (1986), *Z. bella* T.M.Howard & S.Ogden (1990), and a possible new species. We are investigating the nomenclatural history and morphological characteristics of each taxon to determine the name with priority and to accomplish the delineation and distinction of each. Our studies are being based on herbarium loans from MEXU, MO, and TEX plus the Blandy Experimental Farm collections made by R. O. Flagg and the late W. S. Flory [often with the assistance of the late Katherine (Kitty) and Morris Clint of Brownsville, Texas]. We have reasonable confidence that we can provide much definitive taxonomic information and clarification for these plants.

Thursday, April 14 03:00 PM

**Alexander Krings<sup>1</sup>. Taxonomy of *Cephalanthus* (Rubiaceae) in North America. North Carolina State University<sup>1</sup>**

The recognition of *Cephalanthus* at the generic level has been widely accepted and is supported by molecular evidence. However, species and subspecies level recognition within *Cephalanthus* has been considerably less uniform. At least sixteen names have been proposed in New World *Cephalanthus*, fourteen of which have been applied to taxa north of the Isthmus of Tehuantepec. Unfortunately, no empirical analysis of the morphological variation within the complex has been published. Such an analysis would be desirable as a basis for making decisions regarding the circumscription of entities in this morphologically variable group and be timely vis-à-vis the effort to complete the Rubiaceae for the Flora of North America. To address this need, we measured or scored fifteen morphological character states for over 450 specimens distributed throughout the range of North American *Cephalanthus*. Species limits were explored using specimen aggregation analysis. Relationships among OTUs were further analyzed using descriptive statistics, ANOVA, cluster analysis, principal components analysis, and principal coordinates analysis. To facilitate exploration of climatic patterns and their potential relationship to the geographical distribution of morphological character states, collection localities were georeferenced and occurrences subsequently mapped in DIVA-GIS. Potential correlation between climatic gradients and qualitative morphological characters was tested by applying a generalized linear model with a binomial distribution function. Results support the recognition of two species in North America under the Phylogenetic Species Concept sensu Nixon and Wheeler: *C. occidentalis* and *C. salicifolius*. Patterns of variation and distribution among OTUs also support the recognition of two varieties within the former.

Thursday, April 14 03:15 PM

**Alexander Krings<sup>1</sup>. Revision of *Gonolobus* and *Matelea* s.l. (Apocynaceae, Asclepiadoideae, Gonolobinae) in the West Indies. North Carolina State University<sup>1</sup>**

Nearly fifty species of subtribe Gonolobinae (Apocynaceae, Asclepiadoideae) occur in the West Indies. The vast majority of species (ca. 87%) are narrow endemics, occurring on a single island each. Genera historically referred to the subtribe with representation in the region include *Fischeria*, *Gonolobus*, *Matelea* (incl. *Ibatia*, *Jacaima*, *Macroscepis*, *Poicilla*, *Poicillopsis*, *Ptycanthera*), and *Metalepis*. Subtribal position has been most controversial for *Metalepis*, but recent evidence places it basal to a well-supported *Metastelmatinae*-

Oxypetalinae-Gonolobinae clade. West Indian Gonolobinae require attention as the last treatment of the subtribe is now over a hundred years old and a number of new species have been described since. The results of recent integrated molecular and morphological studies are presented here. Work has focused on resolving generic circumscriptions, realigning species, and describing new taxa. While the status of *Gonolobus* has been clarified, the relationships and circumscriptions of a number of lineages currently submerged within *Matelea* s.l. require additional attention.

**Thursday, April 14 03:30 PM**

**Roland P. Roberts<sup>1</sup>, Natalia Ceaicovscaia<sup>1</sup>, Kemardo Henry<sup>1</sup> and GAGANPREET Singh<sup>1</sup>. The position and relationships of *Lorandersonia* within Solidagininae. Towson University<sup>1</sup>**

Previous molecular investigations of the phylogenetic relationship for *Lorandersonia* indicated both its affiliation to the *Solidago* lineage and its distinctiveness from *Chrysothamnus Sensu stricto*. Species within its circumscription are placed into a single well-supported evolutionary lineage. Of seven species of *Lorandersonia*, four species included in a phylogenetic analysis of genera of Solidagininae formed a strongly supported lineage based on both independent and combined analyses of chloroplast and nuclear data. However, like most Astereae, it is difficult to make conclusive species determination within *Lorandersonia* based on macro-morphological criteria. Morphological similarities in leaf characteristics within *Lorandersonia* and between certain species in closely related lineages are possibly the result of convergence resulting from adaptation to arid habitats. Such similarities were also the basis, in part, for their taxonomic treatment within *Chrysothamnus* or the earlier affiliation of some species with *Ericameria*, which has similar features. Here we present the results of an analysis of morphological and anatomical traits of species of *Lorandersonia* and those of related lineages to explore the presence of a pattern of adaptation in *Lorandersonia* that might be consistently different from allied genera. The position and relationships of the *Lorandersonia* lineage is robustly supported by molecular data. However, the lack of corroborating morphological and anatomical traits impedes the utility of the new classification.

**Thursday, April 14 03:45 PM**

**Eric Schuettpeiz<sup>1</sup>, Amanda L. Grusz<sup>2</sup>, Layne Huiet<sup>2</sup>, Kathleen M. Pryer<sup>2</sup>, Michael D. Windham<sup>2</sup> and George Yatskievych<sup>3</sup>. Biogeographic analyses reveal low levels of intercontinental dispersal in xeric-adapted ferns. University of North Carolina Wilmington<sup>1</sup> Duke University<sup>2</sup> Missouri Botanical Garden<sup>3</sup>**

Although most fern species are restricted to mesic habitats, some have evolved the ability to occupy drier environments. The vast majority of these xeric-adapted ferns belong to a single lineage (cheilanthoids) that includes some 450 species and exhibits a variety of features enabling survival in regions where water is only sporadically available. These xeric adaptations are manifested in several morphological syndromes, which were used traditionally to define cheilanthoid genera. Recent phylogenetic studies revealed extensive adaptive convergence among cheilanthoids and rejected the monophyly of nearly all the morphological syndromes, along with the genera they defined. However, the same studies also suggested a high level of geographic structure. To examine the biogeographic history of cheilanthoid ferns, we estimated divergence times and reconstructed ancestral ranges across a well-sampled phylogeny. We found most diversification to have occurred within (as opposed to among) continents and we uncovered remarkably low levels of intercontinental dispersal. The earliest cheilanthoid divergences took place in North America; long distance dispersal out of this continent appears to have been mediated by both intrinsic and extrinsic factors.

Thursday, April 14 04:00 PM

**Emily L. Gillespie<sup>1</sup>, E. A. Powell<sup>2</sup>, Elaine Durscholz<sup>2</sup> and Mallory Williams<sup>2</sup>. An Updated Phylogeny and Biogeographic Analysis of the North American Blueberries (*Vaccinium*, Ericaceae). Wake Forest University<sup>1</sup> University of Evansville<sup>2</sup>**

We investigated evolutionary relationships among the North American *Vaccinium* (blueberries) to provide a framework for examination of biogeographic patterns. We included at least one representative from all 25 currently recognized North American *Vaccinium* species. We used Maximum Parsimony, Maximum Likelihood and Bayesian analyses of three gene regions (nrITS, matK and 5' ndhF) to test the monophyly of the North American blueberries within the context of the genus (*Vaccinium*) and tribe (Vaccineae). Our analyses indicate that the North American blueberries are likely not monophyletic, but some of the recognized sections within the North American blueberries are monophyletic. Some of the species examined from multiple accessions showed evidence of poorly delineated species boundaries. The North American blueberries exhibit a wide variety of distribution patterns across the continent, including multiple widespread and several narrowly distributed species. Our constructed phylogeny permitted examination of biogeographic patterns within the monophyletic sections and using DIVA and S-DIVA software packages, we were able to generate hypotheses regarding the evolution of geographic distributions in these groups. Preliminary analyses indicate that section *Cyanococcus* may have originated in the southeast, whereas section *Myrtillus* may have originated in the northwest. Based upon our phylogenetic reconstructions and subsequent biogeographic analyses, we have pinpointed several species complexes that need further investigation and we have also gained some understanding of centers of origin for sectional lineages in this enigmatic group.

### Scholarship of Teaching and Learning

#### ORAL PRESENTATIONS

Thursday, April 14 01:30 PM - 03:45 PM

Thursday, April 14 01:30 PM

**Howard S. Neufeld<sup>1</sup>. Myths Surrounding Darwinian Evolution and the Creation/Evolution Debates: Using History to Improve Our Understanding of Evolution. Appalachian State University<sup>1</sup>**

Like any story that is centuries old, myths arise that bend the truth about what really happened in the past. In this talk, I discuss several myths, or if you prefer, misconceptions, about Darwinian evolution and the current creation/evolution debates. By invoking a historical perspective, I provide background to each myth, and show that in reality, the situation was either different from that commonly reported in textbooks, or completely wrong. My thesis is that getting the history and context correct not only improves our understanding of evolution, it also removes yet another opportunity for creationists to criticize evolutionists. The myths I will briefly discuss are that: (1) prior to the publication of Darwin's 1858 paper on natural selection people did not think species could go extinct, nor could they change through time, (2) T.H. Huxley resoundingly defeated Samuel Wilberforce during the Oxford Debates of 1860, (3) evolution was not taught or tolerated in southern states after the Origin was published, (4) the anti-evolutionists were defeated after the Scopes Trial, (5) anti-evolutionism is only a problem in America, and finally, (6) evolution is adequately taught in schools in the United States today. Using primarily texts and articles written by noted science historians and by associates of the National Center for Science Education, I show that these myths are best

refuted when they are placed into their historical context. Correcting myths removes some creationist criticisms of how evolution is taught, and may increase its acceptance among students and the general public.

**Thursday, April 14 01:45 PM**

**David A. Eakin<sup>1</sup>. Advantages of Reversing Information Flow in Biology Labs and Lectures. Eastern Kentucky University<sup>1</sup>**

The distinct advantage of teaching introductory non-majors lecture from the bottom up while beginning laboratory coverage from the big picture and working down to atoms and cells will be discussed. The presenter has based his conclusions on 19 years of experience as laboratory coordinator for such a course design in a regional university. The advantages to both grad student TA's and GA's will be presented, as well as the increase in topical coverage for the professors and students alike. The advantage of this approach over the more traditional approach of matching lecture and lab topics will be covered.

**Thursday, April 14 02:00 PM**

**Roger A. Sauterer<sup>1</sup>. Integration of astrobiology concepts across the life sciences curriculum. Jacksonville State University<sup>1</sup>**

Astrobiology is a highly interdisciplinary field that examines the fundamental parameters and nature of life, the interaction of the planetary environment with the biosphere, the origin of life, and the possibility of life elsewhere in the universe. Because astrobiology integrates data from astronomy, the geosciences, chemistry and the life sciences, the use of concepts of astrobiology in the classroom can give students a holistic outlook and appreciation for the interactions between astronomical events, planetary evolution and the biosphere that is frequently ignored or deemphasized in typical biology courses. Astrobiology concepts can be integrated into introductory biology courses, microbiology, and cell/molecular biology courses. Examples of important astrobiology concepts include the causes of mass extinctions and their effect on the evolution of life, the effects of methanogenic metabolism and oxygenic photosynthesis on the global environment and subsequent effects on life, non-photosynthetic-based ecosystems such as hydrothermal vent and subsurface ecosystems, extremophile biology and "alternate" metabolic strategies such as sulfur or metal oxidation. The possibility that life similar to current methanogens and extremophiles may have existed or still exist on Mars and in the subsurface ocean of Europa can be discussed. Additionally, discussions on what are the most fundamental properties of life and strategies for its detection can be used to stimulate classroom discussion and student essays. Use of these and other concepts require relatively little classroom time but can greatly increase student understanding and appreciation of the fundamental aspects of life, evolution and the interactions between the planet and the biosphere.

**Thursday, April 14 02:15 PM**

**Beasley W. Rodney<sup>1</sup> and Schmitz Darrel<sup>1</sup>. An Experimental Exercise Used to Determine if Mississippi's Science Framework is Adequately Preparing High School Graduates to Make Informed Decisions About Ground Water. Mississippi State University<sup>1</sup>**

According to the National Science Education Standards, eighth graders should possess appropriate knowledge about groundwater and its role in sustaining life on Earth. There were two groups of students studied, Mississippi eighth graders and earth science students at Mississippi State University. Both groups were tested to identify what types of ideas they possess about groundwater. This information can be invaluable information for high school and postsecondary science teachers in addressing students' prior conceptions. In addition, the data could provide science educators insight on where curriculum revisions in the science framework are needed. Both groups were given one

multiple choice question and one drawing exercise. The multiple choice question and drawing were both scored by a rubric for evidence of understanding the formation, movement, and storage of groundwater. It is to be noted that from five Mississippi public schools, 92 percent of the eighth graders have naïve conceptions concerning groundwater. Seventy-two percent of the undergraduate college students have naïve conceptions concerning groundwater. These results show that there are some gaps within the secondary science curricula.

**Thursday, April 14 02:30 PM**

**Nicole T. Welch<sup>1</sup> and Charlene D'Avanzo<sup>2</sup>. Faculty comments on using diagnostic assessment and active teaching to transform biology courses. Mississippi University for Women<sup>1</sup> Hampshire College<sup>2</sup>**

Calls for reforming college science teaching most recently rang out from AAAS's report, *Visions and Change in Undergraduate Biology Education*. Advocates urge faculty to shape course content around learning outcomes (i.e., students being able to apply core concepts and logical reasoning to fundamental questions in biology), which requires the use of assessment tools [e.g., clicker questions, think-pair-share activities, etc.], interspersed within instruction. Here we report on faculty experiences and responses to a NSF-funded program designed to help faculty from a wide range of institutions use diagnostic assessments and active teaching to transform their courses. Pre-instruction, faculty participants used diagnostic question clusters (DQCs) to assess student understanding of a key biological concept followed by active teaching exercises targeting known misconceptions and poor reasoning associated with that concept. Post-instruction use of the DQCs allowed the faculty to assess students' progress in learning. We surveyed the faculty participants and found they appreciated how the methods "helped me realize where students are going wrong" and showed "how poor a job one does trying to just cover all the material." Another response expanded on this notion with "That in itself is going to help me become a better instructor and it will help my students be better prepared for whatever the next step is for them." Given the positive opinions of these motivated faculty who adopted informed teaching methods, we encourage more to use these methods, and for both faculty and administrators to realize that the transition is a multi-year process that needs institutional support.

**Thursday, April 14 03:00 PM**

**Ellen W. McLaughlin<sup>1</sup>, Carol Ogle<sup>1</sup> and Suzanne Montgomery<sup>1</sup>. Nature Education for Adults: Role of Biology Departments and University Continuing Education Programs. Samford University<sup>1</sup>**

ELLEN MCLAUGHLIN, CAROL OGLE AND SUZANNE MONTGOMERY. Samford University. Nature Education for Adults: Role of Biology Departments and University Continuing Education Programs. A natural history program was developed in 2009 for adult learners with the cooperation of Samford After Sundown and The Department of Biological and Environmental Sciences. There are many excellent nature programs for children but, other than Master Naturalist/Gardener certifications, few comprehensive programs exist for adults who work, are retired or do homeschooling. Our premise is that people who begin to appreciate and enjoy the beauty and diversity of the local flora and fauna, will become more active in conservation efforts. Several courses were developed covering the spectrum of nature that individuals might encounter in day to day living-- from backyards to roadsides, nearby woods and streams and from soil and rocks to sky. Courses include Wildflowers, Tree Identification and Tree Bark Biota, The Forest Floor, Birding, Fishes and Aquatic Biology, Insects, Geology, Local Vertebrates, The Microscope, Astronomy and Wildlife Photography. Biology courses meet for six hours, usually on a Saturday and include a laboratory microscope experience and field trips. Awards are given to encourage continued participation. After four courses the participant receives a Legacy poster of Alabama Wildlife. After seven courses and a Citizen Science

project, a Certificate of Achievement, another Legacy poster and a Field Guide are awarded. Samford After Sundown handles the advertising and registration. The Biology Department furnishes the laboratory and microscopes. Cost is \$60.00 per course and average enrollment is 10.

**Thursday, April 14 03:15 PM**

**Jennifer J. Davis<sup>1</sup>. A General Biology Class Project: Costs and Consequences of the Chernobyl Nuclear Reactor Disaster (1986) and the Gulf BP Oil Spill (2010). Shorter University<sup>1</sup>**

A class project comparing aspects and consequences of the Chernobyl nuclear reactor explosion (1986) and the recent Gulf BP Oil Spill was conducted during fall term 2010 in a general biology class. The project consisted of: 1) group oral presentations on particular topics related to either the Chernobyl or the Gulf Oil Spill events, and 2) individual written responses to questions posed by the instructor. Students researched the effects of these events on humans and the environment and considered responsibility for and responses to the events. At the end of the course a student survey assessed attitudes toward the various 'costs' of these events and attitudes toward the development of alternate energy forms. Survey results showed that the majority of students thought the various 'costs' of both events too high for society to tolerate and favored development of alternate energy forms to reduce use of nuclear and fossil fuels.

**Thursday, April 14 03:30 PM**

**Kefyn M. Catley<sup>1</sup>. College student challenges in acquiring 'tree-thinking' skills. Western Carolina University<sup>1</sup>**

The author, a leading researcher in the field of macroevolution education and the emergent field of tree thinking will present the latest research findings and share research-based strategies for teaching diagrammatic reasoning in biology. The ability to understand evolutionary diagrams (i.e., cladograms) is an essential skill that all students of biology must acquire. Yet, recent findings indicate that cladograms are cognitively opaque to college students, which leads them to misinterpret the information depicted. The current studies address the impact of biological knowledge on two foundational tree-thinking abilities. College students (N = 112) with prior training in the biological sciences, as well as those without, were asked to evaluate the relationships among taxa depicted in four cladograms. Stronger background students fared better than weaker background students in the absence of instruction. A subset of stronger biology background students (N=42), enrolled in an upper level evolution class, was then provided with 2.5 days of instruction. As expected, students' tree-thinking skills improved with instruction; yet, some misinterpretations were not remedied. These results highlight the importance of teaching phylogenetics; 'business-as-usual' instruction is not sufficient for the acquisition of core tree-thinking skills.

### **Aquatic Ecology & Invasive Species**

#### **ORAL PRESENTATIONS**

**Friday, April 15 08:30 AM - 11:15 AM**

**Friday, April 15 08:30 AM**

**Harry A. Meyer<sup>1</sup> and Megan N. Domingue<sup>1</sup>. New Species of Water Bear (Phylum Tardigrada) from the Gulf Coast States. McNeese State University<sup>1</sup>**

Over 200 species of freshwater and terrestrial water bears (Phylum Tardigrada) are known to occur in North America. Of these, sixteen species have been collected in Louisiana. Foliose and fruticose lichens collected in Crowley, Acadia Parish, Louisiana, on April 18, 2010, were stored in paper envelopes and later soaked in tap water overnight. Tardigrade specimens and eggs were extracted and mounted in polyvinyl lactophenol. The samples contained nine species of water bear, three of which are new to science. *Minibiotus acadianus* sp. n. has a unique pattern of small gibbosities on the fourth pair of legs, in three caudal rows, and in a single row at the level of the third pair of legs. Reexamination of specimens identified as *M. fallax* in an earlier paper on the Tardigrada of Louisiana indicates that they are, in fact, *M. acadianus* sp. n., suggesting that the new species is widely distributed in Louisiana. *Macrobiotus julianae* sp. n. belongs to the *Macrobiotus hufelandi* complex, and is distinguished by its exceptionally long distal egg processes; the species is also found in Florida. *Murrayon hyperoncus* sp. n. is distinguished by its size, especially in its wide buccal tube and very large claws and lunules. *Echiniscus arctomys*, *Milnesium tardigradum*, *Hypsibius convergens*, *Mesocrista spitzbergensis*, *Macrobiotus* cf. *Harmsworthi*, *Minibiotus intermedius*, and *Paramacrobiotus richtersi* were also present - *E. arctomys*, *H. convergens*, and *Mesocrista spitzbergensis* are new records for Louisiana.

Friday, April 15 08:45 AM

**Susan M. Sewell<sup>1</sup>, Mark Meade<sup>2</sup> and Frank Romano<sup>2</sup>. Metabolic rates of an aquatic tardigrade, *Dactylobiotus parthenogeneticus*. Gadsden State Community College<sup>1</sup> Jacksonville State University<sup>2</sup>**

Tardigrades are one of the most elusive groups of microscopic animals on earth. Tardigrades have been observed to form cysts and enter a suspended state of animation during changing environmental conditions and it is thought that metabolic rates must change dramatically as environmental conditions change. Methods of accurately measuring metabolic rates (i.e., oxygen consumption rates) in microscopic animals have been limited by the ability to monitor low rates of consumption as well as miniscule changes in oxygen tensions. We report here the use of a fiber optic probe micro-respirometry system to compare oxygen consumption rates in individual nematodes to previous methods used and the effects of various temperatures on metabolic rates of aquatic tardigrades. Oxygen consumption of individual adults, eggs, and cysts of *Dactylobiotus parthenogeneticus* were acclimated and measured at 12 ° C, 17 ° C, 22 ° C and 27 ° C. Individual adults averaged 117.9 + 7.0 mgO<sub>2</sub>/kg/hr at 12 ° C, 238.12 + 7.2 mgO<sub>2</sub>/kg/hr at 17 ° C, 601.33 + 9.8 mgO<sub>2</sub>/kg/hr at 22 ° C and 0.325 + 2 at 27 ° C. Individual eggs averaged 217.8 + 7.6 mgO<sub>2</sub>/kg/hr at 12 ° C, 545.13 + 14.1 mgO<sub>2</sub>/kg/hr at 17 ° C and 1478.47 + 23.6 mgO<sub>2</sub>/kg/hr at 22 ° C. Cysts averaged 104.1 + 8.1 mgO<sub>2</sub>/kg/hr at 17 ° C and 446.15 + mgO<sub>2</sub>/kg/hr at 22 ° C. These results indicate that oxygen consumption rates in tardigrades follow trends demonstrated by other invertebrate species where environmental temperatures influence oxygen consumption and metabolism. Higher oxygen consumption rates in eggs may reflect higher energy demands due to developmental processes while lower rates for cysts may indicate a reduction in metabolism.

Friday, April 15 09:00 AM

**Cailin R. Kellmann<sup>1</sup> and Alicia S. Schultheis<sup>1</sup>. The Effect of Diet and Temperature on Growth and Development of the Springsnail *Floridobia floridana*. Stetson University<sup>1</sup>**

Florida's freshwater springs contain many endemic springsnails and face multiple threats to ecosystem integrity (e.g., aquifer depletion). We studied effects of diet and temperature on growth and development of the springsnail *Floridobia floridana*. The effect of temperature on development was determined by measuring shell length monthly at three sites on Volusia Blue Spring with different temperature regimes (Site 1 mean=23.3°C,

range=23.2-23.5°C, Site 2 mean=23.4°C, range=23.1-28.1°C, Site 3 mean=23.5°C. range=23.0-35.4°C,  $p < 0.001$ ). We predicted that higher temperatures would increase development rate. Although mean temperature was similar across sites, temperatures fluctuated more with increasing distance from the boil. However, these variations do not appear to profoundly affect *F. floridana* development: at all sites, the life cycle is approximately one year and reproduction occurs in autumn. The effect of diet on the growth rate of *F. floridana* was studied in the laboratory over a five-month period. Springsnails were fed varying diets of filamentous algae common in Blue Spring: *Vaucheria* sp. (yellow-green), *Lyngbya* sp. (blue-green), or a mixture of both. We predicted springsnails fed poorer quality filamentous algae (i.e., blue-green) would have a slower growth rate compared to those fed yellow-green filamentous algae or a mixed diet. Our hypothesis was supported: springsnails fed *Lyngbya* sp. had a slower growth rate ( $p < 0.01$ ). Information from this study can be used to understand critical points in the life cycle of *F. floridana* and to help determine ecosystem effects of the recent increase in standing crop of filamentous algae at Blue Spring.

**Friday, April 15 09:30 AM**

**Erica R. Teasley<sup>1</sup>, Deborah A. McGrath<sup>1</sup>, Vanaja R. Bodeddula<sup>2</sup>, Jeffrey Boles<sup>3</sup> and Ken C. Smith<sup>1</sup>. Pharmaceuticals from wastewater in streams draining a forested watershed on the Cumberland Plateau. University of the South<sup>1</sup> Tennessee Tech University<sup>2</sup> Tennessee Tech University<sup>3</sup>**

Research has increasingly focused on the excretion of pharmaceuticals and their metabolites into the environment through wastewater effluent. Little is understood about how these substances affect humans, other organisms or ecosystem dynamics. Aquatic organisms are particularly vulnerable because they spend most of their lifecycle in water. There is no legally mandated screening of pharmaceuticals during the municipal water or wastewater treatment process. Wastewater treatment at the Sewanee Utility District (SUD) in Sewanee, Tennessee, involves biodegradation of wastewater passing through open lagoons. In lieu of discharging the treated wastewater directly into streams, the effluent is discharged through spray fields onto 65 acres of surrounding hardwood forest. Using Polar Organic Chemical Integrative Samplers (POCIS), we sampled water from rain-fed lakes, raw sewage, treated effluent and streams draining the SUD watershed to determine if pharmaceuticals present in sewage are broken down during the treatment process. The POCIS were analyzed using a HPLC coupled with triple quadrupole MS/MS. Caffeine, ephedrine, methamphetamine, amphetamine and their metabolites were present in the raw sewage. No pharmaceuticals were present the rain-fed drinking water lakes nor in two of the streams draining the forested SUD watershed. However, methamphetamine, N-formyl amphetamine, and ephedrine were present in one stream. These results suggest that tertiary treatment (spraying treated effluent on forest and soil) may reduce the presence of some, but not all, pharmaceuticals in stream water.

**Friday, April 15 09:45 AM**

**Lori R. Tolley-Jordan<sup>1</sup> and Michael A. Chadwick<sup>2</sup>. Zoogeography of the invasive snail, *Melanoides tuberculata* (Muller, 1774) and its concomitant trematode pathogen, *Centrocestus formosanus* (Nishigori, 1924). Jacksonville State University<sup>1</sup> Kings College, London<sup>2</sup>**

*Melanoides tuberculata* (Gastropoda: Thiaridae), a parthenogenetic, operculate snail of Asian origin, is the most common first intermediate host of *Centrocestus formosanus* (Digenea: Heterophyidae), a pathogen of Asian origin that causes decreased fitness or mortality in second intermediate fish hosts. We documented range expansions (outside of Southeast Asia) of *M. tuberculata*, and *C. formosanus* infections in snails and host fishes using published records. Results showed *M. tuberculata* occurs in tropical waters on all continents, the Caribbean, Indo-Pacific and Oceanic islands. Further, in temperate latitudes, the snail invaded warm-water springs with water temperatures greater than 17

degrees C. The parasite was also globally distributed by *M. tuberculata* and fishes (128 species); albeit no infected snails or fishes were reported from the Caribbean, South America, or Africa. We suspect further invasions into novel systems via releases of infected snails and fishes. In addition, declines in populations of rare fishes, particularly in warm-water springs, are of major concern. Monitoring the invasion of snails and parasites into novel freshwaters is necessary to document, and possibly prevent, further range expansions of these invasive species.

**Friday, April 15 10:30 AM**

**Kara E. Salpeter<sup>1</sup> and David B. Vandermaast<sup>1</sup>. Evidence for biotic resistance to invasion across spatial scales in riparian forest vegetation. Elon University<sup>1</sup>**

Charles Elton's biotic resistance hypothesis suggests that areas that are rich in native species are more resistant to invasion. Our research tests Elton's hypothesis for accuracy in a riparian forest environment. Riparian forests are regularly scrubbed by floodwaters, which can remove existing species and deposit seeds of invasive ones. Our work involves collecting data from 40 vegetation survey plots along the Haw river in the Piedmont of North Carolina. In this study, we 1) report on the identity and frequency of invasive species encountered in the watershed, and 2) the average cover of invasive species, and 3) examine the relationship between native and invasive species richnesses across spatial scales ranging from 0.01 m<sup>2</sup> to 1000 m<sup>2</sup>. Of 251 species identified, 30 (8.4%) were invasive. The most frequent invasive species were stilt grass (*Microstegium vimineum*: 90.5%), Japanese honeysuckle (*Lonicera japonica*: 71.4%), and ground ivy (*Glechoma hederacea*: 61.9%). Furthermore, our data indicate that, unlike studies that report greater invasion in more species rich communities, the relationship between invasive and native species is consistently (albeit weakly) negative across spatial scales from 0.01 to 100 m<sup>2</sup> in Haw River riparian forests. Our results suggest that biotic resistance may be a better explanation of the relationship between native and invasive species richnesses in riparian forests. Possible reasons for this will be discussed.

**Friday, April 15 10:45 AM**

**Dawn Lemke<sup>1</sup>, Jennifer Brown<sup>2</sup> and Yong Wang<sup>1</sup>. Application of adaptive sampling with a generalized random tessellation stratified design: A case study of invasive plants at reclaimed mines on the Southern Cumberland Plateau. Alabama A&M University<sup>1</sup> Canterbury University<sup>2</sup>**

Adaptive sampling is an approach to data collected that adjusts sampling effort based on site conditions as the research is being conducted. In this case if an invasive species was found then further sampling was done. The method can be used to increase the efficiency of sampling, particular for a rare event. Adaptive sampling has strong theoretical development, but few ecological field applications have been published. Invasive species are likely to be clustered and may be a rare occurrence, thus adaptive sampling may be more effective for detecting the occurrence and distribution patterns. This approach increases the information collected about where the invasive plant is found and how extensive the invasion is. We used adaptive sampling to assess invasive plants across reclaimed mines on the Southern Cumberland Plateau. This was combined with a Generalized Random Tessellation Stratified (GRTS) design to maximize the relevant data collected from field sampling. GRTS design provides sampling flexibility: as sampling points are spatially distributed, if a point cannot be reached (permission and field access difficulties), the next spatially balanced point will be selected. Sampling can also be extended in a spatially balanced manner if time permits further sampling to be completed. Our goal was to sample 100 points, more if time permitted. We stratified the landscape by three time frame of reclamation completion and located 100 spatial balanced points in each stratum. Field sampling was undertaken from June 2010 through September. In this presentation we will discuss value of both adaptive sampling and GRTS to our project.

**Friday, April 15 11:00 AM**

**Elizabeth L. Stapleton<sup>1</sup>. Edges and exotic plant distribution in a suburban forest fragment. Guilford College<sup>1</sup>**

In central North Carolina, forests frequently exist as fragments within a suburban matrix. Native species within these fragments are challenged by limited habitat, as well as habitat degradation from the increased presence of exotic invasive plants. Invasive species likely become established along forest edges and although trends have begun to emerge there is no overarching model for edge invasion. A significant section of the Guilford College Woods, a 240-acre fragment in Guilford County, NC, has remained uncultivated within known history. Unlike other sections of the fragment, this area appears largely devoid of invasives. To determine forest characteristics that may prevent or allow invasion, this study seeks to 1) confirm that there are significantly fewer exotic invasive shrubs across the old growth edge when compared to other edges of the fragment and 2) to determine significant ecological differences in soil and species composition that could account for such a trend. I established four transects in each of three different forest habitats: an old growth area, an area of newer growth, and a small corridor area. Tree and undergrowth composition and focal invasive species were measured and recorded along each transect. Preliminary results confirm no significant invasion of the old growth section, in contrast with other areas. Further study will quantify the penetration of exotics inward from the different edges and examine soil characteristics at the different sites in hopes of determining the importance of edge effects and microhabitat factors in invasive plant distributions.

**Community & Population Ecology**

**ORAL PRESENTATIONS**

**Friday, April 15 08:30 AM - 10:45 AM**

**Friday, April 15 08:30 AM**

**Alexander K. Anning<sup>1</sup>, Darrin L. Rubino<sup>2</sup>, Elaine K. Sutherland<sup>3</sup> and Brian C. McCarthy<sup>1</sup>. Dendrochronological analysis of white oak growth patterns across a topographic moisture gradient in southern Ohio. Department of Environmental and Plant Biology, Ohio University, Athens, OH 45701-2979<sup>1</sup> Hanover College, P. O. Box 108, Hanover, IN 47243-0108<sup>2</sup> U.S.D.A. Forest Service, Rocky Mountain Research Station, PO Box 8089, Missoula, MT 59807<sup>3</sup>**

Moisture availability is a key factor influencing white oak (*Quercus alba* L.) growth and productivity. In unglaciated eastern North America, available moisture varies greatly along topographic and edaphic gradients. The goal of this investigation was to determine how these gradients affect white oak radial growth in four mixed-oak forests of southern Ohio. Using accurately measured and crossdated tree rings, we analyzed 119 white oaks growing across an integrated moisture index (IMI), a computer-generated GIS model that simultaneously combines topographic and edaphic features into a moisture index scale. Growth rate measured as basal area increment (BAI) varied considerably across the IMI classes with trees in the mesic sites exhibiting patterns much different from those in either xeric or intermediate sites. White oak tree ring chronology correlated significantly with macroclimate (PDSI, precipitation and temperature). Climate influences on growth rate were also variable across the IMI with trees in xeric sites showing the greatest response to climatic variation and trees in mesic sites exhibiting the least. Growth patterns in the xeric and intermediate sites were quite similar despite the differences in growth rate responses across the IMI categories. Finally, IMI proved to be useful for identifying and comparing white oak growth patterns across the complex landscape of southern Ohio.

Friday, April 15 08:45 AM

**Stephanie Matson<sup>1</sup> and David Vandermast<sup>1</sup>. Effect of experimental shading on a wintergreen plant: the crane-fly orchid (*Tipularia discolor*). Elon University<sup>1</sup>**

Crane-fly orchid (*Tipularia discolor*) is a wintergreen herb commonly found in the understory of deciduous woodlands in the eastern part of the United States. It produces one leaf per plant which emerges which each fall and photosynthesizes during the winter, dying back when leaves on canopy trees emerge in spring. One effect of global warming is that deciduous forests retain their leaves longer each fall and gain them earlier each spring, which shortens the canopy free period for Crane-fly orchid photosynthesis. The inflorescence of this plant emerges in late summer, independently of its leaves. To determine the effect that the reduction in leaf-free period might have on Crane-fly orchid, we experimentally shaded 20 Crane-fly orchids in the Piedmont of North Carolina in February 2010 and again in winter 2010-11. During summer and early fall and of 2010 we measured fecundity (inflorescence emergence date, death date, emergence period, height, and number of flowers). Results of this analysis indicate that the spring 2010 shading did not affect fecundity. Given that *T. discolor* stores photosynthetic products in underground corms, this result was not unanticipated. We are currently measuring in situ biochemical markers of stress using a PAM fluorometer and will measure chlorophyll a/b ratios using spectrophotometry. We hypothesize that shading will result in significant measures of leaf stress such as an increase in chlorophyll b production. Results of the leaf stress measures will be presented.

Friday, April 15 09:00 AM

**Nick Zaczek<sup>1</sup>, James Fralish<sup>1</sup> and Eric Holzmueller<sup>1</sup>. Impact of balsam fir *Abies balsamea* on soil, herbaceous plants, and regeneration in northern Wisconsin forest types. SIUC<sup>1</sup>**

High densities of balsam fir *Abies balsamea* can result in lower species diversity and higher risk of severe disturbance. *Abies balsamea* threatens to shift vegetation development and successional patterns in northern Wisconsin forests by invading forest stands and out-competing other species. This study will focus on 3 stand types: quaking aspen *Populus tremuloides*, white birch *Betula papyrifera*, and balsam fir in a 9 county region of northern Wisconsin. Data collection consists of manually locating appropriate forest stands from maps and visual observations. Data will be collected from 0.04 ha circular plots which are divided into 4 sections along the 4 cardinal directions North, East, South, West. Within plots all mature stems (>9cm) will be recorded. Seedlings and saplings will be recorded from circular micro plots half the distance from plot center (5.64m) along cardinal direction lines. Additional square micro plots (1.0 by 1.0m) half the distance from plot center at azimuths 45°, 135°, 225°, and 315° will be used to record herbaceous plants on the forest floor. A single soil pit is constructed to collect soil samples.

Friday, April 15 09:30 AM

**Claudia L. Jolls<sup>1</sup>, Julie E. Marik<sup>1</sup>, Kayri Havens<sup>2</sup>, Jeremie B. Fant<sup>2</sup>, Pati Vitt<sup>2</sup>, A. K. McEachern<sup>3</sup>, Noel B. Pavlovic<sup>4</sup>, Timothy J. Bell<sup>5</sup> and Marlin L. Bowles<sup>6</sup>. Persistence of *Cirsium pitcher*, Pitcher's thistle, rare sand dune endemic of the upper Great Lakes. East Carolina University, Greenville, NC<sup>1</sup> Chicago Botanic Garden, Glencoe, IL<sup>2</sup> US Geologic Survey, Western Ecological Research Center, Ventura, CA<sup>3</sup> US Geological Survey, Great Lakes Science Center, Porter, IN<sup>4</sup> Chicago State University, Chicago, IL<sup>5</sup> Morton Arboretum, Lisle, IL<sup>6</sup>**

*Cirsium pitcheri*, Pitcher's thistle, is a federally threatened monocarpic perennial of the open freshwater dunes and shorelines of the Great Lakes. Our long-term collaboration since 2005 brings together demographic and genetic work on Pitcher's thistle since 1988

and at 27 sites throughout its geographic range to understand how factors contributing to local demography and genetic composition interact to influence persistence at the population and regional levels. Detailed demographic monitoring of northern sites on Lake Michigan shows a population below replacement for 9 of the 11 years calculated (stochastic lambda of  $0.9101 \pm 0.0017$ ), a trend seen for most natural populations. Populations at the southern end of the range have been extirpated and extant ones may be in decline, yet restorations appear successful in the short term. Genetic analyses show population differentiation throughout the range, although it is not yet clear whether groupings reflect historic colonization events or current gene flow. The critical phase of the life cycle is seedling recruitment; however, successful ecesis is dependent on light, litter accumulation and water availability associated with natural succession, lake level fluctuations, weather, seed predation, invasive species and ultimately, climate change. *Cirsium pitcheri* can serve as a model species, for basic and applied questions in ecology, evolution and conservation, to help understand how threats interact to change demographic trajectories and ultimately the evolutionary trajectory of a species that appears to be heading toward extinction in a major portion of its range.

**Friday, April 15 09:45 AM**

**Clint T. Patterson<sup>1</sup> and Luben D. Dimov<sup>1</sup>. Effect of Overstory Density and Fertilizer Supplement on American Chestnut Seedlings. Alabama A&M University<sup>1</sup>**

American chestnut (*Castanea dentata*) was once a dominant overstory species of eastern North American forests. It provided better food and habitat for wildlife than oaks. Blight resistant hybrid chestnuts share most morphological characteristics with *C. dentata*, so studying *C. dentata* establishment and early growth will help develop more effective methods for establishing blight resistant hybrids. We were unable to find any studies that reported a significant improvement in growth or survival of *C. dentata* seedlings with fertilization. It is likely that supplementation with limited nutrients will increase early *C. dentata* performance and that further study is needed to determine the adequate amount and combination of nutrients. This study examined the effect of three shade levels and a novel leaf spray fertilizer supplement. Comparison of the marginal means was used to evaluate growth effects. Relative basal area and relative root collar diameter growth of seedlings treated with fertilizer supplement twice was approximately 25% greater than control trees. The relative basal area and relative root collar diameter growths were about 60% greater in the open than in the lightly thinned plots. The effects were non-significant for relative height growth. By the end of the first growing season, seedling mortality was 57%, 9%, and 17% in the open, light shade, and heavy shade, respectively. Planting blight resistant hybrid chestnuts on abandoned agricultural fields is not recommended.

**Friday, April 15 10:15 AM**

**Diana M. Neal<sup>1</sup>, Brian S. Baldwin<sup>1</sup> and Gary N. Ervin<sup>1</sup>. Growth responses and biomass allocation of rivercane (*Arundinaria gigantea*) across a gradient of light conditions. Mississippi State University<sup>1</sup>**

Extensive stands of native bamboo *Arundinaria* (Michx.), canebrakes, were once abundant throughout the bottomlands of the southeastern United States. Canebrakes provided wildlife habitat, riverbank protection, and acted as buffers for sensitive ecosystems. However, this habitat has declined in coverage since the European colonization of North America, and currently it exists as scattered patches under sparse forest canopies and along the forest edges. In this study, light requirements of *A. gigantea* were determined to maximize growth and establishment rate. Four experimental light regimes (30, 50, 60, and 85% light reduction, manipulated by screen cages) were compared to a control treatment (0% light reduction) on rivercane seedlings. Plant Growth Index (PGI), a non-destructive indicator of growth, was used to assess growth during the two-year experiment, and plants were harvested to determine above- versus belowground biomass allocation at the end of the experiment. PGI indicated maximum plant canopy

was achieved under 50-60% light reduction. Total plant biomass was higher under 0% light reduction, and plants exposed to 85% light reduction had the lowest dry weight. Among light reduction treatments, biomass allocation to root systems followed the relative rankings of shade reduction: 47.9% of the total plant biomass (0% light reduction), 36.7% (30% reduction), 35.7% (50%), 34% (60%), and 27% (85%). As light availability declined, plants allocated more resources to aboveground tissues and less to root systems. Leaf and rhizome biomasses were almost constant on average (12.1 % and 21.6%, respectively) through all treatments. These data would seem to indicate that although rivercane is a shade tolerant species, it is better suited to open areas conferring greater biomass allocation for establishment, survival and expansion success of the plant.

**Friday, April 15 10:15 AM**

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**Friday, April 15 10:30 AM**

**H M. Kile<sup>1</sup>, Joey Shaw<sup>1</sup> and Jennifer N. Boyd<sup>1</sup>. The effects of canopy thinning and burning on transplantation of federally threatened *Scutellaria montana* Chapm. (Lamiaceae, large-flowered skullcap) in a southeastern deciduous forest. University of Tennessee at Chattanooga<sup>1</sup>**

Federally threatened *Scutellaria montana* Chapm. (large-flowered skullcap) is a perennial herbaceous plant endemic to 11 counties in southeastern Tennessee and northern Georgia. A large population of *S. montana* exists at the 648 ha Tennessee Army National Guard Volunteer Training Site (VTS) in Catoosa County, Georgia. VTS has a security directive to clear vegetation along the perimeter, including some *S. montana* habitat. Considering that *S. montana* has been predominately found in open, mid-successional oak-hickory forests, this action could be potentially destructive to plants persisting in these areas. Anecdotally, this species has been observed responding well to locations with light gaps in the overstory canopy and recent fire. To improve our understanding of transplantation as mitigation and the effects of light availability and prescribed burning on *S. montana*, 100 affected individuals were relocated onsite in spring 2010. Transplants

were evenly divided into four 25-m<sup>2</sup> plots with interactive overstory clearing and low-grade burning treatments. Growth and physiological measurements were used to evaluate the plants' success in the different plots. A 96% survival rate was observed three months after transplantation. Instantaneous leaf-level gas exchange measurements showed that both burning and thinning treatments had trends of increasing the net photosynthetic rate, stomatal conductance, and leaf mass per area (LMA). An increased LMA may allow denser leaves to have more chloroplasts, increasing photosynthetic capacity. Increased leaf number was also observed in the thinning treatment, suggesting a strategy to take advantage of increased light availability. Burning and thinning treatments appear to have positive effects on plant growth.

### Herpetology

#### ORAL PRESENTATIONS

Friday, April 15 08:30 AM - 11:30 AM

Friday, April 15 08:30 AM

**Nathalie C. Aall<sup>1</sup> and Thomas K. Pauley<sup>1</sup>. Influence of abiotic and biotic factors on movement and microhabitat selection in *Terrapene c. carolina* (Eastern Box Turtle). Marshall University<sup>1</sup>**

Natural history studies lay the groundwork for future ecological and behavioral research as well as contribute necessary information toward the management and conservation of species populations. *Terrapene c. carolina* (Eastern Box Turtle) populations are declining in northeastern deciduous forests. Due to their terrestrial nature, *T. c. carolina* are directly influenced by various environmental conditions, both daily and seasonally, as they navigate through microhabitats. This study investigates the effects of both environmental parameters and individual variation on movement and microhabitat selection in *T. c. carolina*. Beech Fork State Park in Wayne County, West Virginia served as the study site due to a high population density within a relatively small area. Using radio telemetry to assess individual movements, ten *T. c. carolina*, four females and six males, were tagged in May 2010 and followed through October 2010. Individual positions were recorded with a GPS unit at 48 hour intervals for six months. Environmental parameters recorded were relative humidity, barometric pressure, ground temperature, soil temperature, canopy cover, shade, substrate, elevation, and slope. The results of this study yield additional data on individual box turtle movements across multiple seasons and will provide insight on how various abiotic and biotic factors influence behavior.

Friday, April 15 08:45 AM

**Nicholas S. Forman<sup>1</sup> and Lynn Moseley<sup>1</sup>. A Survey of Salamander Populations and Their Micro and Macro Habitat Affinities in Urban Piedmont North Carolina. Guilford College<sup>1</sup>**

Anthropogenic activities, from development to conservation, have been shown to have varying effects on salamander abundance and population density (Dorcas and Willson 2003, Orser and Shure 1972). I conducted a survey of salamander species in two urban locations to examine the species composition of salamander populations and the macro- and micro-habitat features associated with their presence. Preliminary data for this study suggests that species-specific distribution varies between the Two-Lined Salamander, *Eurycea cirrigera*, and the Northern Dusky Salamander, *Desmognathus fuscus fuscus*, according to forest community type. Additional data will be collected across transects investigating micro-habitat features, as well as macro-habitat characteristics such as proximity of transects to streams and land use history. Through an understanding of the

distribution of salamander populations in relation to habitat features, conservation efforts can identify the vulnerability of species and the necessary habitat components for maintaining a population. The sites chosen for this study reflect a gradient of habitats including old-growth forest, heavily impacted sections of stream, and rehabilitated streams. Thus, from our results, the response of salamander populations to restoration efforts and other human impacts can be better understood.

**Friday, April 15 09:15 AM**

**Daniel S. Armstrong<sup>1</sup> and Thomas P. Wilson<sup>1</sup>. Population genetics of an isolated spotted salamander population in southeastern Tennessee. University of Tennessee at Chattanooga<sup>1</sup>**

Genetic substructure is common in metapopulation scenarios as a result of local adaptation, genetic drift, and often limited gene flow between subpopulations. However, the use of genetic markers for inferring local population demography has been virtually nonexistent despite the potential uses of hypervariable microsatellite markers for this purpose. Population demography is an important consideration for conservation biology because loss of this genetic diversity may have deleterious effects on the long-term survival of the population. In addition, the use of microsatellite markers to examine population structure can reveal demographic information that would be more difficult or impossible to obtain using traditional ecological studies. Effective management strategies should take into account the existence of fine-scale genetic substructure as well as the effective population size in order to more efficiently preserve the long-term viability of populations. The present study examines measures of genetic diversity and population structure in a local population of spotted salamanders (*Ambystoma maculatum*) in southeast Tennessee. Preliminary results indicate that the VAAP population, along with nearby wetlands, comprise an isolated population with no recent migration, no historical reduction in population size, and no sex-biased dispersal.

**Friday, April 15 09:30 AM**

**Elliott Diggs<sup>1</sup>, Timothy Curran<sup>2</sup> and Alastair Freeman<sup>3</sup>. Examining Population Structure in Two Species of Australian Freshwater Turtles in the North Johnstone River, Queensland. Guilford College<sup>1</sup> The School for Field Studies<sup>2</sup> Queensland Parks and Wildlife Services<sup>3</sup>**

Freshwater turtle populations are declining across the world. Understanding the population structure of a species, such as its ecological niche and demography, is critical to its conservation. Two important aspects of population structure are age class and sex ratios. Age class ratios compare juvenile and adult subpopulations. Sex ratios compare breeding pairs (adults) and future breeding pairs (juveniles). I examined these ratios in four populations of freshwater turtles, *Eseya stirlingi* and *Wollumbinia latisternum*, in four pools in the North Johnstone River, Queensland, Australia. Data shows that the age class ratios varied in different pools. *W. latisternum* populations were composed of more juveniles in most pools. *E. stirlingi* age class ratios favored juveniles in two pools, and adults in two pools. Sex ratios differed in the two species. For juveniles, *E. stirlingi* populations had a higher proportion of females in two pools, and two pools contained more males. For adult *E. stirlingi*, the same trend occurred within the pools. *W. latisternum* populations' favored adult females for one pool, adult males for two pools, and one pool had only juveniles. Collectively, both species' sex ratios were approximately equal and both populations skewed toward adults.

**Friday, April 15 09:45 AM**

**Timothy E. Baldwin<sup>1</sup> and Yong Wang<sup>1</sup>. Survivorship and the Influence of Varying Spatial Environmental Factors on Spotted Salamander, *Ambystoma maculatum*, Egg Masses in Northern Alabama. Alabama A&M University<sup>1</sup>**

In this study we wanted to compare spotted salamander, *Ambystoma maculatum*, egg survivorship throughout vernal pools in the Cumberland Plateau in northern Alabama. Twenty four vernal pools were surveyed biweekly between December and April from 2008 through 2011. This project was executed over three field seasons. During this time we sampled spotted salamander egg masses using two timed visual encounter surveys. During each visual encounter survey, a gps unit was used to log each transect within the vernal pool. Each egg mass was identified down to species, tallied, and each egg counted. Biweekly surveys were executed until no Spotted Salamander embryos were noted during the surveys. At least four rounds were completed for each wetland. A round was completed if the wetland's entire basin had been sampled. In addition to spotted salamander egg data, we also took data on the wetland hydroperiod and area. The following wetland environmental measurements were also taken: soil and water temperature, water pH, dissolved oxygen concentration, and canopy cover. Landscape variables were calculated using ArcGIS 10 and ERDAS 10 at three buffer distances to represent juvenile and adult salamander migration distances. The three distances used were 75 meters, 115 meters, and 200 meters. Multiple linear regression was used to examine the relationship between the spotted salamander egg numbers and densities, pool conditions, and landscape parameters.

**Friday, April 15 10:15 AM**

**Matthew -. Klukowski<sup>1</sup>. Influence of reproductive state on plasma corticosterone levels in free-living female fence lizards (*Sceloporus undulatus*). Middle Tennessee State University<sup>1</sup>**

Numerous factors have been shown to alter stress responsiveness in vertebrates including age, sex, season, body condition, and social status. The potential role of reproductive state has received less attention, particularly in reptiles. Since maternal steroids may be transferred to the yolk, elucidation of the influence of reproductive state on plasma corticosterone levels has important implications for offspring development and phenotype. Here I tested whether females of differing reproductive state (early-, late-vitellogenic, or gravid) differed in baseline or stress-induced levels of plasma corticosterone. Adult female fence lizards were captured in the field and bled as quickly as possible to obtain baseline blood samples. Females were subsequently confined for one hour in a cloth bag, bled again, and then brought into the laboratory where laparotomies were performed to determine each female's reproductive condition. Females were released the following day. Plasma triglyceride and lactate levels were measured in addition to corticosterone. Gravid females had significantly higher baseline corticosterone levels than the vitellogenic groups and exhibited the weakest stress responses in terms of both corticosterone and lactate. All three groups differed in plasma triglyceride levels with the highest levels observed in late-vitellogenic females. Altogether these results indicate a substantial influence of reproductive condition on plasma corticosterone levels in female fence lizards. In particular, whether the relatively high baseline corticosterone levels observed in gravid females is indicative of chronic stress or plays some role in reproduction deserves further study.

**Friday, April 15 10:30 AM**

**Glenn A. Marvin<sup>1</sup> and Amanda G. Shelton<sup>1</sup>. Critical Tail Autotomy for Reduction of Maximal Swimming Performance in a Desmognathine Salamander. University of North Alabama<sup>1</sup>**

Tail autotomy is the ability to lose the tail when grasped by a predator. Although tail autotomy has an immediate survival benefit, tail loss may subsequently hinder locomotion and predator avoidance. Few studies have examined the effect of tail autotomy on locomotor performance in salamanders. Previous research showed that maximal swimming performance may be reduced after tail loss in the Black-bellied Salamander (*Desmognathus quadramaculatus*). With the loss of about 65% of tail length, swimming

burst speed declined about 50%. Thus, the loss of a large amount of tail length can be costly for this primarily aquatic species in terms of a reduction in maximal locomotor performance. However, the minimal amount of tail loss that causes a significant reduction in swimming performance (i.e., the “critical tail autotomy” for locomotion) has not been determined. We examined the effect of partial tail loss (either 15% or 30% of tail length) on burst swimming performance. After the loss of 15% of tail length in one experimental group (n = 15), mean burst speed (0.96 m/s) was not significantly different from pre-autotomy burst speed (0.97 m/s; paired t-test,  $t = 0.32$ ,  $P = 0.751$ ). After the loss of 30% of tail length in a second experimental group (n = 15), mean burst speed (0.91 m/s) was significantly less than pre-autotomy burst speed (0.98 m/s; paired t-test,  $t = 2.71$ ,  $P = 0.017$ ). We conclude that the critical tail autotomy for reduction of maximal swimming performance is about 30% of tail length in this species.

**Friday, April 15 10:45 AM**

**James R. Rayburn<sup>1</sup>. Reduction of Acrylamide induced developmental toxicity to *Xenopus laevis* embryos by selected antioxidants. Jacksonville State University**

Studies with the Frog Embryo Teratogenesis Assay (FETAX) have demonstrated that acrylamide, a compound present in processed plant-derived foods such as bread crust and potato fries, is a teratogen. Other studies showed that administration of acrylamide during organogenesis produced maternal and developmental toxicity in mice and maternal, but not developmental, toxicity in rats. L-cysteine, N-acetyl Cysteine are precursors to making Glutathione which has antioxidant properties. The FETAX assay was chosen because the embryos develop externally and are transparent which make them an excellent choice for evaluating developmental toxicity. This assay has both human health and environmental implications. The objective of the present study was to determine if L-cysteine, N-acetyl-L-cysteine and glutathione could be used to reduce acrylamide toxicity and teratogenicity. To accomplish this objective, we investigated the effect acrylamide alone and then the effects of each test chemical on mortality, malformation and embryo length induced by select concentrations of acrylamide using the standardized FETAX assay. Bred frogs with human chronic gonadotropin, collected and dejellied the eggs with 2% L-Cysteine. At small cell blastula stage we placed the embryos into test solutions (renewed every 24 hrs). The test was performed in an incubator at 24°C in the dark. At the end of 96 hrs we counted survivors, malformed and measured embryo length. We selected concentrations of acrylamide that induced 100% malformations and mortality to test the anti-teratogenic potential of each test chemical. The data were analyzed using Systat ANOVA analysis to determine if the test chemicals significantly reduced the toxicity of acrylamide. The data indicate that each test chemical had the ability to protect the embryos against acrylamide induced malformations and mortality to different degrees. These results suggest that these chemicals have the potential to protect fetuses of against acrylamide-induced malformation; and demonstrate the potential utility of FETAX for determining protective effects of other dietary ingredients against acrylamide toxicity.

**Friday, April 15 11:00 AM**

**Lindsey M. Minton<sup>1</sup> and James Rayburn<sup>1</sup>. Does natural pine leachate cause feminization in frogs?: Evaluation of aqueous extract of Virginia Pine (*Pinus virginiana*) by examining time to metamorphosis, and gross & histological gonadal structure of African Clawed Frogs (*Xenopus laevis*). Jacksonville State University, Biology Department<sup>1</sup>**

Estrogenic compounds are introduced into amphibian habitats through a multitude of mediums, the majority of which are influenced or created through human mechanisms. Couple the reliability of amphibians as indicators with the ease to which they are exposed and the model genus of *Xenopus* becomes important test organisms for a wide array of environmental problems. Some naturally occurring estrogens found in the environment as

compounds in some pine trees have been determined to cause estrogenic changes in fish. For our test, we exposed groups of *X. laevis* in tanks to concentrations of pine tree extract (from Virginia Pine, *Pinus virginiana*) from 96hrs after fertilization until metamorphosis, including the stage of gonadal differentiation. Dosages of the pine tree extract were administered on a biweekly basis using test concentrations of differing percentages (1% - high, 0.5% - low), and throughout the experiment, the frogs were kept in covered 20L tanks with a controlled temperature range of 25-29° Celsius. Effects from this pine tree extract will be determined by time to metamorphosis, malformations, mortality, and histological observations and compared to subjects in the positive control groups exposed to estrogen. The study is focused on determining the best techniques to observe gonadal mutations and malformations of male and female African Clawed Frogs after metamorphosis. These evaluations will focus on major sites of primary sexual characteristics, such as the testes and the ovaries, and will be examined using histological slides, staining, and light microscopy.

**Friday, April 15 11:15 AM**

**Thomas P. Wilson<sup>1</sup>. Analysis of Greeninfrastructure for Use in Regional Planning of Metacommunities with Applications for the Conservation of Amphibians and Reptiles. University of Tennessee at Chattanooga<sup>1</sup>**

Reptiles and amphibians are the most under-represented species' in habitat fragmentation studies even though such habitat alteration is the primary cause of their range reduction and population instability. This study is the first to use green-printing, circuit theory and corridor models to characterize and map habitat connectivity for two species of mole salamander (Spotted salamander- *Ambystoma maculatum* and Marbled salamander- *Ambystoma opacum*) near an industrial park in Hamilton County, Tennessee. Since 2007, I assessed this growing ecological problem by studying a community of pond-breeding salamanders in a suite of wetlands proximate to an industrial park. I collected data on life-history and community structure and then used landscape and habitat variables to map and predict corridor suitability in an effort to minimize the effects of development. Data suggest that the stability of the current community may be imperiled and that future species will be at risk given the current state of habitat fragmentation and loss. Research findings such as these should be communicated to elected officials, regional planning agencies, and the development community at large in order to make sound conservation and management strategies.

### **Microbiology**

#### **ORAL PRESENTATIONS**

**Friday, April 15 08:30 AM - 11:15 AM**

**Friday, April 15 08:30 AM**

**Jessica L. Arighi<sup>1</sup>, Rebekah Young<sup>1</sup>, LaJoyce H. Debro<sup>1</sup> and Christopher A. Murdock<sup>2</sup>. Finding Momo and Flo: The Isolation and Characterization of Mycobacteriophage. Jacksonville State University<sup>1</sup> Jacksonville State University<sup>2</sup>**

Viruses that infect bacteria were discovered in 1915 and are known as bacteriophages or phage for short. Bacteriophages must have a host bacterium to replicate and have the potential to control bacterial growth, which could lead to an alternative for antibiotics. The goal of this project was to find Mycobacteriophages and begin to characterize them by their physical and genetic properties. A Mycobacteriophage is specific to Mycobacterium. In this study, the host bacterium was *Mycobacterium smegmatis*. *M. smegmatis* is very similar to the bacteria which cause the deadly disease tuberculosis, *Mycobacterium*

*tuberculosis*. Soil samples were taken from Dadeville, Alabama, and Rome, Georgia, and enriched to help the phage grow. After multiple rounds of purification, one single bacteriophage was isolated from each sample. The initial characterization of the two Mycobacteriophages found, MomoMixon and Florence, supports our conclusion that they are newly discovered isolates.

**Friday, April 15 08:45 AM**

**Nazia Mojib<sup>1</sup>, Amin Farhoomand<sup>1</sup> and Asim K. Bej<sup>1</sup>. : Evidence for the role of purple violet pigment in ultraviolet (UV) radiation resistance in *Janthinobacterium* sp. Ant5-2 from East Antarctica. University of Alabama at Birmingham<sup>1</sup>**

Protection against solar UV radiations in organisms includes production of secondary metabolites such as pigments that can absorb UV and visible light. In this study, *vioA* gene involved in the biosynthetic pathway of violacein-like purple violet pigment (PVP) was cloned and sequenced from an Antarctic bacterium *Janthinobacterium* sp. Ant5-2. A non-pigmented *vioA* mutant strain was obtained following mini-Tn10 transposon mutagenesis that produced less extracellular polysaccharide. Survival of *vioA* mutant strain both in exponential and stationary phase of growth was significantly reduced compared to the wild-type strain when exposed to UVB (320 nm) and UVC (254 nm) (dose range: 0-300 J/m<sup>2</sup>) light. The survival was higher for exponentially growing cultures than the stationary phase cells in wild-type and *vioA* mutant strains. When exposed to UV light, a decreased viability of the mutant strain was noticed when grown at 4 °C upon starvation mimicking Antarctic conditions. An increased pigment production was observed in surviving cells following increased doses of both UVB and UVC. Interestingly, at higher doses i.e. 100 and 300 J/m<sup>2</sup>, pigmented wild-type strain showed better survival to harmful UVC than UVB. This could be attributed to the pigment structure which has absorption maxima in visible (575 nm) as well as in UVC (270 nm) range. In conclusion, this study defines the photoprotective role of the pigment in *Janthinobacterium* sp. Ant5-2 against UV using single gene mutation.

**Friday, April 15 09:00 AM**

**Jonathan P. Huang<sup>1</sup>, Nazia Mojib<sup>1</sup>, Dale Andersen<sup>2</sup> and Asim K. Bej<sup>1</sup>. Microbial diversity in calcified mats from a perennially ice covered Lake Joyce in McMurdo Dry Valley, Antarctica. The University of Alabama at Birmingham<sup>1</sup> Carl Sagan Center for the Study of Life in the Universe (SETI Institute)<sup>2</sup>**

The calcified microbial mats residing in Lake Joyce in the McMurdo Dry Valleys in Antarctica offer a unique opportunity to investigate the formation of structures that are analogous to ancient stromatolites. The diversity of the eubacterial communities in these mats was determined using culture-independent community DNA and culture-dependent methodologies. The 16S rRNA gene sequences from the community DNA clone library were found to be unique and unable to pair with known bacterial genera. This suggests that Lake Joyce microbial mats harbor a complex microbial community which may potentially yield new eubacterial genera. In addition, an uncommon group of bacterial genera including *Pelobacter*, *Rhodopseudomonas*, *Bdellovibrio*, *Curvibacter*, *Opiritatus*, *Spartobacteria*, *Sterolibacterium*, and *Nitrospira* were identified. Other common genera of known Antarctic bacteria were also found in these microbial mats including *Flavobacterium*, *Clostridium*, and *Rhodoferrax*. Our results showed that both culture-independent and culture-dependent methodologies are essential in obtaining the best coverage of the microbial diversity in Lake Joyce mat samples. The study of the taxonomic identification and the extent of biodiversity of the microbial consortium are essential to unfold their role in the formation of the calcified microbialites in Lake Joyce and other lakes in the McMurdo Dry Valleys.

Friday, April 15 09:15 AM

**Steve McCauley<sup>1</sup>, Kelly Funderburk<sup>2</sup>, Taylor Edwards<sup>1</sup>, Greg Lewis<sup>1</sup> and Min-Ken Liao<sup>1</sup>. Impact of a poultry processing plant on the concentration of antibiotic-resistant bacteria in a stream in northwestern South Carolina. Furman University<sup>1</sup> Princeton University<sup>2</sup>**

Antibiotic-resistant bacteria (ARB) are becoming more prevalent in the environment, possibly due to pollution from humans. For example, the Columbia Farms chicken processing plant in the upper piedmont region of South Carolina has a drainage pipe that discharges water into a headwater branch of Brushy Creek in the Enoree River Basin. Because many chickens are fed antibiotics as part of the agricultural process, there may be residual antibiotics and/or ARB present in this wastewater. We hypothesized that the amount of fecal-indicator bacteria and ARB would increase directly downstream from the point of discharge and then gradually decrease further downstream. We analyzed water samples from upstream and downstream of the effluent input at seven locations, and also from five reference streams (similar size and urban land cover) for comparison. The samples were tested for concentrations of total coliform, *E. coli*, and *Enterococcus* using IDEXX, and cultures of *E. coli* were isolated from filtered samples using EPA standard protocol. The concentrations of indicator bacteria in the tributary formed by the effluent were well above the 95% confidence interval of the data from the reference streams, suggesting that the plant's drainage pipe is indeed introducing bacteria into the environment. However, the concentrations found 430 m downstream from the pipe were within this confidence interval. This could be due to dilution from groundwater sources or settling of the bacteria onto the streambed. The number of ARB was highest in the plant effluent, with a decrease at sites further downstream, supporting our hypothesis.

Friday, April 15 09:30 AM

**Richard Watkins<sup>1</sup> and LaJoyce H. Debro<sup>1</sup>. The Link Between cry26 and the Exosporium Enclosed Inclusion of Bacillus thuringiensis. Jacksonville State University<sup>1</sup>**

*Bacillus thuringiensis* subsp. *finitimus* produces two crystalline inclusions during sporulation, one of which atypically remains with the spore inside the exosporium. Two genes, *cry26* and *cry28*, have been cloned and sequenced from this strain but neither has been associated with the exosporium enclosed or the free inclusion. The goal of this project was to examine the role of *cry26* on inclusion formation. Using the probable reading frame of *cry26*, primers were designed to encompass varying amounts of regulatory sequence preceding the putative start site of transcription. The generated amplicions were ligated into a shuttle vector and introduced via electroporation into *B. thuringiensis* subsp. *israelensis* (4Q8) and *B. thuringiensis* subsp. *finitimus* (5E), a plasmid cured variant of the wildtype bacterium under investigation. Both microscopic and protein analysis techniques were used to determine expression of *cry26*. Transformed *B. thuringiensis* subsp. *finitimus* (5E) appeared the same as the untransformed bacterium. *B. thuringiensis* subsp. *israelensis* 4Q8 containing *cry26* preceded by three putative promoters (*sigG*, *sigK*, *sigE*) appeared to be morphologically different, where a small atypical structure was associated with the spore. However, we were unable to detect *cry26* protein expression using protein analysis. The data suggest that *cry26* has a role in the formation of the atypical crystalline inclusion that remains with the spore inside the exosporium. However, there is likely an additional mechanism responsible for regulating the amount of the protein produced and deposited within the exosporium with the spore.

Friday, April 15 09:45 AM

**Quyen T. Pham<sup>1</sup>, Premila N. Achar<sup>2</sup> and MY Sreenivasa<sup>3</sup>. Histopathological Changes Due to Dssential Oils, Antifungal Agents, Against *Aspergillus flavus* in Peanuts. Kennesaw State University<sup>1</sup> Kennseaw State Universitiy<sup>2</sup> Universtiy of Mysore<sup>3</sup>**

*Aspergillus flavus* contamination and aflatoxin B1 production in peanut is a serious problem in the US. Increasing interest in alternative antimicrobial agents such as essential oils are used to aid in reduction of fungal growth rate and spore germination. Present study aims at screening plant based essential oils against *A. flavus* in peanuts and reporting histopathological changes of treated mycelium. Essential oils, such as clove, cumin, eucalyptus, cinnamon, lavender, peppermint, and cedar wood known for antifungal activity, were tested using the poisoned food method (Viuda-Martos et al., 2006) and incubated for 7-10 days at 25°C. Minimum Inhibition Concentration (MIC) was determined by the plate diffusion procedure (Hadacek and Greger, 2000). Since clove oil showed maximum antifungal activity, treated and untreated mycelium was subjected to electron microscopy study. Scanning electron microscopy (SEM) showed changes in the morphology of hyphae, conidiophores, conidia, and phialides in treated samples and alterations varied with concentration of the clove oil and incubation period. Transmission electron microscopy (TEM) showed disruption of cell wall, septa, vacuoles, mitochondria and overall interference of the protoplasm. Since essential oil such as clove showed antifungal properties, we recommend further investigation to establish clove as a biological control agent to control *A.flavus* and minimize aflatoxin B1 production in peanut

Friday, April 15 10:15 AM

**Carl Dischler<sup>1</sup>, John Miller<sup>1</sup>, John Shaugnessey<sup>2</sup> and Michael Land Ph.D.<sup>1</sup>. Staphylococcus aureus incidence in a college locker room setting. Northwestern State University<sup>1</sup> Northwestern State Univeristy<sup>2</sup>**

Staphylococcal infections are more commonly known to be spread through human skin to skin contact or direct contact with fomites coated with bacteria. Staphylococcus infections are especially high among athletes that participate in direct contact sports, such as football. Common surfaces and air samples were sampled in a collegiate locker room setting for *Staphylococcus aureus*. Positive samples were further analyzed for coagulase capability and for methicillin resistance. The most effective disinfectant solutions was also investigated using hibicin mixtures to achieve possible sustained sterility of these surfaces.

Friday, April 15 10:30 AM

**Erika A. Scocco<sup>1</sup> and James W. Buck<sup>2</sup>. Puccinia pelargonii-zonalis urediniospore production and dispersal within a greenhouse. Wingate University<sup>1</sup> University of Georgia<sup>2</sup>**

Geranium rust caused by *Puccinia pelargonii-zonalis* can result in significant economic losses to commercial greenhouse operators. Production and movement of rust urediniospores throughout the greenhouse can affect management options such as fungicide applications or crop removal. The purpose of this research was to determine urediniospore production by *P. pelargonii-zonalis* and to track airborne movement of urediniospores under greenhouse conditions. Two to three week-old sporulating pustules on 'Maverick Red' geraniums were assessed for urediniospore production over 24-h intervals for 3 days. An average of 1580 urediniospores were produced per pustule every 24 h. Movement of urediniospores from infected plants along a greenhouse bench and down rows of geranium plants was assessed in separate experiments. Atmospheric urediniospore concentrations and urediniospore deposition were measured at varying distances from source plants. After 8 h, urediniospores were detected up to 1.82 m at bench level (deposition) and 2.1 m at pot height in the atmosphere from the source plants.

Integrated disease management strategies that significantly disseminated the most urediniospores were those that included non-fungicide, plant manipulation, and either drip or hand watering treatments. Minimal inoculum movement occurred on plants furthest from the source, while the majority of the inoculum remained close to the source plants. Therefore, focus of plant eradication in a contaminated greenhouse should be placed on plants around the disease loci, rather than all plant material.

**Friday, April 15 10:45 AM**

**Matthew T. Purcell<sup>1</sup> and Leos G. Kral<sup>1</sup>. Can bacterial community structures act as indicators of environmental differentiation? University of West Georgia<sup>1</sup>**

We have demonstrated previously that *Etheostoma tallapoosae*, endemic to the Tallapoosa river, is divided into genetically distinct non-interbreeding populations. This structuring could be due to either vicariance and genetic drift or adaptation. While no obvious environmental differences are associated with these genetically divergent fish populations, it is hypothetically possible that there are physiochemical differences in the aqueous environment that may not be easily measurable. It is known that different skin areas of the human body harbor distinct communities of bacterial species presumably due to different localized environments. Differences in microbial communities have been also been observed in river sediment at different locations within and among river systems and these have been shown to correlate with environmental variables. In this study we utilized denaturing gradient gel electrophoresis (DGGE) of PCR amplified bacterial 16S rRNA genes isolated from river sediment samples to determine if community structure differences could be detected that correlate with distribution of genetically distinct *E. tallapoosae* populations. While no such correlation was apparent, this type of bacterial community structure analysis may be of utility in long term monitoring of environmental change within river systems.

**Friday, April 15 11:00 AM**

**Michael S. Bodri<sup>1</sup> and Anthony Glenn<sup>2</sup>. Fungal Endophyte Diversity in Sarracenia. North Georgia College & State University<sup>1</sup> USDA, ARS, Russell Research Center<sup>2</sup>**

Fungal endophytes were isolated from 4 species of the carnivorous pitcher plant genus *Sarracenia*: *S. minor*, *S. oreophila*, *S. purpurea*, and *S. psittacina*. Twelve taxa of fungi, 8 within the Ascomycota and 4 within the Basidiomycota, were identified based on PCR amplification and sequencing of the internal transcribed spacer sequences of nuclear ribosomal DNA (ITS rDNA) with taxonomic identity assigned using the NCBI nucleotide megablast search tool. Endophytes are known to produce a large number of metabolites, some of which may contribute to the protection and survival of the host. We speculate that endophyte-infected *Sarracenia* may benefit from their fungal associates by their influence on nutrient availability from within pitchers and, possibly, by directly influencing the biota within pitchers.

## **Plant Sciences**

### **ORAL PRESENTATIONS**

**Friday, April 15 08:30 AM - 11:30 AM**

**Friday, April 15 08:30 AM**

**Eric E. Lamont<sup>1</sup> and Richard Stalter<sup>2</sup>. Historical and extant rare, protected, and noteworthy plants of Plum Island, New York. New York Botanic Garden<sup>1</sup> St. Johns University<sup>2</sup>**

Plum Island, New York, provides habitat that supports 40 species of rare, protected, and noteworthy vascular plants, including 16 listed as "State Endangered or Threatened", 4 as "State Rare", 17 as "Exploitably Vulnerable" and 3 as "Rare on Long Island". This report is exclusively based on field work conducted on Plum Island from 2002 to 2008 and on herbarium and literature searches. In addition to the authors' recent collections of the flora of Plum Island, this report also includes data from historical collections by Taylor (1915), Jansson (1932), Monachino (1937, 1938), and reports by Latham (1914-1940's), Zarembo (1984), and Zika (1989). Rare plant status is based on New York Natural Heritage Program (Young 2010), New York State Department of Environmental Conservation (Protected Plant List 2000), and Long Island Botanical Society (database of Long Island vascular plant species, 2010). Based on this data, Plum Island is among the 10 to 12 most diverse regions in New York State for rare plants.

**Friday, April 15 08:45 AM**

**Ronald L. Jones<sup>1</sup> and Allen C. Risk<sup>2</sup>. Woody plant survey along the main trail in a small nature sanctuary in southern Costa Rica. Eastern Kentucky University<sup>1</sup> Morehead State University<sup>2</sup>**

In June 2010 a trail guide was completed for the Sendero Naturalista in the Alexander Skutch "Los Cusingos" Bird Sanctuary, in southern Costa Rica. The trail is about 1000 m long, with elevations ranging from 650 m to 750 m, and extends through a mostly primary premontane forest, with a number of trees exceed 1 m dbh. Using a variety of resources the identity was determined for nearly all the characteristic and conspicuous species along the trail. The dominant trees were *Brosimum utile*, *Goelthalsia meiantha*, *Sloanea laurifolia*, *Symphonia globulifera*, *Virola guatemalensis*, and *Vochysia ferruginea*. Smaller trees and shrubs include species of *Cecropia*, *Jacaratia*, *Miconia*, *Myrciaria*, *Psychotria*, *Tovomita*, and *Vismia*. Two tree-sized palms occur in the area—*Euterpe precatoria* and *Socratea exorrhiza*, and shrubby species of *Bactris* and *Chaemodorea* are common. Species of *Mouriri* and *Humiriastrum*, which were among the larger canopy trees, had not been previously known from the site or the general region.

**Friday, April 15 09:00 AM**

**Ronald L. Jones<sup>1</sup> and Allen C. Risk<sup>2</sup>. A survey of the available resources for woody plant identification in Costa Rica. Eastern Kentucky University<sup>1</sup> Morehead State University<sup>2</sup>**

Identification of tropical woody plants can be both frustrating and very rewarding. A number of resources are now available to assist the budding tropical botanist in Costa Rica. Of primary value are short courses, such as the Tropical Dendrology course taught each year by Dr. H. Jimenez. This 2-week course provides invaluable first hand experiences with the plants and expert assistance from Dr. Jimenez and his associates. The available volumes of Manual de Plantas de Costa Rica are also of great value, as is A. Gentry's book on woody plants of northwest South America, and the 3-volume set on the trees of Costa Rica. Other helpful books include the two recent popular field guides by W. Zuchowski and by M. Gargiullo and coauthors, and the book on tropical woody plant identification by R. Keller (highly technical but highly original). There are also books available on particular groups, such as tendrillate climbers (A. Krings and R. Braham), guabas (N. Zamora V. and T. Pennington), tree ferns (A. Rojas), and all ferns (R. Moran, Flora Mesoamerica I). Books on particular regions, such as Chirripó National Park (E. A. Vindas), Golfo Dulce (A. Weber), and Manuel Antonio National Park (P. Harmon) are also very helpful. Several webs sites can also provide help with identifications (especially those at the Field Museum in Chicago). It is often necessary to consult the collections and experts at the Herbario Nacional or one of the other herbaria for confirmations and assistance with exporting permits.

Friday, April 15 09:15 AM

**Allen C. Risk<sup>1</sup> and Ronald L. Jones<sup>2</sup>. A ground-based, preliminary inventory of the ferns of Los Cusingos Bird Sanctuary, Costa Rica. Morehead State University<sup>1</sup> Eastern Kentucky University<sup>2</sup>**

Los Cusingos Bird Sanctuary is located near San Isidro El General in Pérez Zeledón Cantone, in southern Costa Rica. The 78 hectare preserve, situated along the Rio Pénas Blancas, is mostly covered by a mixture of primary and secondary pre-montane rain forest with some small lawn and garden areas associated with several buildings. Ninety-five collections were made via ground-based inventory during May and June 2010. Fifty seven species were documented by the effort. Four species of tree ferns, *Alsophila firma*, *Cyathea multiflora*, *C. delgadii*, and *C. bicrenata*, were discovered to occur on the preserve. Two vine-like taxa, *Salpichlaena volubilis* and *Polybotrya gomezii*, were common throughout the preserve, often occurring in immature, non-climbing form as fully terrestrial individuals. The largest genera were *Trichomanes* (7 species) and *Hymenophyllum* (5 species).

Friday, April 15 09:30 AM

**Amelia Harris P. Harris<sup>1</sup>. A FLORAL SURVEY AND *CASTANEA DENTATA* (FAGACEAE, AMERICAN CHESTNUT) CENSUS AT BENDABOUT FARM, BRADLEY COUNTY, TENNESSEE. The University of Tennessee at Chattanooga<sup>1</sup>**

A FLORAL SURVEY AND *CASTANEA DENTATA* (FAGACEAE, AMERICAN CHESTNUT) CENSUS AT BENDABOUT FARM, BRADLEY COUNTY, TENNESSEE. Amelia Harris, J. Hill Craddock and Joey Shaw, The University of Tennessee at Chattanooga, Chattanooga, Tennessee. Bendabout Farm is a 1,619-ha family farm in Bradley County, TN. Portions of this property have been owned by the same family since 1841, making it an important piece of land in Tennessee's Ridge and Valley. The farm includes habitats such as upland hardwood forests, lowland forests, wetlands, open pastures and pine forests. Wooded areas are managed with prescribed burns to improve wild game habitat. There are two major goals of this study, the first being to conduct a thorough inventory of the Farm's flora and delineate specific habitat types. Since June 2010, fifteen collecting trips were made documenting 204 species from 64 families. Twenty-one non-native species have been identified thus far, comprising 10% of the total. Some interesting species include spiderlilies, *Hymenocallis caroliniana*, and American chestnut, *Castanea dentata*\*. The second goal is to complete a census of naturally-occurring American chestnuts, with the intent to locate areas best suited for the introduction of blight-resistant hybrids into natural populations. Since 1994, three American Chestnut Foundation orchards on the farm have played a significant role in efforts to breed blight-resistant American chestnuts. Census research will begin in summer 2011.

Friday, April 15 09:45 AM

**Wendy B. Zomlefer<sup>1</sup>, Jason Comer<sup>1</sup>, Alexandre M. Santos<sup>1</sup>, James Allison<sup>1</sup> and James H. Leebens-Mack<sup>1</sup>. Genetic diversity of isolated populations of *Veratrum woodii* (Liliales: Melanthiaceae) in Georgia and Florida: A preliminary study with AFLP fingerprint data. University of Georgia<sup>1</sup>**

*Veratrum woodii* [*Melanthium woodii*; Ozark Bunchflower], a herbaceous perennial, occurs mainly from Iowa/Arkansas to Ohio/Kentucky, with the southeastern limits of its range represented by isolated populations in the Southeast to as far south as the panhandle of Florida. This study focuses on the scattered populations in Georgia and Florida, where the species is ranked rare and endangered, respectively. Most of the Georgia populations, in particular, are threatened by encroaching development, and effective management plans require information on the genetic variation of *Veratrum woodii* in these areas. Our

preliminary study of 13 populations utilizes AFLP (Amplified Fragment Length Polymorphism) data as dominantly inherited markers to characterize variation and genetic structure within and among these populations. The distance between clusters of populations (up to several hundred miles) in these two states could potentially prevent extensive outcrossing. Our results indicate that these *Veratrum woodii* populations are genetically similar despite the physical gaps separating them, suggesting either that these isolated (and possibly long-lived) plants may still be outcrossing or cessation of gene flow has been recent. Maintaining conservation efforts for all populations in Georgia and Florida would, therefore, be prudent to preserve genetic diversity and viable populations.

**Friday, April 15 10:15 AM**

**Kree Cameron<sup>1</sup> and Mac H. Alford<sup>1</sup>. DNA Evidence for the Recognition of Several Species of Cudweeds (*Gamochaeta*, Compositae) in the Eastern United States. University of Southern Mississippi<sup>1</sup>**

*Gamochaeta* (Compositae) is a common genus of weedy plants in the eastern United States. Some have recognized as few as one species in this region, but others have recognized as many as eight species. Although the eastern North American representatives are morphologically variable, the variation could be environmental, allelic (intra-specific), representative of unique features for several species, or even indicative of unrecognized introductions to the flora. Here a genetic study was undertaken to assess whether the morphological variation as represented in putative species corresponds to genetic differences. A nuclear region of DNA, the internal transcribed spacer (ITS), was sequenced, and haplotypes were compared among the morphological samples of the eight putative species. The results indicate that the putative species have unique genetic markers as well as morphological features. Given the sampling of U.S. species, the phylogeny also indicates that the cudweeds with bicolor leaves form a monophyletic group.

**Friday, April 15 10:30 AM**

**Jennifer Boyd<sup>1</sup> and Joey Shaw<sup>1</sup>. Successful relocation of federally threatened *Scutellaria montana* (Lamiaceae, large-flowered skullcap). University of Tennessee at Chattanooga<sup>1</sup>**

Investigating the effects of transplantation on *Scutellaria montana* Chapm. (large-flowered skullcap) is an important step toward understanding how potential major threats to this federally threatened species may be remediated. We transplanted and investigated the impacts of transplantation on *S. montana* individuals across small spatial and temporal scales in the location of a proposed highway construction project in Chattanooga, Tennessee. Specifically, during late spring 2009, we identified and relocated 49 *S. montana* individuals from a small population that would be impacted directly by this construction project to an established fenced population nearby that would not be impacted directly by roadway construction. Despite initial signs of water stress, 98 percent of relocated individuals survived to the time of subsequent monitoring in late spring 2010. Additionally, relocated individuals exhibited significant increases in mean overall plant size, reproductive output, and observed general health when compared with their pre-transplantation status. Although these results indicate that transplantation could benefit *S. montana* individuals, we suggest that herbivory protection provided by the fenced site of relocation was the most likely cause of our results as evidenced by a dramatic observable difference in overall vegetative ground cover of the fenced area compared with surrounding unfenced areas. Regardless of the exact cause, our study does indicate that the relocation of *S. montana* from potentially impacted sites can be successfully achieved when transplanted individuals are subsequently protected.

Friday, April 15 10:45 AM

**Lindsay D. Leverett<sup>1</sup>, Claudia L. Jolls<sup>1</sup> and Julie E. Marik<sup>1</sup>. INITIAL INVESTIGATIONS OF *PACKERA TOMENTOSA* (ASTERACEAE) SEED ECOLOGY: MASS VARIATION AND HETEROMORPHISM. East Carolina University<sup>1</sup>**

The production of seeds with high mass variation stimulates differential offspring behavior based on differences in dispersal, competitive ability and germination behavior. Seed heteromorphism, or the production of two or more seed morphs with different forms and/or behavior, when expressed, can be an extreme form of seed mass variation. In the Asteraceae, seed heteromorphism or heterocarpy often produces morphs with contrasting dispersal and germination behavior. We investigate seed mass in an eastern North Carolina population of *Packera tomentosa*, a native perennial of the Asteraceae distributed primarily within the eastern and southern Coastal Plain. To date, our analyses of *P. tomentosa* seeds show that average mass is comparable to that reported for congeners ( $0.2461 \text{ mg} \pm 0.0001 \text{ SE}$ ,  $N=639$ ). Within-population seed mass variation for *P. tomentosa* is high ( $CV=32\%$ ), as documented for other species. Our preliminary data suggest central achenes may be heavier than peripheral achenes, a trend contrary to that typically documented in heterocarpic Asteraceae. Additional investigations of *P. tomentosa* seed mass variation and seed heteromorphism as well as how these strategies may influence germination behavior are currently in progress. Although seed mass variation challenges empirical, experimental and statistical approaches, differences in seed size, morphology and behavior have important implications for progeny success in variable environments.

Friday, April 15 11:00 AM

**Alexander D. Murphy<sup>1</sup> and Brian C. McCarthy<sup>1</sup>. Germination Biology of *P. tomentosa* Seeds. Ohio University<sup>1</sup>**

Princess Tree, *Paulownia tomentosa* (Scrophulariaceae), undergoes no seed dormancy and may produce up to twenty million seeds per year, per tree. This deciduous, nonnative invasive species has established populations along the eastern seaboard west to Texas. It was hypothesized that light regime, temperature regime, and duration of storage of *P. tomentosa* seeds may effect germination rates. "Fresh" seeds were harvested from an Ohio tree in November 2010 and "old" seeds utilized those stored in glass at room temperature harvested four years previously. Fifty seeds were arranged in a seven by seven grid with one outlier on filter paper saturated with sterile water and inserted into growth chambers set for: 10/14h photoperiod at 20/10C, 12/12h at 25/15C, or 14/10h at 30/20C representing spring, early summer, and mid-summer, respectively throughout the central Appalachian region. The number of germinates, determined by primary root appearance, was recorded every ten days for a thirty-day period. "Fresh" seeds from the summer treatments germinated with greater frequency initially than the spring treatment; however, the spring treatment reached equivalent germination by the end of the trial. "Fresh" seeds in all treatments germinated with higher frequency than "old" seeds and "fresh" seeds stored at ambient temperature germinated with greater frequency than those stored in the cold prior to plating. These results suggest that the method and duration of seed storage influences germination of Princess Tree in vitro. Further studies will be undertaken to examine early stages of recruitment and establishment in an effort to understand all phases of early regeneration.

Friday, April 15 11:15 AM

**Timothy Kennell<sup>1</sup> and Michael S. Bodri<sup>1</sup>. A REVERSIBLE SMOKE-INDUCED SECONDARY DORMANCY IN VENUS FLYTRAP (*DIONAEA MUSCIPULA*) SEED. North Georgia College & State University<sup>1</sup>**

The Venus flytrap (VFT) (*Dionaea muscipula*) is fire adapted because it can regenerate vegetatively from its rhizome after seasonal fires. Additionally, fire triggers regrowth of VFT after plants have gone dormant when outcompeted for light by other vegetation. Many plants that are fire adapted also have fire adapted seed that only germinate after exposure to smoke, yet VFT seed are quiescent at maturity and germinate almost immediately when exposed to the correct combination of physical environmental factors. Here we show that exposure to smoke induces a secondary dormancy in VFT seed. Smoke-exposed seed exhibited either complete inhibition or a significant delay of germination; however, our results indicate that the smoke-induced, secondary dormancy can be reversed by soaking the seed in a hydrogen peroxide solution or stratifying the seed. Whereas the treatment with hydrogen peroxide resulted in immediate germination comparable to controls, stratification resulted in germination of VFT seed over a prolonged time period. Therefore, we propose that the induced dormancy of the VFT seed demonstrates a unique fire adaptation as dormancy would prevent summer germination under potentially adverse conditions and will stagger germination in the spring following winter stratification, allowing seeds to germinate over a wider and more favorable range of environmental conditions.

### Animal Ecology

#### ORAL PRESENTATIONS

Friday, April 15 01:30 PM - 04:00 PM

Friday, April 15 01:30 PM

**Kristin D. Shirey<sup>1</sup> and James R. Rayburn<sup>1</sup>. Preliminary Comparison of the Developmental Toxicity of venom from two Tarantula Species, *Grammostola rosea* and *Haplopelma lividium*, using embryos of *Xenopus laevis*: Old World vs. New World. Jacksonville State University<sup>1</sup>**

Tarantulas are the largest spiders in the world. The *Grammostola rosea* is found in Chile the *Haplopelma lividium* is found in Africa. As they become more common in the pet trade, questions about the effects and components of their venom have arisen. Many types of venom are known to contain toxins which have pharmacological actions. However, the exact mode of action of tarantula venom is unknown. A group of researchers have isolated a single 36-residue peptide,  $\omega$ -grammotoxin SIA, from the crude venom of *Grammostola rosea*. This peptide is shown to block various ion channels, including, Ca<sup>2+</sup> channels, which decreases the duration of action potential. To obtain the venom for the experiment, the tarantulas were anesthetized using carbon dioxide. The tips of the fangs were placed into a vile and electric stimulation was applied at their fang base to stimulate venom flow. The venom was stored at -20°C until used. We performed a 96hr test with petri dishes with 20 embryos in each dish. Venom concentrations ranged from 0-0.2% (v/v). We recorded the mortality and the data was analyzed with PROBIT analysis using Tox tools. We were able to generate a 96 hr embryo LC50 and EC50 for both species. The *Grammostola rosea* venom had an approximate 96 hr LC50 of 0.044% (v/v) and an EC50 of 0.029% (v/v). It also showed a consistent spinal malformation and reduction of embryo growth. The *Haplopelma lividium* venom had an approximate 96hr LC50 of 0.06% (v/v) and an EC50 of 0.091% (v/v).

Friday, April 15 01:45 PM

**Matthew B. Engelthaler<sup>1</sup>, Amy N. Jordan<sup>1</sup> and Jeffery M. Ray<sup>1</sup>. Fish survey and bioassessment of Cox Creek in Lauderdale County, Alabama. University of North Alabama<sup>1</sup>**

Cox Creek is a second order spring-fed tributary to Cypress Creek (Tennessee River drainage) in northwest Alabama, draining a portion of the city of Florence. This stream may have suffered the cumulative effects of urban watershed development over the last few decades, which may be reflected in the absence of historically documented species or in an Index of Biotic Integrity (IBI) assessment of the fish community. A fish survey and bioassessment of Cox Creek was conducted in 2010-2011. The IBI was calculated for 7 localities that utilized the 30+2 sampling method of the Geological Survey of Alabama; scores ranged from 38-50 out of 60 (Fair to Good). Scores showed an overall increase downstream, suggesting a lack of cumulative biotic degradation of Cox Creek. Collections yielded a total of 38 species, with a mean of 19 species per collection. Including all historical records, the fish fauna of Cox Creek is 49 species and no historically documented species have declined in their presence in recent collections. Future developments within this watershed should be monitored to insure the aquatic diversity of the stream is not compromised.

**Friday, April 15 02:00 PM**

**Tom Blanchard<sup>1</sup>. Initial response of a fish assemblage to stream restoration efforts along Crooked Creek, a tributary of the South Fork Obion River. University of Tennessee at Martin<sup>1</sup>**

In aquatic systems, the loss of habitat heterogeneity due to stream channelization is known to cause altered species compositions and reduced species richness and diversity. Because of the well-recognized effects of channelization on river systems, stream restoration has become an important tool in the effort to prevent further loss of biodiversity. In the summer of 2008, the West Tennessee River Basin Authority began a project to restore a 1300 meter section of Crooked Creek (a tributary of the South Fork Obion River) in Carroll County, TN. This restoration effort included the addition of approximately 2000 meters of stream by constructing a new stream channel that more closely resembles typical stream morphology. Water was allowed to flow into the constructed channel at the end of August of 2010. The goal of our project was to document the response of the fish assemblage in Crooked Creek to the restoration effort. We used back-pack electrofishing surveys to compare the fish assemblage in a channelized portion of the stream (prior to connection) to that of the constructed meandering portion. Throughout the course of this study, we collected 3713 individuals including 48 species and 16 families of fishes. Although we have relatively few samples from the newly constructed stream reach, our initial findings indicate that species richness and diversity are substantially lower compared to those of the channelized reach. We expect that as the physical factors in the restored reach change over time, more species will be able to successfully colonize this area.

**Friday, April 15 02:15 PM**

**Lisa M. Gardner<sup>1</sup>. Stopover ecology of migrating songbirds at an inland site in northeastern Alabama. Alabama A&M University<sup>1</sup>**

Most research of stopover ecology of migrating landbirds has focused on sites near ecological barriers. This project examined the use of an inland site with data from three seasons (2006-2008) from two habitat types in northern Alabama: a wetland and a riparian forest. I captured 5,016 birds across all years. Seventy-one percent of birds captured were Neotropical migrants; 12% were temperate migrants. Seven percent of all captured birds were recaptured at least once (n=332). Recapture rates varied by species. Magnolia Warbler had the highest recapture rate (10.7%). Species such as Indigo Bunting and Common Yellowthroat preferred the forest edge surrounding the wetland, while thrushes and Gray Catbird preferred areas that had high numbers of northern spicebush. Species such as Ovenbird, Magnolia Warbler, and Trail's Flycatcher were generalists, found in most sites. Age ratios were 3:1 immature to adult. This was lower than that found at coastal sites but higher than that found along the Rio Grande, New Mexico. Recapture

data showed that Neotropical migrants gained mass and fat and increased daily body condition, but temperate migrants did not show gains in either, and daily body condition remained constant or decreased. High relative numbers of adults, coupled with an overall increase in body condition for Neotropical migrants, suggests this area may provide suitable stopover habitat for long-distance migrants. In the face of increasing habitat loss and conversion, it is important for the conservation of these birds that potential high-quality stopover habitat is identified and protected.

**Friday, April 15 02:30 PM**

**Jeremy S. Browning<sup>1</sup> and Stephen C. Landers<sup>1</sup>. Exuviotrophic apostome ciliates from freshwater decapods in Southern Alabama. Troy University<sup>1</sup>**

The ciliated protozoan *Hyalophysa bradburyae* is an ectosymbiont reported from grass shrimp and crayfish in Pike County, AL. This study examined the distribution of *H. bradburyae* from shrimp and crayfish across southern and central Alabama. The decapods were collected from twenty sites spanning nine drainage systems within the study area. The Chatton-Lwoff silver nitrate technique was used to stain ciliates collected from these hosts. *Hyalophysa bradburyae* was found on both crayfish and shrimp from fifteen sites in eight drainages. A new species of *Hyalophysa* was found infesting crayfish at three sites. The new species differs from the more typical *H. bradburyae* in details of the ciliary patterns on the feeding stage. Specifically, ciliary rows 1 and 2 are not divided, and there are 4 short ciliary rows anterior to row 5. Also, the new species has an apparent second contractile vacuole pore. This report expands the known range and diversity of the genus *Hyalophysa* in the state of Alabama.

**Friday, April 15 03:00 PM**

**Erickson M. Daniel<sup>1</sup>, Wood A. Elizabeth<sup>1</sup>, Oliver Kerry<sup>2</sup>, Billick Ian<sup>3</sup> and Abbot Patrick<sup>1</sup>. The potential influence of ant *Formica obscuripes* on the protective mutualism between bacteria *Hamiltonella defensa* and aphids. Vanderbilt University<sup>1</sup> University of Georgia<sup>2</sup> Rocky Mountain Biological Laboratory<sup>3</sup>**

*H. defensa* is a bacterial symbiont of aphids known to confer protection against parasitoid wasps. The frequency of infection and advantage provided by the bacteria vary widely. Because ant-aphid associations are commonplace and also important to aphid fitness, we hypothesized ants play an important role in determining the net benefit of *H. defensa* for aphids and explaining the frequency of infection in natural populations. We tested the effect of ants on *H. defensa* frequency in aphids by excluding *F. obscuripes* ants from *O. frigidae* aphid aggregations and comparing infection frequencies between manipulated and undisturbed aphid groups. We measured embryo number in individual aphids, number of aphids, aphid mummies, and ants tending per aphid group. When parasitoids were absent, we found no direct effect of ants on *H. defensa* frequency in *O. frigidae*. Due to few parasitoid attacks, we were unable to test correlations of infection frequency and ants with parasitoids. The effect of ants on parasitoid attack rate and thus *H. defensa* frequency is not clear. However, we found parasitoid DNA was absent in ant-tended aphids without *H. defensa*. We hypothesize parasitized aphids without *H. defensa* are removed by ants before observation. Finally, *H. defensa* significantly increased fecundity of *O. frigidae*, but we found a trend suggesting infection was associated with smaller groups of *O. frigidae*. In a natural setting, *H. defensa* may have an unknown cost to *O. frigidae* that counteracts the benefits of high fecundity and explains the lack of fixation of *H. defensa* in *O. frigidae*.

**Friday, April 15 03:15 PM**

**Lisa Kelly<sup>1</sup>, Chris Spencer<sup>1</sup> and Matthew Bublitz<sup>1</sup>. *Solenopsis invicta* (Red Imported Fire Ant): Colony Density and Distribution in Clay-based Carolina Bays. University of North Carolina at Pembroke<sup>1</sup>**

The ecological impact of invasive species is largely a function of population density. The red imported fire ant (*Solenopsis invicta* Buren) is one of the most invasive pest species in the United States, readily colonizing disturbance habitats. We report the species from two relatively pristine, clay-based Carolina bays --- Antioch and Goose Pond Bays in North Carolina. The Nature Conservancy owned, the bays support rare plants and animals, a dense herbaceous groundcover, and unique savanna habitat dominated by pond cypress (*Taxodium ascendens*). During summer 2010, we used line transects to determine colony mound density and distribution of *S. invicta* within each bay. Mound densities were similar in the bays (means of 56 and 52 mounds ha<sup>-1</sup>) and were similar to monogyne mound densities in other habitats in the southeastern United States. Mounds were distributed throughout the bays but were uncommon in areas of dense shrub cover. Thus fire management to enhance biodiversity could inadvertently favor *S. invicta* by reducing shrub cover. Most mounds were located against or atop objects, which may allow the species to persist in the bays, even during prolonged winter flooding, and to pose a year-round threat to the native biota.

Friday, April 15 03:30 PM

**J. J. Ghazal<sup>1</sup>, Frank A. Romano, III<sup>1</sup>, Stephen C. Landers<sup>2</sup> and G W. Ingram<sup>3</sup>.  
Meiofauna community structure in the northern Gulf of Mexico. Jacksonville State University<sup>1</sup> Troy University<sup>2</sup> National Marine Fisheries Service, Pascagoula, MS<sup>3</sup>**

A multiyear, collaborative study of meiofauna from the northern Gulf of Mexico is currently underway. Bottom substrate samples were collected using a Shipek grab sampler and multiple 5 x 5 cm diameter PVC core samples were removed and processed with all organisms enumerated (nematodes, copepods, tardigrades, polychaetes, kinorhynch, priapulids, loricifera, plus foraminiferans, radiolarians, and mites). Abiotic data were collected including environmental (temperature, salinity, oxygen concentration) and spatial (depth, latitude and longitude) at each sampling site. A total of 209,220 organisms were collected from the 2007-2009 samples. A total of 26,577 meiofauna were collected of which nematodes=87.01%, copepods=8.12%, tardigrades=0.10 %, polychaetes=4.11%, kinorhynch=0.26%, and priapulids=0.24%. Mean nematode numbers/sample for the entire collection was 224.52±290.67 and varied considerably within years; 2007=425.00±419.48, 2008=148.62±158.62; and 2009=120.89±112.21. The 2008-2009 data are much closer in both numbers/sample and standard deviations, most likely due to the patchiness of the meiofauna. Mean copepod numbers/sample for the entire collection was 20.96±30.50 and varied much less considerably within years; 2007=34.38±49.97, 2008= 17.38±26.77; and 2009=12.65±11.39. Correlations between meiofauna abundances and between meiofauna abundance and abiotic factors were run. Highly significant correlations ( $p < 0.00001$ ) were found between specific taxa, such as kinorhynch and tardigrades ( $r=0.40$ ) and forams and radiolarians ( $r=0.61$ ) suggesting that habitat is the factor in these correlations. Significant correlations ( $p < 0.05$ ) were found between abiotic factors and the abundance of meiofauna taxa. Total abundance is correlated with -latitude (south), with -longitude (east) and with -temperature (slightly colder water). Depth is not significantly correlated to meiofauna abundance.

**Genetics - Cell & Molecular Biology****ORAL PRESENTATIONS****Friday, April 15 01:30 PM - 04:30 PM****Friday, April 15 01:30 PM****Jaylen B. Sweat<sup>1</sup> and Michael S. Bodri<sup>1</sup>. ISOLATION OF PROTOPLASTS FROM NEPENTHES. North Georgia College & State University<sup>1</sup>**

Protoplasts are plant cells altered by mechanical and/or enzymatic procedures for the purpose of removing the cell wall. This research was aimed at isolating and culturing protoplasts from *Nepenthes* grown and maintained under greenhouse conditions in order to develop a protocol suitable for wild species. Leaf mesophyll protoplasts were liberated from the hybrid *N. 'Rokko ' Exotica* following surface sterilization of the lamina. Various concentrations of cellulase, hemicellulase, and pectinase in differing molarities of mannitol or sorbitol were evaluated. The most successful treatment for protoplast isolation was a 25 °C digestion under low light in 0.5 M sorbitol media with 5% Cellulase Onozuka RS + 0.5% Macerozyme R -10 + 0.3% Pectolyase Y -23, shaken gently at 40 rpm for four hours. Average protoplast yield was  $4.35 \times 10^6$  / gm of leaf tissue (n=3) of which 62.1% were viable as determined by FDA staining. Regeneration was attempted with various densities of protoplasts in modified Murashige and Skoog media. Culture methods included hanging drops, thin-film alginate, embedding in low melting point agarose, and liquid culture on agarose with differing concentrations of the synthetic plant auxins 2,4 -D or picloram and the cytokinin kinetin. The osmotic environment of the media was maintained with sorbitol and sucrose during culture attempts. Subsequent staining with FDA and Calcofluor -white verified cells survived in vitro and regenerated a cell wall. Cell division has not been observed. This plant tissue culture method shows promise for regenerating whole *Nepenthes* plants from these cells and is the basis for ongoing research.

**Friday, April 15 01:45 PM****Christopher Dubose<sup>1</sup> and Chris R. Gissendanner<sup>1</sup>. A combinatorial RNAi-based screen to identify genes that genetically interact with the NR4A nuclear receptor gene *nhr-6* in *Caenorhabditis elegans*. Department of Biology, University of Louisiana at Monroe<sup>1</sup>**

NR4A nuclear receptors are critical regulators of cell proliferation and cell differentiation and are rapidly becoming relevant in several human diseases including cancer, neurodegeneration, and vascular disease. We are studying the NR4A nuclear receptor in the genetic model organism *C. elegans* to identify NR4A signaling pathways that may be applicable to disease models of NR4A. The focus of this study is to identify signaling genes that genetically interact with the *C. elegans* NR4A ortholog, *nhr-6*. A previously published genome-wide genetic interaction screen was successful in identifying the Eph receptor tyrosine kinase as a potential signaling protein upstream of NHR-6. However, a screen that is focused only to *nhr-6* will likely yield additional candidate signaling pathways. NHR-6 regulates cell proliferation and cell differentiation during development of the spermatheca, a somatic gonad organ system. We used database searches to identify 93 genes encoding known or predicted signaling proteins that are expressed during spermatheca development in *C. elegans*. Our strategy involves using a combinatorial RNA interference approach to identify genetic enhancers among these 93 genes. To identify genetic enhancers, we screen for genes that exhibit synergistic effects on reproduction when RNAi or gene knockout of the candidate gene is combined with *nhr-6* RNAi. To date, we have optimized our screening approach and have identified two genes, *fkh-6* and *paa-1*, that exhibit a strong genetic interaction with *nhr-6*. Validated genetic enhancers will be

further characterized to determine their role in spermatheca development and their effect on NHR-6 expression or activity.

**Friday, April 15 02:00 PM**

**Vittobai R. Rangaraj<sup>1</sup> and Chris R. Gissendanner<sup>1</sup>. In vivo determination of NR4A nuclear receptor target genes in *Caenorhabditis elegans*. Department of Biology, University of Louisiana at Monroe<sup>1</sup>**

NR4A nuclear receptors are emerging as increasingly important transcriptional regulators of numerous developmental processes. NR4A NRs have been implicated in several human diseases including cancer, atherosclerosis, and neurodegeneration. A core cellular function of NR4A appears to be in regulating the balance between cell proliferation and differentiation. The mechanisms through which NR4A NRs regulate distinct transcriptional responses are unknown. An important part of uncovering NR4A pathways is the identification of downstream target genes. In *C. elegans*, the NR4A homolog is encoded by the gene *nhr-6*. To identify NHR-6 target genes we are using the chromatin immunoprecipitation (ChIP) technique. In ChIP, proteins are cross-linked to chromatin in vivo using formaldehyde. This is followed by fragmentation of the chromatin by sonication. Protein:DNA complexes are then immunoprecipitated using an antibody specific to the protein of interest. Our experiments utilize a functional NHR-6::GFP fusion protein and the ChIP is performed with a monoclonal GFP antibody. We have been successful in isolating NHR-6::GFP bound DNA using this technique. As an initial analysis, we used qPCR to detect specific target sequences that we hypothesized to be NHR-6 target genes. Two of the genes we are testing are *cye-1* and *cyd-1*, which encode cyclin E and cyclin D proteins, respectively. qPCR analysis of the ChIP DNA demonstrated an enrichment of these target genes relative to our negative control, indicating that these genes are bound by NHR-6. Experiments are underway to analyze NHR-6 target genes on a genomic scale by coupling ChIP to high-throughput next generation DNA sequencing.

**Friday, April 15 02:15 PM**

**Christiana M. Daily<sup>1</sup> and Tina R. Hubler, PH.D.<sup>1</sup>. Isolation of the Chorionic Gonadotropin Beta Subunit Gene Promoter in the Owl Monkey, *Aotus nancymaae*. University of North Alabama<sup>1</sup>**

Luteinizing hormone (LH) and chorionic gonadotropin (CG) are members a hormone family known as gonadotrophins. While gonadotrophins share a similar alpha subunit, differences in the beta ( $\beta$ ) subunit of these proteins give them their distinct functions. In humans and other Old World primates, LH is made in the anterior pituitary whereas CG is secreted during pregnancy by placental trophoblasts. However, in New World primates such as the squirrel monkey, CG is expressed in both the pituitary and the placenta. The differences in CG expression in New World versus Old World primates may be related to differences in the CG $\beta$  gene promoters. To begin to study expression of CG $\beta$  in the New World primate *Aotus nancymaae*, lymphocyte genomic DNA was used to isolate the CG $\beta$  promoter by polymerase chain reaction (PCR) and primers designed from squirrel monkey CG $\beta$  promoter sequence. We isolated a 800-bp fragment that was sequenced and compared to the squirrel monkey and human CG $\beta$  promoters. BLAST analysis revealed 97 and 78 percent identity to the squirrel monkey and human promoters, respectively. Transcription factor binding sites previously shown to be critical for pituitary expression of squirrel monkey CG $\beta$  are conserved. Although functional analyses must be performed, these data suggest that the owl monkey CG $\beta$  promoter may function similarly to the squirrel monkey CG $\beta$  promoter. Specifically, the New World primate CG $\beta$  promoter mediates expression of CG in both the pituitary and the placenta, in contrast to the human promoter that is selectively active in the placenta.

Friday, April 15 02:30 PM

**Leos G. Kral<sup>1</sup> and Dyanna M. Fountain<sup>1</sup>. Isolation and Characterization of the *Etheostoma tallapoosae* CENP-A Gene. University of West Georgia<sup>1</sup>**

Centromeric protein A (CENP-A) is a histone H3 variant that is thought to act as the epigenetic mark for the assembly of all centromeric proteins. Interestingly, CENP-A (and its orthologs CenH3 in plants and Cid in *Drosophila*) show adaptive variation in a variety of organisms. In *Drosophila*, adaptive evolution of Cid was detected in both the N-terminal tail as well as in the histone fold domain (HFD) with many of the adaptive changes being localized in L1 of the HFD. The L1 region was shown to confer species specific targeting of chimeric Cid to centromeres. Adaptive variation was also detected in CenH3 from several species in the Brassicaceae family and in CENP-A in 14 species of primates. In order to study the evolution of CENP-A in percid fish species, we have isolated and characterized the CENP-A gene from *Etheostoma tallapoosae* by PCR based gene walking. As a result of this study we have demonstrated that the Tallapoosa darter CENP-A gene HFD sequences can be isolated from genomic DNA by nested PCR in a manner that does not lead to the amplification of the highly sequence related histone H3 gene. We also demonstrated that PCR based walking can be subsequently used to isolate the rest of the CENP-A gene and adjacent gene sequences. The isolation and characterization of the Tallapoosa darter CENP-A gene provides us with a starting point for the isolation and characterization of the CENP-A gene from other Percid fish species.

Friday, April 15 03:15 PM

**Ana Kitazono<sup>1</sup>. Regulation of the Cin5 transcription factor by the stress response in yeast. University of Alabama in Huntsville<sup>1</sup>**

*CIN5* is a non-essential gene that was first isolated in a genetic screen for yeast mutants that exhibit chromosome loss and sensitivity to microtubule inhibitors (CIN = chromosome instability). Cin5 is also termed Yap4 because it belongs to the YAP family of eight basic leucine zipper transcription factors (b-ZIP, Yap1-8), which are involved in the stress response to a series of agents, from chemicals to heat. Expression of *CIN5* is induced in response to several forms of stress from osmotic, to oxidative and chemical. Given its key and diverse role in the stress response, *CIN5* has been isolated in several genetic screens. *CIN5* is involved in response to presence of high salt concentrations and therefore, also termed *HAL6*, and is required for survival upon treatment with the membrane-perturbing agent chitosan, a widely used antimicrobial. Interestingly, overexpression of Cin5 confers resistance to the antimalarial drugs quinidine, mefloquine and cloroquine, and to several DNA-damaging agents such as cisplatin, methylmethane sulfate (MMS), and mitomycin C. Accordingly, it has been suggested that Cin5 is involved in pleiotropic drug resistance via a single common mechanism. A series of genetic and biochemical approaches in our laboratory has determined that Cin5 is sumoylated and that this modification is required for proper response to presence of high salt. One residue at the amino terminus has been identified as crucial for sumoylation of Cin5. We will be report the results of our characterization of non-sumoylated *Cin5* mutants.

Friday, April 15 03:30 PM

**Mijitaba Hamissou<sup>1</sup> and Ploy Kurdmongkoltham<sup>1</sup>. An Investigation of Some Biologically Active Compounds in Pokeweed, *Phytolacca Americana*, Extracts and Their Effects on Prokaryotic and Eukaryotic Cells. Jacksonville State University<sup>1</sup>**

Pokeweed (*Phytolacca americana*) is a perennial herb native to the eastern United States. It belongs to the Phytolaccaceae, a small family found mostly in Africa and the New World. The family includes several South American trees and some unusual serpentine vines of the tropics. Pokeweed is known to contain several toxins. It is also known to contain proteinoeous toxins such as lectin. These toxins include the alkaloid phytolaccine, the resin

phytolaccatoxin, and the saponin. Although most highly concentrated in the roots, all parts of pokeweed are toxic. Pokeweed may possess potential medicinal and economic values to humanity. Can pokeweed extracts be used for biological fungicide or bactericide? The objectives of this research are to investigate the antibacterial properties of pokeweed extract by analyzing their inhibitory effects on bacterial growth, investigate the inhibitory effects of pokeweed extract to the growth and development of *Arabidopsis* callus cells. We collected pokeweed plants from the Jacksonville State University properties. The plants were separated into leaves, stems, and berries. Aqueous and methanolic extracts were obtained from the different parts and analyzed for their inhibitory effects to bacterial and to callus cells. Preliminary data indicated that the extracts of pokeweed are rich in proteins and alkaloids. Western blot and molecular analyses confirmed the presence of lectin-like proteins and several other organic compounds. Bacterial and callus cells growth curves were altered by the addition of the extracts.

**Friday, April 15 03:45 PM**

**Joshua M. Holifield<sup>1</sup> and Elizabeth L. Brandon<sup>1</sup>. The Role of Leptin in the Metastasis of Melanoma. Mississippi College<sup>1</sup>**

Obesity increases the risk of several types of cancer, including melanoma, a highly metastatic cancer. The relationship between obesity and melanoma is not well understood, although obesity causes changes in growth factors and hormones that may contribute to enhanced tumor growth. Leptin, a hormone produced by adipocytes, increases cell proliferation, angiogenesis, and invasiveness of breast and pancreatic cancer cells. To test the hypothesis that leptin enhances melanoma metastasis, we measured the migration of B16F10 mouse melanoma cells in response to mouse leptin (100 ng/mL). Cells were plated inside chambers containing membranes through which the cells could migrate to the bottom of a 24-well plate. Our preliminary results suggest that the hormone leptin may have a positive effect on metastasis of these cells. These results will be tested further by using a leptin receptor antagonist to block signaling through the leptin receptor. This work was supported by the Mississippi INBRE (P20RR016476) funded by the National Center for Research Resources, National Institutes of Health.

**Friday, April 15 04:00 PM**

**Erika Balogh<sup>1</sup>, Claire T. Hann<sup>1</sup>, Soumitra Ghoshroy<sup>1</sup>, John M. Herr, Jr.<sup>1</sup>, Mihaly Czako<sup>1</sup> and Laszlo Marton<sup>1</sup>. Differential distribution of sodium, potassium and chloride ions in tissues of high-salinity and low salinity of *Arundo donax* using environmental scanning electron microscopy and energy-dispersive X-ray spectroscopy. University of South Carolina<sup>1</sup>**

Giant reed (*Arundo donax*) well tolerates various environmental stresses. A salt-tolerant clone of giant reed ('GT' ecotype) was isolated in from a high salinity environment. The mechanism of salinity tolerance is important as it is a promising biomass crop on marginal and polluted lands. The investigation reported here compares the NaCl tolerance and uptake of the 'GT' ecotype and a clone from non-saline environment ('Blossom' ecotype). Both were grown on 0% and 1% NaCl in water. While reduction of growth was observed on 1% NaCl in both ecotypes, root and shoot growth reduction was less in 'GT' than in 'Blossom'. Localization and quantitation of Na<sup>+</sup>, Cl<sup>-</sup>, and K<sup>+</sup> ions throughout plant tissues were carried out in the energy-dispersive X-ray spectroscopy (EDX) mode of the environmental scanning microscope in roots, stems, and leaves of both ecotypes. The data clearly show tissue specific differences in the distribution and level of these ions between the two ecotypes. In roots on 1% NaCl, the Na<sup>+</sup> concentration was higher in cortex and pericycle in 'GT' than in 'Blossom', while 'Blossom' accumulated more Na<sup>+</sup> in the rest of the stele than 'GT'. The aerenchyma of 'GT' contained the highest concentration 1.89% (DW) compared to 1.6% in Blossom. Blossom accumulated about twice more Na<sup>+</sup> than 'GT' on 1% NaCl in both stem and leaves, especially in the stem

parenchyma (1.93%) and leaf phloem (0.66%). The distribution of Cl<sup>-</sup> mirrored that of Na<sup>+</sup>. K<sup>+</sup> concentration was the highest in the roots of 'GT' on 0% NaCl.

**Friday, April 15 04:15 PM**

**Lauren Milleville<sup>1</sup>, Michael R. Taylor<sup>2</sup>, Charles A. Lessman<sup>3</sup> and Ethan A. Carver<sup>1</sup>. Characterization of the dead elvis (DEL) mutation in zebrafish. University of Tennessee at Chattanooga<sup>1</sup> St. Jude Reserach Hospital<sup>2</sup> University of Memphis<sup>3</sup>**

During embryonic development, a subset of cells differentiate into discrete muscle tissues. This process allows the embryo to propel itself, contract the heart muscle to drive blood throughout the organism, and perform other functions necessary for continued existence. Here we describe the genetic localization and phenotypic characterization of the zebrafish, dead elvis (del), which was discovered through a novel screening methodology in Dr. Lessman's laboratory at the University of Memphis. Dead elvis (del) manifests a non-motile phenotype starting around 20 hours after fertilization for embryos that are homozygous for the allele. The dead elvis mutant exhibits obvious myotome defects. We have localized the mutation with a whole genome scan. Utilizing immunohistochemistry and confocal microscopy techniques we have observed muscle formation and sarcomeric assemblage differences between the dead elvis and wildtype zebrafish. A further study of this mutation may aid in the understanding of myotome development within skeletal muscle and lead to more insight into human neuromuscular disease conditions.

### **Scholarship of Teaching and Learning**

#### **ORAL PRESENTATIONS**

**Friday, April 15 01:30 PM - 03:45 PM**

**Friday, April 15 01:30 PM**

**Debora J. Weaver<sup>1</sup> and Michelle S. Thomas<sup>1</sup>. Teaching Cross-Cultural Awareness in Tanzanian Health-care Settings. Campbell University<sup>1</sup>**

Cross-cultural awareness is gaining importance in US health-care due to globalization and increased diversity of patient populations. Students exposed to different populations and health settings are better equipped for future health careers. In 2010 eleven Campbell University students and alumni traveled to Tanzania for a medical service-learning course. The main goals of the course were: 1) increased cultural awareness, 2) exposure to medicine in a developing country, and 3) knowledge of major infectious diseases in East Africa. Prior to the trip the students took a two-credit course emphasizing Tanzanian history, geography, health-care, and culture. A major component included student-developed health-care projects to be implemented in Tanzania. While abroad, students worked in different medical settings, including hospitals and rural clinics, and performed home medical health surveys. They designed and implemented wellness clinics to establish health records for children and distributed medication for common parasitic infections. In the preparatory course students were assessed using quizzes, response papers, and project evaluations. In Tanzania students were evaluated through journal summary, final project papers, group discussions, and post-course survey. Students demonstrated an increased awareness of Tanzanian culture, infectious disease and the differences in health-care between Tanzania and the U.S. All students agreed to have increased cultural sensitivity and gave examples that demonstrate being sensitive to a different culture. Students could list the major health concerns of Tanzania and give examples of differences between U.S. and Tanzanian hospitals. The course offers opportunities to broaden student world-view and provides skills for giving health-care to diverse populations.

**Friday, April 15 01:45 PM****J. C. Havran<sup>1</sup>. Hawaiian Natural History and Ethnoecology. Campbell University, Department of Biology<sup>1</sup>**

The Hawaiian archipelago is recognized as a living laboratory for studies of ecology and evolution. The archipelago is the most isolated island chain in the world and contains high concentrations of endemic and endangered species. Hawaiian Natural History and Hawaiian Ethnoecology are paired courses that explore the interaction between Hawaii's geology, biota, and rich cultural heritage. The courses were taught over of four weeks in summer 2010 across the islands of Oahu, Hawaii, and Kauai. Students were undergraduates and had a broad background in biology. Course lectures and laboratory sessions incorporated guest lectures from educational institutions, conservation organizations, and research agencies across Hawaii. Students were assessed through in-course quizzes, journal activities, and a course-long research project involving the intersection of various aspects of Hawaiian culture and natural history. Projects were assessed during a final student research presentation session at the National Tropical Botanical Garden on Kauai. Post-trip surveys were used to measure student perception of the success of course learning outcomes and learning objectives. In post-trip surveys, all students enrolled in the course agreed or strongly agreed that they were able to differentiate between culturally and ecologically important species in numerous Hawaiian habitats and that they were able to explain the cultural and ecological influences that shape modern Hawaii. The courses offer many opportunities for students to engage in conservation and habitat restoration efforts across Hawaii.

**Friday, April 15 02:15 PM****Linda Jeschofnig<sup>1</sup> and Dr. Peter Jeschofnig<sup>2</sup>. Teaching Lab Science Courses Online - Resources for Best Practices, Tools & Technology. Hands-On Labs, Inc.<sup>1</sup> Colorado Mountain College<sup>2</sup>**

Linda Jeschofnig, president and CEO of Hands-On Labs, Inc., and recently published author of Teaching Lab Science Courses Online: Resources for Best Practices, Tools, and Technology is a recognized industry leader in online learning and in promoting online science education. During this session, Linda and her husband, Dr. Peter Jeschofnig will provide details of how their online teaching methods, use of interactive web-based technologies, and adoption of commercially produced lab experiments combine to provide academically rigorous lab science learning experiences that help students and institutions achieve their academic goals. Linda examines the two factors associated with taking science courses online: 1. educators' trepidation over how to provide students with the hands-on wet lab component and 2. educators' lack of knowledge on how to transition their course content and interaction from face-to-face to online delivery. This presentation will provide answers and examples to address both issues. Educators will also have the opportunity to ask questions and participate in hands-on laboratory experimentation, replicating the experience of an online student. The intended audience for this presentation are administrators, course designers, and science instructors who already provide online science courses; those who providing hybrid courses; and those desiring to soon transition from face-to-face to fully online course delivery in high schools, community colleges, career colleges, and four-year universities.

**Friday, April 15 02:30 PM****Chris Murdock<sup>1</sup> and LaJoyce Debro<sup>1</sup>. Bacteriophage Genomics as a Research Model in Introductory Biology Labs. Jacksonville State University<sup>1</sup>**

Jacksonville State University (JSU) participates in the Howard Hughes Medical Institute (HHMI) sponsored National Genomics Research Initiative (NGRI) of the Science Education Alliance (SEA). The long term goal of the project is to improve science

education using isolation and characterization of Mycobacteriophage as a model to promote undergraduate research. The specific aim of the JSU project is to test the hypothesis that participation in research will promote learning across the curriculum. We describe here the implementation, impact, and results from the experience. The experimental group consisted of fourteen students representing a cross-section of the freshman class. These students enrolled in the traditional biology lecture, along with the control group. However, the HHMI-SEA students replaced the traditional laboratory component with an experimental laboratory course. Students were assessed by comparing academic performance and by measuring changes in attitudes toward science. We observed no significant difference in academic performance. However, unlike the control group, the experimental group demonstrated a measurable difference in gains in the student attitudes about science. There were also measurable differences in student satisfaction with learning and in research productivity during the semester. Although none of the participants in the experimental course had any prior laboratory experience, preliminary results support the concept that beginning students can become fully engaged in novel scientific research. We conclude that participation in the research experience had no measurable effect on academic performance (i.e., assessment scores), but made a significant impact on student interest in science.

**Friday, April 15 03:00 PM**

**Rita M. Fincher<sup>1</sup>. USDA Forest Inventory and Analysis in the undergraduate Ecology curriculum. Samford University<sup>1</sup>**

The United States Department of Agriculture's Forest Inventory and Analysis (FIA) Program is a continuous census of the nation's forests, collecting data on forest extent, distribution, and diversity and tree size, growth, mortality, harvest rates, and health. This program uses standardized methods to collect uniform data, which are stored in a readily-accessible, online database. The FIA website also offers the Forest Inventory Data Online (FIDO) tool, which allows users to create tables and maps showing selected FIA data for selected species, forest types, or regions. In Fall 2010, an undergraduate Ecology course at Samford University used methods adapted from the FIA to repeat a 2001 forest inventory conducted at Ruffner Mountain Nature Reserve, Birmingham, Alabama. We used the free software program EstimateS to construct rarefaction curves for 2001 and 2010 and performed several classic FIA analyses of forest changes. The FIDO tool allowed us to generate figures to compare our local results with state- and nation-wide data. I will discuss modifications that make FIA accessible to undergraduates and discuss the power of combining field data collection with an extensive, long-term national data set and the FIDO online analysis tool.

**Friday, April 15 03:15 PM**

**Henry G. Spratt<sup>1</sup>. Development of bioremediation laboratory exercises for an upper-level environmental science course. University of Tennessee at Chattanooga<sup>1</sup>**

Bioremediation enables the use of living systems to clean up contaminated sites. Laboratory sections of upper-level courses in bioremediation often focus on student-driven research projects. However, when enrollment increases to 15 or more students, it is difficult to facilitate this group research. Two bioremediation exercises were developed to enable a much more predictable laboratory environment for the larger class. The first exercise focused on bioremediation of waste motor oil spilled onto composted mulch, focusing on concepts of passive bioremediation, biostimulation, and bioaugmentation. The second exercise addressed mineralization of the herbicide Simazine by microorganisms present in soils/sediments with or without previous exposure to herbicides, addressing the concept of prior exposure. Unique equipment needed for these exercises included: analytical balance, fume hoods, shakers, water baths, automatic pipetors, air-tight microcosms, and a liquid scintillation counter. For the herbicide mineralization study [<sup>14</sup>C-Simazine was used, requiring a radioactive materials licensed laboratory,

adequate safety training for the students, and the radiolabeled herbicide. Results from the student exercises enabled assessment of the most effective means to clean up sites contaminated with either oil or Simazine. Although, the oil degradation study resulted in no significant differences in the rates of oil degradation for the three conditions tested, the students developed a good appreciation of how to approach an oil spill. The herbicide mineralization study yielded clearly (statistically relevant) data in support of the idea of prior exposure. Overall, students in this lab gained valuable hands-on experience directly related to the field of bioremediation.

**Friday, April 15 03:30 PM**

**Darrell L. Ray<sup>1</sup>. Spreadsheets in the Biology Classroom: Leveraging Common Technology to Teach Biological Principles. University of Tennessee, Martin<sup>1</sup>**

Among the challenges facing biology educators today are the problems of teaching elementary principles of scientific inquiry while also introducing appropriate uses of math, statistics, and basic computing technology. Tools to facilitate these processes are practically universally available in the form of commercial or free spreadsheet applications such as Microsoft Excel and LibreOffice Calc. Using spreadsheets provides a virtual laboratory for quickly demonstrating sampling principles, building graphing and statistical skills, and visualizing results of mathematical models that bring abstract concepts into clearer focus. Examples are presented that illustrate a range of topics that can be addressed with spreadsheets, suitable for high school and college applications.

#### **SABS Symposium**

#### **ORAL PRESENTATIONS**

**Friday, April 15 01:30 PM - 04:10 PM**

**Friday, April 15 01:30 PM**

**Joe E. Winstead<sup>1</sup>. The Southern Appalachian Botanical Society and 75 Years of Plant Biology. Southern Arkansas University<sup>1</sup>**

The diversity of the flora of the ecosystems comprising the majestic habitat known as the Southern Appalachians has been mirrored by the work of the members and associates of SABS dedicated to the understanding and examination of plant life of this major biome. From comprising checklists and locations of vascular and non-vascular species to elucidation of evolutionary relationships of plant species, successional patterns of plant communities, and plant ecosystem stability, the members of the "Club" and then "Society" have provided stimulation and support for the continuation of discovery of plant life structure and function beyond the usually accepted boundaries of the Southern Appalachians. In doing so the work published in the journal CASTANEA as well as other scientific documentations by the membership has been an important stimulus in the recognition of the values gained from relating vegetation to humankind and all of nature. The connections and threads of personal relationships through the past history of this Society will continue and will provide timeless and priceless associations contributing to the preservation and appreciation of both plant life and the spirit of botanical inquiry.

**Friday, April 15 01:40 PM**

**Alan Weakley<sup>1</sup>. We've Come a Long Way! -- Eight Decades of Progress in Understanding the Southeastern Flora. UNC Herbarium / NC Botanical Garden / UNC-Chapel Hill<sup>1</sup>**

In the almost 80 years that have passed since J.K. Small's 1933 Manual, much has changed in our understanding of the vascular flora of the Southeastern United States. Alpha taxonomy discoveries continue, with new species being discovered and named

every year. New types of data and analytic techniques have been added every decade, most recently cladistic analyses of molecular data, with resulting improvements in our understanding of the systematics (at all taxonomic ranks) and ecological relationships of the Southeastern flora. Real changes in the flora have also occurred, with the loss of a few native species through extinction, and the addition of many hundreds of alien species through naturalization. The appropriate taxonomic rank at which to treat finer level taxa (species, subspecies, variety, and form) remains a matter of variable subjective opinion. New constituencies and purposes for study of the flora and its distribution have been added; Natural Heritage programs, other conservation agencies, and NGOs now work with academic institutions to catalog the flora itself, its distribution, and its biogeography, and to conserve it effectively, as human usage of the landscape intensifies. Our increased knowledge of the flora and digital access to that information now allow more sophisticated scientific inquiry and conservation action than could be imagined even a generation ago, yet that knowledge remains dangerously fragmentary and a vast amount of information remains poorly accessible. In the Southeastern United States, the fields of systematics, ecology, conservation, and bioinformatics represent vast, open landscapes for future endeavor.

**Friday, April 15 02:00 PM**

**Zack E. Murrell<sup>1</sup>, Michael B. Denslow<sup>1</sup> and Derick W. Poindexter<sup>1</sup>. Where do we go from here? -- Challenges and Opportunities in Understanding the Southeastern Flora. Appalachian State University<sup>1</sup>**

At the beginning of the 21st century, we see technological advances of computers, the internet, molecular biology, visualization of geographic data, increasingly precise georeferencing tools, and remote sensing data and the role these will have on our understanding of the biota. Additionally, scientists are moving into the bioinformatics world, sharing datasets with the community and working to develop standards that will allow us to discover and analyze data in more effective ways. Floristics is being rediscovered as an important source of biodiversity data, largely due to a renewed interest in the world's biota, the mobilization of herbarium records and the concept mapping efforts that are moving us toward a new and robust use of species occurrence data. Throughout the southeast, systematists continue to discover taxa that are new to science. Invasive plant migration patterns provide a new focus for biogeographical and ecological studies, as we witness the progressive introduction and establishment of plants, animals and fungi that alter local ecosystems. Floristicians, systematists and ecologists can increase our overall access to information by taking steps toward semantically enhancing their data and publications, to drive more efficient information discovery. If the floristics, systematics and ecological community can collectively integrate these technological advances, it will generate significant benefits to the scientific community. Ultimately, by modernizing community best practices to meet the challenges of the "information generation", we can provide data to the public in ways that will help assess the role of the biota in providing ecosystem services to our society.

**Friday, April 15 02:20 PM**

**Karen S. Renzaglia<sup>1</sup>, Juan C. Villarreal<sup>2</sup> and Dean P. Whittier<sup>3</sup>. The hidden life of bryophytes and pteridophytes in the Southern Appalachians. Southern Illinois University Carbondale<sup>1</sup> University of Connecticut<sup>2</sup> Vanderbilt University<sup>3</sup>**

Efforts to protect and conserve threatened and endangered plants in the Appalachians must take into consideration reproductive strategies. Unlike seed plants, sexual reproduction in cryptogams involves the overlooked and poorly-characterized gametophyte generation. For pteridophytes, this sexual phase is rarely seen, especially those with non-photosynthetic, subterranean or endosporic gametophytes. The first half of this presentation will explore the hidden sex life of seed-free plants in the southern Appalachians. Examples will include variability in gametophyte body form and the motile

gametes they produce; the later range from biflagellated to multiflagellated and are coiled one to ten revolutions. Unlike pteridophytes, the gametophyte of bryophytes is dominant and often unisexual, a condition known as dioecy. It is estimated that ca. 60 % of mosses, liverworts and hornworts are dioecious and most reproduce via asexual propagation. In the second half of this talk, we present the example of a rare clonal species of hornworts, *Nothoceros aenigmaticus*, that is thought to be endemic to the Southern Appalachians. This hornwort survives as gametophytes only and displays a unique pattern of sex allopatry: male plants are restricted to the Pigeon and Little Pigeon Rivers watersheds, ca. 30 miles from the closest female population. Using sequence data from all genetic compartments it was uncovered that this species originated from sexually reproducing, dioecious, high elevation, tropical populations from Mexico and tropical America. The survival of this Appalachian endemic in the gametophyte stage provides an opportunity to study the impact of clonality and evolution of separate sexes in haploid-dominant eukaryotes.

**Friday, April 15 02:50 PM**

**Allen C. Risk<sup>1</sup> and Paul G. Davison<sup>2</sup>. Cryptogamic discoveries in the Southern Appalachians: progress in floristics and ecology. Morehead State University<sup>1</sup> University of North Alabama<sup>2</sup>**

Significant and foundational cryptogamic studies in the Southern Appalachians for bryophytes include the work of A. J. Sharp in Great Smoky Mountains National Park and L. E. Anderson, R. Schuster, and R. Zander in the Blue Ridge “embayment” gorges near Highlands, North Carolina, and for ferns include research of W. H. Wagner (reticulate evolution in Appalachian spleenworts) and D. R. Farrar (species of independently reproducing fern gametophytes). These and other studies have revealed that the gorges and deep valleys of the region support populations of sub-tropical taxa while the high peaks harbor certain boreal species. While several species such as *Bryocrumia vivicolor* and *Plagiomnium carolinianum* were initially described as Southern Appalachian endemics, more recent work has shown these taxa to be conspecific with plants from eastern Asia and other regions in the world. Species previously thought to be limited within the Southern Appalachians to the Blue Ridge embayment region have been discovered in the gorges of the Cumberland Plateau in Alabama, Tennessee, Georgia, and Kentucky; e. g., *Cheilolejeunea evansii* (AL), *Radula voluta* (AL, TN), *Plagiochila echinata* (AL, TN, KY), *Lejeunea blomquistii* (AL, GA, TN, KY), *Porella japonica* (KY), *Riccardia jugata* (AL, TN, KY), and *Hymenophyllum tayloriae* (AL, TN). Bryoepiphytically, first documented within the Southern Appalachians by Schuster, has been extended to the Cumberland Plateau and has been documented from several additional Blue Ridge localities. Future research could include canopy studies, impact of hemlock woolly adelgid on cryptogamic community structure, biodiversity surrogacy, and developing indices of biotic integrity by ecoregion based on the cryptogamic flora.

**Friday, April 15 03:10 PM**

**Thomas R. Wentworth<sup>1</sup>, Michael T. Lee<sup>2</sup>, M. F. Boyle<sup>2</sup> and Robert K. Peet<sup>2</sup>. Classification and Environmental Relationships of Plant Communities in the Southern Appalachian Mountains of North and South Carolina. NC State University<sup>1</sup> University of North Carolina - Chapel Hill<sup>2</sup>**

In his classic research on vegetation in Great Smoky Mountains National Park, published a half-century ago, Robert H. Whittaker established the importance of complex-gradients of elevation and topographic moisture in controlling distributions of plant species and communities. Whittaker’s model has been widely adopted to account for variation in vegetation and environment throughout the southern Appalachians. With data on vegetation and environment now available from a much wider geographical extent in the southern Appalachians, vegetation scientists have become increasingly aware of the importance of other gradients influencing regional vegetation patterns, particularly soil

chemistry. To explore vegetation-environment relationships across the region, we took advantage of the large database of southern Appalachian vegetation and environment compiled by the Carolina Vegetation Survey. We selected observations from 3,032 plots representing 85 forest, woodland, and shrubland associations of the National Vegetation Classification. We included in our analysis associations occurring in the mountains of North and South Carolina, although we also included plots from other states falling within these associations. Principal component analysis of environmental data identified soil fertility as the first component, accounting for 45% of total variation. The second component (22% of total variation) was associated with elevation, and the third component (10% of total variation) was associated with a simple index of topographic moisture. This analysis underscores the substantial variation in soil fertility across the region, reflecting variation in bedrock chemistry, and the need to recognize this important environmental gradient as we interpret vegetation patterns in the southern Appalachians.

**Friday, April 15 03:30 PM**

**Michael E. Held<sup>1</sup> and William S. Bryant<sup>2</sup>. The Blue Ash – Oak Savanna – Woodland of the Bluegrass Region of Kentucky: The Ecological History of an Extinct Ecosystem. Saint Peter's College<sup>1</sup> Thomas More College<sup>2</sup>**

E. Lucy Braun in 1950 asked the following: "What was the original condition of the Bluegrass section? What did the earliest colonists from Virginia find in the last quarter of the eighteenth century"? Early explorers to the Bluegrass Region of north-central Kentucky saw a great meadow of cane, herbaceous grasses with scattered, widely spreading trees. The original vegetation of this woodland – savanna was described by many of the early settlers, as well as others, as being dominated by fire – resistant oaks, *Quercus macrocarpa* and *Quercus muehlenbergii*, associated with various other species, especially *Fraxinus quadrangulata*. The gentle, rolling topography of this region is primarily underlain by Ordovician limestone and the fertility of the soil is attributed to this highly phosphatic bedrock. This rich and fertile land was attractive to the earliest settlers and this area rapidly changed under their hands, their axes and their plows, and by their livestock. Only small remnants stands of long – lived trees currently exist. Today we will discuss the early descriptions of this system; evaluate hypotheses on this system's unusual tree composition; present an overview of the current research and restoration activities; and finally, propose some ideas about the future of this ecosystem approaching extinction.

**Animal Behavior****POSTER SESSION****Thursday, April 14 8:30AM - 6:00PM****Kimberly J. Bolyard<sup>1</sup>. Reproductive Behavior of the Potomac sculpin (*Cottus girardi*). Bridgewater College<sup>1</sup>**

Potomac sculpin (*Cottus girardi*) were studied in the laboratory during the breeding season and observations were made of males and females together. A description of their reproductive behavior was developed based on these observations. In addition, these fish were evaluated to determine if sexual selection is operating to shape reproductive outcomes. More females associated with males that actively courted them than with males that did not approach them. Also, more females associated with the larger of two males they shared a tank with. While neither of these findings was statistically significant, the implications of the observations are discussed as are future directions for research.

**Amber M. Cheatham<sup>1</sup>, Jennifer A. Watson<sup>2</sup> and Scott Wilson<sup>2</sup>. Ubiquitin Proteasome System Negatively and Positively Affects Memory and Learning in Mice. Oakwood University<sup>1</sup> University of Alabama Birmingham<sup>2</sup>**

Cells have to be capable of reacting immediately to environmental stimuli to maintain homeostasis or to undergo specified developmental decisions. Intracellular proteins are tagged for selective destruction in proteolytic complexes called proteasomes by the covalent attachment of a poly ubiquitin chain. The ubiquitin-proteasome system is responsible for much of the regulated proteolysis in the cell and plays essential roles in cell cycle progression, DNA repair and synaptic function. Usp14, a deubiquitinating enzyme (DUB) is associated with the proteasome and is involved in the recycling of ubiquitin from proteins committed to proteasomal degradation. A catalytic mutant of Usp14 (Tg5) was produced to define the effect of removing the ubiquitin-hydrolase activity of Usp14 in the nervous system. Expression of a ubiquitin-hydrolase inactive form of Usp14 in a wild type mouse resulted in an increase in hippocampal long term potentiation (LTP). We hypothesize that the elevated LTP in the Usp14 catalytic mutants will lead to elevated memory compared to wt controls in the novel object recognition and contextual and cued fear conditioning paradigms. We have developed transgenic mice that over express ubiquitin to determine if changes in ubiquitin levels contribute to the Tg1 phenotype. We hypothesize that over-expression of ubiquitin (Tg1) in wt background will facilitate memory formation via increase protein degradation. To test this hypothesis, the mice underwent various behavior tests. From the results, an increase in LTP does not necessarily mean that Tg5 mice will show an increase in learning and memory from behavior tests.

**Leah M. Good<sup>1</sup>, Caitlin M. Gussenhoven<sup>1</sup> and H. D. Wilkins<sup>1</sup>. Response to alarm and non-alarm calls by Tufted Titmice (*Baeolophus bicolor*) and Carolina Chickadee (*Poecile carolinensis*) in northwest Tennessee. University of Tennessee at Martin<sup>1</sup>**

Alarm calls are often given by members of mixed-species flocks in the presence of a predator. These calls may be used to warn conspecifics of a potential threat, coordinate the flock, or signal a predator that it has been spotted and is no longer a threat. Common members of mixed-species flocks in west Tennessee include the Tufted Titmouse (*Baeolophus bicolor*) and the Carolina Chickadee (*Poecile carolinensis*). We hypothesize that non-alarm calls of a particular species will only elicit responses from individuals of that species, whereas alarm calls will elicit responses from all species participating in the mixed-species flock. From established blinds we observed chickadees and titmice visiting feeding stations baited with sunflower seeds. For three minutes prior to playback we

recorded all alarm and non-alarm calls given by chickadees and titmice. At the end of the three minute pre-playback observation period, we played a non-alarm call four times followed by a three minute post-playback observation period. After five minutes, when the birds returned to their typical behavior, we repeated the process using an alarm call. All calls used were from either a chickadee or a titmouse. Preliminary observations support our hypothesis. Playback of alarm calls tends to increase the number of alarm calls given by both chickadees and titmice, while the playback of non-alarm calls elicit only species specific responses.

**Edward D. Mills<sup>1</sup>. The impact of noise on the frequency alteration of growl calls (courtship) in Blue-breasted Quail (*Coturnix chinensis*). Wingate University<sup>1</sup>**

EDWARD MILLS. Wingate University. The impact of noise on the frequency alteration of growl calls (courtship) in Blue-breasted Quail (*Coturnix chinensis*). Several studies in urban environments have demonstrated that human-generated noises cause males of several bird species to alter their courtship songs. Affected males have shifted the frequencies of their calls away from potential noise masking to increase the efficiency of signal reception. Adult male Blue-breasted Quail produce a two second, low frequency (555.0 – 1581.5 Hz) growl call during female courtship. This call is accompanied by a wing-drooping display and a short strut. The growl call is fairly loud (58.35 dB) and is given in close proximity to the female. A targeted sound file was created (2524.3 Hz, 68 dB) that is slightly higher than the growl call frequency maximum (1581.6 Hz) as a model of urban noise. Comparisons with control birds (not exposed to noise) show that significant changes occur in the growl calls of noise-exposed birds. After four days of noise exposure, the experimental group produced calls that were significantly longer than control calls. In addition, while the lowest frequency remained unchanged (555.0 Hz), the top frequency was reduced to 1481.9 Hz. This significantly reduced band width and moved the call away from the higher frequency noise. Experimental males also produced louder calls (dB) in maximum power and average power than measured in the control males.

**Theodore J. Zenzal<sup>1</sup>, Robert Diehl<sup>1</sup> and Frank R. Moore<sup>1</sup>. The effect of radio telemetry devices on the flight behavior of Ruby-throated Hummingbirds (*Archilochus colubris*): a pilot study. University of Southern Mississippi<sup>1</sup>**

Radio telemetry is a valuable tool in the study of animal behavior, particularly with respect to movement and habitat use. This tool however, has limitations especially when it comes to smaller animals and their associated load bearing capacity. In order to obtain reliable data from radio telemetry, every effort should be made to minimize the impact of the transmitter on the animal's behavior. The Ruby-throated Hummingbird (*Archilochus colubris*) is a challenge in this respect with an average mass of 3g which can easily double during migration. The aim of this study is to evaluate possible negative effects on the flight performance or behavior of individuals fitted with small radio transmitters. We tested three different transmitter designs on 15 males and 15 females using a paired study design. Treatment one used a 240mg transmitter with a 12.7cm antenna, Treatment two used a 218mg transmitter with a 12.7cm antenna, and Treatment three used a 218mg transmitter with a 6.35cm antenna. Birds' behaviors were recorded using video with a high speed shutter of 1/4,000 s. Videos were analyzed for wing beat frequency and time budgets with and without transmitters attached. Preliminary results indicate that Treatment one may have the greatest effect on flight performance, whereas Treatments two and three show little difference from the control. The use of radio telemetry as a tool in studying hummingbird biology, will allow us to broaden our understanding of their migration and stopover biology.

**Paul V. Cupp, Jr.<sup>1</sup>. Responses of ground skinks, *Scincella lateralis*, and green anoles, *Anolis carolinensis*, to chemical deposits of eastern milk snakes, *Lampropeltis triangulum*. Eastern Kentucky University<sup>1</sup>**

This study compared the ability of ground skinks, *Scincella lateralis*, and green anoles, *Anolis carolinensis*, to detect chemical deposits of eastern milk snakes, *Lampropeltis triangulum*. In feeding trials, both species of lizards were eaten by *L. triangulum*. Tests were conducted in plastic containers in which each lizard had a choice of two substrates. In the experiment one substrate consisted of a moist paper towel exposed to *L. triangulum* for 24 hrs and the other consisted of a moist paper towel without snake odor. Lizards were released at the center of the containers and their positions monitored for two 40 minute periods. The results indicated that *S. lateralis* preferred the substrate with no odor over that with *L. triangulum* odor. However, *A. carolinensis* showed no significant preference for either substrate. The avoidance of predatory snake odors by *S. lateralis* may be related to their burrowing habits in leaf litter where milk snakes may be encountered. In this habitat, they rely more on chemical senses to detect and avoid predators. But, *A. carolinensis*, being highly arboreal, are less likely to encounter milk snakes and do not avoid their odors.

**Plant Sciences**

**POSTER SESSION**

**Thursday, April 14 8:30AM - 6:00PM**

**Shannon M. Machen<sup>1</sup> and Mijitaba Hamissou<sup>1</sup>. Molecular Investigation of Salt Stress Responses in *Arabidopsis thaliana* and *Nicotiana tobacum* callus tissues. Jacksonville State University<sup>1</sup>**

Soil salinity is an environmental factor that limits crop productivity or destroys plants biomass. Soil salinity occurs in many semi-arid to arid regions of the world where it inhibits plant growth and yield. The detrimental effects of high salinity on plants can be observed at the whole-plant level or at the cellular level. In this research, *Arabidopsis thaliana* and *Nicotiana tobacum* callus, initiated on Murashige and Skoog media containing with 2 mg/L 2, 4-D (2MS) will be exposed to 100mM and 300mM NaCl in 2MS media for 4 weeks and their weights recorded weekly. After the salt exposure, one half of the callus will be used for proline and glycine betaine determination and the other half will be used to investigate organogenesis and to induce plant regeneration. The effects of exogenous proline or glycine betaine on the callus abilities to withstand high concentration of NaCl will also be investigated by culturing *Arabidopsis* and tobacco callus onto NaCl-containing media supplemented with or without proline or glycine betaine. Our preliminary observations indicated an increased amount of proline and glycine betaine in callus cells grown in high NaCl containing environment, and that exposure of callus tissues to high NaCl concentration affects their regeneration abilities.

**Julie A. Clifford<sup>1</sup> and Jennifer Rhode Ward<sup>1</sup>. Adaptive Variation in Floral Morphology within a Distylous Plant Complex: *Piriqueta Cistoides Caroliniana*. University of North Carolina at Asheville<sup>1</sup>**

Plants have evolved morphological traits to maximize biotic pollen transfer and to avoid inbreeding. Distyly, the spatial separation of stigmas and anthers, can minimize self-fertilization. Floral characteristics also minimize self-fertilization by promoting outcrossing and attracting pollinators. This study focused on three distylous morphotypes from the *Piriqueta cistoides* ssp. *caroliniana* (Turneraceae) complex, found in the southeastern United States: a northern type, a southern type, and their late-generation heterotic hybrids. Samples from over 800 *Piriqueta* individuals (14 populations) were collected from throughout their native range, and from related greenhouse accessions, in 2009 and 2010.

Plants were photographed and dissected in situ, and floral parts were removed and preserved in 70% ethanol. Separation was significantly greater for short style morphs under both field and greenhouse conditions, reflecting a pattern independent of environmental effects. Results from field resampling indicated nearly significant effects of date on degree of herkogamy. Likewise, year of sampling affected stigma length, anther length, and stigma:anther spatial separation. Morphotypes differed significantly in floral size and shape. Results partially supported the hypothesis that genetic differences drive floral variation within this complex. Future work in common gardens and under controlled growth chamber conditions is needed to conclusively separate effects of genetics and specific environmental factors. This work demonstrates differences in reproductive morphology among *Piriqueta* types, with important implications for plant-pollinator interactions, plant demography, and population dynamics. Studies of distylous systems such as the *P. c. caroliniana* complex can give us insight plants' evolution, maintenance, and loss of inbreeding avoidance.

**Edgar B. Lickey<sup>1</sup> and Sydney Bacchus<sup>2</sup>. Non-coding chloroplast DNA sequences indicate limited gene flow between baldcypress and pondcypress. Bridgewater College<sup>1</sup> Applied Environmental Services<sup>2</sup>**

Delimiting taxa within *Taxodium* remains a confounding issue for plant biologists. Pondcypress can be treated either as a variety of baldcypress (*Taxodium distichum* var. *Imbricarium* [Nutt.] Croom) or as a distinct species (*Taxodium ascendens* Brong.). Although there are striking morphological differences between these two taxa in their extremes, many researchers have found that their distinctiveness disappears in sympatric populations and in intermediate habitats. This has been explained as either hybridization or plasticity in response to ecological gradients or some mixture of the two. Previous work based on allozymes and anonymous nuclear DNA sites seem to suggest that there may be some level of gene flow between the two taxa. However, recent and continuing work with non-coding, chloroplast DNA sequences has yielded further insight into this relationship and indicates that gene flow between the two taxa may actually be rare. A survey of over 13,000 bp of non-coding cpDNA sequences comparing bald and pondcypress revealed only 5 nucleotide changes yielding a divergence value of less than 0.04%. Fortuitously, one of those nucleotide differences seems to separate baldcypress from pondcypress with relatively few exceptions, and since chloroplasts are inherited through pollen in conifers, patterns of gene flow are being assessed.

**Edgar B. Lickey<sup>1</sup> and Andrus Voitk<sup>2</sup>. Elucidating the *Omphalina sphagnicola* (Berk.) M.M. Moser species complex in Newfoundland. Bridgewater College<sup>1</sup> Foray Newfoundland and Labrador<sup>2</sup>**

There is a growing number of examples in which North American mushroom species previously identified as European species that are being recognized as species distinct from their European doppelgangers based on recent molecular and micromorphological work. One such group may be members of sphagnicolous species belonging to genus *Omphalina* s.l. Over the past several years collections were made from bogs in Newfoundland and Labrador as part of an ongoing project cataloging the fungi of that Canadian Provenance. The closest identification deduced is European *Omphalina sphagnicola*, but with some reservation. Several characters do not fit with typical *O. sphagnicola* and there is apparent morphological variation among the Newfoundland collections, which seem to include at least three morphotypes. Further analysis has yielded micromorphological differences, particularly with respect to basidiospore shape and size. Preliminary molecular work comparing nuclear ribosomal DNA internal transcribed spacer (nrITS) sequences of these specimens with authentic *O. sphagnicola* specimens, indicates that none of the Newfoundland collections represent *O. sphagnicola*. Additionally, sequence data support the possible existence of the three morphologically

identifiable groups. Several other recognized species, European and American, could be attributed to these Newfoundland mushrooms, but a lack of detailed morphological descriptions in the literature and difficulty in locating authentic herbarium material has been problematic. It is also possible that these collections represent undescribed species, or some mix of the two hypotheses. While continuing to search for authentic herbarium material and type specimens, several new collections are being added to the study.

**Thomas W. Sasek<sup>1</sup>, Lowell E. Urbatsch<sup>2</sup>, Steven P. Darwin<sup>3</sup>, Alex Lasseigne<sup>4</sup> and Rick E. Miller<sup>5</sup>. CyberFlora Louisiana: Building a virtual herbarium for the state. University of Louisiana at Monroe<sup>1</sup> Louisiana State University - Baton Rouge<sup>2</sup> Tulane University<sup>3</sup> Nicholls State University<sup>4</sup> Southeastern Louisiana University<sup>5</sup>**

CyberFlora Louisiana is a three-year project to image all 1.1 million plant specimens in all 15 Louisiana herbaria. Collection information will be extracted from the labels to develop electronic databases. The digitized images and data will be freely available online through a central website offering fast data sorting and filtering, rapid delivery of zoomable images, mapping of specimen locations, and checklists of plants. The website will be supplemented with digital images of live plants, plant parts, and identifying features for species found in Louisiana. In conjunction with SilverBiology, we have developed a high-throughput, semi-automated imaging process that averages 2 to 4 images per minute. We are now developing methods for extracting data from the label images. Imaging, data basing, and geo-referencing all the state's collections will significantly increase the value and utilization of these important resources, especially for local, state, and federal agencies that need to consult the herbaria regularly. For schools, museums, wildlife refuges, and parks, the availability of live plant images, keys, and useful information will also stimulate more interest in plants. Supported by the National Science Foundation Biological Resource Collections program.

**Michael Woods<sup>1</sup> and Alvin R. Diamond<sup>1</sup>. The genus *Baptisia* (Fabaceae) in Alabama. Troy University<sup>1</sup>**

*Baptisia* Ventenat, commonly known as wild or false indigo, is a member of the legume family Fabaceae (Leguminosae) and the tribe Thermopsidae. The genus consists of approximately 17 species confined to the Eastern United States and Canada. Of these, 15 species have been reported from the Southeastern United States and eight species have been reported from Alabama. Based on the results of this study, seven species of *Baptisia* occur in Alabama. The most common species in the state is *Baptisia alba*, represented in 21 counties. *Baptisia bracteata* is represented in 13 counties and *B. megacarpa* is represented in nine counties. Both *B. albescens* and *B. lanceolata* are represented in four counties each. The least common species are *B. australis* (one county) and *B. perfoliata* (one 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 were 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) and the University of North Alabama (UNAF).

**Aaron J. Floden<sup>1</sup>. *Trautvetteria* sp. nov. – an endemic to northeast Tennessee. University of Tennessee<sup>1</sup>**

A new species of *Trautvetteria* from the Powell River Valley of northeast Tennessee is presented. Its distinctive morphology within a phenotypically plastic genus, its habitat, and habitat associated taxa are discussed. Co-occurring taxa, largely northern relicts, and molecular data suggests a relictual status and a sister species to more widespread and

allopatric *T. caroliniensis* and the disjunct western North American *T. grandis*. Its calcareous springhead habitat occurs between the interface of the Copper Ridge dolomite and the underlying Conasauga group where springs form along the river. Cultivation in a common garden shows phenotypic expression is not a factor the distinctive morphology between the species. The occurrence of this new species, its distinctive habitat, and associated species within a largely well known region emphasizes the value in continued fieldwork in "well-explored" regions.

### Developmental Biology

#### POSTER SESSION

Thursday, April 14 8:30AM - 6:00PM

**Erica M. Davis<sup>1</sup>. The effect of ibuprofen on medaka (*Oryzias latipes*) embryos. Shorter University<sup>1</sup>**

Ibuprofen is one of the most common over-the-counter drugs used throughout the world. Ibuprofen has been found in numerous water systems and may pose developmental consequences for animals relying on these waters for growth and development. We used medaka (*Oryzias latipes*) as a model to better understand the effects of ibuprofen on development. Medaka embryos were reared in three concentrations of ibuprofen (0 mg/L, 3 mg/L, and 9-15 mg/L). Percent of hatching and mortality, heart rate, development rate, and other landmarks of development were observed from gastrulation to hatching. Heart rate, hatch rate and development rate were significantly lower in the higher concentration group. This study shows how ibuprofen could slow the development of fish embryos.

**Paige J. Waymer<sup>1</sup>, Dr. Omar Bagasra<sup>1</sup>, Krishna Addanki<sup>1</sup>, Leslie Johnson<sup>1</sup>, Jessica Abercrombie<sup>1</sup> and Mazhar Kanak<sup>1</sup>. DNA Fingerprinting using a Single Cell by in situ PCR. Claflin University<sup>1</sup>**

Short Tandem Repeats (STRs) are used to obtain a DNA profile from biological samples obtained from crime scenes and heavily relied upon by the judicial courts as proof to solve cases. Low copy numbers (LCN) are based on the ability to obtain a partial DNA profile from a small amount of biological trace evidence acquired. Another factor is mixed profiles (2 or more DNA profiles) which contain more than one DNA contributor of a sample leading to a complex interpretation predicament. With inadequate amounts of sample and the scientific techniques that limit the process to increase the utilization of biological evidence that is there, presents a problem for the quality and quantity of the sample used. Given these boundaries, we hypothesize that the usage of in situ PCR to create a DNA profile using a single cell will ultimately eliminate this particular dilemma. The method of in situ PCR is to amplify 16 CODIS STR loci within a single cell before the utilization of DNA extraction, will increase the sample quantity and perhaps answer the LCN problem. The utilization of this method will ensure that the DNA strands are indeed opened without breakage and that the correct loci are amplified within the cell. With the usage of the HeLa cell line by way of cell culturing techniques, the goal is to accomplish amplification of each individual loci thus moving to a multiplex system using a single cell which will attribute a DNA profile to each contributor of the sample.

**Keila N. Miles<sup>1</sup> and Londa L. Schmidt<sup>2</sup>. Effects of household laundry chemicals, detergents, and fabric softeners on *Xenopus laevis* development. Oakwood University<sup>1</sup> Oakwood University<sup>2</sup>**

In this study the effects of phosphate based vs. non phosphate based vs. cationic vs. anionic laundry bleaches, detergents, and fabric softeners on the development of *Xenopus laevis*, an aquatic amphibian, are compared. Commercially available household

laundry bleaches, detergents, and fabric softeners were tested using different 10-fold dilutions of each beginning at 10-3. Two "green" detergents were also used. Control fertilized *X. laevis* eggs were treated in the same way as the test subjects but had no additives in an aquatic community under as normal conditions as possible using filtered pond water. Fertilized eggs in the 10-3 dilutions either did not hatch or died shortly and did not reach a length of more than 5mm. Both Clorox® and Oxiclean® completely eliminated the fertilized eggs in dilutions 10-3 through -6; tadpoles died shortly after hatching at a concentration of 10-7, and continued to develop in the 10-8 through -10 dilutions. The results showed that all of the chemicals had a detrimental effect on the viability of the amphibians at the dilution used when following the package instructions for washing machines (10-3), all had negative effects at higher dilutions on the development of *X. laevis* to adulthood in size of the tadpoles and duration of the metamorphosis process even though the effects were not always lethal. This study represents an experimental and comparative investigation of effects on aquatic communities and offers a perspective on the impacts of household laundry chemicals when non-target organisms are examined under ecologically relevant conditions.

**Brandon Blackburn<sup>1</sup>, Mendel Freidman<sup>2</sup> and James Rayburn<sup>1</sup>. Does Olive Pumice Extract Affect the Developmental Toxicity of Acrylamide to Embryos of *Xenopus laevis*? Jacksonville State University<sup>1,2</sup>**

Acrylamide is an organic toxin that can be found in certain foods due to cooking at high temperatures. Acrylamide is a carcinogen and can react readily with DNA, neurons, hemoglobin, and essential enzymes. Antioxidants help to protect against damage by reactive molecules or free radicals. This experiment examines if olive pumice extract (OPE) can affect the developmental toxicity of acrylamide in *Xenopus laevis* embryos. The interaction between the acrylamide and OPE was examined using Frog Embryo Teratogenesis Assay-Xenopus (FETAX). The *Xenopus laevis* embryos (320) that were selected were divided into groups of 20 and placed into 16 plastic and disposable 60X15 mm petri dishes with 8 ml of a FETAX test solution. The 16 dishes were separated into four groups: One- FETAX Control Solution, Two-Acrylamide Positive Control (0.085 mg/ml) Solution, Three- OPE Test 1 (0.085 mg/ml) Solution, and Four- OPE (0.085 mg/ml) and Acrylamide (0.085 mg/ml) Solution. The FETAX Control Solution was 8 ml of FETAX solution with a pH of 7.4. At 96 hours, the *Xenopus laevis* embryos were examined for malformations, the number of surviving embryos, and lengths of each embryo. The ANOVA with the Bonferroni Adjustment Post Hoc Test was used to determine differences. The ANOVA Bonferroni Multiple Comparison analysis showed that the effects of OPE reduced the effect acrylamide on the mortality and length. These results indicate that the OPE had the potential of reducing the toxicity of the acrylamide in foods.

**Sunde M. Jones<sup>1</sup>. The Preliminary Effects of Coumadin and Caffeine Mixtures on *Xenopus laevis* Embryos: Should They be Used Together? Jacksonville State University<sup>1</sup>**

Coumadin (warfarin) is a medication that is used as an anticoagulant to prevent strokes and heart attacks. Coumadin also prevents blood clots from forming in the veins and lungs of humans. Caffeine is a methylxanthine alkaloid. Caffeine affects the central nervous system by increasing alertness and decreasing fatigue. Caffeine is located in Coca-Cola and Pepsi products and hot drinks like coffee and tea. The objective of this research is to identify the interactions (synergism, antagonism or response addition) that occur with these pharmaceuticals on the developmental toxicity with frog embryos. *Xenopus laevis* embryos are a model organism for testing developmental toxicity in both human and environmental health. A Standardized Frog Embryo Teratogenesis Assay (FETAX) was used to determine the 96 hr LC50, EC50 (malformation) and Teratogenic Index (TI) of the two chemicals. Each test concentration had 2 or 4 replicates per concentration with 20

added embryos at small cell blastula stage to each dish. DMSO was used as a solvent for the Coumadin. Each day dead were recorded and solutions were changed. Our data indicated a higher LC50 than the published work (Deyoung et al 1991). The results indicated a higher malformation and death rate in the dishes containing both Coumadin (40mg/L) and Caffeine (200 mg/L) that is consistent with response addition. Caffeine had the highest malformations compared to Coumadin. There was also a significant decrease in length to the tadpoles located in the dishes containing both Coumadin and Caffeine.

**Jacqueline I. Clemmons<sup>1</sup>. Mapping the Protein-Protein Interaction of the Dynactin Shoulder/Sidearm. Oakwood University<sup>1</sup>**

Dynactin, a multi-subunit protein complex found only in eukaryotes, interacts with cytoplasmic dynein, a minus-end directed microtubule motor. Dynactin helps to increase the motor processivity of dynein. Together these complexes play a role in intracellular motility and are essential for mitosis in eukaryotic cells. Dynactin has three domains, the Shoulder/Sidearm, the Arp1 mini-filament, and the Pointed-end complex. The Shoulder/Sidearm binds dynein and contains two microtubule binding domains, while the Arp1 mini-filament and Pointed-end complex are the cargo binding domains. The Shoulder/Sidearm is composed of p24, p50, and p150 in a 1:2:1 stoichiometric ratio. Little is known about how these three proteins interact to form the shoulder/sidearm. The purpose of this study is to determine the domains of p24 that are required for its interactions with p50 or p150, with the use of a renaturation assay. Although recombinant p24 is insoluble, preliminary experimental results showed that full-length p24 can be renatured with full-length p50. Further study of the interactions of these proteins will help in determining the structure of dynactin, and will aid in crystallizing this multi-subunit protein.

**Ritika Sehgal<sup>1</sup>, Gyunghee Lee<sup>1</sup> and Jae Park<sup>1</sup>. EcR and USP mediated Programmed Cell Death in *Drosophila melanogaster*. Department of Biochemistry and Cellular Molecular Biology University of Tennessee, Knoxville, TN 37996<sup>1</sup>**

The steroid hormone ecdysone is known to signal the onset of metamorphic processes, including the stage specific programmed cell death of larval tissues (Thummel et al., 2000). Ecdysone is also the critical developmental cue orchestrating the metamorphic reformation of CNS, resulting in the formation of adult-specific neural circuitry. Ecdysone signaling is transduced by a heterodimeric receptor complex between EcR and Ultraspiracle (USP), which on activation, results in the coordinated transcriptional regulation of a host of transcription factors regulating genes essential for PCD (King-Jones and Thummel, 2005). USP plays a dual role in ecdysone response, as its function is necessary for both activation and repression of ecdysone primary response genes (Schubiger et al., 2000). The functions of USP are thus heterogeneous in different tissues that respond to ecdysone during metamorphosis. Our preliminary results showed that usp mutant clones in Corazonin neurons could block cell death. We have developed a possible dominant-negative mutant USP (USP<sup>3</sup>), and expressed it in flies using the GAL4/UAS system to further illustrate the role of USP in ecdysone mediated PCD of vCrz neurons. Targeted expression of USP<sup>3</sup> in corazonin neurons resulted in a complete blockage of PCD pathway. Also, to characterize this dominant negative mutant, we have used GAL4 driver system to arrest USP receptor function in different developmental domains.

**Zixing Wang<sup>1</sup>, John Doe<sup>2</sup>, Michael O'Connor<sup>2</sup> and Jae Park<sup>1</sup>. Signaling involving Baboon receptor and its ligand Myoglianin is required for the programmed death of peptidergic neurons during metamorphosis. University of Tennessee<sup>1</sup> University of Minnesota<sup>2</sup>**

Program cell death (PCD) is an essential feature for the development of the central nervous system in *Drosophila* as well as in mammals. During metamorphosis, a group of peptidergic neurons (vCrz) are eliminated from the larval central nervous system (CNS) via PCD within 6-7 h after puparium formation. Using genetic, transgenic and mosaic analyses of various genes in the TGF-beta signaling pathway, we found that Myoglianin (Myo), a ligand TGF-beta, and its type I receptor Baboon play an essential role in vCrz PCD, whereas other components including type II receptors, Punt and Wit, are only marginally required for this process. Although Smad2 is likely a downstream effector of the Babo for vCrz PCD, our genetic data suggest that Myo does not signal exclusively through Babo, indicating complicated signaling pathway of Myo. Interestingly, Sara, a known adaptor protein for Smad2 phosphorylation and cytoplasm retention factor, is also required in vCrz PCD and function as a concentration-dependent modulator of TGF-beta signaling.

### Ecology

#### POSTER SESSION

Thursday, April 14 8:30AM - 6:00PM

**Travis Perry<sup>1</sup> and Alex Viero<sup>1</sup>. Puma (*Puma concolor*) and Mesocarnivore Associations and Distributions in New Mexico. Furman University<sup>1</sup>**

Large carnivores may have cascading effects on ecological communities by affecting the abundance and distribution of herbivores and smaller carnivores. One mechanism by which this can occur is through spatial avoidance of puma by prey species to reduce predation risk. We examined the spatial associations of puma (*Puma concolor*) and several herbivore and mesocarnivore species across three study sites in New Mexico using long-term remote camera data. Our data suggest that puma may have top-down community level effects actuated through the avoidance of 'good' puma habitat by prey species. However, with these data alone we are unable to rule out simple differences in habitat preference across species as a causal mechanism.

**Travis Perry<sup>1</sup> and Brianna Upton<sup>2</sup>. Puma (*Puma concolor*) predation rates and prey selection in riparian and piedmont habitats in New Mexico. Furman University<sup>1</sup> University of New Mexico<sup>2</sup>**

Puma (*Puma concolor*) are known to utilize a wide variety of prey species. Patterns in puma prey selection appear to be most closely tied to prey availability. We examined predation rates, prey selection, and prey availability across two distinct habitats in New Mexico, the Rio Grande flood plain (riparian) and the eastern foothills of the Black Range (grassland/woodland transition). We obtained prey cache information from GPS collared puma in order to locate and identify prey items and remote camera data to evaluate the relative abundance of prey species. We found dramatic differences in the diversity of prey used across the two habitats, with greater utilization of small prey items along the Rio Grande. The use of small, but abundant prey species by puma in riparian habitats has important implications for our understanding of suitable puma habitat.

**Margot A. Wallston<sup>1</sup>, C. R. Rossell, Jr.<sup>2</sup> and H. D. Clarke<sup>3</sup>. Habitat Attributes of Virginia spiraea (*Spiraea virginiana* Britton) along the Cheoah River, North Carolina. UNC-Asheville<sup>1</sup> Dept. of Environmental Studies, UNC-Asheville<sup>2</sup> Dept. of Biology, UNC-Asheville<sup>3</sup>**

Virginia spiraea (*Spiraea virginiana* Britton) is a federally threatened shrub endemic to the southern Blue Ridge and Appalachian Plateau physiographic provinces. This rare clonal shrub is generally restricted to banks of high gradient streams. No quantitative information is available on the habitat requirements of this species. Therefore, this study quantitatively

describes the habitat attributes of *S. virginiana* along the Cheoah River in North Carolina and determines the relative importance of these attributes by comparing them with attributes in the surrounding environment. We established 3-m-diameter circular plots around all known subpopulations of *S. virginiana* ( $n = 33$ ). Each plot was then paired with a randomly located plot where *S. virginiana* did not occur. We collected data on slope, aspect, substrate, herbaceous cover, tree and shrub density, and light from all plots. *Spiraea virginiana* occupied sites with steep, south-facing banks that included rocky substrates and little exposed soil. These conditions resulted in low herbaceous cover and a sparse canopy, creating a high light environment. Type of substrate was the only habitat attribute that differed between plots with and without *S. virginiana*. Plots with *S. virginiana* had a higher percentage of boulders than plots where *S. virginiana* was absent ( $P = 0.02$ ). The presence of boulders likely allows *S. virginiana* to exploit areas and available resources through rhizomatous growth where other plants cannot. These results suggest that *S. virginiana* is a habitat specialist, requiring an early-successional environment with a rocky substrate to compete with neighboring vegetation in its natural habitat.

**Michael Damron<sup>1</sup>, Melissa Daigle<sup>1</sup>, Chelsea Young<sup>1</sup>, Danielle White<sup>1</sup>, Kaleigh Sims<sup>1</sup> and Thomas Nelson<sup>1</sup>. DIVERSITY AND BIOTIC INTEGRITY OF STREAM FISH COMMUNITIES IN THE CHESTATEE RIVER HEADWATERS. North Georgia University<sup>1</sup>**

DIVERSITY AND BIOTIC INTEGRITY OF STREAM FISH COMMUNITIES IN THE CHESTATEE RIVER HEADWATERS. Michael Damron, Melissa Daigle, Chelsea Young, Danielle White, Kaleigh Sims, and Thomas Nelson. Biology Department, North Georgia College and State University, Dahlonega, 30597. Aquatic biodiversity is high in the streams of north Georgia, but water quality and faunal diversity may be threatened by expanding exurbanization and urban sprawl. To investigate the relationship between local land use and fish communities in headwater streams, we conducted a 2-year study to assess species composition, community diversity, and biotic integrity in 9 first- and second-order tributaries of the Chestatee River. Sites were classified as exurban, agricultural, or forested based on the predominant land-use in each sub-watershed. We hypothesized that both fish diversity ( $H'$ ) and biotic integrity (IBI) would decline from forested to exurban sites. A total of 3,030 fish of 24 species was processed during the study. Overall, we found no significant differences among diversity indices or IBIs for the three land-use categories. However, trends in these scores indicated that forested sites were usually in good condition, agricultural sites were highly variable ranging from good to poor, and exurban sites scored as fair to poor. Our data suggest that increased intensity of local land use alters the composition of stream fish communities, lowering fish diversity and biotic integrity.

**Kristina F. Connor<sup>1</sup>. Experiments with Pitcher Plant Seeds. U.S. Forest Service, Southern Res. Lab.<sup>1</sup>**

A study was undertaken in August 2009 to determine field and laboratory longevity of *Sarracenia leucophylla*, Raf. (white-topped pitcher plant) seeds. *Sarracenia leucophylla* seed pods were harvested from plants located in southern Alabama. Seeds were buried outside in screen-wire bags and harvested over the course of one year. Additionally, four replications of 100 seeds each were immediately tested for viability, while others were (1) stratified for varying lengths of time in a walk-in cooler, (2) placed in a vial and left at room temperature for one year, (3) scattered on the surface of two pots and left outside all winter, and (4) stored dry in the walk-in cooler. Seeds placed immediately in the growth chamber without any period of cold stratification did not germinate, while those cold stored for 7 months and then cold stratified for 4, 6, or 8 weeks averaged 75%, 78%, and 72% germination respectively. Those seeds scattered on the surface of two pots and left outdoors averaged 50% germination. Seeds in the buried screen-wire bags began

germinating inside the bags in June 2010. After one year, field germination was down to 8%, whereas seeds cold-stored for one year had 75% germination and those stored at room temperature averaged less than 2% germination.

**J. E. Makowske<sup>1</sup>, Joey Shaw<sup>1</sup> and Jennifer Boyd<sup>1</sup>. Investigating large animal herbivory on *Scutellaria montana* in the Tennessee Army National Guard Volunteer Training Site, Catoosa County, GA. University of Tennessee at Chattanooga<sup>1</sup>**

*Scutellaria montana* Chapm. (large-flowered skullcap) is a locally endemic herbaceous perennial afforded protection under the U.S. Endangered Species Act. We describe a project designed to investigate the impacts of deer and feral hog herbivory on *S. montana* in the Tennessee Army National Guard Volunteer Training Site (VTS). Our research will allow us to determine whether or not controlling large mammal populations – particularly those of deer and feral hogs – within the training site would provide increased protection for *S. montana* there. Specifically, research will consist of a set of experiments designed to allow for the isolation and examination of the impacts of large animal herbivory on seedling, juvenile and mature *S. montana* individuals through comparison of plants protected by exclosures designed to exclude large mammals with non-exclosures. The scope of this research will include investigation of the impacts of large mammal herbivory on undisturbed *S. montana* individuals and individuals in locations of prescribed burning treatments in accordance with ongoing site management activities. We will monitor evidence of large animal herbivory on *S. montana* performance, as well as related physiological properties throughout these experiments to determine how *S. montana* may be impacted by large mammal herbivores at the training site. We will establish the basis for extending our results to the development of a management plan to help protect and support *S. montana* in the VTS.

**Elizabeth Martin<sup>1</sup> and Terri Killeffer<sup>2</sup>. Discoverability of Biodiversity Information & Resources. USGS NBII<sup>1</sup> USGS NBII/IIa<sup>2</sup>**

The USGS National Biological Information Infrastructure (NBII) [www.nbii.gov](http://www.nbii.gov) is an electronic information network that provides access to biological data and information on our nation's plants, animals, and ecosystems. Regional partnerships in the southeast are fostered and supported through the NBII Southeast Information Node (SEIN). Currently, SEIN is supporting an effort with the Southeast Regional Network of Expertise and Collections (SERNEC) to digitally share natural history collections data. With mashup technology, NBII is providing users with easier access to species data and information (i.e. habitat, description, images, geographical distribution and life history information) served dynamically from a variety of biological information sources on a single Web page. NBII is also working with the University of Tennessee's Center for Information and Communication Studies to identify user needs and develop biodiversity information, tools and services for the Southeast. Biological information resources available via NBII include the Raptor search engine for biodiversity information, RSS News Feeds, geospatial data visualization, and downloadable data.

**Meghan L. O'Boyle<sup>1</sup> and Kim M. Tolson<sup>1</sup>. The Biological Potential of the Feral Pig (*Sus scrofa*) in Louisiana. University of Louisiana at Monroe<sup>1</sup>**

All too often exotic species have the ability to occupy an area and utilize resource niches to a greater degree than native species. The feral pig (*Sus scrofa*) has been identified as a particular threat in Louisiana as well as the rest of the United States. The feral pig is an exotic mammal that is capable of reproducing twice a year and can mature at a very early age given the best quality habitat. Previous studies indicate that sows may reach reproductive maturity between the ages of six and twelve months. This research aims to look at the possible effect of soil quality as a primary factor of reproductive maturity versus

age alone. It has been shown that soil quality affects litter size of many species of mammals. This study will focus on reproductive efficiency (RE) and if it correlates with soil quality in a given area. RE will be calculated by counting corpora lutea present in the ovaries and dividing that into the number of fetuses present in the uterus. An attempt will be made to determine gestational age of fetuses to calculate breeding dates of sows. Additionally, all reproductive tissues will be tested for the presence of pathogens. Of particular interest is the pathogen *Brucella suis* which may affect the reproductive potential of the feral pig as well as spread to domestic livestock and humans.

**Nora L. Smith<sup>1</sup> and Kim M. Tolson<sup>1</sup>. Morphometric analysis of select cranial measurements taken from Louisiana wild canids. University of Louisiana at Monroe<sup>1</sup>**

The range of the coyote, *Canis latrans*, has spread since the late nineteenth century from its historical range in the western United States to become North America's most wide ranging wild canid. This spread has facilitated the interbreeding of coyotes with wolves, *Canis lupus* and *Canis rufus*, and the domestic dog, *Canis familiaris*. Interbreeding of this nature can potentially result in the loss of a species which would ultimately result in a loss of biodiversity. Since the extirpation of *C. rufus*, the coyote is the last wild canid present in the state of Louisiana. Howard (1949) reported a 95% reliable method for distinguishing the skulls of coyotes from those of domestic dogs by comparing the ratio of the length of the upper tooth row to the palatal width. If this ratio is 3.1 or greater, the specimen is a coyote; if the ratio is 2.7 or less, the specimen is a dog. Skulls from canids collected in northeast Louisiana were measured to the nearest 0.01 mm using calibrated digital calipers. Data collected to date indicate that the majority of canid skulls sampled exceed the 3.1 ratio. Additional measurements included in the analysis were those found to be most significant for species determination by Lawrence and Bossert (1967).

**Travis Perry<sup>1</sup> and Brendan Talwar<sup>1</sup>. Resident Puma (*Puma concolor*) Populations in Narrow Riparian Habitats in New Mexico. Furman University<sup>1</sup>**

Puma (*Puma concolor*) exhibit habitat preferences thought to be linked to prey availability and ambush cover both of which may be closely tied to vegetation composition and structure. Previous studies have examined regional level habitat distributions as a way of predicting puma occurrence, relative population size, and dispersal corridors. Within puma home ranges that encompass a diversity of habitat types, narrow strips of riparian vegetation have been identified as usable, or even preferred, habitat patches. These narrow riparian areas are also often assumed or identified as high quality dispersal habitat corridors. We present data on a reproductive, resident puma population that confines its distribution almost exclusively to the relatively narrow Rio Grande flood plain in south-central New Mexico. This finding has implications for estimating regional puma population sizes based on habitat quality, the suitability of various regions for the re-establishment of resident puma populations, and the suitability of riparian corridors for dispersal.

**Travis Perry<sup>1</sup> and Michael Jiang<sup>1</sup>. Habitat selection of Puma (*Puma concolor*) and their principle prey species elk (*Cervus elaphus*) and mule deer (*Odocoileus hemionus*) in southcentral New Mexico. Furman University<sup>1</sup>**

Large predators may influence the spatial distribution of herbivores through the avoidance of predation risk with indirect impacts on vegetation and ecosystem level processes. We used GPS collar data and fecal pellet plots to assess habitat use of puma and their large ungulate prey, (elk (*Cervus elaphus*) and mule deer (*Odocoileus hemionus*) respectively. We found that habitat selection differed dramatically between the two groups, suggesting a causal effect of predation risk in determining ungulate distributions. However, with these

data alone we cannot rule out the possibility of simple species specific habitat preferences as the causal agent for this pattern.

**Karissa D. Keen<sup>1</sup>, Megan H. Rayfield<sup>1</sup>, Jonathan Horton<sup>1</sup>, Jennifer Rhode Ward<sup>1</sup> and David Clarke<sup>1</sup>. Effects of Environmental Factors and Genetics on the Production of Bioactive Chemicals in *Panax quinquefolius*. University of North Carolina Asheville<sup>1</sup>**

American ginseng, *Panax quinquefolius*, is a native plant that produces ginsenosides making this plant an important economic crop. Currently, ginseng suffers from reduced reproduction rates and overharvesting, often resulting in loss of genetic variability which could affect its continued use as a medicinal herb. To help restore wild populations and standardize commercial harvesting, unique environmental, physiological, and genetic factors affecting ginsenoside content must be evaluated. We studied wild ginseng individuals from three populations in western North Carolina to determine relationships between abiotic, physiological characteristics, and ginsenoside concentrations. We also measured several above ground plant parameters (height, leaf area, number of leaves, number of leaflets, rachis length and peduncle length) to develop allometric equations between these easily attainable data and plant age. We used these equations to estimate age structure of these populations non-destructively. These demographic data will be used in conjunction with population genetics data to determine long-term viability of these populations. There are two chemotypes of wild *P. quinquefolius*, which are determined based on the relative concentrations of two ginsenosides, Rg1 and Re. We hope to use genetic markers to identify these specific chemotypes. The results of this project will be used in the future to match specific genotypes of wild *P. quinquefolius* with environmental factors to maximize the production of ginsenosides in cultivated plants. Development of cultivation protocols to produce high ginsenoside plants should provide protection for wild populations.

**Dana Virone<sup>1</sup>, Shelley Baltar<sup>1</sup>, Dawn Lemke<sup>1</sup> and Callie Schweitzer<sup>2</sup>. Relationship between invasive plants and forest communities on reclaimed surface mines of the Southern Cumberland Plateau. Alabama A&M University<sup>1</sup> USDA Forest Service<sup>2</sup>**

Throughout the world, the invasion of non-native plants is an increasing threat to native biodiversity. Invasion is especially prevalent in areas affected by land transformation and anthropogenic disturbance. The numerous surface mines along the Southern Cumberland Plateau are major sources of disturbance and may intensify the introduction of invasive plants to the surrounding forest. In this study, forest communities were studied on reclaimed surface mines of the Southern Cumberland Plateau. Our goal was to examine the variation of tree species richness and composition in relation to environmental variables and the presence of non-native invasive species. A total of 112 plots were established and sampled during the summer and fall of 2010 and over 19,000 native trees were tallied. Invasive species were present on 93 plots and included Japanese honeysuckle (*Lonicera japonica*), Chinese lespedeza (*Lespedeza cuneata*), mimosa (*Albizia julibrissin*), paulownia (*Paulownia tomentosa*), sawtooth oak (*Quercus acutissima*), Chinese privet (*Ligustrum sinense*), shrubby lespedeza (*Lespedeza bicolor*), tall fescue (*Lolium arundinaceum*), tree of heaven (*Ailanthus altissima*), and Macartney rose (*Rosa bracteata*). The most common tree species included loblolly pine (*Pinus taeda*), Virginia pine (*Pinus virginiana*) and sweetgum (*Liquidambar styraciflua*).

**Caitlin E. Hurd<sup>1</sup>, Phillip G. Sloan<sup>1</sup> and Timothy O. Menzel<sup>1</sup>. Microhabitat use by seed-eating animals in a recently restored wetland. Piedmont College<sup>1</sup>**

The purpose of this experiment was to determine how granivorous birds and small mammals use the space within a single habitat. The single habitat used for this experiment was a recently drained lakebed undergoing early secondary succession. The

following three hypotheses were developed: 1) The occurrence of these animals is determined by the structure of the vegetation. 2) The occurrence of these animals is determined by the landscape context. 3) The occurrence of these animals is random. Two MRPP tests were used to test these hypotheses for each group of animals. The first tested for non-random occurrence patterns in relation to the vertical vegetation structure, measured at four height intervals: ground cover, bottom, middle, and top. The second tested for non-random occurrence patterns in relation to landscape context including three variables: distance to stream, distance to edge, and distance from other animals within that group. The relationship between mammal occurrence and vegetation structure was not different from random ( $p=0.7998$ ), while the relationship between mammal occurrence and landscape context was different from random ( $p=0.0001$ ), and mammals occurred further from edge than would be expected by chance. There was a non-random relationship between bird occurrence and vegetation structure ( $p=0.0246$ ), while the relationship between bird occurrence and landscape context was random ( $p=0.2026$ ). From these results, we can infer that small mammals are choosing their locations in relation to surrounding features, such as being further from edge and stream, whereas birds select their sites based on vegetation structure.

**Jacob S. Francis<sup>1</sup> and Jonathan L. Horton<sup>1</sup>. Using Dendroecology to Determine the Effect of *Celastrus orbiculatus* on *Liriodendron tulipifera* growth. The University of North Carolina at Asheville<sup>1</sup>**

*Celastrus orbiculatus* Thunb. (Oriental bittersweet) is an invasive exotic liana that was introduced to western North Carolina in the late 19th century and has since established in forests across the southern Appalachians. The twining habit of bittersweet is recognized to have negative impacts on tree growth, by constricting trunks, overtopping canopies, and increasing the probability of wind and ice damage, but no research has directly quantified this decrease in growth. In this study we established invaded sites with both twined and untwined trees to test for the direct and indirect growth effects of bittersweet. We also paired invaded sites with uninvaded sites with similar vegetation and soil moisture as a control for abiotic growth factors. We compared twined tree growth before and after the age of the oldest twining vine to assess bittersweet's direct effects. We also established a mean invasion time based on mean vine age for each invaded site and compared growth between invaded but not twined, twined, and uninvaded trees before and after that time. Limited preliminary results suggest a trend towards decreased growth after bittersweet invasion; we expect to statistically verify this correlation, and quantify the long-term effects that Oriental bittersweet invasion can have on tree growth and thus timber production.

**Rufina N. Ward<sup>1</sup>, Heather Howell<sup>1</sup> and William Stone<sup>1</sup>. Forest Management Practices in Bankhead National Forest:: Impact on Benthic Macroinvertebrate Assemblages. Department of Natural Resources and Environmental Sciences, Alabama A&M University<sup>1</sup>**

The composition and diversity of aquatic insect assemblages associated with forest management practices within the Bankhead National Forest in Lawrence, Winston and Franklin Counties (Alabama) were determined. Aquatic insects were collected seasonally using kick net method from nine study sites downstream from forest stands that have been previously managed [thinned (Rock Creek, Flannigan Creek and Borden Creek ), thinned and burned (Brushy Creek, Rush Creek and West Beech Creek )] or unmanaged (Basin Creek, Thompson Creek and West Flint Creek ). Insect samples were identified to Genus or Family. Assessment of stream habitat and measurements of basic water quality parameters were also performed. This paper reports on our Year 1 data with a focus on EPT [Ephemeroptera (mayflies) - Plecoptera (stoneflies) – Trichoptera (caddisflies)] assemblages. To date, 24 genera of mayflies in 7 families, 24 genera of stoneflies in 8 families and 18 genera of caddisflies in 10 families have been identified among samples

across locations. EPT distributions varied widely across watersheds. Watersheds downstream from unmanaged areas yielded higher EPT ratios to other taxa than all other study sites except Borden Creek. Pooled data across treatments showed highest average percentage EPT in watersheds associated with unmanaged (40.12%) compared to those downstream from managed [thinned (23.76%), and thinned and burned (21.67%)] forest stands. Rock and Flannigan Creeks sustained the lowest population of EPT throughout the year. No significant difference in percent EPT across seasons was detected.

**Brandie K. Stringer<sup>1</sup>, Yong Wang<sup>1</sup> and Callie J. Schweitzer<sup>2</sup>. Forest Disturbance and Songbird Reproductive Success: Temporal Response. Alabama A&M University<sup>1</sup> USDA Forest Service<sup>2</sup>**

Many Neotropical migrants, such as *Dendroica discolor* (Prairie Warbler-PRAW) have declined due to the loss of early successional habitat associated with active forest management practices. Timber production is a major economic activity that affects forest structure and availability across the landscape. Alabama has the third largest commercial forest and the second largest private forest in the nation. Certain forest management prescriptions (such as timber harvesting) can create early successional habitat that may be beneficial for some avian species, including the PRAW. However, these prescriptions may also increase the risk of mortality due to higher predation and parasitism by *Molothrus ater* (Brown-headed Cowbird-BHCO). The trade-off between productivity and mortality (on net population reproductive success at a forest stand level) may change through time. Early successional forest may provide better breeding resources and protection from predation and nest parasitism. During the successional process, forest stands may go through the process of “sink” - “source” habitat dynamics. The study area is located in the mid-Cumberland Plateau in northern Jackson County, Alabama. The songbird community was monitored during breeding season in 2010, and will be monitored again during breeding seasons of 2011 and 2012. The breeding success of each nest will be quantified; overall stand reproductive success will be estimated based on territories detected and these breeding success indexes. Some preliminary data from 2010 will be discussed.

**Megan Rayfield<sup>1</sup>, Karissa Keen<sup>1</sup>, David Clarke<sup>1</sup>, Jonathan Horton<sup>2</sup> and Jennifer Ward<sup>1</sup>. Genetic and Demographic Diversity of American Ginseng (*Panax quinquefolius*) in Western North Carolina. UNC Asheville<sup>1</sup> UNC Asheville<sup>2</sup>**

The medicinal herb, wild American ginseng, (*Panax quinquefolius*), has a growing market in the U.S. and commands a high market value in Asia, with wild roots being worth more than 3.5 times those grown under cultivation. The species, which grows across the eastern United States and as far west as Nebraska, has been listed in CITES Appendix II since 1973 due to aggressive harvesting and non-compliance with harvesting regulations. It has been suggested that genetic diversity is low and instances of inbreeding may be occurring in wild populations. Studies examining the genetic diversity at allozyme loci show differences in genetic structure between protected and unprotected populations. This project uses newly published microsatellite primers to assess genetic relatedness among ginseng individuals in four local protected populations then correlates those data with plants' demographic variables. Leaves from 160 individuals of known size, age, and reproductive status have been collected, DNA has been extracted, and samples are being PCR-amplified with 12 different primer sets. Preliminary data from 2 primer sets showed genetic diversity both within and among populations. Genetic data are also being correlated with analyses of ginsenoside content, with the long-term goal of attributing patterns of ginsenoside production to specific genotypes.

**Megan E. Pitman<sup>1</sup> and Travis W. Perry<sup>2</sup>. Developing a management tool to estimate unmarked puma populations with a remote camera array. Clemson University<sup>1</sup> Furman University<sup>2</sup>**

Remote camera traps placed in an array present a promising new tool for surveying cryptic mammals. Techniques for estimating population levels of unmarked animals or species that do not have individual markings are needed. Our goal was to develop a technique using a remote camera array (1) to determine the camera effort needed to detect resident pumas (*Puma concolor*) with 95% certainty and (2) to estimate the puma density of an unmarked puma population. An array of 25 cameras spread 2km apart in a square grid covering an area of 100km<sup>2</sup> was used to monitor the detection of 5 individually marked pumas. Photographic captures and GPS collar data for one male and one female puma were used to estimate the mean number of camera nights required to reach a detection probability of 95% for a single puma within the camera array for any number of cameras (1-25). These estimates were used to develop a technique to calculate puma density based on the number of cameras in the array, camera nights included in the survey, and puma photos captured. Population estimates were calculated from 71 days of camera data, including 1,220 camera nights. A mark-resight population estimate yielded a puma density of 2.1 (1.7-4.4) pumas/100km<sup>2</sup>. Our population estimate based on photo capture rate yielded 1.8 (1.4-2.2) pumas/100km<sup>2</sup> and fell within the 95% confidence interval of the mark-resight estimate. These results suggest that a remote camera array can be used to accurately estimate puma population density based only on unmarked pumas.

**David Seals<sup>1</sup> and Robert Carter<sup>1</sup>. A noninvasive method for monitoring American Black Bear activity on the Talladega National Forest in northeast Alabama. Jacksonville State University<sup>1</sup>**

The number of American black bear (*Ursus americanus*) sightings in northeast Alabama has increased during the last decade. Black bears are secretive and determining their population status can be difficult. Capturing and tagging bears is expensive and increases animal stress. Monitoring of individuals using non-invasive genetic sampling (NGS) of physical evidence such as hair is a more economical method which does not reduce animal health due to stress. The population status of black bears on the Shoal Creek Ranger District, Talladega National Forest will be estimated by collecting hair with hair snares baited with an attractant. With the hair samples, microsatellite genotyping will be used to analyze the genetic variation of black bears and determine the sex and number of individuals in the study area.

**Wichmann L. Wichmann<sup>1</sup>. Digitization and Mobilization of Natural History Collections: Challenges of and Approaches to a Multi-Disciplined Project. Univeristy of North Carolina Wilmington<sup>1</sup>**

Museums and herbaria house preserved plant and animal specimens that document the biodiversity of our planet and contain important information about the occurrence of species. Efforts to create and expand digital repositories for these natural history collections have been increasing rapidly in the past decade. With funding from the National Science Foundation (DBI: Biological Research Collections), the University of North Carolina Wilmington (UNCW) has undertaken a digitization and data mobilization project with the goal of making its historical collections data available via the internet. UNCW has collections of vertebrates, vascular plants, and marine macrophytes. The disparity among these collections is considerable and poses myriad challenges to digitization efforts. The technical knowledge and equipment needed to capture images and legacy data are collection-specific and, occasionally, taxon-specific. The levels of historical curation, maintenance, and record keeping also vary tremendously across the

collections. Our efforts therefore require substantial coordination among collections personnel. UNCW scientists and technicians have approached this project strategically by: (1) evaluating the status of each collection; (2) addressing any immediate maintenance requirements; (3) establishing and employing discipline-specific protocols for capturing accurate and complete specimen data; and (4) targeting specific parts of each collection to be georeferenced and imaged. UNCW has selected the Specify 6 collection management software that, when customized to meet our specific institutional needs, allows data from multiple disciplines to be contained within one searchable database designed for efficient data mobilization.

**Kathryn E. Becker<sup>1</sup>. EFFECTS OF FLORIDA FLATWOODS ECOSYSTEM RESTORATION AND MANAGEMENT ON CARBON STOCK. University of Central Florida<sup>1</sup>**

Ecosystem uptake and storage of carbon is crucial in mitigating the effect of the increasing addition of carbon to the atmosphere. The vegetation and top meter of soil across the Earth's terrestrial ecosystems serve as carbon reservoirs that hold almost three times the amount of carbon in the atmosphere, but changes in land use, such as deforestation for agriculture, are reducing them. Conserving and restoring natural landscapes, such as forested areas will help counteract this degradation. Ecological restoration of natural landscapes requires reference conditions and estimations of ecosystem services, such as carbon storage. Knowing the amount of carbon stored in an ecosystem can be used to assign reference carbon stock values for ecological restoration efforts, as well as an economic value of carbon offsets from ecological restoration. This study addresses this by quantifying the carbon stocks within the aboveground biomass, litter layer, and soil of five Florida ecosystems undergoing prescribed fire management. These carbon stocks were compared in ecosystems in different stages of restoration; Bahia grass pasture, pasture in restoration for longleaf pine flatwoods, and restored longleaf pine flatwoods, as well as several restored flatwoods communities; longleaf pine flatwoods, slash pine flatwoods, and scrubby flatwoods. Soil carbon properties were assessed using stable isotope analysis. The results of this study may be useful to land managers responsible for long-term ecological restoration and maintenance of similar native Florida ecosystems, as they often must account for multiple uses of the landscape for maintenance of ecosystem services such as carbon storage and biodiversity.

**Ann Huyler<sup>1</sup>, Arthur Chappelka<sup>1</sup>, Stephen Prior<sup>2</sup> and Greg Somers<sup>1</sup>. Potential drivers for soil carbon pools in residential areas in Auburn, Alabama. Auburn University<sup>1</sup> USDA-ARS National Soil Dynamics Laboratory<sup>2</sup>**

Metropolitan areas are expanding worldwide and residential zones are a major contributor. The turf ecosystems of residential yards can be highly productive and accumulate soil carbon undisturbed for decades. Because little is known about urban soil carbon (C) pools in the southeast, we performed this case study on the influence of time since lawn establishment on the soil C pools in residential yards in Auburn, Alabama. In our pure lawn dataset, yards were established between 1958 and 2008 (n=23) and soil C pools were positively related with lawn establishment in the 0-15cm ( $P < 0.05$ ,  $R^2 = 0.37$ ), but negatively related at the 15-30cm ( $P < 0.05$ ,  $R^2 = 0.14$ ) and 30-50cm depths ( $P = 0.08$ ,  $R^2 = 0.11$ ). When yards with trees were included (n=88) and lawn establishment spanned years 1900 and 2008, the soil C pool was positively related with yard age only at the 0-15cm depth ( $P < 0.05$ ,  $R^2 = 0.31$ ). These preliminary data are part of a larger study including yard maintenance, soil texture, nutrients, and tree biomass as potential drivers for the soil C pool in the residential areas of Auburn, Alabama.

**Dawn Lemke<sup>1</sup>, Philip Hulme<sup>2</sup>, Jennifer Brown<sup>3</sup>, James Miller<sup>4</sup> and John Coulston<sup>4</sup>. Ensemble modeling of tallowtree in forest of the Southern USA. Alabama A&M University<sup>1</sup> Lincoln University<sup>2</sup> Canterbury University<sup>3</sup> USDA/USFS SRS<sup>4</sup>**

Predicting the future distribution of non-native plants is pivotal to planning effective management, but is challenged by the fact that expanding populations are rarely at equilibrium within the environment. One tool that can be used to assess future distribution is potential probability mapping, this relies heavily on geospatial tools. These models can be integrated into forest management decision support systems and assist in the development of long term management plans, integrating the impact of potential climate change scenarios. Many geospatial techniques and tools are used for data preparation, model development and final mapping and display. This level of landscape modeling can only be realized through the integration of new geospatial tools with available and developing geospatial datasets supported by ecological knowledge. The model for tallowtree was influenced by three main variables: mean minimum temperature in January, elevation, and mean annual rainfall. Minimum temperature was the dominate variable, representing 42% of the model. The model for the current potential distribution of tallowtree indicated that further spread is possible along the east coast, from North Carolina to northern Florida, while the western limits in Texas appear to have been reached. Another zone of high potential invasion is the Black Prairies across central Alabama and western Mississippi.

**Matthew L. Reid<sup>1</sup> and Joydeep Bhattacharjee<sup>1</sup>. Effects of Levee on Flood-Induced Mortality of Trees and Saplings in a Bottomland Hardwood Restoration Area. University of Louisiana at Monroe<sup>1</sup>**

Currently, restoration of bottomland hardwood forests is a major goal of many state and federal agencies. These agencies have purchased vast amounts of land in their efforts to restore this unique wetland ecosystem. One such restoration area is the Mollicy Unit of Upper Ouachita National Wildlife Refuge. This area consists of former agricultural land that has been purchased by the US Fish and Wildlife Service and planted with traditional bottomland hardwood species. Much of the Mollicy Unit is surrounded by a containment levee, built to hold back the annual floodwaters of the Ouachita River. However, in 2009, two extreme flooding events breached the levee, leaving the area inundated for extended periods of time. We investigated the mortality of trees and saplings in the Mollicy Unit as a result of these prolonged flooding events. Because part of the replanted area lies outside the levee, we were able to compare the differences in mortality based on location inside or outside the levee. Tree mortality inside the levee was 45.12 percent, and mortality outside the levee was 33.81 percent. Sapling mortality inside the levee was 54.43 percent, and mortality outside the levee was 43.30 percent. We also measured individual plot elevation and distance from the river to determine their effect on mortality. Our results indicate that location inside or outside the levee had significant interactions with elevation and distance from the river on the mortality of both trees and saplings in the Mollicy Unit.

**Brian D. Kloeppel<sup>1</sup>, Robbie G. Kreza<sup>1</sup>, Marcus C. Mentzer<sup>1</sup>, Tucker J. Souther<sup>1</sup> and Ryan E. Emanuel<sup>2</sup>. Analysis of secondary forest succession using LIDAR analysis in the southern Appalachians. Western Carolina University<sup>1</sup> North Carolina State University<sup>2</sup>**

Secondary forest succession is a natural process as forested ecosystems develop after disturbance. The rate and extent of succession is difficult and expensive to quantify since southern Appalachian forested areas are large and challenging to assess due to complex topography and a varied land use history. Airplane-based LIDAR, Light Detection And Ranging, image data were used to determine tree height and forest structure and to predict forest successional stage. The goal of our project was to compare field-based

forest structure measurements with that of remotely sensed LIDAR data. Tree height, forest density, forest basal area, and species distribution were measured in the field and compared to the LIDAR prediction of tree height. In addition, leaf area index was measured indirectly using a leaf area meter (model LAI 2000). To test the effectiveness of the LIDAR tree height predictions, we utilized four montane mixed oak-hickory forested stands of approximately 30, 50, 70, and 90 years old at the Balsam Mountain Preserve in western North Carolina. The study site has a 90-year history of forest production before ownership changed the landscape to a mixed housing and preserve land use. We found that basal area peaked in the 90 year-old stand at 48.8 m<sup>2</sup> ha<sup>-1</sup> whereas forest density peaked in the 30 year-old stand at 2000 stems ha<sup>-1</sup>. Leaf area index ranged from 3.26 to 4.16 and was greatest in the 50 year-old stand. Dominant tree height was greatest in the 90 year-old stand and averaged 30.0 m with a decline to 21.6 m in the youngest stands.

**Colette Nammour<sup>1</sup>, Briana Skinner<sup>1</sup>, Dr. Elizabeth Dobbins<sup>1</sup> and Dr. Kristin Bakkegard<sup>1</sup>. The Impact of Local Bank Erosion on Water Quality Parameters in Shades Creek, Homewood, AL. Samford University Department of Biology<sup>1</sup>**

Urbanization has detrimental impacts on stream ecosystems, including increased erosion, fragmentation of habitats, and alteration of hydrology. A portion of Shades Creek in Homewood, AL demonstrates the negative effects of development, particularly erosion on the south bank. To determining the impact of local bank erosion on water quality, we measured pH, water temperature, conductivity, and dissolved oxygen in four different creek regions: two in the erosion area and a downstream and upstream control. Within each site, we collected data at a characteristic riffle, run, and pool in both dry and wet conditions. We assessed variance between each section, as well as between riffles, runs, and pools within sections. We predicted that sites near the eroding bank would have diminished water quality. As predicted, proximity to bank erosion was indicative of degraded water quality. The lowest dissolved oxygen in percent saturation ( $\bar{x} = 84.30 \pm 6.530$ ) and concentration ( $\bar{x} = 7.91 \pm .499$ ) and the highest conductivity levels ( $\bar{x} = 295.54 \pm 33.088$ ) were found at the site to the eroding bank. Optimum water quality was found at the upstream site, where dissolved oxygen concentration ( $\bar{x} = 8.31 \pm .487$  and percent saturation ( $\bar{x} = 88.20 \pm 4.262$ )), and pH ( $\bar{x} = 7.95 \pm 0.104$ ) had the highest mean values. In addition to proximity to erosion, local streambed features and rain events had significant impacts on local water quality ( $p < 0.001$ ). We will use historical data to examine the long-term effects of erosion on water quality in Shades Creek.

**Danielle N. Vidd<sup>1</sup>. The effects of aqueous copper and zinc on the reproduction and survivability of *Daphnia magna*. Piedmont College<sup>1</sup>**

The effects of aqueous copper and zinc on the reproduction and survivability of *Daphnia magna*. Danielle N. Vidd and Dr. Deb Dooley Department of Biology Piedmont College Demorest, GA 30535 Heavy metal toxicity in aquatic environments is of significant concern (Foulkes, 1990, Nriagu, 2003). Copper and zinc are required for most organisms in small amounts to maintain proper function; however, in larger amounts it can have a negative impact on an organism (Golub, 2006). *Daphnia magna* are sensitive enough to heavy metals that they are often used as indicator species for environmental toxicity evaluations. *Daphnia magna* are water fleas which reproduce parthenogenetically, producing offspring in which clutch sizes vary from 2 to 40 individuals (Pennak, 1978). It has previously been discovered that zinc and copper stress on *Daphnia magna* has significantly reduced growth and longevity, although reproduction was not as sensitive (Winner, 2003). To test the reproductive effects of zinc and copper on *Daphnia magna*, three replicates of 10 adult *Daphnia magna* were placed in a 200 mL beaker with solutions of varying metal concentrations. The *Daphnia* were fed dried algae as needed and the experiment ran for four consecutive days. The parents were then removed, and the beaker was observed for seven days for new offspring. When the aqueous copper

concentration was approximately 1.3 mg/l and the aqueous zinc concentration was 5 mg/l, mortality was 100 percent. At lower concentrations for zinc and copper a significant impact was observed. In conclusion, it was found that copper and zinc levels at concentrations near and slightly below the maximum contaminant level, had a significant impact on *Daphnia magna* survivability and reproduction.

**Jacob Roberson<sup>1</sup> and Danielle Satre<sup>1</sup>. A survey of ethinyl estradiol contamination in water systems surrounding Reinhardt University. Reinhardt University<sup>1</sup>**

There is growing concern regarding the use of hormonally active compounds and their effect on the environment. Many of these chemicals, often referred to as endocrine disrupting chemicals, have been shown to have adverse effects on wildlife, most notably on the reproductive system of organisms dependent on aquatic environments. Furthermore, some investigators suggest that these chemicals may be affecting human health, reproduction and development as well. Ethinyl estradiol (EE2) is a synthetic, hormonally active compound and is the chief component of many contraceptive pills. Once ingested, EE2 is not completely absorbed into the body, nor is it fully metabolized. Therefore, when waste is excreted, EE2 and its metabolites could potentially enter our water system. Reinhardt University currently has more female students than male students, many of which use oral contraceptives. This, combined with the fact that water treatment does not completely remove this chemical, suggests there is a potential for water systems around the Reinhardt campus to contain EE2. It was hypothesized that EE2 would be found at environmentally relevant concentrations in waterways surrounding the Reinhardt campus. Water samples were taken from three different locations in Cherokee County, Georgia over an eight week period and will be analyzed for the presence of EE2. Water samples were obtained using the grab sample technique and EE2 concentrations will be determined using ELISA.

**Jon L. Boatwright<sup>1</sup>, Virginia K. Carroll<sup>1</sup>, Kristin A. Bakkegard<sup>1</sup> and Elizabeth G. Dobbins<sup>1</sup>. Effect of local bank erosion on macroinvertebrate assemblages in Shades Creek in Homewood, AL, USA. Samford University<sup>1</sup>**

Streambank erosion increases sedimentation and negatively affects organism populations. This study was undertaken to evaluate the impact of localized severe bank erosion on macroinvertebrate assemblages in Shades Creek in Homewood, Alabama, USA. We hypothesized that the control site, located upstream from the severe erosion site, would have greater taxa richness and a healthier community balance than the erosion site. Macroinvertebrates were collected following the Environmental Protection Agency (EPA) Rapid Bioassessment Protocol. Macroinvertebrates were subsampled to 100 individuals per habitat and identified to the family level. The control and erosion zones were equal in taxa richness. According to the Ephemeroptera, Plecoptera, and Trichoptera to Chironomidae ratio, the community balance of the control zone (0.55) was less balanced than the erosion zone (0.62). However, the control zone had a good water quality rating, and the erosion zone had a good-fair water quality rating. The Pinkham and Pearson's Similarity Index (SI) value for the two sites was 0.38, indicating decreased similarity between the two areas. A possible explanation of this difference is that Pinkham and Pearson's SI gives more weight to more dominant taxa, and approximately 50% of the collected populations were composed of three dominant taxa. These data suggest fairly healthy stream assemblages, water quality, and similarity among the control and erosion zones, but suggest low diversity. Similarity between the erosion and control zones indicates that the stream is impacted upstream from the local erosion site. These data will be evaluated in a historical context of past research in Shades Creek.

**Amanda M. Sheehy<sup>1</sup> and Terry D. Richardson<sup>1</sup>. Abundance and Size Frequency Distributions of *Leptoxis praerosa* in Different Microhabitats. University of North Alabama<sup>1</sup>**

The abundance and size frequency distribution of *Leptoxis praerosa* in three different microhabitats in a section of Cypress Creek in Florence, Alabama were examined in order to determine whether snail abundance and size is related to microhabitat. Snails in both bedrock and cobble/gravel microhabitats were sampled using a standard surber sampler. Snails in boulder microhabitats were sampled by carefully removing each snail from the sampled boulders and then determining the area of each boulder. The abundance of *L. praerosa* in each sample was defined as snails per square meter. Snails from each sample were counted and shell width measured using vernier calipers in order to evaluate size frequency for each microhabitat. There is a considerable difference in *L. praerosa* abundance among the three microhabitats studied. This species was most abundant in cobble/gravel, intermediate in abundance on individual boulders, and least abundant on bedrock (P-value = 0.00618). The size frequency data do not suggest that size is strongly related to microhabitat. There did appear, however, to be a greater proportion of large snails on the bedrock. Differences in abundance of this species among bedrock, cobble/gravel, and boulder might be related to the differences in refugia presented by each of these microhabitats. For example, snails on bedrock and boulder would be more vulnerable to scouring or predation than snails that are interspersed throughout the interstices of cobble/gravel; this could result in *L. praerosa* being much more abundant in this microhabitat.

**Melissa C. Nowell<sup>1</sup> and Nicole M. Hughes<sup>1</sup>. Photosynthetic costs and benefits of light attenuation by anthocyanins in red-leaved evergreen species during winter. High Point University<sup>1</sup>**

Leaves of many evergreen species turn red when exposed to high sunlight during winter due to production of anthocyanin pigments. Anthocyanins are thought to function in light attenuation, reducing high light stress during cold, bright conditions. It has been argued, however, that anthocyanins may also limit photosynthetic carbon gain due to their attenuation of visible light. This effect would be most significant under sunlight intensities below the light saturation point (i.e. < 500  $\mu\text{mol m}^{-2} \text{s}^{-1}$  for most C3 species). Indeed, as we demonstrate here, anthocyanins do significantly decrease quantum yield under low ambient photosynthetic photon flux densities (PPFDs). However, sunlight and temperature regimes characteristic of winter in temperate, deciduous forests indicate that such periods of low irradiance are not only relatively rare (limited to dawn and dusk), but also usually accompanied by temperatures too cold for photosynthesis to occur. Instead, the vast majority of carbon gain occurs during warmer hours of the day, when stomatal opening is maximized, during which times sunlight intensities tend to be well above saturating PPFDs, even under diffuse cloud cover. When photosynthetic carbon gain of red-leaved plants is modeled against daily sunlight and temperature regimes characteristic of both cloudy and sunny winter days, the percent of carbon gain that occurs during sub-saturating irradiances is generally insignificant, comprising <0.5% daily carbon gain. We suggest that the photosynthetic cost of a light-attenuating, anthocyanic layer under low PPFDs is not only negligible during winter, but likely far outweighed by the benefit afforded by photoprotection during this particular season.

**Sarah G. Sapp<sup>1</sup> and Catherine H. Borer<sup>1</sup>. Phenology of foliar calcium accretion and sequestration in *Cornus florida* L. Berry College, Department of Biology<sup>1</sup>**

Flowering dogwood (*Cornus florida* L.) is hypothesized to be an important species in calcium cycling and forest health because of its high concentrations of foliar calcium coupled with rapid leaf litter decomposition. Investigating the phenology, or seasonal

variation pattern, of foliar calcium in *C. florida* would provide valuable insights into this role, and about the dynamics of calcium cycling in forests. Calcium is an essential macronutrient in plants that is pivotal to many physiological processes--most prominently cell membrane support, cell wall support, and signal transduction. Calcium can be evaluated in physiologically-relevant "pools" in foliage: a labile, readily available pool extractable by distilled water; a labile but slightly less accessible pool thought to be associated with pectate in cell walls and extractable by acetic acid; and a crystallized, chemically-sequestered pool extractable by hydrochloric acid. In this study, we are investigating the phenology of these physiologically-relevant pools of calcium in *C. florida* foliage using sequential extractions. Fresh foliage samples were collected from forested plots on the Berry College campus, in northwest Georgia, at 2 to 3 week intervals for an entire growing season. Immediately after collection, samples were washed and flash frozen, then freeze-dried and ground to a fine powder. After each extraction, calcium was assessed colorimetrically. Preliminary data suggest that labile calcium (extractable by water and acetic acid) remains at a fairly constant level throughout the growing season. This is consistent with previous work that demonstrated preferential Ca partitioning into these physiologically active pools under Ca limited conditions.

**Keaton E. Hughes<sup>1</sup>. Determining the shade-tolerance of *Castanea dentata*, *Castanea mollissima*, and their hybrids. University of Tennessee at Chattanooga<sup>1</sup>**

An effort is underway to restore *Castanea dentata*, which has been devastated by chestnut blight, into its historical range. This process involves a breeding program in which hybrid chestnuts are backcrossed to *C. dentata* to produce plants that maintain its morphology while inheriting the blight-resistance of *Castanea mollissima*. However, *C. mollissima* differs in some potentially important ways from its American congener. Specifically, *C. mollissima* has a short stature and broad crown and is associated with open, sunny locations. In contrast, *C. dentata*, can grow very tall and can contend with a shady understory while slowly growing into the forest canopy. These differences suggest that *C. dentata* and *C. mollissima* may differ in their shade-tolerance, which could influence restoration success. Large photosynthetic response to increasing light levels indicate shade-intolerant species, while shade-tolerant species are characterized typically by requiring low light levels to offset respiratory carbon losses (LCP). We determined the shade-tolerance of greenhouse-grown *C. dentata*, *C. mollissima*, and B3F3 hybrids. The maximum values of light-saturated photosynthesis (*A*<sub>max</sub>) and LCP were greater in sun than shade across chestnut types. Additionally, *C. dentata* experienced about 40% greater *A*<sub>max</sub> than either *C. mollissima* or the B3F3 hybrids. The LCP of *C. dentata* also was greater than that of *C. mollissima*, but statistically no different than that of the hybrids. These results suggest that hybrid chestnuts may inherit photosynthetic light response attributes from their Chinese ancestor; however, *C. mollissima* could be more shade-tolerant than suggested by its typical environment.

**Amber N. Mooney<sup>1</sup> and Catherine H. Borer<sup>1</sup>. The influence of leaf litter composition on total body calcium of earthworms (*Lumbricus terrestris* L.). Berry College<sup>1</sup>**

Calcium (Ca) is an essential macronutrient for all organisms, and is necessary for proper functioning of forested ecosystems. Flowering dogwoods, (*Cornus florida* L.) are thought to enhance Ca cycling because of their comparatively high concentrations of foliar Ca and rapid leaf litter decomposition. Because earthworms ingest leaf litter and other available organic matter in soils, we hypothesized that their body composition would contain greater Ca when dogwood foliage is present in the leaf litter than when dogwood foliage is absent. In this preliminary study we assessed total Ca content of earthworms (*Lumbricus terrestris* L.) collected from sites with low Ca soils on Berry College campus, in northwest GA. We raised these earthworms for six weeks in a controlled environment with 0, 33, 66, and 100 percent dogwood foliage by weight. The remaining substrate was mixed leaf litter from

local hardwoods. After the experimental period, earthworms were transferred to empty containers for two days to void their digestive systems. Worms were then washed, flash frozen, oven-dried, and ground to a fine powder. Ca was extracted from worm powder using hydrochloric acid, followed by a colorimetric analysis for Ca. We found greater Ca in the bodies of worms from the two treatments with the greater proportions of dogwood foliage, in comparison with the two treatments with less dogwood foliage. This preliminary study highlights one role of flowering dogwood in Ca cycling in forests, with important implications about nutrition for predators of worms in areas negatively affected by the fungal disease dogwood anthracnose.

**Catherine O. Stone<sup>1</sup>, Angelia R. Campbell<sup>1</sup>, Nadia M. Shamsedin<sup>1</sup> and A J. Pollard<sup>1</sup>.  
Hyperaccumulation of manganese in *Phytolacca americana* from manganiferous soils in South Carolina. Furman University<sup>1</sup>**

Although metallic elements are often essential micronutrients, most induce toxicity at high concentrations. Nevertheless, some plant species may be unusually metal-tolerant and even accumulate metals in their leaves. Hyperaccumulation of manganese (Mn) is rare, known in about ten species worldwide. *Phytolacca americana* L. (pokeweed) has been reported to hyperaccumulate Mn on mine tailings in China, and laboratory studies have shown that North American plants also possess the physiology to hyperaccumulate. However, there have been no studies of *P. americana* growing on high-Mn soils in its native range in the southeastern United States. Our research investigated *P. americana* on outcrops of manganiferous schist and clay in Cherokee County, South Carolina. We collected 36 leaf samples and 23 soil samples for analysis using flame atomic absorption spectrophotometry. Many plants showed elevated foliar Mn levels, but most fell slightly below the 10,000 ppm (1% dry-weight) criterion, conventionally regarded as defining Mn hyperaccumulation. However, one plant contained 10,089 ppm Mn, supporting previous conclusions that *P. americana* is a Mn hyperaccumulator. We believe this is the first report of hyperaccumulation of any metal by any plant in eastern North America. Further research is needed to understand the variation among samples, as genetics, soil properties, and seasonality may all contribute. This knowledge may assist development of phytoremediation as a technology for cleaning polluted soils.

**Casey Moore<sup>1</sup>, Alex Gilman, PhD<sup>1</sup> and Rita M. Fincher<sup>1</sup>. Photosynthetic performance of 8 native Costa Rican tree species in a reforestation experiment. Samford University<sup>1</sup>**

We performed an experiment to study the effects of varying light environments on seedling growth of eight native Costa Rican wet forest tree species. In a large-scale reforestation experiment, individuals of each species were planted in abandoned pasture to grow in full sun conditions and other individuals of each species were planted under the canopy of nearby secondary forest to grow in low light conditions. We used a LI-COR photosynthetic gas analyzer to compare plant performance under these two light conditions by measuring maximal rates of photosynthetic assimilation, light compensation points, and dark respiration rates. Some species thrived in the full sun environment and performed poorly in the shade environment, some species performed well in the shade but were not able to increase their performance in full sun, and others performed moderately in both environments. In addition to providing the first basic physiological measurements for many of these native tree species, this experiment is intended to facilitate species selection for reforestation projects.

## Entomology

## POSTER SESSION

Thursday, April 14 8:30AM - 6:00PM

**Rufina N. Ward<sup>1</sup>, Ernst Cebert<sup>1</sup>, Eric Obeng<sup>1</sup> and Kenneth E. Ward<sup>1</sup>. Distribution of Major Pest and Beneficial Insects on Bioenergy Crops Under Evaluation in North Alabama. Department of Natural Resources and Environmental Sciences, Alabama A&M University<sup>1</sup>**

Several crops are being evaluated for their potential as feedstock for biofuel production at Alabama A&M University's Winfred Thomas Agricultural Research Station located in Hazel Green, AL. These include canola (*Brassica napus*), sweet sorghum (*Sorghum bicolor*), jatropha (*Jatropha curcas*), castor bean (*Ricinus communis*), sweet potato (*Ipomoea batatas*) and pearl millet (*Pennisetum glaucum*). Several pest and beneficial insect species have been observed to forage on these crops. This paper reports on the temporal distribution of pest and beneficial insects on bioenergy crops under study.

**Brian D. West<sup>1</sup> and Mark S. Davis<sup>1</sup>. A PRELIMINARY INVESTIGATION ON THE INFLUENCE OF GALLS ON REPRODUCTIVE EFFORT IN GOLDENRODS. North Georgia College & State University<sup>1</sup>**

A PRELIMINARY INVESTIGATION ON THE INFLUENCE OF GALLS ON REPRODUCTIVE EFFORT IN GOLDENRODS, Brian D. West and Mark S. Davis, North Georgia College & State University, Dahlonega, GA 30597. Goldenrod galls are conspicuous outgrowths that form in response to insects ovipuncturing plant shoots. Larvae hatch from eggs and release chemicals that induce the shoot to produce a gall; gall tissue serves as food and protection for the developing larvae. We examined the effect of galls on the reproductive output of a native goldenrod, *Solidago altissima*. Local populations (Lumpkin County, GA) are attacked primarily by goldenrod rosette gall flies, *Rhopalomyia solidaginis* (DIPTERA: Cecidomyiidae) and goldenrod ball gall flies, *Eurosta solidaginis* (DIPTERA: Tephritidae). These species produce galls that are distinct in appearance. Total inflorescence lengths of galled and ungalled stems were measured in random samples of three goldenrod populations. Total inflorescence length is a simple indicator of seed production because a positive correlation between inflorescence length and seed production has been demonstrated in goldenrods and other plant species. Data were analyzed using a one-way ANOVA followed by a Tukey-Kramer post-hoc test. Galls significantly reduced reproductive output ( $F_{2,74} = 51.06$ ,  $P < 0.0001$ ) and rosette gall flies had more impact on reproduction than ball gall flies. All ungalled stems produced flowers, whereas the percentage of stems with flowers was lower in stems with ball galls (74%) and rosette galls (22%). Our results are consistent with the negative impact hypothesis which states that herbivory can lead to lowered reproductive success in plants.

**Vanessa R. Carey<sup>1</sup>. Biogeographical Survey of Arachnid Species in Subterranean Environments. Shorter University<sup>1</sup>**

Biogeographical Survey of Arachnid Species in Subterranean Environments Vanessa Carey and Joshua W. Campbell Obligate cave dwelling fauna are important because of their potential use for biogeographic analysis. Hypogean habitats provide geographic isolation, which promotes speciation and endemism. Throughout 2010 we surveyed 18 caves in Alabama and Georgia for arachnid diversity. Aspirators were used to collect nearly twenty different species of arachnid many known only to one cave or a single county.

**Brian D. Holt<sup>1</sup>. A Preliminary Checklist of the Cerambycidae of Alabama. Natural Heritage Section, ALDCNR<sup>1</sup>**

A faunal study of the Long-horned Beetles (Coleoptera: Cerambycidae) is currently being conducted for the state of Alabama. Field surveys began in 2007 and will continue through 2012. Additional specimens were examined and annotated from Auburn University, Alabama Natural History Museum, and a private collection and are included in the checklist. To date, 226 taxa have been recorded representing 119 genera and 46 tribes from 8 subfamilies. Fifty-one taxa are reported from the state for the first time. Continuation of field collections and additional inquiries into museum holdings and private collections are planned for a more comprehensive treatment.

**Peter A. Van Zandt<sup>1</sup>, Anna Bianchi<sup>1</sup>, John-Paul Tortorich<sup>1</sup>, Grace Balinda<sup>1</sup> and Grant Gentry<sup>2</sup>. Preliminary survey of the moths of the Cahaba River National Wildlife Refuge, Bibb Co., Alabama. Birmingham-Southern College<sup>1</sup> Samford University<sup>2</sup>**

The Cahaba River National Wildlife Refuge (CRNWR) is a 14.4km<sup>2</sup> refuge located at the boundary between the Southern Ridge and Valley and East Gulf Coastal Plain physiographic regions. Although the region has historically experienced substantial disturbance through logging and mining activities, its location and diversity of habitats have made it a biodiversity hotspot for terrestrial plants as well as other terrestrial and aquatic taxa – especially fishes, mussels, and snails. However, little is known of the insect diversity of the refuge. Therefore, we undertook this preliminary survey to determine whether moth diversity showed a similar pattern of high diversity and rare species. We collected moths on 12 sampling trips from early spring through mid-summer. We selectively sampled specimens attracted to a sheet illuminated by a 175-Watt mercury vapor light powered by a portable generator. We typically collected from 8:00PM to midnight from two locations: one within the refuge and one adjacent to the refuge property. We estimated the total number of moth species from this area by generating a species:area curve and fitting the asymptotic species accumulation with EstimateS. To date, a total of 642 specimens, representing 192 species from 22 families have been identified. No new species have been determined, and very few are listed as rare or uncommon. Based on these surveys, we estimate that approximately 302 species should be expected to occur within or adjacent to the CRNWR. These results are only a tentative estimate, as our sampling was limited to 12 nights and underrepresented micro-moths.

**Evolutionary Biology**

**POSTER SESSION**

**Thursday, April 14 8:30AM - 6:00PM**

**Raley C. White<sup>1</sup> and Carlos D. Camp<sup>1</sup>. TESTING THE EFFECTS OF GLACIATION ON ALLELIC RICHNESS IN LUNGLESS SALAMANDERS (FAMILY PLETHODONTIDAE). Piedmont College<sup>1</sup>**

Biological diversity including genetic diversity is distributed across the planet in a nonrandom, organized manner. Low genetic diversity in a population may be indicative of past events such as bottlenecks or recent colonization. Areas of glacial refugia during the Pleistocene have been shown to be sources of allelic richness. Regions of past glaciation, on the other hand, would be expected to contain populations with low genetic diversity because of relatively recent colonization. Among lungless salamanders (family Plethodontidae), past glaciations have been hypothesized as the explanation for the lack of genetic divergence among populations of several species complexes. We directly tested the hypothesis that populations of lungless salamanders residing in formerly glaciated regions have significantly lower genetic diversity. We did this by comparing the number of alleles (as determined by allozymes) present in populations occupying formerly

glaciated zones with those of populations occupying areas that have never experienced glaciations. We chose five different species complexes whose geographic ranges cover both formerly glaciated and unglaciated areas. Surprisingly, we found no evidence that populations occupying previously glaciated areas have significantly reduced allelic richness. Allelic richness in plethodontids is positively correlated with climatic variables (e.g., rainfall). Local genetic events such as bottlenecks in drought-prone areas may have had a more profound proximate effect on allelic richness and thus may have erased evidence of post-glacial colonization.

**Stephanie A. Pearl<sup>1</sup>. Using *Carthamus tinctorius* L. (safflower) as a model for genome and trait evolution in the Asteraceae. University of Georgia<sup>1</sup>**

Domestication can be viewed as a special case of adaptation, given that crops are adapted for cultivation in human settlements in much the same way that natural plant populations are adapted to the selective pressures imposed upon them by the environments in which they live. Therefore, studying the genetic architecture of the domestication phenotypes of a crop can provide insight into the genetics of adaptation. Domestication also provides evolutionary biologists with an opportunity to study parallel evolution, given that the traits comprising the "domestication syndrome" (e.g., loss of dormancy, reduced shattering, increased fruit size) have arisen independently in a variety of crops. Here, I present preliminary data on my study of the genetic architecture of the phenotypic changes that occurred during the domestication of *Carthamus tinctorius* L. (safflower). Safflower is a drought tolerant crop that is cultivated throughout the world for its flowers and high quality seed oil. It shares a most recent common ancestor with *Helianthus annuus* L. (sunflower) dating back to approximately 40 MYA. These two members of the Asteraceae were independently domesticated for similar purposes and can thus serve as parallel systems for studying the evolution of domestication-related traits.

**Krystal T. Piotrowski<sup>1</sup>, Hank Oppenheimer<sup>2</sup> and J. C. Havran<sup>1</sup>. Floral Morphometric Analysis of *Viola tracheliifolia*. Campbell University, Department of Biology<sup>1</sup> Plant Extinction Prevention Program, University of Hawaii, Department of Botany, Pacific Cooperative Studies Unit<sup>2</sup>**

*Viola tracheliifolia* Ging. (Violaceae) is a violet species endemic to the islands of Kauai, Oahu and the island system Maui Nui. Results from previous surveys indicate that *V. tracheliifolia* populations on different islands may be morphologically dissimilar. The goal of this research was to quantify floral morphological differences between populations of *V. tracheliifolia* on different Hawaiian Islands. Flowers were collected in the fall and summer of 2010 from Kauai (n = 4), Oahu (n = 4), and Maui (n = 5). Specimens were dissected, mounted, scanned, and measured using ImageJ software (National Institute of Health). All floral organs of the specimens from Kauai and Oahu were shorter than those of the Maui specimens. The average lengths for the lateral and posterior petals along with the measurement for the anterior petal were subject to canonical variates and cluster analyses. Canonical variates and the cluster analyses indicated that *V. tracheliifolia* populations of Kauai and Oahu are more similar to each other than to the violet populations of Maui. Average posterior and average lateral petal lengths were significant contributing factors ( $p < 0.05$ ) to the separation of interisland populations according to the canonical variates analysis. Morphological differences between island populations of *V. tracheliifolia* could be explained by population bottleneck following dispersal to Kauai and Oahu. These results mirror previous genetic studies that indicate *V. tracheliifolia* populations on Kauai and Oahu are closely related. Further analysis on other violet populations on all of the islands is required.

## Floristics

## POSTER SESSION

Thursday, April 14 8:30 AM - 6:00 PM

**Curtis J. Hansen<sup>1</sup>, Leslie R. Goertzen<sup>1</sup> and Dale Pancake<sup>1</sup>. A preliminary checklist of the vascular flora of the Auburn University Solon Dixon Forestry Education Center in south Alabama. Auburn University<sup>1</sup>**

The vascular flora of the Solon Dixon Forestry Education Center (SDFEC) is currently being explored and documented. As part of Auburn University's School of Forestry and Wildlife Sciences, the SDFEC is used for teaching, research and extension programs designed to train students and professionals in forestry research and management techniques. The SDFEC straddles Covington and Escambia Counties in south-central Alabama and is bordered by the Conecuh River to the north and private holdings to the east and west. This 21.45 km<sup>2</sup> (5300 acre) study area, located within the Conecuh National Forest, is part of the Lower Coastal Plain physiographic province, a floristically diverse region in the southeastern US. Relative to its size, the SDFEC has strikingly diverse natural resources and habitat types leading to high plant diversity. Habitats range from dry, sandy longleaf pine/turkey oak ridges and relatively undisturbed mature hardwood-dominated mesic slopes to seasonally wet bald cypress/tupelo gum swamps, pitcher plant bogs, riverine habitats, open ponds, pastures, cultivated fields and a disturbed highway corridor. The SDFEC property contains diverse geology including limestone outcrops and sink-holes forming Karst topography, dry iron-encrusted sandstone ridges, natural spring-fed ponds and streams, and rich, loamy slopes. As of January, 2011, approximately 1100 specimens have been collected, of which, 679 species in 136 families have been positively identified. The number of species thus far collected represents over 18% of the total number of known plant species for the entire state of Alabama. Collections and field surveys will continue through the fall of 2011.

**Michael W. Morris<sup>1</sup>. New reports of *Stenanthium leimanthoides* (A. Gray) Zomlefer & Judd and *Nestronia umbellula* Rafinesque in Alabama. Troy University<sup>1</sup>**

Populations of *Stenanthium leimanthoides* (A. Gray) Zomlefer & Judd and *Nestronia umbellula* Rafinesque were discovered in Barbour County while conducting field work in the coastal plain of southeastern Alabama in 2008 and 2010. Barbour County is approximately 95 km southeast of Montgomery, and collection sites here are included in the Southern Red Hills physiographic region and the Choctawhatchee -- Pea River watershed. Both *S. leimanthoides* and *N. umbellula* are considered rare in Alabama. The rankings of S1 and S2 have been assigned to these species, respectively, by the Alabama Natural Heritage Program in Auburn. The habitat for the newly discovered population of *S. leimanthoides* is a seepage slope along a powerline in a highway right-of-way cut through a creek swamp with *Magnolia virginiana*, *Liriodendron tulipifera*, *Nyssa sylvatica* var. *Biflora*, and *Persea palustris*. The *N. umbellula* population was found in the ecotone between the bay swamp and sandy uplands also harboring *Quercus hemisphaerica*, *Q. nigra*, *Vaccinium darrowii*, *Carphephorus odoratissimus*, and *Verbesina aristata*. Additional data on these two rare taxa in Alabama were obtained by consulting the curators of the following herbaria: University of Alabama (UNA), Auburn University (AUA), Jacksonville State University (JSU), University of South Alabama (USA), Anniston Museum of Natural History, and Troy University (TROY). Updated information on the distribution and habitats of *S. leimanthoides* and *N. umbellula* in Alabama will be presented and will include a comparison with habitats in neighboring states.

**Matney N. Casey<sup>1</sup>, Brenda L. Wichmann<sup>1</sup> and Joanna L. Hosch<sup>1</sup>. Evaluation and Digitization of the University of North Carolina Wilmington Herbarium (WNC): Plants Endemic to the Carolina Coastal Plain. UNC Wilmington<sup>1</sup>**

The Atlantic and Gulf Coastal Plain Floristic Province, specifically the Carolina Coastal Plain, represents an important area of speciation and endemism. Centrally located within this area, the University of North Carolina Wilmington Herbarium (WNC) is interested in evaluating its vascular plant collection to determine how well endemic taxa are represented. As part of an ongoing project funded by the National Science Foundation (DBI: Biological Research Collections), we are digitizing our collections giving particular attention to endemic taxa. Using recent literature, we were able to evaluate the endemic diversity of the collection and prioritize specimens for metadata entry, georeferencing, and imaging. Results show considerable gaps in WNC's representation of endemic taxa from the Carolina Coastal Plain. A preliminary analysis indicates that the collection is lacking approximately 40% of the known endemics from this area. To be recognized as a valuable resource for scientific research related to the Carolina Coastal Plain, it is imperative that the collection is expanded to include 100% of endemic taxa from this region. Additional specimens of taxa currently present in the collection are also needed to provide a better representation of the diversity within and among populations. We have broadened our analysis to include the endemic taxa of the entire Atlantic and Gulf Coastal Plain Floristic Province and hope to improve our collection through exchanges with other herbaria and field work. Digitization efforts are ongoing with the ultimate goal of providing an online database of all specimens in the collection and creating a virtual herbarium of taxa endemic to the Carolina Coastal Plain.

**Alexander Krings<sup>1</sup>, Amanda Saville<sup>1</sup> and Tracy Kahn<sup>2</sup>. Hosts and potential hosts of Citrus pests and disease in the United States: A new online diagnostic resource. North Carolina State University<sup>1</sup> University of California, Riverside<sup>2</sup>**

Early pest detection and management are of paramount importance to ensuring continued viability of US Citrus. Rapid communication of new pests and their hosts or significant outbreaks depend on proper taxonomic identification of both pest and host. The objective of this work is to provide a comprehensive user-friendly identification tool to support the identification of host material during Citrus pest and disease survey. As our diagnostic tool is intended primarily to aid those working in Citrus orchards, variety collections, or home gardens, its focus is limited exclusively to taxa of Rutaceae most likely to be encountered in cultivated settings. Cultivars of Citrus and relatives are released in the US through state agencies and to a lesser extent the USDA-ARS. Thus our target list of entities was synthesized from the cultivar lists provided by the various state citrus clonal protection or budwood registration programs and USDA-ARS. The resulting target list includes over 500 entities of Citrus and relatives cultivated in the US. The diagnostic resource includes an illustrated Lucid polyclave, illustrated fact sheets, and an overview of Citrus morphology. Fact sheets provide information on the origin of the culta or taxa when known, synonyms, descriptions, and images of living plants in Florida and California. Hyperlinks are provided to important external resources, such as GRIN, GenBank, and the UCR Citrus Variety Collection. Because Citrus nomenclature is complex and the same cultivar may be known by different names in different regions, we also provide a searchable database based on synthesis of pertinent literature.

**Michael W. Morris<sup>1</sup>. The Genus *Platanthera* L. C. Richard in Mississippi. Troy University<sup>1</sup>**

*Platanthera* L. C. Richard is a genus in the Orchidaceae, subfamily Orchidoideae, tribe Orchideae, subtribe Orchidiinae. There are approximately 200 species distributed across the Northern Hemisphere in boreal and temperate regions. Of these taxa, 10 *Platanthera* species have been documented from Mississippi and are as follows: *P. blephariglottis*, *P. ciliaris*, *P. clavellata*, *P. cristata*, *P. flava*, *P. integra*, *P. integrilabia*, *P. lacera*, *P. nivea*, and *P. peramoena*. These taxa inhabit a variety of wetland habitats, and some of them are indicators of unusual plant community types. Several of the species listed are of

conservation concern. During July, 2009 and July, 2010, when plants were at anthesis, 14 trips were made to locate extant populations of *Platanthera* species, record habitat data, and visit the major herbaria in Mississippi. *Platanthera* specimens in the following herbaria were examined: University of Mississippi (MISS), Mississippi State University (MISSA), University of Southern Mississippi (USMS), Delta State University (DSC), Institute for Botanical Exploration (IBE), Mississippi Museum of Natural Science (MMNS), The Crosby Arboretum, and my personal collections. An artificial key and updated information on the distribution and habitats of the native Mississippi species will be presented. This research was partially supported by a Troy University Faculty Development Summer Research Grant.

**Wayne Barger<sup>1</sup> and Brian Holt<sup>1</sup>. An Overview of the Vascular Floras Conducted on Alabama's Forever Wild Tracts. Natural Heritage Section, ALDCNR<sup>1</sup>**

Alabama's Forever Wild program has secured more than 222,000 acres of ecologically sensitive habitat since the first acquisition in the Fall of 1994. Recently, more aggressive inventory efforts have been initiated to fully develop plant lists for the Forever Wild Tracts. Presented in this poster is an overview of the findings for six vascular floras on Forever Wild land tracts.

**Jessica C. Luker<sup>1</sup> and Brenda L. Wichmann<sup>1</sup>. Seaweed Biodiversity in the Gulf of Mexico: Collections of the University of North Carolina Wilmington Herbarium (WNC). UNC Wilmington<sup>1</sup>**

With funding from the National Science Foundation (DBI: Biological Research Collections), the University of North Carolina Wilmington (UNCW) is actively working to digitize its natural history collections. Within the herbarium, UNCW has an extensive marine macrophyte collection due to the long-term research and exchange efforts of Dr. D.F.Kapraun. Because of increased interest in biodiversity of the Gulf of Mexico, we focused our digitization efforts within the algae collection on specimens from this region. We searched the entire collection and pulled appropriate specimens from these waters for metadata entry, georeferencing, and imaging. We standardized taxonomy and compared the diversity in our collection to a recently published Gulf of Mexico checklist. The UNCW Herbarium (WNC) has an impressive collection of seaweeds from this region, spanning all three major algal groups (Chlorophytes, Rhodophytes, and Phaeophytes). In total, WNC has over 800 specimens representing 60% of the families and 21% of the species recorded from these waters. This is especially striking considering the majority of collection sites are confined to the shallow waters of the northern shore of the Gulf of Mexico. Our imaging efforts are ongoing, \*with the ultimate goal to create an online database and virtual herbarium with images of both slide-mounted and paper-mounted specimens. This resource will enhance the overall understanding of marine life from this region, serve to educate students, and benefit the phycological community. We also hope to expand our collection and improve represented algal diversity by establishing exchange programs with current researchers working in the Gulf of Mexico.

**Genetics - Cell & Molecular Biology**

**POSTER SESSION**

**Thursday, April 14 8:30 AM - 6:00 PM**

**Joshua J. Asamo<sup>1</sup>, Daniel Culver<sup>2</sup>, Susamma Abraham<sup>2</sup> and Li Xhang<sup>2</sup>. Replication of a Gene-Smoking interactions on Sarcoidosis Susceptibility. Oakwood University<sup>1</sup> Cleveland Clinic Foundation<sup>2</sup>**

Replication of a Gene-Smoking interactions on Sarcoidosis Susceptibility Joshua Asamoah<sup>1, 2</sup>; Susamma Abraham<sup>1</sup>; Li Xhang<sup>1</sup>; Daniel Culver DO<sup>1</sup> 1The Cleveland Clinic Foundation, Department of Pathobiology, Cleveland, Ohio 2Oakwood University, Department of Biology, Huntsville, AL (Sponsored by the Howard Hughes Medical Institute) Currently, the specific cause of Sarcoidosis is unknown. In the late 1990s, an etiological study was conducted by National Institute of Health (NIH) researchers, in which no conclusive causative agents were identified. Although, no definitive environmental factors were implicated to cause this disease, smoking was shown to have a negative association with Sarcoidosis. In our study, we hypothesized that polymorphisms in candidate genes is linked to Sarcoidosis. Using polymerase chain reaction, we analyzed various genes (MMP9, MMP7, and PPAR $\gamma$ ) to understand the effects of single nucleotide polymorphisms (SNPs) on disease susceptibility. We identified candidate SNPs in a cohort of 1106 experimental and controls groups from the Cleveland Clinic Foundation (CCF). Using DNA samples from the NIH, we performed replication experiments. Initially, only DNA from African American patients was analyzed, due to the strong correlation that was observed between SNPs and smoking in previous studies. At this time, our lab is focused on the analysis of the sequenced genes to determine if our initial findings using the CCF cohort were in fact replicated using the DNA from NIH.

**David B. Barton<sup>1</sup>, Tiffany E. Fishburne<sup>1</sup>, Dena A. Buzzell<sup>1</sup>, Rosemary N. Plagens<sup>1</sup>, Jonathan D. Wise<sup>1</sup> and Eli V. Hestermann<sup>1</sup>. Induction of gene expression continues after transcription factor degradation. Furman University<sup>1</sup>**

The aryl hydrocarbon receptor (AHR) is a ligand-activated transcription factor that plays a direct role in regulating the expression of genes such as cytochrome p4501A1 (CYP1A1). Activation of the receptor is induced by a wide range of ligands including polyaromatic hydrocarbons and halogenated aromatic hydrocarbons. Previous studies have shown that activation of the receptor with the agonist 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) results in rapid (2-4 hours) degradation of the receptor to less than half of its original levels. Our objective was to determine whether the remaining receptor protein levels were sufficient to induce further response. After treating MCF-7 breast cancer cells with TCDD, we measured CYP1A1 mRNA and heterogeneous nuclear (hn)RNA with quantitative RT-PCR. At 48 hours, CYP1A1 mRNA remained at 150x control levels, and (hn)RNA remained at maximal levels. Furthermore, we tested whether AHR activation was actually necessary for gene expression after this time period. When we treated cells with TCDD for 24 hours and then washed them in several changes of fresh medium, CYP1A1 expression returned to baseline. However, when the cells, which then contained very low amounts of AHR, were again treated with TCDD, CYP1A1 expression returned to maximal levels. Future studies will test whether or not the receptor levels remain low after washing and then re-treating with TCDD. This will give us an indication of the cell's ability to regenerate AHR after degradation.

**George E. Campbell<sup>1</sup> and Margaret J. Kovach<sup>1</sup>. Investigating CpG Island Methylation, Microsatellite Polymorphisms, and Gene Expression in Colon Cancer. The University of Tennessee at Chattanooga<sup>1</sup>**

Even though many gene products have been recognized as causative agents of cancer, not all of the underlying mechanisms of abnormal gene expression that lead to cancer have been determined. Our hypothesis is that genes central to the molecular pathways of cancer can be regulated by microsatellite repeat variability and subsequent genomic modifications. We propose that microsatellite polymorphisms have a direct and/or indirect effect on gene expression by modifying chromatin condensation, the stability of mRNA transcripts, the methylation status of CpG islands, or the binding of regulatory transcription factors. Seven cancer-associated genes subject to both microsatellite variability and CpG island methylation were chosen for study amongst 14 colon cancer cell lines and against

normal colon tissue. Each cell line was evaluated for microsatellite variability, CpG island methylation status by COBRA methodology, and relative gene expression by qRT-PCR; statistical analysis is being conducted to investigate relationships between these characteristics. Microsatellite variability seems to be dependent on position, which may imply functionality. Microsatellites in the last intron display minimal variability, first intron or 3'UTR microsatellites show moderate variability and middle introns show high variability. Although hypomethylation of promoter CpG islands and hypermethylation of internal CpG islands commonly occurs, as expected for cancer phenotype, methylation status alone does not explain all measured relative expression levels. Overall, elevated expression for oncogene CD44 and down regulation of tumor suppressor CDKN1B and, to a lesser extent, tumor suppressor STK11 was observed. Future studies will correlate these expression patterns with CpG methylation status and microsatellite polymorphisms.

**Rachel Daugherty<sup>1</sup>, Karen Vellacott-Ford<sup>1</sup>, Reannon Blackwell<sup>1</sup> and Leland J. Cseke<sup>1</sup>. Metabolic Engineering of Oil Biosynthesis in *Jatropha curcas* for Improved Biodiesel. The University of Alabama in Huntsville, Huntsville, AL<sup>1</sup>**

The world's ever-increasing demand for energy has recently revealed the dangers and limitations of relying on fossil fuels as a primary energy source. Exploration of potential fuel alternatives has shown that the tropical plant species, *Jatropha curcas*, is an ideal biofuel source for several reasons, including its hardiness and high seed oil content. A major obstacle in the use of biofuels is the required investment of energy and resources for extraction and processing. Improvement of seed oil quantity and quality will make *J. curcas* a more sustainable fuel source. We plan to metabolically engineer *J. curcas* to produce seeds with higher quantity and quality oil. All genes involved in the *J. curcas* biosynthetic pathways have been sequenced and annotated and expression patterns of oil biosynthetic genes have been characterized. Methods for *J. curcas* transformation have also been optimized. To manipulate oil biosynthesis in seeds only, we need seed-specific promoter sequences of highly expressed genes. We are currently using the GenomeWalker Universal Kit to obtain these sequences from *J. curcas* genomic DNA. These promoters will be combined with target genes in expression vectors for the manipulation of oil biosynthetic pathways through *Agrobacterium*-mediated transformation of *J. curcas*.

**Thomas C. Eakes<sup>1</sup> and Steven J. Metallo<sup>2</sup>. Binding of Small Molecule Inhibitor Analogs to c-Myc Oncoprotein. Guilford College<sup>1</sup> Georgetown University<sup>2</sup>**

Deregulation of c-Myc transcription factor contributes to many forms of oncogenesis. In order for malignant transformation to occur, the Myc monomer must dimerize with the protein Max. Studies have shown that using small molecule inhibitors that bind Myc can prevent dimerization with Max, and prevent cell proliferation. Three distinct binding regions along the Myc basic-helix-loop-helix-leucine zipper (bHLHZip) have been discovered. Of seven originally identified inhibitors, 10074-A4, 10074-G5, and 10058-F4 independently disrupted the Myc-Max heterodimer. From this finding, structure similarity assessments have been carried out to find derivatives of these compounds that may exhibit similar or improved binding affinity to the Myc protein. In this study, six derivatives of 10074-A4 were examined as potential candidates for Myc binding using a truncation of the full bHLHZip region. Circular dichroism (CD) was used to detect binding of these six compounds. The CD spectra show that three of the six derivatives effectively altered the random coil structure of the Myc monomer. This data provides a foundation for future research to assess how effectively these derivatives bind and if they could potentially disrupt dimerization with Max. Other inhibitor candidates could be chosen based on the structural characteristics exhibited by these inhibitors in comparison with other known inhibitors. This could result in more fine-tuned pharmacophore models, providing further insight into an ideal Myc-Max inhibitor that could be used in cancer therapeutics.

**Jillian C. Goines<sup>1</sup> and Joann M. Lau<sup>1</sup>. Chemopreventative properties of *Ganoderma lucidum* extract in a male lung cancer cell line H2342. Bellarmine University<sup>1</sup>**

With cancer being a leading cause of death in the United States, research has turned to dietary supplements with chemopreventative properties. *Ganoderma lucidum* (Curtis) P. Karst., commonly known as the Reishi mushroom has been used for centuries in many Asian countries. The purpose of this experiment was to examine the effects of the Reishi mushroom on a male lung cancer cell line (H2342). Results with crude Reishi extract showed that cell proliferation decreased by 80% in a time-dependent and dose-dependent manner. Furthermore, the triterpene fraction of the Reishi mushroom appeared to be the bioactive component showing a 70% decrease in proliferation compared to the 20% decrease seen with the polysaccharide fraction. Western blots were used to examine the pro-apoptotic protein (Bax) and the anti-apoptotic proteins (Bcl-2 and Bcl-xL). Furthermore, cell cycle proteins (cyclin D, cdk4, cdc2, and NF- $\kappa$ B) were also analyzed. These results show that the Reishi mushroom may hold potential as an alternative treatment for lung cancer.

**Kimberly Heck<sup>1</sup>, James Brown<sup>2</sup> and Melanie Lee-Brown<sup>1</sup>. Multilocus sequence typing and analysis of natural cave isolates of *Ensifer adhaerens*. Guilford College<sup>1</sup> North Carolina State University<sup>2</sup>**

*Ensifer adhaerens* are Gram-negative, rod-shaped aerobic  $\alpha$ -proteobacteria, in the family Rhizobiaceae, related to *Sinorhizobium*. *E. adhaerens* are predatory soil inhabitants that non-preferentially attack both Gram-positive and Gram-negative bacteria. In this study, four cave isolates of *E. adhaerens* isolated from two different caves in the United States were compared to the characterized type strain ATCC 33212. Small subunit rRNA, RNase P RNA, and five protein encoding genes from each strain were used to generate phylogenetic trees of each gene independently and concatenated alignments in a multilocus sequence typing analysis. These will be used to determine the evolutionary relationships between these natural isolates and the type strain, and between *Ensifer adhaerens* and related species of *Ensifer* and *Sinorhizobium*.

**Elizabeth A. Killion<sup>1</sup>, Nicholette Allred<sup>2</sup> and Donald Bowden<sup>2</sup>. Understanding Adiponectin Expression: Sequencing the ADIPOQ Gene in European Americans. Guilford College<sup>1</sup> Wake Forest University<sup>2</sup>**

Adipose tissue is important for regulating the body's metabolism through the secretion of many proteins, including adiponectin. While the exact mode of action of adiponectin is not completely understood, it is known that obesity reduces the expression of this protein. Levels of blood plasma adiponectin are highly heritable, so it is likely that differences in adiponectin levels within populations can be explained by genetic variations such as single nucleotide polymorphisms (SNPs) in the ADIPOQ gene, the gene coding for adiponectin. Previous research found a rare genetic variant in the ADIPOQ gene in a population consisting of Hispanic American families. The SNP found was able to account for 17% of plasma adiponectin variance in Hispanic Americans studied. The purpose of this research is to detect rare variants in the ADIPOQ gene in forty-eight Caucasian individuals diagnosed with type 2 diabetes that have either significantly low or significantly high levels of blood plasma adiponectin. This technique is used in order to find SNPs in this population that would explain such extreme differences in adiponectin expression. Methods used include PCR amplification of the promoter, exons, and 3' untranslated regions of the ADIPOQ gene, direct sequencing of these regions, and visualizing data using Sequencher Software. No unique SNPs were observed in this population; however, fourteen previously recorded SNPs were noted. Two of these SNPs, rs2241766 (exon 2) and rs17366743 (exon 3), are located in translated regions of the ADIPOQ gene, and

therefore, they may account for differences in adiponectin expression in this Caucasian population.

**Paul S. Lee<sup>1</sup> and Eli V. Hestermann<sup>1</sup>. Binding of aryl hydrocarbon receptor and its repressor to DNA sequences. Furman University<sup>1</sup>**

The aryl hydrocarbon receptor repressor (AHRR) protein is so named because it was discovered through its ability to interfere with aryl hydrocarbon receptor (AHR) signal transduction. However, AHRR also impacts the activity of other transcription factors, notably the hypoxia inducible factor, which is responsible for cellular responses to reduced oxygen. The mechanism by which AHRR acts and the breadth of its activity in regulation of gene expression is still unclear. In order to better understand this process, we treated HeLa cells with the AHR agonist 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) or a solvent control for 45 minutes, and then isolated DNA fragments interacting with AHR or AHRR by chromatin immunoprecipitation. Enrichment of AHR-target gene enhancer sequences compared to control sequences by precipitation with AHR antibody increased from 8-fold in solvent-treated cells to 130-fold in TCDD-treated cells, while enrichment following precipitation with AHRR antibody fell from 22-fold to background levels. This suggests that AHR, once stimulated by agonist, may competitively displace AHRR from DNA regulatory sequences. The DNA recovered by this procedure is being sequenced in depth to determine the set of sequences to which AHR and AHRR bind.

**Sudershana Nair<sup>1</sup>. Regulation of Pigment dispersing factor in *Drosophila melanogaster*. University of Tennessee<sup>1</sup>**

All living organisms display daily rhythms, controlled by an endogenous clock that runs with a period of approximately 24 hour that can persist without environmental time cues. External Zeitgebers (e.g. food, light, temperature) can synchronize daily rhythms providing the organism with an internal representation of the external time. A circadian oscillator keeps circadian time and activates rhythmic outputs at the appropriate time of the day. Disturbance of the biological rhythms can cause serious health problems, including insomnia, seasonal affective disorder, delayed or advanced sleep phase syndrome, and other temporary problems caused by a jet lag and work shifts. Pigment dispersing factor (Pdf) is an important neuropeptide that regulates circadian pace-making system and a modulator of the clock output pathways in various insects. We have previously shown that *Drosophila melanogaster* lacking Pdf gene shows altered circadian locomotor activity rhythms suggesting that Pdf is an essential component of the circadian clock output pathway. Pdf is also important for intercellular communication for the synchronization of different groups of clock neurons. Hence, appropriate levels of the Pdf within the key pacemaker neurons are very important for the normal clock functions in *D. melanogaster*. Pdf expression is regulated and maintained in the core clock neurons but how exactly it acts on downstream circuits to mediate rhythmic behavior is unknown. Our preliminary data from heterologous promoter analysis indicate a homeobox transcription factor, SCARECROW (SCRO) to be involved in negative regulation that limits the Pdf transcription to the ventro-lateral clock neurons.

**Lori Rushing<sup>1</sup>, Elizabeth J. Schmidt<sup>1</sup> and Miriam Segura-Totten<sup>1</sup>. Mechanism for the Regulation of Barrier-to-Autointegration Factor (BAF) Function during Nuclear Assembly. North Georgia College & State University<sup>1</sup>**

Barrier-to-Autointegration Factor (BAF) is a chromatin protein with roles in gene expression and nuclear envelope assembly. Phosphorylation of Ser-4 and Thr-2/3 by vaccinia-related kinase-1 abolishes BAF interaction with DNA and lowers affinity of BAF for LEM proteins. To test our hypothesis that phosphorylation regulates the effect of BAF on chromatin, we added purified BAF proteins mutated at the phosphorylation sites to

*Xenopus laevis* nuclear assembly reactions. Our results suggest that all sites play a role in regulating BAF-mediated chromatin decondensation, but point to Thr-2/3 as key sites. We have not determined whether phosphorylation regulates the effect of BAF on chromatin only by controlling DNA binding. To investigate this, we will test the effect on chromatin of BAF mutant proteins that: cannot bind DNA but can be phosphorylated, or cannot bind DNA and cannot be phosphorylated. To do this, we need to clone the cDNAs for these proteins from the pcDNA5/FRT/TO mammalian expression vector into the pET 15b bacterial expression vector. We engineered NdeI and BamHI restriction enzyme sites at the ends of the BAF sequences for cloning into pET 15b. The inserts were ligated into the pGEM intermediate vector and digested for ligation with pET 15b. We hypothesize that ligation into pET 15b was unsuccessful because of overlap between the engineered sites and those located on the pcDNA5 vector. We are repeating the cloning procedure using XhoI sites. Once we clone the BAF cDNAs, we will express and purify the mutant BAF proteins and test them in the *Xenopus* system.

**Irma M. Santoro<sup>1</sup>, Danielle Satre<sup>1</sup> and Ryan Wauford<sup>1</sup>. Using a mutagenicity assay and *Saccharomyces cerevisiae* to assess the mutagenic potential of aquatic pollutants. Reinhardt University<sup>1</sup>**

Even though chemical substances are involved in environmental pollution, the effects of air, water and soil pollutants on ecosystems are still unclear. What is becoming more evident is the link between cancer and environmental contamination. It has been suggested that people can reduce their cancer risk by taking steps to avoid such contaminants. Hence, the first step in cancer prevention is to identify the carcinogens that represent the greatest cancer risk. Yet, only 2 % of the estimated 62, 000 different synthetic chemicals have been tested for toxic effects. There are several methods to assay for the mutagenic potential of a chemical. The standard cell based assay for mutagenicity testing is the Ames test which uses a *Salmonella* bacterial strain. This assay can be cumbersome since a liver microsome fraction is used to activate the compounds being tested for mutagenicity. More recently, an alternative method that uses the budding yeast *S. cerevisiae* to test the mutagenicity of compounds has been established. *S. cerevisiae* is a true eukaryote, and as such expresses enzyme activity similar to the liver microsome fraction in the Ames test, so a liver microsome fraction is not needed. The development of an assay using haploid strains of *S. cerevisiae* as sensors to detect mutagens present in environmental water samples will be presented. The water samples were collected near Reinhardt University's campus in Cherokee County Georgia from several locations along Moore's Mill Creek including one near a wastewater treatment plant effluent.

**Yoedono Sovyanhadi<sup>1</sup>, Marta Sovyanhadi<sup>1</sup>, Leonard Williams<sup>2</sup> and Juliet Durant<sup>1</sup>. In-vitro study on the effect of water extract of bitter melon capsules (*Momordica charantia*) on the insulin production of hit-t15 pancreatic beta cells. Oakwood University<sup>1</sup> North Carolina A & T State University<sup>2</sup>**

Impaired  $\beta$ -cell function is an important contributing factor in the development of type 2 diabetes. Bitter melon (*Momordica charantia*) is commonly used for diabetes therapy as it demonstrates hypoglycemic potency. The purpose of this study is to evaluate the efficacy of bitter melon extract in stimulating insulin production by  $\beta$ -cell line through manipulation of dosage and length of treatment. Pancreatic HIT-T15 cells was cultured in media with 0.0 mM, 0.8 mM, 7.5 mM and 11.1 mM glucose for 8 weeks. The cells from each glucose concentration were then divided into 2 sets of subcultures. The first and second sets of subcultures were treated for 1 week and 2 weeks, respectively, with water extract of bitter melon capsules at 0.0  $\mu\text{g/ml}$ , 20  $\mu\text{g/ml}$  and 40  $\mu\text{g/ml}$ . The cell counts and the concentrations of insulin in the media were measured at the end of the treatments in order to know the average insulin release per  $\beta$ -cell. For the main effect of sugar concentration,

$\beta$ -cells that were maintained at 7.5 mM sugar showed significantly higher insulin release ( $p < 0.01$ ). This characteristic was probably due to the activity of intracellular glucokinase that results in different amount of insulin release. On the other hand, bitter melon treatments did not significantly stimulate the insulin release by the  $\beta$ -cells. The interaction between glucose concentration and bitter melon treatment became significant ( $p < 0.01$ ) after 2-week exposure. Such results might have been caused by the type and preparation of bitter melon extract used in this experiment. Key words: bitter melon (*Momordica charantia*), HIT-T15 beta cells, insulin release

**Yoedono Sovyanhadi<sup>1</sup> and Marta Sovyanhadi<sup>1</sup>. In-vitro study on the potency of vitamin C, vitamin E and peptide-YY as growth inhibitors in HEp-2 human larynx cancer cells. Oakwood University<sup>1</sup>**

**ABSTRACT** The use of vitamin C and vitamin E in cancer therapy has been a topic of controversy. Some reports state that these vitamins has no effect on the development of cancer cells and even enhance cancer growth or interfere with the standard therapy. However, increasing evidences show that vitamin C and vitamin E have potential in suppressing cancer growth. Another therapeutic substance, which is commonly used in combination with vitamin E for cancer treatment, is a naturally occurring gut hormone peptide-YY (PYY). In this project, the effects of administrations of vitamin C, vitamin E and PYY on the growth of human larynx cancer HEp-2 cell line were tested in-vitro. The experiment was divided into two stages. The first stage was to observe the colony growth of HEp-2 cells in different concentrations of the adjuvant. Two groups of trials, group A and group B, were treated with the adjuvant at different time, namely at the starting of the experiment and at 48 hours after the starting. The second stage was to examine the viability of the floating cells when the cells detached from the culture plate due to high concentration of adjuvant in the media. The results showed that administration of vitamin C at the starting of the experiment was deleterious, while vitamin E and PYY were capable of delaying cell proliferations. Administration of adjuvant at 48 hours after starting the experiment have suppressive effects on cell growth, starting at 125  $\mu$ M for vitamin C, 12.5  $\mu$ M for vitamin E and 5  $\mu$ M for PYY. The floating cells were confirmed as dead cells. This study has demonstrated the potency of vitamin C, vitamin E and PYY as anti proliferative and anti tumor agents against HEp-2 cell line as these substances may induce DNA breaks, necrosis, apoptosis, or reduce the energy intake by blocking some ion transport systems. Key words: vitamin C, vitamin E, peptide-YY, growth inhibitors, HEp-2 cells

**La'Tisha Wilson<sup>1</sup> and Elizabeth Brandon<sup>1</sup>. IGF-1 Stimulates Melanoma Cell Proliferation. Mississippi College<sup>1</sup>**

Obesity rates have been steadily increasing leading to a higher prevalence of illnesses and an increase in the illnesses' detrimental effects. Amplification of hormone production (i.e. estrogen, insulin, inflammatory cytokines, and insulin-like growth factor (IGF-1)) has been attributed to creating an ideal environment for diseases such as cancer. IGF -1 has been shown to increase cell proliferation in breast cancer patients working synergistically with the adipokine, leptin. This research tested the hypothesis that IGF-1 independently stimulates cell growth in melanoma cells. A time course experiment was designed to determine the proliferative effects of IGF-1 on B16F10 mouse melanoma cells (MMCs) and to provide both quantitative and visual results. The experiment was performed in vitro using B16F10 MMCs with and without IGF-1. Data were gathered at 0, 24, and 48 hr time points. A cell count, using a hemacytometer, and digital images, using ImagePro imaging software, were obtained to document proliferation. IGF-1 enhances cell proliferation during the first 24 hrs of treatment, although the effect wanes by 48 hrs. Based on the results acquired from this study, IGF-1 has a short-term stimulatory effect on B16F10 MMC growth. Future experiments will include IGF-1 replenishment after the first 24 hrs in order to maintain a more constant concentration of the growth factor in the medium and a test to

determine whether IGF-1 acts synergistically with leptin to promote cell growth. This work was supported by the Mississippi INBRE (P20RR016476) funded by the National Center for Research Resources, National Institutes of Health.

**Ryan O. Cephas<sup>1</sup>, Lakshmi Dharmarajan<sup>2</sup> and Biswarup Mukhopadhyay<sup>2</sup>. Aspartate binding and inhibition in *Clostridium perfringens* PepcA. Oakwood University<sup>1</sup> Virginia Polytechnic Institute and State University<sup>2</sup>**

Aspartate binding and inhibition in *Clostridium perfringens* PepcA Phosphoenolpyruvate carboxylase (Pepc) is a CO<sub>2</sub>-fixing enzyme that produces oxaloacetate from bicarbonate and phosphoenolpyruvate, a product of the glycolysis pathway. Pepc is found in plants, bacteria, and archaea; but not in humans. Plant and bacterial Pepcs such as those in maize and *E. coli*, are regulated more significantly by metabolites than archaeal Pepcs (PepcAs). Aspartate inhibits plant and bacterial enzymes strongly and primarily binds to an allosteric site on these enzymes. PepcAs, however show different sensitivities to aspartate and the allosteric binding site of the inhibitor is absent in these enzymes. In *Clostridium perfringens* PepcA, our kinetic analysis has indicated that aspartate acts as a competitive inhibitor. Therefore, we hypothesize that aspartate has a different binding mode in this enzyme. In order to study this, we have expressed the *C. perfringens* Ppc gene in an *E. coli*-based system. PepcA will be purified using Ni-NTA and gel filtration chromatography. Crystallization trials will be set up with the purified enzyme and the structure of the aspartate-bound enzyme will be determined. Our previously determined crystallography data of the substrate-free enzyme will greatly accelerate this process. This comparative study of the inhibition mode in Pepcs and PepcAs will ultimately help in engineering a novel Pepc having a wide range of applications. These include improvement of photosynthetic CO<sub>2</sub>-fixation efficiency in C<sub>3</sub> crop plants and industrial production of amino acids and organic acids from renewable raw materials.

### Herpetology

#### POSTER SESSION

Thursday, April 14 8:30 AM - 6:00 PM

**Derek A. Bozell<sup>1</sup> and Thomas K. Pauley<sup>1</sup>. The Effect of Auditory Call Playback on Anuran Detectability, Catch Probability and Visual Encounter Survey Efficiency. Marshall University<sup>1</sup>**

With current threats to amphibian biodiversity, it has become increasingly important for surveys to maximize data collection. One of the most striking features of frogs (Order Anura) is the auditory calls that males emit during the breeding season. These calls have been studied extensively because they are species specific and useful identification tools. Calls are used to attract mates as well as ward off other males. Traditionally, calls have been used to aid researchers in estimating population parameters. The established methods of anuran surveying include auditory surveys and visual encounter surveys (VESs), where a researcher actively searches for individuals. One historical difficulty with surveying anurans is that males cease calling after any disturbance in the area, including those made by researchers. I am proposing a variation on current methods that utilizes the propensity of male frogs to compete with one another by reducing the period after a researcher-created disturbance where males cease to call. To accomplish this, I am creating site specific playlists of the calls of all species at a breeding site using automated recording devices. By playing these recordings while conducting subsequent surveys, I intend to increase the efficiency and yield of visual encounter surveys, as well as anuran detectability and capture probability when compared to traditional survey methods. I hypothesize that playing calls through a speaker system while conducting visual encounter surveys for anurans will increase the ability of the researcher to locate

individuals, thereby increasing anuran detectability, search efficiency, and catch probability.

**Desiree J. Moffitt<sup>1</sup>, Michael Gangloff<sup>1</sup> and Lynn Siefferman<sup>1</sup>. THE INFLUENCE OF ELEVATION ON SALAMANDER ASSEMBLAGE COMPOSITION ON GRANDFATHER MOUNTAIN. Appalachian State University<sup>1</sup>**

Elevation influences the structure and diversity of assemblages of different organisms. We surveyed salamanders of the family Plethodontidae on Grandfather Mountain, Avery Co., North Carolina to examine species richness, abundance, and population estimates along an elevational gradient. From May to November 2010, we surveyed five transects on the south side of the mountain at elevations from 1259 (transect 1) to 1533 m (transect 5). Each transect contained five equally-spaced survey plots. We used both timed nocturnal searches and cover boards to quantify salamander assemblage structure. Cover boards were checked approximately once weekly and night surveys were conducted approximately twice per month. To estimate abundance, we marked salamanders with Visible Implant Elastomer (VIE) and will use mark-recapture models to estimate population sizes. We found eight species of salamanders: *Plethodon cinereus*, *P. cylindraceus*, *P. montanus*, *P. welleri*, *P. yonahlossee*, *Desmognathus orestes* and *D. wrighti*. *Plethodon welleri*, a species of special concern in NC, was restricted to transect 5. *Plethodon montanus* was the most abundant salamander and was found at every transect. We calculated Shannon diversity (H') for both day and night surveys and found no significant difference between the two sampling methods. Species richness and abundance varied with elevation: richness decreased with increasing elevation while abundance followed a similar trend but spiked at transect five. Moreover, both seasonality and weather patterns influenced capture rates. Examining the factors that influence salamander assemblages can provide baseline population estimates, offer insight into amphibian decline and management strategies.

**Zachery L. Napier<sup>1</sup>, Megan E. Gibbons<sup>1</sup> and Gabriel Speiler<sup>2</sup>. The amphibian chytrid fungus *Batrachochytrium dendrobatidis* in north central Alabama. Birmingham-Southern College<sup>1</sup> Alabama School of Fine Arts<sup>2</sup>**

The amphibian chytrid *Batrachochytrium dendrobatidis* (Bd) is a pathogenic fungus that has been attributed to mass mortalities and extinctions of amphibian populations worldwide. Bd leads to a disease known as Chytridiomycosis, which causes symptoms ranging from lethargy to lesions, and in many cases death. This fungus, which is typically found in tropical mountain ecosystems, has recently been documented at two sites in Alabama. We conducted a study sampling amphibian populations in several different ponds in north central Alabama for Bd zoospores. Samples were taken in the summer (July-August), and the winter (January-February). Adult and juvenile anurans (Families Hylidae, Ranidae, Microhylidae) and salamanders (Family Salamandridae and Ambystomatidae) were swabbed and samples were analyzed using an adapted polymerase chain reaction (PCR) technique. To date, we have found no Bd-positive samples on any of the amphibians tested, but winter samples are still being processed. The relationship between Bd, amphibians, and climate is very complex. It is essential for more research to be performed in these areas to better understand these relationships.

**Christopher J. O'Bryan<sup>1</sup>, Chad Brooks<sup>2</sup> and A. F. Scott<sup>1</sup>. A COLD-BLOODED KILLER, PRESENCE OF RANAVIRUS IN SYNTOPIC AMPHIBIAN LARVAE IN WEST TENNESSEE, USA. Center of Excellence for Field Biology, Austin Peay State University<sup>1</sup> Department of Biology, Austin Peay State University<sup>2</sup>**

Ranaviruses have been linked to pervasive die-offs in amphibian populations throughout the Americas, Europe, Asia, and Australia. Studies have found ranaviruses throughout the

Southeast United States, however, no research has identified this pathogen in West Tennessee. It has been shown that anthropogenic induced stress is a pivotal cause of amphibian susceptibility to disease and this could exacerbate ranavirus infected amphibian mortalities. Poor water quality from cattle-access (an anthropogenic stressor) has been suggested to be linked with ranavirus infection. This study describes the presence of Frog Virus 3, an aggressively pathogenic strain of ranavirus, at cattle-access and non-access ponds from select sites in West Tennessee. Frog tissues tested were shown to contain ranavirus DNA and to be prolific in the ponds examined. These data support the notion that Frog Virus 3 could be spreading westward across the US and point to the need for developing management and conservation techniques to reduce ranavirus-derived amphibian decline.

**Keith Paluso<sup>1</sup>, Scott Smith<sup>1</sup>, James Stewart<sup>1</sup>, Steven Pitts<sup>1</sup> and Tom Blanchard<sup>1</sup>. Preliminary results of amphibian and reptile surveys at two National Wildlife Refuges in northwest Tennessee. University of Tennessee at Martin<sup>1</sup>**

Although the Reelfoot Lake area in northwest Tennessee is known to support a diverse assemblage of amphibians and reptiles, we know of no published accounts that include regular sampling efforts with the intent of long-term monitoring. We used a combination of techniques including cover board arrays, drift fences with pitfall traps, road cruising, and un-timed scan searches to document amphibian and reptile species occurring on the Reelfoot National Wildlife Refuge (RNWR) and the Lake Isom National Wildlife Refuge (LINWR). Both of these refuges include bottomland hardwood forests of similar composition, but the RNWR is much larger (4250 ha.) with more area of undisturbed habitat than the LINWR (730 ha.), which is more isolated. The primary goal of this study was to provide information on species occurrences that could be incorporated by refuge personnel into land management practices. Because our study sites at these two refuges are different with respect to surrounding land use, the results of this study could provide information on the response of amphibian and reptile diversity to agricultural activities. To date, we have documented 729 animals including 167 from the RNWR and 562 from the LINWR. Although total abundance at the Lake Isom site was much higher due to a large number of leopard frogs, the species richness was substantially lower than that of the Reelfoot site. This study is intended to be long term for a more accurate depiction of the herpetofaunal community at these two refuges.

**Lisa D. Brown<sup>1</sup> and John L. Carr<sup>1</sup>. Herpetofaunal Survey of Upper Ouachita National Wildlife Refuge in northern Louisiana. University of Louisiana at Monroe<sup>1</sup>**

During the last century, the amount of original bottomland hardwood forest (BHF) cover lost was substantial. The primary cause of this loss was conversion to agricultural production, along with hydrological changes associated with flood control. Upper Ouachita National Wildlife Refuge (UONWR), composed of BHF and former agricultural fields, has been the site of a major BHF restoration effort. As an extension of that restoration effort, the containment levee surrounding former farmland is being removed in order to restore the natural hydrological cycle across the area. Herpetofaunal communities are significantly impacted by hydrology in BHF; therefore, monitoring this community, in both altered and unaltered refuge habitat, is vital as the restoration work progresses. Total species richness as of 15 November 2010 at UONWR was 26 species, of which 8 were amphibian species and 18 were reptile species. Species diversity indices for aquatic trapping resulted in a reciprocal of Simpson's index of diversity (1/D) value of 2.93 for the farmland unit and a 1/D value of 2.65 for unaltered refuge habitat, and a diversity t-test found no significant difference between the samples ( $P=0.762$ ). However, diversity indices for visual encounter surveys resulted in a 1/D value of 1.22 for the farmland unit and a 1/D value of 2.48 for unaltered refuge habitat, and a diversity t-test found the difference between samples statistically significant ( $P<0.001$ ). The unaltered refuge habitat appears to have higher

species diversity than the farmland unit likely due to the farmland's lack of forest cover and natural hydrology.

**Priscilla D. Fisher<sup>1</sup>, Gavin R. Lawson<sup>2</sup> and Timothy A. Kreps<sup>3</sup>. Monitoring Amphibian Use of Constructed Wildlife Pools in the Shenandoah Valley. pdf002@eagles.bridgewater.edu<sup>1</sup> glawson@bridgewater.edu<sup>2</sup> tkreps@bridgewater.edu<sup>3</sup>**

The goal of this study was to determine whether wildlife pools constructed by the US Forest Service in the George Washington National Forest are productive amphibian breeding habitat. We analyzed amphibian abundance data from dipnet samples collected annually from 1999-2006 from 35 ponds scattered throughout the national forest. We also sampled five ponds in the central portion of the national forest using a variety of techniques (dip nets, minnow traps, drift fences with pitfall traps). Analysis of the long-term data showed that ponds in the southern Shenandoah Valley tended to be frog-dominated whereas northern ponds tended to be salamander-dominated. Also, certain species tended to associate, particularly *Lithobates sylvaticus* and *L. clamitans* as well as *Ambystoma maculatum* and *A. jeffersonianum*. We observed a correlation between general pond characteristics and species composition with the smallest ponds being salamander dominated, intermediately-sized ponds being frog-dominated, and the largest being dominated by newts (*Notophthalmus viridescens*). In the five ponds sampled with multiple methods, all of which had large larval amphibian populations, only one was confirmed to produce a significant number of metamorphs (specifically *L. sylvaticus* and *A. jeffersonianum*), suggesting these ponds do have the potential to significantly contribute new members to local amphibian communities but do not always do so. Different sampling techniques caught different species indicating that multiple methods should be employed for amphibian surveys.

**Michelle L. Guidugli<sup>1</sup> and Stephen C. Richter<sup>1</sup>. Pattern of reproductive and post-metamorphic movements in relation to meteorological factors for two ephemeral pond-breeding amphibians (*Ambystoma jeffersonianum* and *A. maculatum*). Eastern Kentucky University<sup>1</sup>**

For many amphibian species, temporal patterns of migration are poorly understood. To better understand these processes, an ephemeral pond-breeding amphibian community was studied using a drift fence-pitfall trap array that completely encircled the pond. Meteorological variables including daily rainfall and mean, minimum, maximum, and maximum changes in air temperature, humidity, and barometric pressure were measured. Several amphibian species including *Rana catesbeiana* (American Bullfrog) inhabited this pond; however, *Ambystoma jeffersonianum* (Jefferson's salamander) and *A. maculatum* (Spotted Salamander) were the only species that bred in large enough abundance for analysis. The environmental cues influencing breeding migrations for the *Ambystoma* species were only somewhat similar between them with rainfall and maximum changes in pressure, temperature, and humidity the most common cues. For exiting migrations, mean temperature was the only cue shared between species and the only factor explaining adult *A. jeffersonianum* exiting migrations. Post-metamorphosis movements for *Ambystoma* species showed no commonality in their use of cues. Similar to adults, the exiting movements for *A. jeffersonianum* metamorphs were influenced only by mean temperature. Variables explaining exiting movements for *A. maculatum* metamorphs were much more varied and more similar to the cues for their respective adult breeding migrations. Overall, the most common cue for movements was mean temperature for *A. jeffersonianum*, and cumulative precipitation for *A. maculatum*; however, many other variables were significant in explaining movements. These results exemplify how closely movements of amphibian species are linked to their environment, yet how species, even closely-related ones, respond differently to the same suite of environmental factors.

**Ryan M. Huang<sup>1</sup> and Lawrence A. Wilson<sup>2</sup>. Detecting the presence of *Batrachochytrium dendrobatidis* in amphibians in Piedmont vs Blue Ridge habitats in northern Georgia. Emory University<sup>1</sup> Fernbank Science Center<sup>2</sup>**

With countless species of amphibians under threat of extinction, the deaths of individuals from the chytrid fungus (*Batrachochytrium dendrobatidis*) are all the more worrisome. On top of this, the presence of chytrid in the Blue Ridge habitats of northern Georgia, known to be one of the world's hotspots of salamander diversity, is particularly alarming. This study aimed to help determine the extent to which chytrid has infected both anura and caudata species in habitats in both the Blue Ridge as well as the Piedmont physiographic provinces of Georgia. Ten different sites, five in Blue Ridge Province of north Georgia and five within the Piedmont region, were sampled using dip nets and upon capture, individuals were swabbed to look for the presence of zoospores. Each swab sample was analysed by one of the authors (RH) at Emory University using real-time PCR to determine the presence or absence of chytrid. Approximately 300 individuals were sampled for chytrid from nine different salamander species and four different frog species. Amphibians have in the past shown positive results in the mountain region, but our data represents the first extensive data set for the Piedmont region of Georgia as well as a comparable mountain sample.

**Scott P. Jones<sup>1</sup> and Thomas K. Pauley<sup>2</sup>. Incorporating field techniques and ArcGIS to assess trends in reptile and amphibian diversity across varying levels of urbanization. East Carolina University<sup>1</sup> Marshall University<sup>2</sup>**

Urbanization forces many species to occupy smaller patches of habitat or new urban habitats. Some species can adapt to urban habitats, while others are excluded from them. Because of this, urbanization can play a large role in determining community composition. The goal of this study was to determine if urbanization or natural processes explained reptile and amphibian species richness at four sites in West Virginia. One site, a state park, was considered a non-urban habitat while the other three sites were considered urban habitats. This was confirmed in ArcGIS since the three urban sites fell within polygons of urbanization, showed high levels of nighttime lights, and had a high Human Footprint index, while the non-urban site was 7.62 km from the nearest polygon of urbanization, had low levels of nighttime lights, and had an intermediate Human Footprint index. Species richness ranged from 6 at one of the urban sites to 21 at the state park. Reptile and amphibian community similarity ranged from 25% between two urban sites to 57.1% between the third urban site and the state park. Tree community similarity ranged from 52.8% between two urban sites to 66.7% between one of those sites and the third urban site. Soil pH, moisture content, organic matter content, and leaf litter/organic soil combined mass were not significantly different between the sites ( $P > 0.05$ ). Urbanization and animal species richness followed similar trends, but the environmental variables showed different trends, suggesting that urbanization may determine animal community composition at these sites.

**John M. Yeiser<sup>1</sup>, Alice L. Jones<sup>1</sup> and Stephen C. Richter<sup>1</sup>. Salamanders are useful bioindicators of water quality and watershed health in eastern Kentucky. Eastern Kentucky University<sup>1</sup>**

In the Appalachian region, coal mining and other land-use practices by humans are threats to headwater streams and entire watersheds. Here we investigated the usefulness of *Desmognathus* (Dusky) Salamanders as bioindicators in streams with different mining histories in Letcher County, Kentucky. We also examined how body conditions of these salamanders are affected by water quality. We captured and measured *Desmognathus* salamanders in three streams, each with different mining histories. The three streams

included one with no mining that served as the control in this study; a recently mined watershed with final reclamation ending nine months prior to the study; and a third that was mined in the 1970s before the Surface Mining Control and Reclamation Act of 1977 (SMCRA). In the third pre-SMCRA watershed, a large sediment pond was left at the head of the stream but no reclamation efforts were performed and the land has reforested on its own. Temperature, pH, dissolved oxygen and specific conductivity data were collected and habitat was assessed at each site using the EPA's high-gradient Rapid Habitat Assessment protocol. Salamanders were collected on both sides of the stream bed and measured, weighed and released within an hour of capture. *Desmognathus* abundance and body condition were significantly and positively correlated with habitat scores and specific conductivity, respectively. These results warrant further investigations of how salamanders can be used broadly to indicate the water quality and ecosystem health in streams across a range of disturbance and how body conditions vary among those disturbances.

**Courtney E. Rigsby<sup>1</sup>. Terrestrial Habitat Environmental Influence on Amphibian Larvae and Metamorphs within Temporary Wetlands. Reinhardt University<sup>1</sup>**

Potential terrestrial environments surrounding temporary wetlands exhibit significant relationships with amphibian larvae and metamorph abundance and size morphometrics. Furthermore, wetland canopy cover can influence terrestrial conditions, whereas certain environmental variables are significantly different between open and closed canopy types. In order to test these claims, I assessed various environmental factors within a 25 meter buffer zone surrounding temporary vernal pools. I then sampled amphibian larvae and metamorphs in the aquatic and terrestrial environments of 15 wetlands. I included four amphibian species noted for their specific tolerance of high temperatures and dry conditions. My findings showed that DBH, CWD, and Soil Moisture were significantly related to some amphibians, such as *Pseudacris crucifer*, *Hyla chrysoscelis*, and *Ambystoma maculatum*. Open and closed wetlands differed significantly in relation to ground cover (leaf litter), canopy cover (herbaceous growth), and soil temperature. Although possessing specific tolerances, species included did not show significant relationships to habitat canopy type, but showed relationships to other environmental variables.

**Stephanie D. Hunt<sup>1</sup>, Evan A. Eskew<sup>1</sup>, Steven J. Price<sup>1</sup> and Michael E. Dorcas<sup>1</sup>. Assessing Detectability Of Herpetofauna Using Active Search-Based Methods. Davidson College<sup>1</sup>**

Because of the threatened status of herpetofauna in North America and elsewhere, it is important to establish effective methods for monitoring amphibian and reptile populations. Active searches provide one straightforward means of detecting reptiles and amphibians, however the effectiveness of this method has rarely been evaluated and compared with other standard methods of documenting herpetofauna. Our objectives were to calculate detection estimates of reptile and amphibian groups and to compare anuran detection estimates calculated using active search data with detection estimates from anuran calling surveys. We documented herpetofauna using half-hour active searches at twenty-one riparian wetlands along the Broad and Pacolet rivers of South Carolina. Five-minute frog calling surveys were also conducted at these and other sites in the same area to provide a point of comparison for detection probability data. We documented thirty-nine amphibian and reptile species using active searches, but most were seen at relatively few sites and had low detection probabilities. Active searches were much more effective at detecting anurans than any other reptile or amphibian group. However, given that calling surveys and active searches had similar detection probabilities for most anuran species, the extensive time required for active searches may make them a less efficient option.

**Invertebrates**  
**POSTER SESSION**

**Thursday, April 14 8:30 AM - 6:00 PM**

**Zachary J. Loughman<sup>1</sup>. Ecology of *Cambarus (J.) dubius* in north-central West Virginia. West Liberty University<sup>1</sup>**

High elevation burrowing crayfishes have not received focused research attention, leaving much of their life and natural history unknown. Efficient conservation of high elevation burrowing crayfish species can not be performed if basic natural history parameters are not examined. In an effort to gather this data, an ecological study of *Cambarus (J.) dubius* was performed at Terra Alta, Preston County, West Virginia. Study parameters focused on life history, habitat use, and interspecific interactions with neighboring taxa. Life history information included identifying size at sexual maturity, age cohort designation, and determining individual age. Habitat utilization was determined by burrow portal/m<sup>2</sup> estimation for forested seeps and anthropogenic habitats utilized by *C. (J.) dubius*. Interspecific interactions were documented for all taxa observed utilizing *C. (J.) dubius* burrows. Morphometrics analysis for 263 crayfish determined no significant difference in size at maturity for males and females, and an average age of 18 months. The oldest individuals within the population were 84 (7 years) months old. Burrow portal densities were highest in forested seep habitats and distributed across the forest in a discrete populations, while anthropogenic habitat burrow portal densities were unevenly distributed throughout the landscape, and less dense than forested environs. Interspecific utilization of burrows indicated *C. (J.) dubius* burrows represent important habitats for plethodontid salamanders and several terrestrial invertebrate species.

**David Foltz II<sup>1</sup>, Nicole Garrison<sup>1</sup>, Tricia Kangisser<sup>1</sup>, Stuart Welsh<sup>2</sup> and Zachary Loughman<sup>1</sup>. Baited lines, a novel approach to collecting burrowing crayfishes. West Liberty University<sup>1</sup> USGS Cooperative Office, Morgantown WV<sup>2</sup>**

Collection methods for organisms are constantly being improved upon or experimented with in order to reach the highest capture rate with the least amount of effort possible. Excavation is the primary method used for collecting primary burrowing crayfish. This method is moderately successful and often physically demanding, time consuming, and difficult in certain habitats. Recently, burrowing crayfish nets have been used to collect crayfishes without excavating burrows. Unfortunately, success rates with a BCN is directly correlated to weather events, making use of this method temperamental. Baited lines are fishing hooks baited with earthworms, tied to 20-30cm long monofilament leaders, and require investigators to see crayfishes resting at the entrances of burrows. Crayfish when observed, are tempted with the worms from their portals, where they are then grasped. The focus of this study is to compare the baited line method against burrowing crayfish nets and excavation in a variety of habitats with different crayfish species in order to determine the success of the Baited line. Four study areas were selected throughout West Virginia to ensure broad coverage of primary burrowing crayfishes. Prior to the creation of baited line rigs, burrow colonies were found during daylight hours and scouted. Active burrows were flagged so they could be returned to after dark. Baited lines were used when crayfish were within arm's reach of the investigator. Crayfishes were lead 5-10 cm from the burrow portal over a 5- 20s period, and grasped or pinned to the entrance of the burrow and extracted. The additive model (taxa + sampling method) was the best approximating model to the data (AIC weight = 0.71), and provided evidence for differences in capture rates among taxa and sampling methods (Table 1). In all instances, baited lines were the most successful method used to collect burrowing crayfishes. Baited lines represent a novel way to collect burrowing crayfishes without drastically disturbing the landscape. This method can only be used during nightfall, which makes incorporating

it into a busy field day rather problematic. That said, a suite of field situations exists that are extremely conducive to the use of this collection method. Baited lines always proved more favorable in forested situations, where the method is now our primary means of collecting upland burrowing species.

**Nate Taylor<sup>1</sup>, David Foltz<sup>1</sup>, Tricia Kangisser<sup>1</sup> and Zachary Loughman<sup>1</sup>. Conservation of West Virginia's Kanawha River bottomland burrowing crayfishes: species relationship to soil composition and compaction with an emphasis on *Fallicambarus fodiens*. West Liberty University<sup>1</sup>**

Crayfish conservation efforts have become increasingly more prevalent over the past decade, with the majority of conservation directed toward epigeal species. Burrowing crayfishes have not received the same level of intensity of investigation. In West Virginia, the Kanawha River floodplain (KRFP) of Mason and Putnam counties is the center of burrowing crayfish diversity in. Burrowing species occurring in bottomland forests in the region include *Cambarus thomai*, *Fallicambarus fodiens* and *Procambarus acutus*. *Cambarus thomai* is common throughout the KRFP bottomlands. Both *Fallicambarus fodiens* and *Procambarus acutus* are state endangered with distributions limited to the Kanawha River floodplain. Identifying preferred habitat for these species is the first step towards their conservation. In order to identify specific broad habitat types harboring high levels of burrowing crayfish diversity, soil analysis was conducted at eight sites located within the remaining bottomland forest of the KRFP. Soil compaction levels were determined using a soil compaction meter. Soil type was also determined through percentages of sand, silt, and clay particles found in soil cores extracted from each site. Loam soils had highest diversity levels, and were the only soil type in which both *Fallicambarus fodiens* and *Procambarus acutus* occurred simultaneously. *Fallicambarus fodiens* and *P. acutus* apparent dependence on attributes associated with loam soils warrants possible use of this soil type as a future predictor of potential sites harboring these state endangered species. *Cambarus thomai* was present at all sites, and was not allied to a soil type.

**Lauren L. Harding<sup>1</sup>, Joshua W. Campbell<sup>1</sup>, Richard Pirkle<sup>2</sup>, Jacob A. Kirkpatrick<sup>2</sup> and Jeffrey Williams<sup>2</sup>. Creepy Cave Invertebrates and Their Attraction to Different Types of Leaves. High Point University<sup>1</sup> Shorter University<sup>2</sup>**

Leaf litter is an energy source which is considered allochthonous organic material in a cave ecosystem. Leaf type has rarely been considered a criteria that may control abundance and species richness of cave invertebrates. We placed six types of leaves (red oak, white oak, dogwood, sugar maple, sweetgum, and loblolly pine) into three caves in Alabama and Georgia. Two sets of each leaf type were left in the twilight zone (close to the cave entrance where some light is received) and dark zone (an area with no light penetration) of each cave and were left in each cave for 30, 60, and 100 days. Leaf decomposition rates were measured and all invertebrates found on each leaf type were collected during each sampling period. Leaf type showed varying results and decomposition rates were relatively high.

**Microbiology**

**POSTER SESSION**

**Thursday, April 14 8:30 AM - 6:00 PM**

**Lisa A. Blankinship<sup>1</sup>. The Effects of Emu Oil on *E. coli*, *P. aeruginosa*, and *S. aureus*. University of North Alabama<sup>1</sup>**

The use of emu oil in health care settings has become popular over the past twenty years. Emu oil has been used with burn patients because of its regenerative properties. The oil is easily absorbed by the skin thus making it an ideal vector for topical application of medicines to the blood stream. However, the antimicrobial properties of emu oil have not been investigated. In this experiment, three common opportunistic pathogens (*Escherichia coli*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus*) were tested for their ability to grow in the presence of emu oil and utilize emu oil as a growth substrate. Emu oil mixed with known antimicrobial substances was also tested for each organisms' ability to grow. The antibiotic resistances profile for each organism was included for reference purposes.

**Brian S. Burnes<sup>1</sup>. Identifying Sources of Pathogen Contamination in the Upper Fish River, Alabama. University of West Alabama<sup>1</sup>**

Fish River, in the Weeks Bay watershed, Baldwin County, Alabama is on the Clean Water Act §303(d) list for pathogen contamination. Typical efforts to reduce potential sources of pathogen contamination, such as fencing-out cattle, providing an alternative watering source, and providing a hard-bottom crossing, have failed to reduce pathogen counts in the Fish River. Additionally, development in the upper Fish River watershed has added numerous potential sources such as septic systems, sewer lines, wastewater treatment plants, and urban stormwater runoff. To address this problem, *E. coli* from several sites in the upper Fish River were tested for antibiotic resistance and the results were analysed using linear discriminant function analysis. Antibiotic resistance patterns exhibited by the Fish River *E. coli* were compared to the antibiotic resistance of *E. coli* in a reference database generated from humans, cattle, and horses to establish the most likely source(s) of pathogen pollution. Although significant *E. coli* contributions were identified from humans, the predominant antibiotic resistance patterns appear to be from horses.

**Brian S. Burnes<sup>1</sup>. Antibiotic Resistance Patterns of *Escherichia coli* from the Gastrointestinal Tracts of Humans, Cattle, and Deer. University of West Alabama<sup>1</sup>**

One thousand one hundred and forty four strains of *E. coli* were isolated from a municipal wastewater treatment plant, cattle, or deer in the Dry Creek watershed in central Alabama and tested for resistance to ampicillin, chloramphenicol, erythromycin, neomycin, oxytetracyclin, spectinomycin dihydrochloride, streptomycin sulfate, and tetracycline hydrochloride. Eighty three unique resistance patterns were observed; 78 from humans, 8 from cattle, and 6 from deer. Resistance to no antibiotics was found in 39% of cattle *E. coli* and 48% of deer *E. coli*, but only 1% of human *E. coli*. Over 50% of the remaining cattle *E. coli* and over 46% of the remaining deer *E. coli* were resistance to one or two antibiotics, compared to 18% of the human *E. coli*. Resistance to three or more antibiotics was found in 7% of cattle *E. coli*, 0% of deer *E. coli*, and 81% of human *E. coli*. No *E. coli* from cattle or deer were resistant to ampicillin, chloramphenicol, neomycin, or oxytetracycline, however 82% of human *E. coli* were resistant to ampicillin, 58% to chloramphenicol, 38% to neomycin, and 43% to oxytetracycline. The results of this study suggest that cattle and deer have antibiotic resistance patterns which are clearly differentiable from humans, and that cattle and deer present lower risks of harboring or spreading antibiotic resistant *E. coli* than humans.

**Kristen T. Carlisle<sup>1</sup>, LaJoyce H. Debro<sup>1</sup> and Christopher A. Murdock<sup>1</sup>. Discovering Mycobacteriophage Cryptkeeper. Jacksonville State University<sup>1</sup>**

Over the past century, scientists have been working together in efforts to further knowledge of the Mycobacteriophage population throughout our planet. It is hoped that the obtained knowledge of this microscopic agent will lead to the production of vaccines and new medical treatments for antibiotic resistant bacteria, as well as lead to advancements in biological warfare weaponry. Knowledge of the Mycobacteriophage

population is being expanded by the collection and characterization of new viruses. Mycobacteriophage can be found in a variety of locations. My objective was to answer the question, "Is it possible to discover a Mycobacteriophage from an environmental sample collected from a cemetery in Ragland, Alabama?" To answer this question, I enriched an environmental sample using host bacterium *Mycobacterium smegmatis* and purified a Mycobacteriophage from the mixture. Analysis of the physical and genetic properties of the isolate, Cryptkeeper, support our conclusion that this is a newly discovered virus.

**Jennifer Kennard<sup>1</sup> and Brian Burnes<sup>1</sup>. Antibiotic Resistance Among *Escherichia coli* from Human, Bovine, and Equine Samples. University of West Alabama<sup>1</sup>**

*Escherichia coli* was collected from three different hosts from the Fish River Basin and tested for growth in response to thirteen different antibiotics. Antibiotic resistance was measured using the Kirby-Bauer Disc Diffusion Assay. Zones of inhibition were recorded and analyzed for correlation among the different animals. The *E. coli* from the human samples were found to be more resistant to ampicillin, amoxicillin, chloramphenicol, ciprofloxacin, erythromycin, gentamicin, nalidixic acid, and sulfisoxazole. *E. coli* obtained from equines were found to be more resistant to neomycin and streptomycin whereas *E. coli* obtained from bovines were found to be more resistance to spectinomycin, oxtetracycline, and tetracycline. In conclusion, there are clear differences in the antibiotic resistances among *E. coli* from the three hosts.

**Jasmine Reedes<sup>1</sup>, Tamanda Chanza<sup>1</sup>, Taylor Edwards<sup>1</sup>, Wayne Gordon<sup>1</sup> and Elaine Vanterpool<sup>1</sup>. Characterization of methicillin-resistant *Staphylococcus aureus* drug resistance and virulence factors. Oakwood University<sup>1</sup>**

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a growing concern in the medical community. Emerging MRSA strains have developed mechanisms of inactivating beta-lactam based antibiotics and antibiotics of different classes, including the protein synthesis inhibitors. Data from our lab demonstrates that MRSA strains can induce apoptosis in mammalian cell lines quicker than the non-pathogenic ATCC strain suggesting that there may be an increase in the expression of the virulence factors in these strains. Thus, it is our central hypothesis that multidrug resistant *S. aureus* can increase the expression and distribution of their virulence factors (example: proteases) in comparison to the ATCC strain. In this study, we are characterizing six clinical MRSA isolates and non-pathogenic *S. aureus* for their susceptibility to numerous antibiotics of several classes. In addition, we are analyzing the virulence factor expression including assessment of the membrane-bound and secreted proteases and their catalytic activities and distribution in the presence and absence of antibiotics. Findings of this study can provide a better understand of the pathogenesis of MRSA and can be used to develop better treatment strategies for Staph-related pathologies.

**Zachary L. Riley<sup>1</sup>. Isolation of *Kurthia gibsonii* from Bottom of Shoe. University of West Alabama<sup>1</sup>**

Tests were done to identify the type of bacteria species was on the bottom of a shoe that was exposed to canine feces. The microbe was motile, gram +, non-sporing, rod shaped, non-pigmented, aerobic, and it grew significantly at 42 degrees Celsius. Biolog plate test indicated the bacteria grew at 5 and 6 pH levels and at 5 to 6% NaCl solution. From comparison to Bergey's Manual of Determinative Bacteriology, 9th edition, it is concluded that the sample is *Kurthia gibsonii*. *Kurthia* can be found in cured meat that has been stored at elevated temperatures in addition to being in stomachs of mammals. But most often species of *Kurthia* can be found in the feces of domestic animals such as chickens and pigs, but the bacteria has also been found in the feces of human patients having diarrhea. Leaving a colony of *Kurthia* in the direct sunlight increased the growth rate,

therefore, decreasing the temperature of the environment discourages the growth of *Kurthia gibsonii*.

**Clea J. Moore<sup>1</sup>, Eric Donaldson<sup>2</sup> and Ralph Baric<sup>2</sup>. Characterizing Viral Genomes in North American Bats. Oakwood University<sup>1</sup> UNC - Chapel Hill<sup>2</sup>**

Bats are the reservoir species for several important human viruses, but few studies have investigated the role of bats in the pathway of disease, despite observations of bats harboring over 96 different RNA viruses, including Rabies (RABV), Dengue, and Severe Acute Respiratory Syndrome (SARS-CoV). We hypothesize that viral trafficking along orthologous cell receptors likely facilitates viral transmission between the human and bat species. We also believe that different viruses are found within different bat populations. Therefore, within this study we focused on characterizing the virome of 7-10 North American bat species and accomplished initial characterization for the genome of three viruses: a Rhabdo-like virus, a Coronavirus strain, and an *Acyrtosiphon pisum secondary endosymbiont phage* (APSE bacteriophage). By utilizing pyrosequencing to obtain viral sequences within bat fecal samples, partial viral genomes were constructed. PCR was then able to utilize those sequences to further fill in unknown viral regions and verify the sequence information. The complete genome assembly of these viruses, as well as other viruses found in bats, will expand our knowledge of which viruses naturally occur in different bat species and lay the foundation for furthering our understanding of viral cross-species transmission. HHMI; Grant #: 52006309

**Parasitology**

**POSTER SESSION**

**Thursday, April 14 8:30 AM - 6:00 PM**

**Natassia P. Watson<sup>1</sup>, Jason R. Rohr<sup>1</sup> and Neal H. Halstead<sup>1</sup>. EXAMINING THE COST OF RESISTANCE AND TOLERANCE THROUGH DOSES RESPONSE AND RESOURCE RESTRICTION. University of South Florida<sup>1</sup>**

In the presence of an infectious agent, organisms can respond by either reducing their parasitic burden (resistance) or limiting the damage caused by a parasite (tolerance). Disentangling the difference between resistance and tolerance in animals is a challenging feat that remains unaccomplished partly due to the need for well-designed experiments that can lend themselves to more meaningful statistical analyses. Trematodes are common parasites of amphibians that are useful in the study of resistance and tolerance. We sought to determine if there was variation in tadpole resistance and tolerance as function of both trematode exposure and available resources. We did so using a dose-response approach in which different levels of parasite exposures were crossed with different levels of available resources in a full factorial design. We also examined whether there were any differences in resistance and tolerance between tadpoles that were resource restricted before or after being exposed to parasites. Applying linear regression analysis to these results, we show that change in tadpole mass as a function of resource levels was dependent on the level of parasite exposure, but only when the tadpoles were resource restricted before parasite exposure. This suggests that amphibian condition before trematode exposure is more influential to the fitness consequences of trematode infections than amphibian condition after infection establishment. Body condition was not significantly affected by the treatments, and we await further results regarding effects of the treatments on development and the proportion of parasites that successfully infected the tadpoles. These findings could therefore be used to assess the suitability of amphibian habitats and/or determine ways in which to improve amphibian health.

**Lindsey Childress<sup>1</sup> and Ricky Fiorillo<sup>1</sup>. Trematode community of aquatic snails in Black Bayou Lake NWR in Northeast Louisiana. University of Louisiana at Monroe<sup>1</sup>**

All digenetic trematodes have heteroxenous life cycles that include a mollusk, typically a snail, as a 1st intermediate host. Our objective is to characterize the trematode community of snails in Black Bayou NWR. Parasitized snails shed free swimming larval stages called cercariae. Shedding cercariae is evidence that all hosts required for the digene to complete its life cycle are found at that locality. In contrast, adult worms in definitive hosts may represent infections acquired outside the system being studied. This is especially true for vagile hosts. In September 2010, we began collecting snails monthly from Black Bayou Lake. Through January, we have examined 2,703 snails for shedding cercariae (2,079 *Physa gyrina*; 609 *Micromenetus* sp.; 11 *Helisoma anceps*; 4 *Pseudosuccinea* sp.), and only 2 individuals harbored trematodes. One *P. gyrina* and one *Micromenetus* sp. were infected with xiphidiocercaria and furcocercous type cercariae, respectively. Prevalence (% of hosts infected) is extremely low but can vary significantly seasonally. We'll present data on snails collected through March 2011, and we'll continue to monitor snail populations through summer 2011.

**Katie Davis<sup>1</sup> and Ricky Fiorillo<sup>1</sup>. Parasites, host life-history, and rostrum characteristics of the grass shrimp *Palaemonetes kadiakensis*. University of Louisiana at Monroe<sup>1</sup>**

We measured rostrum size and counted dorsal and ventral rostral teeth of 111 grass shrimp, *Palaemonetes kadiakensis*, collected from two localities in Black Bayou National Wildlife Refuge in northeast Louisiana between September 2008 and May 2009. The rostrum is a long anterior and dorsal extension of the carapace that may function as a deterrent to predation. Shrimp were weighted, and body length was measured with a digital caliper. Individuals were sexed then necropsied and examined for metacercariae of an undescribed species of the microphallid trematode (Trematoda: Microphallydae). Metacercariae are thought to become sexually mature when shrimp are eaten by a bird definitive host. Digital photographs of the rostrum were taken with a Moticam 1000 digital microscope camera at 10X magnification with a Leica Dissecting microscope. All rostrum measurements and counts were made with a Motic Image Plus Software. Here we report data on the relationship between parasites, shrimp life history traits (body size and sex), as well as rostrum length and dentition pattern.

**Valentina R. Garbarino<sup>1</sup> and Joshua W. Campbell<sup>1</sup>. A Survey of Ectoparasites Across Twelve Waterfowl Species. High Point University<sup>1</sup>**

Ectoparasites are organisms found living on the surface of a larger host organism. Ducks and other waterfowl have numerous ectoparasites, such as feather mites and lice, living on their skin and feathers. However, there is little information on the types of ectoparasites found living on water birds and the impact they may have on waterfowl. We collected 50 hunter-killed waterfowl comprising 12 species. Ectoparasites were removed from the skin and feathers by thoroughly washing the waterfowl and passing all effluent through a sieve. Numerous species of biting and chewing lice were collected along with several feather mite species that were common to all waterfowl species collected. Abundance and species richness of ectoparasites varied greatly among species of waterfowl but also among individual birds. Our data indicates that factors other than sex, species, and location may control ectoparasite abundance and species richness on waterfowl.

**Erica Henderson<sup>1</sup>, Kruti Desai<sup>1</sup>, Kathryn Doornbos<sup>1</sup> and Alan F. Smith<sup>1</sup>. A continuing study of the prevalence of the causative agent of Rocky Mountain Spotted Fever (*Rickettsia rickettsii*) in field-collected *Dermacentor variabilis* from the Great Smoky Mountains National Park, NC. Biology Department, Mercer University<sup>1</sup>**

ERICA HENDERSON, KRUTI DESAI, KATHRYN DOORNBOS, AND ALAN F. SMITH. Department of Biology, Mercer University, Macon, GA 31207. A continuing study of the prevalence of the causative agent of Rocky Mountain Spotted Fever (*Rickettsia rickettsii*) in field-collected *Dermacentor variabilis* from the Great Smoky Mountains National Park, NC. Rocky Mountain Spotted Fever (RMSF) poses a significant public health threat with the highest rates of incidence occurring in North Carolina. In this ongoing study, tick collection was conducted during the 2009 summer season in the southeastern section of the Great Smoky Mountains National Park, predominantly within the Deep Creek area. A total of 312 *Dermacentor variabilis* were drag-cloth collected, individually preserved in 70% isopropanol at 20°C, and GPS coordinates were recorded. No other tick species were collected. Ticks were processed in sequence of collection via genomic DNA extraction, PCR amplification of disease-specific fragments, and agarose gel electrophoresis. A previously developed *R. rickettsii* amplicon, sub-cloned into the pDrive Cloning Vector (Qiagen) and confirmed by DNA sequencing, served as a reliable internal control template. Tick-specific control primers based upon the hypervariable, second transcribed spacer (ITS2) of the multicopy rDNA (5'-TCGCTCGTTCGTGTCACCGC-3' and 5'-TTCGCCATTCCGGCAGCAGAC-3') served as an additional control confirming successful genomic tick DNA extraction. An initial round of PCR based on the 16S *Rickettsia* rDNA (5' TGGCTCAGAACGAACGAACGCTA TC-3' and 5'-TTTACCGTGGTTGGCTGCCT-3') failed to generate a visible 1414-bp amplicon. However, a second round of amplification with nested internal primers to the *Rickettsia* rDNA (5'-CTTTTCGGTTTCGCAGCTAAC-3' and 5' TTTTAGGGATTTGCTCCACG-3') demonstrated the presence of the putative-RMSF pathogen in 11.1% of the *D. variabilis* tested to date. Funding was provided by the Mercer University Biology Department and Friends of the Great Smokies.

### Scholarship of Teaching & Learning

#### POSTER SESSION

Thursday, April 14 8:30 AM - 6:00 PM

#### **Crystie Baker<sup>1</sup>. A Mixed Methods Proposal to Measure the Effectiveness of Environmental Education Efforts. MMNS & USM<sup>1</sup>**

Presently, there is a lack of statistics-based research regarding the effectiveness of native environmental education efforts in Mississippi. As a result of this deficit, the current dissertation proposal was designed to answer the question, "does hands on Environmental Education (EE) affect student learning (compared to traditional direct instruction methods)? And if so, in what ways does it impact their learning?" To answer this question, the researcher will collect data from pre tests, post tests, delayed post tests, as well as interviews and questionnaires with the students involved in the study. Data will compare groups with the EE treatment to groups without the treatment (i.e., the groups who received the same material presented by direct instruction). Thus, both qualitative and statistical quantitative analyses will be conducted, providing subjective as well as empirical results. The addition of the qualitative component will provide insight into how the hands on EE activities affected the students' learning as well as their educational experience. The researcher predicts that students will learn more content and demonstrate increased comprehension when hands on EE activities are utilized.

#### **Chris Manis<sup>1</sup>, John Patrick<sup>1</sup> and Thomas P. Wilson<sup>2</sup>. Developing an Environmental Awareness Program: The Mill Creek Project. Dalton Middle School<sup>1</sup> University of Tennessee at Chattanooga<sup>2</sup>**

In 2005, environmental science faculty from the Dalton Public School System and the University of Tennessee at Chattanooga began a collaborative effort to develop a comprehensive environmental awareness program for 7th grade science students. The

primary foci of this project are two-fold: 1) to promote hand on service learning in science, technology, and mathematics; and, 2) continue to foster and cultivate a sound environmental ethic in tomorrow's leaders. Our target organisms are native amphibians and reptiles found on the Dalton Middle School Campus, and the project is entitled "The Mill Creek Project". Today, the Mill Creek Project has established several distinct and regionally recognized programs that cater to all socioeconomic classes and backgrounds. Furthermore, this effort has been incorporated in to the 7th grade environmental science curriculum. In short, the Mill Creek Project is turning young students into local leaders that are aware of the rich and diverse ecosystems that are found throughout their region, and more importantly these students are acquiring the necessary background to make sound environmental decisions that influence their families. In closing, the program has provided educational information on the regional biodiversity and ecosystems, the conservation of habitats, the scientific method, environmental toxicology, and population and community ecology to all interested parties.

**Bradley R. Reynolds<sup>1</sup> and Thomas P. Wilson<sup>1</sup>. Factors Leading to the Selection of an Undergraduate Environmental Science Major. University of Tennessee at Chattanooga<sup>1</sup>**

In spite of increased environmental awareness among the general public, environmental problems are increasing exponentially. The solution to today's environmental problems can be achieved in part by training more environmental scientists in our colleges and universities. Following a brief literature review, a mixed-methods approach is employed to better understand why students select environmental science as a major. Ultimately, it is determined that while both practical and affective concerns are important, the most important factor in selecting environmental science as a major is the potential for finding a job in the field. Recommendations and implications are included and explicated.

**Stephanie R. Songer<sup>1</sup> and Irene Kokkala<sup>1</sup>. Online Instruction in Undergraduate Microbiology: A Comparison of Hybrid vs. Fully Online Courses. North Georgia College & State University<sup>1</sup>**

Online instruction in laboratory courses is a relatively new endeavor for biology. However, with the expanding use of technology in education an increase in online delivery of biology courses has been noted. Despite the new online offerings there is the question of the effectiveness of online courses. Who are the students taking these courses and to what extent do they benefit? To address these questions, we surveyed undergraduate students in fall 2010 hybrid and fully online sections of medical microbiology. The hybrid sections had lecture material online and laboratory exercises two days per week on campus. The fully online students had the same online lecture materials, and in addition purchased laboratory kits to conduct their experiments at home. Students were surveyed at the outset of the semester to collect demographic data, as well as gauge their readiness for online instruction using a combination of the University System of Georgia's Student Online Readiness Tool (SORT) and questions we generated ourselves based on the American Society for Microbiology's recommendations for undergraduate coursework in microbiology. We also surveyed students at the end of the course to see to what extent they had mastered fundamental concepts and skills in microbiology. The two course types were compared to see if there were marked differences between the hybrid and fully online students in terms of student profile and performance.

## Ecology

## POSTER SESSION

Friday, April 15 8:30 AM - 6:00 PM

**Christy Buckles<sup>1</sup>, Joshua W. Campbell<sup>1</sup> and Matthew N. Waters<sup>2</sup>. Paleoeecology of a 64 cm Peat Core from Okefenokee Swamp. High Point University<sup>1</sup> Valdosta State University<sup>2</sup>**

Okefenokee Swamp, located in south Georgia, is comprised of 402,000 acres. The paleobiology of Okefenokee Swamp has not been thoroughly investigated. We obtained, processed, and examined a 64 cm peat core from Okefenokee Swamp for diatom assemblages, charcoal, nutrients, and heavy metals. The first 32 cm of the core shows a rich and varying amount of diatoms such as: *Frustulla rhomboids*, *Actinella punctata*, *Eunotia flexuosa*, *Pinnularia streptoraphe*, *Eunotia monodon*, *Anomoeoneis serians*, *Eunotia exigua*. In the last 32 cm of the core there is a transition from the rich sample of diatoms to abundant sponge spicules. Charcoal and heavy metal data showed various fluctuations with the diatom and spicule assemblages. Overall, several ecological changes in Okefenokee Swamp are detected throughout our peat core. Currently, we are waiting on Pb210 and C14 dates for our core.

**John A. Barone<sup>1</sup>, JoVonn G. Hill<sup>2</sup> and Lisa McGinnis<sup>3</sup>. Evaluation of Prairie Restoration Techniques in Blackbelt Prairies of Mississippi. Columbus State university<sup>1</sup> Mississippi State University<sup>2</sup> National Park Service<sup>3</sup>**

One threat to remnant blackland prairies in Mississippi is succession. In the absence of fire, the prairies become overgrown by cedar (*Juniperus virginiana* L.) trees and other woody species. We are examining the ecological effects and economic costs of three prairie restoration techniques on 21 plots (20 by 10m) in remnant prairies along the Natchez Trace Parkway. In the thin-and-haul treatment, *J. virginiana* trees are removed from the plots. In the thin, lay and burn treatment, the trees are cut but left on the plot and burned. In the burn treatment, the *J. virginiana* trees are burned standing. To evaluate the ecological effects of the treatments, we sampled the richness of grasses and forbs, grasshoppers and ants for the year prior to the initiation of the treatments and in the year after the treatments began. Unfortunately, because of wet winter conditions, burns were not possible during the first winter. However, a 2-way ANOVA (with year and treatments as independent variables) showed that plant species richness was significantly higher in both thin-and-haul and the thin, lay and burn plots (which had not yet been burned) compared with the controls. Year had no effect. Non-native species richness did not change significantly in the treated plots across years, despite the disturbance caused by the treatments. Across all the plots there were 115 native flowering species in 2009 and 114 in 2010. Preliminary results suggest that the different approaches to cedar removal have similar ecological consequences for species richness.

**Kathryn R. Selm<sup>1</sup>, C R. Rossell, Jr.<sup>1</sup>, H D. Clarke<sup>1</sup>, Jennifer Rhode-Ward<sup>1</sup> and Jonathan L. Horton<sup>1</sup>. Assessment of Browsing of the Federally-Threatened Virginia Spiraea (*Spiraea virginiana*) by Beaver along the Cheoah River, North Carolina. University of North Carolina at Asheville<sup>1</sup>**

Virginia spiraea (*Spiraea virginiana*) is a federally-threatened shrub endemic to the southern Blue Ridge and Appalachian Plateau physiographic provinces. Observations along the Cheoah River, where the largest population of *S. virginiana* occurs in North Carolina, indicate that beaver (*Castor canadensis*) browse *S. virginiana*. However, the effects of browsing on this population are unknown. The objectives of this study were to determine the relative abundance and relative extent of browsing of woody plants along the scour zone of the Cheoah River where *S. virginiana* is known to occur. Fifty belt transects (25 m long and 2.5 m wide) were randomly located along the center of the scour zone. Within each transect, all basal stems of woody plants ( $\leq 2.5$  cm dbh) were counted,

identified to species, and assessed for evidence of beaver browsing. A total of 4963 basal stems of 59 species of woody plants occurred in the scour zone. *Spiraea virginiana* accounted for 3.5% of the total number of stems and ranked eighth in relative abundance, and accounted for 8.8% of the total stems browsed which was fourth highest among all species. These results suggest that beaver are likely having an impact on this population of *S. virginiana*, with moderate levels of browsing possibly benefiting this species by stimulating vegetative reproduction. However, additional studies are needed to better understand the role beaver browsing plays in the population dynamics of this rare species.

**Megan A. Avakian<sup>1</sup>, Jessica Howells<sup>1</sup> and Ray S. Williams<sup>1</sup>. Effects of elevation and genotype on aphid infestation of *Solidago altissima*. Appalachian State University<sup>1</sup>**

Intraspecific genetic diversity within host-plant populations has been shown to alter the structure of associated arthropod communities, however the mechanisms behind this process are not well delineated. In this study, fifty-three genotypes of *Solidago altissima* were collected from six elevations ranging from 260 - 1227 m in Tennessee. Clones of each genotype were propagated from rhizomes and grown to maturity under standardized conditions outside of the Appalachian State University greenhouse (approximately 1000 m elevation). These plants were infested by aphids, providing an opportunity to examine aphid plant selection. Aphid abundance was visually ascertained and nondestructive plant biomass was measured. Foliar C:N, volatile terpene levels, leaf area, fresh and dry weights, and water content were determined. There was a significant effect of elevation and genotype on mean aphid abundance per gram plant biomass (aphids/g). Aphids/g was significantly different between genotypes within elevations for plants from 227 m ( $p < 0.013$ ), 585 m ( $p < 0.0001$ ), and 885 m ( $p < 0.01$ ). A significant negative correlation between elevation and aphids/g was found ( $r^2 = 0.73$ ,  $p < 0.025$ ). Plants from the lowest elevations (227 and 260 m) had the highest aphid abundance and were significantly different in abundance from higher elevations. This could be attributed to differences in plant quality. Our study suggests that these differences may structure herbivore diversity in genetically heterogeneous plant populations at different elevations.

**Laura E. Simmons<sup>1</sup> and Timothy O. Menzel<sup>1</sup>. The Influence of Management History and Interspecific Interactions on Ant Assembly at Topographically Similar Locations Within the Tugaloo Basin. Piedmont College<sup>1</sup>**

We proposed two hypotheses for explaining the assemblage of ground foraging ants at locations within the Chattahoochee National Forest in Northeast, Georgia. The first hypothesis was that habitat type has a significant effect on the assemblage of ants found at different sites. The habitat types being considered were ridge tops that had been managed for either hardwood trees or pine trees. A Multiple Random Permutation Procedure (MRPP), which compares within group distance to between group distance, was used to determine if there was a non-random relationship between ant assemblage and management type. The second hypothesis proposed that ant assemblage is affected by interactions between ant species. A C-score analysis was used to test for non-random species co-occurrence patterns. The relationship between ant assemblage and habitat type was not different from random ( $p = 0.158$ ), and habitat type does not appear to be a good predictor of ant assemblage. There was a non-random co-occurrence pattern ( $p = 0.0172$ ) indicating that interspecific interactions may be playing some role in determining ant species assemblage.

**William E. Stone<sup>1</sup>. Discovering the Diets of Bats through Analysis of Guano in northern Alabama. Alabama A&M University<sup>1</sup>**

We investigated the diet composition of four species of insectivorous bats from analyzing guano samples from bats collected using mist nets over streams in the Bankhead National

Forest, Alabama. Captured bats were identified, measured, held for an hour in individual 5-liter containers, and then released at the point of capture. The four species captured were Tri-Colored Bat (*Perimyotis subflavus*), Evening Bat (*Nycticeius humeralis*), Eastern Red Bat (*Lasiurus borealis*), and Northern Long Eared Myotis (*Myotis septentrionalis*). Guano samples were treated with 70% ethanol in the lab and the exoskeletons of insect prey were examined under a microscope and identified to taxonomic Order using a 10-point grid to compute percent composition for each species. A chi-square analysis was performed to compare the diet composition of the four species. The analysis demonstrated significant differences in prey consumed by different bat species. Coleoptera was the only Order found in all four species, and none of the species consumed all six Orders of insects that could be identified. *P. subflavus* consumed Coleopteran, Dipteran, Lepidopteran, Hymenopteran, and Hemipteran prey. *M. septentrionalis* consumed Coleopteran and Lepidopteran prey. *L. borealis* consumed Coleopteran and Dipteran prey. *N. humeralis* consumed Coleopteran, Dipteran, Lepidopteran, Hemipteran, and Blattodean insect prey. One sample from *M. septentrionalis* contained an intact specimen from the taxonomic Family Scolytidae, in the Order Coleoptera, a type of bark beetle that damages pine trees.

**Christopher Mowry<sup>1</sup>, Lesley Mobley<sup>1</sup>, Nathan Schwartz<sup>1</sup>, Thomas Baldvins<sup>1</sup>, Jennifer Sheldon<sup>2</sup> and Robert Crabtree<sup>2</sup>. Coyote (*Canis latrans*) diets in Yellowstone National Park. Berry College<sup>1</sup> Yellowstone Ecological Research Center<sup>2</sup>**

We are investigating coyote diets in Yellowstone National Park (YNP) by determining food remains in scats (n=1388) collected annually in spring (after snowmelt) and summer (usually July) in the Lamar Valley region over the past 20 years. Our analysis includes a comparison of the percent frequency of occurrence (PFO) of coyote food items in three distinct time periods: 1) prior to the reintroduction of gray wolves into YNP (1990-92), 2) during and recently following wolf reintroduction (1996-99), and 3) ostensibly after wolf populations stabilized (2003-2006). We are also comparing annual and seasonal coyote diets. Food remains (e.g., teeth, claws, hair) were extracted from coyote scat samples and compared to voucher specimens for identification to species whenever possible. Mammalian prey had a PFO of 85% or higher in all time periods. Uinta ground squirrels, voles, pocket gophers and ungulates (e.g., elk, deer, pronghorn antelope) made up the vast majority of mammalian prey. The average PFO of ungulate remains in coyote scats increased from 12% to 47.4% with the reintroduction of wolves and then leveled off to 31.8% during the wolf stabilization period. Conversely, average small mammal PFO went from 79.8% to 51.3% following wolf reintroduction and then to 66.6% during wolf stabilization. During time period 3 (wolf stabilization), ungulate PFO in coyote scats was consistently higher in spring than in summer. Vole PFO was generally higher in spring than summer across all time periods, while the reverse was true for Uinta ground squirrels.

**Szymanski A. Fields II<sup>1</sup>, Wubishet Tadesse<sup>1</sup>, Luben Dimov<sup>1</sup> and Callie Schweitzer<sup>2</sup>. LIDAR and Color Infrared Imagery to measure forest characteristics in the William B. Bankhead Forest, Alabama. Alabama A&M University<sup>1</sup> USDA Forest Service, Southern Research Station<sup>2</sup>**

Aerial platform discrete Light Detection and Ranging (LiDaR) and Color Infrared imagery (CIR) was incorporated to quantify forest structures and distinguish coniferous trees from deciduous trees for selected stands within the William B. Bankhead National Forest, Alabama. The broader focus of this study is to provide information and models to advance some forestry inventory methods as many agencies and companies transition from labor-intensive, field-derived stand characteristics to more cost-effective and punctual systems of using remotely sensed data. The ability of LiDaR to accurately measure individual tree heights was assessed through interpolation of LiDaR point clouds for the selected stands.

Tree species was classified using object-based classification of CIR via ENVI EX © software. The classification accuracy was statistically evaluated and validated through the implementation of commission and omission error, user and producer error calculations. Tree locations and heights in the form of a Canopy Height Model were derived from LiDaR bear earth returns, processed by a Digital Terrain Model; vegetation point clouds were processed via a Digital Surface Model. The resulting LiDaR tree height measurements were then modeled using TreeVaW © software package and compared with ground measured tree heights from each corresponding plot. An independent T-test was applied to assess the measurement accuracy of LiDaR. The results suggest that LiDaR derived measurements rival traditional in-situ methods in tree parameter estimation accuracy, and can exceed in-situ methods in cost-effectiveness and data collection time.

**Robert L. Hopkins II<sup>1</sup> and Jason H. Knouff<sup>2</sup>. Niche conservatism or niche evolution? The use of broad scale climate data to infer factors regulating species distributions and niche diversification. University of Rio Grande<sup>1</sup> Saint Louis University<sup>2</sup>**

The advent of global climate and topographic datasets has greatly enhanced the study of species distributions. Much research has aimed to estimate the environmental niche and assess the potential for rapid niche evolution in invasive species. The central assumption of this approach is the range of each of the environmental variables defining a species' niche accurately represents constraints on the species' distribution. We argue that the large number of spatially correlated variables used in this approach could invalidate this assumption and lead to inaccurate estimates of the environmental niche and spurious results when patterns of niche evolution are examined. We demonstrate our concerns using a dataset consisting of distributional information for 18 species of North American freshwater fishes from 17,794 sites, including both native and established introduced populations. In our analyses, we applied Boosted Regression Trees methodology integrating native population localities and eight commonly used climate variables to predict species distributions. The locations of introduced populations were then used to test whether the environmental niche of each species has shifted since introduction. Our results indicate significant niche differentiation has occurred in all species when all eight climate variables are used to assess niche differences between native and introduced populations. However, when only the most influential variable is used to assess niche differences between native and introduced populations, all species exhibit similar (i.e., conserved) niche parameters in native and introduced regions. Thus, depending on variable choice, the environmental niche is either conserved or has shifted in response to the novel environment.

**Jordan C. Roush<sup>1</sup> and Robert L. Hopkins<sup>1</sup>. Effects of Surface Mining on Freshwater Fish Distributions: A Case Study of Contrasting Life Histories. University of Rio Grande<sup>1</sup>**

Freshwater fish diversity is declining at an alarming rate across North America. Human land uses and disturbances within watersheds have been implicated as the primary cause of decline. The effects of surface coal mining, which results in dramatic changes at the landscape-level, has been relatively understudied in this context. In this study, we modeled the distributions of six fish species with contrasting life histories from the upper Kentucky River watershed (Ohio River drainage) using a variety of landscape compositions and pattern variables, with special emphasis on surface coal mining metrics. Boosted Regression Tree (BRT) analysis was used to develop the species distribution models, and examine the relative influence of each landscape metric on species presence/absence. Our results suggest that the distribution of each species was primarily governed by the watershed area, as this variable was of marked influence (> 12%) in all six models was the most influential variable in three of the models. The mean patch size of forest cover was also important in many cases – exceeding 30% influence in three of

the models. Only two species distributions were notably correlated with surface coal mining – Southern Redbelly Dace and Sharpnose Darter. Both species were negatively correlated with the mean patch size of surface mining in the watershed, with relative influences of 10.7% and 10.1%, respectively. In summary, the influence of surface mining varied according to species life history, with headwater species being most affected. For four of the six species, surface mining displayed no influence in the distribution models.

**Kristin A. Bakkegard<sup>1</sup> and Lawrence J. Davenport<sup>1</sup>. *Nephila clavipes* (Arachnida: Araneae): A Model Organism for Monitoring Climate Change in the Southeastern United States. Samford University<sup>1</sup>**

We propose that *Nephila clavipes* (Golden Silk Orbweaver) be used as a model organism to track climate change in the southeastern United States. As an ectotherm, it is sensitive to changes in local climatic conditions. More importantly, this large, unmistakable spider elicits a strong emotional reaction, especially from those unfamiliar with it. As its range expands, people will take notice, photograph it, and then post those pictures in the public domain via blogs and social or scientific websites which can be easily viewed by scientists. For a “starting point,” we here present the most complete range map to date for this species. This map shows that *N. clavipes*, traditionally restricted to the Gulf and Atlantic coastal areas of the southeastern United States, has recently (since 2000) expanded its range out of the Coastal Plain into counties north of the Fall Line.

**Connor A. Ojard<sup>1</sup>, Matthew Parker<sup>1</sup>, Betsy Dobbins<sup>1</sup> and Kristin Bakkegard<sup>1</sup>. A Novel Method for Evaluating Local Sediment Deposition in a Third-Order Urban Stream in the Southeastern United States. Samford University<sup>1</sup>**

Urban streams are undervalued ecosystems threatened with permanent and detrimental changes due to the effects of urbanization on their fragile ecosystems. Among the pollutants introduced by industrial and residential development, sediment causes some of the most widespread and overlooked damage to urban streams and their native species. Shades Creek, a 56.4-mile long stream that runs southwest through the Shades Valley in north-central Alabama, is a tributary to the Cahaba river, the longest free flowing river in Alabama. Although Shades Creek is a 303d listed stream due to sediment, little is known about the impact of point source bank erosion on local sediment deposition. As an assay into sediment movement, we deployed 48 ceramic tiles for 26 days and measured amounts of sediment deposited by the stream. This method has been used in first order stream in the Western US (Brian Helms, personal communication). We found that the average amount of sediment adjacent to the bank erosion site is significantly higher than that of the upstream control site ( $F=5.34$ ;  $p<0.01$ ). From this we conclude that bank erosion increased the local sediment load in this microhabitat of Shades Creek. The collection method appears effective for evaluating local differences in sediment deposition.

**Stephanie A. Whitaker<sup>1</sup> and Wubishet Tadesse<sup>1</sup>. Evaluating Hydrologic Response to Urbanization in the Flint River Watershed, North Alabama using Remote Sensing and GIS Technologies. Alabama A&M University<sup>1</sup>**

The Flint River watershed (FRW) located in north Alabama is a primary resource for drinking water, public recreation, and wildlife habitat for imperiled species in a rapidly urbanizing area. Urbanization results in an increase in the amount of impervious surfaces, such as roads, parking lots, and rooftops. This increase can intensify natural hazards such as drought and flooding, and increase runoff into streams. This project will develop land use scenario projections for the FRW, from the baseline year of 2000 to the year 2030, using the Prescott Spatial Growth Model (PSGM). The PSGM is used to develop growth scenarios from which to assess environmental impacts of increased urban growth. Land use for 2030 in conjunction with the hydrological process model, Soil & Water Assessment

Tool (SWAT), will be used to evaluate the contribution of land use land cover change (LULC) to sediment and water yield. Stream flow and turbidity will be evaluated for several different sites within the study area and used as input variables for SWAT. The projected land use for 2030 will portray three possible future scenarios, which have inherent differences related to conservation, planning, and open development. Specifically, this study will (1) analyze historical and current satellite remotely sensed data to detect potential future land use patterns and develop a comprehensive geodatabase for the study area, (2) utilize LULC and a hydrologic model to assess the river's health under different future scenarios, and (3) identify sensitive sub-basins and look at the degree to which spatial parameters can influence sedimentation processes.

**Heather Howell<sup>1</sup>, Allison Bohlman<sup>1</sup> and Helen Czech<sup>1</sup>. Aquatic Community Responses to Urbanization in the Flint River Watershed: Correlation between In-Stream Habitat Characteristics and Macroinvertebrate Assemblages. Alabama A&M University<sup>1</sup>**

The Flint River watershed drains the much of Madison County, Alabama. This area is undergoing rapid changes in land cover due to increasing population and development. In order to understand the relationship between urbanization, habitat changes, and benthic macroinvertebrate community structure, in-stream habitat characteristics were measured, including substrate composition, embeddedness, mesohabitat variability and structure, as well as streambank characteristics. In addition, macroinvertebrates obtained through kick net sampling were identified to family or genus, in the case of Ephemeroptera, Plecoptera, and Trichoptera. Subwatersheds were characterized as to degree of urbanization using 2005 land use land cover data generated by object based classification of Landsat imagery. Indirect gradient analysis and correlation analysis was used to make composite habitat variables. Direct gradient analysis was used to examine relationships between habitat variables, urbanization metrics, and macroinvertebrate community composition. Preliminary results indicate that urbanization and agriculture both adversely affect macroinvertebrate communities through changing substrate characteristics. However, developed land cover is more predictive of the complete absence of sensitive taxa. In addition, the closeness of the relationship between land cover and macroinvertebrate community composition is a function of scale. Further investigation will examine what role water demand in the subwatersheds has to community structure and its link to land cover change.

**Leslie Ouy<sup>1</sup>, Michael K. Moore<sup>1</sup> and Alan F. Smith<sup>1</sup>. Interaction of biotic and abiotic factors influencing the distribution of Bronze frog tadpoles along a water depth gradient. Department of Biology, Mercer University<sup>1</sup>**

Numerous lab-based studies have demonstrated the effects of both abiotic (dissolved oxygen, temperature, pH) and biotic factors (refuge use, predator-prey interactions) on the survival of anuran larvae. Recent studies have begun to elucidate how interactions between such factors regulate growth and distribution patterns in pond environments. In this study, Bronze frog (*Lithobates clamitans clamitans*) larvae and Odonata nymphs (Aeshnidae) were sampled along transects (perpendicular to the shoreline) of increasing depth in a small farm pond located in Central Georgia. Dissolved oxygen, temperature, and percent ground cover (i.e., aquatic vegetation) were all influenced by depth. The abundance of tadpoles along the gradient displayed an inverse relationship with odonates. The observed distribution of these species appears to be related to the well-known predator-prey dynamic between these groups. Tadpole abundance was greatest in depth ranges that increased the likelihood of survival. Tadpoles were more common in quadrats where vegetative cover was plentiful and dissolved oxygen was relatively high. Increased density of vegetation may provide essential cover for tadpoles, and possibly reduce the effectiveness of the sit and wait mode of predation displayed by Odonata nymphs.

Alternatively, warmer, low oxygen environments with less vegetation likely elicit tadpole behaviors that increase visibility and risk of predation by odonates.

**Dalisa Kendricks<sup>1</sup>. The Relationship of Water Quality to the Taxa Richness of Aquatic Macroinvertebrates in the Flint River, Alabama. Alabama A&M University, Butler High School<sup>1</sup>**

Good water quality is beneficial to both aquatic organisms and humans, and taxa vary in their response to water quality impairment. Therefore, by assessing the community of aquatic organisms, one may determine how impaired or unsuitable the water is for drinking or other use. In order to test how water quality affected taxa richness, both basic water quality data and macroinvertebrate data were collected at ten locations within the Flint River Watershed. The data were analyzed using Canonical Correspondence in CANOCO to determine where the water quality of a particular site falls within a gradient of poor to good. We then assessed the community composition and taxa richness within the stream sites. Taxa richness was dependent upon where streams fell within the gradient. The closer a stream was to the poor water quality classification end of the gradient, the lower the taxa richness was, and, in the streams with poor water quality, the abundance was high, but lacked taxa richness. Only taxa with high tolerance levels were found in streams with poor water quality; inversely, a large amount of sensitive taxa were found in streams with fair to good water quality. This allows sites in the Flint River to be classified as to their level of impairment.

**Lee Stanton<sup>1</sup>. Measuring marsh plant productivity and micro-, meio-, and macrofaunal abundance and diversity in response to oiling in a Northern Gulf of Mexico salt marsh. University of West Alabama<sup>1</sup>**

Much uncertainty exists regarding the impact that oiling may have on the ecology of intertidal salt marsh systems. The Deepwater Horizon event provides a unique opportunity to assess the manner in which salt marsh communities respond to stressors of this nature. In addition, it provides an opportunity to evaluate the long-term response of the salt marsh community at several levels. Our goal is to quantify the impacts to microbial and meiofaunal distributions, plant diversity and productivity, and macrofaunal habitat utilization by comparing oiled to non-oiled salt marshes in coastal Alabama and Louisiana. We have begun sampling microbial and meiofaunal distributions, plant diversity and productivity, and macrofauna habitat utilization in both oil-impacted and non-impacted locations at Point aux Pins (PAP) salt marsh in south Mobile County, Alabama. Information from NOAA's SCAT-Mobile Ground Observations ([www.geoplatform.gov/gulfresponse](http://www.geoplatform.gov/gulfresponse)) on August 3, 2010 indicate light and moderate oiling on the eastern shore of PAP, as well as comparable non-oiled areas. Similar samples will be collected quarterly from marsh locations near Port Fourchon, LA. The SCAT-LA Ground Observations indicate heavily oiled locations in Timbalier Bay marshes beginning in May of 2009, with adjacent areas free from oiling. Louisiana sites will be sampled only for microbial, meiofaunal, and plant community composition, and will provide a heavily oiled/non-oiled point of reference for comparison to Alabama sites. While Alabama and Louisiana salt marsh system are fundamentally different in structure, a comparison of oiled and non-oiled sites in the two areas may provide insight into how these two distinct communities respond to and recover from oil stress.

**Stephen C. Landers<sup>1</sup>, Frank A. Romano III<sup>2</sup> and Craig A. Schimmer<sup>1</sup>. Analysis of the BP Deepwater Horizon oil spill impact using meiofauna. Troy University<sup>1</sup> Jacksonville State University<sup>2</sup>**

Meiofaunal animals live in the sediment and are generally defined as organisms smaller than 1mm. A multi-year study of the Gulf of Mexico meiofauna by Troy University and

Jacksonville State University has provided pre-spill data on meiofaunal abundance and diversity before the Deepwater Horizon disaster. Post-spill samples have been collected and are being analyzed. A comparison of Fall 2010 with Fall 2009 meiofaunal abundance from the North Central Gulf of Mexico will be presented. Preliminary data indicate that nematode and copepod average abundance per sediment core were elevated in 2010 compared to 2009 though the nematode/copepod ratio was similar between the two years (14.29 in 2009, 14.60 in 2010). Polychaete abundance per core increased in 2010. Additional abundance data for foraminiferans, radiolarians, kinorhynchans, and other phyla will be compared. The authors thank NOAA and the NMFS, SEFSC Mississippi Laboratory for providing ship time and sample collection on the R/V Gordon Gunter and R/V Pisces. This research is supported by a Gulf Research Initiative grant funded by BP and administered by the Alabama Marine Environmental Sciences Consortium (Dauphin Island Sea Lab).

**Candice S. Canady<sup>1</sup> and Kelly H. Kilbourne<sup>2</sup>. Replicating Surprisingly Cool Coral Geochemistry-Based Paleotemperatures in the Caribbean at the End of the Little Ice Age. Southern Arkansas University<sup>1</sup> Chesapeake Biological Laboratory<sup>2</sup>**

Replicating paleoclimate records is necessary to distinguish between climate and non-climatic signals in proxy-based climate reconstructions. This study reproduced a coral  $\delta^{18}\text{O}$  record from southwestern Puerto Rico using a *Montastraea faveolata* collected at the same location and time as the 04LPTA specimen reported by Kilbourne et al. (2008). The new record extends from 1906-2004 and consists of 13.4mm subsamples representing ~1.8yrs each. The data have a mean  $\delta^{18}\text{O}$  value of -4.15.04 per mil and a -0.002 per mil/year decreasing trend, indicating about 1°C warming and/or 1psu freshening over the nearly hundred year record. A mean offset of 0.19.05 per mil between the two cores for the years 1906-2004, is consistent with the inter-coral  $\delta^{18}\text{O}$  variability found in previous studies. The  $\delta^{18}\text{O}$  variability within the two cores is similar, especially at the decadal scale. The Pearson's correlation coefficient for the 2-year resolution record is 0.62, whereas that of the 10-year smoothed data is 0.94. The results indicate that the coral  $\delta^{18}\text{O}$  from the previous study are reproducible within the expected error and that the Caribbean Sea can experience relatively large climate fluctuations.

**Sarah Cranston<sup>1</sup> and Mark S. Davis<sup>1</sup>. LEAF CARBON:NITROGEN RATIOS AND CHEMICAL DEFENSE IN PLANTS. North Georgia College & State University<sup>1</sup>**

LEAF CARBON:NITROGEN RATIOS AND CHEMICAL DEFENSE IN PLANTS, Sarah Cranston and Mark S. Davis, North Georgia College & State University, Dahlonega, GA, 30533. We investigated the relationship between nutrient level and chemical defense in plants. Forage plants might be desirable to herbivores because of higher nitrogen content, and therefore a lower carbon : nitrogen (C:N) ratio. Leaves of ten plants from each of three toxic species (butterfly weed, spotted water hemlock, dog hobble) and three nontoxic species (goldenrod, joe-pye weed, muscadine) were collected, washed, blotted, and then dried for 36 h at 50° C. Dried samples were bagged, assigned a numerical code for identification, and sent to the Stable Isotope/Soil Biology Laboratory at the University of Georgia for C:N ratio determination. Leaves from each plant were homogenized to talcum powder consistency (< 250  $\mu\text{m}$ ), and percent carbon and percent nitrogen levels (per mg of dried homogenized leaf tissue) were determined by blind observers using the Micro-Dumas Combustion method. C:N ratio data were analyzed using a nested (hierarchical) ANOVA with species nested within toxic and nontoxic groups. We found no significant difference in C:N ratio between toxic and nontoxic plants ( $P=0.81$ ) and conclude that chemical defense in these plants is not associated with higher leaf nitrogen content.

**Lois A. O'Boyle<sup>1</sup> and Wayne A. Bennett Jr.<sup>1</sup>. Evaluating Thermal Ecology of Dusky Pipefish and Gulf Pipefish. University of West Florida<sup>1</sup>**

Little is known about the thermal tolerance of pipefishes that which, across their latitudinal range, regularly experience large seasonal and diel shifts in water temperature. In this study, we used critical thermal methodology (CTM) to estimate upper and lower thermal limits of dusky (*Syngnathus floridae*) and gulf pipefish (*Syngnathus scovelli*) inhabiting grass beds in the Gulf of Mexico. Acclimation temperatures ranged 11-33°C for gulf and 12-32°C for dusky pipefish. Critical thermal maxima and minima were significantly correlated with acclimation temperature ( $p < 0.0001$  in both species) and accounted for 93-98% of the variability in CTM. Gulf pipefish had both the highest CTmaxima, 39.6°C, and the lowest CTminima, 3.2°C. Polygons calculated for dusky and gulf pipefish had total areas of 617°C<sup>2</sup> and 736°C<sup>2</sup>, respectively. Gulf pipefish possess a larger intrinsic tolerance compared to dusky pipefish, which may suggest a well developed mechanism for thermal tolerance. Differences in thermal tolerance between dusky and gulf pipefish may indicate disparate use of seagrass habitats. Continued patterns of sea surface warming could impact local pipefish populations and challenge them to seek new habitats.

**Florence C. Anoruo<sup>1</sup> and David Lincoln<sup>2</sup>. Nitrogen Availability and the Rate of Nitrogen Fixation by Frankia. Claflin University<sup>1</sup> University of South Carolina, Columbia<sup>2</sup>**

FLORENCE ANORUO1 AND DAVID LINCOLN2. Claflin University1, University of South Carolina2. Nitrogen Availability and the Rate of Nitrogen Fixation by *Frankia* 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 *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°C and 22°C 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.

**Richard L. Boyce<sup>1</sup>, Richard D. Durtsche<sup>1</sup> and Joshua Shouse<sup>1</sup>. Impact of the invasive Amur honeysuckle (*Lonicera maackii*) on stand transpiration in a wetland forest. Northern Kentucky University<sup>1</sup>**

Amur honeysuckle is an invasive shrub found in the Ohio River Valley that excludes native plants from areas that it invades. Its effect on water use by a wetland forest in Kentucky near the Ohio River was determined during the summer and fall of 2009. A mature forest stand was compared with a second-growth stand on the St. Anne Wetlands Research and Educational Center in Melbourne, KY. While the mature stand had a very sparse shrub canopy, the second-growth stand had a dense Amur honeysuckle cover. Shrub basal area was more than 5 times greater in the second-growth stand, and >85% was honeysuckle. Transpiration rates from trees were similar in the two stands. Shrub transpiration from the mature stand was only 1.9% of tree transpiration (10% due to honeysuckle) but 9.1% (6.6% due to honeysuckle) from the second-growth stand. Shrub transpiration was

dominated by honeysuckle in the second-growth stand. Because of its extended leaf-out period, honeysuckle continued to transpire late in the fall, when tree and native shrub transpiration has ceased. Honeysuckle transpired the equivalent of ~10 mm of rainfall in the second-growth site over the monitored period, whereas it transpired the equivalent of ~1.9 mm in the mature site, a > 5-fold increase. The additional transpiration caused by Amur honeysuckle may shorten the lives of ephemeral ponds and streams in wetlands, with adverse impacts on organisms, such as amphibian larvae, that require them.

**Caitlin A. Peterson<sup>1</sup> and Cynthia C. Bennington<sup>1</sup>. Ecotypic variation in stomatal characteristics of *Eriophorum vaginatum*. Stetson University<sup>1</sup>**

In the Arctic tundra, increases in both temperature and atmospheric carbon dioxide are predicted to result in changes in nutrient cycling, soil decomposition rates, and plant community composition (Chapin & Shaver 1996). *Eriophorum vaginatum* is a dominant sedge in tussock tundra throughout much of Alaska. Although genetic differences among populations in morphology as well as overall performance of *E. vaginatum* have been well studied, stomatal characteristics have not been documented. From 1980-82, Shaver et al. (1986) established six reciprocal transplant gardens of *E. vaginatum* along a latitudinal gradient in Alaska's interior to model changes that might occur in the event of warming temperature. I created impressions of the abaxial leaf surfaces of the transplanted individuals using clear nail polish and viewed them under a light microscope. I measured stomatal density and size (length of guard cells) for all individuals and performed separate two-way analysis of variance tests to quantify the effect of genetics and environment on stomatal characteristics. I found evidence for genetic differences among populations in stomatal density as well as a general trend of increasing density with increasing temperature. My data also suggest that stomatal size is influenced by both genetics and environment, and that changes in size in response to the environment may be restricted by an individual's ecotypes. Because of the importance of stomata in plant gas exchange processes, understanding the response of stomatal characteristics is critical for predicting physiological responses of plants to future changes in the Arctic environment.

**Alison N. Carey<sup>1</sup> and Matthew Klukowski<sup>1</sup>. EFFECTS OF FOOD DEPRIVATION ON PLASMA CORTICOSTERONE AND NUTRIENT METABOLITE LEVELS IN WATER SNAKES, *NERODIA SIPEDON*. Middle Tennessee State University<sup>1</sup>**

Food restriction has been shown to be stressful in a variety of vertebrates, but little work has been done in snakes. The purpose of this study was to determine if plasma corticosterone levels rose in response to a mild food deprivation in water snakes *Nerodia sipedon* and to determine the effects of food deprivation on plasma triglyceride, uric acid, glucose, and lactate levels. Snakes that were starved for 15 days lost body mass, had elevated baseline corticosterone and depressed levels of triglycerides and uric acid. Elevation of corticosterone levels would be expected to help snakes mobilize stored energy, such as fat and protein, to allow them to survive periods of restricted feeding. Depressed levels of triglycerides seem to be associated with mild starvation in snakes. Uric acid is the main excretory product of protein breakdown in reptiles. Low uric acid levels might also be a useful marker of starvation.

**Timothy E. Baldwin<sup>1</sup> and Yong Wang<sup>1</sup>. Use of Various Life Stages of Mole Salamanders, *Ambystoma talpoideum*, to Assess Local and Landscape Influences on Reproductive Fitness in Northern Alabama. Alabama A&M University<sup>1</sup>**

Mole Salamanders, *Ambystoma talpoideum*, are traditionally a floodplain species, but they have been found within the southern Appalachians. The populations within the Appalachians, especially the Cumberland Plateau are disjunct populations. Within this study, we investigated relationships between adult, larval, and metamorphic salamanders

and the wetlands that they use for reproduction. We believed there would be a difference in mole salamander adult, larvae, and metamorphic abundances as well as varying size metrics across various wetland types. Wetlands were classified to three types based on the amount of canopy cover in the landscape and surrounding the wetlands: open canopy (pools with no canopy trees within 3 meters of the wetland edge), forested (pools surrounded by forests with trees in the basin), and perimeter canopy (pools surrounded by canopy trees with no trees in the basin). Canopy type and environmental landscape variables were believed to influence adult amphibians that migrate from terrestrial refuges in order to reproduce. The study was executed between June, 2008 and January, 2011. During this time, twenty four vernal pools were sampled biweekly. Three minnow traps were anchored at three different distances at each wetland. The three distances were one, two, and three meters from the shoreline. Statistical analyses were used in order to determine the difference between environmental variables within and surrounding wetlands where Mole salamanders reproduce. Analysis of Variance was used to compare differences in animal data across wetland types. Multiple linear regression was used to compare the relationship between environmental parameters and animal data.

### **Genetics - Cell & Molecular Biology**

#### **POSTER SESSION**

**Friday, April 15 8:30 AM - 6:00 PM**

**Yoedono Sovyanhadi<sup>1</sup>, Juliet Duran<sup>1</sup>, Leonard Williams<sup>2</sup> and Marta Sovyanhadi<sup>1</sup>.  
PRELIMINARY STUDY ON ANTI-RADIO-RESISTANCE POTENCY OF PEPTIDE-YY,  
VITAMIN C AND VITAMIN E USING HEp-2 HUMAN LARYNX CANCER CELLS.  
Oakwood University<sup>1</sup> North Carolina A & T State University<sup>2</sup>**

The development of cellular resistance during cancer treatment has become a critical obstacle to successful cancer therapy. Studies revealed that radio-resistance which usually develops from fractionated irradiation procedure is strongly correlated to the activation of a radiation-responsive transcription factor NF-kappaB. The naturally occurring gut hormone peptide-YY (PYY), vitamin C and vitamin E are all known as inhibitors for the activation of NF-kappaB, and therefore they are instrumental in helping solve the problem of tumor radio-resistance. In this project, the effectiveness of peptide-YY (PYY), vitamin C and vitamin E for preventing the development of radio resistance in human larynx cancer cell line (HEp-2) were evaluated in vitro. In this experiment, PYY (375 pM), vitamin C (125 µM) and vitamin E (12.5 µM) were added to the culture media at 48 hours after seeding of 100,000 cells/mL. The adjuvants were used singly as well as in combination. Except for the controls, cell cultures were exposed to UV radiation at 15 J/m<sup>2</sup> for five consecutive days to induce radio resistance. The cells were transferred into new media and were again exposed to radiation. Cells from each trial were then sub-divided into five groups for UV exposure at 0 J/m<sup>2</sup>, 25 J/m<sup>2</sup>, 50 J/m<sup>2</sup>, 75 J/m<sup>2</sup> and 100 J/m<sup>2</sup>. Results of this study showed a synergistic effect of vitamin E and PYY when combined with UV radiation. Vitamin E and PYY might have effectively inhibited the activation of radiation-responsive transcription factor such as NF-kappaB, thereby enhancing the effect of radiation. Surprisingly, vitamin C increased the cell survival when used in combination with UV radiation. The effects of PYY, vitamin C and vitamin E compounds when combined with radiation therapy need further elucidation. The physiological pathways of these substances that contribute in regulating gene expressions and the epigenetic factors that enhance or inhibit their functions are the main interest for future studies. Key Words: PYY, Vitamin C, Vitamin E, HEp-2 cells, radio-resistance.

**Avinash Sreedasyam<sup>1</sup>, Geetika Trivedi<sup>1</sup>, Peter E. Larsen<sup>2</sup>, Frank R. Collart<sup>2</sup>, Gopi K. Podila<sup>1</sup> and Leland J. Cseke<sup>1</sup>. Defense and stress response regulation during**

**Populus tremuloides - Laccaria bicolor ectomycorrhization. University of Alabama in Huntsville, Huntsville, AL<sup>1</sup> Argonne National Laboratory, Lemont, AL<sup>2</sup>**

Interactions between dominant tree species in temperate, boreal and montane regions with soil fungi develop into symbiotic structures called ectomycorrhizae. The exchange of nutrients and metabolites between these partners is elemental for the success of this association. Ectomycorrhization also provides resistance in plants against biotic and various abiotic stress conditions. Though the importance of ectomycorrhizal associations is far recognized, molecular mechanisms underlying its protective nature against stress in host plants and defense response regulation for establishing the mutualistic lifestyle is not clear. In this study, we used the next generation Illumina sequencing technology to generate 310 million RNA-sequence reads to profile gene expression associated with transition to mycorrhizal state and fully-formed mycorrhizae in *Populus tremuloides* with *Laccaria bicolor*. We analyzed expression pattern of genes involved in regulating stress and defense responses in symbiotic partners and families of transcription factors likely to be overlooking the defense mechanism in context of mutualistic interaction. Our results suggest that fungal transcription factors that regulate various cellular processes and stress responses like Zn(II)-2Cys6, C2H2, CCHC-type zinc finger and plant TFs belonging to AP2-EREBP, bHLH, WRKY and MYB families are among the highly expressed TFs during early interaction and in symbiotic organ. We are currently undertaking comparative transcriptomics approach involving comparison of mycorrhizal transcriptome with biotic and abiotic stress (arsenic) as well as nutrient (nitrogen and phosphorus) starvation studies to identify poplar defense/stress response molecular events specific to ectomycorrhiza formation.

**Colleen Mikelson<sup>1</sup>, Navia Stephens<sup>1</sup> and Jose Barbosa<sup>1</sup>. Oxidative stress patterns of ald3 and ald4 knockouts of *Saccharomyces cerevisiae* and possible abatement by caffeine. Dept. Biology & Environmental Sciences, University of Tennessee at Chattanooga<sup>1</sup>**

The consumption of caffeine is popular worldwide and research into this powerful psychoactive stimulant is now starting to focus on its potential to reduce the effects of oxidative stress on cells through its ability to scavenge hydroxyl radicals. Studies using rats have shown a reduction of oxidative stress in liver cells and lens tissue after oral administration of caffeine. The production of  $\beta$ -alanine is dependent on the cytosolic aldehyde dehydrogenase isozyme, (ald3p). The mitochondrial isozyme, (ald4p), is responsible for the production of acetate from acetaldehyde in yeast. Previous research has shown increased sensitivity to oxidative stress in two knockout strains of *S. cerevisiae*, ald3 and ald4. In this experiment, the hypothesis that caffeine would display the same oxidative stress attenuation was tested in *S. cerevisiae*, using both the ald3 and ald4 knockouts and the wild type strain, BY4743. Two different concentrations of caffeine were added to the growth cultures of BY4743, ald3 and ald4 strains of *S. cerevisiae*. Hydrogen peroxide induced oxidative stress levels were measured through a survival rate determination and the DCFHDA assay, a detector of overall oxidative stress. Support for the antioxidant properties of this popular drug translated into an easily manipulated model organism would be beneficial to the further exploration of this chemical and the extent of its biological properties

**Jennifer Curran<sup>1</sup>, Vishal Patel<sup>1</sup> and Jose Barbosa<sup>1</sup>. Identification of *Arabidopsis thaliana* genes involved in stress tolerance by heterologous expression and complementation in yeast uga1 mutant. Dept. Biology & Environmental Sciences, University of Tennessee at Chattanooga<sup>1</sup>**

The yeast UGA1 gene encodes GABA aminotransferase, one of the three enzymes of the GABA shunt pathway, which converts GABA to succinyl semialdehyde. GABA is a

ubiquitous compound that accumulates in many species in response to a myriad of stresses. Therefore, the activity of this enzyme should not only allow yeast cells to metabolize and use GABA as carbon and nitrogen source but should play an important role in stress tolerance. Yeast cells carrying disruption in YGR019w (UGA1) gene were tested for their ability to grow on GABA as the sole nitrogen source, in addition to their response to salinity, osmotic, and oxidative stresses. Results of the study showed that *uga1* mutant cells had an increased sensitivity to salinity stress, osmotic stress, and oxidative stress. With the intent to identify plant orthologs of yeast UGA1, three *Arabidopsis thaliana* cDNA's referred to as AtputAT1, AtputBAAT, and AtputProt, which show high homology with the yeast UGA1 and other aminotransferases, were expressed in yeast cells carrying disruption in the UGA1. The endogenous yeast UGA1 gene was also expressed in the yeast *uga1* mutant. All three *Arabidopsis* cDNAs, AtputAT1, AtputBAAT, and AtputProt complemented the salinity and osmotic stress sensitive phenotype of the yeast *uga1* mutant to the same extent. However, only AtputAT1 and the endogenous yeast UGA1 gene complemented the oxidative stress sensitive phenotype of the *uga1* mutant and its ability to grow on GABA as the sole source of nitrogen. On the basis of sequence similarity it is evident that AtputAT1 encodes an *Arabidopsis* GABA-T. Further bio-informatics studies have revealed that in spite of the great sequence similarities among these *Arabidopsis* cDNA's, there are important structural differences among encoded proteins that confer to them some specific and differing activities.

**Geetika Trivedi<sup>1</sup>, Avinash Sreedasyam<sup>1</sup>, Peter E. Larsen<sup>2</sup>, Frank R. Collart<sup>2</sup>, Gopi K. Podila<sup>1</sup> and Leland J. Cseke<sup>1</sup>. Transcriptome analysis of *Populus tremuloides* X *Laccaria bicolor* ectomycorrhiza to understand metabolic re-programming during ectomycorrhizal symbiosis. University of Alabama in Huntsville<sup>1</sup> Argonne National Laboratory<sup>2</sup>**

Ectomycorrhizal symbiosis is crucial component of forest ecosystem because not only it helps to improve plant health by overcoming nutritional limitations but is also critical for nutrient cycling and provides resistance to various biotic and abiotic stresses. Studying the molecular mechanisms and regulatory machinery of ectomycorrhizal symbiosis would help to better understand effects of mycorrhizal symbiosis on important ecosystem processes like nutrient mobilization, carbon cycling and bioremediation. We used NGS to identify the genes regulated in the metagenome comprised of *Laccaria bicolor* and *Populus tremuloides* in ectomycorrhizal symbiosis. Transcriptomic analysis of the plant as well as fungal partner was done simultaneously in this study. We identified the key transporters, signaling components and regulators expressed during mycorrhizae in symbionts. Our result revealed that uniquely expressed transcription factors and signaling components most likely comprise the regulatory machinery that monitors and controls nutrient flow between symbionts. This information helped to understand how both partners make shift in their metabolism and its regulation in order to form ectomycorrhizae. A predicted model for mycorrhizal regulome was developed which consists of differentially expressed transcription factors, signaling components and transporters which regulate the flow of nutrient between ectomycorrhizal partners.

**Valarie A. Burnett<sup>1</sup>. An immunohistochemical study of GABA+ cells in rat perirhinal cortex and neuronal loss following Li-pilocarpine-induced status epilepticus. University of South Carolina-Union<sup>1</sup>**

VALARIE BURNETT. University of South Carolina-Union, University of South Carolina School of Medicine. An immunohistochemical study of GABA+ cells in rat perirhinal cortex and neuronal degeneration following Li-pilocarpine-induced status epilepticus. Perirhinal cortex (PR) is important in recognition memory and temporal lobe epilepsy (TLE), but little is known about its cell populations or its vulnerability in TLE. Previously, we reported that most calretinin (CR), parvalbumin (PV), and somatostatin (SOM) cells in rat PR contain

GABA and do not colocalize, and these cell types exhibited significant loss 6 days after Li-pilocarpine-induced status epilepticus (SE). Understanding PR's role in TLE will require detailed knowledge of its GABA+ cells. Thus, the present study analyzed the distribution of GABA+ cells and their coexpression with CR, PV, and SOM. GABA+ cells were highest in layers (L) 2 and 5, and PV+, SOM+, and CR+ cells collectively accounted for the majority of GABA+ cells. In addition, a Li-pilocarpine model of TLE was used to study selective changes in PR neurons during the acute and early silent phases following SE. Fluoro-Jade B staining revealed laminar (L) differences in neuronal degeneration at 1, 3, and 6 days (d) post-SE. Moderate damage occurred in L1 at 3d. High degeneration occurred at 1d for L 2/3; 1, 3, & 6d for L5; and 1 & 3d for L6. Given the differences in temporal vulnerability and frequencies of CR+, PV+, and SOM+ cells, future experiments are planned to examine selective vulnerability of these cells at 1, 3, and 6 d post-SE.

**William R. Bolus<sup>1</sup>, Tonya A. Carver<sup>1</sup> and Margaret J. Kovach<sup>1</sup>. The Function of Peripheral Myelin Protein 22 (PMP22) in the Context of Tissue Development and Cellular Differentiation. University of Tennessee at Chattanooga<sup>1</sup>**

Charcot Marie Tooth (CMT) disease is a commonly inherited neurological disorder, affecting 1/2500 people. CMT type 1E has an additional deafness component. Greater than 70% of CMT cases are caused by duplication of the PMP22 gene, however, CMT1E variants are primarily due to point mutations in the PMP22 gene. In neural tissue, PMP22 is highly expressed and involved in proper myelination of peripheral nerves. In non-neural tissues PMP22 is expressed at lower levels and is implicated in cellular processes central to tissue development and differentiation. The dual expression pattern of PMP22 is consistent with the symptoms of CMT1E patients, exhibiting both neural and cochlear (non-neural) deficits in their hearing loss. We hypothesize that PMP22 expressed in non-neural tissues is regulating gene expression involved in tissue development, including that of the inner ear. We suggest that mutations in PMP22 lead to abnormal gene expression patterns that characterize the deafness phenotype of CMT1E. Utilizing the Trembler-J mouse, Differential Display has identified 754 differentially expressed transcripts. Two hundred of the 754 transcripts have been successfully cloned and sequenced. In an effort to understand the molecular pathology of the disease state, these genes have been categorized into groups by cellular function. Major groups include: cell communication and signal transduction (25%), nucleic acid metabolism (22%), and cell growth/maintenance (15%). Quantitative real-time PCR is being used to characterize differential expression patterns of promising candidate genes across developmental time points. A model of gene interaction will be developed to explain the deafness phenotype found in CMT1E patients.

**W C. Connerand<sup>1</sup>, Kai Sha<sup>2</sup> and Jae H. Park<sup>3</sup>. Corazonin neuropeptide gene from the House Fly, *Musca domestica* (Diptera: Muscidae). Undergraduate program in Department of Biochemistry and Cellular and Molecular Biology, University of Tennessee-Knoxville<sup>1</sup> Graduate program in Department of Biochemistry and Cellular and Molecular Biology, University of Tennessee-Knoxville<sup>2</sup> Department of Biochemistry and Cellular and Molecular Biology, University of Tennessee-Knoxville<sup>3</sup>**

We described a gene encoding a neuropeptide Corazonin (Crz) in the House Fly, *Musca domestica* and characterized its spatial and developmental expression in the central nervous system. The Crz-encoding gene of *M. domestica* (MdCrz) contains two introns, one within the 5' untranslated region and the other in the open reading frame. The 150-amino-acid precursor deduced from the 738-bp full-length cDNA consists of a N-terminal signal peptide, and mature Crz followed by Crz-associated peptide. The Crz-associated peptide region is highly diverged from those of other insect precursors, whereas the primary structure of the mature Crz is identical in other dipteran members of the Crz family. In situ hybridization and immunohistochemistry consistently found in a group of

MdCrz-producing neurons in the dorso-lateral protocerebrum, and weakly in eight bilateral pairs of neurons in the ventral nerve cord in the larvae. In adults, the expression was found exclusively in the five to seven neurons located in the pars lateralis of the brain. Comparable expression patterns of the MdCrz to those observed in other distantly related dipteran species suggest that the regulatory mechanisms of the Crz expression and Crz functions are conserved during the course of evolution, although the structure of the Crz-encoding gene is rapidly diverged.

**Brandon J. Dixon<sup>1</sup>, Andrew Patterson<sup>2</sup> and Lubo Zhang<sup>2</sup>. ROS SCAVENGERS BLOCKS HYPOXIA-INDUCED DECREASE OF PKC $\epsilon$  EXPRESSION IN H9c2 CELLS. Oakwood University<sup>1</sup> Loma Linda University<sup>2</sup>**

Previous studies have shown that PKC $\epsilon$  plays an important role in cardio protection against ischemia reperfusion injury. Chronic hypoxia has been shown to significantly decrease PKC $\epsilon$  expression and alter the methylation status of the PKC $\epsilon$  promoter in fetal hearts. Hypoxia is also known to increase reactive oxygen species (ROS) production in cardiomyocytes. Normally, when an excess of ROS occurs, healthy cells contain a variety of mechanisms to break down and degrade the ROS. However when these mechanisms become inundated or strained the cell goes into a state of oxidative stress. Oxidative stress then leads to damage of intracellular structures, changes in gene expression, and may cause apoptosis. We test the hypothesis that hypoxia-induced ROS plays an important role in the decrease of PKC $\epsilon$  expression. We used the rat embryonic ventricular myocyte H9c2 cell line for this study. Cells were treated with either 21% O<sub>2</sub> or 1% O<sub>2</sub> for 24 hours in the presence and absence of the ROS scavengers, N-Acetylcysteine and 4-Hydroxy Tempol. After treatment, protein and mRNA were isolated to determine the abundance of PKC $\epsilon$  by western blotting and real-time RT-PCR. We found that hypoxia readily decreased PKC $\epsilon$  protein and mRNA. Furthermore, in the presence of either N-Acetylcysteine or 4-Hydroxy Tempol, PKC $\epsilon$  protein and mRNA were restored to normoxic levels. These findings suggest that ROS produced as a result of hypoxia plays a vital role in the hypoxia-induced repression of PKC $\epsilon$  expression in H9c2 cells.

**Brandon Praslicka<sup>1</sup> and Chris R. Gissendanner<sup>1</sup>. Investigation of the role of SUMOylation in the regulation of NHR-6, the *C. elegans* ortholog of the NR4A nuclear receptor. Department of Biology, University of Louisiana at Monroe<sup>1</sup>**

SUMOylation is post-translational modification that can affect protein localization, stability, and activity. The addition of SUMO peptides to transcription factors can either enhance or repress their transcriptional activities. Our lab is studying the NR4A nuclear receptor transcription factor in the nematode *C. elegans*. NHR-6, the *C. elegans* ortholog of NR4A, is required for development of the spermatheca, a somatic gonad organ important for ovulation and fertilization. *nhr-6* is required for both cell proliferation and cell differentiation during development of the organ, similar to its mammalian counterparts. A major area of interest in our lab is to identify the mechanisms by which NHR-6 can regulate these opposing processes. Post-translational modifications, such as phosphorylation and sumoylation, are likely to be important in NHR-6 regulation. In *C. elegans*, the SUMO peptide is encoded by the *smo-1* gene. We have found that *smo-1* loss of function causes abnormal spermatheca cell differentiation defects very similar to *nhr-6* loss of function. To determine if NHR-6 was a candidate SUMO target, we searched for consensus sumoylation sites in NHR-6. We have identified two consensus sumoylation sites in the N-terminal region of NHR-6. This region of nuclear receptor proteins serves as an important site of post-translational modifications that can affect transcriptional activity. We mutated the acceptor lysine in one of the consensus sites to an arginine and asked if this mutated form of NHR-6 was functional in a genetic rescue assay. Preliminary results suggest that this lysine is required for wild-type levels of NHR-6 activity.

**Danielle Satre<sup>1</sup>, Yong-Hwan Kim<sup>2</sup> and Cynthia Corbitt<sup>3</sup>. Androgen receptor location in the Dark-eyed Junco using a probe for in situ hybridization histochemistry generated from zebra finch cDNA. Reinhardt University<sup>1</sup> Buck Institute for Age Research<sup>2</sup> University of Louisville<sup>3</sup>**

Due to the role of sex steroids, namely testosterone (T), in the development and production of song in songbirds, androgen receptor (AR) densities in the brain regions controlling this behavior (i.e., the song control system) have long been studied. Many methods have been used to determine AR density and location to investigate the functional role of T in song development and production; however, a riboprobe developed from zebra finch (*Taeniopygia guttata*) cDNA was shown to be much more sensitive than previous methods. The zebra finch is a common model for song development and is sexually dimorphic, but does not breed seasonally or display seasonal changes in song control region volume. In this study, we used this riboprobe for in situ hybridization histochemistry (ISHH) to describe AR mRNA location in the brain of the Dark-eyed Junco (*Junco hyemalis*), a seasonally-breeding model for which T has been shown to be important. Additionally, we provide a detailed comparison of AR mRNA location between these species. We found that this probe is indeed highly sensitive. We detected AR mRNA in four major regions of the song control system (HVC, MAN, RA and AreaX). Additionally, we found that the location of AR mRNA in other regions varied only slightly between these two species. These findings suggest that this method is suitable for use across songbirds and it could be useful in the ongoing attempts to elucidate the roles of sex steroid hormones on the development of this and other sex steroid dependent behaviors in songbirds.

**Chase M. Mitchell<sup>1</sup> and Tina R. Hubler<sup>1</sup>. Organization of the Chorionic Gonadotropin Beta Subunit Gene in the Owl Monkey, *Aotus nancymaae*. University of North Alabama<sup>1</sup>**

Luteinizing hormone (LH) and chorionic gonadotropin (CG) are gonadotropins that are composed of an alpha and beta subunit. It has been shown that the beta subunit confers biological specificity. Old World primates such as humans, baboons, and macaques produce both LH and CG. In Old World primates, LH is synthesized and secreted by the anterior pituitary, whereas CG is made in the placenta during pregnancy. Recent evidence suggests that New World primates (NWP) such as the common marmoset, squirrel monkey, and owl monkey produce CG in the pituitary rather than LH. In this work, we isolated the DNA for the owl monkey CG beta (CG $\beta$ ) subunit by PCR using genomic DNA from owl monkey lymphocytes and determined its sequence. Exon and intron boundaries were deduced by comparison of the owl monkey CG $\beta$  DNA sequence to the squirrel monkey CG $\beta$  DNA sequence, and a predicted mRNA and the amino acid sequence for owl monkey CG $\beta$  were determined. The amino acid sequence for owl monkey CG $\beta$  was identical to the amino acid sequence previously deduced from owl monkey pituitary mRNA. The owl monkey CG $\beta$  gene sequence encodes a protein that has 89%, 85%, and 64% identity to common marmoset CG $\beta$ , squirrel monkey CG $\beta$  and human CG $\beta$ , respectively. The human and owl monkey protein sequences differ predominantly at the C-terminus, a difference that may explain its ability to substitute for LH. These data are consistent with findings in other NWP that suggest that LH is substituted by CG in the pituitary.

**Shaina S. Morris<sup>1</sup>, Steven L. Stephenson<sup>1</sup> and Katie Winsett<sup>1</sup>. Is *Didymium pertusum* a "good" species of myxomycete? University of Arkansas<sup>1</sup>**

The myxomycetes are a little known but fascinating group of organisms found in habitats all over the world. For one part of their life cycle, they exist as microscopic cells while in

another they exist as a macroscopic cell called a plasmodium that develops into fruiting bodies that release spores. The small size of the slime molds makes it difficult to use morphological characteristics to describe a species or to separate closely related taxa. Frequently, molecular techniques are crucial in the study of these organisms. For the slime molds *Didymium pertusum*, *Didymium squamulosum*, and *Didymium minus*, morphological differences have not proven sufficient for the separation of *D. pertusum* into a distinct species and molecular techniques are needed. In this project, these three species have been cultured and DNA isolated from fruiting bodies. From the DNA, polymerase chain reactions were performed to sequence the cytochrome oxidase 1 (cox1) subunit. Thus far, 9 sequences from *D. pertusum* have been obtained and comparison of these sequences shows strong correlation. It is hoped that more sequences will be obtained from the other two species so that a multiple species comparison can be performed for the cox1 sequence. A morphological study was also done on the specimens cultured. From the cultures, both plasmodium and fruiting body color were carefully recorded and compared to the expected characteristics of these species. The results of the morphological study show a discrepancy in the characteristics of slime molds cultured in the lab from those collected in nature.

**Timothy M. Roberts<sup>1</sup> and Alicia Schulteis<sup>1</sup>. Genetic differentiation in populations of the Florida springsnail *Floridobia floridana*. Stetson University<sup>1</sup>**

*Floridobia floridana* (Hydrobiidae) is an obligately aquatic spring snail that occurs in freshwater springs throughout central Florida. Because of *F. floridana*'s limited mobility, the endemic nature of many hydrobiid species, and the disjunct distribution of springs, we predicted high levels of genetic differentiation among populations. We used 1083 base pairs of mitochondrial DNA representing partial sequences of two genes, 603 bp cytochrome oxidase I (COI) and 480 bp NADH dehydrogenase I (NDI) to evaluate genetic structure among several central Florida populations (Volusia Blue Spring, Gemini Spring, Itchetucknee Spring, and Rock Spring). Population genetic structure was analyzed using ARLEQUIN (ver. 3.11). Twelve unique haplotypes were identified; each was restricted to a single spring. AMOVA analysis showed high levels of genetic differentiation among populations ( $\Phi_{st} = 0.92$ ). These results supported our hypothesis and suggested very little gene flow among springs, even for a cosmopolitan species. Understanding the connectivity of freshwater spring populations is important for efficient conservation of these critical habitats, which face many threats (e.g., aquifer depletion and nutrient runoff).

**Tess Branon<sup>1</sup> and Gladys Alexandre<sup>2</sup>. Interactions Between Chemotaxis-Like Signal Transduction Pathways in *Azospirillum brasilense*. Western Carolina University<sup>1</sup> University of Tennessee, Knoxville<sup>2</sup>**

Interactions between chemotaxis-like signal transduction pathways were studied in the soil bacterium *Azospirillum brasilense* in the Alexandre lab of the University of Tennessee, Knoxville Department of Biochemistry and Cell and Molecular Biology. The bacterium studied is a motile, diazotrophic alphaproteobacterium whose genome encodes for four putative operons for chemotactic signal transduction. The Alexandre lab had studied the first chemotactic operon in *A. brasilense*, Che1, and found that the primary function of the Che1 operon was not the control of motility bias; rather, further experimentation and observation suggested that the Che1 operon contributed to chemotaxis but had primary effects on the regulation of cell length at division and on cell clumping behavior. Because chemotaxis is not the apparent primary function of the Che1 pathway, it was hypothesized that another chemotactic operon controls motility bias in *A. brasilense*. Comparative genomics and bioinformatics analyses suggested that of the other three operons, the fourth operon, Che4, was the most likely to contribute to chemotaxis behavior. In preliminary experiments, it was observed that Che1 and Che4 had opposing effects on chemotactic behavior, suggesting that Che1 and Che4 may indeed work together to

modulate the motility bias. To further determine if the two sets of chemotactic proteins from the Che1 and Che4 pathways are closely associated in signaling complexes and thus physically interact, fluorescent tagging of individual chemotaxis proteins was used to observe their respective localization within the cell and to determine whether the localization of the proteins of the Che1 pathway and the proteins of the Che4 pathway rely on each others' presence. Localization patterns of the YFP fused chemotaxis proteins supported the hypothesis of crosstalk between the Che1 and Che4 pathways, and showed the possibility of cooperative interaction in the control of chemotaxis in *A. brasilense*.

**Norman R. Estes II<sup>1</sup>, Megan Moorer<sup>1</sup>, Jennifer Sutliff<sup>1</sup> and Arsalan Tariq<sup>1</sup>. Effect of Light Wavelength on Growth and Lipid Synthesis in the Green Algae *Chlorella vulgaris*. Auburn University Montgomery<sup>1</sup>**

Microalgae have been considered a viable source of biofuels, and many studies have been aimed at optimizing conditions for algal growth and lipid synthesis. Manipulation of growth conditions has been shown to be capable of modulating the growth and/or lipid content of various algal species, and additional studies have suggested an effect of light wavelength on growth of algae as well as effects on the synthesis of some intracellular molecules. In this study, we investigated the effects of light wavelength on the growth rate and overall quantity of lipids synthesized by the green algae *Chlorella vulgaris*. To determine the effects of light wavelength on algal growth, algae were exposed to various wavelengths of light and growth was measured as a function of optical density. Wavelength was shown to have an effect on the overall growth of algae over a ten day assay period, with algae grown under ambient light showing the highest overall rate of growth. Growth of algae was inhibited most by light in the red spectrum. To assess lipid quantity, algae were exposed to various wavelengths of light and lipid quantity was accessed via fluorescence microscopy using a lipid specific dye. One of the major hurdles to the use of algae as a viable source of biofuels is the identification of strains and growth conditions that optimize lipid synthesis within the cells, and in light of current data, it is feasible that light wavelength could modulate the intracellular lipid content of green algal cells.

**Joseph Wayman<sup>1</sup>, Andrew Adrian<sup>1</sup>, Derek Thacker<sup>1</sup>, Sharon M. Talley<sup>2</sup> and Leland J. Cseke<sup>1</sup>. Genotyping Technology for the Mikania Species Complex. The University of Alabama in Huntsville, Huntsville, AL<sup>1</sup> USDA/APHIS, Fort Collins, CO<sup>2</sup>**

We have developed methods to provide a reliable and cost-effective diagnostic tool to differentiate between the highly invasive weed, Mikania micrantha and closely related species, including U.S. native species (*M. scandens* and *M. cordifolia*) and invasive species (*M. cordata*). *M. micrantha* is a listed Federal Noxious Weed in the U. S. and a state noxious weed in ten states. Until recently, it has been successfully excluded from the U.S., but in late 2009, *M. micrantha* was found invading in Miami-Dade County, Florida. Taxonomists at the time had difficulties distinguishing it from the more wide spread *M. scandens*, and disagreements on its identification continue to present problems. We developed these methods to work with the minimum amount of effort required to make an accurate distinction among the different Mikania species by using differences in the nucleic acid sequences in the nuclear ITS region. The basic protocol involves extracting DNA from a small tissue sample (1-20 mg of dry leaf or herbarium specimens) followed by amplifying the ITS region with PCR. The PCR product is then sequenced using a single sequencing reaction with a specific sequencing primer. Comparison of the generated sequences with known orthologous sequences can then be performed to identify the species. Using these methods, we were able to confirm the identity of the suspect plants as *M. micrantha*, and the State of Florida took official action to eradicate it and has quarantined infected nurseries.

## Herpetology

## POSTER SESSION

Friday, April 15 8:30 AM - 6:00 PM

**Benjamin O. Koester<sup>1</sup> and Norman Reichenbach<sup>2</sup>. Winter environmental conditions and their influence on Eastern Box Turtle (*Terrapene carolina carolina*) overwintering behavior in Central Virginia. Marshall University<sup>1</sup> Liberty University<sup>2</sup>**

In temperate regions, understanding how an organism responds to cold winter conditions is necessary for a full understanding of their natural history. For Eastern Box Turtles (*Terrapene c. carolina*), winter can result in high mortality rates which may cause drastic population fluctuations, especially due to variable environmental conditions. This threat to an already rapidly decreasing species necessitates the study of their winter ecology. In order to study conditions experienced by overwintering Eastern Box Turtles, as well as the influence winter conditions have on box turtle behavior, I followed five radio-tagged turtles into hibernation. Weather stations, temperature probes, and on-site surveys recorded key environmental conditions including wind, precipitation, ground temperature, air temperature, soil moisture, and ground cover. I conducted surveys every 72 hours to examine box turtle movement (position, direction, vertical angle in hibernacula, and depth), behavioral changes, and hibernacula conditions. I statistically analyzed these two data sets using summary statistics as well as multivariate analysis to determine the influence environmental conditions had on box turtle behavior. Preliminary results suggest irregular behavior patterns during hibernation correlated with recorded environmental data. The results also strongly suggest that emergence from hibernation is influenced by ground temperature and precipitation. Irregular behavior and temperature-induced emergence, coupled with rapidly shifting freezing conditions, present a significant mortality threat to overwintering Eastern Box Turtles. Future studies will attempt to determine the exact cause of overwintering behavior in order to provide a basis for further conservation of this, and other, reptilian species.

**Kyle Welsh<sup>1</sup>, Stephanie Chavez<sup>1</sup> and Brenda L. Wichmann<sup>1</sup>. Digitization of The University of North Carolina Wilmington's Herpetological Collection: Snakes of Southeastern North Carolina. University of North Carolina Wilmington<sup>1</sup>**

The University of North Carolina Wilmington (UNCW), with funding from the National Science Foundation (DBI: Biological Research Collections), is currently digitizing its vertebrate collections, including the snakes of southeastern North Carolina. Snakes of this region are of special interest because of their diversity and continued threats to the habitats they occupy (especially the once expansive longleaf pine ecosystem). There is considerable interest in biological specimen metadata and demand for digital images of museum specimens has increased markedly in the past decade. By digitizing the UNCW collection of snakes from southeastern North Carolina, the University will provide a valuable resource that can be used for teaching, conservation, natural resource management planning, and scientific research endeavors. Prior to beginning digitization efforts within the herpetological collection, it was imperative that the overall status of the collection was assessed, and that all specimens were matched to hand-written data records. Once specimens were linked to legacy data and necessary maintenance performed, an efficient protocol was established and followed to obtain and mobilize accurate and complete specimen metadata. Efforts specific to the snake collection included standardizing nomenclature and selecting a representative group of specimens for imaging. Imaged specimens were those deemed to display the typical morphological features associated with each species. In total, the UNCW herpetological collection has 191 snake specimens, representing the three families known to occur in southeastern North Carolina, including one elapid, five vipers, and 29 of 31 documented colubrids. Imaging efforts are ongoing within the snake collection. Metadata and specimen images of

UNCW's collection of snakes will be available soon via the UNCW vertebrate collections website.

**Danielle E. Peters<sup>1</sup>, Whitney A. Kroschel<sup>1</sup>, Ben O. Koester<sup>1</sup> and Thomas K. Pauley<sup>1</sup>. Morphometric differentiation between aquatic adult and terrestrial eft stages in West Virginia populations of Eastern Red Spotted Newts (*Notophthalmus v. viridescens*). Marshall University<sup>1</sup>**

Life histories in the family Salamandridae are complex in habitat among all life stages. In the well-studied Eastern Red Spotted Newts (*Notophthalmus v. viridescens*), there are three life history stages: aquatic larva, terrestrial red eft, and aquatic adult. Using modern computational technology, variances in length and the drastic color change between the eft and adult stages have been studied; however, no study using precise photo imaging software has been found that examine morphological differentiation linearly in this species. We propose to use the program tpsDIG v2 to compare 25 morphometric, linear measurements between 75 preserved samples of Eastern Red Spotted Newts in three groups: red eft, female aquatic adult, and male aquatic adult. Our observations compare relative body size to the standard snout-vent length (SVL) in order to account for overall growth between the eft and adult stages. We hypothesize that, between both life stage and gender there will be significant morphometric differences that contribute to the use of different habitats by life history stages and genders. Broader implications of our findings will further strengthen future work on newt developmental evolution.

**Rebecca H. Hardman<sup>1</sup> and Joseph H. Pechmann<sup>1</sup>. Predicting Occurrence of the Green Salamander, *Aneides aeneus*, in Western North Carolina. Western Carolina University<sup>1</sup>**

The green salamander (*Aneides aeneus*) is a crevice dwelling salamander whose range extends over much of the Cumberland plateau and Blue Ridge escarpment. It is a species of concern in many states. We modeled green salamander occurrence using landscape level variables to better understand habitat requirements and attempt to locate additional populations. Using GIS locations and MaxEnt Species Distribution Modeling we predicted occurrence of *A. aeneus* over the Blue Ridge Escarpment in western North Carolina. We used various environmental variables in GIS layer format to develop predictive models. Model evaluation showed a good predictive ability (AUC= 0.87) with *A. aeneus* presence associated most with soil type, canopy height, and elevation. Ground-truth surveys were conducted during Fall 2010 in areas of high probability of occurrence. No new populations have been discovered, however, due to the nature of large-scale variables models could only provide certain resolution in output maps. We believe the use of winter aerial photographs of high probability areas will help narrow the selection of sites to survey and greatly increase the chance to detect new populations.

**Zach I. Felix<sup>1</sup>, Jessica A. Wooten<sup>2</sup> and Jesse Rigsby<sup>1</sup>. Taxonomic affinities of yellow-spotted isolates of the Wehrle's salamander (*Plethodon wehrlei*): preliminary data. Reinhardt University<sup>1</sup> University of Findlay<sup>2</sup>**

Lungless salamanders of the genus *Plethodon* are well-known for their high levels of cryptic diversity. The systematics of many species within the genus have been investigated using a variety of molecular techniques, but populations of *Plethodon wehrlei* remain relatively unexplored. Focusing on populations on the Cumberland Plateau of West Virginia, Kentucky, and Tennessee, we use morphometric, niche-modeling, and phylogenetic analyses to explore levels of diversity found within the species. These southwestern *P. wehrlei* populations were first described in Kentucky and have a distribution centered mainly on the Pine Mountain formation. Ecologically, these populations appear distinct from other populations in that they are almost always found in

rock cliffs and outcrops, whereas members of other populations are found on the forest floor. Bioclimatic modeling also suggests that these populations show some level of ecological niche divergence relative to other populations. Morphologically, these populations exhibit a smaller adult body size than other populations throughout the species' range and exhibit large paired yellow spots throughout their ontogeny. We have collected preliminary tissue samples from North Carolina, Tennessee, Kentucky, and West Virginia and phylogenetic trees based on these will be presented.

**Gavin R. Lawson<sup>1</sup> and Eran S. Kilpatrick<sup>2</sup>. Hybridization Among the Subspecies of Eastern Newts (*Notophthalmus viridescens*) in South Carolina. Bridgewater College<sup>1</sup> University of South Carolina - Salkehatchie<sup>2</sup>**

Relatively little work has been done on hybridization in the eastern newt (*Notophthalmus viridescens*). In the most recent and extensive study to date, Gabor and Nice (2004) analyzed allozyme variation among the four eastern newt subspecies throughout the species range. Phylogenetic and phenetic analyses divided the sampled populations into northern and southern groups rather than along taxonomic lines suggesting introgressive hybridization had occurred. Furthermore, patterns of genetic variation indicated a pattern of restricted gene flow with isolation-by-distance among northern populations whereas southern populations appeared to be isolated and undergoing genetic drift. To evaluate whether the pattern is also observed at a more local level, we sampled eight South Carolina populations representing three subspecies. Maximum parsimony, maximum likelihood and statistical parsimony analyses of 540 bp of the NADH dehydrogenase (ND2) and the flanking tRNAMet genes revealed similar patterns with populations clustering geographically by river drainages rather than subspecific designation. Furthermore, no haplotypes were shared among populations supporting the idea of local isolation even at restricted geographic scales.

**Zackary L. Seymour<sup>1</sup> and Carlos D. Camp<sup>1</sup>. Morphological Divergence in an Isolated, Peripheral Population of Black-Bellied Salamander, *Desmognathus quadramaculatus*, in Northern Georgia. Piedmont College<sup>1</sup>**

Peripatric speciation is hypothesized to occur when a peripheral population, initially divergent as a result of drift, is prevented from exchanging genes with other populations of the same species. We investigated potential morphological distinction in an isolated, peripheral population of the black-bellied salamander, *Desmognathus quadramaculatus* in northern Georgia to test whether peripatric divergence is occurring. The population of interest is located in the watershed of the Broad River in Madison County, Georgia. It is approximately 40 km SE of streams forming the headwaters of the Broad River, which house the closest known populations within the contiguous portion of the range of the species. We morphometrically analyzed salamanders from Nancytown Creek, located in Habersham County near the headwaters of the Broad River, and compared them to salamanders from the isolated, peripheral population. Measurements of 25 separate morphological traits were made on each salamander to quantify characteristics of each population. Analysis of Covariance was run with snout-vent length as a covariate in order to determine if size-free differences exist. Seven of the 25 measurements showed a significant difference between the two populations. These included various measurements of body width, toe length, and limb length. Principle-components analysis of the 25 traits indicated that the two populations are distinct. While they are genetically related, our results show that the two populations are morphologically divergent and thereby support predictions of the hypothesis of peripatric speciation.

**Ben DeLancey<sup>1</sup> and Wade Worthen<sup>1</sup>. Changes in microhabitat selection and head dimensions between three different age classes of *Desmognathus quadramaculatus*. Furman University<sup>1</sup>**

In previous research, immature *Desmognathus quadramaculatus* preferred deeper water and had diets with a higher percentage of aquatic prey than their mature counterparts. Here we attempt to partition the effects of developmental stage and body size. We sampled *D. quadramaculatus* salamanders in drainages in northeastern Greenville Co., SC, in the summer and fall of 2010, comparing snout-vent length, head width/length ratio, water depth, and distance from land between and within larval, immature, and mature stages. Head width/length ratio and snout-vent length were positively correlated in larval salamanders, uncorrelated in immature salamanders, and negatively correlated in mature salamanders. Water depth was also positively correlated with snout-vent length in larval salamanders but a negative correlation was found across the entire data set. No significant correlations between water depth and snout-vent length were found in immature and mature age classes. Larval salamanders were also found farther from land and in deeper water than immature and mature salamanders. If head width/length ratio can be used as a proxy for trophic niche, then developmental changes in allometric growth suggest that resource partitioning may be more directly related to age/developmental class than body size alone.

**Elizabeth E. Hieb<sup>1</sup>. A population genetic analysis of the Alabama red-bellied turtle. University of South Alabama<sup>1</sup>**

The federally endangered Alabama red-bellied turtle (ARBT; *Pseudemys alabamensis* Baur) occurs in an isolated range in southern Alabama and Mississippi. Several distinct nesting populations of ARBT exist within this range, but no genetic comparisons amongst these populations currently exist in the literature on this species. In this project, we identified microsatellite markers to be used for a population genetic analysis across the ARBT range. Microsatellites are tandemly repeating segments of DNA which yield information on recent evolutionary history and can estimate relatedness amongst individuals. Microsatellites which amplified cleanly and proved to be polymorphic in the ARBT were used to genotype samples representing different populations. The genotyping results will be used to answer questions regarding the genetic variation within and amongst these populations. How closely related are individuals within each population? Are members of different populations closely related or genetically distinct? Genetic comparisons between populations will also yield information on the reproductive structure of the ARBT across its range. Does gene flow occur between nesting populations or are they genetically isolated from each other? Answers to all of these questions may lead to more effective conservation management for the ARBT. Understanding the reproductive structure of the ARBT is a key objective in developing conservation strategies for the species. Additionally, if the different populations can be shown to be genetically distinct, then they may warrant individual protection under conservation authorities. It is the goal of this project to provide data which may be used to more effectively direct ARBT conservation.

**George R. Cline<sup>1</sup>. Societal impact of amphibians and reptiles and their economic value. Jacksonville State University<sup>1</sup>**

Human-herp interactions are varied, and the intensity and direction of these interactions varies greatly. Humans feed on a variety of reptiles (snakes, turtles, turtle eggs, crocs and alligators, and some lizards), but the number of amphibians that are eaten is measurably less (various frogs). Cases of herps feeding on humans are generally limited to some crocodylians and a few of the giant snakes. There has been an increase in the use of herp related products in the medical industry, especially related to the use of snake venoms,

and the development of anti-venins. One new, and rather bizarre use of snakes is in the area of snake massage therapy. Herps, especially frogs, have traditionally been used in anatomy and physiology labs across the country. The increased use of virtual dissections has cut into the demand for herp specimens, but there is still a market for skeletal material. Sea turtles have been used to make rings, bracelets, hair combs, brush handles, and the base for mirrors. Skins have been used to make wallets, purses, belts, hat-bands, and boots. Herps continue to be popular sources for entertainment from starring in movies (i.e. Snakes on the Plane, SSStanley, Frogs), use in 'theater' (snake charmers and in burlesque), to frog jumping contests and as aphrodisiacs. Pet trade might also be considered a part of this activity. While largely despised by Christian churches (except snake handling churches in the South), snakes play roles in religious ceremonies across the world.

**Daniel S. Armstrong<sup>1</sup>. Conservation Genetics of a Spotted Salamander (*Ambystoma maculatum* (Shaw 1802), Ambystomatidae) Population in Hamilton County, Tennessee.**<sup>1</sup>

Genetic studies can reveal information about local population dynamics that is more difficult to obtain using traditional ecological studies. Despite their potential use for this purpose, the use of genetic markers for inferring local population demography (e.g., yearly migration routes of individuals) has been virtually nonexistent. Genetic diversity and local population dynamics are important considerations for conservation biology because loss of genetic diversity may have deleterious effects on the long-term survival of the population. The present study examines measures of genetic diversity and population structure in a local population of spotted salamanders (*Ambystoma maculatum*) in southeast Tennessee. Genetic diversity was low overall, with low heterozygosity and significant evidence of inbreeding. Females exhibited slightly higher genetic diversity than males, although this difference was not statistically significant. No population substructure, bottleneck signature, or recent immigration was detected. The local population in question appears to have been isolated from genetically differentiated wetlands throughout its history and appears to have served as a reservoir for salamander populations during the time period when the VAAP facility was used for TNT storage.

**Rachael Fairhurst<sup>1</sup>, Jesina Elliston<sup>1</sup>, Caitlin Cole<sup>1</sup>, George Dennison<sup>1</sup> and Nancy E. Dalman<sup>1</sup>. ASSESSING TERATOGENIC EFFECTS OF TIRE CRUMB LEACHATES ON FROG EMBRYO DEVELOPMENT. North Georgia College and State University<sup>1</sup>**

There is growing concern over the environmental safety of recycled tire crumb usage in playgrounds and landscapes. Rain water runoff from tire crumbs may increase the amounts of toxicants in aquatic habitats. A FETAX (Frog Embryo Teratogenesis Assay) test with *Xenopus laevis* embryos was conducted using tire crumb leachates made from black playground-grade tire mulch (non-weathered) and also in leachate made from mulch exposed to environmental conditions for 6 months (weathered). The leachates were prepared at 24°C in order to simulate typical Georgia springtime weather. Embryos exposed to the non-weathered crumb leachate had a 47.5% survival rate and a 7.5% malformation rate while embryos exposed to the weathered crumb leachate had a 37.5% survival rate and a 32.5% rate of malformations. By contrast, the control saline solution produced a 65% survival rate and a 7.5% malformation rate. In addition to a higher overall malformation frequency, embryos incubated in weathered leachate showed more serious malformations, such as eye abnormalities, blisters and stunted body structure, than embryos incubated in the non-weathered leachates or saline solution. Taken together, these results suggest that tire crumb leachates possess compounds that are teratogenic to *X. laevis* embryos.

## Invertebrates

## POSTER SESSION

Friday, April 15 8:30 AM - 6:00 PM

**Tricia Kangisser<sup>1</sup>, David Foltz II<sup>1</sup>, Nate Taylor<sup>1</sup>, Nicole Garrison<sup>1</sup> and Zachary Loughman<sup>1</sup>. Creation of Reach-Scale Habitat Models to Determine Crayfish Abundance in Central Appalachia. West Liberty University<sup>1</sup>**

Determining reach scale variables that could be used to predict crayfish richness and species presence could be a powerful conservation tool for these imperiled animals. This study utilized reach scale data and QHEI scores to produce predictive models for broad and species level association of different crayfish species within reach-scale habitats and water quality variables. Crayfish assemblage was measured by abundance (catch per unit effort) at 64 different sites. This study was performed in the, Coal and Upper Kanawha River basins of West Virginia. These basins contain large areas heavily impacted by anthropogenic use, specifically mining. The ability of variables to predict crayfish assemblage was assessed using multiple linear regression analysis and R2 values. Results indicated that several habitat quality characteristics and QHEI individual parameter scores for in-stream cover and pool/current appeared to be important predictors. Interspecies predictive models differed between taxa, indicating different habitat needs for different species. Results from this study indicate physical stream degradation and channelization, and the destruction of in-stream cover is the most important threat to crayfishes in central Appalachia. Physiochemical impacts did not readily correlate to crayfish abundance, and did not have much predictive ability. In order to preserve crayfish diversity in central Appalachia, concerted effort should focus on maintaining and creating diverse in-stream habitats, and controlling activities that result in in-stream habitat homogenization.

**Bryan Ayres<sup>1</sup>, Robert Carter<sup>1</sup>, Chris Murdock<sup>1</sup> and Benjie Blair<sup>1</sup>. A Technique for the Detection of *Borrelia burgdorferi* *Amblyomma americanum* and *Ixodes scapularis* in Calhoun County, Alabama. Jacksonville State University<sup>1</sup>**

Black-legged, *Ixodes scapularis*, and lone star ticks, *Amblyomma americanum*, have been shown to be vectors of Lyme disease (*Borrelia burgdorferi*). To determine the percentage of ticks with the *B. burgdorferi* bacterium in their guts, ticks will be collected from Calhoun County, Alabama by the dragging method. This method consists of dragging a white flannel cloth along the forest floor and gathering all ticks caught on the cloth. Ticks will be preserved in alcohol, and the species, sex, and developmental stage determined in the lab. The ticks will then be processed and DNA isolated. A real-time PCR assay will be developed to allow for the detection of the FlaB gene belonging to *B. burgdorferi*.

**Kyle McGill<sup>1</sup>, Ken Cushman<sup>1</sup> and Zachary Loughman<sup>1</sup>. Molecular systematics of *Cambarus carinirostris* and *Cambarus b. bartonii*. Department of Natural Sciences and Mathematics, West Liberty University, West Liberty WV.<sup>1</sup>**

Cambarid crayfishes have received considerable taxonomic attention in recent years. Several species from multiple genera have been described, and with the advent of phylogenetic methodologies, many pressing taxonomic questions can and have been answered. The taxonomic standing of *Cambarus carinirostris*, and its relationship to *Cambarus b. bartonii* represents one such problem. *Cambarus carinirostris* was described by Hay in 1914 and split from *Cambarus b. bartonii* based off of chelae and rostral characteristics. Several authors have not recognized *C. carinirostris*, stating that this taxa is a geographic cline of *C. b. bartonii*. Previous investigators used morphology to determine the taxonomic standing of *C. carinirostris*. We investigated divergence between *C. carinirostris* and *C. b. bartonii* using PCR and the COI gene, and excluded morphology

from our analysis. Sequenced results were analyzed with MEGA 4.1 beta 3 and phylogenetic trees containing bootstrap and p-distance values were created from sequence data. Cytochrome oxidase I divergence values between *C. carinirostris* and *C. b. bartonii* samples were not greater than five percent lending strength to the argument *C. carinirostris* should be synonymized with *C. b. bartonii*. Taxonomic and zoogeographic impacts of this result are discussed.

### Microbiology

#### POSTER SESSION

Friday, April 15 8:30 AM - 6:00 PM

**Alicia Mitchell<sup>1</sup> and Christopher Bates<sup>1</sup>. The presence and frequency of *Escherichia coli* in beverages sold to the local public. Augusta State University<sup>1</sup>**

Coliforms are defined as Gram negative bacilli capable of fermenting lactose. *Escherichia coli* (*E. coli*) is a specific type of coliform found in the intestinal tract of mammals and serves as an indicator of fecal contamination. A survey of local restaurants was performed to determine the presence and frequency of *E. coli* in beverages sold to the public. Additionally, we determined the ability of *E. coli* to grow in select beverages. The information gathered through this study, will help educate the general public about food preparation at restaurants in the local area.

**Michka G. Sharpe<sup>1</sup>, Susanna Brantley<sup>1</sup> and Amanda R. Pendleton<sup>1</sup>. *Rhodiola rosea* extracts enhance infectious bronchitis virus infection in vitro. Oxford College of Emory University<sup>1</sup>**

Infectious bronchitis virus (IBV) is a pathogenic chicken coronavirus. Currently, vaccination against IBV is not wholly effective; therefore, better preventions and treatments are sorely needed. Plants, which produce antimicrobial secondary compounds, may be a source for finding these preventions and treatments. We examined the effects of *Rhodiola rosea* (golden root) on the replication of IBV, since this plant may produce antiviral secondary compounds. A 70% ethanol extraction of the powdered root was not toxic to Vero N6 cells at the  $7.5 \times 10^{-5}$  g/ml and  $1.5 \times 10^{-4}$  g/ml concentrations. Surprisingly, preliminary data indicated that treatment of these cells with these concentrations did not reduce IBV titers. Rather, *R. rosea* enhanced IBV replication by 1.5-fold ( $p < 0.05$ ) and two-fold ( $p < 0.01$ ), respectively. It is unclear whether this two-fold difference would be significant in vivo. However, these results, combined with the prevalence of human coronavirus infections and the increasing popularity of *R. rosea* as an herbal remedy, suggest that further testing is warranted.

**Mina A. Youssef<sup>1</sup>, Premila N. Achar<sup>1</sup> and MY Sreenivasa<sup>2</sup>. Plant based Essential Oils as antifungal agents against *A.flavus* and *A. parasiticus* in peanuts. Kennesaw State University<sup>1</sup> Universtiy of Mysore<sup>2</sup>**

*Aspergillus flavus* is a very common fungus in peanuts and are known to produce aflatoxins which are carcinogenic. In certain years significant contamination of peanuts with aflatoxin occurs, which threatens the economic viability of the entire U.S. peanut industry. At present, pre and post harvest aflatoxin management in peanuts is practiced solely through adaptation of suitable agricultural practices such as crop rotation, use of good quality seed and fungicides. The antifungal nature of essential oils has been demonstrated against fungi (Basilico, 1999). Antifungal activity of essential oils such as clove, cinnamon, thyme and others were tested using the poisoned food method (Viuda-Martos, 2006). Selected essential oil was separately diffused in Potato dextrose Agar (PDA) plates and incubated for 7-10 days at 25 oC. Following incubation, the inhibition

halo diameter was measured and significant data was analyzed by t-test. Minimum Inhibition Concentration (MIC) was determined by the plate diffusion procedure (Hadacek and Greger, 2000). Our study showed that Clove oil was most successful in inhibiting the growth of *A. flavus* following Cinnamon and Thyme. While, Cinnamon oil was the most inhibiting against *A. parasiticus* followed by Clove and Lemongrass. In conclusion, this study indicates that Clove and Cinnamon can be further investigated, especially with the active ingredients responsible for growth inhibition. These oils show potential for use as biological control agents against both *A. flavus* and *A. parasiticus*.

**Barbara Biebinger<sup>1</sup> and Christi Magrath<sup>1</sup>. Determining antibiotic resistance in wastewater exposed *Saccharomyces cerevisiae*. Troy University<sup>1</sup>**

Using a large collection of *Saccharomyces cerevisiae* knockout strains that each contain a deletion of a single gene, the sensitivity of these deletion strains to wastewater effluent and several control water samples was assessed. Gene ontology analysis indicated that sensitivity to drugs and antibiotic resistance were overrepresented in the identified strains that displayed morphological (colony) differences during growth analysis on solid media prepared with the various water samples. Consequently, an analysis of the antibiotic responsiveness of yeast deletion strains is being completed to determine if the yeast strains will display altered antibiotic sensitivity when exposed to antibiotics incorporated in media with control water samples, as well as water from both upstream and downstream of a wastewater treatment facility (Troy Wastewater Treatment Plant). Determining the best suited mechanism of exposing the yeast to the antibiotics is imperative. Many different antibiotic sensitivity testing methods have been previously described; however, a comparison of the use of various testing methodologies with yeast deletion strains is being completed to allow comparative assessment of the broth dilution method, the Kirby Bauer (disc diffusion) method, and agar diffusion method. Determining the best approach for exposing yeast deletion strains to commonly used anti-fungal antibiotics incorporated into media made from environmentally-collected water samples will facilitate a more thorough investigation of the response of *Saccharomyces cerevisiae* to antibiotics present in wastewater treatment effluent and other natural water samples.

**Tamanda Chanza<sup>1</sup>, Wayne Gordon<sup>1</sup>, Antonia Primus<sup>1</sup> and Elaine A. Vanterpool<sup>1</sup>. Methicillin Resistant *Staphylococcus aureus* mechanisms of inducing cell death via ER signaling. Oakwood University<sup>1</sup>**

*Staphylococcus aureus* is becoming a growing concern in the United States. Recent data from the Centers for Disease Control showed that approximately 12 million Americans visit physicians suspected of having staph infections. Staph can create a diseased state resulting in destruction of host cells. It has been demonstrated that other pathogens can cause damage to the host cells resulting in apoptosis. The endoplasmic reticulum (ER) is an important organelle that plays a critical role in protein folding and packaging. Alterations in intracellular calcium $[Ca^{2+}]_i$  levels housed by the ER may result in a cascade of events due to activation of calcium-dependent proteins, including apoptosis. Data from our laboratory has demonstrated that Jurkat-T (immune) cells were able to up-regulate (increase) the expression of the ryanodine receptors (RyR) calcium release channels (from the ER) upon incubation with *Staphylococcus aureus* before apoptosis occurred suggesting the possible involvement of the ER in the cell death process. We have also demonstrated that MRSA strains elicited a quicker apoptotic response in U2OS (osteosarcoma) and PC3 (neuronal) cell lines than a non-ATCC strain of *S. aureus*. Thus, it is our central hypothesis that *Staphylococcus aureus* (MRSA) can induce a threshold of cellular damage that can lead to an ER stress response triggering apoptosis via intracellular calcium regulatory pathways. Defining the role of ER mechanisms induced by microbes, like *S. aureus*, will provide us with useful information that will help develop new potential therapeutic targets against Staph-induced related pathologies.

**April L. Engstrom<sup>1</sup>, Amanda J. Tindall<sup>1</sup>, Sydney Clark<sup>1</sup>, Drew Geissinger<sup>1</sup> and Dinene L. Crater<sup>1</sup>. College Friends You Do Not Want: The Prevalence of MRSA in High Point University Students. High Point University<sup>1</sup>**

*Staphylococcus aureus* is a common organism found all over the human body. They are opportunistic pathogens, and as such, antibiotic use has been aggressive, especially in high risk populations. Consequently, antibiotic resistance has become widespread, with an increasing incidence of strains resistant to strong antibiotics. Methicillin-resistant strains are becoming especially dangerous in hospitals and other high risk environments, but what about healthy populations? This study examines the student population of High Point University for both *Staphylococcus aureus* and methicillin-resistant *Staphylococcus aureus* (MRSA) to characterize the prevalence and attempt to connect nasal carriage with demographic data. Isolation of a nasal sample is inoculated on standard mannitol salt agar (MSA) plates and incubated for 48 hours. After incubation, samples from positive, fermenting species identified on MSA plates are transferred to a plate formulated to select for MRSA. Samples testing positive for MRSA infections are examined for molecular similarities. Currently our preliminary data suggests an incident rate of *Staphylococcus aureus* of approximately 12% in our campus sub-population. Current research includes identifying the prevalence of MRSA strains, expanding our sample population, and utilizing molecular techniques (PCR and DNA sequencing analysis) to analyze MRSA strains for genetic similarities among demographic sets.

**Sara Radmard<sup>1</sup>, Michael Spinner<sup>1</sup>, Max Teplitski<sup>2</sup> and Nitya Jacob<sup>1</sup>. The Effects of Quorum Sensing on Nodule-Expressed (nex) Genes in *Sinorhizobium meliloti*. Oxford College of Emory University<sup>1</sup> University of Florida<sup>2</sup>**

Nodulation, the infection of bacteria inside the root of a plant, is a form of symbiosis between rhizobium bacteria and legume plants where the bacteria fixate nitrogen for plants in return for nutrients. Quorum sensing (QS) in rhizobium bacteria is the communication among bacteria critical for infection in symbiosis and pathogenesis. This investigation examines the expression of several "nodule-expressed" (nex) genes in the symbiosis between (*Sinorhizobium meliloti*) and (*Medicago sativa*) (alfalfa) plants and determines if the Sin system of quorum sensing affects nex gene expression. A nex gene promoter-bacA-gus construct was integrated into four (*S. meliloti*) strains: wildtype (SinI+/ExpR+) and QS deficient mutants (SinI+/ExpR-, SinI-/ExpR-, and SinI-/ExpR-). Nodules formed in plant roots infected with the four strains of bacteria were observed for nex gene expression using a  $\beta$ -glucuronidase (GUS) activity assay. Our results indicate that expression of nex genes occurs in the infection and/or nitrogen-fixing zones and QS impacts some nex genes. Results showed that three of the nine nex genes are exclusively expressed in the nitrogen-fixing zone of nodules, suggesting that their function impacts nitrogen fixation specifically. The expression of two of the nine genes was visibly impacted in QS-deficient mutants. This led to the conclusion that few nex genes are regulated by QS during the process of rhizobium-bacteria symbiosis in alfalfa plants.

**Zachary H. Wood<sup>1</sup>, Melanie Lee-Brown<sup>1</sup> and Michele Malotky<sup>1</sup>. Can *Caenorhabditis elegans* acquire antibiotic resistance by ingestion of resistant *Escherichia coli*? Guilford college<sup>1</sup>**

Previous studies have suggested that resistance to puromycin can be transferred via puromycin N-acetyl-transferase containing plasmids to the nematode *Caenorhabditis elegans* by ingestion of the filamentous bacterium *Streptomyces alboniger*. This study is testing whether puromycin resistance is transferable to *C. elegans* by ingestion of *Escherichia coli* (HT115) containing the puromycin resistance plasmids pBCH21-R4R3 and pBCH22-R4R3. *C. elegans* will be fed puromycin-resistant and susceptible HT115

and nematode survival will be monitored on plates containing 0.25 mg/ml puromycin. Preliminary data suggests that ingestion of puromycin-resistant HT115 fails to render the nematodes resistant to puromycin. If confirmed, this would suggest that the ability to transfer antibiotic resistance between bacteria and *C. elegans* may be more complex than plasmid transfer.

# ***Beta Beta Beta***

## ***Paper and Poster Abstracts***

***From the 54<sup>th</sup>  
Tri-Beta Annual Meeting***

***Held with the 72<sup>nd</sup>  
Annual ASB Meeting***

***Hosted by***

***University of Alabama***

***Huntsville, Alabama***

***April 13-16, 2011***

### Paper Presentations Southeastern District I

Fielitz, Christopher, Achal Kalicharan and Timothy Whiteside. Eta Iota, Emory & Henry College. Analysis of two unknown fossilized fish neurocrania from the late Cretaceous period found in the Corsicana Marl formation.

Two small fossil neurocranium of unknown teleost fish were found in a Corsicana-Marl formation in Padrome Hill, Bexar County located in San Antonio, Texas in August 2007. These fish neurocraniums are no longer than 1.25 cm in length and .75 cm deep and are estimated to have lived during the middle Maastrichtian stage of the crustaceous period approximately 70.6 to 65.5 million years ago. At the location, an abundant amount of invertebrate fossils were found and only a few vertebrate fossils were recovered such as *Picnodont* and *Enchodis* teeth. We believe that these two specimens are Elopiformes which consist of a very interesting set of bulbous otic bulla, fused dermalsphenotic and pterotic bones, and varying parasphenoids among these two fish. Moreover, we want to find out if these two fossils found are related and possibly discover a species for them.

Klaphaak, Jessica. Sigma Phi, Guilford College. *Listeria monocytogenes* Kills Tumor Cells.

The Gram-positive bacterium *Listeria monocytogenes* (*Lm*) has been well studied because of its unique intracellular life cycle. *Listeria's* ability to kill tumor cells has allowed *Lm* to take the spotlight as an immunotherapeutic for tumors; however the mechanism of cell death is not understood. Upon entering the cytosol of a host cell, *Lm* triggers the formation of protein aggregates called inflammasomes that activate the protease Caspase-1. Among other functions, Casp-1 has been implicated in a newly identified form of cell death called pyroptosis. To address the mechanism of cell death, Casp-1 activation was quantified using flow cytometry in time course and dose response assays in several melanoma cell lines upon WT *Lm* infection. Microscopic images were examined in parallel, depicting cell death. At both high multiplicity of infection and later time points, Casp-1 activation and cell death were maximal, suggesting a pyroptotic mechanism. A cytotoxicity assay will also be performed to determine if lactate dehydrogenase (an indicator of pyroptosis) is released by tumors upon *Lm* infection. We are also monitoring tumor cell death *in vivo* induced by *Lm* infection. The results of these experiments will inform our overall understanding of how *Lm* might best be utilized as a tumor therapeutic.

Jones, Deziree. Sigma Gamma Chapter, Erskine College. The role of HSP70 and HSP70B' in the oxidative and nitrosative stress response to oxLDL and oxLDL-IC.

During the atherosclerotic process, oxidized low-density lipoproteins (oxLDL) and oxLDL-containing immune complexes (oxLDL-IC) contribute to the formation of lipid-laden foam cells. Oxidative and nitrosative stresses have been shown to be induced by the presence of oxLDL, contributing to the onset and development of atherosclerotic vascular damage. The Hammad lab has shown that one member of the heat shock protein 70 family, HSP70B', influences macrophage activation and survival. This study examines the relationship between HSP70 and HSP70B' and the oxidative and nitrosative stresses in response to oxLDL and oxLDL-IC. U937 cells were transfected with siRNAs using electroporation. Knockdown was verified by immunoblot analysis. Cells were primed with IFN- $\gamma$  then treated with oxLDL, oxLDL-IC, KLH-IC or IMDM control in combination with DCF-DA for H<sub>2</sub>O<sub>2</sub>, DAF-FM + l-arginine for NO, and Mito Tracker for mitochondrial membrane potential and visualized. Knockdown of HSP70B' resulted in a significant decrease in NO production in response to oxLDL compared to control-transfected cells, while HSP70 knockdown resulted in an intermediate reduction in NO generation. There was no significant decrease in H<sub>2</sub>O<sub>2</sub> production in response knockdown. These findings

suggest that HSP70 and HSP70B' expression influences the nitrosative stress response induced by oxLDL in human macrophages.

Bucher, Rae N. Mu Omicron, Columbus State University. Nitrate Phytoremediation Using Gempler's Nitrate Test Kits.

Nitrate is a naturally occurring ion found in nature. However, high levels can have harmful effects on human health. In the past, testing for aquatic nitrates in the field has been a difficult and complicated task. Gempler's is a commercial work-supply company and offers a range of nitrate kits to be used in the field. Gempler's test kits were tested for accuracy in detecting a change in nitrate level in both water and aquatic plants. Comparing the kits data with a nitrate probe and light absorption spectroscopy will allow us to determine the kits accuracy and efficacy in detecting change. Initial data indicates that the water nitrate kits can detect a change in nitrate levels, however an exact amount is not possible. The plant nitrate kits indicate that they are not able to detect a change in aquatic plant nitrates; however, this could be due to the fact that the plants are not storing nitrates.

Patel, Roma V. Mu Omicron, Columbus State University. Potential cytotoxicity of colored orthodontic latex bands to human fibroblast cells.

Orthodontic rubber bands are made of latex and although generally thought to be non-bioreactive, the compositional protein in latex is a known allergen. Colored rubber bands are becoming highly popular and could pose threats if they release chemicals that are toxic. These rubber bands are retained in the mouth for long periods of time, ranging from just two weeks to two months, with the average being one month. Human fibroblast cells were grown in culture using Dulbecco's Modified Eagles Medium in which orthodontic bands had been soaked for 30 days at 37° C. Colors of dyed bands used were black, red, blue and orange. Bands without coloration (clear) were used as a control for dye release. Media exposed to no bands was used as a control for any chemical release. Cell viability percentages and 24-hour growth rates were used to assess affects on the cells. Single factor ANOVA tests revealed no significant difference in cell viability among the varying colors of bands.

\*Lachance, Sara. Sigma Phi, Guilford College. Identifying Dachshund's Role in Hedgehog Signaling and Urchin Development.

This research studies embryogenesis using sea urchin embryos in order to gain a better understanding of the processes involved in development. An important process in embryogenesis is germ layer specification into endoderm, mesoderm, and ectoderm. This process is controlled by transcription factors, which are proteins that bind to DNA and determine the expression of certain genes at different developmental stages. This study looks specifically at the gene dachshund, which is believed to be expressed in the endoderm and whose role in invertebrate development is currently unknown. Dachshund is evolutionarily conserved between invertebrates and vertebrates and was identified in the urchin genome. Sequence alignment programs were used to identify the conserved gene sequences between different species. From this information, degenerate primers were used in order to clone dachshund from a cDNA library. This clone was then used to develop and optimize an *in situ* hybridization probe in order to identify the spatio-temporal expression of RNA transcripts in a developing sea urchin embryo. With the expression pattern of dachshund identified, the next step is to use a morpholino in order to knock down gene expression and determine dachshund's function within the developing sea urchin embryo.

Tran, Christina and Trenton Agrelius. Kappa Kappa, Augusta State University. Effects of Shade and Competition on Growth and Flower Production in *Phacelia dubia* var. *georgiana* (Hydrophyllaceae).

*Phacelia dubia* var. *georgiana* is a granite outcrop endemic which has become weedy in some adjacent roadside areas. Two populations were obtained within 1 mile proximity of each other off of Columbia Rd. in Columbia County, GA. The Kiokee outcrop population is isolated by forest where plants remain partially shaded. The second population is weedy along the roadside adjacent to a disturbed outcrop with full sun. Seasonal observations reveal that the weedy population flowers approximately one month before Kiokee. We hypothesize that early flowering is a novel genetic adaptation resulting from a combination of full sunlight and plant competition. To determine the effect of shade on growth and development, an experiment was conducted using a controlled lighting system. For each population, plants were placed in either shade for 4 hours or in full light (14 hr. day). Over five weeks in shade, growth was significantly stunted in both populations with no flower production. However, in full light, growth rates were significantly higher, and the weedy population produced approximately 70% more flower buds than Kiokee. Thus, it is possible that the shady environment at Kiokee contributes to a slower growth rate and lower fitness than the weedy plants found in open sunlight.

Campbell, James. Kappa Kappa, Augusta State University. Identification and Susceptibility of Bacteria Isolated from Ears of *Canis familiaris*.

Bacterial infections cause a variety of diseases in animals and humans, and the overuse of antibiotics to treat these infections increases antibiotic resistance in bacteria. Previously in our lab, bacteria were isolated from the ears of *Canis familiaris* and their susceptibility to antibiotics was determined. Various biochemical tests in conjunction with growth on selective and differential media allowed further characterization of the bacteria. A subset of strains was tested on an additional type of media for susceptibility to antibiotics, and mechanisms of resistance were further classified. Testing of the characteristics and identification of the strains could contribute to the development of medical treatments through research.

**\*District I Brooks Award Winner, Best Paper.**

### **Paper Presentations Southeastern District II**

Shelley, Virginia. Mu Iota, Northern Kentucky University. Inhibition of white nose syndrome in hibernating bat colonies: Identification of antifungal agents.

Since 2006, White-Nose Syndrome (WNS), caused by the fungus *Geomyces destructans*, has devastated bat populations in caves across Northeastern US. More than 115 cave hibernacula are now affected with WNS, which is estimated to have killed more than 1,000,000 bats since it was first discovered. To reduce the spread of this pathogen and protect endangered bat species, we are currently looking for compounds that can be used to treat bats in vivo. We have focused on testing natural organic compounds that are able to prevent the growth and further transmittance of *G. destructans*. Various compounds were tested on their ability to prevent the growth of the model organism *Geomyces pannorum* using two different competition assays: 1) a disk diffusion assay; and 2) a direct application of the chemical solution. In order to specifically target the *Geomyces* species, the same tests were also performed using *Penicillium pinophilium* and *Aspergillus brasiliensis*. This ensured that any *Geomyces* inhibiting compound did not destroy other

fungal populations within the cave. A number of compounds have been identified for further testing, both on pathogen *G. destructans* and on healthy bat populations.

Barron, Jeremy K. and Alyce Shearing. Mu Epsilon, Troy University. Growth of *Saccharomyces cerevisiae* with filamentous growth mutations using Treated Wastewater - a Genetic Approach.

Potential stress on the yeast *Saccharomyces cerevisiae* due to the chemical components in wastewater samples can be indicated by alterations in growth rate, filamentous growth, and/or differences in the average colony size. Three strains of *S. cerevisiae* ( $\Delta$ Gas1,  $\Delta$ Uba4,  $\Delta$ Tpk2) were selected from the yeast deletion library based on changes of growth in responses to wastewater exposure and involvement in filamentous growth (a stress response). The various water samples used included: distilled water from the lab (control), water from Walnut Creek (upstream of Treatment Plant), and water from the mixing zone at Troy Wastewater Treatment Plant. Genetic analysis—including mating, tetrad dissection, and molecular screening—is being utilized to create knockout strains from combinations of the three previous strains. Analysis indicates that heterozygote diploids created during mating of the filamentation mutants do not have any alteration in filamentation; however, the modest impacts on growth seen in single deletion haploid strains and the heterozygotic diploid may be amplified in the double knockout strains. The viability and filamentation levels of double deletion strains will be used to assess changes to yeast survival in various environments and increase understanding of response to environmental stress. (Research mentor: Christi Magrath and Teresa Moore)

Lemay, Katherine. Beta Phi, University of West Alabama. A comparison of oiled and unoiled communities in an Alabama salt marsh.

In the wake of the Deepwater Horizon disaster of April, 2010, coastal ecosystems throughout the Gulf of Mexico were impacted by crude oil and dispersants. In this study, I report preliminary results of a study designed to investigate the impact on a salt marsh community in coastal Alabama. NOAA data indicates that salt marsh areas on the eastern shore of Point aux Pins in Mississippi Sound received light to moderate oiling in the late summer of 2010. Ecologically similar areas on the western shore did not receive oil impact. Our research will examine macrofauna, meiofauna, microflora, and plant communities at each site for a twelve month period in an attempt to ascertain the ecological effects of oil exposure. The study, which began in January 2011, has yielded interesting preliminary results, particularly for meiofaunal communities which indicate possibly significant differences between the two areas.

Earwood, Tyler, Deanna Cousette and Ashley Jespersen. Beta Phi, University of West Alabama. The abundance and diversity of sunfish in Alamuchee creek, Sumpter County, Alabama.

The sunfish (Family Centrarchidae) are among the dominant groups of fish in both lotic and lentic environments in the southeastern United States. In this research, we examine the distribution and abundance of sunfish in a Sumter County, AL, stream and an adjacent oxbow lake. The goal is to evaluate the manner in which sunfish guilds respond to changing environmental parameters. To investigate this question, sites in Alamuchee Creek and adjacent lentic environments were sampled on six occasions during the Winter and Spring of 2011. Fish were collected by seining, traps, and other techniques to determine community composition. Abiotic factors measured included current velocity, pH, dissolved oxygen, canopy cover, turbidity, and temperature. Community compositions were compared employing multivariate statistics. *Lepomis macrochirus* (bluegill) was a dominant species at both sites, while other species differed in abundance between lentic and lotic environments.

\*Sheehy, Amanda M. and Terry D. Richardson. Beta Zeta, University of North Alabama. Monitoring Freshwater Snail Populations with Digital Photography.

It is currently difficult to study endangered freshwater snail species because traditional methods of monitoring snail population age, structure, growth or decline, and life histories cause stress or death to individuals studied. However, with digital technology and developments in underwater photography, it may now be possible to monitor freshwater snail populations without collecting or harming individuals. Using underwater photographic methods, information such as population density could be gathered by simply taking pictures. We will examine the accuracy of this technique by studying non-listed snail populations inhabiting riffles in a stream near Florence, Alabama. We will use a surber sampler by first taking a photograph of the sample area then collect the sample and compare photographs to actual sample data. Ten surber samples will be photographed and collected. In the laboratory, photographs will be enlarged and snails counted. Snails in the actual samples will also be counted comparison. If accurate, this technique could have significant applications in the field of endangered freshwater snail species conservation.

Samuels, Megan K. Mu Chi, Midway College. An exploration into photodynamic inactivation of *Staphylococcus aureus* inoculated on spinach.

The bacterial contamination of produce has been an ongoing struggle for many years. The normal method for decontamination is washing, however little research has been done on other methods that could be implemented. In this study photodynamic inactivation (PDI) is investigated as a possible way to rid spinach of contamination in the form of *Staphylococcus aureus*. This study investigates the use of Rose Bengal as an effective photosensitizer for *S. aureus* inoculated on spinach leaves. Results indicate that *S. aureus* is effectively inactivated when treated with Rose Bengal and exposed to light for thirty minutes, the overall percentage of killing being 75% ( $\pm 20$ ). This study also showed a seemingly significant level of inactivation when the concentration of Rose Bengal is doubled and the exposure time is cut in half. These results could possibly be used to develop a new method of decontamination of produce, where instead of washing the produce is treated with Rose Bengal, exposed to light and rinsed.

Seal, M.I., T.J. Mozdzer and J.P. Megonigal. Beta Chi, University of Southern Mississippi. Physiological responses of introduced *Phragmites australis* to climate change stressors.

Wetlands throughout North America are threatened by the invasion of a non-native genetic lineage of the common reed, *Phragmites australis*. This introduced Eurasian lineage is expanding into historically unoccupied habitats resulting in catastrophic losses in plant species richness and ecosystem services. Preliminary research suggests introduced *Phragmites* responds positively to the primary climate change stressors (rising carbon dioxide concentrations and nitrogen pollution). However, it is unclear how establishment processes will respond to multiple interacting climate change factors. To evaluate the effects of these interacting factors, a mesocosm experiment was conducted in a Chesapeake Bay brackish marsh. Atmospheric CO<sub>2</sub> was maintained at either ambient concentrations or concentrations predicted at the end of this century (640ppm), nitrogen under ambient or eutrophic conditions (25g N m<sup>-2</sup> yr<sup>-1</sup>), and plant mesocosms were exposed to a 65 cm range of elevation mimicking current and predicted relative sea-levels. To evaluate plant physiological stress, we measured quantum yield and rETR<sub>s</sub> using a Walz mini PAM fluorometer. To evaluate plant growth, we created allometric relationships. The anticipated benefits of elevated CO<sub>2</sub> and N pollution cannot overcome the effects of rising sea-levels, and the optimum aboveground plant growth occurs at a relatively narrow range around the current marsh platform.

**Hitter, Alexandra. Mu Chi, Midway College. Effects of habitat characteristics on lentic turtle populations in bluegrass region ponds of Kentucky.**

I sampled three open canopy and three forested ponds in the bluegrass region of Kentucky. Two aquatic turtle species were collected from both pond types: common snapping turtle (*Chelydras serpentina*) and red-eared slider (*Trachemys scripta*). One aquatic turtle species, midland painted turtle (*Chrysemys picta*), was found in just one closed pond. Averages of biomasses and carapace lengths were recorded for each pond type. Statistics were also run for biomasses, carapace lengths, and the number of turtles caught in each pond type. I found no statistical differences in the turtle characteristics found in open versus forested ponds.

**\*District II Brooks Award Winner, Best Paper.**

**Paper Presentations  
Southeastern Districts I and II**

Sitaula, Sadichha and Wanda T. Schroeder. Sigma Lambda, Wesleyan College.  
Expression of transglutaminase I in mouse cervical epithelium during the estrous cycle.

The proliferation and differentiation of uterine and cervical epithelia are tightly controlled by estrogen during the estrous cycle. While changes in differentiation-specific markers, such as cytokeratins, have been thoroughly studied in uterus and cervix, the effect of estrogen on the expression of other markers of epithelial differentiation, such as transglutaminase I (TGase-1) have not been previously examined in these tissues. In this study, we analyze the expression of TGase-1 in ectocervix and endocervix of mice during the stages of the estrous cycle by immunohistochemical staining with a TGase-1-specific monoclonal antibody. The results of these experiments provide valuable insight into the pattern of differentiation of cervical cells and potential differences between ectocervical and endocervical epithelia. The cervix contains transitional epithelium, which is the site where most cervical carcinomas develop. Therefore the results of this study may provide valuable information concerning differences in hormonally-controlled tissues of the female reproductive tract. A better understanding of the normal pattern of cellular differentiation in endo- and ectocervical tissues may aid in the identification of abnormal differentiation such as found in cervical carcinomas.

Adhikary, Sadikshya and Wanda T. Schroeder. Sigma Lambda, Wesleyan College.  
Analysis of Bcl-2 protein expression during calcium-induced differentiation of human epidermal keratinocytes using the HaCaT cell line.

Extracellular calcium concentrations are intricately involved in epidermal keratinocyte terminal differentiation in culture. At low levels of extracellular calcium (0.03 mM) epidermal keratinocytes proliferate and remain undifferentiated. At high calcium levels (2.8 mM), cultured epidermal keratinocytes begin to differentiate and stratify. Normal epidermal keratinocyte differentiation involves a specialized form of apoptosis, or programmed cell death, that enhances epidermal function. Bcl-2 is a member of a family of proteins that regulates apoptosis. In other studies, Bcl-2 protein has been shown to suppress apoptosis. The aim of this research is to investigate the expression of Bcl-2 protein in undifferentiated and differentiating keratinocytes utilizing the epidermal keratinocyte HaCaT cell line. In this study, immunohistochemical analysis of the expression of the Bcl-2 protein in HaCaT cells grown in low  $\text{Ca}^{2+}$  (undifferentiated) and high  $\text{Ca}^{2+}$  (differentiated) media using a Bcl-2-specific monoclonal antibody provides information on the relationship between Bcl-2 expression and apoptosis in epidermal keratinocytes. The results of this

investigation will contribute to the understanding of normal epithelial differentiation, apoptosis, and abnormal differentiation which results during epidermal disease.

Ziegler, Patricia R. Nu Upsilon, Bridgewater College. A Survey of arthropods in arboreal Spanish moss (*Tillandsia usneoides* [L.] L.) plants from central Florida.

Spanish moss supports diverse arthropod communities including both resident and transient species. This study is a survey of arthropods occurring in Spanish moss in both summer (August) and winter (January) in central Florida. Samples were obtained from multiple positions on two individual *Quercus nigra* L. trees. Each was fumigated, dried and inspected for macroscopic arthropods. A subsample of 5-10 g dry weight was placed in 70% ethanol for inspection for microscopic arthropods. Arthropods were placed in vials in 70% ethanol for later identification. The samples taken in August were found to have higher numbers of resident arthropods including a number of spider egg cases and cocoons. Host specific insects such as *Orthezia tillandsiae* (scale insect) were observed, as were apparent nonresident species. Other arthropods we found include at least two species of mites, at least two species of spiders, and a variety of insects. This study adds support to previous research that shows tree dwelling Spanish moss provides habitat to a wide variety of arthropod communities.

\*Rooker, Kelly and Lora Harris. Nu Upsilon, Bridgewater College and University of Maryland, Center for Environmental Science. The modeling and evaluation of wild rice *Zizania aquatic* particle capture at Jug Bay, Maryland.

Freshwater tidal marshes are important ecosystems located between fresh and oligohaline waters. These ecosystems are constantly undergoing sediment changes, with sediment being simultaneously deposited, carried away, and/or captured by the vegetation present there. While broad-leaved species are common in many of these wetlands, intertidal vegetation also includes species with cylindrical stem morphology such as that characteristic of *Zizania aquatica* (wild rice). In a wild rice-dominated low marsh at the Jug Bay Wetlands Sanctuary, Maryland, we observed sediment dynamics over a tidal cycle with an emphasis on looking at particle capture by stems and leaves. Data from this study and measurements from a broad-leaved *Nuphar advena* (spatterdock) site were used to parameterize a model of particle capture. Here we present model output and a sensitivity analysis using this model, with comparisons between the narrow and broad-leaved species. In addition to concluding that morphology does affect sediment capture rates, simulated particle trapping was higher in spatterdock than wild rice. We will also discuss the impact of water velocity, total suspended solids, and percent particles captured on simulation dynamics.

Hayes, Stephanie J. and Richard D. Durtsche. Mu Iota, Northern Kentucky University. Induced hypoxia in aquatic systems by the invasive shrub Amur honeysuckle (*Lonicera maackii*): microbial activity.

Aquatic hypoxia (low dissolved oxygen [DO] levels: 1 mg/L) impacting frog tadpole survival is linked to allochthonous leaf litter from the invasive shrub Amur honeysuckle (*Lonicera maackii*). Our studies investigated oxygen-binding plant proteins, humics with chelating elements, and microbial activity from decomposition of *L. maackii* leaves in water to determine which impacted DO loss. Several protein analyses were performed on *L. maackii* leaf teas, but no proteins were ultimately found. ICP-OES elemental analyses of both teas and leaves were used to determine potential humic chelating metals that might bind oxygen, and found Ca, K, and Mg were leached into teas more readily from honeysuckle leaves than from native tree leaves. Standard plate counts of bacterial activity determined that honeysuckle teas have roughly  $10^3$  times more bacteria than native riparian tree teas. Gram stain characterization and thymoglycolate incubation of pure

culture honeysuckle tea bacterial species found all microbes to be aerobic. Sterile filtered *L. maackii* leaf teas were also found to have DO levels at or slightly above normal DO levels over extended periods in comparison with unfiltered teas. In only 4 day-old unsterilized leaf teas, microbial metabolic rates were significantly higher in honeysuckle than native tree leaves or a water control.

Enam, Charisma, J. Rowan and H. Boettger-Tong. Sigma Lambda, Wesleyan College. Sex Influences Single Alternation Pattern Learning Abilities in C3H/HeNHsd Mice.

Learning and recall of ordered information is a vital, evolutionarily conserved cognitive function. To experimentally assess pattern learning and to determine the influence of both intrinsic and extrinsic factors on this ability, operant chamber devices, which work by associating rewards with correct responses, have been used. Although modular operant chambers have been used to assess learning in mice, these devices are limited in combinatorial possibilities and in list array choices. A modified, octagonal operant chamber has been used extensively to study pattern learning in rats, but limited data is available for its use in other rodent species. The aim of this study was to determine if mice are capable of learning a single alternation pattern (121212) in rat octagonal operant chambers and to determine if there is a difference in learning between male and female mice. Data from this pilot experiment indicate that in this task, female mice demonstrate significantly better working and reference memory than their male counterparts, but exhibit no difference in latency responses. The wide variety and availability of genetically modified mice provides a new venue for examining mechanistic information about serial pattern learning in this model system.

Flake, S. Sigma Phi, Guilford College. Effects of white-tailed deer (*Odocoileus virginianus*) on invasive exotic woody plants in Piedmont North Carolina forest communities

Invasive exotic plants are associated with biological and economic damage to forest communities. Studies in the mid-Atlantic, Great Lakes, and Northeastern regions of the United States have found that numbers of exotic invasive plants increase in the presence of white-tailed deer; however, I have found no study assessing these effects in Piedmont North Carolina. This study investigates the interactions between plants and deer in three contiguous Piedmont forest community types in Guilford County, NC. I am conducting line transects for deer bites on woody plants to determine food preference, and I will estimate deer populations in various areas by surveying fecal pellet groups. Preliminary results from bite count transects suggest that deer prefer to forage upon invasive shrubs (*Eleagnus umbellatus* and *Ligustrum sinense*) do not show a preference for native saplings as shown in other studies. This study may present evidence counter to the prevailing enemy release hypothesis, wherein invasive plants become invasive due to lack of herbivory. This suggests that other factors, such as edge effects or seed dispersal by animals may be facilitating the spread of invasive exotic plants in these communities. This study has implications for management of both deer and invasive plants in suburban Piedmont communities.

Campbell, Patricia L. Mu Omicron, Columbus State University. Efficacy of the rbcL+matK barcode in the taxonomically complex groups of *Rhododendron*.

DNA barcoding is the use of specific gene regions that can be attributed to species identity. Recently, the rbcL+matK barcode has been shown to provide relatively high species resolution in plants. However, the efficacy of the rbcL+ matK barcode has been rarely tested in taxonomically complex groups. Here, we evaluate rates of sequence recovery and species resolution in taxonomically complex groups of *Rhododendron* at Callaway Gardens, Ga. Results demonstrate that while taxonomic coverage varied between gene regions and rates of sequence recovery differed substantially between the

two loci, overall sequence recovery for the two gene regions combined was relatively high. Although, species resolution also varied among individual gene regions (rbcl or matk), the ability of the rbcl+matk barcode to discern specific clades, as well as species, was relatively high. This work represents one of the few studies that evaluate the performance of the rbcl+matk barcode in a genus of broad taxonomic dispersion.

Anglin, Scott, Timothy McLean, David Jayroe and Helen Namataka. Beta Chi, The University of Southern Mississippi. Characterizing Populations of dsRNA in *Karenia brevis* Present at Different Times of the Diel Cycle.

*Karenia brevis* is a mixotrophic, marine dinoflagellate found in the Gulf of Mexico that generates periodic, if not annual, harmful algal blooms in certain coastal areas. In an effort to better understand the biology of this organism, a functional genomics project has been initiated. As part of that project, it has been determined that a significant number of natural antisense transcripts (NATs) as well as double-stranded RNA (dsRNA) molecules exist within the transcriptome of *K. brevis*. The purpose of this research is to determine if dsRNAs play a role in regulating gene expression. The methods involved in this procedure include extracting total RNA from cells grown under different culture conditions, isolating and cloning the dsRNAs, and sequencing a representative sample of each clone library. We will assess the relative level of expression of the most abundant genes under the tested conditions. Any differential expression between conditions will support the hypothesis of dsRNAs regulating the expression of genes via a post-transcriptional mechanism. The results of these experiments will possibly lead to a better understanding of environment-gene interactions for this organism, which, in turn, will aid our ability to understand the factors and mechanisms associated with cell growth and bloom formation.

**\*Districts I and II Brooks Award Winner, Best Paper.**

### **Poster Presentations Southeastern District I**

Aryal, Suvkshya. Beta Alpha, Salem College. Analysis of levels of C4 in African Green Monkeys of varying age and sex.

Complement is an integral part of innate immune system. It links innate and adaptive immunity to viruses by serving in recognition and elimination of pathogens via direct killing and/or stimulation of phagocytosis. C4 is an important component protein of the system, because the two pathways, classical and lectin, converge in the presence of C4. C4b, an activated component of C4 along with C3b leads to the downstream activation of membrane attack complex (MAC). MAC is essential for the lysis of virion particles and infected cells. Deficiency of this protein is associated with lupus and type I diabetes. Human populations have different kinds and levels of C4 due to existence of varying haplotypes of the encoding gene cluster, polygenetic variations, or hemolytic activities. This project involves the analysis of the variance in C4 levels. The levels of C4 were investigated according to age and sex among series of samples from African Green Monkeys. The results showed that the males had consistently high levels of C4 but the females had random pattern. However, age did not seem to correlate with the levels of C4.

Bartanus, Justin, Xuan, Pengfei, and Anna Blenda. Sigma Gamma, Erskine College. Collection, annotation and public database display of the agronomically important traits in cotton.

Molecular breeding facilitates development of cotton varieties with improved agronomically important traits, providing higher quality cotton. Several types of DNA molecular markers are being used in cotton molecular research and breeding to determine the location of particular traits on cotton chromosomes. Most of the agronomically important traits in cotton are genetically determined by the quantitative trait loci (QTLs) and show polygenic inheritance. Cotton Marker Database (CMD) at Clemson University ([www.cottonmarker.org](http://www.cottonmarker.org)) provides public access to the molecular markers associated with agronomically important cotton traits and their QTLs. As an ongoing project, the goal of this specific research has been to collect, annotate and display through the CMD the published information about a number of agriculturally important cotton traits and corresponding QTLs, which had been genetically mapped using molecular markers. The specific goal was to upload the collected mapped trait/QTL data into the Comparative Map Viewer (CMap) on CMD, which allows comparison of several cotton genetic maps at the same time. As a result, 169 mapped QTLs were added to 27 cotton genetic maps and are publically available for the cotton research community to view and download from the CMD CMap (<http://www.cottonmarker.org/cmap/index.shtml>).

Di Iulio, Zachary, John Martin, Jonathan Stanford and Nathaniel Fuller. Kappa Kappa, Augusta State University. Human-wildlife interface: geospatial movements of the yellow-bellied slider (*Trachemys scripta scripta*) in an urban setting.

Animals and humans often share the same habitat and can influence each other's lifestyles and living conditions. Lifestyle changes that occur in the presence of the other species can be either positive or negative. To observe any possible changes in the lifestyle of the yellow-bellied slider turtle (*Trachemys scripta scripta*), several female turtles were tracked using telemetry measurements at Brick Park Pond in North Augusta, SC. These turtles were tracked at least once a week during the spring of 2009, and the spring, summer, and fall of 2010. The results of these measurements showed that many turtles remained in a vicinity where human provided food was readily available, and their home range was smaller than that of turtles that were not fed by humans. The area where this human food was available was unsupervised and gave anyone unrestricted access to the turtle population. Because the food was often available, much of the turtle population congregated around the area. This shows that the home-range and lifestyle of the turtles was indeed affected by human proximity.

\*Ware, Nylvia. Mu Omicron, Columbus State University. Antiviral Effects of Lactoferrin at Different Stages of Herpes Simplex Virus Type 1 Infection of Vero Cells.

Lactoferrin (Lf) is an iron-binding glycoprotein found in mucosal secretions, such as tears and saliva, making it part of the first line of defense against pathogens. Previous studies have shown Lf possesses antimicrobial properties including inhibitory effects against viruses. This project examined the effects of Lf on herpes simplex virus type 1 (HSV-1) at different stages of infection in Vero cells. In the first experiment, a concentration-dependent reduction in plaque-forming units (PFUs) was observed when Lf and HSV-1 were simultaneously added to Vero cells. For the second experiment, HSV-1 and Lf were incubated together prior to inoculation onto Vero cells. HSV-1 was inoculated onto Vero cells pretreated with Lf in the third experiment. A significantly greater reduction in PFUs was observed with HSV-1 pretreated with Lf than with Vero cells pretreated with Lf. In the fourth experiment, in which Lf was added to HSV-1 attached to but not penetrating Vero cells, significant inhibition was also observed. These results indicate that Lf has a direct antiviral effect on HSV-1 rather than a cell-protective effect.

Caldwell, Cristina. Mu Omicron, Columbus State University. Habitat Assessment in Hannahatchee Creek, Stewart County, Georgia.

Ichthyological surveys were conducted at four sites in Hannahatchee Creek in Stewart County, Georgia from July 2006 to October 2008. I will use the results of these surveys to determine if there is any relationship between substrate and habitat quality and to supplement an evaluation of habitat quality in Middle Chattahoochee River tributaries. I will use the Index of Biotic Integrity to analyze the results of the surveys using scoring criteria developed by the Georgia Department of Natural Resources for wadeable streams in the Apalachicola drainage basins of the Southeastern Plains ecoregion of Georgia.

Saleh, Mahmoud and Michele Malotky. Sigma Phi, Guilford College. Identification of a possible target receptor for the Estrogenic Endocrine Disrupting Chemical (EDDC) Bisphenol A in *Caenorhabditis elegans*.

Endocrine Disrupting Chemicals (EDCs) are compounds that alter hormonal and homeostatic systems by interfering with endocrine signaling pathways. Bisphenol A (BPA) is an estrogenic EDC used in the synthesis of polycarbonate plastic. Human studies show a correlation between urinary BPA concentrations and cardiovascular diagnoses. BPA has also been shown to cause abnormalities in growth and reproduction in *Caenorhabditis elegans*, a free-living soil nematode. In this study, we conducted a multigenerational bioassay to observe the effect of BPA on the physical appearance and fecundity of *C. elegans*. Our results show a decrease in egg laying and hatching by the fourth generation at BPA concentrations between 100nM and 10 $\mu$ M. Although similar toxicological studies have been done, target receptors have not been identified. We are currently in the process of creating plasmid constructs containing a short sequence of two potential estrogen receptors in *C. elegans*. These genes, *nhr-14* and *nhr-69*, have significant similarities in gene sequences to estrogen receptors in humans. Once the plasmids are transformed into a feeding strain of *E. coli*, these bacteria will be used in an RNA interference assay to determine the relative contribution of each target receptor to signal transduction by BPA in *C. elegans*.

Gadalla, Mary and Zachary Bloomer. Kappa Kappa, Augusta State University. A Unique Discovery: Zinc Tolerance on Serpentine in Georgia.

*Pediomelum piedmontanum* is a recently discovered endangered plant species that exists in the lower piedmont of Georgia and South Carolina. It features only one known serpentine population in Georgia. It remains unclear why this species is so rare and restricted in habitat. We hypothesize that local adaptations to metals present in the substrate may provide insight into its limited distribution. Our lab has previously shown that this species is tolerant from 10-50  $\mu$ M NiSO<sub>4</sub>. High nickel concentrations are typical of serpentine soils. Zinc tolerance is much rarer than nickel tolerance, but many serpentine species in Europe and a few in the Western United States are co-tolerant to both metals. In order to test for zinc and nickel tolerance, seedlings were transplanted into one of following hydroponic solutions: 50  $\mu$ M ZnSO<sub>4</sub>, 100  $\mu$ M ZnSO<sub>4</sub> or 100  $\mu$ M NiSO<sub>4</sub>. Seedlings in the 50  $\mu$ M ZnSO<sub>4</sub> showed zinc tolerance with increased shoot and root growth whereas growth was significantly less than controls in other metal solutions. To find zinc tolerance above 10  $\mu$ M Zn from a population on serpentine in the Southeastern United States is a unique discovery.

Haram, Brigitte, Salina Patton and Matthew Coleman. Kappa Kappa, Augusta State University. A breeding population survey of the red-headed woodpecker (*Melanerpes erythrocephalus*) in a fire-adapted ecosystem.

A survey of the breeding population of red-headed woodpeckers, *Melanerpes erythrocephalus*, was conducted in a fire-maintained pine tract at the Silver Bluff Audubon Center of Jackson, South Carolina. A tract of planted pine with a large number of standing dead trees with potential nest cavities was chosen. Adult red-headed woodpeckers (RHW)

were observed in order to identify cavities of interest. A wireless camera mounted on an extension pole was inserted into potential nest cavities to confirm activity. Once confirmed as active, nests were monitored weekly and photos were taken to document young RHW development. Data were also collected regarding cavity height, directional orientation and distance from neighboring nest cavities. Three active nest cavities were identified and monitored from May through August; two of which produced a second clutch of offspring. While no clutch exhibited one-hundred percent survivorship, every clutch produced at least one fledgling. Interesting to note are the direction and spacing among nest cavities. Each nest cavity was oriented to face the northeast quadrant while adjacent nests were approximately the same distance apart.

Haungs, Amanda. Sigma Phi, Guilford College. Assessing the role of *nhr-14* and *nhr-69* as possible estrogen-like target receptors for the Estrogenic Endocrine Disrupting Chemical (EEDC) Enterodiol in the soil nematode, *Caenorhabditis elegans*.

Endocrine Disrupting Chemicals (EDCs) are harmful compounds that interfere with endocrine signaling pathways. In this study, *Caenorhabditis elegans* was used to determine the target receptor of the estrogenic EDC, enterodiol. This type of ligand can be found in a variety of foods such as whole grains, fruits, and vegetables. Previous studies have reported that these chemicals can cause irregularities in reproduction and physiological changes in both invertebrates and vertebrates, but the effects of enterodiol have yet to be studied. We are currently using multi-generational assays to observe the physiological effects of enterodiol in *C. elegans*. In addition, we have created a plasmid containing a small sequence of the gene encoding for two nuclear receptors, *nhr-14* and *nhr-69*. Both receptors have a similar sequence to estrogen receptors in humans. We will transform *Escherichia coli* with the plasmid construct to create a feeding strain of bacteria to be used to induce RNA interference (RNAi) in *C. elegans*. RNAi is a process of gene-silencing in which double-stranded RNA is used to silence the expression of a particular gene. RNAi will be used to shut off the gene for a putative estrogen receptor to determine its role in signaling by enterodiol.

Buckaloo, Sophia M. and Stephen F. Baron. Nu Upsilon, Bridgewater College. Isolation of two "bald" mutants of *Streptomyces* sp. 5A defective in synthesis of polyhydroxybutyrate depolymerase.

Polyhydroxybutyrate (PHB) is a biodegradable, plastic-like polymer produced by bacteria. The actinomycete, \**Streptomyces* sp. 5A\*, degrades PHB, using an extracellular PHB depolymerase. Enzyme synthesis is induced by growth on PHB but repressed by glucose, suggesting transcriptional regulation of its corresponding gene (*phaZ*). Bald (*bld*) mutants of this filamentous bacterium do not produce aerial hyphae and thus form smooth, "bald" colonies on agar media. We isolated 21 *bld* mutants of *Streptomyces* sp. 5A, which demonstrated the bald phenotype on media containing glucose as sole carbon source. When grown on media containing PHB, most of the mutants formed some aerial hyphae and also synthesized PHB depolymerase, as evidenced by clearing zones around the bacterial growth. However, two of the mutants, *bld-4* and *bld-15*, failed to produce PHB depolymerase and remained essentially bald as compared to the others. These two mutants may be unable to synthesize an extracellular signaling molecule needed to activate transcription of both aerial differentiation genes and of *phaZ*. To assess this possibility, we are currently determining whether spent medium from the wild type grown on glucose can restore aerial differentiation and PHB depolymerase synthesis in *bld-4* and *bld-15*.

Margarucci, Douglas M. and Charles K. Smith. Phi Zeta, High Point University. Environmental detection of *Batrachochytrium dendrobatidis* in central North Carolina.

Chytridiomycosis, an emergent infectious skin disease caused by the chytrid fungus *Batrachochytrium dendrobatidis*, has been implicated as a factor in the decline of amphibian populations worldwide. Concerted efforts are underway in an attempt to understand the distribution and ecology of the fungus, and the epidemiology of the disease. Although *B. dendrobatidis* appears to be widespread in the southeastern United States, only a few records based on infected hosts have been recorded for North Carolina and details of its distribution in the state are not well known. Our goal is to provide baseline data on the environmental presence of *B. dendrobatidis* in central North Carolina. Water samples from 20 vernal pool sites at which we have documented one or more amphibian species have been collected and filtered, and we are currently conducting quantitative-PCR assays on those samples to detect *B. dendrobatidis*.

Spurrier, Ariel and Gerald L. Smith. Phi Zeta, High Point University. Phylogenetic investigations in southeastern United States and Mexican *Zephyranthes* species.

A phylogenetic study of southeastern United States and pink flowering Mexican species of *Zephyranthes* is being undertaken. A species of *Habranthus* serves as the outgroup. Our studies involve ISSR, flavonoid and morphological analyses of these taxa. The character states are being scored and a matrix is being developed which will be analyzed in PAUP\* 4.0b2. We are interested in the relationship of the southeastern taxa to those in Mexico and hope to establish sister relationships with some measure of bootstrap support.

Rajkarnikar, Sujana. Beta Alpha, Salem College. Artifact on Storage site of Nitrite in Blood using Ferricyanide based Oxidation Assay.

Hemoglobin (Hb) is an extensively studied protein. Nitrite, a molecule present in human blood, has recently been studied because of its various roles in physiology and therapeutics. Several studies have suggested that nitrite is a potential biological reservoir of nitric oxide (NO), which regulates hypoxic vasodilation. A recent study by Pelletier and his team proposed that erythrocytes may be one of the major intravascular storage sites of nitrite in human blood. However, our team predicted that levels of nitrite in plasma and erythrocyte should be in equilibrium. Pelletier and his team used a ferricyanide (FeCN)-based hemoglobin oxidation assay along with reductive chemiluminescence to determine the level of nitrite in whole blood's components, specifically plasma and erythrocytes. Our study tested whether nitrite detection in the erythrocyte by Pelletier was accurate or if use of FeCN led to some artifactual detection of nitrite. The use of 8mM FeCN, following the same procedure as Pelletier, did not provide any artifact. However, the use of a higher concentration (800mM as used by Pelletier et. al.) of FeCN resulted in 13-15% artifact.

Jordan, Jennifer, Roberson Jacob and Satre, Danielle. Psi Pi, Reinhardt University. Dangerous Waters? A survey of bisphenol-A in Cherokee County waterways.

Bisphenol-A, or BPA, is a compound utilized worldwide for several industrial processes, with annual production exceeding six billion pounds. As a major component in the production of plastics, BPA is commonly found in food and beverage storage containers and various everyday products. While utilization of BPA is typical, this compound negatively influences wildlife populations and has the potential to affect human development, particularly by interfering with estrogen-regulated gene expression through the compound's ability to act as an estrogen mimic. Recent studies have shown that exposure to environmentally relevant concentrations of BPA can result in multiple physiological, developmental, and anatomical abnormalities. Bisphenol-A's widespread use, coupled with the inability of public water treatment facilities to adequately remove this compound, suggests its possible presence in local waterways. Once present, BPA remains persistent in the environment, aggrandizing the exposure risk due to bioaccumulation. As a direct result, we expect to find environmentally relevant

concentrations of BPA in local water systems. To assess the level of BPA in local waterways, we obtained water samples from five locations in Cherokee County, Georgia over a two-month period. ELISA will be used to determine BPA concentrations at each location.

Searcy, Samantha and Felix, Zach. Psi Pi, Reinhardt University. Species Differentiation in Habitats of Rock Outcrops in the Cumberland Plateau.

The distribution of species among a given habitat varies greatly upon the ecological and physical characteristics of that habitat and the animals found there. The Cumberland Plateau is a region within the Southeastern United States richly diverse in species of salamanders. Among this diversity, green (*Aneides aeneus*) and “slimy” (*Plethodon kentucki/glutinosus*), both of great abundance among rock outcrops in this area, have been compared using specific physical factors such as SVL (in mm), stage (adult or juvenile), and height from base of the outcrop to position on outcrop (in cm). I visited several different locations among the Cumberland Plateau in Tennessee and Kentucky during the evening and caught and examined any/ and all species that I found. My data was recorded and then tested for any corresponding relationships between species, green or “slimy”, and height at which the animal was found and the species of that animal. The comparison of these two species is important with respect to resource partitioning among a specific habitat, rock outcrops in the Cumberland Plateau in this particular experiment, and also furthers the development of conservation of species and habitats within the environment.

Ilieva, Jorjetta Viktorova. Beta Beta Beta, Mercer University. Structure, Function, and Evolution of Cell Adhesion Proteins in *Monosiga brevicollis* and *Trichoplax adhaerens*.

Phylogenomic analyses have revealed that Metazoa evolved from their unicellular ancestors such as choanoflagellates. For example, the genome of the *Monosiga brevicollis* contains genes for proteins that are essential for cell adhesion and cell signaling found in metazoan organisms. Perhaps the most significant of these proteins is talin, which is found in amoebozoans, choanoflagellates, and metazoans (including *Trichoplax adhaerens*). Although talin is not present in fungi, the essential C-terminal THATCH (I/LWEQ) domain that mediates F-actin binding and subcellular targeting in talin is conserved and present in the fungal protein Sla2/End4p, which is required for endocytosis. Vinculin, a scaffolding protein and partner of talin, is present in each of these groups except amoebozoans. Talin and vinculin interact with one another in multicomponent adhesion/signaling assemblies where talin both activates and connects  $\beta$ -integrin to the actin cytoskeleton. This interaction raises the possibility that talin may play a unique role in vinculin activation. Given that talin, integrin and vinculin have essential roles in cell adhesion and signaling, we anticipate that comparison of choanoflagellate adhesion proteins with those from metazoans will improve our understanding the evolution of these proteins as components of multiprotein assemblies and identify critical factors in the origins of multicellularity in animals.

Ohman, Lisa and Wanda T. Schroeder. Sigma Lambda, Wesleyan College. Cellular pattern of ER $\alpha$  and ER $\beta$  in human cervical and vaginal cell lines.

Estrogen mediates its effects on target tissues through binding to specific receptors. Estrogen receptor  $\alpha$  (ER $\alpha$ ) and estrogen receptor  $\beta$  (ER $\beta$ ) are members of the steroid receptor super-family and are both expressed in varying levels in human uterus and vaginal tissues. Estrogen regulates proliferation and differentiation in uterus and vaginal tissues in rodents and humans in vivo, however cell culture models for studying the effects of estrogen on particular cell types in these tissues have not been well-documented. The purpose of this study is to examine the expression patterns of ER $\alpha$  and ER $\beta$  in different

uterine compartments and vaginal epithelium utilizing immortalized human endocervix (CRL 2615), ectocervix (CRL 2614) and vaginal epithelia (CRL 2616) cell lines. Immunohistochemical analysis using ER $\alpha$ - and ER $\beta$ -specific antibodies demonstrates that expression of ER $\alpha$  and ER $\beta$  differs in these estrogen-responsive tissues lending support to the theory that each receptor subtype may perform specific biological functions.

Williford, Tabitha. Tau Kappa, Georgia Southern University. Identification and Prevention of Contaminants of Algal Biofuel Producers

The present energy-crisis forces consumers to turn to other energy sources and alternative fuels, such as biofuels. The new area of algaculture allows producers and consumers a cheaper, more efficient source of energy with a low environmental impact. However, contaminants and toxins cause problems for producers and can harm the industry. By identifying optimum temperature, a universal media, and primers to identify rDNA regions, we were able to determine multiple contaminants that have a pressing impact on the industry and human health. When testing the impact of D-amino acids, we determined the effectiveness of inhibiting bacterial biofilm formation, but not growth. Ultimately, this will impact the future of biofuels and create a safer, more efficient and cost effective way to produce a energy source for the future.

Jacobs, John, Kevin Shea, Nathan Grimm and Shawn Simonsen. Sigma Phi, Guilford College, Intermountain Orthopaedics, University of Utah School of Medicine, Boise State University. ACL and Knee Injury Prevention Programs for Young Athletes: Do they Work?

The purpose of this study was to determine the level of evidence (LOE) for clinical trials that evaluate training programs to reduce the risk of knee injury. Searches for ACL/Knee injury prevention trials were conducted using 3 medical databases (MEDLINE, Cochrane, CINAHL) and the following study designs were accepted for evaluation using the LOE ranking algorithm described by the Journal of Bone and Joint Surgery: randomized prospective (Level I), non-randomized prospective (Level II), case-control (Level III). No Level I studies, 12 Level II studies, and 3 Level III studies were identified. Of the Level II and Level III studies, 7/12 and 2/3 demonstrated a significant reduction of knee and/or ACL injury, respectively. Although these exercise prevention programs may improve performance, when the levels of evidence of these clinical trials are analyzed, a consistent reduction in knee injury risk is not demonstrated at a high LOE. Some of these studies do show a reduction in risk, but these trials have design flaws, and in many cases, the reduction in injury risk is not statistically significant. Because the current lower quality evidence does suggest a beneficial treatment effect, these programs may still be recommended for injury prevention, especially in female athletes.

Holmes, Arturo and Clem Bell. Beta Omega, Mercer University. Polymorphism in an Allelic Series.

Evolutionary patterns from polymorphic diversity can be discovered by analyzing an allelic series of non-coding DNA. We are exploring polymorphic diversity in one of the Alu non-coding regions in the human genome. DNA sequencing software analysis allows scientists to juxtapose DNA strands by filtering amplified DNA fragments according to base pair order. In our experiments, we first amplify our locus with the polymerase chain reaction and then perform dideoxy enzymatic DNA sequencing on the fragments using fluorescently labeled oligo primers. DNA sequences are analyzed with an automated LYCOR 4300. Our goal is to sequence and compare over 24 alleles at this locus. From this comparison, we will learn if there are mutation hot spots within this locus as well as if there are preferred types of polymorphisms. For example, we have already detected a transversion versus transition preference. We would eventually like to compare this non-

coding locus to a nearby coding region in order to support the idea that non-coding regions accumulate mutations more rapidly than coding regions.

**\*District I Johnson Award Winner, Best Poster.**

### Poster Presentations Southeastern District II

Elswick, Maranda J., Clare C. W. Whittaker and Joseph C. Whittaker, Pi Zeta, Pikeville College. Documentation of Rates of Infection by *Toxoplasma gondii* in House Cats (*Felis catus*) in Eastern Kentucky and Southwestern Virginia.

Toxoplasmosis, a parasitic infection caused by *Toxoplasma gondii*, can affect multiple species, including humans. Most infections go unnoticed although serious problems can arise in immuno-compromised individuals. Pregnant women who contract Toxoplasmosis can pass the parasite to their fetuses, which can develop swelling of the brain, leading to vision and neurological problems. Current research suggests that certain types of schizophrenia are caused by Toxoplasmosis. The definitive host of *T. gondii* is the cat. Felines contract the parasite when they consume infected prey. The parasite is passed in their feces, posing a threat to humans. To gauge the risk of infection in house cats in Pike Co., KY, and Buchanan Co., VA, blood sera of local cats were tested for antibodies to *T. gondii* to determine infection rate. Of the 103 cats tested, 23.03% were positive for *T. gondii* antibodies. Of these positive cases, 62.50% are most likely active cases, and 37.50% are presumed to be immune to re-infection. A positive correlation was noted between infection and contact with other cats.

Jackson, Lillie, Gaukhar Amandossova and Ben Ward. Eta Nu, Samford University. Identification of uncultured soil bacteria from Samford University (Jefferson County, AL) using 16S rRNA gene amplification, cloning, and DNA sequencing

Soil bacteria show a tremendous degree of diversity, yet extensive survey data for soil bacteria in Alabama is lacking. To address this problem, soil samples were taken from a single wooded location on the Samford University campus (Jefferson County, AL) from a depth of up to 1 m in late summer and early winter. DNA was extracted from soil samples using one of two commercial soil-DNA extraction kits. The 16S rRNA gene was amplified by PCR and the segment cloned into *E. coli* using the TOPO-TA kit (Invitrogen). Clones with inserts were sent to GeneWiz for sequencing. DNA sequences were compared with published sequences. Seventeen distinct bacteria have been identified to date, most of which probably represent new species.

McEntire, T., R. Spaulding, M. Caroway, R. Hemmer, H.A. Bullen and K.L. Haik. Mu Iota, Northern Kentucky University. Comparison of toxicity of PBCA nanoparticles on immortalized astrocytes and endothelial cells.

Crossing the blood brain barrier (BBB) presents a great challenge in treating neurological diseases, disorders and injuries. The BBB is made up primarily of endothelial cells lining capillary walls reinforced with astrocytic feet. A potential solution in overcoming the BBB that is being explored involves the use of nanoparticles (NPs). NPs can be used to deliver drugs across the BBB aided by manipulation of their surface characteristics, however the risks of utilizing the NPs has not been fully assessed. The purpose of this study is to evaluate the potential toxicity of polybutylcyanoacrylate NPs using a lactate dehydrogenase (LDH) assay. Cytotoxicity was measured from immortalized endothelial cell cultures and immortalized astrocytes exposed to one of the following treatments: (1) polybutylcyanoacrylate NPs (2) sodium azide (a chemical toxic to cells); and (3)

physiological saline. Results indicate that the doses of NPs used in this study were significantly more toxic than sodium azide regardless of cell line. This research indicates that further experimentation should be conducted to determine doses of NPs that could avoid cytotoxicity and whether co-culture of astrocytes and endothelial cells are resistant to NP cytotoxicity.

McDill, Jessica, Colby Cork, Tyanna Peoples and Josh Jones. Beta Phi, University of West Alabama. Relationships of fish communities to abiotic factors in two Sumter County, AL, streams.

Abiotic factors such as substrate type, pH, dissolved oxygen concentration, turbidity, current velocity, and canopy cover can affect the composition of fish communities in stream systems. Varying sedimentary regimes may exert a strong influence of the nature of these interactions. The goal of this study is to evaluate the effect of these abiotic factors on fish communities in two contrasting stream systems in Sumter County, AL. Ballard Creek, in northern Sumter County, flows over a predominately limestone substrate, while Mill Creek to the south is dominated by sands. To assess the effect on fish communities, we measured abiotic factors and sampled the fish communities in the spring of 2011. Fish were collected by means of seine nets and identified to the lowest possible taxon. Abiotic factors were assessed at the time of fish sampling. Relationships between fish community structure and abiotic factors were examined using correlation analysis with the goal of determining the abiotic factors that are significant in controlling community structure.

Garner, Elizabeth and Indrani Dey. Mu Epsilon, Troy University. Examining environmental stress response in filament formation mutant strains of *Saccharomyces cerevisiae*.

*Saccharomyces cerevisiae* (yeast) has a unique growth mechanism; during environmental stress, filamentous growth is induced. By knocking out certain genes that are involved in filamentous growth, the impact of various environmental stresses can be linked to the presence or absence of particular genes/proteins. In previous analysis, three yeast knockouts with deletions in genes involved in filament formation ( $\Delta$ Gas1,  $\Delta$ Uba4,  $\Delta$ Tpk2) were assessed for growth rate, morphology, and filament formation capabilities. Using standard yeast genetic procedures, a series of heterozygotic diploids were created, pairing  $\Delta$ Gas1 with  $\Delta$ Uba4,  $\Delta$ Tpk2 with  $\Delta$ Gas1, and  $\Delta$ Tpk2 with  $\Delta$ Uba4. The filamentation levels in these heterozygotic diploids was assessed and no alterations in filamentation was observed compared to the haploids. After inducing meiosis and performing tetrad analysis, haploid double knockouts are being isolated using molecular diagnostics (with polymerase chain reaction), and the level of filamentous growth formation in these double knockouts will ultimately be correlated to the levels in the single knockouts. In analyzing the various knockouts, a better understanding of how vital genes work together during filamentous growth has been attained, supporting the use of yeast in environmental analysis of stress response induced by exposure to environmental water samples. (Research mentors: Christi Magrath and Teresa Moore)

Owens, Heather. Mu Chi, Midway College. Methicillin-Resistant *Staphylococcus aureus* (MRSA) in the meat products of central Kentucky using polymerase chain reaction (PCR) for identification.

Methicillin-Resistant *Staphylococcus aureus* (MRSA) was isolated from 2 (4.4%) of 45 meat specimens collected in central Kentucky. There were nine samples tested from each of the five location sites. Meat samples were placed on ice for transport to the lab. They were streaked for isolation on mannitol salt agar plates and placed in 7% salt enrichment broth using an aseptic technique. Beef and processed meat each accounted for 2.2% of the positive samples for MRSA. Polymerase Chain Reaction (PCR) was conducted with the *mecA* specific primer sequences for identification of the isolates identified as MRSA

from the conventional method. After PCR analysis, 1 (6.7%) of 15 isolates had a band at approximately 400b.p. indicating presence of the *SCCmec* element. The *rjmc* forward and *orfX* reverse primers are limited to detecting only MRSA with the *SCCmec* element. Future studies may be needed to develop primers that may detect *SCCmec* (negative) MRSA from animal origins.

Ward, Andrea. Mu Chi, Midway College. Birdfeeder and birdseed preferences and associations in local populations of birds near a riparian zone: Part 3.

Bird watching is a pastime which many Americans enjoy; it involves the selection of appropriate birdfeeders and birdseed to attract various bird species. This study was done to determine if birdfeeder or birdseed preferences or associations exist, as well as to define the local bird populations of a woodland region 6m from a woodland-grassland ecotone in Midway, Kentucky with the transition region located 18m from a riparian zone of the Lee's Branch during the summer of 2010. A pre-baiting period was followed by the birdfeeder study which tested hopper, tube, and platform feeders filled with black oil sunflower seed. Three bird species were accounted for during this study, whereas eight species visited during the birdseed study which tested black oil sunflower seed, white proso millet, and safflower seed each in separate platform feeders. The Chi-Square-Goodness-of-Fit test and the Chi-Square-Test-of-Independence were used to determine preference and association respectively. Preferences and associations made by birds were demonstrated for each of the feeder and seed work. Data supported both alternative hypotheses for each study.

Muhammad, Najah Y. Beta Zeta, University of North Alabama. Identification of bacteria isolates from hands and cell phones of general populations members.

Normal bacterial flora of the skin comes in contact with many surfaces. Items such as cellular phones can act as vectors for community acquire pathogens such as MRSA (methicillin resistant *Staphylococcus aureus*) as well as transmitting normal environmental strains and bacteria from other people. This allows skin surfaces to pick up new bacteria that may become transient normal flora, be lost over time, or become incorporated as long term normal flora species. This project will follow individuals of the general population over a period of four years and monitor changes in their skin bacteria and cell phone associated bacteria. Volunteers from the general public of Northwest Tennessee had their cell phones and the skin between the second and third fingers swabbed. Samples were grown two days at room temperature in tryptic soy broth to increase the total number of microbes collected on the swab. Samples were serially diluted and plated on to tryptic soy agar before randomly selecting three to four organisms for identification for each sample. Hand and cell phone isolates were identified using the Gram stain and biochemical test with the use of a dichotomous key. This project represents data collected for the first year of the study.

Tapscott, Tim A. Eta Nu, Samford University. Species-area relationships in odonates.

Established species-area relationships show that for most species, species richness increases with habitat size. I measured the species richness of Odonates, important bioindicators of wetland health, in North Lake, Tarrant, Jefferson County, Alabama. A literature review allowed me to place my results in context by constructing a species-area curve for Odonates. I used transect sampling, visual encounter surveys, and the Shannon-Wiener diversity index ( $H' = 2.12$ ,  $E_H = 0.826$ ,  $H_{max} = 2.56$ ) to estimate species richness and found that North Lake is home to 13 species of Odonates, including *Libellula needhami*, which was identified as residing more than 300 km north of its northernmost range. Of the 31 species on record for Jefferson County, I recorded 25.8% at North Lake, with the addition of 5 species that are not included in the current record: *Celithemis elisa*, *L.*

*incesta*, *L. needhami*, *Pachydiplax longipennis*, and *Plathemis lydia*. The Odonate population reflects populations and densities expected of a southeastern wetland.

Cordle, Megan E. Mu Phi, Jacksonville State University. Physiological indices of Hg stress in the stream minnow, *Campostoma oligolepis*.

Mercury (Hg), a well-known pollutant in aquatic systems, bioaccumulates in food webs and effects many physiological systems. In fishes, diagnostic measurements are used to assess "stress" in response to environmental condition. Useful stress indicators include measurements of blood glucose and cortisol concentrations, white cell counts, measurements of energy usage, or changes in protein expression. We report here on the use of whole animal respirometry as a means of monitoring stress in fishes collected from a mercury-contaminated stream. Information on metabolism is indicative of energy partitioning and has previously been used to predict growth and fecundity in fishes. Metabolic rates, as determined by oxygen consumption rates, were examined in the stream minnow, *Campostoma oligolepis*, from various Hg-free and Hg-contaminated streams. Specifically, fish examined were collected from Shoal creek, a relatively pristine site in the Talladega National Forest, Mill Creek, an urban site in Jacksonville, AL, and Snow Creek, an urban, Hg-contaminated site in Oxford, AL. Metabolic rates were significantly higher for fishes inhabiting the Hg-contaminated site. It is hypothesized that metabolism is increased in these fishes due to gill damage and the inability to osmoregulate efficiently.

Bolus, William R., Tonya Carver and Margaret Kovach. Sigma, University of Tennessee at Chattanooga. The Function of Peripheral Myelin Protein 22 (PMP22) in the Context of Tissue Development and Cellular Differentiation.

CMT1E is a variant of the inherited neurological Charcot Marie Tooth Disease, with a unique deafness component. CMT1E is primarily due to point mutations in the *PMP22* gene. In neural tissue, *PMP22* is highly expressed and involved in proper myelination of peripheral nerves. In non-neural tissues *PMP22* is expressed at lower levels and is implicated in cellular processes central to tissue development and differentiation. The dual expression pattern of *PMP22* is consistent with the symptoms of CMT1E patients, exhibiting both neural and cochlear (non-neural) deficits in their hearing loss. We hypothesize that *PMP22* expressed in non-neural tissues regulates gene expression involved in tissue development, including that of the inner ear. We suggest that mutations in *PMP22* lead to abnormal gene expression patterns that characterize the deafness phenotype of CMT1E. Utilizing the Trembler-J mouse, Differential Display has identified 754 differentially expressed transcripts. These genes have been categorized into groups by cellular function. Major groups include: cell communication and signal transduction (25%), nucleic acid metabolism (22%), and cell growth/maintenance (15%). Differential expression patterns of promising candidate genes have been characterized across developmental time points by quantitative PCR. A gene interaction model will be developed, explaining the deafness phenotype found in CMT1E patients.

Campbell, George E. and Margaret J. Kovach. Sigma, The University of Tennessee at Chattanooga. Investigating CpG Island Methylation, Microsatellite Polymorphisms, and Gene Expression in Colon Cancer.

Although many genes have been linked to cancer, some mechanisms of abnormal gene expression remain uncharacterized. Our hypothesis is that genes central to the molecular pathways of cancer can be regulated by microsatellite repeat variability and subsequent genomic modifications. Microsatellite polymorphisms may have an effect on gene expression by modifying chromatin condensation, mRNA stability, CpG island methylation status, or transcription factor binding sites. Seven cancer-associated genes

subject to both microsatellite variability and CpG island methylation were chosen for study amongst 14 colon cancer cell lines and against normal colon tissue. Each cell line was evaluated for microsatellite variability, CpG island methylation status by COBRA methodology, and relative gene expression by qRT-PCR. Microsatellite variability displays a position effect, which may imply functionality. While last intron microsatellites display minimal variability, middle introns display high variability. Although hypomethylation of promoter CpG islands and hypermethylation of internal CpG islands commonly occurs, as expected for cancer phenotype, methylation status alone does not explain the expression data. Overall, elevated expression for oncogene CD44 and down regulation of tumor suppressor CDKN1B and, to a lesser extent, tumor suppressor STK11 was observed. The current study will correlate these expression patterns with CpG methylation status and microsatellite polymorphisms.

Edwards, Bobby, Kyle Moore and Sherilyn Garner. Beta Phi, University of West Alabama. Impact of land usage on a Sumter County, AL, stream.

Anthropogenic effects on aquatic ecosystems receiving pasture runoff have been extensively investigated. To test whether these effects operate similarly in a characteristic stream in the Black Belt region of Alabama, we examined water conditions from disturbed and undisturbed stretches of Sicolocco Creek. This stream, located in Sumter County AL, passes through a variety of ecosystems ranging from forested areas to heavily disturbed pasture areas. We measured water and soil pH, turbidity, water and air temperature, current velocity, and dissolved oxygen content on several occasions at two sites, one disturbed and one relatively undisturbed, during the spring of 2011. As our undisturbed area, we chose a location upstream of cattle pastures that intersected a forested area. For a disturbed site, we chose a location downstream from cattle pastures, intersecting grazing fields. We also tested for the biological activity of *Escherichia coli* growth, taking a series of samples from each location and growing them on Coliscan Easygel. Our results indicated that cattle activity had a significant impact on water quality, and that the chalky, limestone bottoms characteristic of Black Belt creeks assist the recovery of streams from livestock impacts.

Kennard, Jennifer. Beta Phi, University of West Alabama. Antibiotic Resistance Among *Escherichia coli* from Human, Bovine, and Equine Samples.

*Escherichia coli* was collected from three different hosts from the Fish River Basin and tested for growth in response to thirteen different antibiotics. Antibiotic resistance was measured using the Kirby-Bauer Disc Diffusion Assay. Zones of inhibition were recorded and analyzed for correlation among the different animals. The *E. coli* from the human samples were found to be more resistant to ampicillin, amoxicillin, chloramphenicol, ciprofloxacin, erythromycin, gentamicin, nalidixic acid, and sulfisoxazole. *E. coli* obtained from equines were found to be more resistant to neomycin and streptomycin whereas *E. coli* obtained from bovines were found to be more resistant to spectinomycin, oxtetracycline, and tetracycline. In conclusion, there are clear differences in the antibiotic resistances among *E. coli* from the three hosts.

Armuelles, Hayden. Beta Phi, University of West Alabama. Extraction of *Aeromonas hydrophila* from *Trichechus manatus latirostris* on the Wakulla River in Northwest Florida.

The Florida manatee (*Trichechus manatus latirostris*) inhabits coastal waters, estuaries, and fresh waters of Florida and adjacent states. Manatees have suffered greatly from a variety of anthropogenic impacts, and are currently listed as Endangered by the United States Fish and Wildlife Service. Environmental contamination and infection by microorganisms represent one threat to declining manatee populations. In this study, I report the results of a bacteriological analysis of the bacterial community on the skin of

one manatee in the Wakulla River in northwest Florida. A single sterile swab from the dorsal side of the animal was used to isolate nine different colonies on trypticase soy agar. The type colony consisted of Gram negative bacilli, which were assayed with the Biolog Gen III system to identify the bacteria as *Aeromonas hydrophila*. This bacterium has been associated with a pathogenic conditions in manatees, including pneumonia and pustular dermatitis.

Riley, Zachary. Beta Phi, University of West Alabama. Isolation of *Kurthia gibsonii* from bottom of shoe.

Tests were done to identify the type of bacteria species was on the bottom of a shoe that was exposed to canine feces. The microbe was motile, gram +, non-sporing, rod shaped, non-pigmented, aerobic, and it grew significantly at 42 degrees Celsius. Biolog plate test indicated the bacteria grew at 5 and 6 pH levels and at 5 to 6% NaCl solution. From comparison to Bergey's Manual of Determinative Bacteriology, 9th edition, it is concluded that the sample is *Kurthia gibsonii*. *Kurthia* can be found in cured meat that has been stored at elevated temperatures in addition to being in stomachs of mammals. But most often species of *Kurthia* can be found in the feces of domestic animals such as chickens and pigs, but the bacteria has also been found in the feces of human patients having diarrhea. Leaving a colony of *Kurthia* in the direct sunlight increased the growth rate, therefore, decreasing the temperature of the environment discourages the growth of *Kurthia gibsonii*.

Ulm, Jodie L. Mu Iota, Northern Kentucky University. Comparison of chlorophyll fluorescence across the growing season in the evergreen red cedar and the deciduous Amur honeysuckle.

Red cedar is a small upright evergreen tree, while Amur honeysuckle is a sprawling deciduous shrub, yet both coexist in disturbed habitats. Little is known about the physiological processes that might allow their coexistence. I have studied how differences in photosynthetic patterns allow the two to coexist in the same habitat by measuring chlorophyll fluorescence, using a chlorophyll fluorometer, in 2010 from late winter. Early in the year, both species responded positively to increasing temperatures. A mid- to late-summer decline was associated with drought conditions. However, red cedar recovered and was able to maintain high levels into the late fall, after honeysuckle dropped its leaves, until freezing temperatures occurred. Red cedar may persist in disturbed habitats in the presence of honeysuckle because the former species can photosynthesize during periods unsuitable for the latter.

McKay, Mary and Jocelyn Philips. Mu Iota, Northern Kentucky University. The effects of polychlorinated biphenyls on motor function in mice using sticker testing and pole climbing.

Polychlorinated biphenyls (PCBs) are widespread organic pollutants that bioaccumulate in the food chain, primarily in fatty fish. PCBs cause numerous human health problems, including harm to the developing brain. We are using a mouse model to explore genetic susceptibility to developmental PCB exposure by comparing mice with differences in the aryl hydrocarbon receptor and the metabolic enzyme CYP1A2. We previously found motor deficits in mice lacking a functioning CYP1A2 enzyme using the rotarod test, which measures cerebellar function. We are now using a comprehensive battery of tests to assess other motor skills. Results from a sticker removal test and pole climbing test will be presented.

Kaiser, Samantha. Mu Iota, Northern Kentucky University. The commensal fungi of cave hibernating bats.

White Nose Syndrome (WNS) has been responsible for the death of more than 1,000,000 bats since 2006, when the first confirmed case was documented in New York. WNS is caused by a previously unrecognized fungus, *Geomyces destructans*, that grows on the muzzle, ears, and wing membrane of bats. With the continued spread of WNS, little is known about the fungi that naturally occur on bats, so the aim of this research is to identify the natural commensal fungi of bats. To do this, ten bats were sampled from three different species *Myotis lucifugus*, *Myotis sodalis*, *Myotis pipistrelle*, in two different cave environments. By understanding the normal fungal populations of bats, we maybe be able to understand which bats are at greater risk from this pathogen and whether protective commensal species can be identified.

\*Kelly, Jennifer E. Mu Phi, Jacksonville State University. Probiotics in aquaculture: Evaluating *Eubacterium cellulosolvens* 5494.

Probiotics have been shown to increase growth rates in aquaculture species. *Eubacterium cellulosolvens* 5494, a gram positive, cellulolytic, strict anaerobe isolated from bovine rumen is investigated as a potential probiont. Effects on insulin-like growth factor 1 (IGF-1) expression were also assessed. Commercial feed was supplemented with *E. cellulosolvens* and presented to *Oreochromis niloticus* fry on three separate occasions over the course of the first 10 days of the experiment. *O. niloticus* fry were maintained in 37.8 L tanks for a total of 45 days. Liver tissue samples were then collected. Real-time PCR was used to analyze expression of this growth hormone. Fish that received the *E. cellulosolvens* supplemented feed were significantly ( $P < 0.1$ ) larger ( $3.66\text{g} \pm 0.29\text{g}$ ;  $n = 75$ ) than the control fish ( $2.76\text{g} \pm 0.51\text{g}$ ;  $n = 75$ ). Treated *O. niloticus* had significantly ( $P < 0.1$ ) higher expression of IGF-1 ( $6.31 \pm 0.22$ ) than the control fish ( $4.85 \pm 0.08$ ). These data may help establish links between growth, molecular mechanisms of growth signals and anaerobic, cellulolytic bacteria in the digestive tracts of aquaculture species.

Bryant, Mark. Eta Mu, Southern University A&M. Raman spectroscopy study of  $\text{BaI}_2$ , Eu and  $\text{SrI}_2$  by scintillator crystals.

Gamma-ray radiation detectors have wide range of applications such as nuclear non-proliferation, medical imaging, industrial inspection and space exploration. Nuclear non-proliferation application, for instance, needs rapid identification of high energy gamma-ray emitted from highly enrich uranium, weapons grade plutonium, and other radioactive sources. The radiation detectors are roughly divided in two families, semiconductor and inorganic scintillator.  $\text{Eu}^{2+}$  doped  $\text{BaI}_2$  and  $\text{SrI}_2$  scintillator crystals have been grown in Fish University, among them  $\text{SrI}_2$ : Eu doped with 4% Eu crystal has excellent energy resolution of 2.7% at 662 keV, high light yield, fast scintillation decay and high effective atomic number which was regarded as one of the most promising scintillator material developed in the world.

**\*District II Johnson Award winner, Best Poster.**

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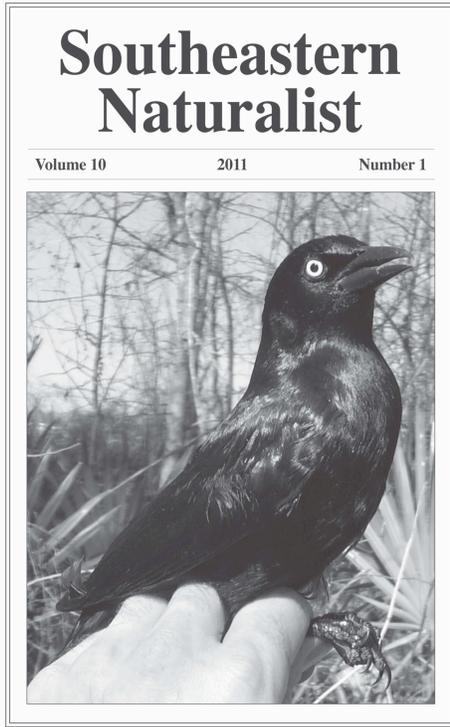


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# Southeastern Naturalist

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## BOOK REVIEW

Melissa Pilgrim, *Book Review Editor*  
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*Lomolino, M. V., B. R. Riddle, R. J. Whittaker, and J. H. Brown.* 2010. **Biogeography**, 4<sup>th</sup> edition. Sinauer Associates, Inc. Sunderland, MA. 878 pp. \$105.95

Biogeography is a broadly integrative field that spans studies investigating variation in a single nucleotide across a landscape to studies investigating the distribution of species and communities in time and space across the entire planet. At the beginning of the semester, in my graduate level biogeography course, most students do not even realize that their own research falls under the broad heading of biogeography. In fact, many are surprised to find out that several of the topics they learned about in their ecology and evolution courses are in fact biogeographical principles.

Lomolino et al. have released the fourth edition of their landmark textbook, *Biogeography*. The most notable change to this comprehensive textbook is the addition of color figures that breathe new life into what has become the standard text for the subject. The addition of color to the text allows for easier interpretation of many figures and helps to make the material more engaging to the student. The text is filled with hundreds of figures and the transition from grayscale to full color was successful with one exception; the colors in Figure 12.21 (pg. 492) and Figure 12.22 (pg. 493) are supposed to coordinate but do not match.

In terms of content and organization, little has changed from the third edition. The book contains 17 chapters that are divided into 6 units. The fourth edition of *Biogeography* contains one less chapter than the third addition due to consolidation of chapters 16 and 17 into a single chapter. The organization and titles of some chapters and subsections have been rearranged, but there is no dramatic change in content. However, the authors updated many tables to include techniques and analyses that have gained usage since the last edition was published.

The book begins (Unit 1) with an introduction and history of biogeography. Unit 2 provides a review of the geographic template and the distribution of species and communities. Unit 3 reviews biogeographic processes such as dispersal, immigration, speciation and extinction. Additionally, Unit 3 covers large scale historical geological processes such as continental drift and the Pleistocene glaciations. Unit 4 covers the evolutionary history of lineages and biotas with an introduction to endemism, systematics, and phylogeography. Unit 5 discusses ecological biogeography with a strong emphasis on island biogeography. Finally, Unit 6 wraps up with a discussion of conservation biogeography and the frontiers of biogeography.

Due to the textbook's comprehensive nature, I believe it would be a challenge to both the student and the instructor to attempt to cover everything in this textbook within a single semester. Instructors will have to decide what to cover and what to leave out, especially if one wants to incorporate primary literature readings into the course. Additionally, like any instructor, I have my own opinions as to the ideal sequence of topics for the course, which do not always agree with the arrangement in the textbook. For example, I prefer to cover species concepts and speciation early in the course, so I cover parts of Chapter 7 (Speciation and Extinction) before I cover Chapter 4 (Distributions of Species). Fortunately, the layout of the book is easily adaptable to these preferences as each chapter can stand on its own.

Overall, the fourth edition of *Biogeography* follows in the footsteps of its predecessors as an outstanding textbook; it should be on the shelf of any student of biogeography, as well as those interested in ecology and evolution.

DAVID M. HAYES, *Department of Biological Sciences, Eastern Kentucky University, Richmond, KY 40475.*

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**OBITUARY****William Julian Koch  
(1925-2009)**

*William Julian Koch was a member of ASB. The following obituary is reprinted here with the permission of the Editor of Plant Science Bulletin, Marshall D. Sundberg. The obituary, prepared by William R. Burk, appears on pages 8 to 10 of the Spring 2011 issue of Plant Science Bulletin, Volume 57, Number 1.*



William Julian Koch, age 85, retired Professor of Botany at the University of North Carolina at Chapel Hill, died 17 July 2009 at his home in Glendale, AZ, after a brief illness.

William was the fourth of four sons of Frederick Henry Koch, a pioneer of folk drama in the United States and the founder of Playmakers Theatre at UNC, and Loretta Regina Hanigan, a housewife. A native Chapel Hill, William attended the local public schools. At UNC he earned three degrees in botany: B.A. (1947), M.A. (1950), and Ph.D. (1956). Interrupting his academic studies, he served in the United States Navy (1943-1946).

Koch conducted his graduate research in mycology under the guidance of world renowned mycologist John N. Couch who inspired William's scientific investigations. While a graduate student, he was an assistant and instructor, both in botany. His master's thesis concerned "A study of the motile cells of *Vaucheria*," and his dissertation dealt with "Studies in the Chytridiales, with special reference to the structure, movement and systematic significance of the swimming reproductive cell." After earning his doctorate, he joined the faculty in the Department of Botany at UNC, advancing in the academic ranks to professor. His early research concerned a group of water molds, chytrids, on which he published a series of papers in scientific journals. When he was asked to assume a heavy teaching load, he shifted his focus from fungi to humans, especially undergraduates.

His lively and inspiring classes were always aimed at stimulating students' innate curiosity for knowledge. When teaching a class about edible plants, William would bring samples for tasting, and he was known for waking up students by pouring dried leaves over them. Many of his classes started with music appropriate to the theme of the lecture: Vivaldi's "The Four Seasons" played at the beginning of the class in which changes of trees during the year took place; and the song "John Barleycorn," prefaced the class in which fermentation, including the brewing of beer, took place. His other primary courses were introductory botany, plant diversity, introductory mycology, and advanced mycology. He wrote several textbooks and laboratory manuals to accompany his courses, which he designed to arouse an interest in students and to closely follow his philosophy of teaching (a humanistic approach).

William's innovative teaching, genuine enthusiasm, and engaging personality earned him respect with students who twice honored him as a featured faculty

member in the school's yearbook, *Yackety Yack*, and celebrated a "Willie Koch Day" on the UNC campus in 1975. Researchers acknowledged his role as a scientist through such tributes as naming a genus of fungus, *Kochiomyces*, for him in 1980.

William held memberships in a number of professional associations. He held offices in several of them, including the Botanical Society of America (Chairman, Microbiology Section, 1963-1964; Education Committee, 1978-1980), Elisha Mitchell Scientific Society (Vice-president, 1960 and 1974; Recording Secretary, 1961-1967), and Mycological Society of America (Committee on Research Grants and Publications). In honorary societies he was elected to Sigma Xi and held several offices in its UNC chapter: Vice-president, 1966-1967; Executive Committee; Nominating Committee, 1976; and Membership Committee, 1975-1978.

In the summer of 1986, William retired to Pembroke Pines, FL, along with his wife, Dott. He worked there with handicapped children, and as a movie actor and model. Subsequently, they relocated to Glendale, AZ. He then pursued the visual arts and created computer images of the natural world. He also published a book and a separate CD (Plant Close-ups: Designs, 2007) that featured 82 color photographs accompanied by personal comments. Interested in the state of the country, he and his wife volunteered for one year at the Arizona governor's office to become better acquainted with societal problems and possible solutions. In his retirement settings, the local vegetation captivated William's curiosity, just as he had captivated so many students at the University of North Carolina.

His wife Dorothy "Dott" (Clarke) Koch of Roseville, CA, survived William at the time of his death, but she died in 2010. Current survivors include three daughters, Patricia Margolis of Redondo Beach, CA, Jean Austin of Jonesborough, TN, and Deb Plylar of Phoenix, AZ; one son, David "DK" Koch of Lincoln, CA; ten grandchildren; and three great grandchildren. William was cremated, and his ashes have not been spread.

#### A List of the Graduate Students of William J. Koch and Their Theses.

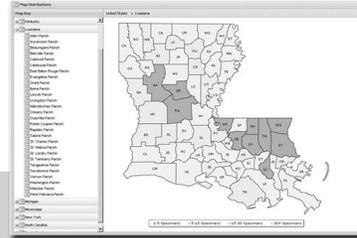
- Bernstein, Linda Beryl. 1966. A biosystematic study of eight isolates of *Rhizophlyctis rosea* with emphasis on zoospore variability. M.A.
- Bostick, Linda Roane. 1966. Studies of the morphology and cytology of *Chytrium hyalinus* Karling. M.A.
- Clausz, John C. 1965. Some factors affecting germination of oospores of *Achlya hypogyna*. M.A.
- McNitt, Rand Edwin. 1973. Light and electron microscopy of *Phlyctochytrium irregulare* Koch. Ph.D. (co-advisor Lindsay S. Olive)
- Powell, Martha J. 1974. Developmental studies of the chytrid *Entophlyctis variabile* sp.n. : A light and electron microscopic investigation. Ph.D.
- Register, Thomas Eugene. 1959. Morphological variation in a new species of *Phlyctochytrium*. M.A.
- Senior, Laura B. 1981. Study of the mycorrhizal organs of *Tipularia discolor*, the crippled crane fly orchid. M.S. 10 Plant Science Bulletin 57(1) 2011
- Tingle, Constance L. 1972. Some physiological aspects of oogonia formation in *Saprolegnia diclina*. M.A.

-Prepared by William R. Burk, friend and fellow mycologist.

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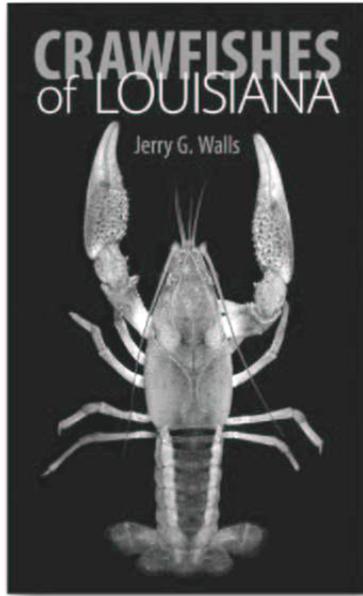
Filters: Family: Asteraceae

Catalog #	Family	Genus	Species	State	Parish/County	Locality
Family: Asteraceae (100 Specimens)						
17429	Asteraceae	Achillea	millefolium	Louisiana	Assumption Parish	Paincourtville
17430				Louisiana	Bienville Parish	unspecified
17431				Louisiana	East Baton Rouge Parish	Baton Rouge
17432				Louisiana	East Baton Rouge Parish	Plains
17433				Louisiana	East Feliciana Parish	Clinton
17434				Louisiana	Lincoln Parish	unspecified
17435				Louisiana	Morehouse Parish	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	albissima	Louisiana	Ascension Parish	New River

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