Biology 1511 labs are held in room CULC 475. Labs begin the first week of classes (August 19, 2013).

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TAs: Zhichao Pu, zpu3@gatech.edu and Becca Howie gte379j@gatech.edu

BIOL 1511 Laboratory

1. Lab structure & learning objectives.

   In this course, honors students are introduced to the process of scientific research in biology. We will be able to design and conduct experiments to answer our own research questions throughout a semester-long research study. This lab is also designed as a research service-learning lab, which means we will use our academic coursework to enhance learning, cultivate civic responsibility, and strengthen communities. We will work with the Atlanta Botanical Garden (ABG). Restoring native riparian plant communities in urban environments is one ongoing ABG project. Last year, our class worked with ABG to collect baseline data about the invasive plant species composition at Mason Mill Park. Since then, more invasive species have been removed. Does this mean the restoration is complete? Will the invasive plants come back? Are the invasive plants bad or good for the resident plants? Together, we will ask specific research questions of our interest, use primary literature as a guide to form scientific hypotheses, design experiments with appropriate methodologies, and finally use a combination of field and lab techniques to answer the research questions. We’ll explore themes related (but not limited) to soil seed banks, the invertebrate community, and the microbial community. We’ll analyze our data, write a manuscript describing our findings, and hopefully publish the study. Since this is a service-learning course, we will share our findings with ABG and the general public. We expect that you will develop knowledge and skills that extend beyond the lab classroom and biology, including:

   - **Scientific process & experimental design:** Be able to design and conduct experiments to collect useful data. Provide constructive feedback to evaluate research designs. Understand what is entailed in doing good science.

   - **Data analysis:** Analyze and interpret experimental data using quantitative and graphical methods.

   - **Scientific communication:** Be able to read and summarize primary literature in your own words. Write a scientific paper (that we will try to publish!). Give a scientific presentation. Convey the science you’re doing in a meaningful way to a general audience through a digital story.

   - **Team work:** Learn about yourself and learn to work effectively with others. Understand that science is a collaborative effort.

   - **Consider what it means to do science:** Reflect on what you think it means to do science, and potentially redefine this for yourself, in the context of your life and community. Recognize that doing science may affect multiple stakeholders with different perspectives.
2. **Lab materials & text.**
   - Composition notebook (used from another course is fine)
   - 100% cotton lab coat (in lab only)

3. **Safety.**
   Safety policies are mandated by federal, state, and institutional rules to keep everyone safe. During lab (in the lab & in the field) it’s important to be aware of your surroundings. Depending on the types of protocols involved in your project, you may be required to wear gloves (provided) and/or your safety goggles. **Report all injuries or accidents immediately.** The following are non-negotiable policies:
   - You must wear your lab coat when we are in lab, regardless of what we’re doing.
   - You must wear shoes that cover your feet entirely (i.e., no flip flops, ballet slippers, or sandals) in lab.
   - No food or drinks, including water bottles, in the lab. But bring water and snack with you for the field.
   - No cell phone use, including texting (phones must be silenced and may not be on the lab bench).
   - Clean up your lab station at the end of lab.
   - During wet labs, required attire includes: long pants to the ankle, goggles and hair tied back.
   - Properly dispose of trash, glassware, and biohazard waste.

4. **Absences & Tardiness.**
   It’s essential that you attend lab and are on time; we are counting on you. There are no make-up labs for unexcused absences as this is a project-based lab. Each unexcused lab will cost you 5% reduction of your grade. There is no penalty for an excused absence. In the event that you miss a lab, or know in advance that you will need to be excused from a lab, contact Zhichao, as well as your group members since they are counting on your contributions. Documented excused absences may include: an illness of your own or within your family (physician’s note required), schedule conflict with an obligation to an official organization (letter from Dean of Students or head of organization is required), car accident (copy of police report required), etc. [FYI: Full-time students can be exempt from/rescheduled for jury duty with proof of full-time enrollment.] **Note: if you miss lab you are responsible for completing assignments and getting data.**

5. **Plagiarism will not be tolerated.**
   We will discuss what plagiarism is and do an activity to be sure that everyone can identify plagiarism. This is particularly important since most work in science is collaborative and scientific knowledge builds on what others have contributed over time. Most of the work you do in lab will be collaborative. Since your name is on this work, you’re responsible for being completely certain that the entire work meets the standards of the honor code. However, lab notebooks are not a collaborative effort; your notes in your notebook must be in your own words, not copied from a classmate. Anything that is not an original idea of yours must be referenced. Direct copying from other students’ work will result in a grade of "0" for that assignment. Your conduct is expected to conform to the Georgia Tech Honor Code ([http://www.honor.gatech.edu](http://www.honor.gatech.edu)).

6. **Grades.** Your lab grade is comprised of the components described below:
   - Project components are worth 70% of your lab grade:
     - Introduction/methods/results/discussion draft (each worth 2.5%) are worth 10%
     - Proposal presentation is worth 10%
     - Collecting and analyzing your group’s samples (datafile) is worth 10%
     - Writing a research report 20%
     - Digital story is worth 20%
- Class participation components are worth 30% of your lab grade:
  - Group evaluations (two, each worth 2.5%) are worth 5%
  - Reflection statements (two, each worth 5%) are worth 10%
  - Other assignments (plagiarism activity, research question proposal, etc) are worth 5%
  - Lab notebook (two unannounced checks, each worth 2.5%) is worth 5%
  - Lab participation is worth 5% (After an initial warning, each >5 min late for the lab with no documented excuse will cost 1% reduction. Tardiness to labs requiring site visits may cause unexcused absence, as we will not hold the van more than 10 minutes for missing students—you will be responsible for your own travel to the site).

7. Class discussions about journal articles and experimental design.
Reading, understanding, discussing and critiquing research papers and thinking through experimental design is crucial to doing science. Since we’re working together to learn about new ideas together, I expect that you will contribute to our class discussions about experimental design and journal articles. This means sharing at least one specific question or comment to each discussion.

Advice from former 1511 and 1521 students to aid in your success:

**Literature searches:**
- Don’t underestimate the value of the annotated bibliographies. Although they may seem like a waste of time, the ability to understand and utilize others’ writing is so useful in research.
- Do tons of research on your topic. Don’t be afraid to investigate something different.
- Be creative and read many research papers for ideas on project topics.
- Find as much literature on your topic as you can. It will save you a lot of time in the end.
- Endnote is your BFF.

**Organization and group work:**
- Pick group members who have similar interests in research topics. Don’t just work with people you like.
- More than anything else, develop a good relationship with your groupmates. It will help you to communicate more effectively with them and also to get work done better. Also, it will be a more enjoyable experience because you will be spending a lot of time in lab with them and outside too.
- Keep communication open and honest with group members. Be sure to plan meetings ahead of schedule and clearly distribute work.
- Make sure you and your group fully think through your procedure step by step to make sure you know what you’re doing.
- Create a regular timeline listing goals and coursework over time, and update them if plans change. It can get overwhelming when you realize you have a lot due the next week and not much time to do it.
- Write your methods section as you go, and then revise it at the end.

**General advice:**
- Don’t be frustrated when you aren’t given instructions. Be confident in trying things and be ready to problem solve to fix mistakes.
- Understand that all the hard work you will put in will teach you about science and it all has a point.

**Most of all: Have fun & have a terrific semester!**
## Tentative Lab Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Lab</th>
<th>Assignments due for lab</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (8/19)</td>
<td>Lab 1</td>
<td>- Bring your laptop</td>
<td>At lab: in-class reflection about prior experience doing science; overview of class and the project; how to keep a lab notebook; plagiarism activity (#1)</td>
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<tr>
<td>2 (8/26)</td>
<td>Lab 2</td>
<td>- reflection statement #1</td>
<td>In the field: discuss journal article; look at sites; site characterization; brainstorm for research questions</td>
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<tr>
<td>3 (9/2)</td>
<td>no lab</td>
<td>- Propose research questions on T-square (due Wed. 9/4) *</td>
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<tr>
<td>4 (9/9)</td>
<td>Lab 3</td>
<td>- plagiarism activity (#2)</td>
<td>At lab: discuss journal article; form groups; learn to search for primary literature and use Endnote to keep references; begin background research</td>
</tr>
<tr>
<td>5 (9/16)</td>
<td>Lab 4</td>
<td>- group contract</td>
<td>At lab: discuss journal article; work on experimental design; 3-5 powerpoint slides for presentation at the end of lab</td>
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<tr>
<td>6 (9/23)</td>
<td>Lab 5</td>
<td>- Proposal presentation at lab</td>
<td>At lab: Proposal presentation, including practicing &amp; critiquing it. Revise proposal. Develop research supply list.</td>
</tr>
<tr>
<td>7 (9/30)</td>
<td>Lab 6</td>
<td>- Proposal presentation</td>
<td>At Atlanta Botanical Garden: proposal presentation/conferencing Go to the filed to finalize experimental design if we have time.</td>
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<tr>
<td>8 (10/7)</td>
<td>Lab 7</td>
<td>- Methods draft with references</td>
<td>In the field: conduct research</td>
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<tr>
<td>9 (10/14)</td>
<td>no lab</td>
<td>- Methods draft with references (Due Fri. 10/18)</td>
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<tr>
<td>10 (10/21)</td>
<td>Lab 8</td>
<td>- midsemester group evaluation</td>
<td>In the field: conduct research</td>
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<tr>
<td>11 (10/28)</td>
<td>Lab 9</td>
<td>- storyboard</td>
<td>In the field: conduct research</td>
</tr>
<tr>
<td>12 (11/4)</td>
<td>Lab 10</td>
<td></td>
<td>In the field: conduct research</td>
</tr>
<tr>
<td>13 (11/11)</td>
<td>Lab 11</td>
<td></td>
<td>At lab: analyze data; write reports; create digital stories; video-editing</td>
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<tr>
<td>14 (11/18)</td>
<td>Lab 12</td>
<td>- Result and discussion draft with references</td>
<td>At lab: revise writing; create &amp; critique digital stories.</td>
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<tr>
<td>15 (11/25)</td>
<td>no lab</td>
<td></td>
<td></td>
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<tr>
<td>16 (12/2)</td>
<td>Lab 13</td>
<td>- digital story on dvd (final)</td>
<td>At Atlanta Botanical Garden: presentations and digital stories</td>
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</tbody>
</table>

*Due Friday, Dec. 6 at noon:
- reflection statement #2
- end of semester group evals

Please bear in mind that the 1511L schedule may change as the semester progresses to accommodate specific project needs.

*Due by midnight before the lab, by email to Zhichao.