**Biological Sciences 3451: Cell and Molecular Biology Laboratory**

Spring 2018 Syllabus and Schedule

Room 330 Cherry Emerson

Section A – Wednesday 12:10-2:50 pm; Section B – Wednesday 3:05-5:45 pm

**Faculty instructor:**

Dr. Shana Kerr

Cherry Emerson A114

[shana.kerr@biosci.gatech.edu](mailto:shana.kerr@biosci.gatech.edu?subject=BIOL%203451:%20)

404-385-0065

Office hours: Thursdays 2-4pm & by appointment

**TA instructors:**

Lina Jay-Garcia, [lmjg3@gatech.edu](mailto:lmjg3@gatech.edu?subject=BIOL%203451:%20)

Office hours: Fridays 3:30-5pm, EBB 5th floor, 5116A-F (Chernoff lab)

Nikki Wyman, [snwyman@gatech.edu](mailto:snwyman@gatech.edu?subject=BIOL%203451:%20)

Office hours: Mondays 5-6 pm, ES&T 2nd floor landing

**Note: This Syllabus and Schedule are subject to change.**

##### Overview and objectives: You will explore fundamental aspects of cell biology and current methods used in cell biology by using the mouse macrophage cell line, J774, as a model system. We will perform a series of experiments to examine changes in cell morphology, viability, metabolic activity, and gene expression in these cells in response to treatment with a plant- or bee-derived immunomodulator, in support of the [Georgia Tech Urban Honey Bee Project](http://bees.gatech.edu/).

By the end of this course, you should be able to:

* Perform specific modern cell and molecular biological techniques
* Differentiate between scientific hypotheses and predictions
* Recognize and apply elements of experimental design
* Graphically and statistically analyze and represent data to support or reject a hypothesis
* Convincingly and accurately communicate your hypothesis, experimental tests of that hypothesis, and analysis and interpretations of results
* Work effectively in a team to investigate scientific questions

**Required Class Websites:** We will make extensive use of two class-related websites. All class resources will be posted to the Cell & Molecular Website ([bio3451.biology.gatech.edu](http://bio3451.biology.gatech.edu/)). All assignments will be due via Canvas. It is your responsibility to check these sites regularly to ensure you are keeping up with required material and assignments.

**Lab safety:** Safety policies are mandated by federal, state, and institutional rules. The following policies are **non-negotiable during experimental weeks**:

* **Attire**
  + Shoes that cover your feet entirely (no sandals, etc.)
  + Long pants to the ankle
  + Long hair tied back
  + Lab coat (purchased by student)
  + Goggles and gloves (provided)
* **Behavior**
  + No food or drinks, including water bottles.
  + No cell phone use, including texting.
  + Clean up your bench at the end of lab and report any mess left from previous lab section.
  + Properly dispose of trash, glassware, and biohazard waste.
  + Follow additional safety procedures for specific lab activities as indicated by your TA/instructor.
* **Improper attire or behavior will result in removal from lab and an unexcused absence for the day.**
* **Report all injuries or accidents to the instructors immediately.**

##### Course components:

##### Attendance and participation: 100% attendance is expected for each lab, and for the entire lab period. Since you are working in teams to perform experiments, there is no mechanism to make up a lab. Each unexcused absence will lower your final grade by half a letter grade. Excused absences require appropriate documentation within 24 hours of missing class. If you miss a lab, you are still responsible for completing assignments and getting data from your lab partner. Requests for extensions on assignments must be made ahead of time and require appropriate documentation as described above for excused absences.

All students are expected to actively participate in bench-work and class/group discussions, and will be assessed by the extent to which they participate in class discussions (by asking questions, answering questions, and offering ideas) and group work evaluations. You are expected to ask a question or offer a comment at least once every class.

Laptops will be frequently required for this course, and you are encouraged to bring them every day. Computer use is not permitted during class for any purpose other than course-related activities as directed by the instructors.

**Protocol quizzes and pre-lab assignments** cover the necessary background for you to perform and understand each experiment, and will be based on both material discussed in class as well as material posted on the[**Cell & Molecular Lab Website**](http://bio3451.biology.gatech.edu/). Pre-labs are based on participation, not accuracy; you will not be penalized for an incorrect answer as long as it is clear you have thoughtfully considered your answer. Pre-lab assignments are due online via Canvas, and quizzes will be administered in the first 10 minutes of class.

**Lab notebooks** will be maintained in spiral-bound composition notebooks. Prior to each experiment, you must complete a lab notebook entry describing the general *experimental question*, *specific hypothesis/es*, *experimental design*, *data analysis plan*, and *experimental predictions* in your lab notebook. Your notebook must also include either printed or hand-written copies of *experimental protocols* that will be used for the experiment. Printed protocols should be taped into your notebook. Lab notebooks will be checked each experimental week, prior to beginning the experiment. You should two copies of the protocol; one in the lab notebook and one loose copy for use on the protocol quiz.

**Project Updates:** After each experiment, you will prepare a Project Update that describes the results and interpretations from the experiment. Project Updates are informal reports for communicating the results of your experiment to another researcher in the same field. Projects Updates are individual assignments, and every aspect of the analysis should be generated individually *with the exception of figures and figure legends.* The data analysis should convincingly and accurately communicate your hypothesis, experimental tests of that hypothesis, analysis of the results, and interpretations of those results. Project updates will be subject to peer review during class.

**Research Project:** Each individual experiment conducted over the course of the experiment is related to larger overall research question. You will synthesize these individual experiments into a final research paper, similar to a peer-reviewed research article.

* **Annotated Bibliography:** You will conduct a search of the scientific literature and create an annotated bibliography of resources related to the overall, semester-long research question. This assignment is to help you become familiar with the background information on the lab research
* **Review Article:** After completing the annotated bibliography, you will use compose a one-to-three page summary, synthesis, and review of the information based on the annotated bibliography and other sources. This review paper will ultimately form the background and introduction for your final research paper. Drafts will be peer-reviewed in class (required for full credit)
* **Final Research Paper**: At the end of the semester, you will synthesize the **literature review** and **data analyses** for each of individual experiments into a coherent research article. Drafts will be peer-reviewed in class (required for full credit)

**Team evaluations:** After each experiment, you will evaluate yourself and your team member(s) participation in the group work, including conducting the experiment, analyzing the results, and providing helpful peer feedback. Thoughtful completion of these evaluations and feedback in the evaluations is part of your participation grade.

**Detailed information and rubrics for all assignments will be posted to the Cell & Molecular Lab website.**

**Late assignments:** Unless otherwise specified, all assignments are due by 11 am the day of lab and must be submitted through Canvas.Late assignments will be subject to a one-letter grade penalty per 24-hour period that it is late, and will not be accepted more than 3 days after the due date. *You are responsible for ensuring that your assignment was properly uploaded to Canvas; any assignment emailed directly to the instructors will be considered late.*

**Re-grade policy:** Requests for re-grading must be made in writing, explain the rationale for the re-grade request, and be made within one week of the assignment’s return.

**Academic integrity:** Academic dishonesty in any form will not be tolerated. Be aware of your obligations and expectations associated with the Georgia Tech Academic Honor Code and Student Code of Conduct (<http://www.honor.gatech.edu>). Academic dishonesty includes cheating, lying about course matters, plagiarism, submitting someone else’s work as your own, stealing classroom materials, or helping others commit a violation of the Honor Code. Plagiarism includes representing the words or ideas of others as your own. **Sharing and discussing information is permitted and encouraged (this is how science is really done!), but *submission of someone else’s work as your own is not* *permitted*. This includes *any* other form of student work. *When in doubt, ask your instructors for help.***

**Students with disabilities:** If needed, we will make classroom accommodations for students with disabilities. These accommodations should be arranged in advance and in accordance with the Office of Disability Services (<http://www.disabilityservices.gatech.edu>).

**Grading:**

* Attendance, participation, team evaluations 10%
* Quizzes, lab notebooks, and other in-class assignments (equally weighted) 20%
* Pre-lab assignments (participation only) 5%
* Project Updates 30%
* Annotated bibliography 5%
* Literature review 10%
* Final Research Paper 20%

Final scores will be rounded to the nearest whole number, and grades will be assigned according to the following scale: 90.0-100% A; 80.0-89% B; 70.0-79% C; 60.0‑69% D; <60% F

**LAB SCHEDULE (subject to change) Unless otherwise specified, all assignments are due online by 11am the day of lab**

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| **Week** | **Date** | **Assignments Due (by 11 am unless otherwise noted)** | **Discussion Topics and Class Activities** | **Notes** |
| 1 | 1/11 |  | Course overview  Introduction to Macrophage Biology  Lab/cell culture safety; sign safety forms | *Bring laptops* |
| 2 | 1/17  Snow day | Pre-lab 1: Macrophage Biology Background  Read assigned research article  Complete figure analysis assignment | ~~Student-led discussion of research article~~  ~~Workshop: Hypotheses, predictions, & experimental design~~  ~~Discussion: How and why we cite~~ | *~~Bring laptops~~* |
| 3 | 1/24 | How and why we cite  Pre-lab 2: Statistics, pipettes, and citations  Citation and plagiarism online tutorial  Confirm access to mycloud.gatech.edu | Student-led discussion of research article  Workshop: Hypothesis, predictions, & experimental design  Protocol Quiz 1: Statistics and pipettes  Pipetting and statistics exercise  Workshop: Using JMP for statistical analysis  Annotated Bibliographies | *Bring laptops*  *Lab coats required* |
| 4 | 1/31 | Pre-lab 3: Measuring cell viability & macrophage activation  Statistics exercise analysis | Discussion: Broad question vs focused hypotheses/experiments  HPED Workshop: Cell viability and macrophage activation | *Bring laptops* |
| 5 | 2/7 | Lab Notebook 1: WST-1 and Propidium iodide | Protocol Quiz 2: WST-1 & Propidium iodide  Experiment: WST-1 and Propdidium iodide | *Lab coats required* |
| 6 | 2/14 | Lab Notebook 2: Griess and Light microscopy | Protocol Quiz 3: Griess and Light microscopy  Experiment: Griess and Light microscopy | *Lab coats required* |
| 7 | 2/21 | Pre-lab 4: Principles of fluorescence microscopy & flow cytometry  Annotated Bibliography | HPED Workshop: Phagocytic activity  Workshop: Scientific Writing (Figure Legends and Methods)  Data analysis: Cell viability experiments | *Bring laptops* |
| 8 | 2/28 | Lab Notebook 3: Fluorescence microscopy phagocytosis assay  Prepare for cell scraping exercise  Project Update 1: Cell viability and activation; *bring printed draft to class for peer feedback; final version due Friday @ 11:55pm via Canvas* | Protocol Quiz 4: Fluorescence microscopy phagocytic assay  Experiment: Fluorescence microscopy  Practice cell collection exercise  Peer feedback: Project Update 1 | *Lab coats required* |
| 9 | 3/7 | Team evaluation 1  Lab Notebook 4: Flow cytometry phagocytosis assay | Protocol Quiz 5: Flow cytometry phagocytic assay  Experiment: Flow cytometry | *Lab coats required* |
| 10 | 3/14 | Pre-lab 5: Changes in gene expression during macrophage activation  Review *Article* draft *submit via Canvas and bring printed copy for peer feedback; final version due Friday @ 11:55pm via Canvas* | HPED Workshop: Gene expression  Peer feedback: Literature Review Drafts  Data analysis: Phagocytic activity experiments | *Bring laptops* |
| 11 | 3/21 |  | ***Spring Break – no lab*** |  |
| 12 | 3/28 | Lab notebook 5: RNA Isolation, cDNA Synthesis, and qPCR  Project Update 2: Phagocytosis *bring printed draft to class for peer feedback; final version due Friday @ 11:55pm via Canvas* | Protocol quiz 6: qPCR  Experiment: RNA isolation & cDNA synthesis  Peer feedback: Project Update 2 | *Lab coats required* |
| 13 | 4/4 | Team evaluation 2  Review How and Why We Cite | Discussion: How and why we cite  Data analysis: Gene expression and activation experiments | *Bring laptops Lab coats required* |
| 14 | 4/11 | Project Update 3: Gene expression *bring printed draft to class for peer feedback; final version due Friday @11:55pm via Canvas* | Discussion: Broad question vs focused hypotheses/experiments  Peer feedback: Project Update 3 | *Bring laptops* |
| 15 | 4/18 | Team evaluation 3  Final Research Paper draft (submit via Canvas and bring printed copy for peer feedback)  *Final Research Paper due 4/24 at 11:55pm via Canvas* | 3451 End of Semester Survey and CIOS  Peer feedback: Final Research Paper Discussion: Project future directions | *Bring laptops* |