BIOL4622/5622  
Aimee Bernard, PhD  
Spring Semester 2014

Advanced Topics in Immunology

Course Description: Biology 4622/5622 is an advanced immunology course designed to extend and deepen the biological knowledge gained in the Introduction to Immunology course. Immunology is a challenging field of study that encompasses many different scientific disciplines, including cell biology, genetics, molecular biology, biochemistry and microbiology. Intensive analysis of primary and secondary literature focused within the field of immunology will result in the development of content integration skills, critical thinking, and analysis skills that can be applied to academic coursework as well as global scientific and societal issues.

Instructor: Dr. Aimee Bernard  
Office: Science 4097
Telephone: 303.556.6250  
Email: Aimee.Bernard@ucdenver.edu

Course Location: SI 1111 - Mondays & Wednesdays - 12:30-1:45pm
In Person Office Hours: Monday 2:00-3:30pm and Tuesday 10:00-11:00am
E-Mail Office Hours: once per week on Thursdays ~3:00-4:00pm. Although I check my e-mail on a daily basis, I only respond to non-emergent student e-mails once per week. If you have sent me an e-mail and you need an answer prior my weekly e-mail response (Thursday), I encourage you to visit me during regularly scheduled office hours or ask me your question before or after class meetings.

Note: Office hours will not be held during the week of Spring Break or Finals Week

Prerequisites: Immunology is the culmination of many scientific fields, including cell biology, microbiology, genetics, biochemistry and molecular biology. Students should have taken and passed BIOL3621 Introduction to Immunology and have a thorough understanding of general biology and cell biology before taking this class. If a student is unsure of his or her preparedness for immunology, please see me, Dr. Bernard, immediately.

Optional Text Kuby Immunology (7th edition – 6th edition (6e) will work but 7e is recommended)  
Judith Owen, Jenni Punt, Sharon Stranford, Patricia Jones, W.H. Freeman and Company

The Principles (ethical standards) of the BIOL4622/5622 Learning Environment
1. I will be courteous and respectful to my professor and classmates in all interactions both inside and outside of the classroom
2. I will fulfill my academic responsibilities associated with this course
3. I will exhibit integrity at all times, regardless of being acknowledged or rewarded
4. I will practice patience and perseverance despite my performance (exemplary or needs improvement) on academic assessments
5. I am using everything in my power to increase my learning, understanding and advancement of knowledge within this course
6. I view my professor, Dr. Bernard, as my intellectual coach whose role is to guide and support me in my learning

Course Rationale:
This course is designed as an elective for advanced undergraduates and graduate students who are interested in exploring the primary literature and developing critical thinking and analytical skills. The course will use the C.R.E.A.T.E. method (Consider, Read, Elucidate hypotheses, Analyze and interpret data, Think of the next Experiment). The C.R.E.A.T.E. approach aims to use small group work and
larger class discussions to probe in detail the scientific method and experimental approaches to a particular biological problem. One aim is to engage students in the creative side of scientific research and discovery, and in this way develop critical thinking skills, analytical skills and an interest in (and passion for) science.

**Course Goals:**
Immunology is the study of how the immune system functions to maintain the health of the organism. It is the integrated study of how the components of the immune system, such as the cells, tissues and organ systems, interact to provide defense against foreign and/or harmful pathogens and how those systems are regulated to maintain health and life. BIOL4622/5622 allow you to explore the content learned in BIOL3621 Introduction to Immunology on a much deeper level and introduce you to intensive analysis of primary and secondary literature focused on a specific topic within immunology. This course will allow you to develop critical thinking, content integration, and analysis skills through a variety of pedagogical techniques. Through reading, group work, oral and written presentations, and class discussion you will explore and expand your understanding and appreciation of the scientific method and develop the ability to critically analyze and evaluate experimental design in both scientific and social contexts.

**This course will help you:**
1. Develop an understanding of the integrated components and function of the immune system. Further, to develop an ability to describe the integration and coordination of the varied components of the innate and adaptive immune systems in the context of defense of the organism and aberrant function.

2. Develop an understanding of relevant structures and functions of physiological components associated with the immune system in the human body, ranging from the molecular level to the organism level of biological organization. Further, to develop an ability to take an integrative approach to studying human immunology in order to analyze immunological concepts and processes at multiple levels of biological organization, from the molecule to the organism.

3. Develop the ability to describe information presented in the course in order to form mental and written intellectual models to explain complex immunological processes, particularly related to human health (e.g. hypersensitivities, autoimmunity and tolerance, vaccines, cancer, infectious diseases, transplantation, and immunodeficiencies) and explain how they are regulated and/or malfunctioning.

4. Expand critical thinking skills including the ability to apply “systems thinking” to the study of immunology so that the subunits of the immune system can be identified along with how those subunits interact to form a regulated system and, further, how to interpret data.

5. Develop the ability to communicate immunological concepts using appropriate language with a goal that you will exit the course with the ability to communicate intelligently and in a discipline-specific manner with a researcher, practitioner, or expert in the field.
Course Learning Objectives:
Upon successful completion of BIOL4622/5622 you will be able to perform the following:

Inquiry and Analysis
1. Critically assess and differentiate between primary and secondary sources, synthesizing evidence representing a variety of perspectives and utilizing these sources to develop an argument/thesis relative to a topic

Critical Thinking
2. Clearly identify and describe the central issues or problems in primary and secondary sources
3. Identify and analyze the points of view of the primary and secondary sources
4. Evaluate the evidence that authors use to support their arguments and question the conclusions of the primary and secondary sources
5. Evaluate journal articles for their scholarly significance
6. Analyze your own and others’ assumptions and the contexts in which assumptions are developed
7. Understand and communicate the process of the scientific method
8. Recognize the relevance and implication of the primary and secondary sources beyond the assigned course-related task

Written Communication
9. Demonstrate an understanding of context, audience, and purpose in written assignments
10. Skillfully communicate the connections between argument/thesis and the sources used to develop ideas

Oral Communication
11. Communicate effectively, using the language of the discipline
12. Present ideas in a clear and organized manner
13. Communicate a clear central point or thesis
14. Use a variety of supporting materials to support a central point.

Teamwork
15. Work cooperatively, helping a working group move forward by actively participating and evaluating a variety of ideas

Problem Solving
16. Identify multiple approaches for solving a problem, paying attention to scientific context and the types of solutions that make sense in a specific context
17. Clearly articulate and defend why a particular solution to a problem was chosen

Information Literacy
18. Effectively define the scope of a research question and determine the types of sources that relate to that question
19. Clearly communicate a full understanding of the ethical and legal issues surrounding the use of published and unpublished materials

Ethical Reasoning and Action
20. Discuss and analyze the ethical issues embedded in the practice and process of scientific discovery
Foundations and Skills for Lifelong Learning
21. Make connections among different courses and readings, applying knowledge and skills in new settings
22. Identify that learning experiences have altered your perspectives in the realm of science

Integrative and Applied Learning
23. Make connections between general education and ‘thinking like a scientist’
24. Make connections between classroom learning and your lives outside of the classroom
25. Develop the ability to critically analyze and evaluate experimental design in both scientific and social contexts

Content Learning Objectives:
Upon successful completion of BIOL4622/5622 you will be able to perform the following:

1. To describe the functional roles of antibody in relation to host defense and autoimmune pathogenesis.
2. To describe B cell development in the bone marrow including details regarding the stages of B cell development in relation to the status of V(D)J recombination and protein expression.
3. To explain the consequences (i.e. clonal deletion or receptor editing) of an immature B cell (IgM+ only) binding to self antigen in the bone marrow during the developmental checkpoint of negative selection.
4. To explain the process of V(D)J recombination, also called somatic recombination, in the context of the creation of the B cell receptor (BCR) including the essential enzymes, proteins and enzymatic steps of the process. Further, explain how this process yields the defining characteristics of specificity and diversity.
5. To describe the composition and function of the recombination signal sequence (RSS) and how it guides the rearrangement of the V, (D), and J gene segments during somatic recombination. Further, explain the 12/23 rule, also called the one-turn two-turn rule, in the context of somatic recombination and the biological significance of this rule.
6. To describe the molecular mechanisms that regulate V(D)J recombination and utilization of Activation Induced Cytidine Deaminase (AID)
7. To describe the mechanisms (i.e. combinatorial diversity x2, junctional diversity and flexibility, somatic hypermutation) that generate diversity in the immunoglobulin repertoire – compare those that occur in the bone marrow during development to those that occur in the periphery after encounter with antigen.
8. To define and explain the biological significance of isotype or class switching. To understand and explain how this event occurs after antigen encounter in the periphery in specialized structures within peripheral lymphoid organs called germinal centers. Further, to explain the role of the germinal center and the events that occur within (i.e. somatic hypermutation (SHM), affinity maturation and isotype or class switch recombination (CSR)).
9. To define tolerance, autoimmunity, and anergy. To compare and contrast central tolerance to peripheral tolerance. To further explain the significance of peripheral tolerance mechanisms in
relation to the B cell (i.e. somatic hypermutation (SHM) in the GC after antigen encounter in the periphery).

10. To explain the role of Activation Induced Cytidine Deaminase (AID) in the context of somatic hypermutation, class switch recombination and the development of autoantibody-related autoimmune disorders.

11. To compare organ-specific autoimmunity to systemic autoimmunity and give several examples of each.

12. To synthesize and explain concepts related to course content in order to explain the pathogenesis of Systemic Lupus Erythematosus and other autoantibody-related disorders.

13. To acquire and/or improve the ability to critically evaluate data presented throughout the course related to the function of the immune system and to apply critical thinking and analytical skills to data not presented within the course. Furthermore, to attain the ability to develop hypotheses and predictions of immune relevance based on limited new information and/or data.

Department of Integrative Biology Core Concepts:
The Department of Integrative Biology faculty, including Integrative Biology’s Teaching Effectiveness Committee and Curriculum Committee, has organized our undergraduate curriculum so that students are exposed to key concepts and competencies (i.e., the ability to perform a particular activity to a prescribed standard) in a predictable manner throughout their studies at CU Denver. Our goal is to ensure you, as a student, are exposed to key concepts and competencies so that after you graduate you will be able to think and act like a biologist and you will have the skills and knowledge to compete for jobs in the professional realm and attain positions in graduate school. An additional and essential goal is to help you become a well-informed and critical thinking member of society. As such, all Integrative Biology courses now list both their course goals (i.e., what an instructor would like to teach students) and course objectives (i.e., what an instructor expects to see students be able to perform as a result of completing the course).

The core concepts and competencies of Integrative Biology’s undergraduate curriculum can be found at:

Course learning objectives for BIOL4622/5622 are aligned to the program objectives for the Department of Integrative Biology as described in the table below.

<table>
<thead>
<tr>
<th>Inquiry &amp; Analysis</th>
<th>Quantitative Reasoning</th>
<th>Modeling and Simulation</th>
<th>Interdisciplinary Nature of Science</th>
<th>Communicate &amp; Collaborate</th>
<th>Relationship of Science &amp; Society</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3, 4, 6, 18, 19, 20, 25</td>
<td></td>
<td></td>
<td>5, 15, 16, 21</td>
<td>7, 9, 10, 11, 12, 13, 14, 17, 19, 20</td>
<td>8, 19, 20, 22, 23, 24, 25</td>
</tr>
</tbody>
</table>

Content learning objectives are aligned to the program objectives for the Department of Integrative Biology as described in the tables below, which will vary depending upon the topic of focus each semester. For spring 2014 the selected topic is the molecular regulation of the production of highly pathogenic autoantibodies, particularly as related to the autoimmune disorder Systemic Lupus Erythematosus (SLE). The connection of the selected journal articles is focused on the function of...
Activation-Induced Cytidine Deaminase (AID), which belongs to a family of proteins termed APOBEC (Apolipoprotein B mRNA-editing enzyme catalytic polypeptide-like) proteins that function as cytidine deaminases. In the context of this course, we will focus on the role of AID in antibody diversification (i.e. somatic hypermutation (SHM) and class switch recombination (CSR)) and the pathogenesis of autoantibody-related disorders.

I provide this information so you can assess how BIOL4622/5622 compares to other Integrative Biology courses in relation to key concepts and competencies. For example, if you are interested in aspects of biology related to inquiry and analysis, communication and collaboration, or the relationship between science and society you could use this information to determine how your pre-requisite courses should have prepared you for BIOL4622/5622 but also how completing this course will prepare you for graduate school or medical school and a variety of health-related careers including, but not limited to, nursing, medicine and a career in scientific research. Additionally, how this course will prepare you to become a member of society that can apply analytical and critical thinking skills to evaluate information read and/or heard (e.g. scientific articles, popular press, websites) in daily life outside of academics and use your acquired skills to question the data, significance, and draw your own conclusions.

Integrative Biology’s core concepts and competencies are informed by a National Science Foundation funded initiative called “Vision and Change in Undergraduate Biology Education – A View for the 21st Century” created to form the backbone of a relevant, exciting 21st century biology education for undergraduates. An excerpt of the core concepts and competencies of biological literacy has been copied and pasted below for your basic understanding. If you are interested in further reading, more information can be found at: http://visionandchange.org/

“CORE CONCEPTS OF BIOLOGICAL LITERACY

1. EVOLUTION:
The diversity of life evolved over time by processes of mutation, selection, and genetic change.

2. STRUCTURE AND FUNCTION:
Basic units of structure define the function of all living things.

3. INFORMATION FLOW, EXCHANGE, AND STORAGE:
The growth and behavior of organisms are activated through the expression of genetic information in context.

4. PATHWAYS AND TRANSFORMATIONS OF ENERGY AND MATTER:
Biological systems grow and change by processes based upon chemical transformation pathways and are governed by the laws of thermodynamics.

5. SYSTEMS:
Living systems are interconnected and interacting."

**“CORE COMPETENCIES AND DISCIPLINARY PRACTICE”**

1. **ABILITY TO APPLY THE PROCESS OF SCIENCE:**
   Biology is evidence-based and grounded in the formal practices of observation, experimentation, and hypothesis testing. All students need to understand the process of science and how biologists construct new knowledge by formulating hypotheses and then testing them against experimental and observational data about the living world. Studying biology means practicing the skills of posing problems, generating hypotheses, designing experiments, observing nature, testing hypotheses, interpreting and evaluating data, and determining how to follow up on the findings.

2. **ABILITY TO USE QUANTITATIVE REASONING:**
   Biology relies on applications of quantitative analysis and mathematical reasoning. The application of quantitative approaches (statistics, quantitative analysis of dynamic systems, and mathematical modeling) is an increasingly important basic skill utilized in describing biological systems (Jungck, 1997; Brewer and Gross, 2003). Advances in several fields of the biological sciences provide opportunities for students to appreciate the impact of mathematical approaches in biology and the importance of using them.

3. **ABILITY TO USE MODELING AND SIMULATION:**
   Biology focuses on the study of complex systems. All students should understand how mathematical and computational tools describe living systems. Whether at the molecular, cellular, organismal, or ecosystem level, biological systems are dynamic, interactive, and complex.

4. **ABILITY TO TAP INTO THE INTERDISCIPLINARY NATURE OF SCIENCE:**
   Biology is an interdisciplinary science. Integration among subfields in biology, as well as integration between biology and other disciplines, has advanced our fundamental understanding of living systems.

5. **ABILITY TO COMMUNICATE AND COLLABORATE WITH OTHER DISCIPLINES:**
   Biology is a collaborative scientific discipline. Biological research increasingly involves teams of scientists who contribute diverse skills to tackling large and complex biological problems; therefore, all students should have experience communicating biological concepts and interpretations.

6. **ABILITY TO UNDERSTAND THE RELATIONSHIP BETWEEN SCIENCE AND SOCIETY:**
   Biology is conducted in a societal context. Biologists have an increasing opportunity to address critical issues affecting human society by advocating for the growing value of science in society, by educating all students about the need for biology to address pressing global problems, and by preparing the future workforce.”

**Course Materials:** There is no required textbook for this course. Instead, you will be reading articles from the scientific literature. These articles will be provided to you or you will use resources from the Auraria Library to access the materials. References for the articles are provided in the course outline below. You are required to supply a three-ring binder/portfolio, in which all graded and un-graded assignments must be kept. This portfolio will be reviewed throughout the semester for grading purposes—please keep it up to date at all times. Your portfolio will also be available to you during all exams and in-class writing assignments.
Course Outline: The outline below is a basic overview of each week. Additional detail, if needed, will be posted on Canvas.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Readings/ Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/22</td>
<td>Introduction to course and C.R.E.A.T.E. method, Surveys (CTT, SAAB, cMap)</td>
<td>- to be done before class</td>
</tr>
</tbody>
</table>
|      | 1/29 | Review Paper – Introduction: Section 1 and Section 2. Individual/group cMap exercise, discussion of background | - Read review article sections 1 and 2  
- make a cMap for Section 1  
- devote a section of notebook to mouse models and terms |
| 3    | 2/3  | Review Paper – Sections 3.- 5. Individual and group work | Section 3. cMap role of hormones on SLE  
Section 4. summarize role of estrogen on B cell development  
Section 5. cartoon experimental design |
Section 7. define agonist and antagonist, relate to estrogen  
Section 8. cMap role of prolactin on B cell development  
Section 9. summarize interplay between estrogen and prolactin |
| 4    | 2/10 | Review Paper - Wrap up discussion | Section 10. discussion  
- comprehensive cMap of review |
|      | 2/12 | Journal Article 1 (JA1) | Introduction – cMap  
Results – Figure 1: define experimental question/elucidate hypothesis, cartoon experimental design, annotate figure, analyze data |
<p>|      |      | <strong>Portfolio review</strong>/hand in | |
| 5    | 2/17 | JA1 | Results – Figures 2 and 3: for each figure define experimental question/elucidate hypothesis, cartoon experimental design, annotate figure, analyze data |
|      | 2/19 | JA1 | Results – Figures 4 and 5: for each figure define experimental question/elucidate hypothesis, cartoon experimental design, annotate figure, analyze data |</p>
<table>
<thead>
<tr>
<th></th>
<th>Date</th>
<th>Activity</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>2/24</td>
<td>JA1</td>
<td>Wrap up discussion of results</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Introduce grant panel exercise</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[mid course evaluation?]</td>
</tr>
<tr>
<td>2/26</td>
<td></td>
<td>JA1</td>
<td>Results – Figures 6 and 7: define experimental question/elucidate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>hypothesis, cartoon experimental design, annotate figure, analyze data</td>
</tr>
<tr>
<td>7</td>
<td>3/3</td>
<td></td>
<td>Grant panel exercise criteria</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Propose “experiment” ideas in small group – choose top 1</td>
</tr>
<tr>
<td>3/5</td>
<td></td>
<td>Pitch</td>
<td>Write (bulleted) list of discussion points based on results</td>
</tr>
<tr>
<td></td>
<td></td>
<td>top ideas</td>
<td>cMap Figures 1-7 (comprehensive – how do the figures/experiments fit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>to class</td>
<td>together?)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>discuss,</td>
<td>Think of potential future directions and next set of experiments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>vote on</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>top 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Share</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>author</td>
<td>Qs</td>
</tr>
<tr>
<td>8</td>
<td>3/10</td>
<td>Midterm</td>
<td>- Have notebook/portfolio up-to-date and ready for midterm exam</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exam</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>– in class,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>open</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>notebook/</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>portfolio</td>
<td></td>
</tr>
<tr>
<td>3/12</td>
<td></td>
<td>Journal</td>
<td>Introduction – cMap</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Article 2</td>
<td>Results – Figures 1 and 2: define experimental question/elucidate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(JA2)</td>
<td>hypothesis, cartoon experimental design, annotate figure, analyze data</td>
</tr>
<tr>
<td>9</td>
<td>3/17</td>
<td>JA2</td>
<td>Results – Figures 3 and 4: define experimental question/elucidate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>hypothesis, cartoon experimental design, annotate figure, analyze data</td>
</tr>
<tr>
<td>3/19</td>
<td></td>
<td>JA2</td>
<td>Results – Figures 5 and 6: define experimental question/elucidate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>hypothesis, cartoon experimental design, annotate figure, analyze data</td>
</tr>
<tr>
<td>10</td>
<td>3/24</td>
<td>Spring</td>
<td>Work on items due on 3/31</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Break</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3/28</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>3/31</td>
<td>JA2</td>
<td>- Write (bulleted) list of discussion points based on results</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- cMap Figures 1-6 (comprehensive – how do the figures/experiments fit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>together?)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Think of potential future directions and next set of experiments</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Read NSF and NIH criteria</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Rethink grant criteria – any changes that should be made since first</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>grant panel? If so, why?</td>
</tr>
<tr>
<td>Date</td>
<td>Assignment</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>4/7</td>
<td>JA2</td>
<td>Pitch top ‘experiment’ ideas to class, discuss, vote on top 1</td>
<td></td>
</tr>
<tr>
<td>4/9</td>
<td></td>
<td>- Prepare to evaluate ‘experiment’ ideas in light of revised criteria</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>cMap JA1 and JA2 together (not simply placing combined cMaps side by side)</td>
<td></td>
</tr>
<tr>
<td>4/14</td>
<td>Journal Article 3 (JA3)</td>
<td>Introduction – cMap</td>
<td></td>
</tr>
<tr>
<td>4/16</td>
<td>JA3</td>
<td>Results – Figures 1 and 2: define experimental question/elucidate hypothesis, cartoon experimental design, annotate figure, analyze data</td>
<td></td>
</tr>
<tr>
<td>4/21</td>
<td>JA3</td>
<td>Results – Figures 3 and 4: for each figure define experimental question/elucidate hypothesis, cartoon experimental design, annotate figure, analyze data</td>
<td></td>
</tr>
<tr>
<td>4/23</td>
<td>JA3</td>
<td>- Write (bulleted) list of discussion points based on results</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- cMap Figures 1-7 (comprehensive – how do the figures/experiments fit together?)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Think of potential future directions and next set of experiments</td>
<td></td>
</tr>
<tr>
<td>4/28</td>
<td>Comprehensive class discussion on JA1, JA2 and JA3</td>
<td>- Review notebook/portfolio</td>
<td></td>
</tr>
<tr>
<td>4/30</td>
<td></td>
<td>- Prepare for comprehensive discussion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discuss author responses</td>
<td>- Read author responses</td>
<td></td>
</tr>
<tr>
<td>5/5</td>
<td>Surveys (CTT, SAAB, cMap)</td>
<td>- Review your notebook/portfolio</td>
<td></td>
</tr>
<tr>
<td>5/7</td>
<td><strong>Portfolio review</strong>/hand in</td>
<td>- Hand in on 5/5, will return on 5/7</td>
<td></td>
</tr>
<tr>
<td>5/12 – 5/17</td>
<td>Final Week</td>
<td>Final exam on May 12 or 14 (decided by AHEC)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Open notebook/portfolio</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Journal Articles:** The journal articles chosen were not from the same laboratory but rather focus on a common theme - the overexpression of AID and its association with increased production of highly pathogenic autoantibodies toward understanding the hormonal modulation (i.e. estrogen) and molecular regulation of the protein, particularly in the context of the female dominated autoimmune disorder SLE. Although you may want to do so, please do not read the entire articles in advance. This course is designed to slowly read and focus on specific portions of each article as assigned. You will gain the most from this course if you read the articles in sections as assigned – thank you!

**Purpose:** To call attention to the medical fact that women are more susceptible to autoimmune diseases and the new finding that the hormone estrogen may play an important regulatory role.


**Purpose:** To provide background and clarify some of the complex topics (i.e. autoimmunity, Systemic Lupus Erythematosus (SLE), B cell development, selection and activation, estrogen receptors and estrogen response elements) within the journal articles selected for the course.


**Methods:** murine and human cell lines and primary cells, generation of hybridomas, cloning and sequencing, immunofluorescence, immunohistochemistry, FACS (fluorescence activated cell sorting), flow cytometry, stimulation and proliferation assays, construction of rAd (recombinant adenoviral) vectors, ELISA (enzyme linked immunosorbent assay), ELISPOT, RT-PCR

**Concepts/Content:** cell biology, B cell development and biology (maturation, activation, somatic hypermutation (SHM), receptor editing, class switch recombination (CSR)), T cell biology (maturation, activation, regulation), molecular biology (mutation)


**Methods:** work with murine cell lines and primary cells, RT-PCR, qRT-PCR, promoter analysis, EMSA (Electromobility Shift Assay), ChIP (chromatin immuno precipitation)

**Concepts/Content:** B cell development and biology (maturation, activation, somatic hypermutation, class switch recombination), molecular biology (eukaryotic regulation of gene expression)


**Methods:** work with murine cell lines and primary cells, flow cytometry, real-time qRT-PCR, chromatin isolation, immunoprecipitation, mass spectrometry, western blotting, in vitro translation, shRNA knockdown, ChIP

**Concepts/Content:** B cell development and biology (maturation, activation, somatic hypermutation, class switch recombination), molecular biology (eukaryotic regulation of gene expression), cell biology

**Evaluation:** You can expect to be evaluated on all aspects of the course. Simply reading the assigned articles will not provide you with sufficient information to master the course content. The information in the assigned readings will be supplemented with the active engagement of the course material inside and outside of the classroom. There will be a base of knowledge that you must acquire to perform well in this course, however, it is your ability to synthesize and evaluate this information that will allow you to do well in this course. For exams and assignments, you will always have open access to your notebook portfolio and journal articles. As a result, you can expect that these assessments will test your ability to think critically, analyze thoughtfully, and express yourself
BIOL4622/5622  
Aimee Bernard, PhD  
Spring Semester 2014

effectively, rather than your ability to memorize and regurgitate facts. To summarize, your ability to think will be evaluated.

Portfolio .......... 100 points (handed in twice during semester, spot checked weekly)  
Participation in class .......... 100 points (scored daily – self and professor evaluations)  
Midterm Exam .......... 100 points (in class, open notebook/portfolio)  
Final Exam .......... 100 points (in class, open notebook/portfolio)  
Total .......... 400 points

Grading: A student’s final class grade will be based on the total point value received from the assessments listed above. Please make note that there is no extra credit for this course.

Grades will be assigned as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>92-100%</td>
<td>A- 90-91.9%</td>
</tr>
<tr>
<td>B+</td>
<td>88-89.9%</td>
<td>B 82-87.9%</td>
</tr>
<tr>
<td>B</td>
<td>78-79.9%</td>
<td>C 72-77.9%</td>
</tr>
<tr>
<td>C+</td>
<td>68-69.9%</td>
<td>C- 70-71.9%</td>
</tr>
<tr>
<td>D+</td>
<td>60-60.9%</td>
<td>D- &lt;60%</td>
</tr>
</tbody>
</table>

Examinations: There will be one midterm examination and one final exam. If you know you will be unable to take an examination at the scheduled time you must contact Dr. Bernard in advance to get approval for an excused absence and to arrange an alternate time for a make-up examination to be given before the regular scheduled class exam time. Excused absences will be granted for good cause, such as illness (certified by a doctor) or family or personal crisis (certified by Dean’s Office, Counseling Center, etc.). Excused absences will not be granted for personal convenience - if you have conflicts at scheduled examination times adjust them in advance. Please see the following link to the university website for the policy on student attendance and absences.

http://www.ucdenver.edu/faculty_staff/employees/policies/Policies%20Library/OAA/StudentAttendance.pdf

Examination format: Examination questions will be short answer, draw and/or label-a-diagram, multiple choice and/or essay questions wherein the student will be required to use appropriate terms, synthesize and recreate information from different parts of the course, explain processes and concepts, and draw conclusions from prescribed conditions or parameters. Exams are open note and open access to journal articles. Exams will be re-graded upon the student’s request. However, all exam re-grades must be received within one week following the return of the exam. All exam re-grade requests must be typed and thoroughly explain why the questions(s) is to be re-graded. Questions about re-grades should be directed to Dr. Bernard.

Writing assignments: To ensure that a core learning objective of effective scientific communication in a written format is attained, there will be several writing assignments embedded into the course. Please understand that it is absolutely essential that the assignments are in your own words. See the syllabus section on ‘Academic Integrity’ for a more thorough understanding of the penalties associated with cheating and/or plagiarism.

Late assignments will not be accepted and will receive a ‘0’ if handed in after class has started on the date due. The writing assignments will be due at the beginning of each class meeting on the dates indicated in the detailed class meeting schedule. If you are not able to attend a class meeting in which
a writing assignment is due or you think you may not arrive to class on time, please submit your writing assignment at an earlier time. Electronic submissions are not accepted.

**Canvas:** This class will use Canvas as the Learning Management System (LMS). You should have access to Canvas using your login and password you use to gain access to your university email account. If you have any problems please contact On-line CU Denver Helpline. In the event of difficulties, Dr. Bernard cannot provide IT support. Canvas will be used to post reading materials and any associated course documents, which you can download and print or have readily available on an electronic device of your choosing. **Canvas should be checked daily for course related announcements.**

**Active Learning:** This class will make use of active learning strategies throughout the entire semester to allow the students to utilize and apply the course content. Students are expected to preview course content before each class meeting and complete the associated assignments in order to have thoughtful and engaged group and class discussions during our class meetings.

**Pre- and Post-course Assessments and Surveys:** At the beginning, the end, and periodically throughout the semester your progress will be assessed. In addition, your feedback on the materials and methods used in this course will be collected, as well as your attitudes, abilities and beliefs about the subjects covered in the course. All these activities are done in an effort to improve your classroom experience and to help you achieve the learning outcomes of the course.

**E-mail etiquette**

E-mail is the official contact method for BIOL4622/5622 and is the most convenient and reliable method of communication. **The subject line of your email message must state “BIOL4622/5622”.** You must identify yourself by name in your valediction. I require that you communicate using proper grammar in your messages; please do not use text-message short-hand, inappropriately casual language, or slang. In other words, please be professional in your messages.

Due to privacy restrictions, specific information about grades cannot be provided by email format. Students will not be allowed to turn in assignments, exam re-grade requests, or other papers by email unless explicitly approved by me.

I am allowed to communicate with students only using official university email addresses (name.name@email.ucdenver.edu); email messages using non-official email addresses (e.g., xx@gmail.com, xx@yahoo.com) will not receive a reply and will most likely end up in my spam folder. Please be aware of this if you forward your ucdenver.edu email stream to another personal account.

**E-mails will be answered once per week on Thursdays during my e-mail office hours.** If you require an answer to a question prior to this day, you may drop by regularly scheduled office hours or ask me your question before or after class.

Please do not e-mail questions that could easily be answered in the course documents. If you have a question, first look to the course syllabus, other course documents, and the Canvas announcements. Most of your questions can be answered by using the course-related resources. You could also ask a student colleague your question – please be resourceful!
Attendance Policy: While attendance in the lecture will not be noted, due to the nature of the course, it is important for students to be in attendance. Information will be provided which relates to the content of the course and related exams that will be critical to student performance on the course objectives. Please see the following link to the university website for the policy on student attendance and absences. Particularly to make not of excused and unexcused absences. http://www.ucdenver.edu/faculty_staff/employees/policies/Policies%20Library/OAA/StudentAttendance.pdf

Communication: Any student uncomfortable with the material, setting, or any other aspect of the course should see Dr. Bernard as soon as possible. Any issues or problems should be dealt with early on to avoid interference with the student’s performance in class.

Academic Integrity: There is “zero tolerance” for academic dishonesty or any other academically unethical behavior in this class. Note that the university policy on academic integrity will serve as the basis for dealing with any such issues in this course. If you are caught cheating or plagiarizing (as defined in the above General Catalog) you will receive a grade of ‘F’ in this course.

Academic Dishonesty
Students are expected to know, understand, and comply with the ethical standards of the University. A university’s reputation is built on a standing tradition of excellence and scholastic integrity. As members of the University of Colorado Denver academic community, faculty and students accept the responsibility to maintain the highest standards of intellectual honesty and ethical conduct.

Academic dishonesty is defined as a student’s use of unauthorized assistance with intent to deceive an instructor or other such person who may be assigned to evaluate the student’s work in meeting course and degree requirements.

Examples of academic dishonesty include, but are not limited to, the following:

A. Plagiarism: Plagiarism is the use of another person’s distinctive words or ideas without acknowledgment. Examples include:
   1. Word-for-word copying of another person’s ideas or words;
   2. The mosaic (the interspersing of one’s own words here and there while, in essence, copying another’s work);
   3. The paraphrase (the rewriting of another’s work, yet still using their fundamental idea or theory);
   4. Fabrication of references (inventing or counterfeiting sources);
   5. Submission of another’s work as one’s own;
   6. Neglecting quotation marks on material that is otherwise acknowledged.

Acknowledgment is not necessary when the material used is common knowledge.

B. Cheating: Cheating involves the possession, communication, or use of information, materials, notes, study aids or other devices not authorized by the instructor in an academic exercise, or communication with another person during such an exercise. Examples include:
   1. Copying from another’s paper or receiving unauthorized assistance from another during an academic exercise or in the submission of academic material;
   2. Using a calculator when its use has been disallowed;
3. Collaborating with another student or students during an academic exercise without the consent of the instructor.

C. Fabrication and Falsification: Fabrication involves inventing or counterfeiting information, i.e., creating results not obtained in a study or laboratory experiment. Falsification, on the other hand, involves the deliberate alteration of results to suit one’s needs in an experiment or other academic exercise.

D. Multiple Submissions: This is the submission of academic work for which academic credit has already been earned, when such submission is made without instructor authorization.

E. Misuse of Academic Materials: The misuse of academic materials includes, but is not limited to, the following:

1. Stealing or destroying library or reference materials or computer programs;
2. Stealing or destroying another student’s notes or materials, or having such materials in one’s possession without the owner’s permission;
3. Receiving assistance in locating or using sources of information in an assignment when such assistance has been forbidden by the instructor;
4. Illegitimate possession, disposition, or use of examinations or answer keys to examinations;
5. Unauthorized alteration, forgery, or falsification;
6. Unauthorized sale or purchase of examinations, papers, or assignments.

F. Complicity in Academic Dishonesty: Complicity involves knowingly contributing to another’s acts of academic dishonesty. Examples include:

1. Knowingly aiding another in any act of academic dishonesty;
2. Allowing another to copy from one’s paper for an assignment or exam;
3. Distributing test questions or information about the materials to be tested before the scheduled exercise;
4. Taking an exam or test for someone else;
5. Signing another's name on attendance roster or on an academic exercise.

Students who fail to comply with the UC Denver CLAS Academic Ethics Policy are subject to disciplinary action as set forth by the College policy. For more information regarding the Academic Ethics Committee policies and procedures, please refer to http://ucdenver.edu/academics/colleges/CLAS/faculty-staff/policies/Pages/HandlingAcademicDishonesty.aspx

Add/Drop Deadlines: See the ‘CLAS Academic Policies and Important Dates’ on the CU Denver website or at the end of this syllabus for exact dates.

Incomplete Grade Policy: To be eligible for an incomplete grade (IW, IF), the student must have successfully completed 75% of the course and have special circumstances outside their control that precluded completion of the course. Incompletes will be granted at the instructor’s discretion but will not be granted to avoid an undesirable grade in the course. Incompletes are not an alternative to dropping the course. Incompletes must be made up within one year.

Special Needs and Accommodations: Students needing special accommodations or special services should contact the “Disability Services Office”, (303) 556-3450, TDD (303) 556-4766 – the office is located on the second floor of North Classroom. The needs of specialized services must be
documented and verified by this office. We will do everything we can to accommodate all students to enhance the learning experience, but we must know of special circumstances in advance.

**Campus Closure:** In the event that the campus is closed for any reason, any scheduled exam, activity or deadline will automatically be rescheduled for the next meeting of the course and the course syllabus will be adjusted if necessary. You can hear announcements by calling 303-556-5000.

**Department of Integrative Biology Grievance procedure:** “If a student has a grievance with any aspect of a course, the first step is to meet with the instructor during office hours or by appointment to discuss the problem. This discussion should not take place by e-mail. Student and instructor should both maintain a professional, respectful demeanor during this discussion, and make an honest effort to listen carefully and to understand the other’s viewpoint. In laboratory courses, the next step in resolving a grievance after meeting with the teaching assistant may involve a discussion with the faculty member in charge of the laboratory course. If the grievance cannot be resolved by an honest and sincere dialogue between student and instructor, the student may then make an appointment to discuss the problem with the department chair.”

**Student Contact Information:** Student must always have an accurate mailing and email address: [http://www.cudenver.edu/registrar](http://www.cudenver.edu/registrar). It is the student’s responsibility to keep their contact information updated with the University.
# Spring 2014 CLAS Academic Policies

The following policies pertain to all degree-seeking students in the College of Liberal Arts and Sciences.

- **Schedule verification**: It is each student’s responsibility to verify online that his/her official registration is correct: verify before classes begin and prior to the drop/add deadline. Failure to verify schedule accuracy is not sufficient reason to justify a late add or drop.

- **E-mail**: Students must activate and regularly check their official student e-mail account for CU Denver business: [http://www.ucdenver.edu/student-services/Pages/WebMail.aspx](http://www.ucdenver.edu/student-services/Pages/WebMail.aspx). Those who forward email must check CU Denver e-mail regularly for messages not automatically forwarded.
  - **Waitlists**: Students are not automatically notified if they are added to a class from a waitlist.
  - Students are not automatically dropped from a class if they never attended, stopped attending, or do not make tuition payments.
  - Waitlists are purged after the 1st week of classes, after which a paper Schedule Adjustment Form (SAF or drop/add form) is required. It is the student’s responsibility to get the form (online or at the Advising Office, NC 4002), have it signed, deliver it to the Registrar (Annex 100) or the Student Services Center (NC 1003), and verify her/his schedule online.

- **Late adds** (after 5 February) will be approved only when circumstances surrounding the late add are beyond the student’s control. This will require a written petition and verifiable documentation. Petition forms are available in NC 4002. The signature of a faculty member on a SAF does not guarantee that a late add petition will be approved.

- **Late drops/withdrawals** (after 7 April) will be approved only when circumstances surrounding the late drop have arisen after the published drop deadline and are beyond the student’s control. This will require a written petition and verifiable documentation. The signature of a faculty member does not guarantee that a late drop/withdrawal petition will be approved.

- **Tuition**: Students are responsible for completing arrangements with financial aid, family, scholarships, etc. to pay their tuition prior to Census Date (5 February). Students who drop after that date are (1) financially responsible for tuition and fees, (2) academically responsible and will receive a "W" grade, and (3) are ineligible for a refund of COF hours or tuition.

- **Graduation**: Undergraduate students wishing to graduate in Spring 2014 must complete the online Graduation Application form, in the UCD Access Portal, and meet with their academic advisor to obtain a graduation application. This application must be submitted by Census Date (5 February). You can obtain an application only after meeting with your advisor. There are no exceptions to this policy.

  Graduate students wishing to graduate in Spring semester 2014 must complete the online Graduation Application form, in the UCD Access Portal, and have a Request for Admissions to Candidacy on file with the CU Denver Graduate School (LSC 1251) no later than 5 PM, February 5, 2014.
### Important Dates and Deadlines

- **January 20, 2014**: Martin Luther King Holiday. Last day to withdraw from all classes via UCDAccess and receive a refund of the $200 advance payment and all tuition.

- **January 21, 2014**: First day of classes.

- **January 26, 2014**: Last day to add or waitlist classes using UCDAccess. After this date, a Schedule Adjustment Form (SAF) is required to change, add, or drop.

- **January 27, 2014**: Last day to drop without a $100 drop charge. No adds permitted on this day.

- **January 28 – February 5, 2014**:
  - UCDAccess registration is closed; registration now requires a SAF with faculty signature.
  - Verify your registration via UCDAccess. You are not registered for a course unless your name appears on the official roster; conversely, your name may have been added automatically from the waitlist without notification, which means that you will be held responsible.

- **February 5, 2014**: Census date.

- **2/5/14, 5 PM**: Last day to add structured courses without a written petition for a late add. This is an absolute deadline and is treated as such. This does not apply to independent studies, internships, project hours, thesis hours, dissertation hours, and modular courses.

- **2/5/14, 5 PM**: Last day to drop a course or completely withdraw from Spring 2014 using a SAF and still receive tuition refund, minus the drop fee. After this date, tuition is forfeited and a "W" will appear on the transcript. This includes section changes. This is an absolute deadline.

- **2/5/14, 5 PM**: Last day to request Pass/Fail or No-Credit option for a course.

- **2/5/14, 5 PM**: Last day for a graduate student to register for a Candidate for Degree and last day for a Ph.D. student to petition for a reduction in hours.

- **2/5/14, 5 PM**: Last day to apply for Spring 2014 graduation. If an undergraduate, you must make an appointment and see your academic advisor to apply. If a graduate student, you must complete the Intent to Graduate and Candidate for Degree forms.

- **February 17-26, 2014**: Faculty can use the Early Alert system.

- **March 24-30, 2014**: Spring Break-(no classes; campus open).

- **April 7, 2014, 5 PM**: Last day for non-CLAS students to drop or withdraw without a petition and special approval from the academic dean. After this date, a dean’s signature is required.

- **April 22, 2014, 5 PM**: Last day for CLAS students to drop or withdraw with signatures from the faculty and dean but without a full petition. After this date, all schedule changes require a full petition. Petitions are available in NC 4002 for undergraduates and in the CU Denver Graduate School offices for graduate students.

- **May 12-17, 2014**: Finals Week. No schedule changes will be granted once finals week has started--there are no exceptions to this policy. Commencement is May 17.

- **May 22, 2014**: Due date for faculty submission of grades (tentative).

- **May 26, 2014**: Spring final grades available on UCD Access (tentative).