COURSE GOALS & LEARNING OBJECTIVES

1. Become conversant in Cell Biology. This will involve learning a vocabulary relating to this field of study and using this vocabulary correctly. Developing a complete vocabulary is necessary to discuss cellular processes accurately. Moreover, having information readily available in one's mind is required in order to quickly make mental connections that lead to new insights and facilitate problem solving.

2. Understand the experimental methods used to study cells. We will discuss a broad range of techniques including different types of microscopy, biochemical and molecular analysis, and genetic approaches—all of which are routinely used by scientists to dissect how cells function. You will need to develop a thorough understanding of the underlying theory as well as the technical application of these techniques. A solid background in this area will allow you to apply this information to a diverse set of circumstances, including interpretation of experimental data and the ability to propose new experiments to answer specific questions.

3. Gain a working knowledge of cellular organization and function. Our work in this course will allow you to gain a mastery of membrane structure and function and how cellular compartments are formed, how cells generate and utilize energy, how proteins are trafficked to the correct location and/or organelle within the cells, how cells respond to their environment, how signaling pathways within the cell elicit specific cellular responses, how cytoskeletal components are assembled and how they regulate cell shape and motility, how the cell duplicates and divides, how cells are organized into tissues, and how disruption of many of the above cellular processes can lead to cancer.

4. Develop the analytical skills of a Cell Biologist. Cell Biology is a science and we will be asking you to think like scientists, whether it be critical analysis of data or the execution and/or interpretation of a scientific experiment. Furthermore, you will gain experience approaching cell biology as a problem-solving endeavor in which you interpret microscopic images and/or utilize your knowledge of the mechanistic details of a cellular processes. Class discussion and exam questions will give you the opportunity to take what you have learned about a normal cellular process and predict a logical outcome when specific parameters are altered (i.e. by experimental manipulation, mutation, drugs).

5. Discover the inner beauty of the cell. Cells are incredibly complex but also innately beautiful. Throughout the term you will frequently be viewing amazing images (and movies!) generated by diverse microscopy techniques. Marvel at how gorgeous life is even at the molecular level!
# TOPICS SCHEDULE

## How do we view cells?
1. **M** 3/30 Thinking on the scale of cells  
   Chapter 18
2. **W** 4/1 Microscopy  
   Chapter 18
3. **F** 4/3 Microscopy problem session  
   Chapter 18

## What is the chemistry of life?
4. **M** 4/6 Protein structure and function  
   Chapter 3
5. **W** 4/8 Enzymes and catalysis  
   Chapter 3

## How are cell compartments built?
6. **F** 4/10 Transport Across Membranes  
   Chapter 4
7. **M** 4/13 Transport Across Membranes

## How do we analyze cells using biochemistry?
8. **W** 4/15 Biochemical experimental approaches  
   Chapter 18
9. **ThX** 4/16 Biochemical Experiments problem session
10. **F** 4/17 Question Hour for exam 1

**M** 4/20 **Exam 1, 8:00-9:50AM, Classes #1-9: LSC**

## How do cells manage energy?
11. **ThX** 4/23 Bioenergetics problem session

12. **F** 4/24 Bioenergetics  
    Chapter 3, 5

## How do proteins know where to go in the cell?
13. **M** 4/27 Protein Sorting  
    Chapter 8
14. **W** 4/29 Protein Sorting  
    Chapter 8

## How do cells integrate and process information?
15. **F** 5/1 Cell Signaling  
    Chapter 8
16. **M** 5/4 Cell Signaling  
    Chapter 15
17. **W** 5/6 Cell Signaling  
    Chapter 15
18. **ThX** 5/7 Sorting and Signaling Problem session  
    Chapter 15
How do cells move and change shape?

**pre-class cytoskeleton intro mini-lecture and quiz

18. W5/13  Cell motility and shape: Actin  Chapter 9
19. Th 5/14  Cell motility and shape: Actin  Chapter 9
20. F 5/15  Cell motility and shape: Intermediate filaments/septins  Chapter 9
21. M5/18  Cell motility and shape: Microtubules  Chapter 9
22. W5/20  Cell motility and shape: Microtubules  Chapter 9
   Th 5/21  Cytoskeleton Problem session
23. F 5/22  The cytoskeleton in action during cell division  Chapter 14

How do cells duplicate?

24. W5/27  The cell cycle  Chapter 14
25. Th 5/28  The cell cycle  Chapter 14

What happens when cell controls are lost?

26. F 5/29  Cancer  Chapter 16
27. M 6/1  Cancer  Chapter 16

TBA  Final Exam Question session
Final Exam (Lectures 18-27) Saturday June 6, 3-6 PM

-----------------------------------------------------------------------------------------------------------------

Professor Gladfelter’s OFFICE HOURS

I will hold office hours in my office in room 224 in LSC on:
Tuesdays 1-2pm
Wednesdays 4-5pm

Note that I am generally available before and after lecture to answer questions.

------------------------------------------------------------------------------------------------------------------

Resources for assistance with class material:

1. **Attend question answering sessions with Prof. Gladfelter**: challenge yourself to come to these sessions with a list of questions to ask so that you digest material

2. **Use Piazza, an online discussion board on Canvas site**: there will be a section of the Canvas site to post any lecture material questions anonymously and these questions will be answered so anyone can see the answers and also learn. Students can help each other by answering questions and TAs and Prof. G will monitor the board every few days. Individual questions sent over email will not be answered.

3. **Course Teaching assistants**: Your lab TA is a Ph.D. student in the MCB graduate program and an excellent resource for information.

4. **Utilize Teaching Science Fellow-Natalia Vecerek**: Natalia is a ’14 who has previously taken Biology 12 with Professor Gladfelter. As a Teaching Science Fellow, she will be hosting bi-weekly office hours (Th 7-9PM, Sun 7-9PM), providing
supplementary study material for the course, and acting as a peer-mentor resource for
the class to help with mastery of material. Feel free to contact her with questions or
concerns about the course, or to set up a time to meet outside of office hours.

5. Join a study group through the academic skills center

6. Do the study questions at the end of the chapter

Textbook – *Cell and Molecular Biology*, by Gerald Karp, 7th edition

Additional Textbooks on Reserve
For those wishing to supplement the lectures and the assigned readings in Karp, I have listed below
several textbooks which are highly recommended and suitable for other perspectives on the topics. All
reading in these textbooks is optional. The following books are on reserve in the new Dana Biomedical
Library (3rd Floor) 37 Dewy Field Road:

*Essential Cell Biology*, 3rd edition (2012) by Alberts et al. This text has been the Bio12 textbook in
past years but is in many ways too simplistic. If you need more background before diving into Karp, try
this book.

*Molecular Cell Biology – Dartmouth Custom*, 7th edition (2013) by Lodish et al. This textbook also
contains more material than Karp. Some students, particularly those eager to learn more, have really
enjoyed reading this textbook.

Grade Distribution

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exam 1</td>
<td>21%</td>
</tr>
<tr>
<td>Exam 2</td>
<td>21%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>21%</td>
</tr>
<tr>
<td>Lab grade</td>
<td>25%</td>
</tr>
<tr>
<td>Participation</td>
<td>12%</td>
</tr>
</tbody>
</table>

Participation will be 6% from online quizzes that will be based on pre-recorded lectures and 6% for a
daily reflection on class content.

Exams will include a mixture of testing your mastery of the information and applying your knowledge to
problem solving.

**Barring documented illness, failure to take an exam or attend a lab section at the scheduled
time will result in a grade of zero.** Documentation of illness requires that you check into Dick’s House
and arrange for Dick’s House to inform your class Dean that you have been admitted to Dick’s House. The class Dean will
then contact me regarding your absence.

**No laptops open in class policy**
In general, there will be no laptops in class unless I announce in advance that we will be using them for
an in class exercise. Numerous recent papers in the psychology literature have shown that being
behind a laptop interferes with efficient learning. It has been shown that taking notes by hand improves
learning, that any pause in focus due to jumping between windows on a laptop or device interrupts
learning, and that there is a second-hand deleterious effect in which students beside another student
with a laptop are impacted negatively in focus and concentration. For these reasons, Bio12 will be a
laptop-closed class.

**Grading Policy For Exams:**
The following points summarize the grading procedures with respect to exams:

[1] After the exam has been graded and returned, a copy of the answer key will be posted on the Bio12 Blackboard site. Review this answer key and be sure to understand the errors in your exam and why you made them.

[2] The number of points given for each answer is final. If, after reviewing your answers and comparing them to the posted answer key before the announced deadline (see below), you find an arithmetic error or detect an omission by the grader for one of the questions, you must observe the following procedures for error correction:

   a) Do not write on the exam. Exams that have been written on will NOT be corrected. Any alteration of the answers between the time when the graded papers were returned to the student and the time when the paper was submitted for re-grading constitutes a breach of the Academic Honor Principle. To deter this practice, we scan exams before grading them.

   b) Prepare a typed cover page with your name and HB number.

   c) If you find an addition error, indicate on the cover page that an addition error has occurred. Specify the page and question numbers.

   d) If you determine that your answer contains all of the information indicated in the key, but you did not receive full credit, simply indicate the number of the question to be re-evaluated and state in one or two short, descriptive sentences (typed) what makes your answer correct. The citation of a text page, diagram, or reference to a lecture date/number will also be helpful.

   e) Attach the typed cover sheet to your complete exam and return it to the Bio12 drop box in the short corridor between Room 200 and 201 in LSC before the announced deadline. We will not accept questions regarding errors in grading after these deadlines. The error correction process will take a few days. You will be notified of the place and time to pick up exams after the re-evaluation is completed.

Error correction requests: must be hand-delivered to the Bio 12 drop box by LSC 202 before these deadlines:

   First Exam: 12:00PM (Noon) on May 4
   Second Exam: 12:00PM (Noon) on May 26

We will not accept questions regarding errors in grading after these deadlines.

The error correction process will take a few days. You will be notified of the place and time to pick up exams after the re-evaluation is completed.

A final word about grades and exams:

You are not competing against each other for grades in Bio 12. Let me be very clear about that and reiterate this point: You are not competing for grades in this class with anyone but yourself. All grades, up until the final letter grades are decided, are recorded as numerical grades, from 0% to 100%. I do NOT assign letter grades to individual exams. Here are three important points about grades in Bio 12:

[i] A grade of 90% or above will always be at least an A-. No one is ever penalized for learning what we teach them. Thus, it is entirely possible for everyone in the class to receive a grade of A- or better. However, my experience suggests to me that this will not happen (see page 6 of this syllabus).

[ii] In order to receive a D, you have to achieve a final grade of at least 50%. In other words, a final grade less than 50% is an E.

[iii] The median grade for both sections of Bio 12 will be a B. That means if the median of an
exam were 62%, then a grade of 62% for that exam is a B. If the median were 29%, then a grade of 29% for that exam is a B (hence negating rule [ii] above). If the median grade is 94% then a grade of 94% for that exam is an A/A- (see rule [i] above). Finally, note there are two sections of Bio 12; each will have its own grade distribution, but each will follow the rules outlined above.

Clickers

We will be utilizing interactive technology in Bio 12 that will require you to have a hand-held device (a "clicker"). "Clickers" can be obtained at the computer store, where you will be charged a fee (~$30 on DA$H card) at the beginning of the term. When you return the "clicker" at the end of the term, you will receive a $20 credit. Please obtain the "clicker" today and bring it to class (including X hrs) for the rest of term. The purpose of using clickers is to learn more about your understanding of the material as it is being delivered so that we can be more effective as instructors. Additionally, they will help you think about the material actively during class which will help you synthesize and learn. Of course, you can think about the material without having a clicker. However, my responses to the class' clicker answers will depend on how the class as a whole responds to a given question. Thus, it is not as informative for me if you answer mentally without having your answer added to the group response. We will use the clickers in the anonymous mode (i.e., the computer will know which serial numbered clickers have answered, but not which student corresponds to a given serial number).

Academic Honor Principle:

The Dartmouth College Student Handbook states "Fundamental to the principle of independent learning are the requirements of honesty and integrity in the performance of academic assignments, both in the classroom and outside. Dartmouth operates on the principle of academic honor, without proctoring of examinations. Students who submit work which is not their own or who commit other acts of academic dishonesty forfeit the opportunity to continue at Dartmouth."

There are a number of situations in which a student in Biology 12 might find themselves tempted to violate the Academic Honor Principle. These situations include (but are not limited to) the following:

a) Examinations must be completed without reference to written materials other than those provided with the exam paper and must be completed without communication with anyone else (the only permissible exception is that students may request clarification of any exam question from the course instructor who is present expressly for that purpose). The answers that you provide must be entirely your own work.

b) Our policy permits the re-submission of exams for potential error correction by the instructor. Any alteration of the answers between the time when the graded papers were returned to the student and the time when the paper was submitted for re-grading constitutes a breach of the Academic Honor Principle. To deter this practice, we scan exams before grading them.

c) Laboratory experiments are performed in pairs or groups, and we encourage collaborative analysis of the data. However, any report submitted for grading must represent the original words of the student submitting that report. Do not share computer files of work (including text, graphs, tables, etc.) to be submitted for grading! The student misrepresenting the work of another as his or her own is in violation of the Academic Honor Principle, as is likely the student who loaned that information. Thus, it is possible that the Committee on Standards will find the student providing the original file also to be in violation of the Honor Principle.

Honesty is the foundation of the academic pursuit of knowledge. In recognition of this, the faculty will not overlook any violations of the Academic Honor Principle. Indeed, the Faculty Handbook of Dartmouth College states explicitly that College faculty are obligated to report potential violations of the Academic Honor Principle to the Dartmouth College Committee on Standards.
Note to Students with Physical or Learning Disabilities:
I encourage students with disabilities, including invisible disabilities such as chronic illnesses and learning disabilities, to arrange for accommodations that might be helpful. Please meet with me soon, preferably during the first week of classes, to discuss possible accommodations. All discussions will be confidential, although the Academic Skills Center may be consulted to verify the documentation of the disability.
HOW TO BE SUCCESSFUL IN BIO 12:

1) PREVIEW each reading assignment the night before class. Look at the figures, read the figure legends, and get a general feel for the vocabulary to be introduced and the topics to be covered in the upcoming lecture. Jot down any questions you have to focus your attention in lecture.

2) ATTEND LECTURES ON TIME (class will start promptly at 8:45 AM), take notes on the material presented in lecture, and ask questions about the things you do not understand. Make sure you ultimately find answers to the questions you wrote down during the end of class reflections.

3) RE-READ the reading assignment as well as your notes that very same afternoon or evening after the lecture, when it is still fresh in your mind. Correct or add points to your notes as you go along.

4) REVIEW the notes and reading assignments from the previous week’s classes sometime during the weekend.

5) BE CURIOUS and ask questions in class, in office hours, in lab and with fellow students. Also ask YOURSELF questions and try to challenge yourself to decide if you really understand the material.

6) TEST YOUR OWN KNOWLEDGE by putting away your notes and drawing out structures and pathways from memory. Your goal is to be able to accurately re-create the details and mechanisms from scratch. Don’t just try to do it in your head. Do it on paper, and then compare your attempt with your notes.

7) ATTEND ALL CLASSES, PROBLEM SESSIONS AND QUESTION SESSIONS.
Welcome to the laboratory of Bio12! This portion of the course will complement the lecture by offering you the opportunity to engage in the scientific process within the field of cell biology. The specific laboratory objectives for Bio12 are as follows:

- You will use an array of microscopy techniques to critically observe both live and fixed cells to analyze cell structure and function.
- You will integrate data from multiple molecular biology assays to yield conclusions regarding the interplay of cellular components.
- You will engage in the process of scientific inquiry by generating hypotheses, developing study designs, collecting data, and interpreting results. Written laboratory reports will be culminating assignments to display proficiency in communicating scientific ideas and findings.

This syllabus will outline the material that will be covered this term, important dates and laboratory policies. We will review this syllabus during your first laboratory session. However, it is your responsibility to be familiar with all parts of this syllabus and to follow them closely. Please refer back to this document throughout the term.

**Laboratory Section Assignment**
On the first day of class you will be directed to fill out an online survey to determine your lab section based on your academic schedule. Conflicts of an academic nature will take priority, followed by work and extracurricular activities. Your lab section assignment will be the same for the entire term and it is your responsibility to ensure that you will be in attendance for all sessions. Be sure to check all exams and X-hours for your other classes throughout the term. This term we will be offering six lab section times:

- Section 1: Monday Afternoon 1:00-5:00pm
- Section 2: Monday Evening 5:30-9:30pm
- Section 3: Tuesday Afternoon 1:00-5:00pm
- Section 4: Tuesday Evening 5:30-9:30pm
- Section 5: Wednesday Afternoon 1:00-5:00pm
- Section 6: Wednesday Evening 5:30-9:30pm

**Laboratory Calendar**
Below is a calendar outlining each laboratory session for the term and relevant assignment due dates. This calendar will also be available electronically through and can be integrated together with your other courses for the term. Be sure to check the Canvas calendar regularly throughout the term for any changes to this calendar.

<table>
<thead>
<tr>
<th>Lab</th>
<th>Dates</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab #1 Microscopy</td>
<td>April 6-8th</td>
<td>In-lab microscopy assignment</td>
</tr>
<tr>
<td>Lab #2 Chloroplasts</td>
<td>April 13-15th</td>
<td>Lab report due two weeks later at the beginning of Lab #3 the week of April 27-29th..</td>
</tr>
<tr>
<td>No lab April 20th-22nd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lab #3 Ion Chromatography</td>
<td>April 27-29th</td>
<td>Lab 3-4 report due two weeks later at the beginning</td>
</tr>
<tr>
<td>Lab #4 Gel Electrophoresis</td>
<td>May 4-6th</td>
<td>of Lab 6 the week of May 18-20th.</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Lab #5 Cell Motility and Experimental Design Discussion</td>
<td>May 11-13th</td>
<td>Lab 5 Abstract due Friday, May 22nd at noon in the Bio DropBox outside LSC 202. Lab 6 Methods due two days after your lab section by email to your TA.</td>
</tr>
<tr>
<td>Lab #6 Experimental Design</td>
<td>May 18-20th</td>
<td>Lab report due at noon on Friday, May 29th in the Bio Drop Box outside LSC 202.</td>
</tr>
</tbody>
</table>

**Laboratory Grades**

Your work in the laboratory will contribute to 25% of your overall grade in Bio12. The lab grade will be composed as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Quizzes</td>
<td>25%</td>
</tr>
<tr>
<td>In-Lab Microscopy Assignment</td>
<td>5%</td>
</tr>
<tr>
<td>Chloroplast Report (Lab 2)</td>
<td>15%</td>
</tr>
<tr>
<td>Protein Report (Labs 3-4)</td>
<td>25%</td>
</tr>
<tr>
<td>Cell Motility Abstract (Lab 5)</td>
<td>5%</td>
</tr>
<tr>
<td>Experimental Design Methods (Lab 6)</td>
<td>5%</td>
</tr>
<tr>
<td>Experimental Design Report (Lab 6)</td>
<td>20%</td>
</tr>
</tbody>
</table>

**Assignments**

You are required to prepare your assignments electronically and submit a hard copy of the assignment at the beginning of your laboratory session. Printing problems are not an acceptable excuse for lateness so plan your assignment printing advance.

**Lab Assignment Grading Error Correction Requests**

All of your laboratory assignments are graded carefully and conscientiously. If you identify arithmetic or omission errors by the grader after reviewing your graded assignment, you must observe the following procedure to correct the error.

1. Do not write on the assignment. Assignments that have been written on will not be corrected. Any alteration to the assignment following the original submission will be considered a violation of the Academic Honor Principle.
2. Prepare a typed cover page with your name and HB number.
3. Prepare a typed page outlining the grading error(s) you have identified.
   a. If you find an addition error, indicate which page of the assignment has the error.
   b. If you determine that your assignment contains the requisite information to satisfy a grading comment but did not receive full credit, indicate which grading comment you are referring to and which section of your assignment satisfies the comment.
4. Submit your grading error correction, comprised of the cover page, grading error description, and original hard copy assignment, in the Bio DropBox outside of LSC 202 by the designated deadline. Grading error corrections submitted after this time will not be accepted.

Chloroplast Report Error Correction Requests: due at noon on Wednesday, May 13th
Protein Report Error Correction Requests: due at noon on Tuesday, June 2nd

Academic Honor Principle
As stated in the Dartmouth College Student Handbook, “Fundamental to the principle of independent learning are the requirements of honesty and integrity in the performance of academic assignments, both in the classroom and outside. Dartmouth operates on the principle of academic honor, without proctoring of examinations. Students who submit work which is not their own or who commit other acts of academic dishonesty forfeit the opportunity to continue at Dartmouth.”

Part 2 of the Academic Honor Principle indicates that it is the responsibility of the faculty to “(a) provide continuing guidance as to what constitutes academic honesty, (b) to promote procedures and circumstances which will reinforce the principle of academic honor; and (c) to review constantly the effective operation of this principle.”

In line with these obligations, we have outlined below how the Academic Honor Principle is fulfilled in the laboratory portion of your Bio12 course work.

- Science is a collaborative field and we encourage collaboration for many aspects of the course while still requiring demonstration that each individual has an understanding of key concepts. You will work in partners during the laboratory sessions to perform all in-lab activities including microscopy, data collection, and hypothesis generation. We encourage you to collaborate with your partner and peers in the analysis of your data, including discussion of data presentation and interpretations. While the ideas and overall interpretations may result from collaboration, we require that the textual and graphical content of any lab report submitted for grading is prepared by you individually without the assistance of anyone else.

- Frequently you will search the scientific literature in order to find support for your hypotheses or data interpretations. It is critical to cite all references used. We require that you use the citation style of the Cell, available at http://www.cell.com/cell/authors. For extensive lab reports, it is recommended that you use a citation manager program such as RefWorks, which is freely available to you through the Biomedical Library.

- Any attempt to mislead the laboratory instructor, TA, or other course personnel regarding late submission of assignments, absences from lab, or discrepancies in assignment grading will be considered academic dishonesty and will not be tolerated and reported to the Committee on Standards.

Laboratory Policies

Attendance
Attendance is required at ALL of your assigned lab dates. It is your responsibility to ensure that you are in attendance for all of your assigned laboratory sessions for the entirety of the laboratory period. Barring prior approval from the lab instructor, failure to attend a lab section at the scheduled time will result in a grade of zero on the in-lab questions and participation and a zero for any written assignment associated with lab. In the event of illness that inhibits lab attendance, you are required to email Dr. Nick Sylvain, and are encouraged to go to Dick’s House to seek treatment. Accommodations due to unique conflicts such as religious observances must be communicated at the beginning of the term. No arrangements exist for make-up labs.
Lateness
All laboratory sessions will start promptly at the beginning of the period in order to ensure that the entire experiment can be completed. It is your responsibility to arrive on time to all laboratory sessions. If you anticipate that there is a chance that you will be late, for example due to a class immediately prior to lab across campus, please communicate this with the laboratory instructor and TA ahead of time. Late arrivals will receive a zero for the participation score associated with that lab and/or a 25% late penalty on any assignments due that day.

Attire
We will routinely be working with hazardous chemicals and equipment. Therefore it is critical that you come to the laboratory with appropriate attire to perform all laboratory procedures safely. You are required to wear closed-toe shoes and long pants or ankle-length skirts at all laboratory sessions. Shorts, capris, skirts above the ankle and sandals are not allowed. During the winter months, it is recommended to bring dry shoes to avoid slipping in wet boots. Arrival at the laboratory with inappropriate attire will result in you being sent home to acquire the appropriate lab attire. This will result in a zero for your participation score associated with that lab.

We will provide lab coats, gloves and goggles when necessary. The purpose of this personal protective equipment is to prevent the contamination of yourself and your belongings, therefore please remove all lab coats, goggles, and gloves if you leave the laboratory, including to the vestibule for any reason during the laboratory session.

Electronics
Due to the nature of the reagents and equipment that are used in the laboratory, it is critical that electronics are used in a controlled way during the laboratory sessions. Cell phones are not permitted in the laboratory at any time and must be kept in the vestibule during the entire laboratory session. Laptop computers are permitted only during designated incubation times as communicated by your TA and can only be used in designated areas to avoid contamination with hazardous reagents.
Welcome to the laboratory of Bio12! This portion of the course will complement the lecture by offering you the opportunity to engage in the scientific process within the field of cell biology. The specific laboratory objectives for Bio12 are as follows:

- You will use an array of microscopy techniques to critically observe both live and fixed cells to analyze cell structure and function.
- You will integrate data from multiple molecular biology assays to yield conclusions regarding the interplay of cellular components.
- You will engage in the process of scientific inquiry by generating hypotheses, developing study designs, collecting data, and interpreting results. Written laboratory reports will be culminating assignments to display proficiency in communicating scientific ideas and findings.

This syllabus will outline the material that will be covered this term, important dates and laboratory policies. We will review this syllabus during your first laboratory session. However, it is your responsibility to be familiar with all parts of this syllabus and to follow them closely. Please refer back to this document throughout the term.

Laboratory Personnel

Laboratory Directors
Dr. Lara Park  
lara.k.park@dartmouth.edu
Dr. Nicholas Sylvain  
nicholas.r.sylvain@dartmouth.edu

Graduate Teaching Assistants
Cassandra Burke  
cassandra.m.burke.GR@dartmouth.edu
Tiffany Coupet  
tiffany.a.coupet.GR@dartmouth.edu
Yang Gao  
yang.gao.GR@dartmouth.edu
Therese Gerbich  
therese.m.gerbich.GR@dartmouth.edu
Erin Langdon  
erin.m.langdon.GR@dartmouth.edu
Kimberley Lewis  
kimberley.a.lewis.GR@dartmouth.edu

Laboratory Section Assignment
On the first day of class you will be directed to fill out an online survey to determine your lab section based on your academic schedule. Conflicts of an academic nature will take priority, followed by work and extracurricular activities. Your lab section assignment will be the same for the entire term and it is your responsibility to ensure that you will be in attendance for all sessions. Be sure to check all exams and X-hours for your other classes throughout the term. This term we will be offering six lab section times:
Laboratory Calendar

Below is a calendar outlining each laboratory session for the term and relevant assignment due dates. This calendar will also be available electronically through and can be integrated together with your other courses for the term. Be sure to check the Canvas calendar regularly throughout the term for any changes to this calendar.

<table>
<thead>
<tr>
<th>Lab</th>
<th>Dates</th>
<th>Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab #1 Microscopy</td>
<td>April 6-8th</td>
<td>In-lab microscopy assignment</td>
</tr>
<tr>
<td>Lab #2 Chloroplasts</td>
<td>April 13-15th</td>
<td>Lab report due two weeks later at the beginning of Lab #3 the week of April 27-29th.</td>
</tr>
<tr>
<td>No lab April 20th-22nd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lab #3 Ion Chromatography</td>
<td>April 27-29th</td>
<td>Lab 3-4 report due two weeks later at the beginning of Lab 6 the week of May 18-20th.</td>
</tr>
<tr>
<td>Lab #4 Gel Electrophoresis</td>
<td>May 4-6th</td>
<td></td>
</tr>
<tr>
<td>Lab #5 Cell Motility and Experimental Design Discussion</td>
<td>May 11-13th</td>
<td>Lab 5 Abstract due Friday, May 22nd at noon in the Bio DropBox outside LSC 202. Lab 6 Methods due two days after your lab section by email to your TA.</td>
</tr>
<tr>
<td>Lab #6 Experimental Design</td>
<td>May 18-20th</td>
<td>Lab report due at noon on Friday, May 29th in the Bio Drop Box outside LSC 202.</td>
</tr>
</tbody>
</table>

Laboratory Grades

Your work in the laboratory will contribute to 25% of your overall grade in Bio12. The lab grade will be composed as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Quizzes</td>
<td>25%</td>
</tr>
</tbody>
</table>
Assignments
You are required to prepare your assignments electronically and submit a hard copy of the assignment at the beginning of your laboratory session. Printing problems are not an acceptable excuse for lateness so plan your assignment printing advance.

Lab Assignment Grading Error Correction Requests
All of your laboratory assignments are graded carefully and conscientiously. If you identify arithmetic or omission errors by the grader after reviewing your graded assignment, you must observe the following procedure to correct the error.

1. Do not write on the assignment. Assignments that have been written on will not be corrected. Any alteration to the assignment following the original submission will be considered a violation of the Academic Honor Principle.

2. Prepare a typed cover page with your name and HB number.

3. Prepare a typed page outlining the grading error(s) you have identified.
   a. If you find an addition error, indicate which page of the assignment has the error.
   b. If you determine that your assignment contains the requisite information to satisfy a grading comment but did not receive full credit, indicate which grading comment you are referring to and which section of your assignment satisfies the comment.

4. Submit your grading error correction, comprised of the cover page, grading error description, and original hard copy assignment, in the Bio DropBox outside of LSC 202 by the designated deadline. Grading error corrections submitted after this time will not be accepted.

Chloroplast Report Error Correction Requests: due at noon on Wednesday, May 13th
Protein Report Error Correction Requests: due at noon on Tuesday, June 2nd

Academic Honor Principle
As stated in the Dartmouth College Student Handbook, “Fundamental to the principle of independent learning are the requirements of honesty and integrity in the performance of academic assignments, both in the classroom and outside. Dartmouth operates on
the principle of academic honor, without proctoring of examinations. Students who submit work which is not their own or who commit other acts of academic dishonesty forfeit the opportunity to continue at Dartmouth.”

Part 2 of the Academic Honor Principle indicates that it is the responsibility of the faculty to “(a) provide continuing guidance as to what constitutes academic honesty, (b) to promote procedures and circumstances which will reinforce the principle of academic honor; and (c) to review constantly the effective operation of this principle.”

In line with these obligations, we have outlined below how the Academic Honor Principle is fulfilled in the laboratory portion of your Bio12 course work.

- Science is a collaborative field and we encourage collaboration for many aspects of the course while still requiring demonstration that each individual has an understanding of key concepts. You will work in partners during the laboratory sessions to perform all in-lab activities including microscopy, data collection, and hypothesis generation. We encourage you to collaborate with your partner and peers in the analysis of your data, including discussion of data presentation and interpretations. While the ideas and overall interpretations may result from collaboration, we require that the textual and graphical content of any lab report submitted for grading is prepared by you individually without the assistance of anyone else.

- Frequently you will search the scientific literature in order to find support for your hypotheses or data interpretations. It is critical to cite all references used. We require that you use the citation style of the Cell, available at http://www.cell.com/cell/authors. For extensive lab reports, it is recommended that you use a citation manager program such as RefWorks, which is freely available to you through the Biomedical Library.

- Any attempt to mislead the laboratory instructor, TA, or other course personnel regarding late submission of assignments, absences from lab, or discrepancies in assignment grading will be considered academic dishonesty and will not be tolerated and reported to the Committee on Standards.

Laboratory Policies

Attendance
Attendance is required at ALL of your assigned lab dates. It is your responsibility to ensure that you are in attendance for all of your assigned laboratory sessions for the
entirety of the laboratory period. Barring prior approval from the lab instructor, failure to attend a lab section at the scheduled time will result in a grade of zero on the in-lab questions and participation and a zero for any written assignment associated with lab. In the event of illness that inhibits lab attendance, you are required to email Dr. Nick Sylvain, and are encouraged to go to Dick’s House to seek treatment. Accommodations due to unique conflicts such as religious observances must be communicated at the beginning of the term. No arrangements exist for make-up labs.

**Lateness**
All laboratory sessions will start promptly at the beginning of the period in order to ensure that the entire experiment can be completed. It is your responsibility to arrive on time to all laboratory sessions. If you anticipate that there is a chance that you will be late, for example due to a class immediately prior to lab across campus, please communicate this with the laboratory instructor and TA ahead of time. Late arrivals will receive a zero for the participation score associated with that lab and/or a 25% late penalty on any assignments due that day.

**Attire**
We will routinely be working with hazardous chemicals and equipment. Therefore it is critical that you come to the laboratory with appropriate attire to perform all laboratory procedures safely. You are required to wear closed-toe shoes and long pants or ankle-length skirts at all laboratory sessions. Shorts, capris, skirts above the ankle and sandals are not allowed. During the winter months, it is recommended to bring dry shoes to avoid slipping in wet boots. Arrival at the laboratory with inappropriate attire will result in you being sent home to acquire the appropriate lab attire. This will result in a zero for your participation score associated with that lab.

We will provide lab coats, gloves and goggles when necessary. The purpose of this personal protective equipment is to prevent the contamination of yourself and your belongings, therefore please remove all lab coats, goggles, and gloves if you leave the laboratory, including to the vestibule for any reason during the laboratory session.

**Electronics**
Due to the nature of the reagents and equipment that are used in the laboratory, it is critical that electronics are used in a controlled way during the laboratory sessions. Cell phones are not permitted in the laboratory at any time and must be kept in the vestibule during the entire laboratory session. Laptop computers are permitted only during designated incubation times as communicated by your TA and can only be used in designated areas to avoid contamination with hazardous reagents.