I. COURSE DESCRIPTION

CC106 is designed to round out your exploration of the natural sciences by focusing on the science of life. Life is remarkable in its improbability, diversity, and uniqueness (as far as we know, life is limited to this planet, though this may change shortly). Importantly, life counteracts the tendency toward disorder that characterizes physical and chemical systems, and the evolution of living systems gives rise to organisms both beautiful and sublime. In this course we aim to instill in you an appreciation for the diversity and remarkable complexity of life, and also an understanding of the elegant mechanisms that govern the evolution of life.

II. INSTRUCTORS

If you can't attend office hours, contact the instructor by e-mail to arrange an appointment.

<table>
<thead>
<tr>
<th>Instructor</th>
<th>Office</th>
<th>E-mail</th>
<th>Phone</th>
<th>Office Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robin Stevens (Core)</td>
<td>CAS 119</td>
<td><a href="mailto:rjs01@bu.edu">rjs01@bu.edu</a></td>
<td>8-2891</td>
<td>T 11-12:30, Th 4-5:30</td>
</tr>
<tr>
<td>Nathan Stewart (Bio)</td>
<td>BRB 217</td>
<td><a href="mailto:nlstewar@bu.edu">nlstewar@bu.edu</a></td>
<td>3-2432</td>
<td>M 10-12, F 10-12</td>
</tr>
<tr>
<td>Jelle Atema (Bio)</td>
<td>BRB 231</td>
<td><a href="mailto:atema@bu.edu">atema@bu.edu</a></td>
<td>8-4392</td>
<td>M 2-3, T 4-5</td>
</tr>
<tr>
<td>Christopher Schneider (Bio)</td>
<td>BRB 521</td>
<td><a href="mailto:cschneid@bu.edu">cschneid@bu.edu</a></td>
<td>3-5566</td>
<td>M 10-12</td>
</tr>
</tbody>
</table>

Undergraduate mentors (all meetings take place in CAS 119):

<table>
<thead>
<tr>
<th>Mentor</th>
<th>E-mail</th>
<th>Office Hours</th>
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</thead>
<tbody>
<tr>
<td>Katie Angelica</td>
<td><a href="mailto:kaa@bu.edu">kaa@bu.edu</a></td>
<td>M 5-7</td>
</tr>
<tr>
<td>Catherine Enwright</td>
<td><a href="mailto:ttenwrig@bu.edu">ttenwrig@bu.edu</a></td>
<td>MW 4-5</td>
</tr>
<tr>
<td>Nate Fairchild</td>
<td><a href="mailto:ndf93@bu.edu">ndf93@bu.edu</a></td>
<td>W 12-1, Th 11-12</td>
</tr>
<tr>
<td>Stefanie Grossano</td>
<td><a href="mailto:stegro@bu.edu">stegro@bu.edu</a></td>
<td>Su 5-6</td>
</tr>
</tbody>
</table>

CAS 119 is staffed Sunday evenings from 4-6 PM for an open study. All Core students are welcome.

III. GRADING

A. Lecture Participation, 10%. Attendance and active participation are required.

B. Exam I: Feb. 18, 15%. This exam will cover material from lectures, discussions and labs, up to, and including, Integrating Forum I. Questions will be multiple choice with some short answer. Most of the exam will test your understanding of key principles and material presented in lecture. You will be expected to understand the required readings, particularly as they pertain to the material covered in lecture, discussion, lab, or the forum. You will not be asked to remember details from the readings that were not covered in class. You will be expected to understand and interpret laboratory exercises and hypothesis testing.

C. Exam II: March 27, 15%. This exam will cover material from lecture, lab and discussion up to, and including, Integrating Forum II.

D. Exam III: May 1, 15%. This exam will cover material from lecture, lab and discussion up to, and including, Integrating Forum III.

E. Discussion, 10%. Discussion is required and is an integral part of the course. Discussion will focus on issues that are related to topics covered in lecture. Some questions on the exams will refer to the readings assigned for discussion.
F. **Paper, 15%**. You will compose a piece of scientific journalism based on a paper from the scientific literature in an area closely related to the course content. More information on the paper will be available on the course web site and in Discussion early in the semester.

G. **Lab, 20%**. The labs will require you to perform exercises and answer questions. You will work in teams of two, and both partners will receive the same grade for their work.

IV. **READINGS** (http://learn.bu.edu).

Required readings for the course are taken from the primary and popular literature. All readings will be posted to the course website in electronic form.

V. **COURSE WEB SITE** (http://learn.bu.edu)

The course website at http://learn.bu.edu contains all the information for the course, including downloadable lectures, laboratory manuals, animations, announcements, and news. You should consult the course website often. When important updates are made to the course website, you will be notified by e-mail. You can also follow the course on Twitter @BUCore106.

VI. **LECTURE/EXAM SCHEDULE** (http://learn.bu.edu)

Lecture Location: CAS 211. Time: Tuesdays and Thursdays from 2-3:30. Students are expected to attend and be active participants in all lectures. Attendance and participation constitute a significant portion of your grade and attendance will be taken. Material covered during lecture will be weighted heavily on the exams.

**Unit: Organismal Diversity and Function: Sensory Biology**

(Week 1)

Lecture 1. Jan. 16, Schneider: Welcome and Introduction to the course. Description of course structure, syllabus, requirements and expectations.

Atema: Sensory Biology: The big picture

“The brain is an organ that creates an image of the world and predicts the future.”

(Week 2)

*Monday Jan. 20 is a holiday – no discussion this week.*

Lecture 2. Jan. 21, Atema: Vision 1: The creation of our visual world: “What {UC = Uget}”. What, why, how do we see?“


Jan. 24: Last day to register for a class.

(Week 3)


Jan. 31: Last day to add a class

(Week 4)


Lecture 7. Feb. 6, Atema: Hearing 2: Sound as a wave phenomenon.
(Week 5)


(Week 6)
Monday Holiday. Wednesday Feb. 19 follows a Monday schedule. No discussion or lab this week.

Unit: Evolution: The Unifying Theme for All of Biology

(Week 7)
Lecture 10. Feb. 25, Schneider: Darwin’s great insights, and great dilemma.

(Week 8)
Lecture 13. Mar. 6, Schneider: Sexual selection. Why do some males have all the luck?

(Week 9)
Mar. 8-16 Spring Break

(Week 10)
Lecture 14. Mar. 18, Schneider: Species and Speciation. What are species and how do they arise?
Lecture 15. Mar. 20, Schneider: How does evolution tinker with genomes to produce the diversity of living forms?

(Week 11)
Exam II. Mar. 27. Covers material presented in Lectures #9-15, Lab III, Discussions E – I, and Integrating Forum II.
Mar. 28, Last day to DROP classes with a ‘W’

Unit: Ecology and Biodiversity: Life on a changing planet
(Week 12)
Lecture 16. Apr. 1, Stewart: The Grand Assembly of Life and The Ecological Theater
Lecture 17. Apr. 3, Stewart: Biodiversity and the Distribution of Species

(Week 13)
Lecture 18. Apr. 8, Stewart: Population Dynamics and Dynamic Populations
Lecture 19. Apr. 10, Stewart: Keystones, Sentinels, and Ecosystem Engineers

(Week 14)
Lecture 20. Apr. 15, Stewart: Fisheries: Feeding Down the Food Chain To Feed Our Planet
Monday, Apr. 21, is a holiday. Discussion sections will meet on Thursday, following a Monday schedule.

Lecture 22. Apr. 22, Stewart: Global Change and Species Resilience

Apr. 24, all classes follow a Monday schedule. No lecture. Discussions will meet.

(Week 16)


Exam III, May 1. Covers material presented in Lectures #16-22, Labs IV and V, Discussions J-N, and Integrating Forum III.

VII. DISCUSSION SCHEDULE (http://learn.bu.edu)

Topics and readings will be posted weekly to the course web site. Attendance at discussion is mandatory. Unlike the practice in CC105, instructors will not directly review lecture material in discussion. Rather, the material covered in discussion is meant to expand your understanding of key principles and to provide current, topical examples related to the lecture material. Material from discussion may be used in exam questions. Note that we will reserve three discussion sessions to review for exams. We will not go over lectures again, but we will answer questions and work with you to make sure you understand the material. The discussion schedule is as follows.

A. Week 2, Jan. 20: No discussion - Holiday
B. Week 3 Jan. 27 & 29: TBD
C. Week 4 Feb. 3 & 5: TBD
D. Week 5 Feb. 10 & 12: REVIEW FOR EXAM I.

   End of material covered on the first midterm exam: February 13.

E. Week 6 Feb. 19 (Monday is a holiday, Wednesday is a Monday Schedule): No discussion.
F. Week 7 Feb. 24 & 26: Evolution as tinkering
G. Week 8 Mar. 3 & 5: TBD
H. Week 10 Mar. 17 & 19: Intelligent design and evolution
I. Week 11 Mar. 24 & 26: REVIEW FOR EXAM II

   End of material covered on the second midterm exam: March 25.

K. Week 13 Apr. 7 & 9: Animals as Sentinels of Human and Ecosystem Health (Reading TBD)
M. Week 15 Apr. 23 & 24: (Thursday is a Monday Schedule): Translocation, Reintroduction, and Adaptive Capacity in a Changing Climate (Reading TBD)
N. Week 16 Apr. 28 & 30: REVIEW FOR EXAM III
VIII. **LAB SCHEDULE** (http://learn.bu.edu) See Lab Syllabus below.

- **Lab I, Jan. 27 & 29:** Human sensory biology
- **Lab II, Feb. 10 & 12:** Sensory biology and behavior
- **Lab III, Mar. 3 & 5:** Evolution: Simulating natural selection and building phylogenies
- **Lab IV, Mar. 17 & 19:** Biosphere I: Building an ecosystem
- **Lab V, Mar. 31 & Apr. 2:** Biosphere II: Analysis of an ecosystem

IX. **ACADEMIC CONDUCT** (http://bu.edu/academics/resources/academic-conduct-code/)

Definition from BU's Academic Conduct Code: “Academic misconduct is conduct by which a student misrepresents his or her academic accomplishments, or impedes other students’ opportunities of being judged fairly for their academic work. Knowingly allowing others to represent your work as their own is as serious an offense as submitting another’s work as your own.”

It is each student’s responsibility to know and understand the provisions of the Academic Conduct Code at BU (http://www.bu.edu/academics/resources/academic-conduct-code/). Cases of suspected misconduct will be referred to the CAS Dean’s office. Penalties can be severe, so please think twice before cheating.
Introduction to Core Natural Science Labs

The Core Natural Science labs are designed to give you hands-on exposure to the scientific process while reinforcing material covered in the lectures. During the labs you will utilize some of the tools and methods that scientists use to acquire and analyze data. You will also gain experience performing spreadsheet manipulation, quantitative reasoning, and graphical and statistical analysis. Keep in mind that just like “real” science, the experiments you will perform are subject to error, biases, and the limitations of measurement tools. These labs will give you a taste of the joys and challenges that come from doing science and will help you develop skills that will be beneficial no matter what future path you may take.

Lab Structure

Before lab: In order to make the best use of your time in the lab, it is essential that you come prepared. This means that you should be familiar with the relevant background material and have knowledge of the experiments and analyses you will be performing during the session. You will be expected to complete pre-lab readings and/or exercises that will be posted on Blackboard (under the “Labs” tab). Unlike CC105, there will be no quizzes during the lab sessions. However, for some labs you may be asked to hand in pre-lab questions at the beginning of lab. These questions will be worth 5-10% of that week’s lab grade. Material covered in the labs will also be included in your exams.

During lab: Labs will meet for two hours in SCI 307 (in the Metcalf Science Center, 590 Commonwealth Ave.). You will perform all lab experiments and analyses with a partner that will be assigned during the first lab session. Lab time will be spent conducting experiments, recording data, and performing analyses. At the end of lab you will upload relevant data files to Blackboard. Just like in CC105, you and your partner will be assigned a group on Blackboard that will allow each of you to upload, view, and edit your lab reports.

After lab: After the lab, you and your partner will finish data analysis and answer any follow-up questions you did not have time to complete during the lab session. For some labs you will also perform statistical tests using data generated by the entire class. The compiled data from all lab groups will be posted on Blackboard within 24 hours of the last lab session. You and your partner will have two weeks to complete your analyses and upload your lab report and any additional data files to Blackboard for grading. The deadline for submitting labs online is 11 PM on the date indicated in the lab schedule posted below. Late submissions will be penalized (see Grading Policy below); therefore you are strongly encouraged to submit your work as early as possible (ideally at least 24 hours before the deadline). Last-minute technical problems (internet, computer, corrupt files, etc.) will not be accepted as an excuse for late submissions. If you have technical difficulties, please contact Dr. Stevens as soon as possible.

You can use any library computer to complete your post-lab work. Alternatively, if you wish to finish your work on your personal computer, you will need to install a word processing program (such as MS Word) and MS Excel (available in the MS Office bundle on http://www.bu.edu/tech/desktop/site-licensed-software/microsoft/ or http://ithc.collegestoreonline.com).
Grading and Absence Policy
Your lab grade will primarily be based on your lab report and supplementary data files (i.e., Excel spreadsheets). For certain labs you may be asked to hand in pre-lab questions that will be worth 5-10% of that week’s lab grade. Lab partners will receive the same grade on their lab reports, but each person will receive an individual grade on pre-lab questions (if required for that lab session). Your combined lab scores will be worth 20% of your total course grade. Because CC106 helps fulfill the CAS laboratory requirement, missing or failing (a grade less than 50% of full credit) TWO or more labs will result in you failing the course no matter how well you perform on other areas of the course.

Late lab report submissions will be penalized unless a prior arrangement has been made. A 10% penalty will be assessed if the lab report is less than 24 hours late, while a 20% penalty will be assessed if it is between 24 and 48 hours late. If the lab report is more than 48 hours late, you will receive no credit.

If you know ahead of time that you will miss a lab or if you have a sudden illness or emergency, please let Dr. Stevens know as soon as possible. It may be possible for you to come to another section.

Safety
Although the experiments we will perform have little to no safety risks, it is always good practice to err on the side of caution while working in a laboratory space. Eating, drinking, and smoking are never allowed in the lab. Please do not bring food or drink into the lab (including gum and water). Please follow all instructions carefully and notify the instructor immediately if there is a safety concern.

Lab Schedule
Labs will meet approximately once every two weeks during the semester (see next page). If scheduling changes need to be made, announcements will be made on Blackboard and via e-mail. You should be registered for either a Monday or Wednesday lab section, and you will only attend labs on the day you are assigned. Please do not come unannounced to a different section. If you have a scheduling conflict, please contact Rose Grenier (rgrenier@bu.edu).

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<tr>
<th>Lab</th>
<th>Lab Meetings (SCI 307)</th>
<th>Lab Reports Due by 11 PM online</th>
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<tr>
<td>1. Human Sensory Biology</td>
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<td>2. Sensory Biology and Behavior</td>
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<td>2/24</td>
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<td>3. Evolution</td>
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<tr>
<td>5. Biosphere II</td>
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