

BISC 11a Biodiversity Connections
Summer Online 2017

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Course Description:

This online course explores the evolution, extinction, and conservation of biodiversity for students not majoring in the sciences. Students leaving this course will have a firm grasp of the scientific method, the benefits and limitations of scientific conclusions and the interplay between science and society. In the online environment we will explore topics through a variety of formats to promote both instructor lead and peer facilitated learning. Often we will take a case study approach dissecting an ecological story. Each case study will explore the details from natural history to ecological and social impacts about a particular species or group of species. Then we will examine the relevant underlying scientific theory and social connections.

It is impossible to explore biodiversity without promoting bioliteracy of the flora and fauna local to students. This course will introduce students to digital species identification tools and make use of iNaturalist (www.iNaturalist.org). iNaturalist is a worldwide citizen science platform that enables users to build naturalist skills and connect with a local community of naturalists while at the same time providing worldwide data on species distribution to the Global Biodiversity Information Facility (www.gbif.org). Given the online structure of this course and presumed varied geographic location of students, complementing our work with this citizen science experience will enable students to have a place-based experience and develop lifelong naturalist skills. In addition, it will offer insights to non-majors on the type of science contributions they can make now and in the future.

Prerequisites and Audience (*a.k.a. Who should take this course?*):

There are no prerequisites for this course. The course is open to non-science students from any discipline wishing to fulfill their science requirement.

Resources:

We'll be drawing upon a book for a lay audience, readings from both the popular and scientific literature, and other multimedia sources. See below for details. Additional instructor written and curated resources will support each week's discussion prompt. Readings from the primary literature will often be the basis of our content each week. These will be complemented with lay sources which will be part of each week's discussion prompt.

Kolbert, Elizabeth. (2014). *The sixth extinction : an unnatural history*. New York :Henry Holt and Company.

Class requirements:

Success in this 4 credit hour course is based on the expectation that students will spend a minimum of 12 hours of study/work time per week in preparation for online class engagement (this will include readings, making and documenting natural history observations via iNaturalist, identifying iNaturalist observations of others, completing literature searches to support posts, completing homework and other written assignments, etc.).

Course Components:

1. Online Learning: This course will require student's mastery of our online learning platform. Much of our work will be dependent upon the active participation of students in our facilitated discussions and online activities. This course will be conducted completely online using Brandeis' LATTE site (latte.brandeis.edu). The site contains the course syllabus, assignments, discussion forums, links/ resources to course-related organizations and sites, and weekly checklists, objectives, outcomes, topic notes, and discussion questions.

Weekly Online Discussions: Each you can expect to engage for 3+ hours in an online facilitated discussion with your peers. Discussions will be central to our course and will offer you an opportunity to demonstrate your mastery of that week's topic. A discussion prompt will be provided

along with additional materials curated and/or written by your instructor that will prepare you for the prompt. You must complete these readings in addition to the weekly readings provide for the course.

Feedback will be provided weekly using the rubric found in LATTE; comments will provide tips for improvement or highlight concerns that should be addressed in the subsequent weeks. You are expected to meet posting guidelines and deadlines outlined in the discussion guidelines.

As the weeks progress, you will find that our conversations will deepen. After week 2 you will be expected to provide appropriately cited evidence for your posts; you can expect that as you become more comfortable with the online platform, your proficiency will increase and this will be reflected in your grades as the course progresses. Discussion guidelines can be found at the end of this document.

2. Citizen Science Participation and digital literacy: Participation in an international citizen science research platform will provide opportunity for students to become citizen scientists. Students should learn the process of citizen science and how its framework models how people can make change with or without specialized training. In the process of participating in citizen science, students will regularly reflect on the societal impact that is possible via collaboration with concerted focus on cause. The course structure embeds opportunity for students to use weekly discussions to follow the unpredictable nature of scientific data collection and observation of the natural world. During the first two weeks of participation as a citizen scientist in iNaturalist you will only be required to submit your observations. By week 3 you will be expected to become a member of the iNaturalist community who also helps your fellow citizen scientists identified their unknown sightings. This should reflect the increase in your own personal bioliteracy. You can expect to engage 2 - 3 hours per week photographing, uploading sightings, and identifying unknown observations on iNaturalist.

3. Natural History Observation and Exploration: Students will engage in ongoing natural history observations throughout the semester. This will require spending time outdoors observing biodiversity in a diversity of settings (natural to developed). Opportunities for students to share experiences and skill observations will be provided both in our online learning platform and in the citizen science platform (iNaturalist). In addition, students will be required to complete an independent in-person or virtual field trip to a natural history museum.

Evaluation:

Engagement and Participation in Online Learning Community (Weekly discussions)	40%
Homework and Writing assignments	40%
Citizen Science Research Project Participation	20%
Total:	100%

Learning Objectives:

By the end of the semester you will know and/or be able to:

1. Define contemporary and historic examples of natural history research and observation.
2. Describe biodiversity and identify the different levels to examine biodiversity.
3. Describe and explain the mechanisms of evolution.
4. Describe and explain how species interact (applying basic ecological and evolutionary principles).
5. Analyze and critique how citizen science is shaping the understanding and documentation of the world's biodiversity.
6. Participate in authentic citizen science research.

Schedule:

Week 1: Biodiversity, Science and Society (What is it and how has it changed?)	
Learning Objectives	<ul style="list-style-type: none">● Defining biodiversity● Define and apply the scientific method● Exploring contemporary projects
Readings/Resources:	<ul style="list-style-type: none">● Primack (2014) What is Biological Diversity? in Richard Primack, Essentials of Conservation Biology. Sinauer (23 - 49)● Gustetic, J. and L. Shanely. (January 14, 2015) Citizen Science Contributes to Advances in Scientific Understanding. [Web Log Post]● The Royal Society. (2015. March 6). Science Stories - Amateurs. [Video File] Retrieved from https://www.youtube.com/watch?v=A9Irz791nz4&noredirect=1
Week 2: Information Literacy in Biology	
Learning Objectives	<ul style="list-style-type: none">● Be able to access and utilize library database search tools (gain skills to access sources).● Define different types of literature: primary vs. secondary, academic vs. public.● Compare and contrast the value and efficacy of library database search tools as compared to internet search tools.● Evaluate sources for relevance to your topic and critically assess the evidence they contribute to your arguments.● Evaluate credibility as it applies to citizen science research.
Readings/Resources	<ul style="list-style-type: none">● Instructor/Librarian created readings and customized materials available in LATTE.●
Week 3: Natural History to Citizen Science (The past, present and future of understanding nature.)	
Learning Objectives	<ul style="list-style-type: none">● Defining citizen science● History of citizen science● Exploring contemporary projects● Citizen science as a research tool● Citizen science as a scientific literacy tool
Readings/Resources	<ul style="list-style-type: none">● www.iNaturalist.org● Bonney R., C. Cooper, J. Dickinson, S. Kelling, T. Phillips, JL Shirk (2009) Citizen science: A developing tool for expanding science knowledge and scientific literature. Bioscience 59:11 977-984.● Miller-Rushing, A., R. Primack, and R. Bonney. (2012) The history of public participation in ecological research. Front Ecol Environ; 10(6): 285-290, doi:10.1890/110278
Week 4: Evolution and Coevolution (<i>Case-Study</i> - Ants and Acacias: coevolutionary tale)	

Learning Objectives	<ul style="list-style-type: none"> ● Define species interactions, evolution and coevolution ● Compare and contrast evolution vs. coevolution
Readings/Resources	<ul style="list-style-type: none"> ● Meehan et al. (2009) Herbivory in a spider through exploitation of an ant-plant mutualism. <i>Current Biology</i>. 19: R892-R893. ● Janzen (1966) Coevolution of mutualism between ants and acacias in Central America. <i>Evolution</i>. 20: 249-275.
Week 5: Observing the Natural World	
Learning Objectives	<ul style="list-style-type: none"> ● Examine the link between natural history and scientific research. ● Use online tools to identify and observe species. ● Make a natural history observation. ● Demonstrate the skills necessary for communicating natural history information.
Readings/Resources	<ul style="list-style-type: none"> ● See Latte for complete list of digital resources (apps/websites) for identification. ● Ballard et al. (2017) Contributions to conservation outcomes by natural history museum-led citizen science: Examining evidence and next steps. <i>Biological Conservation</i>. <i>In Press</i>.
Week 6: Anachronisms and Ecological Analogs (<i>Case-Study</i> - Pleistocene Anachronisms: An exploration of historical extinctions, natural selection and adaptation.)	
Learning Objectives	<ul style="list-style-type: none"> ● Define and compare/contrast traditional, hybrid and novel communities (historical and contemporary). ● Describe and explain how non-native species impact ecological communities and ecosystem function (positive and negative).
Readings/Resources	<ul style="list-style-type: none"> ● Janzen & Martin (1982) Neotropical Anachronisms. <i>Science</i>. 215: 19-27. ● Wilkinson, D.M. 2004. The parable of Green Mountain: Ascension Island, ecosystem construction and ecological fitting. <i>Journal of Biogeography</i> 31: 1-4. ● Griffiths et al. (2010) The Use of Extant Non-Indigenous Tortoises as a Restoration Tool to Replace Extinct Ecosystem Engineers. <i>Restoration Ecology</i>. 10(1). ● Web-link: NPR broadcast: Mastodons in Manhattan: A Botanical Puzzle (Listen online)
Week 7: Climate Change and Biodiversity (What can natural history records tell us?)	
Learning Objectives	<ul style="list-style-type: none"> ● Explain the signature of climate change in organisms. ● Identify and explain regional examples range shift and phenology shifts in species. ● Identify and apply the characteristics of organisms that inform climate change studies. ● Identify how citizen science research can support documenting change by scientists and understanding of climate change in the public.
Readings/Resources	<ul style="list-style-type: none"> ● Miller-Rushing, A. J. and R. B. Primack. 2008. Global warming and

	<p>flowering times in Thoreau's Concord: a community perspective. <i>Ecology</i> 89: 332–341.</p> <ul style="list-style-type: none"> • Miller-Rushing, AJ, Primack, RB, Primack, D, Mukinda, S. (2006) Photographs and herbarium specimens as tools to document phenological changes in response to global warming. <i>American Journal of Botany</i>. 93(11): 1667-1674. • Polgar, C., Primack, R., Williams, E., Stitche, S., Hitchcock, C. 2013. Climate effects on the flight period of Lycaenid butterflies in Massachusetts. <i>Biological Conservation</i>. 160: 25-31.
Week 8: Genetics, Conservation and Biodiversity (<i>Case-study</i> - What kind of fish is that? DNA Barcoding and Consumer Advocacy)	
Learning Objectives	<ul style="list-style-type: none"> • Define DNA Barcoding. • Identify the application of DNA Barcoding for consumers, conservationist and taxonomists. • Define genetically modified organisms.
Resources/Readings	<ul style="list-style-type: none"> • Wolf. 2008. Barcode of Life. <i>Wired Magazine</i>. 212. • DiPinto et al. 2015 Species identification in fish fillet products using DNA barcoding. <i>Fisheries Research</i>. 170.
Week 9: Ecosystems Services (Biodiversity impacts for you, your community, and your world)	
Learning Objectives	<ul style="list-style-type: none"> • Define ecosystem services and identify how ecosystem services impact your life. • Provide different examples of ecosystem services. • Identify tools for conserving ecosystems services (species-specific vs function-specific approaches). • Define and compare ecosystem-level conservation and management, versus species-level conservation and management.
Resources/Readings	<ul style="list-style-type: none"> • Primack (2014) <i>In direct Use Value</i> in Richard Primack, <i>Essentials of Conservation Biology</i>. Sinauer (95-114) • Ellis et al. (2015) Do Pollinators Contribute to Nutritional Health? <i>PLoS ONE</i> 10(1): e114805. doi:10.1371/journal.pone.0114805
Week 10: Biodiversity Connections (The past, present and future of understanding nature)	
Learning Objectives	<ul style="list-style-type: none"> • Analyze and critique how citizen science is shaping the understanding and documentation of the world's biodiversity.
Readings/Resources	<ul style="list-style-type: none"> • Janzen (2010) Hope for Tropical Biodiversity through True Bioliteracy. <i>Biotropica</i>. • Chandler et al. (2016). Contribution of citizen science towards international biodiversity monitoring. <i>Biological Conservation</i>. • Ripple et al. (2017) Conserving the World's Megafauna and Biodiversity: The Fierce Urgency of Now. <i>Bioscience</i>. (<i>Preprint</i>)

Online Discussion Guidelines:

- Each discussion will be scored out of a total of 10 points.

- *Initial Post* (Must be completed by day 2 of module): This post should be original, pertinent and well documented with credible evidence from the public and/or scholarly literature. Your initial post will form the foundation of the thread you will manage in that week's discussion. The expectation is that these postings are professional, derived from readings or personal experience, and beginning in week 2 cited appropriately (with both in-text and reference list citation entries when indicated in the discussion requirements). (200 - 500 words)
- Follow-up posts (Must be completed by day 5 of module): These include both your posts to other students and the response post to peer posts in your thread. A substantive reply is more than just agreement or approval. You must contribute to the discussion with new material or ideas; or you must challenge the author's supposition with substantive evidence or argument. You should also reply to any substantive responses submitted in answer to your initial post. For the most part, you should also be citing your evidence appropriately in these follow-up posts. Sometimes you might find it valuable to post with simply a question or a very brief statement for clarification, this is fine if it pushes the conversation along and is in addition to your minimum number of substantive posts. The number of follow-up posts will vary depending on the topic and week. (200 - 300 words)
- *Final Post* (must be completed between days 5 and 7 of module): Discussions are not complete until you have closed your thread. You should address any peer or faculty questions addressed in the thread and post a final summary of your thoughts on the topic. (150 word minimum)
- *Discussion Tips:*
 - Our best understanding of material comes as we communicate our views with one another. If you are absent from the discussions, you are missing out on one of the most valuable experiences in the course. Consequently, we expect that you post the required minimum indicated in that week's prompt. To earn a higher grade for the week's discussion you are welcome to post more, but we will value quality over quantity in this course.
 - Carefully reading posts and responding directly to what others have written will grow our online community as a responsive, reflective place for learning. Be concise and precise in your posts thereby giving each member "your all".

Privacy: This class requires the use of tools that may disclose your coursework and identity to parties outside the class via digital biodiversity identification tools and citizen science platforms.. To protect your privacy you may choose to use a pseudonym/alias rather than your name in submitting such work. You must share the pseudonym/alias with me.

Accommodations: If you are a student with a documented disability on record at Brandeis University and wish to have a reasonable accommodation made for you in this class, please consult us immediately.

Academic Integrity: You are expected to be familiar with, and to follow, the University's policies on academic integrity. Please consult Brandeis University Rights and Responsibilities for all policies and procedures. All policies related to academic integrity apply to in-class and take home projects, assignments, exams, and quizzes. Students may only collaborate on assignments with permission from the instructors. Allegations of alleged academic dishonesty will be forwarded to the Director of Academic Integrity. Sanctions for academic dishonesty can include failing grades and/or suspension from the university.