BI 425/525  NATURAL HISTORY OF ANTARCTICA
Fall, 2016       TTh 16:40-18:30,      SRTC Rm. 219
                Lab: TTh 18:40-20:10       SRTC Rm. 219

Professors: Dr. Brad Buckley and Dr. Debbie Duffield
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Texts:
1. McGonigal, D. Antarctica: Secrets of the Southern Continent (or McGonigal
   and Woodworth – Antarctica: the Blue Continent) - Bookstore
2. Thomas, D.N. Frozen Oceans: the Floating World of Pack Ice - Amazon
3. HISTORICAL PAPERBACK (one of these is required reading) - Amazon
   Cherry-Garrard, A. The Worst Journey in the World. – OR -
   Shackleton, E. The Heart of the Antarctic: the Farthest South Expedition.

Class Organization: Natural History of Antarctica is a lecture, lab and discussion
course that covers a wide variety of topic areas. Students will be expected to
summarize readings weekly, present selected readings in lab and to look up and
to discuss additional current journal articles. There will also be a variety of
assignments and species presentations expected in lab throughout the course.
Students are, of course, encouraged to delve further into topics of special interest
to them.

Specific Expectations: Students are required to; 1) make a detailed map of Antarctic,
2) construct a field guide of all organisms covered in the class and lab (a list will be
provided), 3) read and summarize two journal articles per week (one of which will
be presented for discussion), 4) make power point presentations each week (will be
discussed and assigned during the first lab), and 5) read and summarize one of the
historical paperbacks listed under TEXTS. A field guide would include, at a
minimum; identification & taxonomy, distribution, annual reproductive cycle, diet,
predation and causes of mortality.

The grade in this class is based on: 1) quizzes, two midterms and a final
presentation; 2) reading summaries & special assignments (map, field guide, lab
assignments, historic book summary); and 3) attendance/participation in lab.

DATE       PROPOSED SCHEDULE

Week 1
Sept 27  Introduction to Antarctica
LAB: 1. Antarctic Overview
2. Lab Assignment: map landmark presentation. During the class we
would like you to become thoroughly acquainted with Antarctica by
making a detailed map or series of maps that include geographical
and geological landmarks, names of territories (lands), historical sites,
oceanographic features, etc. These will help to familiarize you with
locations of things presented and discussed in class. Your map will be
due by the final. However, for lab on Thurs, each of you will be
assigned two areas to investigate in detail and present to the class via
a power point presentation. These will be assigned during this first
lab. All power points throughout the class must be emailed to Rachel
(T.A.) prior to the lab in which they are to be presented.

Sept 29  Origin/Geology
LAB: Class presentations of Antarctic areas

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Week 2
Oct 4  Oceanography
LAB: 1. Discussion of READING SUMMARY for Week 1
2. Videos

Oct 6  Climate and Historic Climate Change
LAB: 1. Discussion of READING SUMMARY for Week 2
2. Videos

Week 3
Oct 11 Icy Ecosystems
LAB: Discussion of current journal articles (student choice)

Oct 13 The Microbiome
LAB: 1. Assignment on microbial diversity: the class will present
species accounts for selected Antarctic microbes.
2. Discussion of READING SUMMARY for Week 3 and microbial
diversity.

Week 4
Oct 18 Overview to Land & Marine Invertebrates
LAB: 1. Quiz on microbial diversity
2. **Assignment on invertebrates**: the class will present species accounts for selected Antarctic invertebrates.

**Oct 20**
Invertebrates continued; terrestrial and aquatic adaptations
LAB: 1. Discussion of **READING SUMMARIES** for Week 4
2. Videos

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**Week 5**

**Oct 25**
**MIDTERM EXAM #1 in class** (will include a Quiz on Invertebrate taxonomy)
Lab: Antarctic Terrestrial Plant Research – Todd Rosenstiel

**Oct 27**
Primary Productivity from Aquatic to Terrestrial systems
Lab: 1. Discussion of **READING SUMMARIES** for Week 5
2. Videos

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**Week 6**

**Nov 1**
Fish Ecology and Adaptation
LAB: 1. **Quiz on plant taxonomy**
2. **Assignment on fish**: the class will present species accounts for selected Antarctic fish species and Discussion on Fish systematics.

**Nov 3**
Life in Extreme Environments
LAB: 1. Discussion of **READING SUMMARIES** for Week 6
2. Videos

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**Week 7**

**Nov 8**
Seabird Identification and Ecology
LAB: 1 **Quiz on fish taxonomy**
2. **Assignment on seabirds**: the class will present species accounts for selected seabird species.
3. Videos

**Nov 10**
Geological studies in Antarctica – Andrew Fountain
LAB: 1. Discussion of **READING SUMMARIES** for Week 7

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**Week 8**

**Nov 15**
Penquin Identification and Ecology
LAB: 1. **Assignment on penguins:** the class will present species accounts for selected penguin species.
2. Videos

**Nov 17**
Marine Mammal Identification & Ecology
LAB: 1. **Quiz on seabird and penguin taxonomy**
2. Discussion of **READING SUMMARIES** for Week 8
3. Videos

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**Week 9**

**Nov 22**
Marine Mammal/Penguin Diving Physiology
LAB: 1. Discussion of **READING SUMMARIES** for Week 9
2. Videos

**Nov 24**
**HAPPY THANKSGIVING**

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**Week 10**

**Nov 29**
Human Impacts
LAB: **Assignment:** Research and present an example of the effects of human interaction (for ex, research or tourism), climate change, the impact of introduced biota (plants, invertebrates, vertebrates), etc.

**Dec 1**
**MIDTERM EXAM #2 in class** (will include a Quiz on marine mammal taxonomy)
LAB: Discussion of **READING SUMMARIES** for Week 10 and Class Wrap Up

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**DEC 6 Tues 17:30-19:20** **Final Presentation**

**Final Presentation Assignment:** each student will be assigned an Explorer, and will be expected to present a power point overviewing that individual’s involvement in Antarctica.

- **Map, Field Guide and the Historical Book Summary** *(Cherry-Garrard or Shackleton)* are due at the final.
READING ASSIGNMENTS:
1-2 pg. summaries of two of the articles specific to the week are due by the end of that week. You will be asked to give a short summary of one of them – that will be assigned during the first lab. The appropriate text readings as also given.

Week 1: Texts: McGonigal (16-35, 74-135)
Greenbaum et al. 2015. Ocean access to a cavity beneath Totten Glacier in East Antarctica. Nature Geoscience 8:294-298.

Week 2: Texts: McGonigal (36, 37-71);
Barrett 1999. Antarctic climate history over the last 100 million years. Terra Antarctica Reports 3:53-72.

Week 3: Texts: McGonigal (42-51); Thomas (Chaps 1, 2, 3, 4, 5)
For lab: CHOOSE A CURRENT JOURNAL ARTICLE OF YOUR CHOICE and one of the following.

Week 4: Texts: McGonigal (141, 148-155); Thomas (Chaps 6, 7)


Week 5: Texts: McGonigal (138-145)


**Week 6: McGonigal (153)**

**Week 7: Texts: McGonigal (204-233); Thomas (Chap 8)**

Week 8: Texts: McGonigal (156-203, 234-259); Thomas (Chap 8)

Week 9: Texts: McGonigal (262-381); Thomas (Chap 9)


Week 10: Texts: Thomas (Chap 10); Antarctic Treaty System, CCAMLR, Legal framework for marine mammal conservation and protection

Also: choose 2 of the following articles: any of these can be topics for your presentation on human impact


Additional Titles of Interest

Basic:
Antarctica, ed., W.N. Bonner and D.W.H. Walton
Antarctic Communities: Species, Structure and Survival, Ed. B. Battaglia, J. Valencia and D.W.H. Walton
Antarctic Ocean and Resources Variability, S.Z. El-Sayed
Biology of the Southern Ocean. G.A. Knox
The Crystal Desert: Summers in Antarctica, D.G. Campbell
A Natural History of the Antarctic: Life in the Freezer. A. Fothergill
Antarctica (a novel), K.S. Robinson
Antarctica (historical): Gabrielle Walker

Seabirds and Penguins:
Birds of the Antarctic and Sub-Antarctic, G.E. Watson
Antarctic Birds and Seals - A pocket guide by Sharon Chester
Field Guide to Seabirds of the World, P. Harrison
Penguin Biology, L.S. Davis and J.T. Darby
Penguins, B. Stonehouse
Watson, G.E. Birds of the Antarctic and Sub-Antarctic

Marine Mammals and Fish:
Antarctic Fishes. J. Eastman

Physiology and Ecology:
Cold Ocean Physiology, ed. H.O. Portner and R.C. Playle
Polar Ecology, B. Stonehouse
Biogeography and Ecology in Antarctica, ed. J. van Meighem and P. van Oye

Picture Books:
Penguins, W. Kaehler
Antarctic Splendor, F.S. Todd
Antarctic: Beyond the Southern Ocean, C. Monteath