Animal Stable Isotopic Ecology  
Biol F605, CRN 34324, 37356  
Spring 2014  
3 credits  

Professor: Diane O’Brien  
Office: 230 AHRB  
Lab: 221 AHRB  
Phone: x5762  
Email: dmobrien@alaska.edu  

Class meeting times and locations:  
Mon and Wed 9:15 – 10:45, Murie 130 (or VCON)  
Office hours by appointment!

Prerequisites: Graduate standing

Course materials  
Readings will be from books and from the primary literature. Readings will either be handed out in class or posted to Blackboard as PDFs.

A few books for background on isotopes, not required for this course!

Sharp, Z. “Principles of Stable Isotope Geochemistry” (2007), Pearson Prentice Hall  
This is an excellent reference for fundamental principles, written for geologists.

Fry, B. “Stable Isotope Ecology” (2006), Springer  
This is a light-hearted, at times goofy guide. The organization is opaque and the style is wordy, but there are some good insights and it has entertainment value. With a CD full of simulations and exercises.

This has a great, comprehensive, clearly written chapter on Animal Isotope Ecology. Highly recommend.

This edited volume is more focused on isotope variation in the environment than on methods for inferring animal biology, diet or behavior. However, given this focus it is a great reference.

Course Description  
This seminar examines recent primary literature in stable isotope ecology, which uses naturally occurring variation in $^{13}$C, $^{15}$N, $^{18}$O, $^{2}$H, and $^{34}$S as markers of organismal and ecological processes. The focus will be on animal studies, including dietary and food web analysis, nutrient allocation, migration, and compound-specific stable isotope analysis. Emphasis may vary by the research needs of enrolled students.

Instructional Methods  
We will alternate classes devoted to lecture (where new concepts will be introduced) and classes devoted to discussion of literature. We will use Blackboard for communication and for posting readings and assignments. I encourage students to take advantage of the discussion board feature in Blackboard; the more we can resolve before class, the farther we will get DURING class. This will also help foster a sense of community that will help our in-class discussions to be more productive.
Course Goals and Student Learning Outcomes
This course will prepare students to incorporate stable isotope techniques into their own independent research, and will give them experience with critical reading of primary literature, paper presentations, laboratory methods, study design, and data interpretation and presentation. The students should expect to master terminology, principles, key formative studies, applications, and data interpretation.

The Final Grade in this course will be assigned as follows

<table>
<thead>
<tr>
<th>Assessment</th>
<th>% of Grade</th>
<th>Date posted</th>
<th>Date due</th>
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<tbody>
<tr>
<td>Midterm</td>
<td>25%</td>
<td>March 7</td>
<td>March 12</td>
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<tr>
<td>Final Exam</td>
<td>40%</td>
<td>May 2</td>
<td>May 8</td>
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<tr>
<td>Class Project</td>
<td>30%</td>
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<tr>
<td>• Proposal</td>
<td>• 5%</td>
<td>Jan 22</td>
<td>February 12th</td>
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<td>• Samples submitted</td>
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<td>March 14th</td>
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<tr>
<td>• Results</td>
<td>• 10%</td>
<td>Jan 22</td>
<td>April 9th</td>
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<tr>
<td>• Presentation</td>
<td>• 15%</td>
<td>Jan 22</td>
<td>April 28th</td>
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<tr>
<td>Participation</td>
<td>5%</td>
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<td>N/A</td>
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<tr>
<td>TOTAL</td>
<td>100%</td>
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EXAMS: Both exams will consist of take-home, essay style open book questions to test the breadth and depth of your stable isotope knowledge.

CLASS PROJECT: For this project you will select 10 “well chosen” samples to analyze and interpret. These will be the subject of a research presentation you’ll give in the last full week of class. These can be samples relating to your graduate project, or they can test an unrelated question that piques your interest. You will submit a proposal to the instructor for approval and samples will need to be submitted to the Alaska Stable Isotope Facility by March 12.

PARTICIPATION: My expectation is that every student will receive all of these points. However, points will be taken away for (1) unexcused absences, (2) failure to complete in class exercises, (3) consistent lack of preparation for class discussions.

Letter grades will be assigned as follows:
A (≥ 90), B (≥ 80), C (≥ 70), < 70 = F
Plus / minus grades will be used to denote variation in scores within each letter category.

Disabilities Services
We welcome students with disabilities and will work with the Office of Disabilities Services (203 WHIT 474-7043) to provide equal access to the course via reasonable accommodations.
<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Class</th>
<th>Week</th>
<th>Topic</th>
<th>Assignments</th>
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<tbody>
<tr>
<td>22-Jan</td>
<td>W</td>
<td>1</td>
<td>1</td>
<td>Lecture 1: Introduction and the Basics</td>
<td>Spreadsheet assigned</td>
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<tr>
<td>27-Jan</td>
<td>M</td>
<td>2</td>
<td>2</td>
<td>Lecture 2: Fractionation</td>
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<tr>
<td>29-Jan</td>
<td>W</td>
<td>3</td>
<td>2</td>
<td>Discussion: Biological examples of fractionation</td>
<td>Spreadsheet due</td>
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<tr>
<td>3-Feb</td>
<td>M</td>
<td>4</td>
<td>3</td>
<td>Lecture 3: Carbon isotopes in plants and animals</td>
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<tr>
<td>5-Feb</td>
<td>W</td>
<td>5</td>
<td>3</td>
<td>Discussion: Classic studies</td>
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<tr>
<td>10-Feb</td>
<td>M</td>
<td>6</td>
<td>4</td>
<td>Lecture 4: Nitrogen isotopes in plants and animals</td>
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<tr>
<td>12-Feb</td>
<td>W</td>
<td>7</td>
<td>4</td>
<td>Discussion: Classic studies</td>
<td>Project proposal due</td>
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<tr>
<td>17-Feb</td>
<td>M</td>
<td>8</td>
<td>5</td>
<td>LAB TOUR (Meet in Duckering room 446)</td>
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<tr>
<td>19-Feb</td>
<td>W</td>
<td>9</td>
<td>5</td>
<td>Lecture 5: Instrumentation and Measurement, Introduction to diet to</td>
<td>Project proposals approved</td>
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<td>tissue fractionation</td>
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<tr>
<td>24-Feb</td>
<td>M</td>
<td>10</td>
<td>6</td>
<td>Discussion: Estimating diet to tissue fractionation – How much</td>
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<td>precision is necessary?</td>
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<tr>
<td>26-Feb</td>
<td>W</td>
<td>11</td>
<td>6</td>
<td>Lecture 6: Understanding why diet to tissue fractionation varies</td>
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<td>Discussion – Effects of diet quality and growth</td>
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<td>3-Mar</td>
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<td>12</td>
<td>7</td>
<td>Lecture 7: Lipids are Light!</td>
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<tr>
<td>5-Mar</td>
<td>W</td>
<td>13</td>
<td>7</td>
<td>Discussion – accounting for lipid content in biological samples</td>
<td>Samples to Lab</td>
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<tr>
<td>10-Mar</td>
<td>M</td>
<td>14</td>
<td>8</td>
<td>Lecture 8: Turnover</td>
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<tr>
<td>12-Mar</td>
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<td>15</td>
<td>8</td>
<td>Discussion: The effect of metabolic rate and body size on turnover</td>
<td>Midterm</td>
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<td>17-Mar</td>
<td>M</td>
<td>16</td>
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<td>Lecture 9: H and O variation and the GMWL</td>
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<td>19-Mar</td>
<td>W</td>
<td>17</td>
<td>13</td>
<td>Discussion: Is geographical assignment all it’s cracked up to be?</td>
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<td>24-Mar</td>
<td>M</td>
<td>18</td>
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<td>Lecture 10: Mixing Models</td>
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<td>26-Mar</td>
<td>W</td>
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<td>Discussion: Concentration-dependent mixing models</td>
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<td>31-Mar</td>
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<td>20</td>
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<td>Lecture 11: Bayesian Mixing Models</td>
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<td>9-Apr</td>
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<td>16</td>
<td>Workshop (in computer lab)</td>
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<td>14-Apr</td>
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<td>Discussion: Applications of Bayesian mixing models</td>
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<td>16-Apr</td>
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<td>Lecture/Discussion: Routing vs. Scrambling</td>
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<td>21-Apr</td>
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<td>30-Apr</td>
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<td>8-May</td>
<td>TH!</td>
<td>14</td>
<td>21</td>
<td>FINAL EXAM DUE 5 pm</td>
<td>Final exam due</td>
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