Oceanography 400: Chemical Oceanography: Winter 2015
Class web site: www.ocean.washington.edu/courses/oc400

Professor:
James W. Murray
Office: 413 OSB (543-4730)
e-mail: jmurray@u.washington.edu
Office Hours: Every Day from 1030-1130 (or make an appointment. My door is always open.)

TA:
Tessa McGee
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Office Hours: TBA

Class Periods: MTWThF 9:30 - 10:20  OSB425

Course Description: The course content is shown in the Syllabus and consists of 20 numbered lectures (sometimes more than one class period per lecture). See Lecture Schedule for important dates.

The main unifying science Theme #1 is The Global Carbon Cycle. The syllabus is organized into three broad subthemes.

Theme #2. What controls the composition of seawater and are humans changing it?
Theme #3. What are the chemical constraints on and tracers for on biological production in the Ocean?
Theme #4. What is the fate of organic matter produced by biological production and what are the impacts of this organic matter on the chemistry of the ocean and underlying sediments?

Class will be Monday through Thursday at 9:30 (except week 4 when I will be out of town and the weeks content is to be arranged).

The class session on Friday will be run by the T.A. and is voluntary but it is included so that you have the opportunity to ask questions and work additional example problems. Problem Sets will be usually due the next Monday (or Tuesday when Monday is a holiday)

Learning Objectives: We will emphasize concepts, thinking skills and tools rather than facts. The most important things you should get from this class are tools you can apply to problems and an appreciation of current hot topics that drive research in Chemical Oceanography. By the end of this class you will be able to:
1) conduct simple chemical equilibrium calculations – like at what CO2 level will CaCO3 reefs dissolve? (speciation, solubility, oxidation-reduction).
2) construct simple mass balance box models – for example what would the concentration of atmospheric CO₂ be if there was no ocean biology?  
3) critique literature– some papers will be older classics, but that is OK because they cover core material that the field has been built on and has not been expressed better more recently.

**Teaching:**

The Professor is Jim Murray. His background is in aquatic chemistry and chemical oceanography. His current interests are nitrogen cycling in the Black Sea, the distributions of iron and impacts of iron on food-web structure and new biological production in the equatorial Pacific and ocean acidification. A new extracredit interest is peak oil and climate change. See his web site (below) for more information about his past and present research interests:

http://www.ocean.washington.edu/people/faculty/jmurray/jmurray.html

Tessa McGee is the teaching assistant. She is a second year student in chemical oceanography working in Julian Sachs's lab. She is calibrating the influence of salinity on hydrogen isotope fractionation in algal lipids from marine lakes in Palau. This quantitative relationship between salinity and the hydrogen isotope ratio in specific algal lipids can then be used to reconstruct changes rainfall in Palau in the past. Her research is focused on reconstructing past climate variability in the tropical Pacific.

**Reading:**


Additional supplemental reading passed out.

The papers (as PDFs) used for class discussions are posted on the class web site.

**Web Site:**

This contains the PowerPoints slides that will be used for lectures. It also includes PDF versions of the papers used for class paper discussions. Problem Sets and Answer Keys will be posted.

**Problem Sets:**

There will be seven problem sets.

* These are to be turned into the TA by 0930 on the day they are due (see schedule). This will usually be Monday or Tuesday if Monday is a holiday  
* Late submissions will not be graded unless cleared with the TA in advance.

This class has a strong quantitative orientation and doing well on the problem sets will be necessary for doing well on the exams. Grading will evaluate your understanding of the method as well as the correct numerical result. The problem sets (in total) will count 35% of the final grade. Students are encouraged to work together on problem sets. Form a homework team!
Question Day: This year I will be trying a new approach where I give shorter lectures that highlight the main points on the week’s material. The powerpoint lectures will be available on the course web site. Most weeks we will have a “Question Day”. Student’s responsibility is to attend lectures and do the reading in Emerson and Hedges and prepare two questions. More information on how we will do this will be available Monday Jan 5. Probably submitted to a Canvas (or equivalent) web site. I will call on students to read their questions and ask students in the class to answer (with my help). Points will be given for asking a question when called on.

Paper Discussions: There will be five paper discussions in class. The goal of these discussions is to study examples of how the Themes for the course are covered in the literature.
* The papers chosen will be pertinent to the main themes of the class (see syllabus for titles and dates).
* The pdf versions of the papers will be on the web site.
* The paper discussions will be led by the instructors who will prepare a powerpoint of the figures and tables from the paper.
* The student assignment is to write two questions. These can be on anything related to the paper. The questions will be submitted to a Canvas web site with a deadline of midnight before class. These questions will be used for the class discussion. The questions count 5% of the total grade.
* At the start of class students will be divided into small groups to discuss the figures for 5+ minutes, then the class will reassemble and students will be randomly asked in class to come to the board and describe the figures.
* The Instructors will ask the class questions to make sure students understand the basic material and then to do more complex interpretative analysis and perhaps other examples.
* The Key Points will be summarized on the board as they emerge.
* Connections with previous lectures will be drawn.
* At the end of the discussion we will allow time to summarize what we have learned and where does this discussion lead to next.
* There will be questions on the mid-term and final about the papers

Exams There will be one mid-term. This will be in class on Thursday February 12. It will will cover Lectures 1 – 10 and count 15% of the grade.

There will be a Final Exam on Wednesday, March 18 (8:30-10:30). It will be comprehensive and count 40%.

The mid-term and final exams will be closed-book, however you may bring one page (double-sided) of notes/equations. The types of problems and questions in the quizzes and problem sets will prepare you for the mid-term. The mid-term may include questions about the paper discussions that were held in class.
Summary of Grading:

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<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Discussion paper questions (5 x 1.0%)</td>
<td>5%</td>
</tr>
<tr>
<td>Question Day Questions and total class participation</td>
<td>5%</td>
</tr>
<tr>
<td>7 Problem sets (7 x 5%)</td>
<td>35%</td>
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<tr>
<td>Midterm (February 10)</td>
<td>15%</td>
</tr>
<tr>
<td>Final Exam (March 19 8:30)</td>
<td>40%</td>
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Class Participation: To succeed in this class you will need to attend and participate. Participation consists of showing up on time, being prepared, asking questions and participating in discussion. The discussion paper questions and the Question Day questions and will each count 5% of the grade.

Strategies for Success: We realize that many students have not had chemistry for some time so we will try our best to bridge that gap. Make sure you ask questions if you hear unfamiliar terms or jargon. Come see Jim Murray or Tessa McGee with any questions. Our office doors are always open if we are at UW. Getting to know your instructors is a key to success.

Office hrs & e-mail: Jim Murray’s official office hours are for one hour after class Monday through Thursday. Tessa McGee will have office hours but they are TBA. Come see us anytime you have questions or problems. If that is not convenient send questions by e-mail to either of us or make an appointment to meet.