Oceanography (MASC 401; GEOL 403; BIOL 350; ENVR 417) Spring 2016

T-Th 9:30-10:45

Instructor: Alberto Scotti, Venable Hall, 2-9454, ascotti@unc.edu
Office hours: T-Th 11:00-12:15 pm (or by appointment)
TA:

Text: Introduction to Ocean Sciences, Douglas Segar. The (FREE) online edition can be found at http://reefimages.com/oceans/oceans.html
Websites: course: http://sakai.unc.edu

COURSE OBJECTIVES

- Provide an introduction to the basic principles of oceanography
- Instill an appreciation of how the ocean influences our lives
- Introduce topics of current oceanographic research
- Illustrate how the ocean, the land, and the atmosphere comprise an integrated system

COURSE EVALUATION

Requirement	Relative Weight Toward Final Grade (%)
Exam #1	*
Exam #2	*
Exam #3	*
Exam #4	25
Research Paper, peer review	25
Attendance	

* these exams together will count for 50% of the final grade. **ALL THREE REGULAR EXAMS PLUS THE FINAL MUST BE TAKEN**.

Date	Subject	Ch	pages
Jan 12	Class layout. Motivation and background	1,2	1-5,15-34
Jan 14	Sea floor spreading and plate tectonics: concepts and supporting facts	4(59-78), Lecture notes,CC2	
Jan 19	Ocean basin evolution and continental margins		78-88
Jan 21	Coastal processes, sea level change and stratigraphy	11	all chapter
Jan 26	Sediments	6, CC4	all chapter
Jan 28	**1st exam**		
Feb 2	Chemical and physical properties of sea water	5, CC6	all chapter
Feb 4	Earth's heat budget and atmospheric circulation	7, CC5	141-155
Feb 9	Surface boundary layer and wind-driven currents	8, CC12-13	175-190
Feb 11	Hydrography and the thermohaline circulation	8	191-end of ch.
Feb 16	Tides and waves	7, 9,10	
	Topic and references for paper due (must include at least 3 references from original scientific literature)		
Feb 18	Upwelling	Lecture Notes	
Feb 23	**2nd exam**		
Feb 25	NO CLASS		
Mar 1	More seawater properties: why is the sea salty?	5, CC8	
Mar 3	Residence times and hydrothermal Vents	5,15	412-415
Mar 8	Biogeochemical cycles in the ocean – carbon	12	295-298
Mar 10	Nutrient cycles, manganese nodules	12	281-294
	Research paper due		
Mar 22	Global climate change	4,CC9	83-85
Mar 24	**3rd exam**		
Mar 29	Bacterioplankton and the microbial loop	12	(281-285,298-304)
	Peer review due	13	(326-329)
Mar 31	Secondary production -> succession->behavior	12	305-313
Apr 5	Classifications, sinking vs. swimming	12(291-292), 14(all chapter)	
Apr 7	Biology in upwelling systems	13	317-333
Apr 12	Fisheries fluctuations and theories (CC14-16)	14	(376-end of ch.)
Apr 14	Coastal Benthos	14	347-359
Apr 19	Ecosystems	15	409-412
	Revised research paper due		
Apr 21	Ecosystem variability - El Nino, NAO	9	152-160
Apr 26	Final Review	9	152-160

May 3 FINAL (8:00 am) – 50% BO, 50% comprehensive

RESEARCH PAPER

The purpose of this research paper is to:

- Help enhance your ability to write papers and to critique a classmate's paper
- Provide you with an opportunity to acquire detailed knowledge on a specific oceanographic topic that particularly interests you
- Familiarize you with some literature in the natural sciences
- Provide a means to evaluate your ability to think and synthesize ideas

WHAT IS A RESEARCH PAPER?

A research paper reviews the published literature pertaining to a particular topic and organizes the information into a logical framework. A good research paper offers *critical* evaluation of the literature and provides *significant* conclusions based on that literature.

SUBJECT

You may choose any topic you wish as long as it focuses on a marine subject. Below you will find a list with topic ideas, but you are free to choose any oceanographic/marine topic that suits your interests. If in doubt, talk with the instructors! **If at all possible, stay away from Sharks and Coral Reef topics. I am getting tired of reading these papers…**

TYPES OF SCIENTIFIC LITERATURE

The major means of communicating new knowledge in science is through the *primary* literature (i.e., scientific journals). The primary literature contains the results of novel observations and experiments along with the original observer's interpretation of them. Primary literature is usually written assuming that the readers are scientists who are familiar with the field. Undergraduate students often have a difficult time comprehending the primary literature.

Secondary sources are those that summarize, integrate, and interpret the original research of many investigators. These sources generally consist of "review articles" which contain references to a number of primary sources and are thus good introductions to a subject for someone new to the field. Review articles are published in journals that also publish primary literature (e.g., *Science*), journals that specialize in reviews (e.g., *Annual Reviews of Earth and Planetary Sciences*), and scientific magazines (e.g., *Scientific American*).

Textbooks and encyclopedias are sometimes referred to as *tertiary* sources. They cover general aspects of a wide field, usually with little direct reference to primary literature.

Do not rely on articles from the popular media (e.g., *Newsweek*, *Time*, *CNN*, etc.*)* or from the internet (.e.g, *Wikipedia*), as information from these sources is sometimes scientifically inaccurate. Certain websites

(maintained by NSF, or by research groups within a university) may be helpful as a starting place, but you should use printed media (i.e., peer reviewed) as your references.

REFERENCES USED IN THE RESEARCH PAPER

The research paper must be largely based on the primary and secondary literature. Because of the difficulty of understanding primary literature, secondary sources are a good place to start your search for tantalizing topics or to acquire basic information about a selected topic.

The research paper must be based on at least five references, three of which must be from the primary literature. Only cite those references that you have read and incorporated—do not pad the References section. Citing a paper implies that you have read the paper and understood it sufficiently well to explain its main concepts.

GUIDELINES

1) Choose a topic (feel free to discuss it with the instructors before you invest a large amount of time).

2) On February 16, title and reference lists (typed) are due. Prepare a list of at least five references that you plan to use. Three of the references must be considered primary literature. It is important that the references be current (**at least two must have been published within the last five years**).

3) The paper is **due** on March 10. Place it in your dropbox on Sakai. It must conform to the Text Requirements described in the handout. Do **not** put your name, only your PID in the manuscript at this point. This is the file that will be sent out for review.

4) Shortly afters, papers will be re-distributed in class so that each student has another student's paper to review. Reviews are **due** on March 29. (Guidelines for the peer review are listed at the end of this document.). Place your review in the dropbox. Again, do not put your name, just your PID.

5) On Apr 19, your revised paper (taking into account comments from the peer review, as well as additional improvements of your own) is **due**. Use the Dropbox. This time, put your name on it.

Due means that the paper has to be received by the end of the day (midnight). Unlike auctions on Ebay, it is **not** a good idea to wait until a few seconds before the deadline to hit the submit button…

All of these deadlines have to be met for the paper to be counted toward the final grade. Plan accordingly, and don't forget that life is full of unknowns.

GRADING

The research paper and peer review together will constitute 25% of the overall course grade. The paper will be graded on the basis of organization, clarity, scientific content, originality, scholarship, and relevance of references.

NOTE

Scientific writing, like all writing, is about communication. If it can't be read, it's worthless. Thus, clarity of writing, correct grammar and spelling, and logical organization are important and will influence your grade. Also keep in mind that although the physical state of the paper is not specifically graded, a sloppy paper reflects poorly on you and will bias the person reading and grading the paper.

SUMMARY

- Adhere to the Text Requirements
- Organize your ideas
- Tell a story
- Make a point

TEXT REQUIREMENTS

1. *Style.* The report must be submitted on standard paper (8.5 x 11 in.) and the page margins should be at least one inch. The paper must be double spaced. This includes text, references, figure captions, and quoted material. Each page should be numbered (page numbering begins with the title page).

2. *Length*. Text length (**not** including the abstract, figures, tables, and references) should be 9-12 pages.

3. *Format.* The report should consist of the following sections in this order:

    - Title page including your name, year, and major
    - Table of Contents (include all sections and subsections)
    - Abstract
    - Introduction
    - Discussion (this section can be divided into subsections)
    - Conclusions
    - References

3. *Abstract.* An abstract is required for each paper. Abstracts should be typed on a separate sheet at the front of the paper.

4. *References*. All statements based on published work must be cited in the text. For one- or two-authored papers, include the names of both authors followed by the date (e.g., "Smith and Jones (1994)

showed that ^{14}C is an effective tool for dating water masses.") For papers with three or more authors, include the name of the first author followed by "et al." and the date (e.g., "Primary productivity in the Sargasso Sea is limited by nitrogen (Brown et al., 1993).") If an idea is attributed to more than one paper, separate the references by a semicolon (e.g., "Major El Niño events occur about once every decade (Green, 1990; James and Miller, 1992; Eliot et al., 1993)." All references must be listed at the end of the paper beginning on a separate sheet of paper, using the format illustrated by the following examples:

Journal article: Ahrens L. H., Mathews R. T., and Simple W. M. (1992) The use of diagenetic models to evaluate pore water chemistry. *Geochemica et Cosmochimica Acta* **56**, 112-124.

Book: Henderson P. (1988) *Chemical Oceanography*. Pergamon Press.

Chapter in a book: Menard H. W. and Williams P. T. (1965) Sea floor relief and mantle convection. In *Physics and Chemistry of the Earth* (ed. B. R. Merlot), pp. 315-364. Pergamon Press.

Notice that there are no commas separating the authors' last names and initials. Papers in the References sectioned must be listed in alphabetical order according the the first authors last name. When referring to papers with the same author, some of which are multi-authored, the sequence should be:

a) Single author, chronological

b) Two authors, alphabetical on second author

c) Three or more authors (cited as "et al." in text), chronological

For example:

Smith A. B. (1983)

Smith A. B. (1989)

Smith A. B. and Brown E. F. (1984)

Smith A. B. and Jones C. D. (1980)

Smith A. B., Jones C. D., and Brown E. F. (1986)

Smith A. B., Brown E. F., and Jones C. D. (1989)

6. *Subheadings*. It is helpful to the reader to have the Discussion section divided into subsections. The first level of subheadings should be flush-left, bold. If necessary, the second level should be flush left italic.

7. *Figures*. Figures should be integrated into the text and have an appropriate caption. It may be necessary to modify or customize figures copied the literature to make them appropriate for your research paper. All components of each figure should be relevent to the text. Figures and captions must be numbered correctly. Within the text, figures are referred to in the abbreviated form as, for example, Fig. 1; only when beginning a sentence is the unabbreviated word (i.e., Figure 1) used. Multiple part figures are designated with lower case letters (e.g., a, b, c).

8. *Tables*. Tables should be integrated into the text and have an appropriate title. As with figures, the tables in your paper should not contain any information that is extraneous to your paper. All tables must be numbered.

JOURNALS THAT CONTAIN PAPERS PERTAINING TO MARINE SCIENCES

Most of these journals are available at UNC-Chapel Hill.
Check the on-line catalogue to determine their location.

SOURCES OF SECONDARY LITERATURE

Advances in Ecological Research
Advances in Marine Biology
Advances in Microbial Ecology
American Scientist
Audubon
Annual Reviews in Earth and Planetary Sciences
Earth
Natural History
Nature
Oceanography
Oceanography and Marine Biology: Annual Review
Oceans
Oceanus
Progress in Oceanography
Science
Scientific American
Sea Frontiers
Smithsonian

SOURCES OF PRIMARY LITERATURE

American Association of Petroleum Geologists Bulletin
American Fisheries Society, Transactions of
Applied and Environmental Microbiology
Atoll Research Bulletin
Aquaculture
Biological Bulletin
Biological Oceanography
BioScience
Botanica Marina
Bulletin of Marine Science
Canadian Journal of Fisheries and Aquatic Sciences
Continental Shelf Research
Coral Reefs
Deep-Sea Research
Earth and Planetary Science Letters

(continued on next page)

Earth Science
Ecological Monographs
Ecology
Estuaries
Estuarine and Coastal Marine Science
Fishery Bulletin (U.S. National Marine Fisheries Service)
Geological Society of America Bulletin
Geology
Geochimica et Cosmochimica Acta
Geomarine Letters
Geotectonics
Global Biogeochemical Cycles
Journal of Coastal Research
Journal of Experimental Marine Biology and Ecology
Journal of Geophysical Research
Journal of Marine Research
Journal of Physical Oceanography
Journal of Plankton Research
Journal of Sedimentary Petrology
Limnology and Oceanography
Marine Biology
Marine Chemistry
Marine Ecology — Progress Series
Marine Geology
Marine Pollution Bulletin
Microbial Ecology
Nature
Netherlands Journal of Sea Research
Ocean and Shoreline Management
Ocean Optics
Oecologia
Oikos
Palaios
Paleogeography, Paleoclimatology, Paleoecology
Polar Biology
Science
Sedimentology

Guidelines for Peer Reviews of Papers

At the top of your review, be sure to list the title and author of the paper that you are reviewing. Don't put your name on the review. Use your PID instead.

The principle objectives of this peer review are (1) to aid a classmate in writing a coherent, well-focused research paper, and (2) to hone your critical thinking and writing skills through evaluation of a paper on a scientific topic. Your review should be approximately two pages long (double-spaced). The following list includes a few of the points that you should consider when writing your peer review:

- What was the main point of the paper?
  - -Was the specific focus of the paper clearly stated?
  - -Did the main theme of the paper clearly carry through from introduction to conclusion?
  - -Was the focus too broad? Too narrow? Well suited for a paper of this length?

- Is the scientific content sufficient?
  - -Did the paper deal with the main topic in sufficient depth, or was the discussion overly superficial?
  - -Was enough specific information presented to support the main point of the paper?
  - -Was use of references adequate? At least five references must be used (explicitly cited in the text), and two of these references must be from the primary literature.
  - -Was there a clear connection between specific references and discussion in the text?

- Was the paper well organized?
  - -Did the introduction present the necessary background information on the topic?
  - -Was the flow of information logically organized throughout the body of the paper?
  - -Did the conclusion section concisely recapitulate the main points of the paper?

- Is the writing clear and concise?
  - -Correct punctuation and grammar?
  - -Were there any run-on sentences or dangling modifiers?

Be as specific as possible in your comments and suggestions!

POTENTIAL TOPICS FOR RESEARCH REPORT

(use your imagination; this is only a starting point)

- **a specific topic in the area of hydrothermal vent ecosystems**
- **physiology of Riftia (gutless worms w/ chemosynthetic symbiotic bacteria, found in hydrothermal systems)**
- **Specific topic related to a selected fishery (e.g., menhaden, whaling, California anchovies, tuna, Maine lobster, etc.)**
- **trace metal uptake/effects on phytoplankton productivity (iron or Cu are two possibilities)**
- **Uncertainties in estimates of oceanic uptake of greenhouse gases**
- **Chemical and biological roles of estuaries**
- **Barrier island dynamics: a specific focus on erosion, effects of hurricanes, etc**.
- **El Niño: some aspect of physics, oceanography, and environmental consequences**
- **Nutrient cycling in the ocean (select a particular nutrient)**
- **Oceanography of the Antarctic region (select a particular topic)**
- **Effects of a selected pollutant in the marine environment**
- **Factors affecting the distribution and abundance of a specific species of pelagic fish**
- **Trace metal cycling in the ocean (pick a specific metal; Zn, Cu, Fe, Mn are all possibilities)**
- **paleoclimate estimates based on fossil record or isotopic evidence**
- **the closing of Georges Banks as a fishing ground: problems of overfishing and fisheries management**
- **Limiting factors in phytoplankton primary productivity**
- **Melting of the West Antarctic Icesheet and its implications**
- **Thinning of Arctic icesheet over the last several decades: potential implications**
- **stromatolites (ancient and recent lithified microbial mats.**
- **Satellite oceanography**
- **Coastal erosion**
- **Hurricanes**
- **Tsunamis**
- **Global ocean circulation**
- **Plankton interaction with internal waves and fronts**
- **Environmental impacts of touristic activities (e.g., cruise ships)**
- **Safety at sea**