SYLLABUS: Organic Geochemistry and Geobiology

GLY 5255 (sec 09H4): Spring 2017

Instructor: Dr. Andrew Zimmerman
e-mail: azimmer@ufl.edu 364 Williamson Hall ph: 392-0070

Meeting time: Tues, Thurs. 1 pm - 2:45 pm (6^{th} - 7^{th})
Meeting place: WM 215

Course objectives: Introduce students to the theory, practice and methods of organic geochemistry, organic biogeochemistry, and geomicrobiology. Students will be made aware of a wide variety of subdisciplines. The primary focus of the class will be on the sources, distributions and fates or organic matter in geological environments (sediments, waters and soils). Further topics of discussion will include the applications of these distributions to paleoenvironmental reconstructions, the biogeochemistry of carbon and geomicrobial processes effecting organic matter distributions in these environments and the analytical techniques currently employed in these fields.

Required Textbook: Killops and Killops, 2005 (Introduction to Organic Geochemistry, 2^{nd} Ed.; Blackwell Publishing). Can be ordered on-line for about $87

Office Hours: Open door or by arrangement to discuss an issue in depth

Grading: Course grade will be based on the following components of the course:
30% midterm **exam**: 1 exam to help you solidify your understanding of basic concepts discussed in lectures and readings. You will be allowed one side of an 8.5x11 page of notes to use during exam. No final exam.
30% **literature critiques + discussion/participation**
40% **term project:**
- 5% **annotated bibliography** related to research proposal or topic review
- 15% **in-class presentation** of research proposal or topic review
- 20% **written presentation** of research proposal or topic review

Literature Critiques
I will assign about 1 paper each week for us to discuss/critique. For each paper, I would like you to have prepared:
1) two questions on an aspect that you didn't understand.
2) two aspects to point out that you found interesting and why
3) be ready to explain the meaning of any graph or figure in the paper

You will be assigned to lead the discussion on at least two papers during the semester AND write up a full critique (to hand in) that will.

Identify the main points of the paper and discuss the strengths and weaknesses of the work*. Example Questions to Answer:

Did they present clear justification for the work?
Is there a clear hypothesis? Is the hypothesis tested? Is the test appropriate?
What are the strengths or limitations of the sample selection and/or methods employed?
Did they discuss their findings fully, and comment on any problems or unusual observations? Was the discussion logical and well organized?
Were additional, interesting questions raised by this work?
What are the important and broader implications of the work?

Most of us find scientific papers hard to read! In fact, you should expect to read a paper several times before you begin to get a strong grasp of its contents. You often may need to refer to (and discuss) other papers, especially those cited in the paper. Your grade on this will be based upon your ability to synthesize and grasp the methods, meaning and importance of the results i.e. thoughtfulness (not completeness) of your evaluation.

*No longer than two pages, single spaced, 1" margins, typed, 12 point font, the complete citation of the paper should be at the top of the page

Organic Geochemistry Proposal or Review Topic

A goal of this course is to help you along in your chosen research field and explore possible cross-overs and applications of organic geochemistry into your research. You are, therefore, given the flexibility to choose a research topic or proposal that will best serve your interests. However, ALL TOPICS MUST BE APPROVED BY AZ.

First, for the **Annotated Project Bibliography,** compile a minimum of 10 peer-reviewed, recent (post-2000) most-important publications on the topic of your project and provide at least two sentences describing the subject and findings of each paper.

In addition, you should also include an abstract for the whole annotated bibliography. The abstract can be short (1-2 paragraphs) and it should identify the major research questions/problems addressed by the 10 publications listed in your bibliography. I'd like everyone to begin using 'Endnotes' software. Use the reference style of *Geochimica et Cosmochimica Acta.*

The **final term presentation and paper** is to write a short (10-15 page, 1.5 line-spaced) 1) outline of what is currently known about a prospective research topic and what major questions remain **OR** 2) an actual research proposal that identifies a research question, formulates a hypothesis and presents a means for testing the hypothesis. Ideally, this would build on your annotated bibliography, although that is not required. You will present your topic/proposed project to the class with a 15-20 minute talk.

TENTATIVE (Spring 17) Organic Geochemistry and Geobiology Schedule

	Date	LECTURE TOPIC	READING: Review/Discussion
		I. Introductory/Background	
1	Jan 5	Intro. to Organic Geochemistry/BGC	R: Carey Ch 1,2,3
2	Jan 10	Organic Chemistry for Geochemists	D: Kvenvolden06 & Nealson01
	Jan 12	Organic Chemistry for Geochemists	
3	Jan 17	Organic Compound Classes	R: Killops Ch 2
	Jan 19	Organic Compound Classes	
		II. The Big Picture - Biogeochemistry	
4	Jan 24	Origin of Life	R: Killops Ch 1
	Jan 26	Origin of Life	D: Bada04 & Chadwick05
	Jan 31	Microbes Intro.	R: Kanhauser Ch.1
5	Feb 2	Microbes/Metabolism	
	Feb 7	Microbes/Metabolism	
	Feb 9	Microbes/Biochemistry	
	Feb 14	Microbes in the Geosphere	D: Lowenstein11& Wilfe10
	Feb 16	Global Carbon Cycle Intro.	R: Killops Ch 6
	Feb 21	Global Carbon Cycle - Marine	
6	Feb 23	Global Carbon Cycle - Terrestrial	
	Feb 28	Dissolved OM	D: TBA
	Mar 2	OM Degradation 1	R: Killops Ch 3
		SPRING BREAK	***Bibliography Due**
7	Mar 14	OM Degradation 2	R: E&M Ch 4, Ch. 11
	Mar 16	OM Diagenesis	D: Cowie92 & Hulthe98
	Mar 21	**Exam** (1 page notes allowed)	
		III. Tools of Organic Geochemistry	
8	Mar 23	Molecular Biomarkers	R: Killops Ch 5 (p.166-207)
	Mar 28	Molecular Biomarkers 2	
9	Mar 30	Stable Isotopes	R: Killops Ch 5 (p.234-245)
10	April 4	Macromolecules	R: Killops Ch 4 (p.117-144)
	April 6	Macromolecules	D: Lehmann15
11	April 11	Organic Geochem. Methods	
	April 13	Organic Geochem. Methods	
	April 18	Student Presentations	
	April 26	**Final Projects Due**	
		VI. Special Topics	
		Molecular records of Earth History	R: Killops Ch 6 (p.254-285)
		Fossil Fuels	R: Killops Ch 4 (p.144-165)
		Organic pollutants in the environment	R: Killops Ch 7