

## ES 423/623 – Marine Biogeochemistry Spring 2018

*"Each day as the sun rises and retires the beautiful green bays like great creatures breathe in and out. By day photosynthetic production of food and oxygen by plants is plentiful, but day and night there is also a furious feasting."*

H.T. Odum and C.M. Hoskin 1958

**Instructor:** Dr. Robinson (Wally) Fulweiler  
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Email: [rwf@bu.edu](mailto:rwf@bu.edu) Office Hours: T 2-3 pm, W 1:30-3:30

**Lecture:** T/Th 12:30-1:45 pm in CAS Room 233; FINAL EXAM= Wed, 5/9 12:30 – 2:30 pm

**Required Text:** Readings from class.

**Course Website:** [www.fulweilerlab.com](http://www.fulweilerlab.com)

**Course Overview** – This course is for upper-level undergraduate and graduate students interested in marine biogeochemistry. Biogeochemistry is a hot topic today in environmental science. It impacts every part of life – in fact, the National Research Council recently recognized, “*studies of biogeochemical cycles as the nation’s highest priority in global change research.*”

**My Course Goals** – I want you to leave this semester with knowledge of the foundations of marine biogeochemistry, as well as familiarity with the cutting edge new research in this field. Importantly, I also want you to learn to “think like a biogeochemist.”

**My Expectations of You** – It goes without saying – but I’ll say it here anyway – that I expect you to be prepared for class, to attend each class, and to be engaged in the learning process. I like lively classes with discussion, questions, and lots of interaction. Thus your active participation is required.

It is your job to participate and communicate. I encourage you to ask questions during class – to call me out if I am unclear or wrong. Do not wait for the end of the semester to express your feelings about any aspect of the course – I will enthusiastically listen to constructive comments and suggestions, and will respond where possible. Of course, I can only do this if I am aware of your comments, concerns, suggestions, etc. So please feel free to contact me outside of class. This does not just apply to course material – if you are interested in a particular subject and would like more information on current topics, something you saw on the news, read in the paper; if you are interested in careers in science or becoming an earth science or marine major – I am happy to help and point you in the right direction.

No cellphones or laptops are allowed in class. There is abundant evidence on how distracting and addictive cell phones are, and how taking notes on laptops is an efficient way to learn. So in this course, for a couple of hours each week, together we will minimize these distractions and maximize our efficiency.

**Exams and Course Grading** – For all students there are two exams, a journal, class assignments, and a final. I do not accept late assignments and when I ask for a printed copy an email with an attachment will not count. The final exam will be cumulative, but will emphasize the latter portion of the class and big picture synthesis. Please don’t be afraid to ask questions and speak up when you don’t understand something.

For those in 423 your grade will be calculated as follows:

Exam I:	20%
Exam II:	20%
Journal:	10%
Participation/Assignments:	20%
Final Exam:	30%

### 623 Additional Responsibilities:

As graduate students you will be expected to do more in this class. You will write a research paper on a “biogeochemistry topic.” Your paper will be an in depth review paper that you will present to the class on the last two days of class. In addition, you will have extra questions on the exams and may be asked to lead some group discussions. For those in 623 your grade will be calculated as follows:

Exam I:	15%
Exam II:	15%
Journal:	10%
Participation/Assignments:	15%
Research Project:	15%
Final Exam:	30%

Journal – Reading and writing are key tools in the world of science. And like anything, the more we read and the write the better we get. To that end, you are required to keep a journal for this course. You are responsible for writing in this journal about biogeochemical topics at least two times each week. Each entry must be 300 words and clearly written – so that I can read it. Each week I will ask you to read and synthesize one paper on the topic we are covering that week, and you will be asked to find, read, and synthesize on additional paper per week.

These journals will be due to be on a rotating basis so that I can read and return them promptly to you. More details can be found on our course website.

### **Academic Conduct Code –**

For everyone, I stress the importance of your familiarity with, and adherence to, Boston University's *College of Arts and Sciences Academic Conduct Code*, in particular those portions dealing with cheating and plagiarism (<https://www.bu.edu/academics/policies/academic-conduct-code/>). Cases of academic misconduct will be promptly referred to the Dean's Office.

## Semester Schedule

*Note this may change, and I will keep you up to date on changes as needed.*

Date	Theme	Topic
Jan.	18	Introduction
	23	Origins and evolution of biogeochemical cycles
	25	Structure and Growth of Microbial Populations
	30	Thermodynamics and Microbial Metabolism
Feb.	1	Carbon Fixation and Primary Production
	6	Heterotrophic Carbon Metabolism
	8	In Class - Salty Ocean models
	13	<i>Guest Lecture - Dr. Cedric Fichot, Earth &amp; Environment</i>
	15	Ocean Primary Production - Spatial and Temporal Patterns
	20	<i>No Class - Monday Schedule</i>
	22	Limiting Nutrients from N to Z(n)
	27	Export Production and the Microbial Loop
March	1	<b>Exam 1 - In Class</b>
	6	<i>Spring Break</i>
	8	<i>Spring Break</i>
	13	Oxygen Minimum Zones
	15	In class- Review of the Fe Experiments
	20	Sediment Diagenesis
	22	In class - Are Dead Zones Really Dead?
	27	Global Ocean Nitrogen Cycle - I
	29	Global Ocean Nitrogen Cycle - II
April	3	Global Ocean Phosphorus Cycle
	5	Ocean Metal Cycling ( <b>Exam II - Take Home Released</b> )
	10	<i>Guest Lecture - Dr. Jeffrey Marlow, Harvard University</i>
	12	Atlantic Cod, Blue Whales, & Sooty Shearwaters are all bags of nutrients to me! ( <b>Exam II Due</b> )
	17	Silicon Cycling Across the Land-Ocean Continuum
	19	Ocean Acidification - Fact/Fiction, Myth/Reality
	24	Salt Marsh and Mangrove Biogeochemistry
	26	Graduate Student Presentations
May	1	Graduate Student Presentations
	9	Wednesday Final Exam (12:30-2:30)