

Department of Earth & Environmental Sciences
Lehigh University

CRN 48708 (UG section 010)

48709 (GS section 011)

Fall 2013

EES 334

Professor Anastasio

GEOSPHERE STRUCTURE AND EVOLUTION

Class: Monday 2:30-3:30PM ST 551

Tuesday and Thursday 9:30-10:30AM ST131

Professor: Dave Anastasio

Office: ST104C (EES Office) ST 225, phone: x85117, Email: dja2@lehigh.edu,

Office Hours: Tuesday 8-9AM, Wednesday 8-9AM or contact me for an appointment

TRAC writing Fellow: Louise McCallie, kam515@lehigh.edu

Louise will help coach your writing at draft stage. Following the submission of your draft writing assignments, you will have a mandatory 15 minute meeting with Louise in the subsequent week. Rewritten final drafts are due 2 weeks after the draft due date.

Textbook: Johnson, M,R.W., Harley, S.L. 2012, *Orogenesis. The Making of Mountains*. Cambridge University Press. ISBN 978-0-521-76556-5, 388 pps.

Geosphere is a solid Earth capstone course that will review orogenic concepts and then examine the geological framework and historical geology of the North American plate. The course will provide a venue for multidisciplinary integration of concepts presented in lower-level EES courses and refine your written and oral communication skills. You will be required to critically evaluate the primary literature to become accomplished self-learners. You and your classmates will provide significant instruction in this course. Class activities will include geologic synthesis, inquiry, and communication. A principal activity is to improve reasoning skills and to help you make and write effective arguments. You will learn that writing and thinking are inseparable processes. The writing should help your skills at objectivity, logical thought, establishment of credibility through documentation, quantification, and use of supporting details from the primary literature and primary observations. Enhancing your writing skills will make you a more critical reader and accomplished researcher.

Each student will be responsible for presenting two topics during the semester. For each topic, we have scheduled 25 minutes of lecture and 20 minutes of discussion. The lectures should be given with PowerPoint graphics, which must be posted to coursesite.lehigh.edu on the day of your seminar. Following your lecture, you should be prepared to moderate the discussion of your topic (i.e. introduce the discussion, pose questions, answer questions, stimulate the

discussion, and summarize the discussion at its conclusion). *Practice your presentation; you will not be permitted to read it!*

Two weeks prior to your presentation, you will provide the class with a short annotated bibliography of your lecture topic posted to coursesite.lehigh.edu. For the first go round, Week 3 speaker's bibliography due with paper draft on the day of the presentation and week 4 speakers must satisfy the annotated bibliography assignment 1 week prior to their seminar. One week prior to your seminar you must post to coursesite a copy of each paper you have chosen for the class to read to prepare for your lecture. On or before the day of your presentation you must post your lecture graphics and your paper draft, which includes an abstract. The paper draft will be reviewed by our TRAC Fellow Louise and returned to you for revision the following week. The final draft of your paper is due electronically to me two weeks after your presentation. Late papers will be penalized one grade per day.

Attendance: Course attendance is mandatory; the discussion format of the course demands a prepared, interactive audience. If a class is missed, you must prepare a summary of the assigned papers relevant to the topic you missed. Summaries will be graded pass/fail. Failure to satisfactorily complete a summary will result in a 10% lowering of your final average for each incomplete assignment.

Syllabus

Week 1

August

26 Introduction / TRAC Fellow introduction / Major features of the Earth and plate tectonics/The cause of orogenesis

27 Rock deformation / brittle deformation / ductile deformation / Strain/Rheology of orogenic belts

Physical and chemical principles/thermal issues

29 Surface processes / erosion and exhumation of the landscape

Week 2

September

2 Library Instruction, Brian Simboli / Annotated Bibliography assignment, ST 121 2:30-3:45pm, talk 1 topics for assignment.

3 Metamorphism in orogens / Geochronology

5 Sedimentary history of foreland basins / mountains and climate

Week 3

9 Reading the primary literature, data versus interpretation / Abstract writing assignment

10 Birth of plate tectonics on Earth, The formation of the North American craton in the Precambrian (1)

12 Plate tectonics on the terrestrial planets excluding Earth (2)

Week 4

16 Dynamic mantle vs convection (3), Orogenic plateaus – Himalaya Tibet (4)

17 Orogenic plateaus – Andes Altiplano (5)

19 Trans-Hudson Orogeny (6)

20-22 New England field trip [abstracts due prior to fieldtrip departure]

Week 5

23 Adirondack Mountains (7), The Grenville Orogeny (8)

24 Ediacagan (9)

26 Cryogenian—Snow Ball Earth (10)

Week 6

30 Rifting processes and birth of Iapetus (11), Paleozoic of Western North America (12)

October

1 Caledonian Orogeny (13),

3 Taconic Orogeny (14),

Abstract final draft due electronically

Week 7 No Class

Week 8

14 No Class, Pacing break

15 No Class, Pacing break

17 Acadian Orogeny (15)

Week 9

21 Alleghanian Orogeny, Central Appalachians (16) , Alleghanian Orogeny, Southern Appalachians (17)

22 Hercynian Orogeny (Variscan Orogeny) (18)

24 Appalachian Anthracite basins (20)

Week 10

28 Ouachita Orogeny (19), Carboniferous Coals of the mid continent and western US, Cyclothems (1)

29 Geology of Mexico (2)

31 Ancestral Rocky Mountains (3)

Week 11

November

4 Tectonostratigraphic Terranes, Wrangalia (4) Other Meso.-Cen. N. Am./Pacific Plate Boundary Terranes (5)

5 Cascadia Subductuion zone (6)

7 Canadian Rocky Mountains (7)

Week 12

11 Idaho-Wyoming-Montana Thrust Belt (8), Laramide Uplifts and Foreland Basins (9)

12 **No Class**

14 Metamorphic Core Complexes (10)

Week 13

- 18 HP/UHP rocks in orogenic belts (11), Basin and Range Province (12)
- 19 Basin and Range Province (13)
- 21 Evolution of the northern boundary of North America (14)

Week 14

- 25 Mesozoic-Cenozoic Atlantic Rifting (15) and Gulf Coast Rifting (16)
- 26 Neotectonic Volcanism, Aleutians and Cascades (17)
- 28 No Class Thanksgiving

Week 15

December

- 2 Neotectonic seismicity of North America (18)
- 3 Pleistocene Glacial history of North America (19)
- 5 Anthropocene (20)

Class Members

- | | |
|-------------------|--------------------------|
| 1. James Carrigan | 11. Andrew Moodie |
| 2. Marisa Repasch | 12. Nicolette Sra |
| 3. Shayna Boulton | 13. Helen Malenda |
| 4. Zhongxiong Cui | 14. Lillian Soto-Cordero |
| 5. MaryBeth Lyons | 15. Anna Lim |
| 6. Jordan Dykman | 16. Phil Martin |
| 7. Nicole Lamb | 17. Erin Lau |
| 8. Joe Solly | 18. Raghida Sharif |
| 9. Moira McGowan | 19. Austin Meys |
| 10. Steph Souza | 20. Baasanbat Tsagaan |

Operational Rules

- Topic leader has question for audience to make sure they did the reading
- Assigned respondent- increment your topic number by 1.
- Points needing clarification in presentation
- Unanswered questions from reading

Course Evaluation:	Writing Assignments
	Abstract 10%
	Paper 1 15%
	Lecture 1 15%
	Paper 2 20%
	Lecture 2 20%
	Class 20% (10% midterm, 10% final)
	Participation includes assigned questioner

All Assignments to be turned in electronically on coursesite

Deliverables

Annotated Bibliography: Instruction and Assignment September 2, 2013, due 2 weeks prior your presentation, except topics 1 and 2 are due 1 class period prior your presentation along with the assigned reading, and topics 3, 4, 5, and 6 are due 1 week prior your presentation along with the assigned reading.

Assigned Reading: A paper from the primary literature you wish the class to critically read prior to your seminar. Choose carefully, an educated audience will make moderating a discussion easier.

Abstract: Instruction and Assignment September 9, draft due by noon September 20 [prior to field trip departure], TRAC reviews begin September 23, Final drafts due October 3, 2013. Everyone writes an abstract of the same paper. Paper distributed September 2, 2013.

Paper 1: Two relevant papers related to the topic will be summarized, synthesized, and critiqued and controversies related to the topic should be exposed.

Length– 2-3 pages.

Due–Draft due on the date of your presentation, TRAC Fellow reviews in the following week, Final copy due 2 weeks following presentation.

Rubric: Effectiveness of presentation, grammatical soundness, logical thought

Paper 2: Multipaper summary of current views of a topic are reviewed, integrated and synthesized.

Length– 4-5 pages, plus figures and references.

Due–Draft due on the date of your presentation, TRAC Fellow reviews in the following week, Final copy due 2 weeks following presentation

Rubric–Presentation evaluation based on preparation, organization, presentation, supporting materials, and overall effectiveness.