

EPIC OF EVOLUTION: LIFE, THE EARTH AND THE COSMOS
Biology/Earth and Planetary Sciences/Physics (BEP) 210
Spring, 2010

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Class Meetings: Tuesday & Thursday, 1-2:30, Brown 100.

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Office Hours: Goodenough: Thursdays 3-5, McD 215A
Will: Thursdays 11-1 or by appointment, Compton 375
Wysession: Wednesdays 1-2, Geosciences 385
TAs: please email TAs to set up a time to meet with them for office hours.

Website: http://epsc.wustl.edu/classwork/classwork_210a/

Course Description: The evolution of the universe, the Earth, and life, woven together. Themes of complexity, scale, energy and entropy applied to the Big Bang, origin of matter, formation of the Earth, geological history, origin of life, how life works, and how life evolves. We will also explore the implications of the epic for philosophy, religion, global polity, and environmental ethics.

Weekly Assignments: Each week you will be asked to complete 2 (roughly) one-page assignments, one of which we call the "Homework Question" and the other the "Evolutionary Narrative."

Homework Question: By Thursday of each week, the lecturer for that week will post on the website, and send out via all-class email, a question relating to the material in his/her lectures for that week. You are asked to turn in an answer to that question, no more than one page in length (double-spaced typing; it can be shorter), at the beginning of class on the following Thursday. This assignment will be worth a maximum of 2 points, meaning that the cumulative number of possible points is 24 (of 100 for the course total). The first homework answer will be due **in class** Thursday, February 4, and will be on the Will material in Weeks 1 and 2 of the course; **after that your answers to the homework questions will be due in class on the Thursday of each week, based on the previous week's lectures. Note late policy below. Mark your calendars now!**

Evolutionary Narrative: After each set of lectures, you are asked to turn in a work, usually of no more than one page, in which you present or *respond* to the scientific material of the previous week as a narrative. This can take many forms. For example, you might write a story as you

would tell it to a parent or a younger sibling. You might choose to include your own feelings about the material from e.g. a philosophical or religious perspective. You might write it in prose or poetry, or include some fantasy or art (simple but careful drawings fine). The point is to give you the opportunity to take what you have heard the previous week and work with it. The narratives will be graded largely on a pass-fail basis: We give full credit (2 points) for every reasonable, on-time effort. (Last year, approximately 70% of the narratives fell into this category). However we reserve the right to give a grade of 0 or 1 for work that shows little or no evidence of thought or effort, and to give up to 3 points for work that is especially interesting or creative. The first narrative (on the first unit, Weeks 1 and 2) will be due **in class** on Tuesday, February 2. **After that, narratives will be due in class each Tuesday and should be based on the previous week's lectures. Note late policy below. Mark your calendars now!**

Integrity: Assignments must represent each student's own work, and conform to university standards of scholarly work. Interaction among students or consultation with professors and TAs is permitted but the assignment that is handed in must be your own version, i.e. in your own words and representing your independent thinking. Copying is a breach of academic integrity. Consultation of outside sources (e.g. Wikipedia) for information is permitted, but answers based on such sources must be in your own words. If it is felt essential to use words from a source verbatim, the words must be placed between quotation marks and the source must be cited.

Late Policy: We will subtract 1/2 point per day for late homeworks and narratives.

Course Requirements and Grading:

Homework Questions (2% for each assignment)	24%
Narratives (2% each)	24%
Midterm exam (Thursday March 18, in class)	24%
Final Exam (Tues., May 11, 1-3 PM)	28%

Note: for those taking the course pass/fail, a grade of C- or better will be required to pass.

Required Textbooks:

Bryson, Bill
A Short History of Nearly Everything,

Broadway, 2003.

Goodenough, Ursula,
The Sacred Depths of Nature (TSDON)
Oxford University Press, 1998.

Rue, Loyal,
Everybody's Story: Wising up to the Epic of Evolution,
State University of New York Press, 2000.

Note: Specific chapters of Rue's book are not assigned for particular lectures; rather, we ask that you read the whole book by the end of the course.

In addition to the above required texts, the following books are on two-hour reserve at Olin.

Rees, Martin,
Just Six Numbers.
Basic Books, 2000.

Weinberg, Steven
The First Three Minutes
Basic Books (1993, updated edition)

Officer, Charles and Page, Jake,
Tales of the Earth: Paroxysms and Perturbations of the Blue Planet,
Oxford University Press, New York, Oxford, 1993.

Press, Frank, and Siever, Raymond
Understanding Earth, 4th ed.
W. H. Freeman and Co., New York, 2004

Davidson, Jon, Reed, Walter, and Davis, Paul
Exploring Earth, 2nd edition,
Prentice Hall, 2001

De Waal, Frans
Our Inner Ape,
Riverhead Trade, 2006

Carroll, Sean,
Endless Forms Most Beautiful,
Norton, 2005.

SCHEDULE OF LECTURES

Jan 19 CMW **The Seven Stages of the Universe**

Reading: Bryson Ch. 1; TSDON Ch. I

Jan 21 CMW **The Universe Today**

Reading: Bryson Ch. 2

Jan 26 CMW **Einstein, Relativity and Big Bang Cosmology**

Reading: Bryson Ch. 8 up to p. 126

Jan 28 CMW **The Universe Expands!**

Reading: Bryson Ch. 8 p. 126 to end

Feb 2 CMW **The First Three Minutes**

Reading: Bryson Ch. 9

Feb 4 CMW **The Atomic Era**

Reading: Bryson Ch. 11

Feb 9 CMW **The Gravity Era**

Feb 11 CMW **Cosmological Bookkeeping**

Feb 16 CMW **Inflation, Branes and other Exotica**

Feb 18 MEW **Heat and Gravity: Formation of Solar System**

Reading for this & next lecture: Bryson Ch. 4, 5, & 10

Feb 23 MEW **Heat and Gravity: Formation of Earth**

Feb 25 MEW **Earth's Forces: Plate Tectonics**

Reading for this & next lecture: Bryson Ch. 12 & 13

Mar 2 MEW **Earth's Forces: Earthquakes and Volcanoes**

Mar 4 MEW **Earth's Materials: Rocks and Minerals**

Reading for this & next lecture: Bryson Ch. 7 & 14

SPRING BREAK

Mar 16 MEW **Earth's Materials: The Rock Cycle**

Mar 18 **EXAM** Based on Will and Wysesession material through Mar 4

Mar 23 MEW **Earth's Water: The Water Cycle**

Reading for this & next lecture: Bryson Ch. 17, 18, & 27

Mar 25 MEW **Earth's Water: Climate and Climate Change**

Mar 30 MEW **Exoplanets: Are there any other Earths out there?**

Reading: Bryson Ch. 16

Apr 1 UWG **Common Ancestry**

Reading: Bryson Ch. 23; TSDON Ch. VI

Apr 6 UWG **Origin of Life and Early Animal Evolution**

Reading: Bryson Ch. 19; TSDON Ch. II

Apr 8 UWG **Emergence and Selection of Biological Traits**

Reading: Bryson Ch. 20-22 & 25; TSDON Ch. III-V

Apr 13 UWG **Evolution of Animal Development (Evo-Devo)**

Reading: Bryson Ch. 24 & 26

Apr 15 UWG **Evolution of Sentience**

Reading: TSDON Ch. VII- VIII

Apr 20 UWG **Evolution of Brains**

Apr 22 UWG **Evolution of Sex and Death**

Reading: TSDON Ch. IX-XI

Apr 27 UWG **Evolution of Primates**

Reading: Bryson Ch. 27-30; TSDON Ch. XII

Apr 29 UWG **Human Evolution**