

SCI 110 Origins: From the Big Bang to Life on Earth
John Jay College, CUNY
Summer 2014

Lecturer: Tiffany Millett MS
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Office Hours: By appointment only
Office: 3.82.03

Course Description.

This course is an overview of some of the most significant scientific discoveries affecting our understanding of the natural world, and the data and evidence that support these ideas. This spectrum of understanding ranges from how we have come to understand the age of our universe to how we have come to understand the molecular basis of all living things. Students will examine the scientific processes and evidence behind phenomena and will be challenged to think critically about important discoveries in science.

Learning Outcomes

At the completion of this course, students will:

1. Identify and apply the fundamental concepts and methods of a life or physical science.
 - Students will identify logical and illogical statements, discuss “fact” and reasoning, explain the basic steps of problem solving, and solve logic puzzles.
 - Interact with other students by posting their conceptual understandings and discussions about ideas on BlackBoard
 - Recognize science as a creative process by reading and discussing the historical perspective of scientific discovery and participate in laboratory exercises that emphasize problem solving.
 - Describe basic concepts in the physical and/or biological sciences toward interpreting the nature of scientific discoveries including the evidence for: the Big Bang Theory, the Theory of Plate Tectonics, the Theory of Evolution
 - Correctly use basic terminology in chemistry, biology and geology. Students actively test their own knowledge and understanding by journal writing or by responding to clicker questions during lecture.

2. Apply the scientific method to explore natural phenomena, including hypothesis development, observation, experimentation, measurement, data analysis, and data presentation.
 - Students will differentiate between data analysis and interpretation by actively participating in two class projects which require students to collect, analyze and interpret both self-collected data and professionally collected data.
 - Will investigate the basic morphology of organisms and make comparisons between organisms.
 - Visit the Museum of Natural History “The Hall of Human Origins” to explore the scientific evidence behind evolution, create a BB thread of your visit and participate in an all class discussion about the evidence.

3. Use the tools of a scientific discipline to carry out collaborative laboratory investigations.
 - Students will practice the skills of collaborative learning in a laboratory environment by working in groups to fulfill laboratory exercises. They will do this by allocating specific responsibility to each lab member, discussing their procedure, and finalizing their results. Ultimately, students are responsible for completing their own lab report. Students will assess themselves on how responsible they are for their own work as well as how well the whole group works together. (See Rubric)
 - Appreciate the character of observation and measuring instruments and the relationships between the instruments and what is to be studied.
 - Quantify uncertainty and error in measurements by calculating percent error.
 - Demonstrate safe lab practice during lab by following lab safety rules and responding appropriately on quizzes.
 - Outline the basic modes of measurement by participating in laboratory exercises that require instrumentation.
 - Identify basic laboratory equipment and practice methods of experimentation & investigation.

4. Gather, analyze, and interpret data and present it in an effective written laboratory or fieldwork report.
- Students will practically apply observation and/or measurement in a larger scientific context and thereby assess the reasonableness of the data they collect.
 - Students will research a natural science phenomenon under the theme of “The Process of Science” by inquiring about a phenomenon and investigating how scientists came to understand the phenomenon based on evidence. Primary and secondary documents are required.
5. Identify and apply research ethics and unbiased assessment in gathering and reporting scientific data.
- Students will discriminate between scientific and non-scientific resources by describing the basic components of a scientific investigation, and contrast this with non-scientific statements.
 - Judge the merit of scientific vs. pseudo-scientific conclusions.

Course website & Readings. Important course announcements, course readings, homework assignments, and other resources will be posted to the course Blackboard website and Visionlearning website. Students must complete a free registration for the Visionlearning site and regularly check the email address they use to register. Readings: B/W – Available in the course textbook and website, W – Available on the course website only, H – Handout

Course parameters: Origins consists of a lecture component and a laboratory component, completion of both is mandatory. There are two (2) lecture exams consisting of ~50 – 60 questions, and in-class activities, quizzes, and homework. All students must take the exams during the indicated periods. If you have a documented emergency, please see the instructor to discuss options. Both exams count; no grade is dropped. The laboratory portion, worth 35% of the final grade, will be derived from the scores of two (2) exams, quizzes, laboratory work, and a paper.

Readings:

Text: Natural Science 6th Ed. by Carpi, A. & Egger, A., Kendall Hunt, Inc., Iowa (2010) TEXT ISBN: 978-1-4652-3479-7

Course Web Site: <http://www.visionlearning.com/>

Course Requirements: Access to Blackboard and handouts using PDF format

Turning Technologies Response Card must be purchased or rented from the JJ B&N bookstore; you must have and use your valid John Jay email address.

Summary of Course Requirements.

Students are responsible for bringing the Response Cards (Turning Technologies) to every class and for accessing Blackboard once per day to check for new announcements. Students must learn how to use the Discussion Board section on BB. See help options under Blackboard 9.1

Cell phones and similar devices must be turned off in class. No electronic devices of any type (phones, computers, calculators, iPods, etc.) are allowed in course exams. Students found using phones or other electronic devices during an exam will not be given credit for that exam. Students must take exams during the scheduled times. Students with a documented conflict should speak with the professor.

A student arriving later than 15 minutes for an exam will not be allowed to take the exam, especially if another student has completed the exam and has left the classroom.

This course conforms to the College policy on plagiarism and grading.

Grading Scale.

Keep in mind, the total grade on BlackBoard is not weighted the same as listed below. Use only individual grades and the following grading scale to calculate your overall grade for SCI 110.

Exam 1 midterm	15%
Exam 2 final	15%
On-line & in-class Assignments	15%
Quizzes	10%
Home work (readings) & Participation/attendance	10%
Laboratory Grade	35%

Lab constitutes 35% of your total lecture grade.

5% Attendance, participation/group work; 10% Research Paper;
10 % Lab Manual Reports (In –Class); 5% Exam 1 & 5% Exam 2

1. Attendance and participation

Lab participation includes adherence to safety rules, involvement in experimental procedures and station cleanup. Students will be required to work in groups and each student should participate in the Laboratory exercises. The Instructor will observe each student's involvement in the laboratory recitations and exercises and the students will be evaluated accordingly. The Lab safety rules will be strictly enforced at all times and students are expected to observe them while in the Lab. In that respect, under no circumstance should food be brought into lab or dispose of food in waste receptacles.

2. Research Paper

Each student is expected to write and submit a detailed research paper (a hard copy and electronic submission to Turnitin.com). A separate handout will provide additional details on the requirements for the successful completion of this assignment. Research Paper will be due on **30Jun2014**. No reports will be accepted after this date.

Please see additional Handout for Research Guidelines.

3. Lab Manual Reports

The Lab Manual Reports are to be completed during the Laboratory exercise and should be handed in at the end of each Lab (prior to the student leaving the Lab). The Reports are to be neatly completed (legible) and all results noted, calculations completed and questions answered as related to the respective laboratory exercise.

4. Lab Practical

There will be a lab practical for the SCI 110 Lab. The practical will cover information discussed and related to the laboratory exercises (calculations, interpretation etc). NO Personal phones or PDA's may be used.

Practical 1 will be administered on **14Jul2014**

There will be no make-up exams or labs.

Attendance.

An important part of the course grade is earned through in-class participation and laboratory work; therefore, it is essential for students to attend lecture and lab if they wish to be successful. No make-ups will be given for missed in-class activities and laboratory work unless there is a documented medical excuse. If you miss an exam (or foresee that you will miss an exam) for any reason, you **MUST** contact the instructor as soon as possible.

An Incomplete Grade may be given only to those students who would pass the course if they were to satisfactorily complete course requirements. It is within the discretion of the faculty member as to whether or not to give the grade of Incomplete.

Accommodations for Students with Disabilities: Students with hearing, visual, or mobility impairments; learning disabilities and attention deficit disorders; chronic illnesses and psychological impairments may be entitled to special accommodation under the Americans with Disabilities Act (ADA). In order to receive accommodation, students must register with the Office of Accessibility Services (O.A.S., Room 1233-N, 212-237-8031, <http://www.jjay.cuny.edu/2023.php>), which will define, for both students and faculty, the appropriate accommodations. Faculty is not allowed to work directly with students to attempt to accommodate disabilities, and accommodations cannot be applied retroactively (after-the-fact).

Statement of the College Policy on Plagiarism: Plagiarism is the presentation of someone else's ideas, words, or artistic, scientific, or technical work as one's own creation. Using the ideas or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations to the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism. It is the student's responsibility to recognize the difference between statements that are common knowledge (which do not require documentations) and restatements of the ideas of others. Paraphrase, summary, and direct quotation are acceptable forms of restatement, as long as the source is cited. Students who are unsure how and when to provide documentation are advised to consult with their instructors. The library has free guides designed to help students with problems of documentation.

This course will utilize the services of Turnitin.com, a plagiarism prevention system approved by the College Council. All students must submit an electronic copy of their final paper using Microsoft Word, WordPerfect, RTF, PDF or HTML format (including the reference page) to Turnitin.com for processing by the date listed. In addition, a printed original must be submitted to the lab instructor by the scheduled date (instructors may also require an electronic copy). All electronic files should be scanned for viruses before submission. Students transmitting electronic viruses will be heavily penalized.

Instructions for BlackBoard

- Visit jjay.cuny.edu
- Under WebApps, click BlackBoard.
- Under CUNY services, click BlackBoard.
- Click on Login in BlackBoard 9 (Directly).
- Enter Username and Password and click Log In.
- Under My Courses on the right hand side, search for your class.
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All emails will be sent to the email address you have on file for BlackBoard/CUNYFirst.

Make sure that you check this email and your mailbox is not full.

Instructions for VisionLearning

- Visit VisionLearning.com
- Click Sign In (On the top).
- Click Not Registered? Sign Up.
- Enter a Username (*This website will not tell you why if your user name is not accepted. It will just blank the other information entered on this page. Best advice-choose something unique with a combination of letters and numbers.*)
- Enter your John Jay Email.
- Enter a Password.
- Confirm Password.
- After reading the Legal Agreement, check all three boxes.
- Click Next.
- Click Classroom on the top.
- Under Course, click Course Catalogue, followed by Undergraduate.
- Search for, using the exact words below.

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Instructor(s): Tiffany Millett – John Jay College of Criminal Justice

- Click Enroll.

Instructions for TurningTechnologies Response Card

- Purchase or rent a Turning Technologies response card from the John Jay College Bookstore.
- Visit student.turningtechnologies.com
- Enter your Device ID (found on the back of the response card).
- Enter your First Name.
- Enter your Last Name.
- Enter your section in Other Info (01).
- Enter Image Text.
- Click Next.
- Enter Instructor Email (tmillett@jjay.cuny.edu).
- Click Submit Address.
- Under Available Classes, find your class and highlight it. (SCI 110 ## Summer 2014). (## = section).
- Click Add. Make sure the correct class is moved to the column "Classes Selected to Register Device".
- Click Next.
- Verify information and click Complete Registration.

Instructions for TurnItIn

- Log into Turnitin with a student user profile.
- Click on the "Enroll in a class" tab on the student homepage.
- Enter the Class ID (**8081088**) and Enrollment Password (**science110**) for the new class.
- Click "submit" to enroll in the class and add it to the user homepage.

<p>Week 1 (28May2014)</p>	<p><u>Lecture Topic and Assignments</u> Course Introduction and Overview</p> <ul style="list-style-type: none"> • Introduce yourself on Blackboard Discussion Section • Explain in Discussion Section on BlackBoard: What is Science? How does it bring meaning to your life? • The Metric System • Scientific Notation • Significant Figures <p><u>Required Reading</u></p> <ul style="list-style-type: none"> • Visionlearning: The Scientific Method; The Practice of Science; The Metric System; Density; Unit Conversion • HW: Answer any questions on BlackBoard/Assignments; Metric Mania
<p>Week 2 (02Jun2014, 04Jun2014)</p>	<p><u>Lecture Topic and Assignments</u> Problem Solving, Logic & Science</p> <ul style="list-style-type: none"> • What is the process of scientific reasoning? How do we assess the value of science? <p>The Nature of Science</p> <ul style="list-style-type: none"> • Logical arguments • Absolute and conditional statements and problem solving as a foundation for scientific reasoning. • First and second law of thermodynamics. <p><u>Required Reading</u></p> <ul style="list-style-type: none"> • McNeil, Jr. D. (2011, Jan. 31). Gates Calls for a Final Push to Eradicate Polio. <i>New York Times</i>. Retrieved from: www.nytimes.com Under Lecture Content BB • Visionlearning: The Nature of Scientific Knowledge; Energy; Light I; Scientific Controversy • HW: Answer any questions on BlackBoard/Assignments; Suduko; Error and Uncertainty <p><u>Laboratory Experiment</u> Collaborative groups of four: Lab: Collaboration is measured by a rubric in which students will assess themselves and discuss collaborative strategies with their peers (meta-cognition technique). Metric System: Investigate Units of Measure- weight, volume, length, & density using the Metric System and compare their values with the U.S. Customary System of Measures. Calculate percent error comparing their measurement to a standard unit.</p>
<p>Week 3 (09Jun2014, 11Jun2014)</p>	<p><u>Lecture Topic and Assignments</u> Age/Origins of the Universe</p> <ul style="list-style-type: none"> • Examine the scientific evidence for determining the age of the universe. • Describe the Doppler shift for understanding wave motion. • Discussion Section on BB: Describe scientific controversy <p>Birth of the Universe</p> <ul style="list-style-type: none"> • The Big Bang Theory and what the early universe may have been like. • Edwin Hubble, the Hubble Telescope and the discovery of other galaxies. • Theory of Plate Tectonics: The driving forces for the movement of plates: gravity and mantle convection. • The Earth's atmosphere and the carbon cycle • Begin In-class GeoMapApp/Smithsonian volcano and earthquake data mapping using real-time data. • In-class 1 paragraph writing assignment: How did marine fossils end up on Mt. Everest? <p>Quiz 1 – The Metric System and Scientific Notation</p>

	<p><u>Required Reading</u></p> <ul style="list-style-type: none"> • Visionlearning, Early Ideas about Matter; Atomic Theory I; Atomic Theory II; The Origins of Plate Tectonic Theory; Plate Boundaries, and Driving Forces • HW: Answer any questions on BlackBoard/Assignments; USGS: Earthquake Hazards Program– explore a variety of sources of real-time data; BlackBoard Discussion: What is the Doppler shift? How does it help us to understand the motion of stars and galaxies? <p><u>Laboratory Experiment</u></p> <p>Collaborative groups of four where students work together to analyze and interpret the retention rate of various components.</p> <p>Thin Layer Chromatography: Resolution of matter into pure substances. How do we determine the nature of elements using TLC?</p>
<p>Week 4 (16Jun2014, 18Jun2014)</p>	<p><u>Lecture Topic and Assignments</u></p> <ul style="list-style-type: none"> •Development of the Universe • The nature of energy and gravity and the relationship of force, distance, and mass. • NOVA – PBS Video: Back to the Beginning • Scientific journal article Extra Credit due <p>Exam 1 – Everything!</p> <p><u>Required Reading</u></p> <ul style="list-style-type: none"> • Visionlearning, Nuclear Chemistry; The Periodic Table of the Elements; Earth Structure; The Composition of Earth’s Atmosphere; DNA I; DNA II • HW: Answer any questions on BlackBoard/Assignments; Podcast assignment: Listen to Mountain Radio Astronomy and respond to questions posted on BlackBoard <p><u>Laboratory Experiment</u></p> <p>Collaborative all-class lab</p> <p>The Physics of Light: Measuring the wavelength of gases– students rotate around the class room measuring the wavelength of various gases and observing the diffraction of white light.</p>
<p>Week 5 (23Jun2014, 25Jun2014)</p>	<p><u>Lecture Topic and Assignments</u></p> <p>A Dynamic Earth</p> <ul style="list-style-type: none"> • Theories on the formation/change of the Earth • Seismic measurement and what it tells us about earth structure; The Iron Catastrophe • NOVA– PBS: Earth is Born • Analyzing & Interpreting Data: In class activity on student–collected data analysis and interpretation. <p>Phylogeny & Organism Change</p> <ul style="list-style-type: none"> • Life’s Diversity <p>DNA and RNA</p> <ul style="list-style-type: none"> • Replication, translation, and transcription. • In-class: What was the state of competing ideas regarding the origin of species at the time of Darwin? <p><u>Required Reading</u></p> <ul style="list-style-type: none"> • Visionlearning: Uncertainty, Error and Confidence; Data Analysis & Interpretation; The Carbon Cycle; Mendel and Inheritance; Adaptation • HW: Answer any questions on BlackBoard/Assignments

	<p><u>Laboratory Experiment</u> Collaborative all class discussion on real-time data and the technologies used to collect it. Continue GeoMapApp (Lamont Doherty Earth Observatory)/Smithsonian volcano and earthquake data mapping using real-time data</p>
<p>Week 6 (30Jun2014, 02Jul2014)</p>	<p><u>Lecture Topic and Assignments</u> Origins of Life</p> <ul style="list-style-type: none"> • Macromolecules: carbohydrates, proteins, lipids, nucleic acids. • Miller/Urey experiment describes a popular theory of how life on Earth may have begun. • Biogenic/ Exogenic theories on life's origins <p>Visit the American Museum of Natural History</p> <p><u>Required Reading</u></p> <ul style="list-style-type: none"> • Visionlearning: The Discovery and Structure of Cells; Carbon Chemistry • Wolfgang Kiessling <i>et al.</i> (2010). Reefs as Cradles of Evolution and Sources of Biodiversity in the Phanerozoic. <i>Science</i> 327,196 – 198 • HW: Answer any questions on BlackBoard/Assignments <p><u>Laboratory Experiment</u> Collaborative groups of four The Cell: structure and function of bacteria, plant, and animal cells. Examine morphology of organisms by observing prepared slides as well as live specimens Collaborative group work through discussion and problem solving. Phylogenetics: Human Evolution; examine a section of the human genome that displays a mutation; look for patterns (on paper).</p>
<p>Week 7 (07Jul2014, 09Jul2014)</p>	<p><u>Lecture Topic and Assignments</u> Theories on the origins of life.</p> <ul style="list-style-type: none"> • The fundamental elements that make up all living things: carbon, hydrogen, nitrogen and oxygen • Processes of living things: metabolism, photosynthesis, cellular respiration, movement, reproduction • In-class writing assignment: What is life? <p>Early Development of Life</p> <ul style="list-style-type: none"> • Diversity of Life: theories on how life may have evolved • The Fossil Record: A History of Life over 500 million years as preserved in the fossil record. • NOVA-PBS Video: How Life Began <p>Quiz 2- DNA</p> <p><u>Required Reading</u></p> <ul style="list-style-type: none"> • Visionlearning: Charles Darwin I; Charles Darwin II • Smith, L (2008, April 25). Tyrannosaurus Rex protein proves dinosaurs evolved into birds. <i>New York Times</i>. Retrieved from: www.nytimes.com • HW: Answer any questions on BlackBoard/Assignments; Paleoclimate Assignment <p><u>Laboratory Experiment</u> Comparative Anatomy of Primates; Examining attributes of primate skulls</p>

Week 8 (14Jul2014, Final-TBA)	<p><u>Lecture Topic and Assignments</u></p> <p>Human Origins</p> <ul style="list-style-type: none"> • Evidence for Change in Humans • Wrap-up • NOVA-PBS Video: Becoming Human • Review for final • Extra Credit due: Bill Bryson: A Short History of Nearly Everything <p>Final Exam. Please see Registrar's website to confirm the schedule for the final exam</p> <p><u>Required Reading</u></p> <ul style="list-style-type: none"> • Visionlearning: Theories, Hypotheses, Laws • HW: Answer any questions on BlackBoard/Assignments <p><u>Laboratory Experiment</u></p> <p>AMNH: Hall of Human Origins Short paper and all –class presentation</p> <p>Laboratory Final practical</p>
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Grades for courses that have been completed through the final examination are as follows.

Grade	Numerical Value	Percentage Equivalent
A	4.0	93.0-100.0
A-	3.7	90.0- 92.9
B+	3.3	87.1- 89.9
B	3.0	83.0- 87.0
B-	2.7	80.0- 82.9
C+	2.3	77.1- 79.9
C	2.0	73.0- 77.0
C-	1.7	70.0- 72.9
D+	1.3	67.1- 69.9
D	1.0	63.0- 67.0
D-	0.7	60.0- 62.9
F	0.0	Below 60.0