

Science and Writing

Honors College, Honors 298: Special Topics, 3 credits

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Course Description: Students explore the logic of science by examining the language and writing about science – using various thinking-writing exercises to stimulate their research. While hearing lectures about fundamental scientific principles and analyzing knowledge structures of scientific discourse, students write cause-and-effect explanations of a variety of phenomena by building them up from first principles; science essays are developed using standard rhetorical devices of scientific discourse. Small-group exercises include “workshopping” each student’s writing regarding tone, clarity, fluidity, and accuracy. Twenty-three students enroll in this course.

Texts:

Six Easy Pieces, by Richard Feynman

The Nature of Science, by James Trefil

The Science Book, by Peter Tallack

On Writing Well, by William Zinsser

Syllabus

Date	Topic
24 Jan	Writing and Language - How to actively observe a diagram and write a 500-word guided tour - How to interrogate a quotation, and integrate it into a text Assign 25 one-pg Tallack essays per week as a gentle & pleasant introduction to science
26 Jan	Kinetic Theory: inter-atomic collisions - Feynman: Chapter 1: “Atoms in Motion” - Trefil: “Kinetic theory” + links - Cause-and-effect relationships linking gas laws and random atomic motion
31 Jan	Atomic Theory - Feynman Chapter 2, “Basic physics” - Trefil: “Bohr Model” + links - The Bohr model of the atom; electrons and nucleons; electron orbitals - Spectroscopy as the experimental basis of atomic theory
2 Feb	Writing and Language - Textual macrostructures and macropropositions
7 Feb	Heat - Feynman: Chapter 1: “Atoms in Motion” (review) - Trefil: “Heat “ and “Changes of State” + links - Phase transitions; the domino effect, thermal transfer and mammalian thermoregulation: conduction,

	<p>convection, radiation, and evaporation</p> <p>Hand in: First 500-word guided tour of a diagram for the first term paper</p>
9 Feb	<p>Sound</p> <ul style="list-style-type: none"> - Trefil: "Doppler Effect" + links - Tuning fork experiment introducing resonant energy transfer; the nature of sound, and the domino effect; waves, wavelengths, frequencies, and amplitudes; The Doppler Effect and - Doppler medical imaging <p>Hand in: Five extended definitions + examples for the first term paper (500 words total)</p>
14 Feb	<p>Hearing*</p> <ul style="list-style-type: none"> - The domino effect in the ear; the lever system of ossicles in the middle ear; the inner ear and resonant energy transfer; cochlear implants
16 Feb	<p>Writing and Language</p> <ul style="list-style-type: none"> - Local cohesion and global coherence of texts - How to write extended definitions using examples, analogies, graphics, applications, and generalizations <p>Hand in: 500-word essay describing two scientific principles fundamental to the first term paper</p>
21 Feb	<p>Electricity and Magnetism</p> <ul style="list-style-type: none"> - Trefil: "Coulomb's Law," "Magnetism," "Electrical Properties" + links - Coulomb's Law; the electron, magnetism, magnetic and electric fields - Faraday's Principle applied to alternative energy production <p>Hand in: Second 500-word guided tour of the first term-paper diagram</p>
23 Feb	<p>Feynman Chapter 3: "The relation of physics to other sciences"</p> <ul style="list-style-type: none"> - Trefil: "Chemical Bonds" + links - Chemical bonding and the Periodic Table; covalent / ionic bonds
28 Feb	<p>Writing and Language</p> <ul style="list-style-type: none"> - Identifying fundamentals principles of scientific topics (axiomatics) <p>Hand in: Three rewrites of previous assignments – of (1) a guided tour, (2) the definitions, and (3) the fundamental principles</p>
2 Mar	<p>Chemical Bonding</p> <ul style="list-style-type: none"> - Polar molecules, van der Waals bonds, detergents, and dietary physics <p>Hand in: macrostructures of the first term paper + transitional sentences</p>
7 Mar	<p>In-class midterm; the take-home writing component due today</p>
9 Mar	<p>Writing and Language</p> <ul style="list-style-type: none"> - Rhetorical structures in scientific writing, e.g., analogy, logical deduction, semantic parallelism, experimental testing, generalizations and induction - The nature of science in the nature of scientific rhetoric
14 Mar	<p>Science analogies</p> <ul style="list-style-type: none"> - Exercises on analogies and how to develop them for term papers: the Bohr Model and the planetary system; the Domino effect, sound, and heat transfer; tuning forks and the vibrating inner-ear membrane; ATP as the currency of living things
16 Mar	<p>Neurons and Nerve Impulses</p>

	<ul style="list-style-type: none"> - Trefil: "Nerve Signals" + links - Bio-electricity, neurons, action potentials, nerve impulses <p>Hand in: First term paper</p>
21 Mar	<i>Spring Break</i>
23 Mar	<i>Spring Break</i>
28 Mar	<p>Writing and Language</p> <ul style="list-style-type: none"> - Interactive and interactional metadiscourse and its function in scientific writing; How to anticipate and accommodate readers' needs
30 Mar	<p>Weather</p> <ul style="list-style-type: none"> - Trefil: "Archimedes' Principle" and "Water Cycle" + links - Archimedes' Principle and global weather patterns; rain formation; <p>Hand in: 500-word guided tour of a diagram for the second term-paper</p>
4 Apr	<p>Grand Processes and Principles of Science</p> <ul style="list-style-type: none"> - Feynman Chapter 4: "Conservation of Energy" - Trefil: "Molecular Biology, central dogma," "Evolution," "Greenhouse Effect," - "Thermodynamics," "Photosynthesis," and Conservation laws [index] + links
6 Apr	<p>DNA and large molecules</p> <ul style="list-style-type: none"> - Trefil: "Molecules of life," "Proteins," "Mendel's Laws" + links
11 Apr	<p>Writing and Language</p> <ul style="list-style-type: none"> - Varieties and uses of quantitative graphics - Small-group decision making / critical reasoning using quantitative graphs <p>Hand in: Five extended definitions + illustrative examples (500 words total) for the second term paper</p>
13 Apr	<p>Writing and Language</p> <ul style="list-style-type: none"> - How to get the reader's attention – examples from popular science writing - Small-group exercises to explore methods of humanizing science essays
18 Apr	<p>Light</p> <ul style="list-style-type: none"> - Trefil: "Electromag. spectrum," "Spectroscopy," "Snell's Law" + links - The visible spectrum; refraction; prisms, and rainbows <p>Hand in: 500-word guided tour of a quantitative figure for the second term paper</p>
20 Apr	Vision – Corrective lenses, color vision, laser eye correction, retinal implants**
25 Apr	<p>Nuclear Structure and Radiation</p> <ul style="list-style-type: none"> - Trefil: "Nuclear fusion and fission" and "Radioactive decay" + links - Rutherford's experiment; nuclear structure and stability; $E=mc^2$; small-group exercises to analyze (quantitative) graphs of atomic properties <p>Hand in: macrostructures of the second term paper + transitional sentences</p>
27 Apr	<p>Students discuss science articles that they found in the popular press</p> <p>Hand in: 500-word essay of analogies relevant to the second term paper</p>
2 May	<p>Astronomy and Cosmology</p> <ul style="list-style-type: none"> - Feynman Chapter 5: "Theory of Gravitation"

	<ul style="list-style-type: none"> - Trefil: "Big Bang," and both "Newton" entries + links - Gravity, the solar system, stellar evolution, and nucleosynthesis
4 May	<p>Nuclear theory</p> <ul style="list-style-type: none"> - Trefil: "Correspondence Principle," "Vital Force" "Determinism" + links - Philosophy of indeterminism, Born's statistical interpretation in quantum physics; wave-particle duality; Laplacian determinism
9 May	<p>The Limits and Value of Science</p> <ul style="list-style-type: none"> - Trefil: Selections from the Introduction, + links - Discussion about big issues raised by the Big Bang, origins, and endings; compare and contrast religious faith, scientific faith, and scientific method <p>Hand in: Second term paper</p>

* *Scientific American Frontiers*: <http://www.pbs.org/saf/1509/resources/resources-1.htm> + links.

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** <http://www.nlm.nih.gov/medline+ency/article/001023.htm#visualContent> + links.

Grading Policy

Your grade will be based on two tests (20% each) and two term papers (20 % each), + homework assignments / class participation (20%).

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