

RESC 098.16: *Revolutions in Science*

Class: MWF 1–1:52 PM in Academic West 200
Common Hour: 2–3:52 PM in Academic West 108
Course Website: <http://moodle.bucknell.edu/course/view.php?id=9914>

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Description of Subject Matter & Methods of Instruction

Karl Popper, an influential philosopher and historian of science, proposed that “Science must begin with myths, and with the criticism of myths.” From this perspective, we can trace the historical origin of science back to creation stories and ancient philosophy. But how did science as we know it today emerge from this myth- and mysticism-infused origin? Is science a special or privileged way of expanding our knowledge of the world? What makes a theory “scientific”? What propels scientific revolutions? In addressing these questions, course will contest a common (if unspoken) myth about science: that it *has* no creation story, that it had to be the way it is. Our attention to the history and philosophy of science will — in concert with the other courses in the Discovery College — address the themes of the role of science in society and in the development of our conception of ourselves in relation to nature.

Class meetings will involve a mix of lecture, seminar discussion, in-class, small group activities. As W1 course, the class will include recurring instruction of good writing as a process and set of specific skills. As a “Res. College” course, you will be part of a larger living/learning community and have access to supplemental programming and travel opportunities. Buckle up!

Learning Outcomes

In successfully completing this course, you should:

- Gain skill in productively participating in a seminar-style discussion;
- Gain skill in composing sound expository and critical/argumentative writing;
- Gain skill in researching and presenting on complex topics in a compelling and organized fashion;
- Develop a general appreciation of the fundamental ambiguities and complexities involved in the human attempt to answer questions about knowing, valuing, and living.
- Develop a sophisticated understanding of science as a social and historically-embedded human practice.

Instructional Materials and Sources

The following books should be available at the Bucknell Bookstore (400 Market St., <http://bucknell.bncollege.com>). Please obtain copies as soon as possible. Other materials will be made available in PDF format on our Moodle Site.

- Alvarez, *T. rex and the Crater of Doom*
- Ferris, *Coming of Age in the Milky Way*
- Graff, *They Say, I Say*
- Kuhn, *The Structure of Scientific Revolutions*
- McGrew et al., *Philosophy of Science: an Historical Anthology*

Evaluation & Expectations

Course grades will be based on the quality of your preparation for class, willingness to engage in productive discussion, and your performance on a number of short writing assignments and a final essay and group presentation. At Bucknell, one credit courses have a minimum expectation of twelve hours per week of student academic engagement. Our time together represents only three hours (up to five hours counting our common “hour”). You should thus plan to spend *at least* seven–nine hours outside of class each week reading, writing, visiting me in my office hours, or doing other course related activities. Note as well what the different letter grades represent. According to the Course Catalog (www.bucknell.edu/catalog.xml), an ‘A’ means ‘Superior achievement’, a ‘B’ means ‘High pass’, a ‘C’ means ‘Pass’, a ‘D’ means ‘Low pass’, and an ‘F’, of course, stands for ‘Failing work’. Unless you’re some kind of savant, it’s highly unlikely that you can produce ‘superior work’ (or even B-level, *good*, but uninspired work) without putting time and effort into your studies. Here’s the breakdown of how I understand the various graded components:

Preparation & Participation (25%). To begin with the obvious: you should come to every class meeting. However, merely showing up and looking attentive will not secure a good grade on this component of the course. Rather, I expect you to be a willing and informed participant. Break the ice. Ask questions. Respond to your peers. Own up to your confusion/puzzlement/failure. There is a good amount of often fairly dense reading for this course. I expect you to do it — all of it — and do it well. Your highlighter is not a magical brain–paper interface device. *Read actively!* Take notes; mark up your books/papers; keep a journal. In short: *critically engage with* the reading and come to class ready to share the fruits of your labors.

Short Assignments (20%). Most meetings will have associated a short assignment, usually to be completed via the online journal feature in Moodle. These might be to answer a question or reflect on the assigned reading or follow up on a class discussion. Unless otherwise stipulated, these will be due by 11AM before the relevant class. Grades will be assigned on a simple 0, ✓–, ✓, ✓+ basis. At the end of the term, I will drop your lowest five marks and scale this component of final grade so that an average of ✓s corresponds to a B+.

Writing Exercises (25%). Over the course of the term, you will complete approximately eight short pieces of writing of varying lengths. These will target specific techniques and strategies and will be scored on more detailed rubrics to be provided. Your lowest two (completed) marks will be dropped.

Final Presentation & Essay (25%). Your final project will have an individual and a group component. In the first half of the term, you will be assigned a group composed of around three students from the different Discovery College seminars. Each group will be tasked with giving a presentation at the end of term Res. College Symposium. This project will have various stages (including a proposal, outline, and practice run). The individual component will be a 2,000–3,000 word (i.e., ~7–10 page) research essay connected with your group's topic that will go through multiple drafts.

Quality of Failure (5%). It's an underappreciated fact that one of the most powerful forms of learning stems from failing and reflecting on our failure. In this course, you will be rewarded in this course for "failing well". We'll discuss what this means in class.

Other Course Policies & Information READ THIS, PLEASE!

Office Hours. You are invited and encouraged to supplement your in-class learning by visiting me in my scheduled office hours (see my website for the latest) or at some other time that suits us both. You do not need to have any specific mission to accomplish. Feel free to drop by during posted office hours or make an appointment. You may also catch me via Skype or on my cell phone (address/number can be found in my email signature) during reasonable hours. I'd prefer not to receive text messages, however.

Attendance. Your attendance in class and common hours is required and expected. Failure to attend will significantly drop your participation grade. If you believe that you have a legitimate reason to not be in class or common hour, please consult with me well before the class in question. If you fall ill, contact me as soon as you can and arrange to get notes from a classmate. Don't simply email me asking if you "missed anything important"!

Civility. We have a limited time to spend with one other; class time is *special* time. Please be there on time with the relevant books and materials in hand. Don't sally forth out of class to use the bathroom (and check your texts/status) unless you really need to. Don't distract yourself — or others, or *me* — with electronic marvels such as smartphones, laptops, beepers, ham radios, &c. Don't fall asleep right in front of me (do I really have to say all this?). Failing to keep your impulses in check will have consequences for your participation grade (moreover, I reserve the right to summarily *fail* seriously delinquent students from the course).

Late Work. Late Short Assignment submissions may not be graded (note that Moodle time-stamps submissions). Other work will be penalized by 1/3 of a grade (e.g., a B+ to a B) per partial grade late.

Sources and Academic Honesty. I expect you to abide by Bucknell's Honor Code (www.bucknell.edu/x1324.xml). In particular, unless otherwise instructed, your written work must correctly and completely cite all materials used (including primary sources, textbooks, and other materials from the internet). I will not hesitate to refer students who commit any form of academic dishonesty to the University Board of Review (www.bucknell.edu/x1337.xml).

Accommodations for the Disabled. If you have a disability that may affect your work in this course, please talk to me (either by email or in person) at your earliest convenience and I will make every effort to accommodate your needs. If you have not yet spoken with the appropriate dean about your disability (www.bucknell.edu/x7759.xml), please do so as soon as possible. Accommodations will need to be sanctioned by their office.

Schedule Sketch & Important Dates

This is meant only to convey the a outline of topics. It is subject to change. Please stay current with the Moodle site for specific assignments.

Weeks 0–1 (August 24th–30th): Introductions & Early Origins of Science in Myth and Pre-Socratic Philosophy

- **Tuesday 8/27 @ 3PM:** Res. College Receptions, *Trout Auditorium* (in Vaughan Lit on the Quad) for welcome followed by the *Observatory* for our Discovery College Reception.
- **Wednesday 8/28 @ 1PM:** First Class, Academic West 200 (see Moodle for assignment)
- **Friday 8/30 @ 1PM:** Second Class (ACWS 200)
2PM: First Common Hour (ACWS 108)

Week 2 (September 2nd–6th): Ancient Natural Philosophy

- Platonic / Aristotelian Metaphysics and Cosmology
- The Geocentric Model

Weeks 3–5 (September 9th–27th): The Scientific Revolution

- Copernicus, Kepler, Galileo on Heliocentrism
- Newton, Boyle, Bacon, Huygens, and Descartes on Method

Weeks 6–7 (September 30th–October 11th): Kuhn on the Structure of Scientific Revolutions

- Field Trip to *Priestly House*: 10/4 from 1–4PM

Fall Recess: October 12th–15th

Weeks 8–10 (October 16th–Nov 1st): Biological and Geological Discovery

- Darwinian and Pre-Darwinian Natural History
- The Catastrophism/Uniformitarian Controversy
- The cause of the Cretaceous–Paleogene (K–Pg) extinction event.
- **Fall Trip to Pittsburgh:** Saturday 10/19 (*required*)
- **Field Trip to local fossil bed:** Friday 11/1 from 1–4PM

Weeks 11–14 (November 6th–25th): Science vs. Pseudoscience

- The Demarcation Problem
- Cases Studies of Astrology, Alchemy, Creationism, Homeopathy, Hunting for Bigfoot

Thanksgiving Break: November 27th–December 1st

Weeks 15–16 (December 2nd–9th): Final Presentations

- **Res College Symposium:** Saturday, December 7th
- **Final Essay Due:** Friday, December 13th (!) @ 3:30PM