

# RESC 098.16: *Revolutions in Science*

Class: MWF 1–1:52 PM in Taylor 210

Common Hour: 2–3:52 PM in Academic West 108

Course Website: <http://moodle.bucknell.edu/course/view.php?id=13957>

**Professor Matthew H. Slater**

email: [matthew.slater@bucknell.edu](mailto:matthew.slater@bucknell.edu)

web: <http://www.mhslater.com/>

office: 221 Vaughan Lit | tel. 570-577-2767

## *About the Course*

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? In what ways is science a privileged way of extending our knowledge and understanding of the natural world? How does it impact society and how does society impact it? We will address these and other questions by sketching a (necessarily partial and selective) history of science through the so-called “Scientific Revolution” centered on physics and astronomy — attending also to revolutions in medicine/physiology, geology, and evolutionary biology — and reflecting on how science has changed over the past several millennia.

## *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 sophisticated understanding of science as a social and historically-embedded human practice.
- Develop a general appreciation of the fundamental ambiguities and complexities involved in the human attempt to answer questions about knowing, valuing, and living.

## *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.

- Graff, *They Say, I Say*
- McGrew et al., *Philosophy of Science: an Historical Anthology*
- Tucker, *Blood Work*
- Kuhn, *The Structure of Scientific Revolutions*

## *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, a group video project, and final essay. One credit courses have a minimum expectation of twelve hours per week of student academic engagement. Our time together represents 4–5 hours per week (including our “common hour”). You should thus plan to spend *at least* 7–8 hours outside of class each week reading, writing, discussing course material with your peers, visiting me in my office hours, or doing other course related activities. Please note that depending on your background and strengths, you may have to spend considerably more time on the course if your goal is to receive a high grade. At Bucknell, grades are assigned based on demonstration of academic achievement; according to the Course Catalog ([www.bucknell.edu/catalog.xml](http://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 work*) without putting time and effort into your studies.

Here’s the breakdown of how I understand the various graded components:

**Preparation & Participation (25%).** There will be a lot of reading for this course and much of it will be difficult (for various reasons). I expect you to do all of it and to do it well. This might involve reading something multiple times. Your highlighter is not a magical brain–paper interface device. *Read actively!* Take notes; mark up your books/papers; keep a journal of ideas and questions. I will sometimes open our discussion by asking *you* what you found most interesting or confusing or worth discussion from the reading; be ready with an answer.

But while my expectations for your preparatory *efforts* are very high, please know that our classroom is a safe environment to take intellectual risks, express ideas, and ask questions. I don’t care what side of an issue or debate you’re on, if you don’t get something, or whether your interpretation of a text is right or wrong as long as you’ve struggled with it and are engaging in the discussion respectfully; understanding will often come later. In fact, there’s probably no better, more powerful, or long-lasting way to learn than to try, fail, learn from your failure, and try again — doing so will be celebrated and rewarded (see below).

**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 0–3 basis, where 0=“Insufficient/Incomplete”, 1=“Getting There”, 2=“Good; Meets my Expectations”, and 3=“Exceeds my Expectations”

(usually given only to the best 1–2 responses). At the end of the term, I will drop your lowest five marks, average the rest, and curve things so that an average of 2.0 lands on a B/B+.

**Writing Exercises (25%).** Over the course of the term, you will complete approximately six short pieces of writing of varying lengths. These will target specific writing techniques and strategies and will be scored on 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. You will be assigned to a group of three or four students and tasked with creating a ten minute video on a course-relevant topic to be presented at the Residential Colleges Symposium on December 6th. This project will have various stages, including a proposal, outline, and practice run, and you will receive ample help with the technical side of the video production. 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 IMPORTANT!

**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 on the web and in my email signature) during reasonable hours.

**Attendance.** Your punctual attendance in class and in our common hours is required and expected. Failure to attend in full will drop your participation grade substantially. If you believe that you have a legitimate reason to not be in class or in common hour, please consult with me well before the occasion 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”! The short answer is always: *yes*.

**Professionalism.** We have a limited time to spend with one other. Respect this time by coming prepared, on time, equipped with relevant books and materials in hand (including printouts of electronic articles, pencil and paper for notes), and ready to give us your full attention for 52 minutes. Do not distract yourself (or others, or *me*) with electronic marvels such as smartphones, laptops, beepers, ham radios, &c. Do not wander out of class to use the bathroom unless you really need to (and *try not to get in a situation where you really need to*). Do not doze off, work on other homework, engage in side-conversations, or otherwise be disruptive or disrespectful to the rest of the group. In general, comport yourself as a professional; failure to do so will have serious consequences for your participation grade (moreover, I reserve the right to summarily *fail* seriously delinquent students from the course).

**Late Work.** Late Short Assignments will be ineligible for the highest mark of 3 and will receive a 0 if not submitted after 24 hours (note that Moodle time-stamps submissions). Other work (writing exercises, the final essay, &c.) will be penalized by 1/3 of a grade (e.g., a B+ to a B) per 24 hour period late.

**Sources and Academic Honesty.** I expect you to abide by Bucknell’s Honor Code ([www.bucknell.edu/AcademicResponsibility](http://www.bucknell.edu/AcademicResponsibility)). In particular, unless otherwise instructed, your written work must correctly and completely cite all materials used (including primary sources, textbooks, websites, and other material from the internet you consult, quote, or paraphrase). Failure to do so is a cardinal academic sin which is taken very seriously here and can result in your suspension or expulsion if committed. 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](http://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 someone in the Office of Accessibility Resources (OAR) about your disability, please do so as soon as possible. Accommodations must be sanctioned by that office. For more info, see <[www.bucknell.edu/campus-life/office-of-accessibility-resources/](http://www.bucknell.edu/campus-life/office-of-accessibility-resources/)>.

## Schedule Sketch & Key Dates

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

### Weeks 0–1: Introductions & Early Origins of Science

#### Week 2: Ancient Natural Philosophy

- Platonic / Aristotelian Metaphysics and Cosmology
- The Geocentric Model
- **Field Trip to local fossil bed:** Friday 9/12 (*weather permitting*)

### Weeks 3–5: The Scientific Revolution

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

### Weeks 6–7: Kuhn on the Structure of Scientific Revolutions

*Fall Recess:* October 11th–14th

### Week 8: Preparing for our Class Common Hour

### Weeks 9–11: The Bloody Development of Medicine

- **Fall Trip:** Saturday 10/25 (*required*)

### Weeks 12–13: Revolutions in Natural History

- The Catastrophism/Uniformitarian Controversy
- Darwin’s Achievement

*Thanksgiving Break:* November 26th–30th

### Weeks 14–16: Science vs. Pseudoscience

- **Complete Final Essay Rough Draft Due:** Monday, December 1st.
- **Final Group Video Project Due:** Friday, December 5th.
- **Res College Symposium:** Saturday, December 6th.
- **Final Essay Due on the Final Exam Date** (*set by Registrar*)