FYSE 1329: Caveman Chemistry & Low-Tech Living

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Office Hours: T 1:00-2:30; Th 1:30-3:00; F 10:00-11:30 & by appt.
Caveman website: http://blogs.middlebury.edu/caveman (go/caveman)
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Location & Times*

M/W: 11:15 – 12:05 in MBH 311, unless otherwise stated
Lab M: 1:30-4:15 p.m. MBH 459, unless otherwise stated

* We will meet in alternative locations (e.g., pottery studio) for some activities. Locations are indicated on the schedule, but changes may be announced in-class. You are responsible for arriving at the appropriate location on time.

Required reading

Required for purchase; available at the College Bookstore & elsewhere

- Caveman Chemistry by Kevin Dunn, Universal Publishers, 2003.
- Technology Matters: Questions to Live With by David Nye, The MIT Press, 2007.
- Better Off: Flipping the Switch on Technology by Eric Brende, Harper Perennial, 2005.
- The Plenitude: Creativity, Innovation, and Making Stuff by Rich Gold, The MIT Press, 2007.

Course description

Long before the Industrial Revolution, humans routinely transformed mundane natural materials into incredibly useful goods. Stone into bronze tools! Plants into colorful dyes and fat into soap! Using *Caveman Chemistry* as our guide, we will create a sampling of our own primitive goods using low-tech methods and explore the chemistry behind these seemingly magical transformations. Complementing our chemical glimpse into the past, we will explore current-day motivations for creating from scratch and making use of more primitive technologies by reading current works, including *Better Off: Flipping the Switch on Technology* and meeting with local artisans.

Goals

- **Effective writing**: Find, evaluate, synthesize, and cite information from primary and secondary resources; organize information into a logical, coherent, and well-supported essay; use writing as a means to deeper thinking and learning.
- **Effective in-class communication**: Follow and contribute respectfully to in-class discussion; present work orally in a clear, concise, accurate manner.
- **Connect a molecular-scale perspective** to macroscopic material properties and observable transformations
- **Learn fundamental scientific laboratory practices**, including lab safety, keeping a scientific notebook, and designing an experiment
- **Reflect on the complex relationships** among individuals, culture, and technology
- **Have fun making cool stuff!**

An important goal of a first-year seminar program is to improve and develop your writing skills. Accordingly, you will write, write, rewrite, revise, and then….well…write some more. Writing assignments will often have interim deadlines, so that an early draft can be critiqued by your classmates, your Mentor, and me. The processes of peer review and revising multiple times are important to the writing process and are used routinely by scholars. In order to get the most out of the peer review/revision process, the "drafts" are expected to be complete products and you may have already gone through a few revisions on your own. Writing assignments include out-of-class assignments (1-page Reflection Essays (4), 3-4 page Reading Response Papers (2), a short (1-2-slide) presentation, and a 15-minute presentation and 8-10-page research paper on a topic of your choice), as well as in-class writing (e.g., keeping a laboratory notebook).

Approach

This is a seminar-style course, not a traditional lecture-style course. In a lecture, you may be able to sit back and listen to a scholarly authority speak their mind. In this seminar, your active participation will drive our class meeting time. This is why your level and quality of participation forms a hefty portion of your grade. Each day we meet, be sure that you **are prepared to contribute,** which means that prior to class you have

read *and reflected on* the reading
worked the text examples/problems/calculations *on your own*
generated answers and questions for the class to consider

Course Policies

- Attendance is required at all classes, laboratories, and other course activities. Please obtain a "Dean's Excuse" if you are unable to attend any of these sessions. Your overall attendance will be factored into your participation grade.
- Students are expected to follow the College Honor Code (outlined in your handbook) for all work associated with this course. The Honor Code must be written and signed on all work turned in for a grade.
- Students are expected to turn in all assignments on or before their due dates. Penalties for late assignments will be 10 points each day the assignment is late.

Assessment

Your grade in the course will be based on your performance on the following

Laboratory notebook (3 projects)	3 x 25 pts = 75 pts	(15%)
1-page Reflection Essays	4 x 20 pts = 80 pts	(16%)
3-4 page Response Papers	2 x 45 pts = 90 pts	(18%)
Soap/Paper Group Presentation	30 pts	(5%)
Research Presentation (50) & Paper (100)	150 pts	(30%)
Participation & Attendance	75 pts	(15%)
Total	**500 pts**	

A > 450 B = 400-449 C = 350-399 D = 300-349 F < 299

Pluses and minus are assigned at my discretion.

Laboratory notebook

You are required to keep a laboratory notebook detailing your work on three experimental projects: ceramics making, bronze making, and *either* soap *or* paper making. Keeping a notebook for these projects involves

- Writing **before class** for each of the three projects: **Overall purpose** of the project and **approach** (methods summary) that will be taken
- Writing **before** each project day: **specific tasks, methods**, and **reminders**
- Writing **during** class each project day: **observations, data, results, and conclusions**

Your notebook must be brought to all laboratory meetings and activities (even when they take place during lecture times!). Your notebook is primarily an in-class writing assignment, which means that before you leave an experimental activity your notebook should be fully up-to-date. Detailed guidelines on which notebook to buy and how to keep a scientific notebook will be provided.

Reflection Essays

My hope is that our explorations (experiments, discussions, readings, films) this semester will inspire you to reflect on a personal and academic level on topics such as (but not limited to!) human creativity and innovation, the power of chemistry to explain observable phenomena, the relationships among individuals, culture/society, and technology, as well as less tangible ideas of beauty, meaning, and personal choice. Your task in a reflection essay is to provide a glimpse into your personal experience in the course: consider, for example, what you've learned, what surprised/inspired you, new ways of thinking, or how the different aspects of the course and your own personal experience fit together. In other words, these essays should draw explicitly on course content and experiences and link this content to your own life experience and personal perspectives.

Response Papers

The course readings provide a range of perspectives, from more scholarly perspectives on the history of technology and culture (*Technology Matters: Questions to Live With*), to a memoir of someone who chooses to rely minimally on modern technology (*Better Off: Flipping the Switch on Technology*), to a reflection by someone whose life's work was inventing and innovating next season's latest and greatest technology (*The Plenitude: Creativity, Innovation, and Making Stuff*). I expect that these readings will elicit a range of responses, from curiosity to annoyance, from surprise to doubt, from questions about the past to visions for the future. Each of you comes to this course with a different background, different interests, and different views on technology. I expect that this diversity will enliven and enrich the discussions! Response papers will provide you with a formal opportunity to engage with and critique the author's ideas and support your own ideas using outside sources of information.

Soap/Paper Presentation

Following our first two experiments (ceramics and bronze), the class will break into Soap and Paper research teams. You will each, individually, make either soap or paper, but your experiment will fit into a larger collective team experiment designed to examine the effects of specific experimental variables. In other words, as a Research Team, you will design and carry out a scientific experiment and make something pretty cool in the process! As a team, you will

teach the rest of the class the history and chemistry of soap/paper, with each of you presenting 1-2 power point slides on the topic agreed upon by your group, in consultation with me.

Research Presentation & Paper

The final project involves writing an 8-10-page, double-spaced, research paper on an approved topic of your choice and presenting your research to the class (~15 minutes). My objectives for you in this project are to

- ❖ follow your own curiosity,
- ❖ conduct rigorous literature research,
- ❖ gain a scientific understanding of an important and interesting human technology

I encourage you to be creative in your choice of topic, and give it some thought. If you are genuinely interested in the topic, chances are that you will enjoy the project and do a better job. Projects must focus on an older, if not exactly primitive, human technology and the chemistry involved. Specifically, projects must present

- ❖ the science involved and possibly how the science/technique changed over time (primary goal) and
- ❖ the historical context of the technology (who, when, where, how) (secondary goal).

Multiple students will not be approved to research the same topic, so topics will be approved on a "first-come first-served" basis. I have placed numerous books on library reserve that may be helpful for generating topic ideas and to use as information sources for your projects. It is likely that you will need to borrow sources from another library (e.g., ILL or NEXPRESS), which takes time. It is your responsibility to obtain your resources in time for use in your project. Additional guidelines and information will be provided.

Participation and Attendance

Attendance is required at all classes, laboratories, and other required activities. Please obtain a "Dean's Excuse" if you are unable to attend any of these sessions. The seminar nature of the course means that participation will be assessed each and every day. During discussions, I expect each of you to contribute your perspectives and ideas, to listen carefully to others' perspectives, and to engage the class in a respectful conversation. To do this, you must be prepared (see above, Approach). The earnestness, good-nature, and curiosity with which you approach the experimental task, as well as their final quality will be assessed. This component of your grade is subjective, and I am happy to provide feedback at any time – just ask!

Additional resources on reserve in Armstrong Library

Napoleon's Buttons: How 17 Molecules Changed History • Brilliant: The Evolution of Artificial Light • 5000 Years of Glass • The Ascent of Man (&DVD) • On Food and Cooking: The Science and Lore of the Kitchen • A handmade life: In search of simplicity • Out of the fiery furnace: The impact of metals on the history of mankind • Handmade in America: Conversations with Fourteen Craftmasters • Glass: A world history.