BHP240: Chemistry and Conflict
Sample Syllabus

Course Description:

Chemistry and other sciences have radically changed the conduct of war and mechanisms of human conflict. Using case studies from the Chemical Revolution to present day, this course examines how knowledge of matter altered warfare – in terms of its scale, its boundaries, and its meaning. To this end, we study Antoine Lavoisier's work with gunpowder in the 18th century alongside a more famous case of wartime chemistry: Fritz Haber's development of chemical weapons during World War I. We also study the Manhattan Project, which produced the world's first atomic bomb in the final days of World War II. Secondly, this course investigates the many legacies of these new weapons. We follow the development of the military-industrial complex, the use of war chemicals as pesticides, and the deployment of Agent Orange in Vietnam. Finally, we examine more recent uses of chemical weapons, including in Japan, Iraq, and Syria. Throughout the course, students will bring knowledge of chemistry to bear on these historical episodes. They will demonstrate how knowledge of key chemical principles – such as atomic structure, bonding, and reactivity – help to contextualize the development of modern war.

This course fulfills a CLAS general education natural sciences requirement.

Course Outcomes	**Sample Assignment**	**University Learning Outcome**
Define basic chemical concepts -- including atomic and molecular structure, chemical reactivity, and biochemical interactivity – and apply them to important historical situations.	Students' understanding of the basic science and its connections to history will be assessed via five quizzes. These quizzes will include problem-solving and short-answer questions.	Critical Thinking Scientific Reasoning Quantitative Reasoning
Summarize examples of the application of scientific reasoning and analyze ways that scientific exploration impacted important human conflicts	Each week, students will be asked to respond, via Canvas, to an assigned scholarly reading. Prompts will require students to both summarize and critique one or more of the article's arguments.	Critical Thinking Written Communication Information Literacy Scientific Reasoning

Argue varying points of view related to human conflict through reference to historiographical strategies and/or scientific principles.	Students' participation in lively and professional discussions will be carefully monitored. To support such discussions, each week, three students will come to class with one "critical thinking" question based on the week's topic and reading.	Critical Thinking Scientific Reasoning
Synthesize historical and scientific research regarding situations involving human conflict.	Students will make an assertion regarding relationships between scientific progress and an example of human conflict. They will identify and deploy other scholars' ideas and information to develop and support this assertion in the form of a research paper.	Critical Thinking Written Communication Information Literacy Scientific Reasoning
Explain and defend an assertion regarding a significant impact of scientific progress on human conflict to an educated audience.	Students will develop a logically-organized oral presentation of approximately 10-12 minutes in which they present and defend an assertion regarding chemistry and conflict. This oral presentation will include appropriate visual aids. Presenters will address questions and concerns put forth by the audience.	Critical Thinking Oral Communication Information Literacy Scientific Reasoning

Methods of Evaluation:

Students will be expected to attend class regularly, to prepare for class appropriately, and to engage in discussions and other in-class activities. Student understanding in each of the content sections (i.e. atomic structure, bonding and reactivity, and biochemistry) will be assessed by at least one quiz; quizzes will cover reading and lecture material and will include problem-solving and short-answer questions. A total of twelve Canvas Responses will be assess students' deep understanding of weekly readings and discussions (the lowest two scores on these responses will be dropped). More detail concerning the term project and the oral presentation can be found below and on the course's Canvas site.

Quizzes (five at 4% each):	20%
Term paper:	35%

5% Annotated Biblio
5% Outline
5% Rough Draft
20% Final Output

Oral Presentation: 15%
Canvas Responses (10 at 2% each): 20%
Discussion/Participation: 10%

Term paper and presentation:

In this course, we will examine several case studies of chemistry in the context of war and, more broadly, in political conflicts. However, these represent only a few examples of the many, many ways that chemistry impacts warfare and politics. For your term assignment, choose another example that interests you, but that we did not have time to cover in class. A broader list of suggested topics is available on Canvas, but you might, for example, choose to investigate the use and improvement of explosives during the American Civil War, the significance of anti-malarial drugs to the outcome of World War II, or debates on the toxicity of cigarettes.

Your goal is not to simply explain a topic but to develop and support an assertion that will help to illuminate some narrowed aspect of the impact of scientific knowledge and/or progress on your chosen instance of human conflict. In pursuing your own expertise on your research question, you will be required to reference at least four scholarly, peer-reviewed sources in addition to at least two "serious," though not necessarily scholarly, sources (including reports from reputable news outlets such as *The New York Times).* Note that a required annotated bibliography encompassing at least ten such sources will assist you in this regard (details of the preliminary assignments (annotated bibliography, outline, and rough draft) are available on Canvas and will be discussed further in class.

You will demonstrate your mastery of your topic in two related but different ways: an oral presentation (10-12 minutes) and a final paper (12-15 pages). More information will be provided concerning these two assignments. But note that the oral presentation will require you to utilize appropriate evidence, including visual and/or multimedia aids, to convince the class of your assertion. Presenting in this way will allow the class, and your professors, to challenge your claims (in a respectful way). This assignment will help you to hone your presentation skills and may help to shape your written argument.

Tentative course schedule:

Section	Week	Topic	Tentative Reading List	Due
I: Introduction	1	Introduction	Marcus Chown "The Dawn of the Nuclear Age" *The Independent*, Aug 2003	
II: Atomic Structure	2	The Periodic Table, nuclear structure, and nuclear changes: Designing and detonating atomic bombs	US Dept of Energy: The Manhattan Project -- Making the Atomic Bomb	
	3	Isotopes and radioactivity: Harvesting energy in a chaotic world	Selections from Kate Brown *Manual for Survival*: *A Chernobyl Guide to the Future*	Quiz 1
III. Bonding and Reactivity	4	Basic patterns in reactivity: Combustion -- burning and explosions	Jean-Pierre Poirier, "The Gunpowder and Saltpeter Administration," "The Arsenal Residence," and "The New Chemistry," in *Lavoisier, Chemist, Biologist, Economist*	*Topic Proposal*
	5	Stoichiometry and basic energetics: Fertilizing the world and feeding the war machine with ammonia	Daniel Charles, "Fixation," in *Master Mind: The Rise and Fall of Fritz Haber, the Nobel Laureate who Launched the Age of Chemical Warfare* (New York: HarperCollins, 2005): 73-97.	Quiz 2

	6, 7	Valence electrons and covalent bonding: Chlorine on the battlefield and cyanide in death camps	"When Chemicals Became Weapons of War." *Chemical and Engineering News*. February 23, 2015: 9-21. Edmund Russell, "Joining the Chemists' War," in *War and Nature: Fighting Humans and Insects with Chemicals from World War I to Silent Spring* (Oxford: Oxford University Press, 2001): 37-52. Daniel Charles, "Dispossession," and "Requiem," in *Master Mind: The Rise and Fall of Fritz Haber, the Nobel Laureate who Launched the Age of Chemical Warfare* (New York: HarperCollins, 2005): 217-246.	*Annotated Bibliography (Week 6)* Quiz 3 (Week 7)
	8	Molecules and reactions in the environment: Ozone, CFCs, and the atmosphere	Naomi Oreskes and Erik Conway, "Constructing a Counternarrative: The Fight Over the Ozone Hole," in *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*	*Outline*
	9	Altering chemical reactions: Vulcanization and rubber	Daniel Immerwahr, *How to Hide an Empire: A History of the Greater United States*	Quiz 4
IV: Biochemistry	10	Chemicals and the nervous system, part 1: DDT in war and peace	Edmund Russell, "Annihilation (1943-1945)," and excerpts from "War Comes Home (1945-50)," in *War and Nature: Fighting Humans and Insects with Chemicals from World War I to Silent Spring* Selection from Rachel Carson, *Silent Spring* (New York: Houghton Mifflin, 1962)	

	11	Chemicals and the nervous system, part 2: Nerve gases	Robert Harris and Jeremy Paxman, "Hitler's Secret Weapon," in *A Higher Form of Killing: The Secret Story of Chemical and Biological Warfare* (New York: Hill and Wang, 1982): 53-67.	*Rough Draft*
	12	Hormones in plants and animals: The lasting devastation of Vietnam by Agent Orange	David Zierler, "Science, Ethics, and Dissent," in *The Invention of Ecocide: Agent Orange, Vietnam, and the Scientists who Changed the Way we Think about the Environment* (Athens: University of Georgia Press, 2011): 89-111.	Quiz 5
V. Conclusions	13	Why study chemistry and conflict?		
Final paper due via Canvas on course's final exam day				