

Environmental Studies 311 – Fall 2015

History of the Chemical Revolution in United States Agriculture

Tuesday, Thursday – 8:30-9:45 am

Rm. Clark 205

Professor Adam Romero



Workers dusting cotton with calcium arsenate – Tallulah, Louisiana, ~1935.

Courtesy of the National Archives.

Class Statement

Where do fertilizers, pesticides, and other agricultural chemicals come from? How are they made and why are they used? This class examines the history of United States agriculture through a lens of the chemical revolution. We begin with the development of US agriculture and the fertilizer industry in the 19th century. Through a lens of industrial waste, we examine the emergence of the “pest problem” and the chemicals used to treat it. We then turn to WWI and the intensive growth of the US chemical industry and agrochemical consumption during and after the war, situating their growth within an era of chronic farm surplus. We pay particular attention to the chemical industry’s relationships with seed technology, chemical warfare, mechanization, labor, government institutions, the politics of toxicity, and the expansion of the oil industry in the lead up to and during WWII. We conclude by reading *Silent Spring* through a lens of contemporary agrochemical use and pesticide regulation and use the history of the agrochemical revolution in US agriculture to examine the rationales and policies that support the ongoing consumption of fertilizer and toxic chemicals throughout the US agroindustrial complex.

Goals of the Class

The cultivation of food and fiber is arguably the single most important arena of human interaction with the environment. Over the last twenty-five years, in the US and across the world, there has been a tremendous increase in studying and practicing alternative forms of agriculture. However, the turn to alternative forms of agriculture also has its detractors and critics, particularly around questions of food production, inclusion, equity, and labor. My teaching goal is to provide a new generation of agricultural scholars, activists, and practitioners with a critical and self-reflexive understanding of US agricultural history, food politics, and agrarian political economy. I believe, as the 19th Century Swiss historian Jacob Burckhardt did, that the purpose of studying history is not make to us smarter next time, but wiser forever. My objective for students in the class is threefold:

- to be able to put yourself in the shoes of people and times we read about
- to gain perspective, to see how things have changed, and to be able to take the long view
- to be able ask complex questions about the past and to better understand our own times

A good student of history is like a good traveler: keep your eyes open, be curious, see things from a stranger's perspective, but don't give up your own viewpoint.

Office Hours and Email

I will hold office hours on Tuesdays from 10 am -12 pm at the Eco Cafe in the atrium of the Science Center and Wednesdays from 4 pm to 6 pm in Environmental Center Rm. 212. Email me if you want to meet and you can't make these hours. My email address is amr6@williams.edu. I am not the best at responding to emails and prefer to meet in person, but please feel free to contact me with any questions or concerns.

Resources

Williams College offers an extensive array of academic resources, including writing help, peer tutoring, and study skills. I encourage you to take advantage of these resources. More information can be found at: <http://academicresources.williams.edu>

Disability and Special Accommodations

Students with disabilities who may need accommodations for this course are encouraged to contact the Director of Academic Resources at ext. 4672 as soon as possible to ensure that accommodations are provided in a timely manner. More information can be found at: <http://academicresources.williams.edu/disabilities/>

Academic Integrity

Students are expected to follow the Williams Honor Code. While I strongly encourage discussion and debate, any test, paper, report or homework submitted under your name is presumed to be your own original work that has not previously been submitted for credit in another course. All words and ideas by other people must be properly attributed: fully identified as to the source and

the extent of your use of their work. Cheating, plagiarism, and other academic misconduct will result in a failing grade on the assignment, paper, quiz, or exam in question and will be reported to Student Honor Committee.

College Recording Policy

Williams College seeks to protect the integrity of what transpires in the classroom among students and professor, any course materials prepared by the professor, and the privacy of students and faculty. With this in mind, Williams College prohibits any recording (audio or video) of lectures, seminars, or other classroom activities without the express permission of the instructor. Authorized recordings (including any made in order to accommodate ADA considerations) and all other course materials (including any materials posted on Glow or other Course Management site) may only be used for the purposes of an individual's (or group's) study in the course, and may not be shared with any wider audience on or off campus unless the instructor has explicitly given such permission. Violations of this policy would be considered a violation of community standards and would fall under the disciplinary processes in place at the College.

Assignments and Grading

Students are expected to come to class to come prepared. That includes not just reading the assigned material but also thinking about what you didn't understand and what related questions it raised for you. It may help to write down a few of your reactions to or questions about the reading. Many of the readings are challenging, especially for those of you without a background in chemistry, but I will do my best in lecture to guide you through them.

Your overall grade is based on the following:

- *Four One-Page Reading Responses* (10%) – Three must be turned in before Thanksgiving. A guide will be handed out on September 15.
- *Historical Newspaper Analysis Paper* (30%) – Paper assignment will be handed out in class on October 15. Paper is due in class on December 10.
- *Take Home Midterm* (30%) – To be handed out in class on October 8 and due in class October 15 at the beginning of lecture.
- *In-Class Final Exam* (30%) – To be announced.

GLOW, Reading Packets, and Computers in the Classroom

Lecture slides and assignments will be made available on GLOW following class. There are no books to purchase for class. All readings are found in the ENVI 311 reading packet, available for pickup on September 10 at the Print & Mail Room, 51 Park St. Numerous studies have shown that taking class notes by hand leads to better learning outcomes, therefore I do not allow computers in the classroom. If you need to use a computer to take notes, please see me.

Schedule and Readings

Week 1 – What is Agriculture?

September 10

- Introductions and Class Discussion

Week 2 – The Development of US Agriculture in the 19th Century

September 15

- Cochrane, W. 1993. "From Pioneering to Commercialization: 1820-1860, and The Last Frontier: 1860-1897." In *The Development of American Agriculture: A Historical Analysis*, 57-77, 78-98. Minneapolis, MN: University of Minnesota Press.

September 17

- Kloppenburg, J. R. 2004. "The Genetic Foundation of American Agriculture." In *First the Seed: The Political Economy of Plant Biotechnology*, 51-65. Madison, WI: University of Wisconsin Press.
- Baptist, E. E. 2014. "Left Hand 1805-1861." In *The Half Has Never Been Told: Slavery and the Making of American Capitalism*, 111-144. New York, NY: Basic Books.

Week 3 – The Metabolic Rift, Guano, and the Exhaustion of the Soil

September 22

- Von Liebig, J. 1859. "Letter XXXIII." In *Familiar Letters on Chemistry, In Its Relation to Physiology, Dietetics, Agriculture, Commerce, and Political Economy*, 485-492. London: Walton and Maberly.
- Marx, K. 1976. "Large-Scale Industry and Agriculture." In *Capital: A Critique of Political Economy*, 636-639.
- Wines, R. A. 1985. "The Recycling System, and the Impact of the Recycling Mentality." In *Fertilizer in America: From Waste Recycling to Resource Exploitation*, 6-21, 22-32. Philadelphia: Temple University Press.

September 24

- Mellillo, E. D. 2012. "The First Green Revolution: Debt Peonage and the Making of the Nitrogen Fertilizer Trade. 1840-1930." *American Historical Review* 117 (4):1028-1060.
- Crookes, W. 1900. *The Wheat Problem: Based on Remarks Made in the Presidential Address to the British Association at Bristol in 1898*. New York, NY: G.P. Putnam and Sons, 32-46.

Week 4 – Origins of the US Fertilizer Industry and the Industrial Production of Reactive Nitrogen

September 29

- Nelson, L. B. 1990. "Discovery and Development of Phosphate Rock and Sulfur Deposits: 1867-1920, and Launching of the U.S. Fixed Nitrogen Industry: 1890's to 1930's." In *History of the U.S. Fertilizer Industry*, 55-96, 193-232. Muscle Shoals, AL: Tennessee Valley Authority.

October 1

- Smil, V. 2001. "A Brilliant Discovery: Fritz Haber's Synthesis of Ammonia, and Creating an Industry: Carl Bosch and BASF." In *Enriching the Earth: Fritz Haber, Carl Bosch, and the Transformation of World Food Production*, 61-82. 83-107. Cambridge, MA: MIT Press.

Week 5 – Wealth From Waste and the Bugs Crawl Out

October 6

- Richter, F. E. 1927. "The Copper-Mining Industry in the United States, 1845-1925." *The Quarterly Journal of Economics* 41 (2):236-291.
- Haynes, W. 1933. "Chemical Supply and Demand." In *Chemical Economics*, 55-78. New York, NY: D. Van Nostrand Company, Inc.
- Fay, I. W. 1911. "Coal Tar and Its Products." In *The Chemistry of the Coal-Tar Dyes*, 5-6. New York, NY: D. Van Nostrand Company.

October 8

- Whorton, J. 1974. "The Insect Emergency." In *Before Silent Spring: Pesticides & Public Health in Pre-DDT America*, 3-25. Princeton, NJ: Princeton University Press.
- Smith, J. B. 1908. "Cultivation and Susceptibility to Insect Attack." *Journal of Economic Entomology* 1 (1):15-17.
- Essig, E. O. 1933. "Insects and Agriculture." *Journal of Economic Entomology* 26 (4):869-872.

Week 6 – War Brings New Industry

October 13

- No Class (Reading Period)

October 15

- Haynes, W. 1933. "The World War and the Chemical Industry." In *Chemical Economics*, 200-226. New York, NY: D. Van Nostrand Company, Inc.
- Howe, J. L. 1918. "War of Chemicals Reaches Climax." *New York Times*, June 16.
- Sinclair, J. F. 1930. "War Brings New Industry." *Los Angeles Times*, January 26.

Week 7 – War and Nature

October 20

- Russell, E. 2001. "Chemical Warfare in Peace (1918-1937)." In *War and Nature: Fighting Humans and Insects with Chemicals from World War I to Silent Spring*, 53-73. New York, NY: Cambridge University Press.
- Howard, L. O. 1922. "War Against Insects." *Nature* 109 (2725):79-80.
- Fries, A. A. 1928. "By-Products of Chemical Warfare." *Industrial and Engineering Chemistry* 20 (10):1079-1084.

October 22

- Russell, E. 2001. "War Comes Home (1945-1950) and Arms Races in the Cold War (1950-1958)." In *War and Nature: Fighting Humans and Insects with Chemicals from World War I to*

- Silent Spring*, 165-183, 184-203. New York, NY: Cambridge University Press.
- LAT. 1945. "New Insecticide Fog Generators Revolutionize Man's War on Pests." *Los Angeles Times*, May 13.

Week 8 – Chemurgy, Chronic Surplus, and the Paradox of Plenty

October 27

- Perkins, J. H. 1983. "Insects, Food, and Hunger: The Paradox of Plenty for U.S. Entomology." *Environmental Review* 7 (1):71-96.
- Mullen, R. A. 1933. "Why Poison Bugs, Foes or Surpluses?" *The Washington Post*.
- Wallace, H. A. 1933. More Purchasing Power for Farmers. In *Extension Service Review* 4 (3): 33-34. Washington, DC: USDA.

October 29

- NYT. 1926. "Holds Chemistry is Farmer's Hope." *New York Times*, August 12.
- Beeman, R. 1994. "'Chemivisions': The Forgotten Promise of the Chemurgy Movement." *Agricultural History* 68 (4):23-45.
- Hale, W. J. 1939. "The Chemical Age." In *Farmward March: Chemurgy Takes Command*, 3-21. New York, NY: Coward-McCann, Inc.

Week 9 – Interwar Expansion and a New World of Science

November 3

- Duncan, C. 1996. "Mechanization and Chemicalization Distinguished." In *The Centrality of Agriculture: Between Humankind and the Rest of Nature*, 116-121. McGill-Queen's University Press.
- Downs, E. W., and G F Lemmer. 1965. "Origins of Aerial Crop Dusting." *Agricultural History* 39 (3):123-135.
- O'Kane, W. C. 1921. "The Common Ground of Science and Industry." *Crop Protection Digest* 1: 10-16.

November 5

- Rasmussen, N. 2001. "Plant Hormones in War and Peace: Science, Industry, and Government in the Development of Herbicides in 1940s America." *Isis* 92 (2):291-316.
- Stine, C. M. 1942. "Molders of a Better Destiny." *Science* 96 (2492):305-311.

Week 10 – Pure Food and The Politics of Toxicity

November 10

- Whorton, J. 1974. "Regulatory Prelude." In *Before Silent Spring: Pesticides & Public Health in Pre-DDT America*, 95-132. Princeton, NJ: Princeton University Press.
- Kallet, A, and F. J. Schlink. 1933. "A Steady Diet of Arsenic and Lead." In *100,000,000 Guinea Pigs: Dangers in Everyday Foods, Drugs, and Cosmetics*, 47-60. New York, NY: The Vanguard Press.

November 12

- Whorton, J. 1974. "No Longer A Hazard." In *Before Silent Spring: Pesticides & Public Health in Pre-DDT America*, 212-247. Princeton, NJ: Princeton University Press.
- McWilliams, J. 2008. "Complaints are coming in': A Year in the Life of an Insecticide Nation." In *American Pests: The Losing War on Insects From Colonial Times to DDT*, 169-193. New York, NY: Columbia University Press.

Week 11 – WWII and Beyond

November 17

- Cushing, E. C. 1957. "The Fight Against Anopheles Mosquitos and the Allies, and Entomologists on the Home Front." In *The History of Entomology in World War II*, 41-56, 93-106. Baltimore, MD: Smithsonian Institution, Lord Baltimore Press, Inc.
- Cochrane, W. 1993. "The Technological Revolution: 1933-1970." In *The Development of American Agriculture: A Historical Analysis*, 122-149. Minneapolis, MN: University of Minnesota Press.

November 19

- Williamson, H. F., R. L. Andreano, A. R. Daum, and G. C. Klose. 1963. "Crude Oil Production and the Beginning of Conservation, and The Beginnings of Petrochemistry." In *The American Petroleum Industry 1899-1959: The Age of Energy*, 299-307, 423-437. Evanston, IL: Northwestern University Press.
- Chapman, K. 1991. "World War II and the Establishment of the Petrochemical Industry." In *The International Petrochemical Industry: Evolution and Location*, 64-89. Cambridge, MA: Oxford University Press.

Week 12 – WWII and Beyond continued

November 24

- Nelson, L. B. 1990. "Ammonia Synthesis: 1932-1980." In *History of the U.S. Fertilizer Industry*, 323-349. Muscle Shoals. AL: Tennessee Valley Authority.
- Turrentine, G. H. 1953. "Petrochemicals Come of Age." *The Analysts Journal* 9 (5):45-50.
- Rosin, J., and M. Eastman. 1953. "The Road to Abundance." *Challenge* 1 (12):47-51.

November 26

- No Class (Thanksgiving)

Week 13 – Silent Spring Revisited

December 1

- Carson, R. 1962. "A Fable for Tomorrow, The Obligation to Endure, Elixirs of Death, The Human Price." In *Silent Spring*, 1-4, 5-14, 15-38, 187-198. New York, NY: Houghton Mifflin Company.
- Van Den Bosch, R. 1978. "The Pesticide Treadmill." In *The Pesticide Conspiracy*, 17-35. Berkeley, CA: University of California Press.

December 3

- Davis, F. R. 2014. "Rereading Silent Spring." In *Banned: A History of Pesticides and the Science of Toxicology*, 153-186. New Have, CT: Yale University Press.
- Mascarelli, A. 2013. "Growing Up With Pesticides." *Science* 341 (6147):740-741.

Week 14 – Class Presentations and Review

December 8

- Class Presentations on Summary of Research Findings

December 10

- Review and Class Discussion