

History of Science 280
Honors Seminar: Studies in Science, Technology and Medicine
Topic: Science and the World Wars
Spring 2002

2:30-3:45 p.m. TR, 6304 Social Sciences

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Office Hours: 2:30-3:30 p.m. M, 4-5 p.m. R

Modern science has shaped the wars of the twentieth century, and in important respects is itself a child of those conflicts. In this honors seminar we examine the complex role of science in the two World Wars, showing how thoroughly military involvement has challenged the social identity of the scientist, and transformed the disciplinary basis of scientific research. Although the history of warfare has attracted considerable attention, historians have only recently taken up the task of establishing a thorough analysis of the character of scientific engagement; here students will have the opportunity of undertaking original research on the themes raised. Examining published primary sources from the period, and key interpretative accounts, we will explore tensions between nationalism and internationalism, openness and secrecy, purity and application, control and powerlessness that take us to the heart of common images of the scientist's identity. Topics include psychology, cybernetics and military environmentalism as well as the development of new weapons by chemists and physicists; and our examination of both wars will provide a comparative basis for understanding the changing relations between the state, military and science. The course requires a series of informal and formal writing assignments, leading up to a research paper of 8-10 pages with a major revision. Students will share their research projects with the class in oral presentations at the end of the semester.

Reading Materials

I am recommending (but not requiring) two books, available from the University Bookstore:

Richard Rhodes, *The Making of the Atomic Bomb* (New York: Simon and Schuster, 1988).

Michael Frayn, *Copenhagen* (New York: Anchor, 1998).

Both are masterfully written. Rhodes's dense and involving account of the making of the atom bomb weaves together a narrative of scientific exploration and involvement in the wars that begins early in the century. It sets scientists' careers and the development of the Manhattan project in the context of the troubled political history of the twentieth century. Frayn's recent play is an imaginative and analytical exploration of a fascinating meeting between Werner Heisenberg and Niels Bohr that convinced Bohr the Germans were pursuing an atomic bomb. Exploring the theme of uncertainty in our knowledge of human actions, it registers the moral dimensions of engagement. These books are intended to

provide an overview and provoke reflection on the nature of historical knowledge itself, rather than to form the basis for our own immersion in the subject of science and war. That will come through the materials gathered in the Course Reader. This contains chapters and articles culled from many sources, including both primary materials and interpretative accounts.

Course Reader. Available from the History of Science Department Office, 7143 Social Science.

Our program of readings is intended to provide an overview of the subject at the same time as introducing the skills of historical research. The list of topics is broad, exemplifying the extraordinary reach and sometimes surprising effect of war on particular scientific disciplines.

Assessment

Assessment is through three primary tasks.

Class Participation (25%)

Class discussion of the assigned readings will be a primary forum for the intellectual work of the seminar, and a participation grade forms a significant component of your assessment. As I approach it “participation” includes regular attendance, completion of the two informal assignments discussed below, and especially a willingness to engage actively in our discussions. Given differences in temperament and personality I do not expect all class members to contribute equally all the time, and I have no intention of penalizing people who may be shy or lack the confidence to talk a lot. However, it will be important for everybody to do their best to support the discussion, and I expect everyone to be ready to answer questions when asked.

Primary Source Assignments

On two different occasions students will be responsible for introducing the class to a new primary source. That means 1) finding a primary source that is relevant the theme of a particular day’s discussion and 2) giving a brief report to the class. The report will describe the nature of the source and outline its historical context and significance (you will also submit an informal written version of 1-2 pages).

The first report will be given at the meetings of either February 12, 14, 19 and 21, when class members will each find one primary source relevant to our discussion of chemistry, physics, shell shock and psychology in World War I.

The second report will be on a primary source relating to a topic of your choice throughout the rest of the semester.

Writing Assignments

There are two important writing assignments. The first is an essay in which you will explore the relations between evidence and interpretation in the case of any one of the themes studied in the course of the semester. This will be a chance to explore critically the way in which historical accounts are built up on the basis of particular primary sources, and are perhaps limited by the nature of those sources. The second assignment is a research paper in which you will define your own specific topic within our general subject, work with historical documents in researching the paper, and present an oral report of your work to the group.

In both cases you will produce a good quality draft (typewritten, polished, containing appropriate references and so on), which will be commented on and then revised before submitting the final version. This is because good writing rests on *rewriting*, taking the opportunity not just to correct spelling and grammatical errors, but to rethink what you are trying to do in a paper, and to assess critically how well you achieve your goals. I will comment on the draft of your first essay, and one of your peers will review the first draft of your research paper.

First Essay, 5 pages (20%)

A discussion of the relations between evidence and interpretation on any one of the topics treated throughout the semester.

Draft due February 28 (returned with my comments on March 7)

Final Version due March 14.

Research Paper, 8-10 pages (55%)

On a topic of your choice.

Plan due April 2.

Draft due April 16 (to be reviewed by peer).

Peer Review to be completed by April 23.

Oral Presentations of the project will be delivered on April 30, May 2 and May 7.

Final Version due Monday, May 13.

In addition to all the attention we will be giving to writing skills in class, the Writing Center offers individual tutoring to help students at all levels improve their writing. You can contact them at the Writing Center, 6171 H.C. White Hall (Tel. 263-1992).

Research and Library Resources

The UW-Madison General Library System has over forty libraries, quite a few of which are potentially relevant to topics exploring one or the other scientific discipline. If you are unfamiliar with the campus library system, you can get a useful introduction by doing CLUE (Computerized Library User Education), an interactive, multimedia tutorial, located at <http://clue.library.wisc.edu>.

On January 31 we will be holding a library session to introduce research methods and strategies in particular. In addition to the guidance you receive then, continued use of both libraries and reference librarians is likely to be extremely important in developing your research. As you refine your topic it is helpful to work on two fronts: making critical use of secondary sources (the approaches that historians and others have taken to the material before you) and finding and investigating primary sources (books, letters etc. from the people, period, and subject you are interested in).

Secondary Sources

Our first understanding of a field most often comes from interpretative historical accounts. Of course the assigned readings will be your most direct guide here, but for a far more extensive coverage of potential secondary sources, one core resource is the internet bibliography of books and articles in history of science, medicine and technology with the nickname "Eureka." RLIN's History of Science and Technology (HST) database contains entries in the annual bibliographies published in *Isis* from 1975 to the present; from the Current Bibliography of the History of Technology (published in *Technology*

and *Culture* annually) from 1987; and from the annual Italian bibliography (*Bibliografia Italiana di Storia della Scienza*) from the summer of 1997.

How to get there:

1. From the Libraries homepage go to Journal, Magazine, Newspapers Databases
2. Go to Databases by Title: H
3. Then go to History of Science, Medicine, Technology (1975-)

Please note that this bibliography is very useful, but also incomplete because it only includes material published more recently. For older material you should go directly to the cumulative bibliographies of the journals *Isis* or *Technology and Culture*.

And of course there are many other bibliographies that will help you navigate through literature on a topic. Research and reference librarians will often have invaluable suggestions on ways to approach your interest: ask for help!

Primary Sources

I can't recommend too strongly the importance of using a variety of materials from the time period and field of interest in order to build historical understanding; and learning how to locate primary sources and interpret them will be an important task. We are particularly fortunate because the UW-M library system has excellent collections of relevant books and journals, and (depending on the topic) may even have original manuscript holdings. If you are interested in Robert Oppenheimer or Vannevar Bush, read some of their research papers as well as their more popular writings; if you want to know how Bush's views on science-military relations were received, read the responses of his contemporaries; to gauge how military work became public, try to follow the trail through memo or correspondence to publication. Although it is not particularly strong in twentieth century materials, the Special Collections Department of Memorial Library has a number of excellent History of Science manuscript collections. Go to their website <http://www.library.wisc.edu/libraries/SpecialCollections/> and look under Collections for more details. Robin Rider, the Curator and Head of the Department, is a historian of science and will be very willing to help interested students if you make an appointment. Likewise the History of the Health Sciences Collection in the Middleton Health Sciences Library has extremely good resources (and the curator, Micaela Sullivan-Fowler, even keeps a supply of M&Ms on hand for needy researchers).

Syllabus

All of the material listed below may be found in the Course Reader. Note that *not* all the material included in the Reader is required reading; and make use of the footnotes and bibliographies included in different papers or chapters, which will often help open a trail of discovery.

Introduction: Questioning the History of Science and War

Jan. 22 Introduction

A discussion of course aims and expectations.

Jan. 24 Raising Questions

Niall Ferguson, *The Pity of War* (London: Penguin, 1998), "Introduction," pp. xix-xlv.

L.F. Haber, *The Poisonous Cloud: Chemical Warfare in the First World War* (Oxford: Clarendon Press, 1986), Chap. 1, "Personal Introduction," pp. 1-14.

Jan. 29 Science and War: Overviews

D.E.M. Edgerton, "Science and War," in R.C. Olby, et al. *Companion to the History of Modern Science* (London: Routledge, 1990), pp. 934-945.

Everett Mendelsohn, "Science, Scientists, and the Military," in John Krige and Dominique Pestre, eds. *Science in the Twentieth Century* (Amsterdam: Harwood Academic, 1997), pp.175-202.

Jan. 31 Library Session: Sources and Research Strategies

This session will be held in Memorial Library Room 126, located on the main floor of the library in the West hall (the West hall also includes the computer lab). In preparation for instruction on sources and research strategies from librarian Steven Frye, read the following historiographic and bibliographic overviews:

Alex Roland, "Science and War," in Sally Gregory Kohlstedt and Margaret W. Rossiter, eds. *Historical Writing on American Science: Perspectives and Prospects* (Baltimore and London: Johns Hopkins University Press, 1986), pp. 247-272, but focus on pp. 258-272.

Alex Roland, "Technology and War: A Bibliographic Essay," in Merritt Roe Smith, ed. *Military Enterprise and Technological Change: Perspectives on the American Experience* (Cambridge, MA and London: MIT Press, 1985), pp. 347-379.

Class members will undertake a search for primary and secondary sources on the topic "science in the military."

Feb. 5 Debriefing on Sources and Research Strategies

Discussing the results of class experience in the library.

World War I

Feb. 7 Scientific Resources and the Conduct of War

Richard Rhodes, *The Making of the Atomic Bomb* (New York: Simon and Schuster, 1988), Chap. 4, "The Long Grave Already Dug," pp. 78-103.

Haber, *The Poisonous Cloud*, Chap. 3, "The Chlorine Cloud," pp. 22-40.

Feb. 12 Chemical Warfare

Haber, *The Poisonous Cloud*, Chap. 6, "Chemists at War," pp. 106-138.

Daniel P. Jones, "Chemical Warfare Research During World War I: A Model of Cooperative Research," in John Parascandola and James C. Whorton, eds. *Chemistry and Modern Society: Historical Essays in Honor of Aaron J. Ihde* (Washington, D.C.: American Chemical Society, 1983), pp. 165-185.

Hugh R. Slotten, "Humane Chemistry or Scientific Barbarism? American Responses to World War I Poison Gas, 1915-1930," *Journal of American History* 77 (1990), 476-498.

Feb. 14 Physicists at War

Daniel J. Kevles, *The Physicists: The History of a Modern Scientific Community in America* (Cambridge, MA and London: Harvard University Press, 1995), pp. 102-154.

Feb. 19 Shell Shock in Britain

Grafton Elliot Smith and Tom Hatherly Pear, *Shell Shock and its Lessons* (Manchester: Manchester University Press, 1917), Chap. 1 "The Nature of Shell Shock," pp. 1-25 and Chap. 5 "Some Lessons of the War," pp. 105-132.

Margaret Randolph Higonnet, Jane Jenson, Sonya Michel and Margaret Collins Weitz, eds. *Behind the Lines: Gender and the Two World Wars* (New Haven: Yale University Press, 1987), "Introduction," pp. 1-17. (Note that this reading is optional.)

Elaine Showalter, "Rivers and Sassoon: The Inscription of Male Gender Anxieties," in Higonnet, et al., eds. *Behind the Lines*, pp. 61-68.

Edward M. Brown, "Between Cowardice and Insanity: Shellshock and the Legitimation of the Neuroses in Great Britain," in Everett Mendelsohn, Merritt Roe Smith and Peter Weingart, eds. *Science, Technology, and the Military* (Dordrecht: Kluwer Academic, 1988), pp. 323-345.

Feb. 21 Scientists and the U.S. Army: Physiology and Psychology

Saul Benison, A. Clifford Barger, and Elin L. Wolfe, "Walter B. Cannon and the Mystery of Shock: A study of Anglo-American Co-operation in World War I," *Medical History* 35 (1991), 217-249.

John Carson, "Army Alpha, Army Brass, and the Search for Army Intelligence," *Isis* 84 (1993), 278-309.

Feb. 26 War and Medicine

Roger Cooter, "War and Modern Medicine," in W. F. Bynum and Roy Porter, eds. *Companion Encyclopedia of the History of Medicine* (London: Routledge, 1993), pp. 1536-1573.

Cay-Rüdiger Prüll, "Pathology at War 1914-1918: Germany and Britain in Comparison," in Roger Cooter, Mark Harrison and Steve Sturdy, eds. *War, Medicine and Modernity* (Stroud: Sutton, 1998), pp. 131-161.

Feb. 28 Disciplinary Transformations and Scientists on Science, Technology and War

Pinna G. Abir-Am, "The Molecular Transformation of Twentieth-Century Biology," in Krige and Pestre, eds. *Science in the Twentieth Century*, pp. 495-524.

D.E.H. Edgerton, "British Scientific Intellectuals and the Relations of Science, Technology and War," in Paul Forman, and José M. Sánchez-Ron, eds. *National Military Establishments and the Advancement of Science and Technology: Studies in the 20th Century History*. Boston Studies in the Philosophy of Science, vol. 180, (Dordrecht, Boston and London: Kluwer, 1996), pp. 1-35.

Note: Draft of First Essay Due

Mar. 5 Science, Fiction and War: H.G. Wells and the Idea of an Atomic Bomb

Frederick Soddy, *The Interpretation of Radium: Being the Substance of Six Free Popular Experimental Lectures Delivered at the University of Glasgow, 1908* (London: J. Murray, 1909), pp. 223-250.

H.G. Wells, *The World Set Free: A Story of Mankind* (London: Macmillan, 1914), pp. 76-105.

Warren W. Wagar, "H. G. Wells and the Scientific Imagination," *Virginia Quarterly Review* 65 (1989), 390-400.

World War II

Mar. 7 The Manhattan Engineer District

Michael B. Stoff, Jonathon F. Fanton and R. Hal Williams, eds. *The Manhattan Project: A Documentary Introduction to the Atomic Age* (Philadelphia: Temple University Press, 1991), pp. 17-59.

Robert Serber, *The Los Alamos Primer: The First Lectures on How to Build an Atomic Bomb* edited by Richard Rhodes (Berkeley: University of California Press, 1992), pp. 3-19. (Read this to gain an impression without worrying about the technical details.)

Leslie R. Groves, *Now it Can be Told* (New York: Harper 1962), pp.3-32, 38-93, 149-169.

Note: Draft of First Essay Returned

Mar. 12 On Research Projects

Class discussion of individual research projects

Mar. 14 "The Greatest Achievement of Organized Science in History"

Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm 1870-1970* (New York: Viking, 1989), Chap. 8, "Tennessee Valley and Manhattan Engineer District," pp. 353-442; but focus first on pp. 381-421.

Note: Final Version of First Essay Due

Mar. 19 The German Bomb

Jeremy Bernstein, *Hitler's Uranium Club: The Secret Recordings at Farm Hall* (Woodbury, NY: American Institute of Physics, 1996), Report 4, pp. 117-160.

Michael Frayn, *Copenhagen* (New York: Anchor, 1998), "Postscript," pp. 95-132.

Mar. 21 Post-War Physics in the U.S.

Peter Galison, *Image & Logic: A Material Culture of Microphysics* (Chicago and London: The University of Chicago Press, 1997), Chap. 4: "Laboratory War: Radar Philosophy and the Los Alamos Man," pp. 239-311.

S.S. Schweber, "The Mutual Embrace of Science and the Military: ONR and the Growth of Physics in the United States After World War II," in Everett Mendelsohn, Merritt Roe Smith, and Peter Weingart, eds. *Science, Technology and the Military* (Dordrecht and Boston: Kluwer Academic Publishers, 1988), pp. 3-45.

Mar. 23-31 Spring Recess

Apr. 2 Computing

Martin Campbell-Kelly and William Aspray, *Computer: A History of the Information Machine* (New York: Basic Books, 1996), Chap. 4 "Inventing the Computer," pp. 79-104.

Paul N. Edwards, *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge, MA and London: MIT Press, 1996), Chap. 2, "Why Build Computers?: The Military Role in Computer Research," pp. 43-73.

Note: Plan of Research Paper Due

Apr. 4 Cybernetics

Peter Galison, "The Ontology of the Enemy: Norbert Wiener and the Cybernetic Vision," *Critical Inquiry* 21 (1994), 228-266.

Edwards, *The Closed World*, chap. 6, "The Machine in the Middle: Cybernetic Psychology and World War II," pp. 175-206.

Apr. 9 Military Environmentalism I

Pamela M. Henson, "The Smithsonian Goes to War: The Increase and Diffusion of Scientific Knowledge in the Pacific," in Roy MacLeod, ed. *Science and the Pacific War* (Dordrecht, Boston and London: Kluwer Academic, 2000), pp. 27-50.

Mary Ellen Condon-Rall, "Malaria in the Southwest Pacific in World War II 1940-1944," in MacLeod, ed. *Science and the Pacific War*, pp. 51-70.

Linda Lear, *Rachel Carson: Witness for Nature* (New York: Henry Holt, 1997), pp. 106-121.

Apr. 11 Military Environmentalism II

Edmund P. Russell III, "'Speaking of Annihilation': Mobilizing for War against Human and Insect Enemies, 1914-1945," *Journal of American History* (1996) 82 (1996), 1505-1529.

Edmund P. Russell III, "The Strange Career of DDT: Experts, Federal Capacity, and Environmentalism in World War II," *Technology and Culture* 40 (1999), 770-796.

Apr. 16 On the Military-Industrial Complex and "Command Technologies"

Excerpts from Vannevar Bush, *Science – The Endless Frontier*, 1945, J. William Fulbright, "...the adherence of the professors," 1967, and Barry Goldwater, "The so-called military-industrial complex," 1969, in Merritt Roe Smith and George Clancy, eds. *Major Problems in the History of American Technology: Documents and Essays* (Boston and New York: Houghton Mifflin, 1998), pp. 429-441.

Dwight D. Eisenhower, "Farewell Radio and Television Address to the American People, January 17, 1961: Delivered from the President's Office at 8:30 p.m." Preface by George B. Kistiakowsky (Boston: Council for a Livable World Education Fund, 1981).

David. F. Noble, "Command Performance: A Perspective on the Social and Economic Consequences of Military Enterprise," in Smith, ed. *Military Enterprise*, pp. 329-346.

Draft of Research Paper Due (to be distributed to a class member for peer review)

Apr. 18 On Military Metaphors in Science

Joshua Lederberg, "Infectious History," *Science* 288, no. 5464 April 14 (2000), 287-293.

Susan Sontag, *Illness as Metaphor and AIDS and its Metaphors* (New York: Doubleday, 1990), pp. 57-71, 93-104 and 171-183.

Scott L. Montgomery, "Codes and Combat in Biomedical Discourse," *Science as Culture* 2 (1991), 341-390.

Conclusions

Apr. 23 The Role of the Historian (The Enola Gay Controversy)

Tom Engelhardt and Edward T. Linenthal, "Introduction: History Under Siege," in Edward T. Linenthal and Tom Engelhardt, eds. *History Wars: The Enola Gay and Other Battles for the American Past* (New York: Metropolitan Books/Henry Holt and Co., 1996), pp. 1-7.

Paul Boyer, "Whose History Is It Anyway? Memory, Politics, and Historical Scholarship," in Edward Tabor Linenthal and Tom Engelhardt, eds. *History Wars: The Enola Gay and Other Battles for the American Past* (New York: Metropolitan Books/Henry Holt and Co., 1996), pp. 115-139.

Thomas F. Gieryn, "Balancing Acts: Science, 'Enola Gay' and History Wars at the Smithsonian," in Sharon Macdonald, ed. *Politics of Display: Museums, Science, Culture* (London: Routledge, 1998), pp. 197-228.

Note: Peer Review of Draft to be Completed

Apr. 25 The Role of the Historian

Class discussion with Paul Boyer.

Apr. 30 Project Presentations I

Students will give a 10 min. oral presentation of their project, followed by a 5 min. question period

May 2 Project Presentations II

Students will give a 10 min. oral presentation of their project, followed by a 5 min. question period

May 7 Project Presentations III

Students will give a 10 min. oral presentation of their project, followed by a 5 min. question period

May 9 Debriefing

Class review of the seminar as a whole.

May 13 Final Paper Due

