**CAT 3**

**Atomic Age, Atomic Angst**

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No single technology has more profoundly affected human self-understanding--or had greater existential implications--than the Atomic Bomb. Technically realized in 1945, the bomb was built as a weapon of war, but soon came to be viewed as an instrument of suicide: for the first time in history, humans possessed the means of self-annihilation. As this fact ramified through science, politics, and culture --and as the development of thermonuclear weapons made the prospect of nuclear doomsday petrifyingly plausible--politicians grappled with threat of mutual assured destruction, artists delved into the moral and existential anxieties generated, and scientists recognized the implications of fall-out from weapons testing and the legacies of nuclear waste for the global environment and human health. In this class, we will examine the complex inter-relationships of the technical development of nuclear weaponry, the emotional dimensions of atomic angst, the environmental and health consequences of nuclear fall-out and nuclear industries, and the permanent legacy of nuclear waste.

**Exams and Assignments**
The course grade will be based on one mid-term, final, two short papers, and a term project. The exams will be a mix of short-answers (not multiple choice) and essays. The short papers will be defined questions, based on the class lectures and assigned readings (4-5 pages).

The final project (either individual or group, written or in another medium) will be a development of the notion of technological anxiety, based on the theme "How I learned to stop worrying and love _____." Details will follow, but the goal will be to examine the history of a technology other than the atomic bomb that created anxiety, to explore how and why it worried people, what mechanisms, if any, were emplaeed to control it, and how the society involved came to terms with it, for better or worse.

**Required Reading**
There are four required books:

- *The Making of the Atomic Bomb* by Richard Rhodes
- *By the Bomb's Early Light: American Thought and Culture at the Dawn of the Atomic Age* by Paul Boyer
- *Hiroshima* by John Hersey
- *A World Destroyed* by Martin J. Sherwin

These books are available for sale at ---- and can also be easily purchased at most book stores and any on-line bookseller.

Additonal required readings will be posted as electronic reserves at Geisel Library. Required films will be placed on reserve in the Geisel Film and Video Library.

**I. Atomic Technology**
Where did the atomic bomb come from? What discoveries and innovations made scientists believe that an atomic bomb was not only possible, but that German scientists might already be building one? Why did the US government decide to listen to a bunch of foreign-born theoretical physicists to launch the largest scientific-engineering initiative in US history?

**4/4 Atomic science and the discovery of nuclear fission**
Atomic science in the 1920s. The problem of element 93. Hahn, Meitner and Strassman discover nuclear fission. Neils Bohr and others realize what it means, while the Nazis drive Jewish physicists from Europe.
Reading: Rhodes, *Atomic Bomb,* 198-275.

**4/6 From scientific theory to political problem**
Nuclear physics in America. The NDRC and the mobilization of science for war. Szilard and Einstein's letter to Roosevelt. Why the letter has no impact.
Reading: Kevles, Excerpt from *The Physicists,* pp. 287-323 [electronic reserve]

**4/11 The decision to build an atomic bomb**
British-American discussions. The MAUD report. Enrico Fermi creates nuclear fission and the University of Chicago, Conant and Bush become convinced. FDR agrees.
Reading: Sherwin 1-41 , and
"Inventing a climate of opinion: Vannevar Bush and the Decision to Build the Bomb," *in The Scientific Enterprise in America: Readings from Isis,* edited by Ronald L. Numbers and Charles E. Rosenberg (Chicago: The University of Chicago Press, 1996), pp. 273-296.[electronic reserve]

**4/13 An atomic industry: Los Alamos, Oak Ridge, and Hanford**
The Manhattan Project begins . The design of the bomb. Parallel development. The production of enriched uranium and plutonium. Two different bomb designs.
Reading: Rhodes, *Atomic Bomb,* 522-614.

First take-home essay: due in class Tuesday 4/18
Albert Einstein later said his 1939 letter to Franklin Delano Roosevelt was the greatest regret of his life. Write a thoughtful essay reassuring Einstein of the historical insignificance of his letter. (Note: I do not want you to write about whether the bomb was a good or bad thing, but rather about how to understand the historical significance of the Einstein letter.)

**4/18 Trinity**
DVD in Class: "The Day after Trinity"
Reading: Rhodes, *Atomic Bomb,* 617-678.

***II.* Atomic Politics**
In August 1945, atomic bombs were dropped on the Japanese cities of Hiroshima and Nagaski. Some 200,000 persons perished, mostly civilians. A week later, the war ended. It was easy to presume a causal link—the bombing caused the Japanese to surrender—and this was the story Americans were later told. And no doubt the bombings did contribute to the Japanese decision to surrender. But Americans were also told that the bombing was *necessary* to end the war, Most historians now have a different view. Even at the time, many people at the time questioned the morality of vaporizing civilians, leading the US government, in the years that followed, to attempt the transmogrification of the A-bomb from a weapon of mass destruction to an instrument of peace through civilian nuclear power.

4/20 The bombings of Hiroshima and Nagasaki.
Film in class: Black Rain (or do in evening… it's 123 minutes)
Reading: John Hersey: *Hiroshima* book or article..?

And/or Boyer, Fallout, pp./ 5-27

Film here: Black Rain? (123 minutes—evcning showing?

**4/ 25 The decision to drop the bomb.**
Was the bomb necessary to end the war?.
Reading: Sherwin, pp. 67-140.

**4/27 Atomic diplomacy**
Historians now accept that there were three options on the table to end the war in the summer of 1945: 1) wait for a Russian invasion, to force the Japanese to give up. 2) clarify the surrender terms, to assure the Japanese they could keep their emperor, or 3) use the atomic bomb. Historical evidence suggests that the later option was chosen in large part because Harry Truman felt that it would allow him, after the war, to "dictate our terms" to the Russians.

DVD in class: Peter Jennings, *Hiroshima: Why the Bomb was Dropped*

Reading: Sherwin, pp 141-192

**4/29 The Construction of an American myth**
After the war, Harry Truman told the American people that the bomb was dropped to prevent a land invasion and save American lives—perhaps as many as a million. But historical evidence suggests than a land invasion was at least four months away, and that the figure of lives saved was, in fact, made up after the fact.

Sherwin, pp. 193-238.
Alperovits Excerpt, pp. 437-457.

5/2 Mid-term exam, in class.

***III.*** **Atomic Culture**
While Truman, Stimson and others constructed the official story of why the bomb was required to end the war, the U.S. government also attempted to prove to the world that were had been right in our efforts, because nuclear power could be put to good cause. As the U.S. developed a civilian nuclear power program, weapons tests continued, the H-bomb was built, and the arms race was on. Meanwhile, ordinary people began to feel more and more anxious as to where this would all lead.

**5/ 4The bomb , transmogrified.**
As criticism mounted of U.S. actions, Eisenhower launced "Atoms for peace" and promoted the development of civilian nuclear power—some might say in an attempt to turn a frog into a prince.
Reading: Excerpt from Caroll Pursell, American Technology. Pp 208-237.
Boyer, 107-130.

**5/9 Meanwhile, more bombs, including the "Super"**
Meanwhile, both the U.S. and the Soviet governments continued to build more weapons, beginning the development of what would ultimately become a stockpile of many tens of thousands of warheads, And bomb sides decided to build the ultimate weapon, the "Super", also known as the hydrogen bomb.

Reading: Boyer, Bomb's Early Light, 291-351. and
"In any light: Scientists and the decision to build the Superbomb, 1952-1954," Peter Galison and Barton Bernstein, *Historical Studies in the Physical and Biological Sciences,* 19:2 (1989), pp. 267-347. [electronic reserve]

**5/11 Nuclear weapons, nuclear tests, nuclear fear**

From 1945 to 1992, the U.S. government conducted over 1000 official tests of nuclear weapons. Before 1963, most of these were in the open air, and "fallout" became a household word as radionucliedes were found in Greenland and Antarctica. And increasingly, both scientists and the public worried.
Reading: either Boyer pp 59-106 and/or
excerpts from Weart, Nuclear Fear.

**5/ 16 Nuclear Fear Goes Public**
Dr Strangelove has been billed as the only movie that makes you laugh at the end of the world.
Film in class: Dr Strangelove. (93 minutes)
Reading: Excerpt from Boyer, *Fallout*, pp. 95-102, and Weart , Nuclear Fear, -----/

**5/16 Fallout, radiation, and science fiction**
Artists and film-makers expressed public fears, often through science fiction, which exploded as an artistic genre in the 1950s, playing on the evidence of genetic damage in Hiroshima and Nagasaki survivors revealed by the work of the U.S. Atomic Bomb Casualty Commission. At the same time, however, the U.S. government assured the public that they had nothing to fear.
Film in class: *The Incredible Shrinking Man* (81 minutes)

Assignment: Watch *The Atomic Café* (92 minutes)

**5/18 Nuclear fears, revisited**
In the late 1960s and 1970s, atomic anxiety receded, as the limited test ban treaty pushed nuclear tests underground and out of sight, and as the U.S. and U.S.S.R. settled into the "MAD" truce ( "Mutual Assured Destruction"). But in the 1980s, anxieties became resurgent, as President Ronald Reagan re-invigorated American weapons development and proposed his Strategic Defense Initiative, which potentially threatened the balance of power/ terror that MAD represented. Once more, filmmakers took up the question, this time in a widely discussed made-for-television movie, which once again stressed that no one, not even in middle America, was safe.

Assignment: DVD: *The Day After* (2 hours)
Boyer: pp 352-367.

5/25

**IV. Atomic Legacies**
The Cold War is over. The United States no longer tests nuclear weapons, but only "stewards" its stockpile. The Soviet Union no longer exists, and many weapons have

been dismantled, their highly enriched uranium fuel "downblended" for use in American civilian nuclear power plants. Yet, we live with various legacies—political, social, medical, and environmental. We close this class with a consideration of the ways in which the past is never quite past, but continually unfolding into the future.

**5/30 The Enola Gay affair.**
Why is it still so hard to talk about the bombings of Hiroshima and Nagasaki? Why are we still in denial?
Guest lecture: Laura Harkewicz.
Reading: Boyer, Excerpt from *Fallout*, 246-268

**6/1 A radioactive world: Health legacies of the bomb.**
There are many victims of the bomb who never set foot in Hiroshima or Nagasaki. Yet only recently has the U.S. government acknowledged this, and only recently have scholars managed to estimate how many excess cancers and other medical ailments can be traced to the atomic age.

Reading: *Atomic Audit: The Costs and Consequences of Nuclear Weapons since 1940,* edited by Stephen I. Schwartz (Washington D.C., Brooking Institution Press, 1998), pp 1-32, and pp. 394- 432, "Victims of the bomb."

**6/6 Plutonium is forever.**
The permanent legacy of nuclear waste. Military and civilian waste. The uncertain future of Yucca Mountain.
Reading:

Reading: *Atomic Audit: The Costs and Consequences of Nuclear Weapons since 1940,* edited by Stephen I. Schwartz (Washington D.C., Brooking Institution Press, 1998), pp. 353-394. "Nuclear waste management and environmental remediation,"
Kristin Shrader-Frechette: Burying Uncertainty, ----.

6/8 CONCLUDING LECTURE

**Term Project due Monday June 12**
**Final Exam as scheduled by the University**