

## Lecture 4 - Science the Endless Frontier

### Science and the Endless Frontier

#### Two major decisions need to be made toward the end of the War:

1. What to do with the Bomb?
2. What do we do about science and technology in general?

#### I. Decision about atomic energy

##### Overview

- A. Two problems:
  1. our own policy with regard to atomic energy and the atomic bomb
  2. world policy with regard to the control of atomic energy and the bomb
- B. the positions or sides that developed:
  - Military and government
    - ~ reluctant to loose control of a major new weapon
  - Scientists
    - ~ did not want to give up funding and freedoms
  - Public
    - ~ knew little about the bomb at first
    - ~ early reaction, bomb is a good thing

##### International Policy:

- March 1946, Baruch Plan (Acheson-Lilienthal Plan)
- June, 1946, UN established UN Atomic Energy Commission
- Key issue, how to establish international control
- ~ Control efforts failed

##### The debate over national policy

- A. National Control:
  - July, 1945, Interim Committee on Atomic Power proposal
  - July 1945 - December 1945, Congressional Hearings, Special Committee on Atomic Energy

- B. Scientists are still not satisfied, leads to Federation of Atomic (later American) Scientists, and the Bulletin of the Atomic Scientist, with it famous clock.
- C. Conclusions:
  - 1. advance science and technology first, worry about the consequences later
  - 2. With massive effort, we can accomplish anything
  - 3. Pressing social needs, such as war, play a major role in determining the course that science and technology take.

## II. Debate over science policy and science funding

### Pattern during WW II

- A funding for research increased dramatically
- B. distribution of funding went to a limited number of institutions
  - 66% of contract funds to 68 corporations
  - 40% of contract funds to 10 corporations
  - 90% of academic funds to 8 institutions
  - 35% of academic funds went to MIT (Rad Lab)
  - 9 out of 10 patents resulting from War research contracts went to corporations, not government
- C. Funding and policy was controlled by a few individuals who dominated the major decision-making bodies
- D. Key questions for post-WW II science policy:
  - 1. who should fund
  - 2. who should control
  - 3. how should benefit

### Bush Plan

- A. Vannevar Bush
  - PhD from Harvard and MIT
  - 1923, full professor at MIT
  - did important research on early computers (before electronic)
  - moved rapidly into administration
- B. Bush was part of a larger circle of similar scientific leaders who knew, consulted with, and supported each other
  - major members:
    - Vannevar Bush
    - Karl Compton, president of MIT
    - James Conant, president of Harvard

- Isaiah Bowman, president of Johns Hopkins
- Frank Jewett, NAS and Bell Labs president

C. Plan

- government support should continue
- scientists should control how funds are spent
- principle was that the "good science" would be funded
- no mention of patents, geographical distribution

**Opposite side, public ownership of science**

A. Kilgore Position -

- favored the development of a "National Science Foundation"
- would be organized for the public good
- would be under and controlled by the president
- benefits of federally funded research (patents) would stay with government, or government would at least receive a royalty
- favored funding of the social sciences
- also wanted funding distributed geographically

**Decisions, 1945•1950**

A. constituencies and control again are a problem

- scientists want funding with the least strings attached and the most self-control
- mission-oriented agencies want to control the research that is important to them
  - ~ Military
  - ~ Atomic Energy Commission
  - ~ Public Health Service
- government New Dealer's want maximum government control
- government Republicans want to get back in the hands of private industry

B. military has the resources and the authority to go ahead with its projects:

- AEC act left most atomic research in the hands of the military
- Navy, even during the War, began planning an Office of Naval Research
  - in 1946, when authorized had:
    - let \$24M in contracts
    - had 177 contracts with 81 universities
    - was supporting 602 academic research projects
    - would account for 3 of every 4 federal research dollars spend on research

C. Fall, 1945, Bush's plan become Magnuson bill, Kilgore's plan is Kilgore Bill, both are debated

- battle is over
  - ~ who will control, scientists or president
  - ~ will social sciences be included
  - ~ geographically distributed
  - ~ funding to institutions or individuals
  - ~ control of patents
- March, 1950, NSF bill finally passes
  - omitted geographic distribution
  - all military research left to military
  - was authorized and supported by the government, run by scientists
  - in theory, is closer to Bush Bill

F. State of research in 1949-50

DOD and PHS spent \$63M on campuses for research NSF limited to \$1.5M

- NSF authorization was for \$350K
- in 1949, DOD and AEC accounted for 96% of all R&D dollars spent on college campuses
- funding spread across a wide variety of funding agencies

**Summary:**

A. By 1950, the principle of government support for and scientific peer control of science has been established in NSF

- best science would be funded, as determined by peers
- equity and distribution not as important as quality
- accountability to government and social needs limited
- based on the belief in the importance of strong basic science

B. In fact, most of the nation's R&D is being channeled through DOD and AEC, and much less, PHS

C. UM research budget, 1956 R&D Budget, 200M

- 120M Defense
- 72M DOD
- 45 M AEC
- 26M NIH

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