Lecture 27
Large Science Projects

Superconducting Super Collider

- late 1970s, International Committee on Future Accelerators,
  discussed 20 TeV accelerators
- 1982 & 1983, American Physical Society Division of Particles and Fields workshops
  High Energy Physics Advisory Panel (HEPAP)
- 1983, DOE accept recommendations to fund

1984, set up the Central Design Group (CDG)

- LBL- Lawrence Berkeley Laboratory
- Brookhaven National Laboratory
- Fermi National Accelerator Laboratory
- Texas Accelerator Center --- all involved
- 250 scientists participating

1985-1987

- 1985 DOE review plans
- Presidential decision to proceed, 1987
- 43 proposals received, 35 of which met requirements
- seven selected by NAS review
- -DOE further studies, selects Texas site

1988 construction begins

- 16,000 acres of land purchased
- EIS completed, 1990
- construction of support facilities begun
- construction of magnets begun

1990 and 1992

- Problems emerge
  disagreements over design, especially detectors
  some major personality classes
  costs kept going up, from $2B initially to over 11B estimate when project ended
  GOA found waste in the management of the project
- June 1993, Congress votes to terminate, votes funds to shut down

Lessons

- politics became involved
- changing times
- scientific community did not do a good job of managing politics and cost issues
- jealousy from other scientific groups not being funded

Human genome project

- 1987 National Human Genome Research Institute (NHGRI), NIH
- Goal, comprehensive map of the human genome
  50,000-100,000 genes (estimated)
  3 billion base pairs (A, C, G, and T)
- Joined by DOE and USDA

Mapping varies in resolution:

- chromosomal map, made by microscopic observation and ways of marking
- more detailed maps made by cutting, duplicating, and characterizing

1990-94

- Genetic and physical maps
  Assemble families with known genetic diseases
  Physically identify differences (polymorphisms)
- Explore techniques for rapid sequencing
  Determining order or base pairs
  Create map of entire genome

2001

- Rough map of entire genome
- Estimate 30,000 genes

What does the mapping allow us to do?

- have located cystic fibrosis, Buchenne muscular dystrophy, myotonic dystrophy, neurofibromatosis, retinoblastoma, and most recently gene for some types of breast cancer
- in locating gene, can identify the proteins that it controls
- know proteins, can identify tests and possibly cures

Future of the genome project?

- ☛ After sequencing decisions:
  - Other genomes
  - Proteomics
  - Transcription mechanisms
- ☛ Social and ethical considerations
  - Are there limits to genetic engineering?
  - Cloning/stem cell research
  - Ownership and patenting issues
  - Equity and justice issues