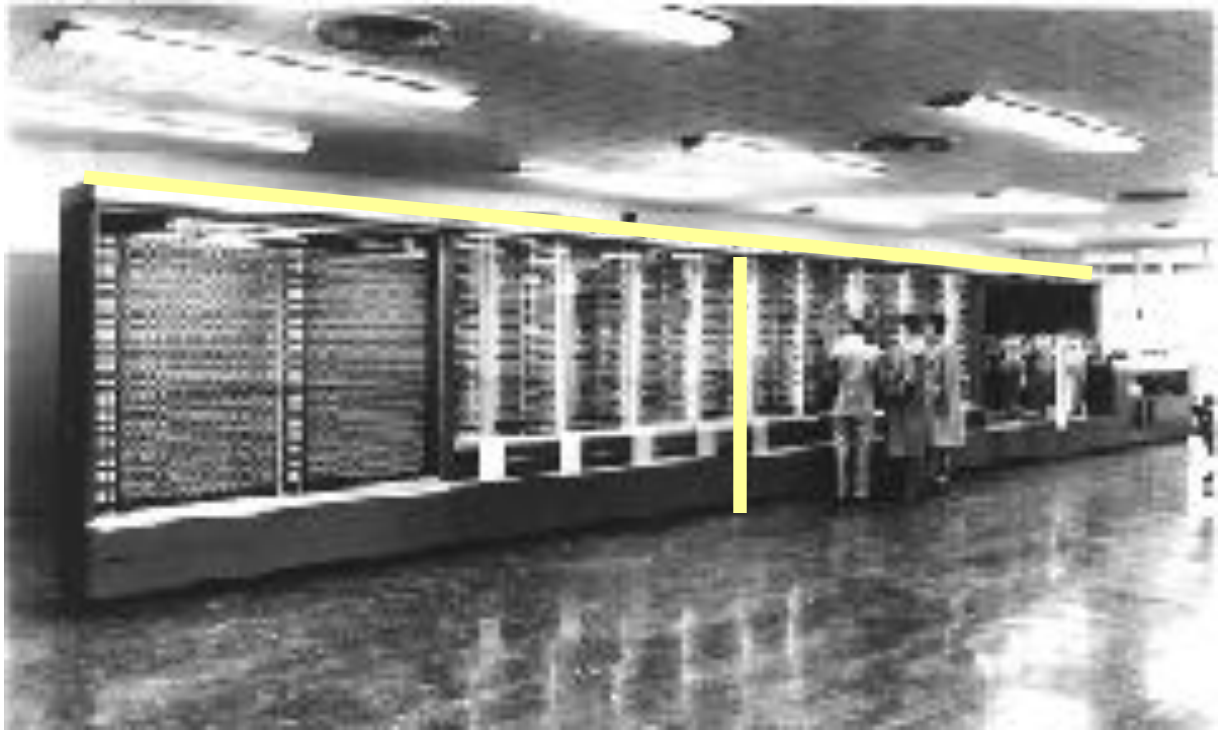
chapter 4

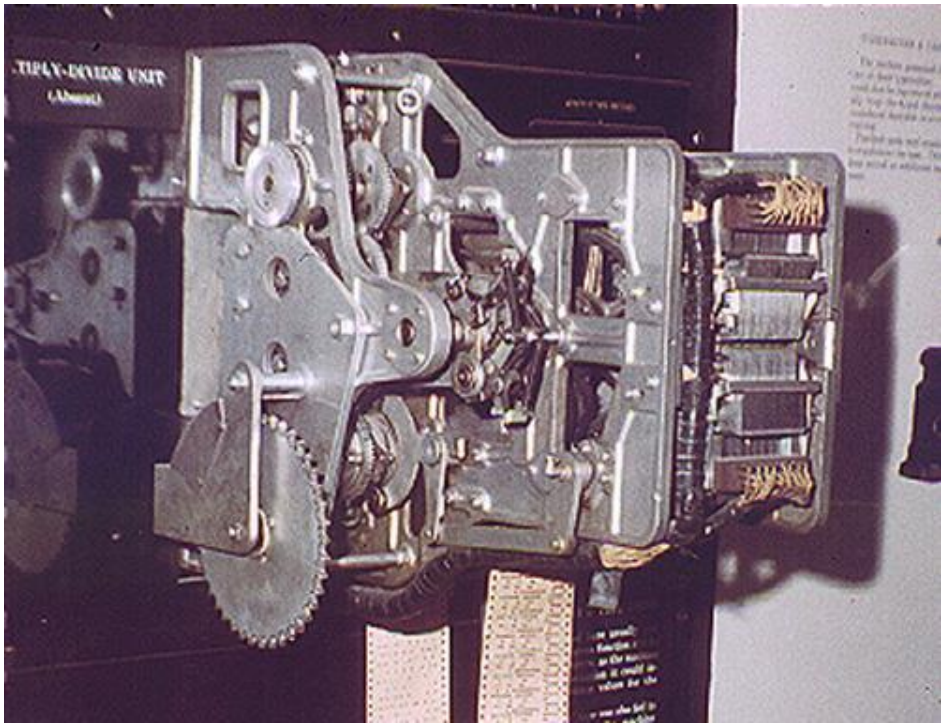
Paradigms (additional materials)

Beginnings – Computing in 1945



- Harvard Mark I
  - Picture from http://piano.dsi.uminho.pt/museuv/indexmark.htm
- 55 feet long, 8 feet high, 5 tons

Context - Computing in 1945



Picture from http://www.gmcc.ab.ca/~supy/

- Ballistics calculations
- Physical switches
  (before microprocessor)
- Paper tape
- Simple arithmetic & fixed calculations
  (before programs)
- 3 seconds to multiply

Batch Processing

- Computer had one task, performed sequentially
- No "interaction" between operator and computer after starting the run
- Punch cards, tapes for input
- Serial operations

People

- Who are the people associated with various interactive paradigm shifts?

Other Resources

- Howard Rheingold – *Tools for Thought*
  - History of interactive breakthroughs

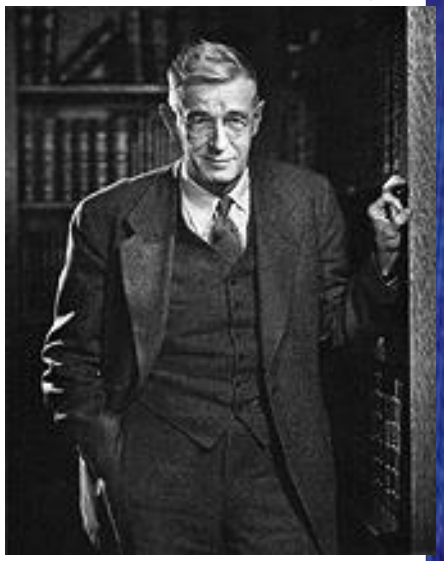
  - On-line at http://www.rheingold.com/texts/tft/

Innovator: Vannevar Bush

- "As We May Think" - 1945 Atlantic Monthly
  - "…publication has been extended far beyond our present ability to make real use of the record."
- Postulated **Memex** device
  - Stores *all* records/articles/communications
  - Items retrieved by indexing, keywords, cross references (now called hyperlinks)
  - (Envisioned as microfilm, not computer)
- Interactive and nonlinear components are key
- http://www.theatlantic.com/unbound/flashbks/computer/bushf.htm

More About Vannevar Bush

- Name rhymes with "Beaver"
- Faculty member MIT
- Coordinated WWII effort
  6000 US scientists
- Social contract for science
  - federal government funds universities
  - universities do basic research
  - research helps economy & national defense



Innovator: J. R. Licklider

- 1960 - Postulated "man-computer symbiosis"
- Couple human brains and computing machines tightly to revolutionize information handling

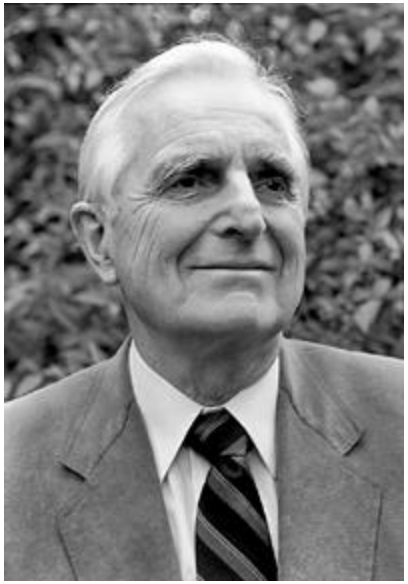
Innovator: Ivan Sutherland

- **SketchPad** - 1963 PhD thesis at MIT
  - Hierarchy - pictures & subpictures
  - Master picture with instances (ie, OOP)
  - Constraints
  - Icons
  - Copying
  - Light pen input device
  - Recursive operations

Innovator: Douglas Englebart

- Landmark system/demo:
  - hierarchical hypertext, multimedia, mouse, high-res display, windows, shared files, electronic messaging, CSCW, teleconferencing, ...

Inventor
of mouse



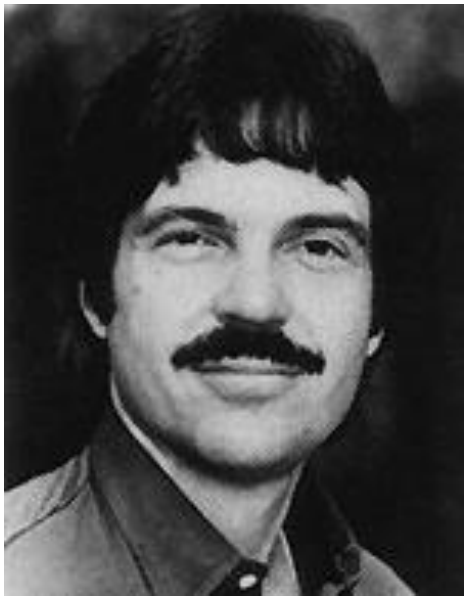
About Doug Engelbart

- Graduate of Berkeley (EE '55)
  - "bi-stable gaseous plasma digital devices"
- Stanford Research Institute (SRI)
  - Augmentation Research Center
- 1962 Paper "Conceptual Model for Human Intellect"
  - Complexity of problems increasing
  - Need better ways of solving problems

Picture of Engelbart from bootstrap.org

Innovator: Alan Kay

- Dynabook - Notebook sized computer loaded with multimedia and can store everything
- @PARC
- Personal computing
- Desktop interface
- Overlapping windows



Innovator: Ben Shneiderman

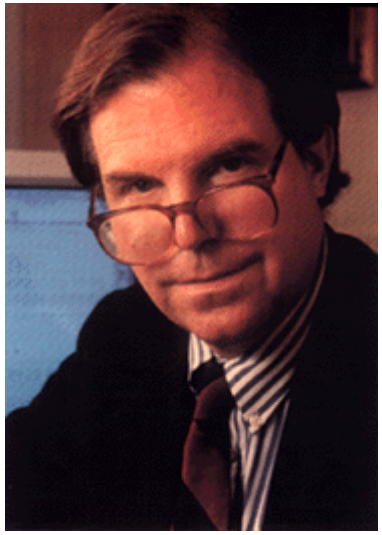
- Coins and explores notion of direct manipulation of interface
- Long-time Director of HCI Lab at Maryland

Innovator: Ted Nelson

- Computers can help people, not just business
- Coined term "hypertext"

Innovator: Nicholas Negroponte

- MIT Architecture Machine Group
  - '69-'80s - prior to Media Lab
- Ideas
  - wall-sized displays, video disks, AI in interfaces (agents), speech recognition, multimedia with hypertext
  - Put That There (Video)



Innovator: Mark Weiser

- Introduced notion of *Ubiquitous Computing* and *Calm Technology*
  - It's everywhere, but recedes quietly into background
- CTO of Xerox PARC