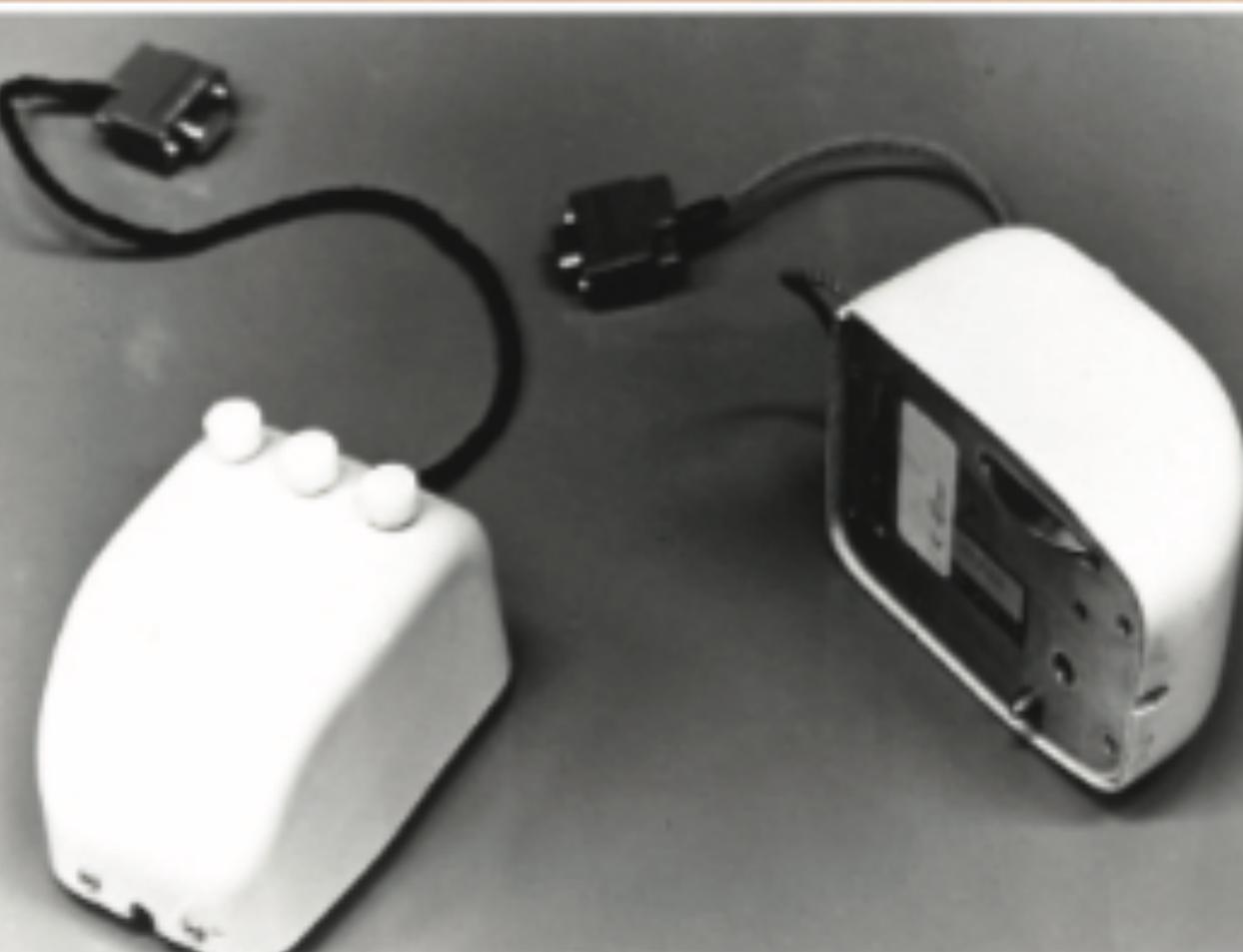


HCI History

CSCI 4849 Spring 2019



Today

- Course FAQs
- Mini-design activity
- History of GUIs
- Prep for coding activities next week 😱

Questions

- Questions about the course
- Syllabus Qs?

New today?

- Get on Canvas
 - Introduction thread
- Watch NLS video
- Reading due next Weds

Mother of All Demos (NLS)

- We'll talk more about this in a bit



An extremely compressed history of computer interfaces

What's important here?

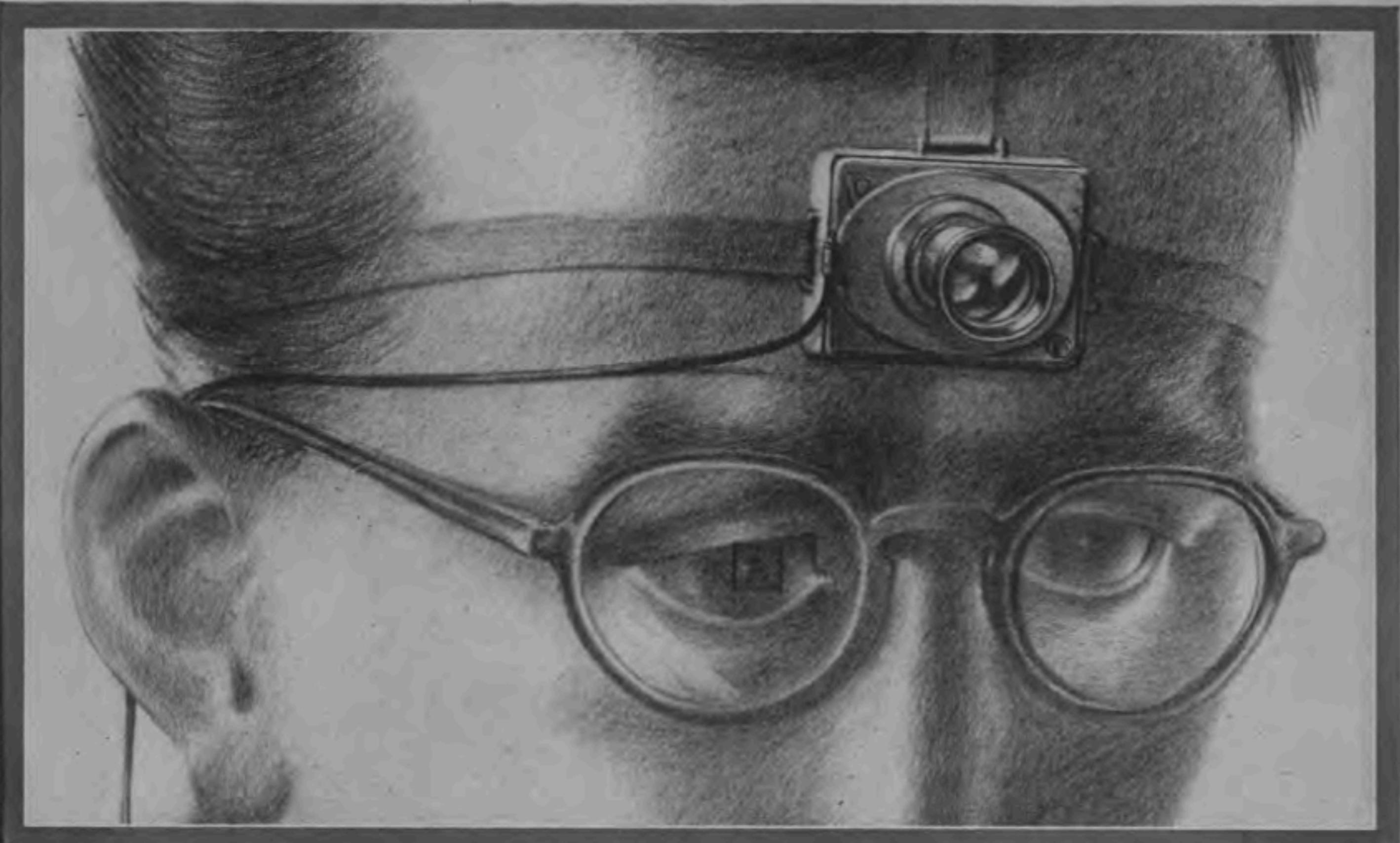
- Understand major points in the evolution of computer interfaces
- Understand the parallel evolution of input devices
- Identify basic interaction metaphors: direct manipulation, input modes
- I highly recommend Moggridge's *Designing Interactions* for more (interesting) history

Influential systems

- Memex (concept design in 1945)
- Sketchpad (1963)
- NLS (1968)
- Dynabook (1972)
- Xerox Alto (1973), Star (1981)
- Apple Lisa (1983), Macintosh (1984)

MEMory EXtender (Memex, 1945)

- Vannevar Bush, “As we may think,” Atlantic Monthly, 1945
- Concept sketch for augmenting human capability



A SCIENTIST OF THE FUTURE RECORDS EXPERIMENTS WITH A TINY CAMERA FITTED WITH UNIVERSAL-FOCUS LENS. THE SMALL SQUARE IN THE EYEGLASS AT THE LEFT SIGHTS THE OBJECT

AS WE MAY THINK

A TOP U. S. SCIENTIST FORESEES A POSSIBLE FUTURE WORLD
IN WHICH MAN-MADE MACHINES WILL START TO THINK

by VANNEVAR BUSH

DIRECTOR OF THE OFFICE OF SCIENTIFIC RESEARCH AND DEVELOPMENT

Condensed from the *Atlantic Monthly*, July 1945

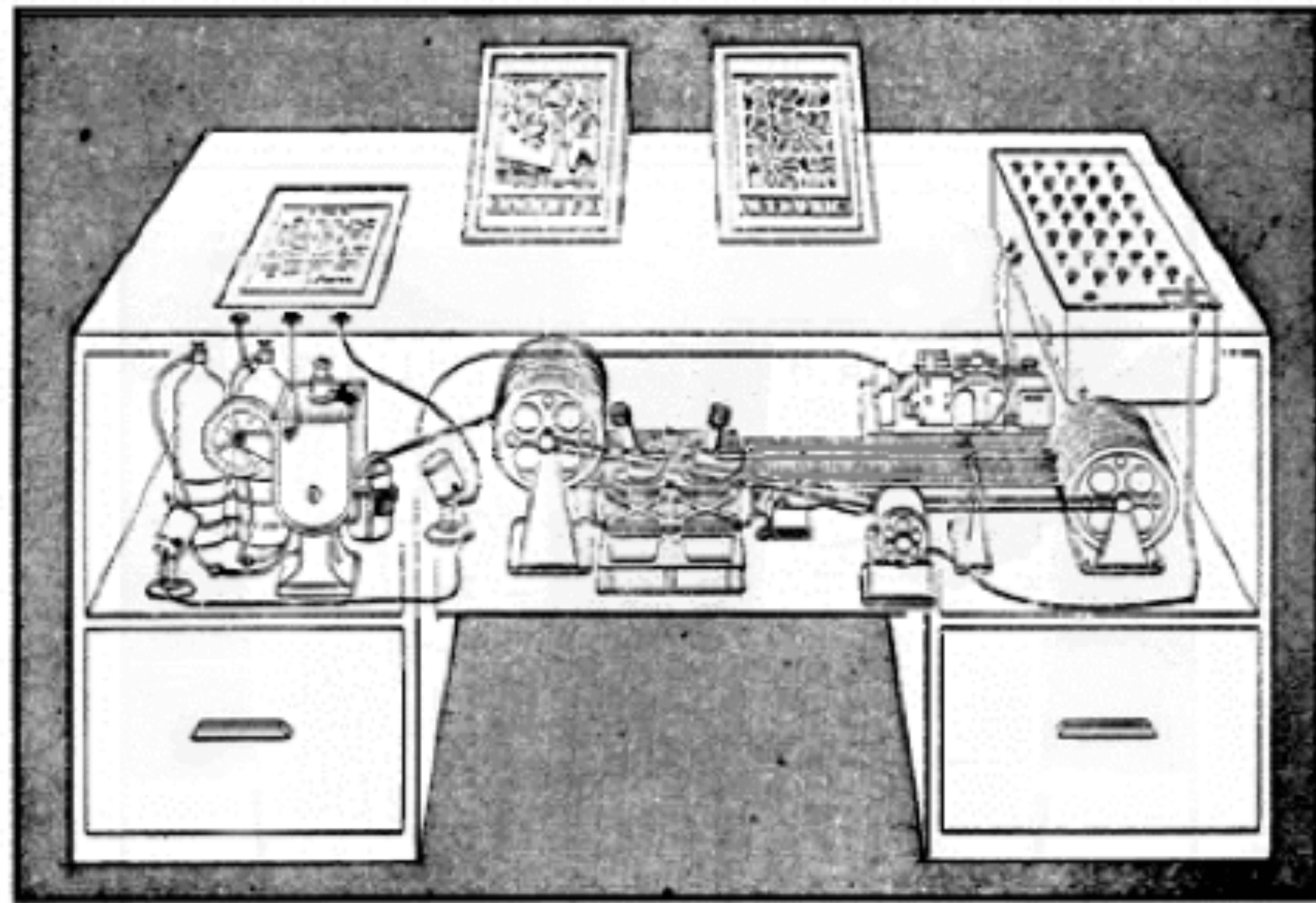
This has not been a scientists' war; it has been a war in which all have had

ress, and the effort to bridge between disciplines is correspondingly super-

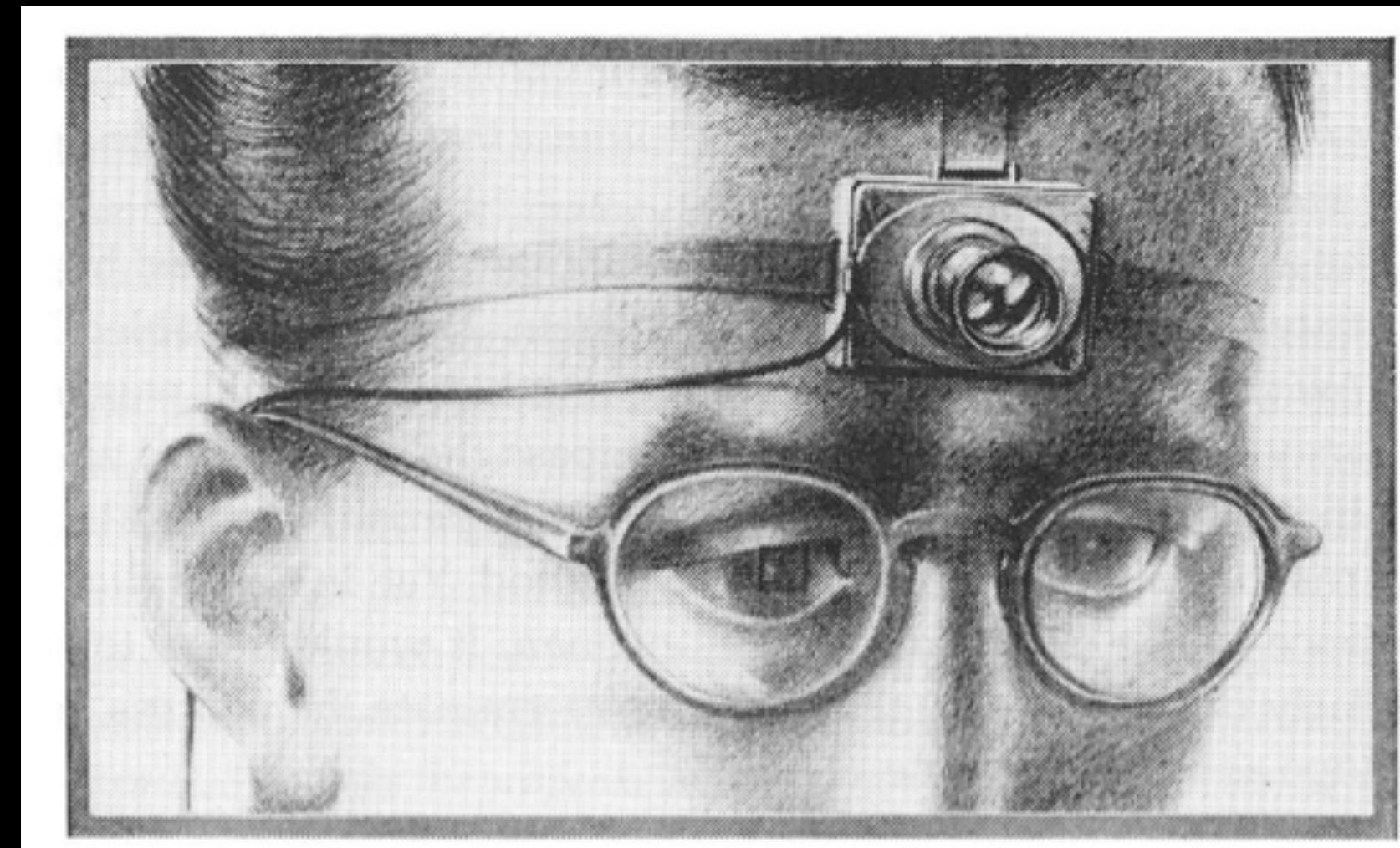
Description of the memex in use

- "The owner of the memex, let us say, is interested in the origin and properties of the bow and arrow. [...] He has dozens of possibly pertinent books and articles in his memex. First he runs through an encyclopedia, finds an interesting but sketchy article, leaves it projected. Next, in a history, he finds another pertinent item, and ties the two together. Thus he goes, building a trail of many items. Occasionally he inserts a comment of his own, either linking it into the main trail or joining it by a side trail to a particular item. [...]"

Memex hardware concepts

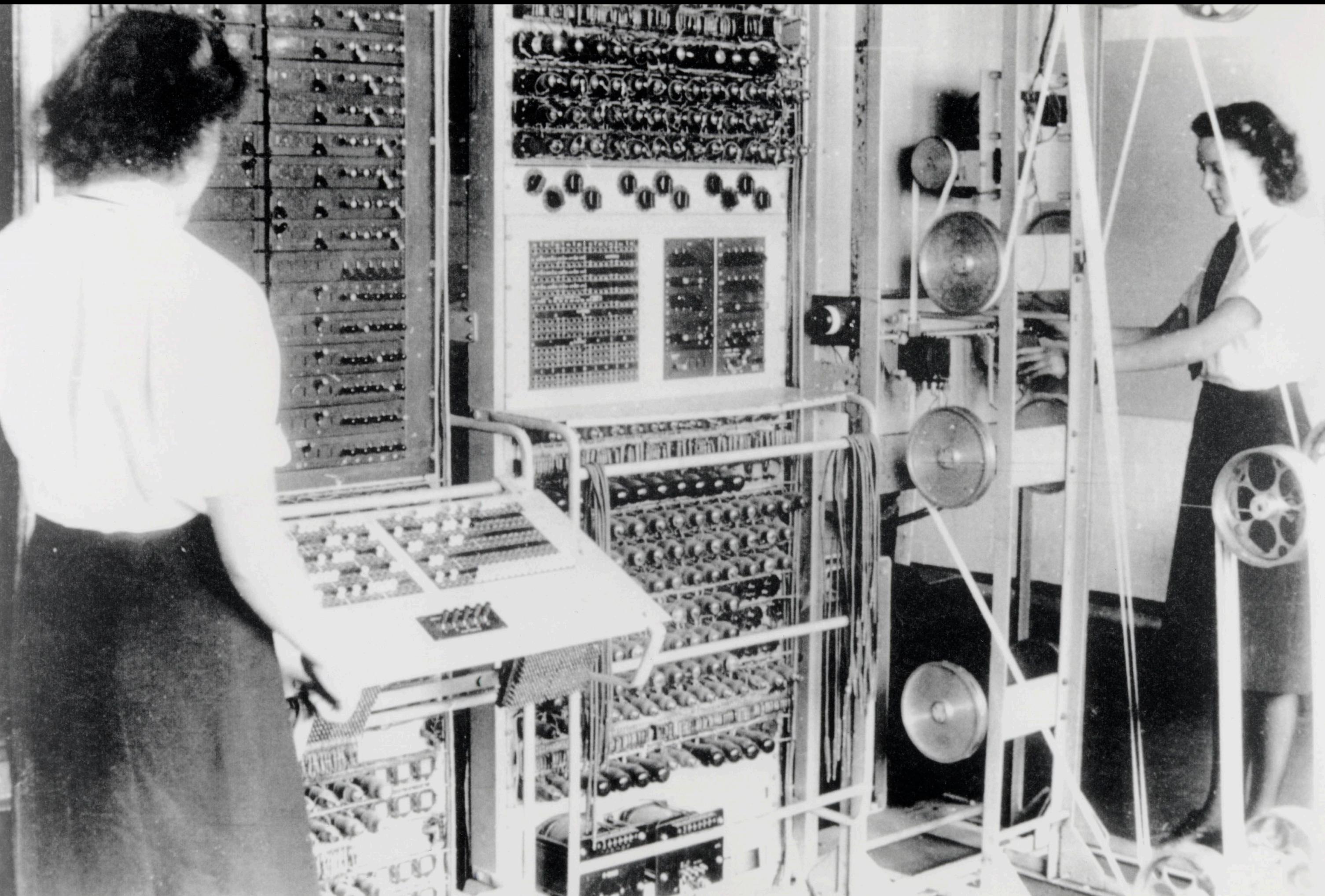


Memex in the form of a desk would instantly bring files and material on any subject to the operator's fingertips. Slanting translucent viewing screens magnify supermicrofilm filed by code numbers. At left is a mechanism which automatically photographs longhand notes, pictures and letters, then files them in the desk for future reference (LIFE 19(11), p. 123).



A scientist of the future records experiments with a tiny camera fitted with universal-focus lens. The small square in the eyeglass at the left sights the object (LIFE 19(11), p. 112).

What computers looked like in 1945



Ideas introduced in the memex

- Hypertext
- Bookmarks
- Document annotations
- Share annotations with other users
- Networked encyclopedias

Sketchpad (1963)

- Interactive drawing tool
- Ivan Sutherland, MIT PhD student
- Used a light pen and oscilloscope (CRT monitors had not been invented yet)



Sketchpad videos

- [Full video](#)
- [Abbreviated version \(narration by Alan Kay\)](#)

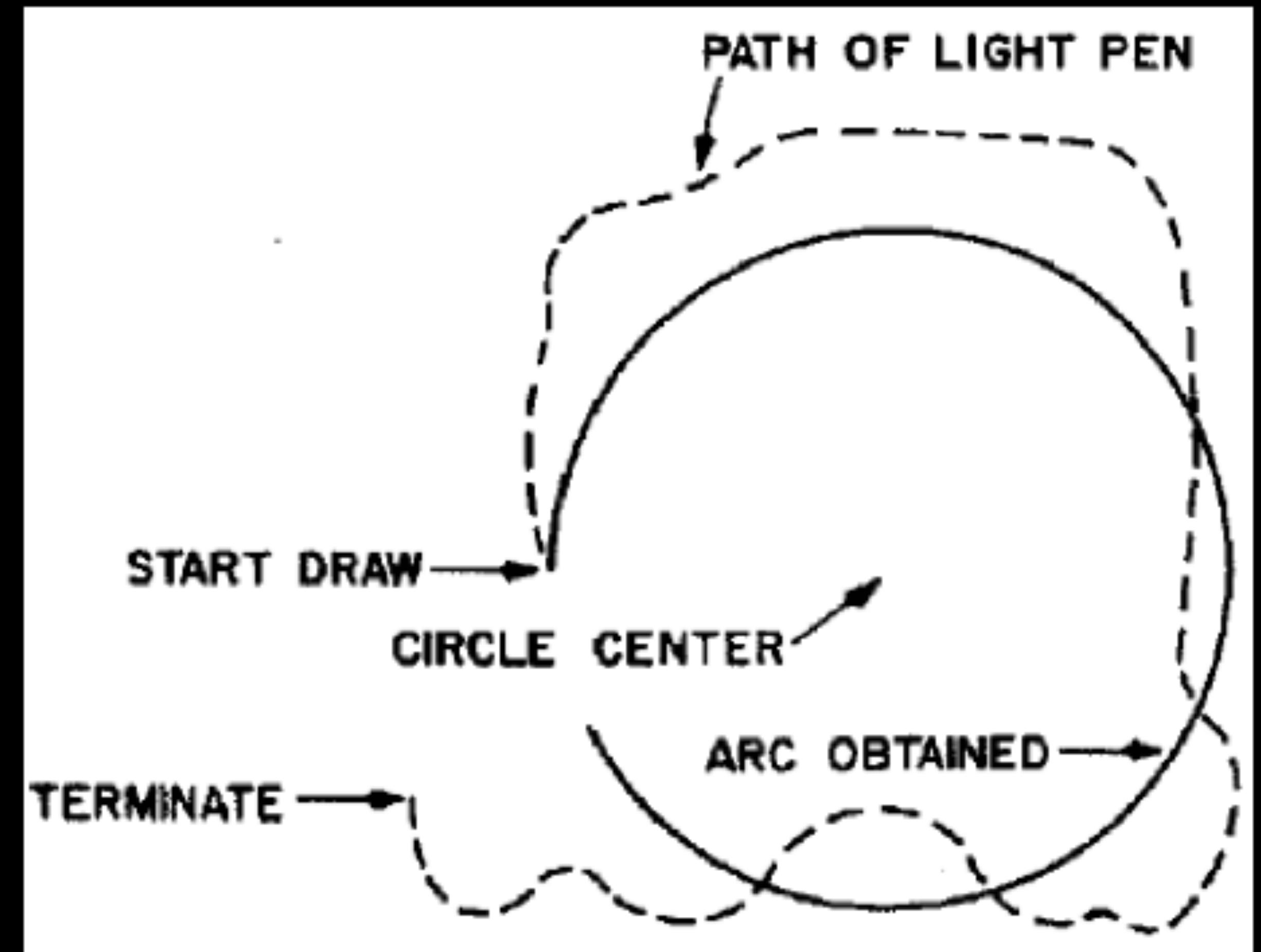
First monitor: DEC VT05 (1970)



What did we see in Sketchpad?

Contributions of Sketchpad

- Graphical user interface
- Direct manipulation
- CAD concepts
- Constraint solving
- Master objects and instances
- Snapping behavior
- Light pen tracking
- Bimanual interaction



Big idea: Direct manipulation

- In the old world, if you wanted the computer to draw a rectangle, you would have to specify numbers describing the rectangle (x,y,w,h)
- Using direct manipulation, you can draw the rectangle where you want, at the size you want
- If you wanted to make it a little larger/smaller, you can drag it to change size, rather than guessing

oN-Line System (NLS, 1968)

- Presented by Douglas Engelbart from the Stanford Research Institute
- "The mother of all demos" Dec 9, 1968

NLS (1968)

- Overview
- Demo highlights



What did we see in NLS?

(Some) Contributions from NLS

- Hypertext
- Cut, copy
- File creation
- Direct manipulation
- Mouse, mouse cursor
- Text editor
- Graph editor
- Networking

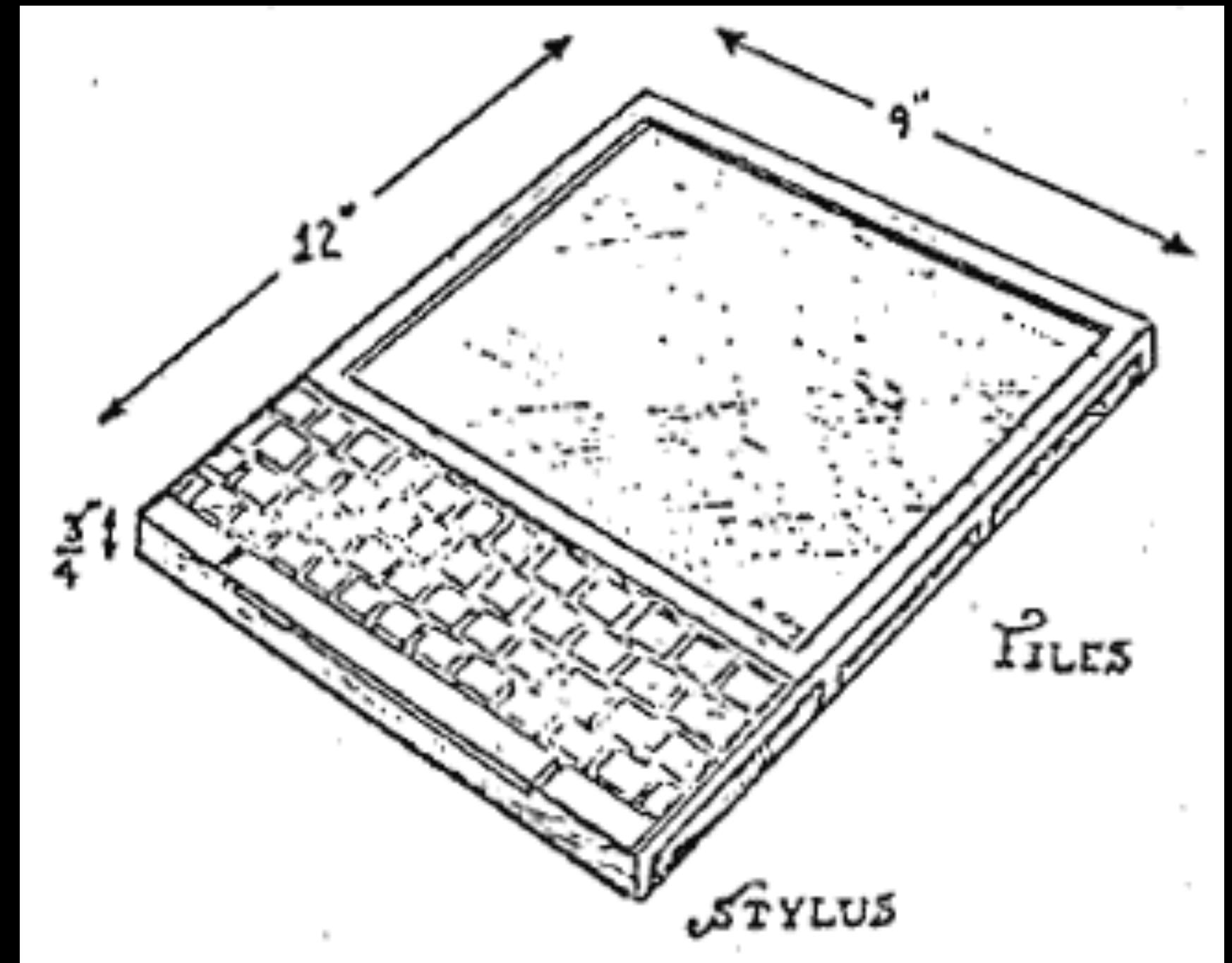
The mouse

- Used two rotary encoders to detect position, three buttons on top



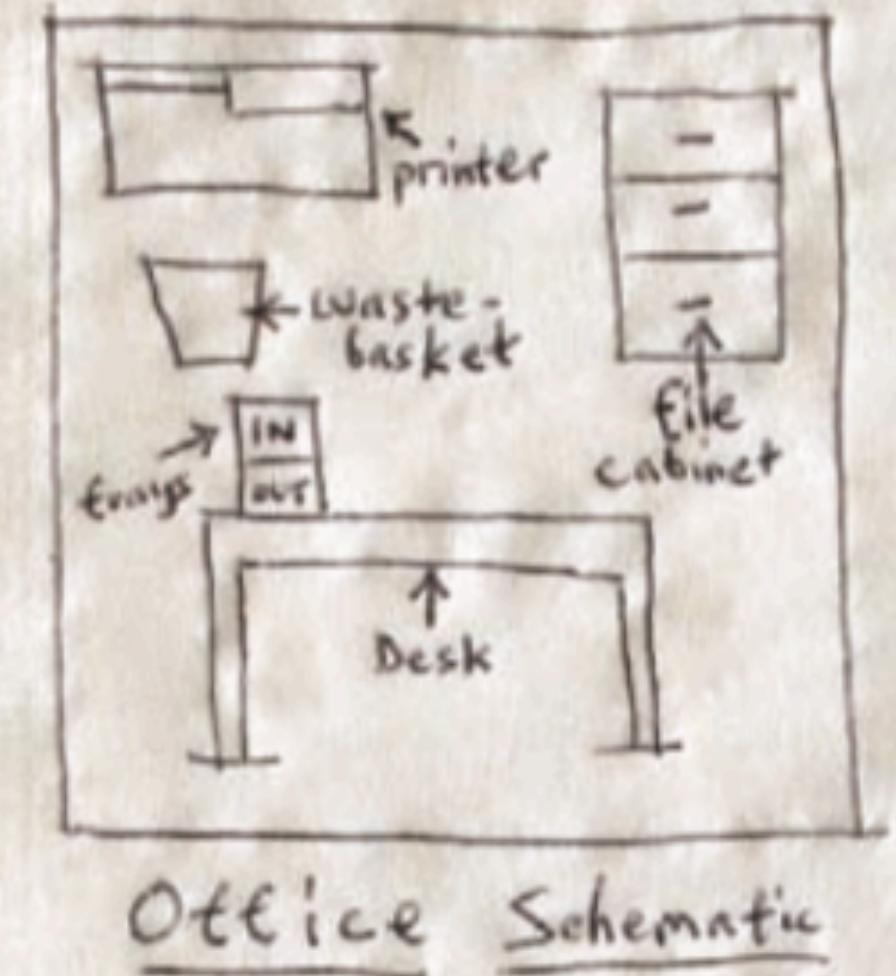
Dynabook (Alan Kay, 1972)

- "A personal computer for children of all ages"
- Concept design



Office schematic (Mott and Tesler, 1970s)

- "I was in a bar late one afternoon waiting for a friend, doodling on a bar napkin and thinking about this problem. I was just obsessed with this design at the time; I was just consumed by it. I was thinking about what happens in an office. Someone's got a document and they want to file it, so they walk over to the file cabinet and put it in the file cabinet; or if they want to make a copy of it, they walk over to the copier and they make a copy of it; or they want to throw it away, so they reach under their desk and throw it in the trash can.
- I'm sitting there thinking about this and I'm doodling. What ended up on the bar napkin was what Larry and I called the "Office Schematic." It was a set of icons for a file cabinet, and a copier, or a printer in this case, and a trash can. The metaphor was that entire documents could be grabbed by the mouse and moved around on the screen. We didn't think about it as a desktop, we thought about it as moving these documents around an office. They could be dropped into a file cabinet, or they could be dropped onto a printer, or they could be dropped into a trashcan."



PRINT, FILE, DELETE, MAIL
all are inter-doc actions
— II —
INTRA-DOC use cut & Paste physical metaphor
what's analog for INTER-DOC ??
Grab & Move !!!

The modern GUI (1970s-80s)

- **Xerox Alto (1973)**
 - First GUI, WYSIWYG editing, graphics editing
 - Keyboard, 3-button mouse, 5-key chording keyboard
- **Xerox Star (1981) - refined, more usable**
 - Bitmap graphics and text
 - Black text on white background!
 - Overlapping windows, desktop metaphor
 - Direct manipulation, Ethernet networking
 - Based on prototyping & user testing



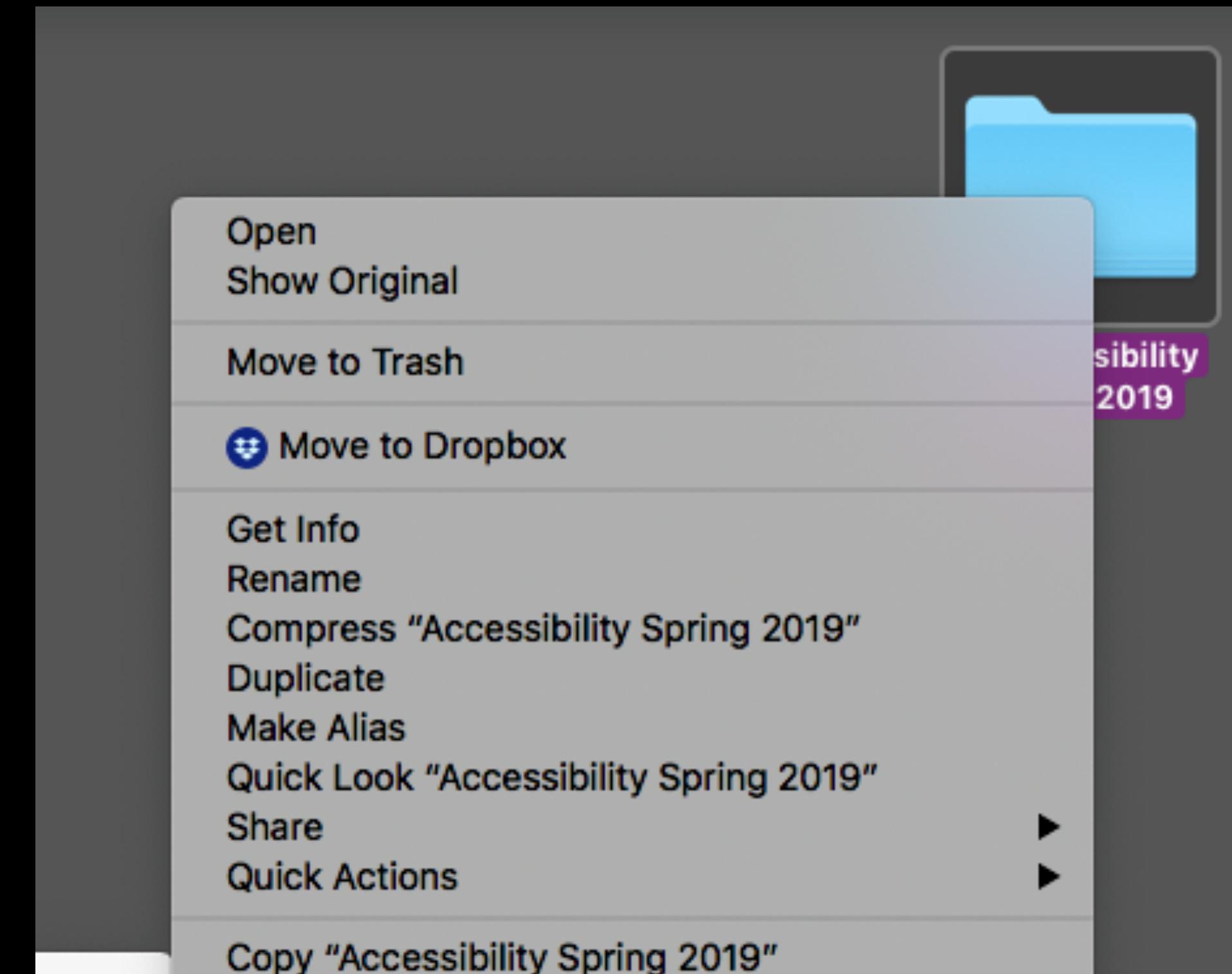
Next steps

- Apple Lisa (1983)
 - Heavily influenced by Xerox Star
 - Cut, copy, paste; menu bar; desktop metaphor; direct manipulation
 - Selection-action: object-verb interaction
- Apple Macintosh (1984)
 - First commercial success
 - Good apps: MacWrite and MacPaint
 - Programmers' widget toolbox in ROM
 - Button, checkbox, scrollbar, menu



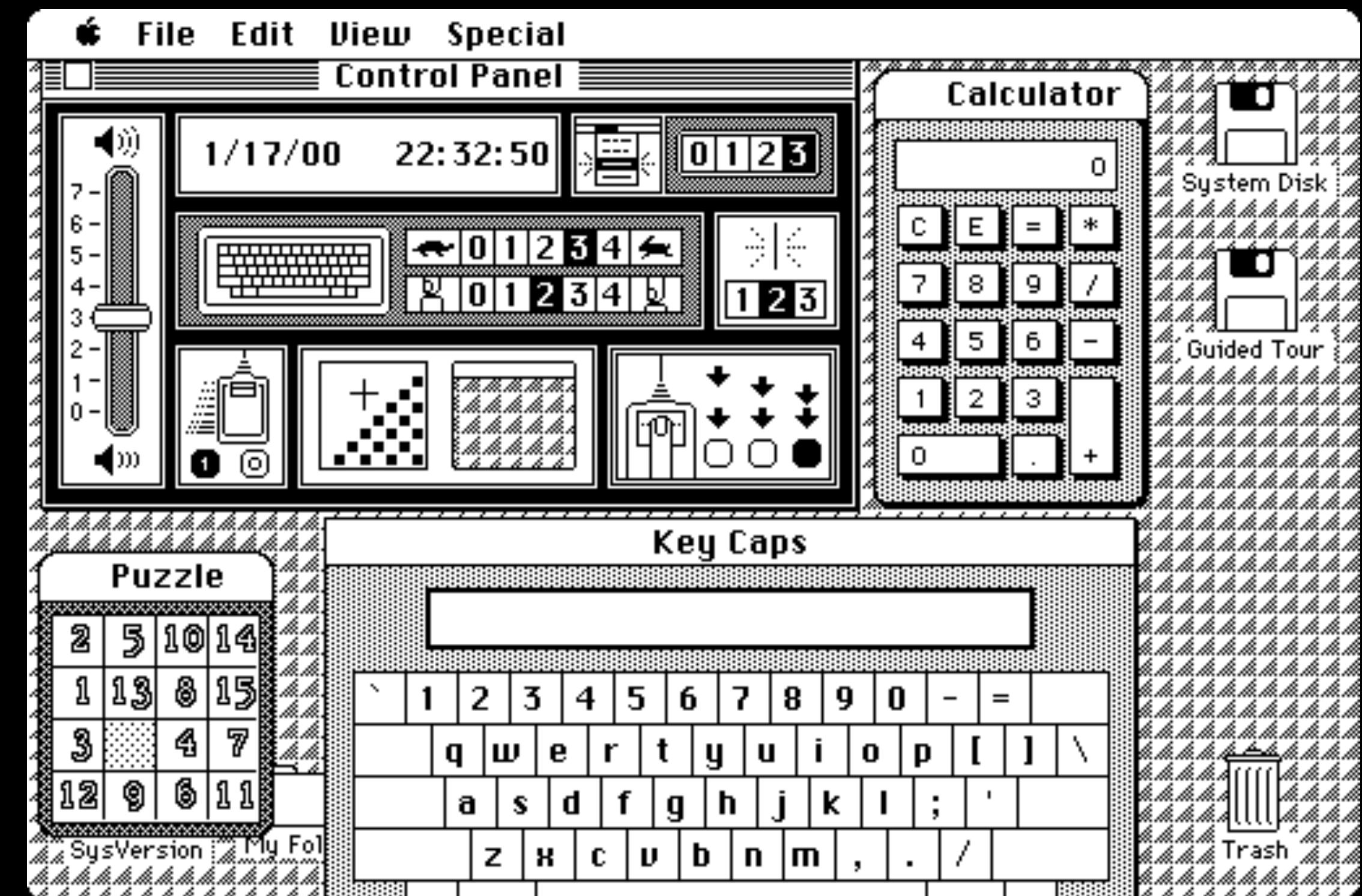
Big idea: object-verb interaction (1983)

- On the command line, we usually follow verb-object order:
 - `ls ~/Documents`
 - `cp a.csv b.csv`
- In GUIs, this is often reversed
 - Why does this matter?



Big idea: widget toolkit (1984)

- Standard set of UI widgets
- Specified common appearance and common behavior



Big idea: Human Interface Guidelines (1987)

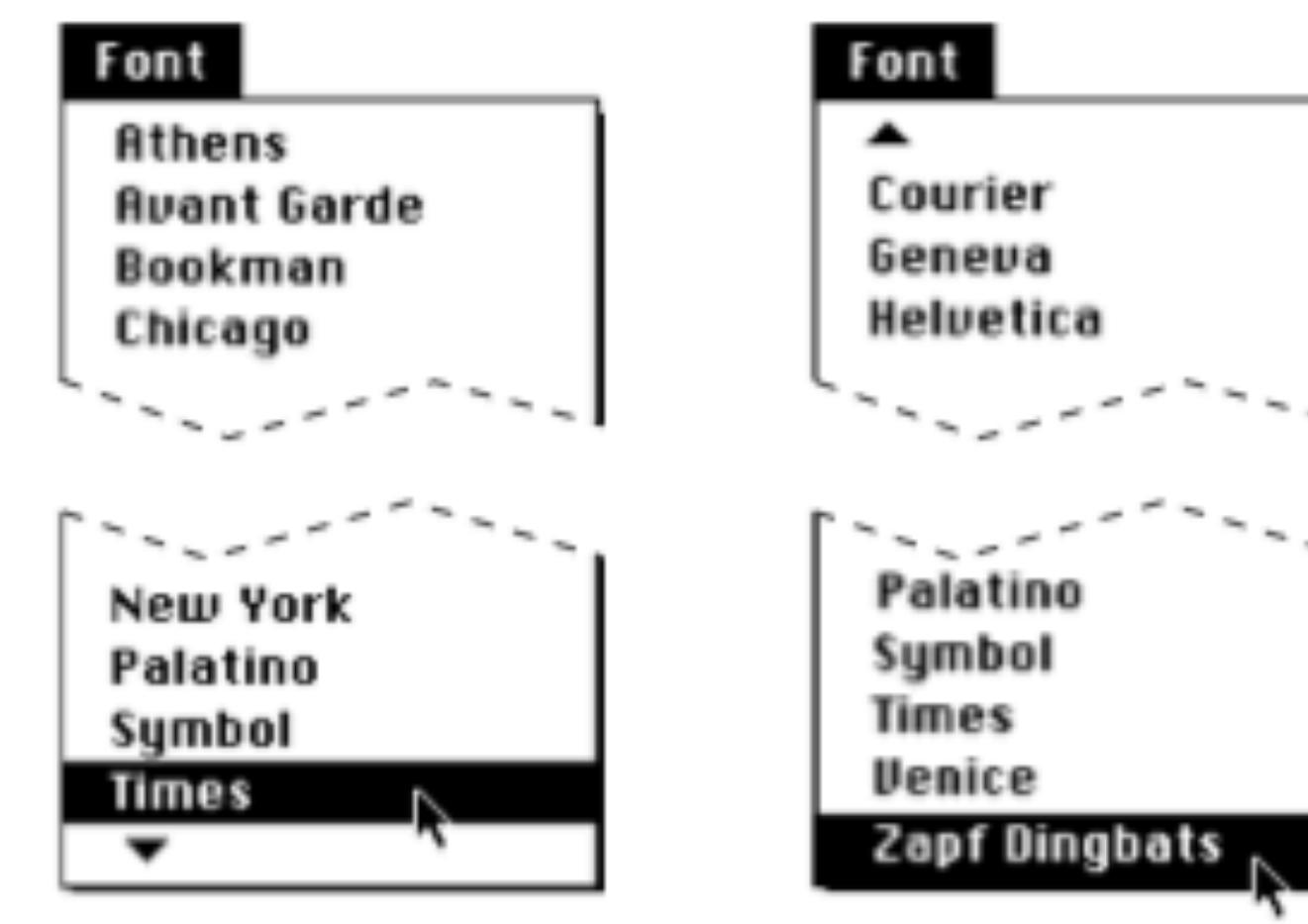
- Document specifying how user interfaces should function

Scrolling Menus

Scrolling menus contain more menu items than are visible on the screen. (For a nonscrolling menu, you can usually use between eight and twelve menu items and still have a menu that is easy to use and to navigate.) Scrolling menus should exist only when a user adds many items to a customizable menu like the Font menu.

If a menu becomes too long to fit on the screen, an indicator appears at the bottom of the menu to show that there are more items. When the user starts to scroll, an indicator appears at the top of the menu to show that some items are no longer visible in that direction. When the user drags past the last visible item, the menu scrolls to show the additional items. When the last item is shown, the downward-pointing indicator disappears. Figure 4-34 shows this behavior.

Figure 4-34 A scrolling menu

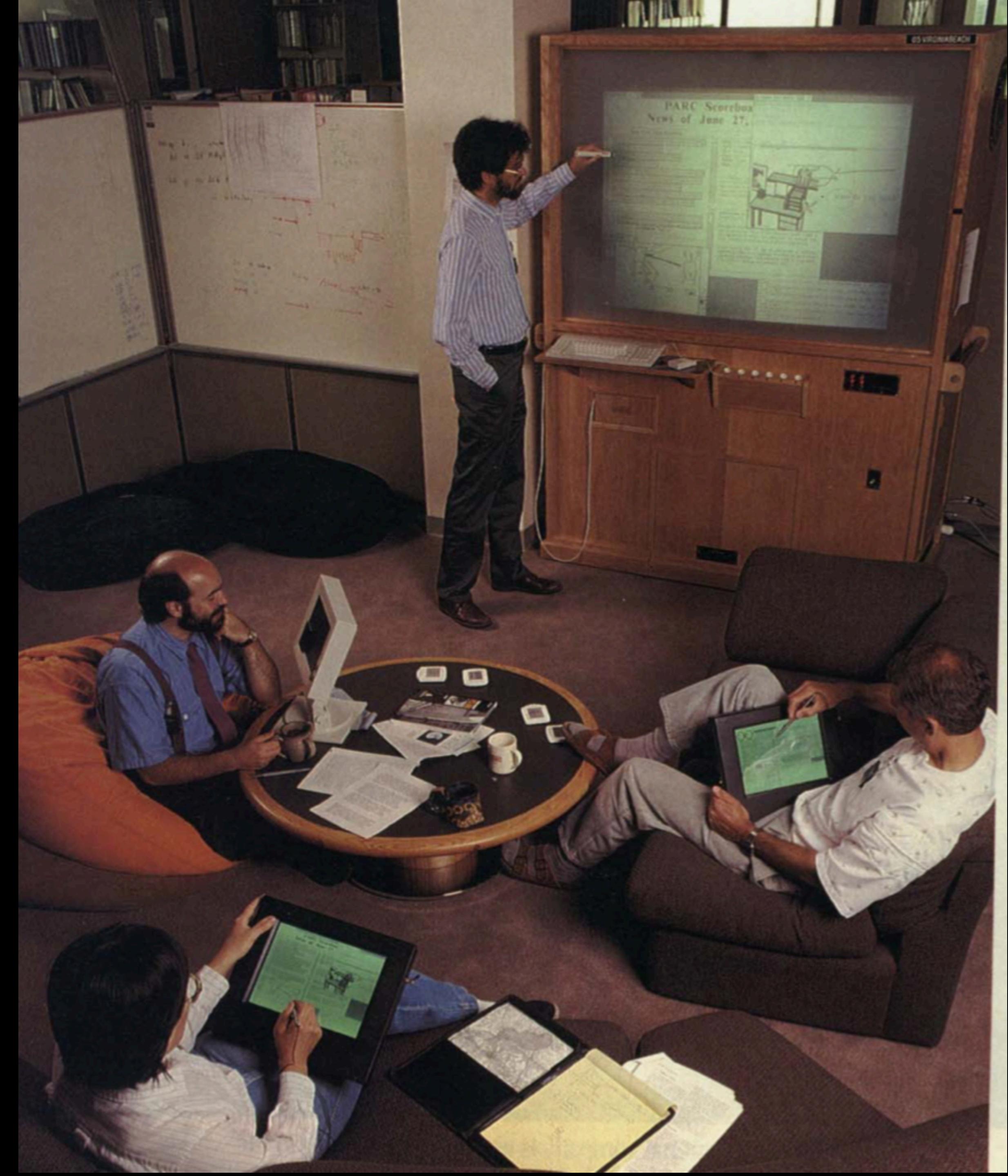


Other influential systems

- Weiser's *Computer for the 21st Century* (1991)
- MetaDESK (1997)

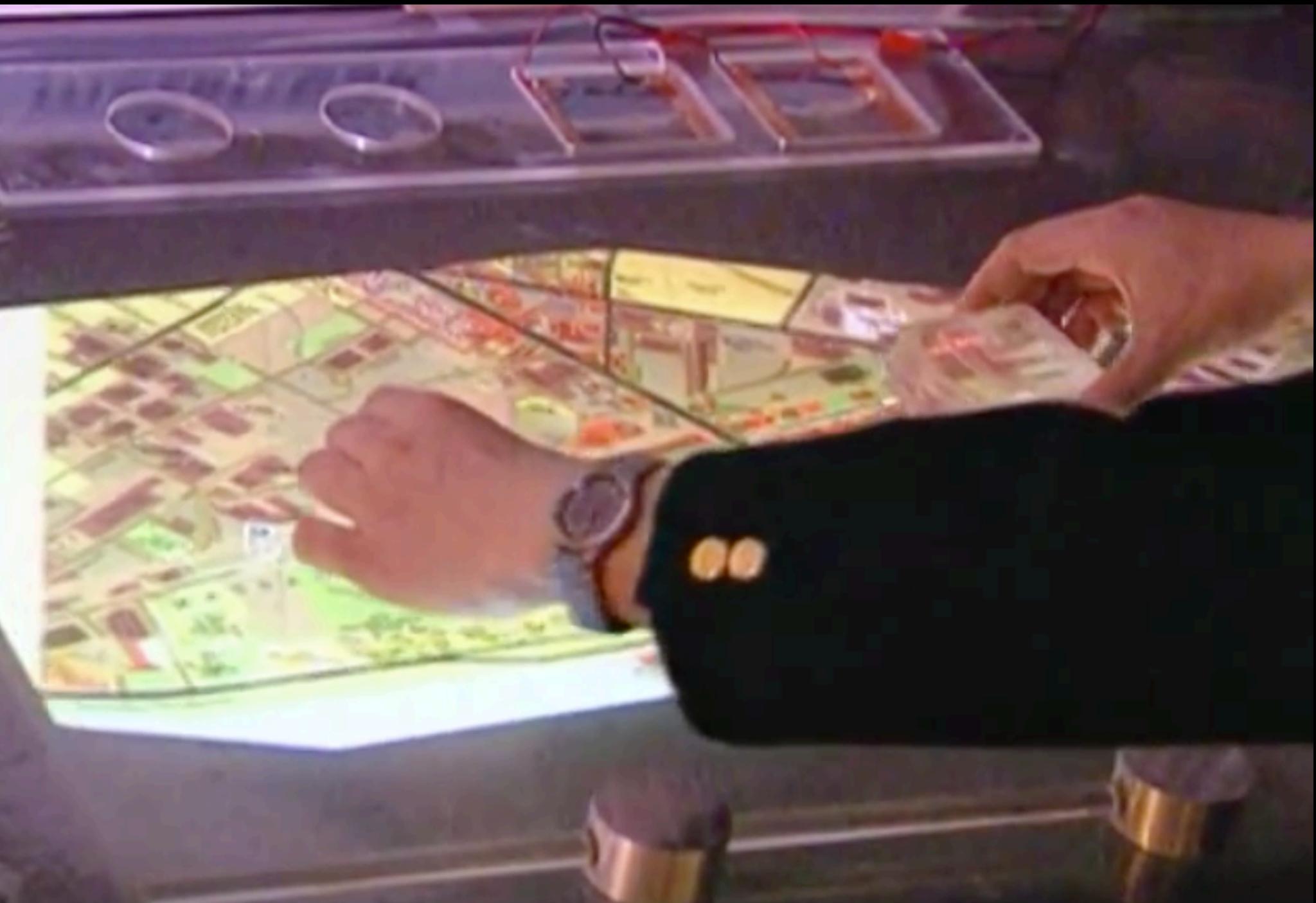
Weiser, ubiquitous computing (1991)

- “Calm computing” - computers are seamlessly integrated into our lives
- New computing form factors: *active badges, pad, tab, and board*



metaDESK (1997)

- Early tangible computing system
- Focus on interacting with computer through physical manipulation of objects

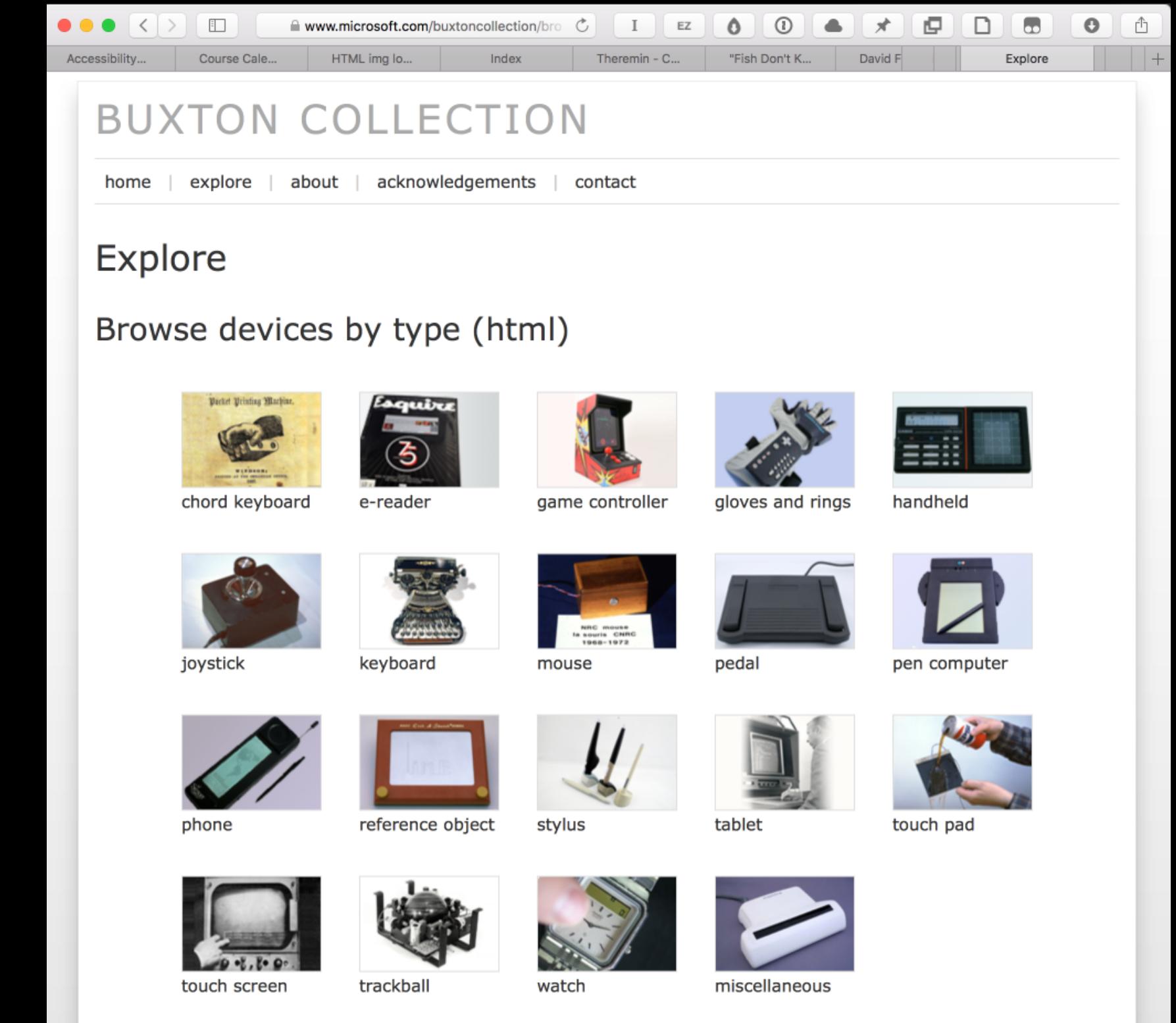


Takeaways

- Parallel development of input mechanisms and interaction paradigms
- Some foundational elements of our UIs: direct manipulation, object-verb interaction
- These are actually quite old!
- Technology is often relatively simple

A whole world of input devices

- Bill Buxton has collected hundreds of input devices covering decades of work
- Physical collection (sometimes touring) and online



Disappearing and re-emerging devices

- Sometimes technology needed more time (e.g. iPad became iPhone and then became iPad)
- Sometimes held back by market forces or production (e.g. depth-sensing cameras only became affordable with Microsoft Kinect)
- Sometimes other uses are found (e.g. chording keyboards used in some wearable computing systems)



Activities

Activity 1: Design history

- Consider the Nintendo Switch (or another gadget from 2016 or later)
- Find its “interaction ancestors”
- See shaun.cat/history

Activity 2: Design

- This is Kavita
- Kavita has Spinal Muscular Atrophy and uses the Beam robot for telepresence
- What kinds of accessibility challenges would Kavita experience in a class like this?
- Let's brainstorm problems (together) and solutions (with our neighbors)



For next time (Wednesday)

- We'll be doing some UI programming in JavaScript, HTML, CSS
- Set up a Github account if you don't have one already
- Draft of activity up on Canvas (may make some small changes)
- **Reading assignment 1 due Wednesday at 3pm**