Fundamentals of Human-Computer Interaction 2

Photos/collage by Jack L. Moffet in Dan R. Olsen, « Interacting in Chaos », Interactions, sept-oct 1999.

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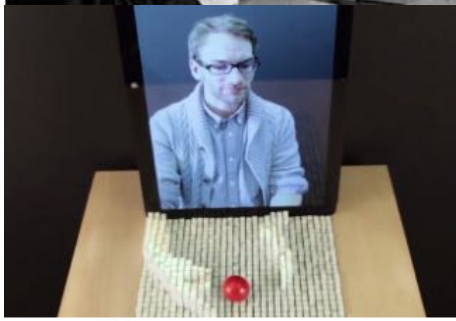
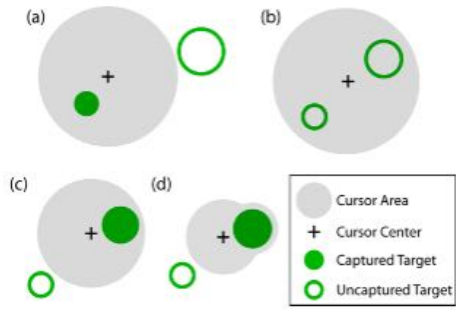
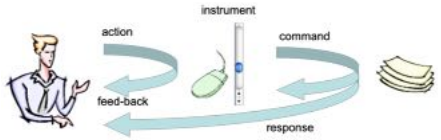
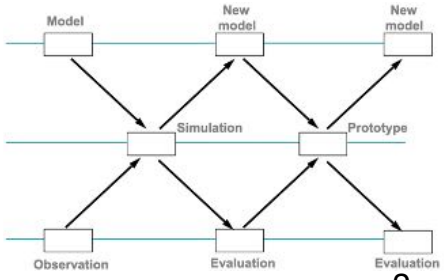
Outline

FundHCI 1	FundHCI 2
Introduction	History
Interaction styles	Collaborative computing
Psychology for HCI	Pointing and navigation
Graphical interaction	Instrumental interaction
Conceptual design	Theories and models for HCI









A short history of Human-Computer Interaction

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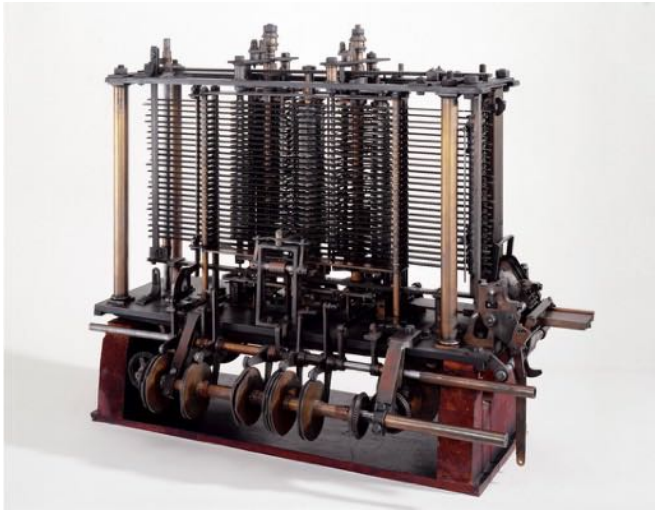
See Michel Beaudouin-Lafon, *50 ans d'Interaction Homme-Machine : retours vers le futur*, 2016, Interstices
https://interstices.info/50-ans-dinteraction-homme-machine-retours-vers-le-futur/

Before computers

Mechanization of calculation

Abacus
2500BC

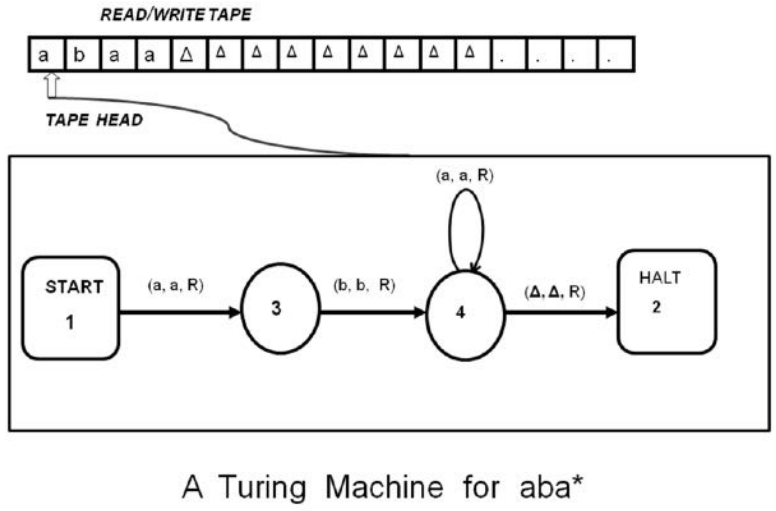
Pascaline
1645



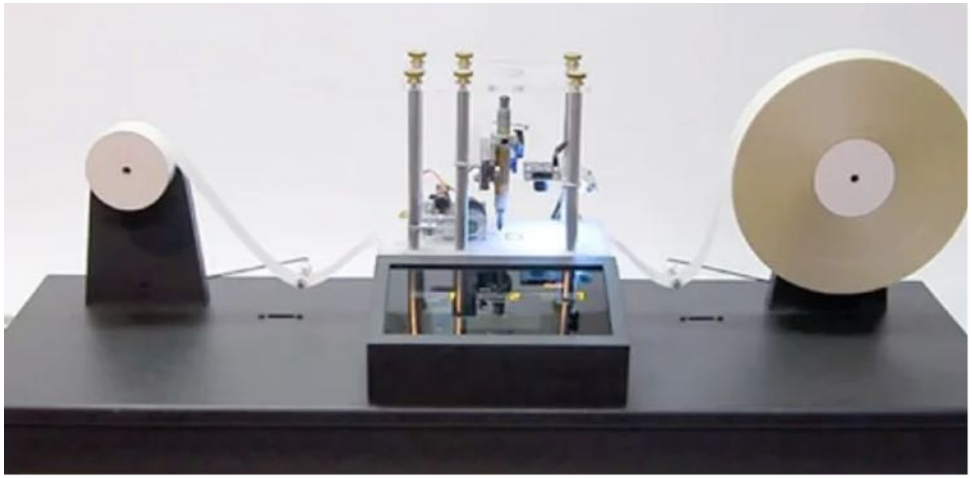
Analytical engine
1837

Universal Turing Machine (1937)

The “universal computer”



A Turing Machine for aba*



Universal but …

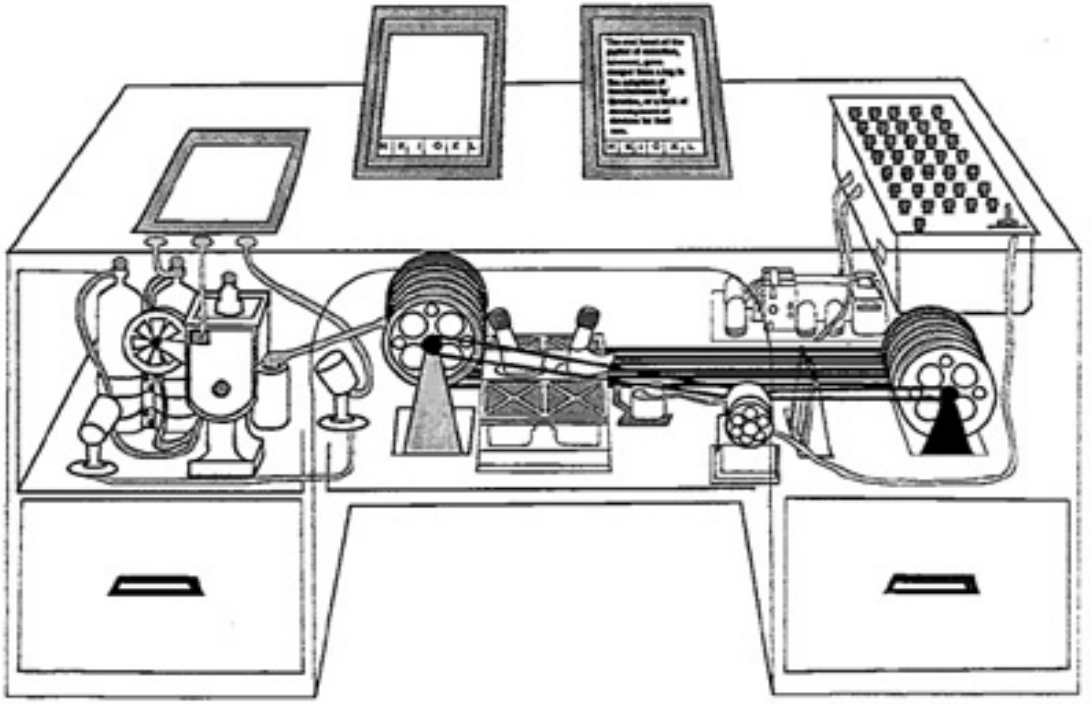
- No interaction
- No notion of time (cannot program a double-click!)

Memex - Vannevar Bush (1945)

Vision for a desktop information management system

Electromechanical system

Seen as the ancestor of the notion of hypertext

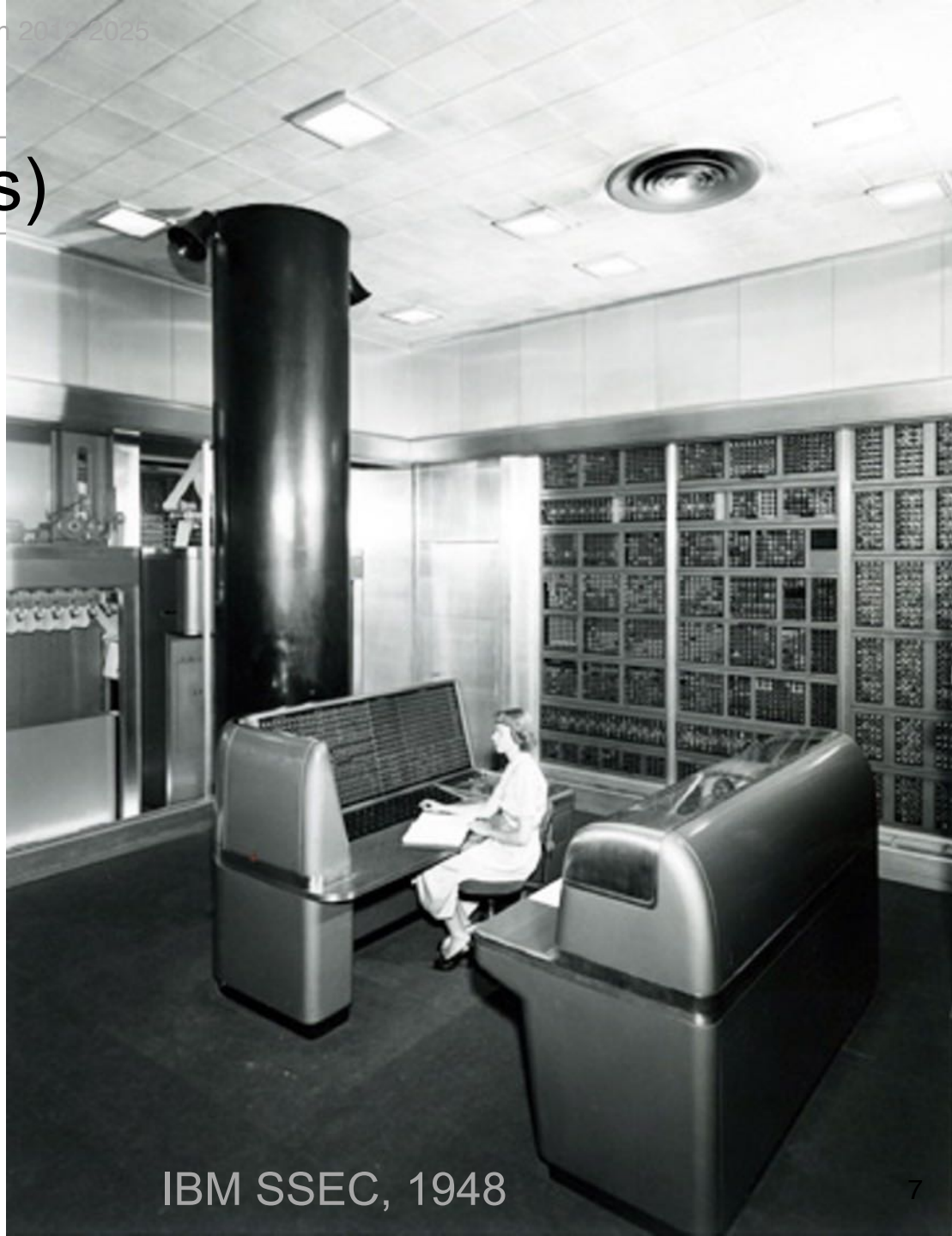


Early computers (1950's)

Humans are "operators"

Mostly women …
until the job is seen as
too prestigious for women…

Grace Murray Hopper
First compiler (1952)

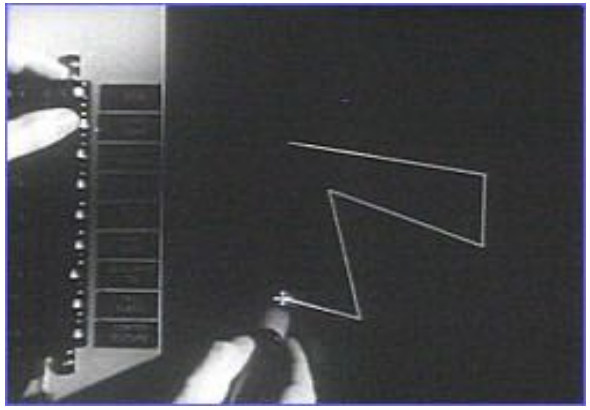


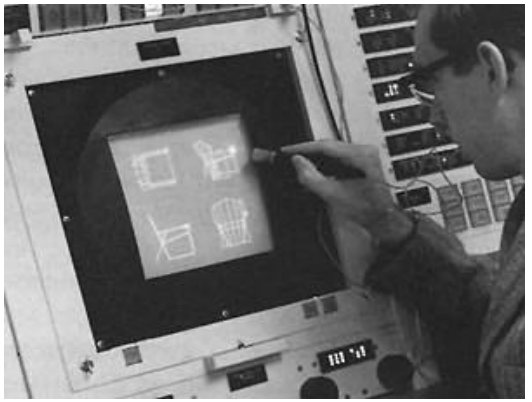
IBM SSEC, 1948

Sketchpad - Ivan Sutherland (1963)

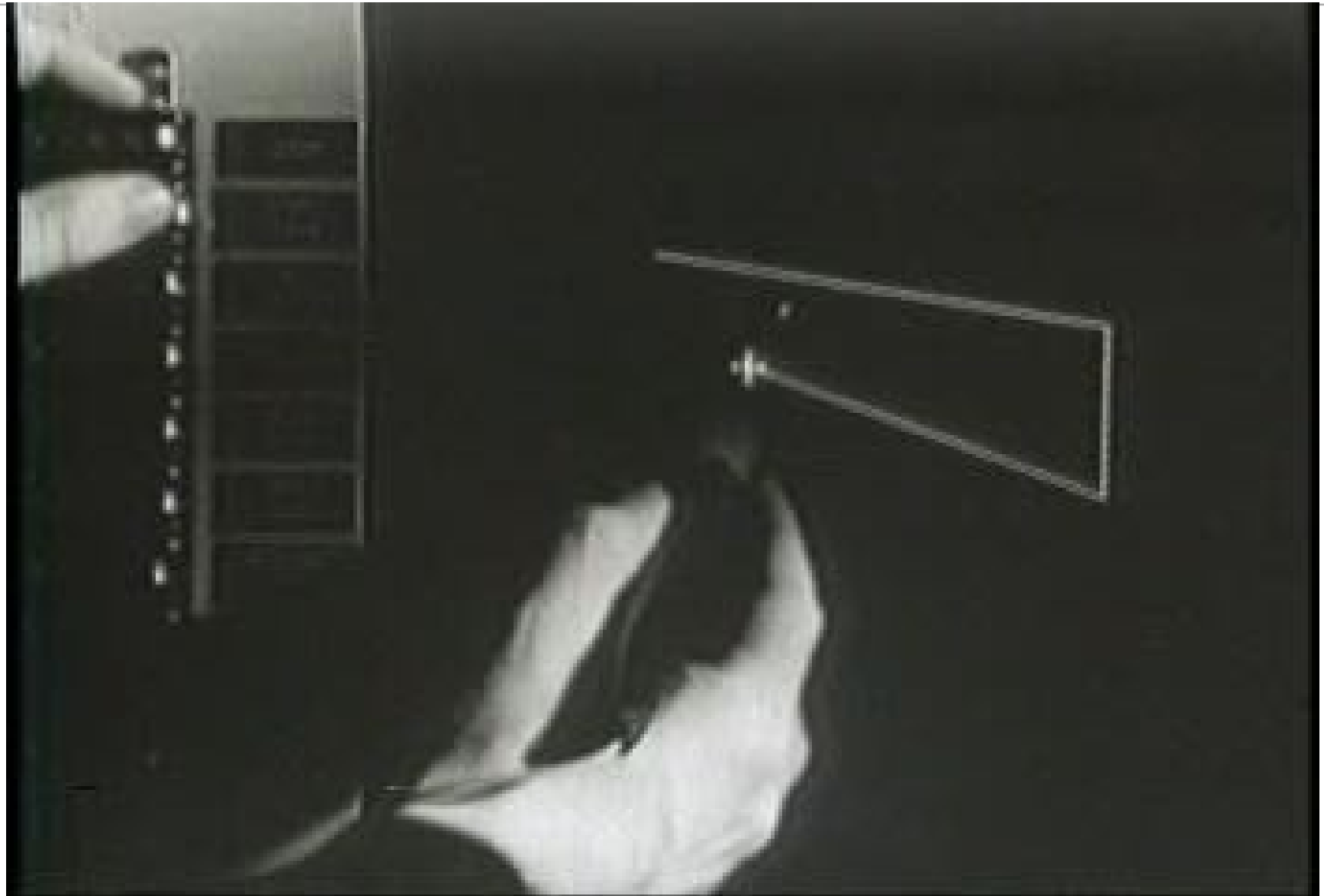
Direct manipulation geometric shapes

Geometric constraints, zoom, click-drag

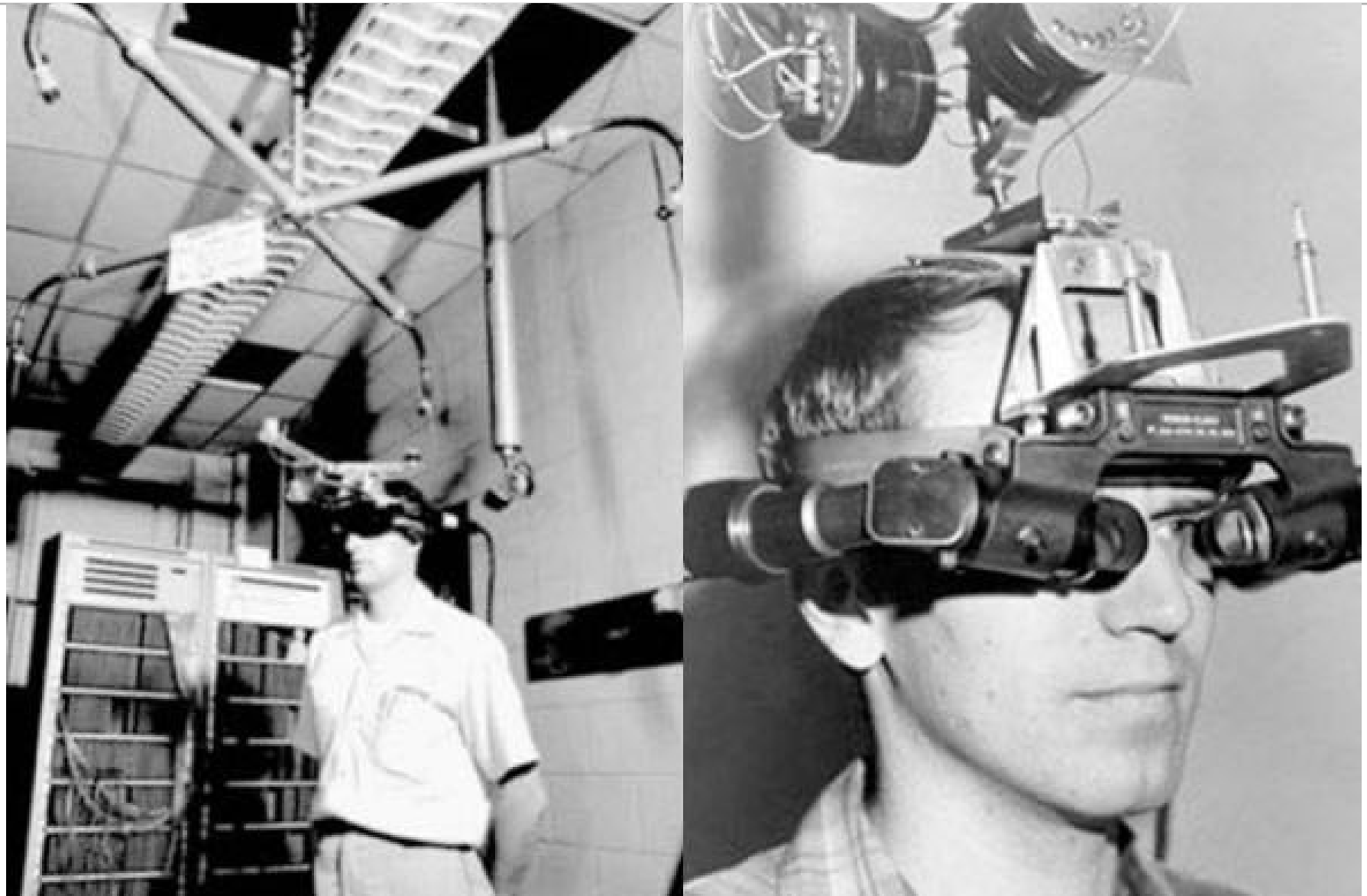




Sketchpad - Ivan Sutherland (1963)



Virtual Reality - Ivan Sutherland (1968)



NLS / Augment - Douglas Engelbart (1968)

Inventor of the mouse (1963)

Bimanual interaction

Hypertext, cooperative work,
document sharing, video-conferencing

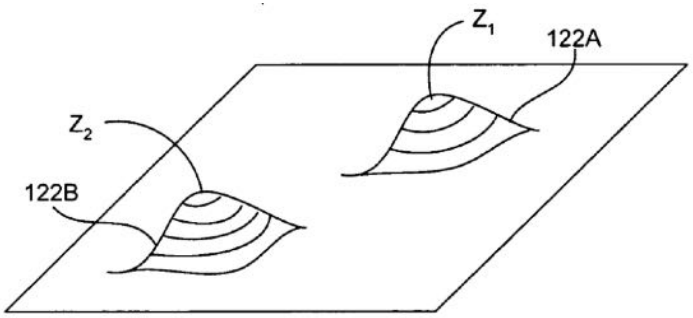
NLS / Augment - Bill English

NLS / Augment

PLATO IV touchscreen - CDC (1972)

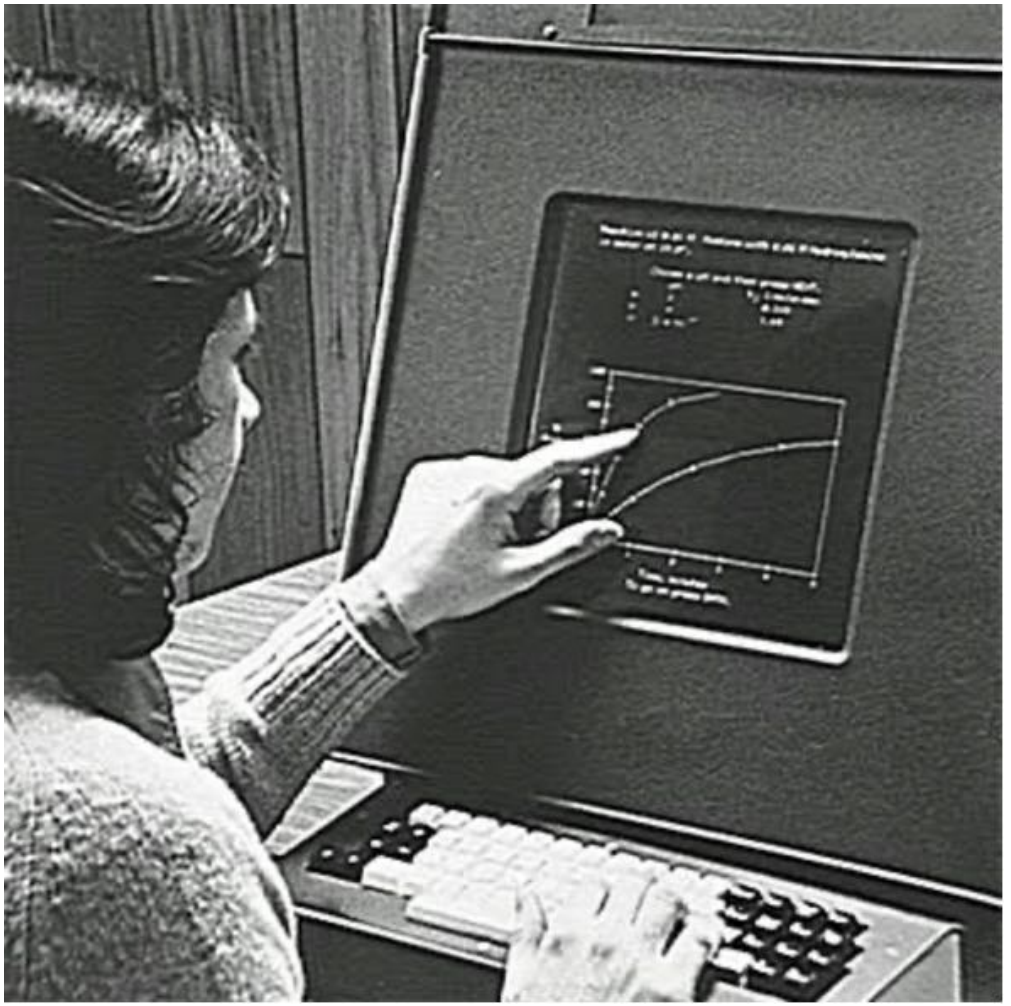
first touch screen

E.A. Johnson (UK), 1965



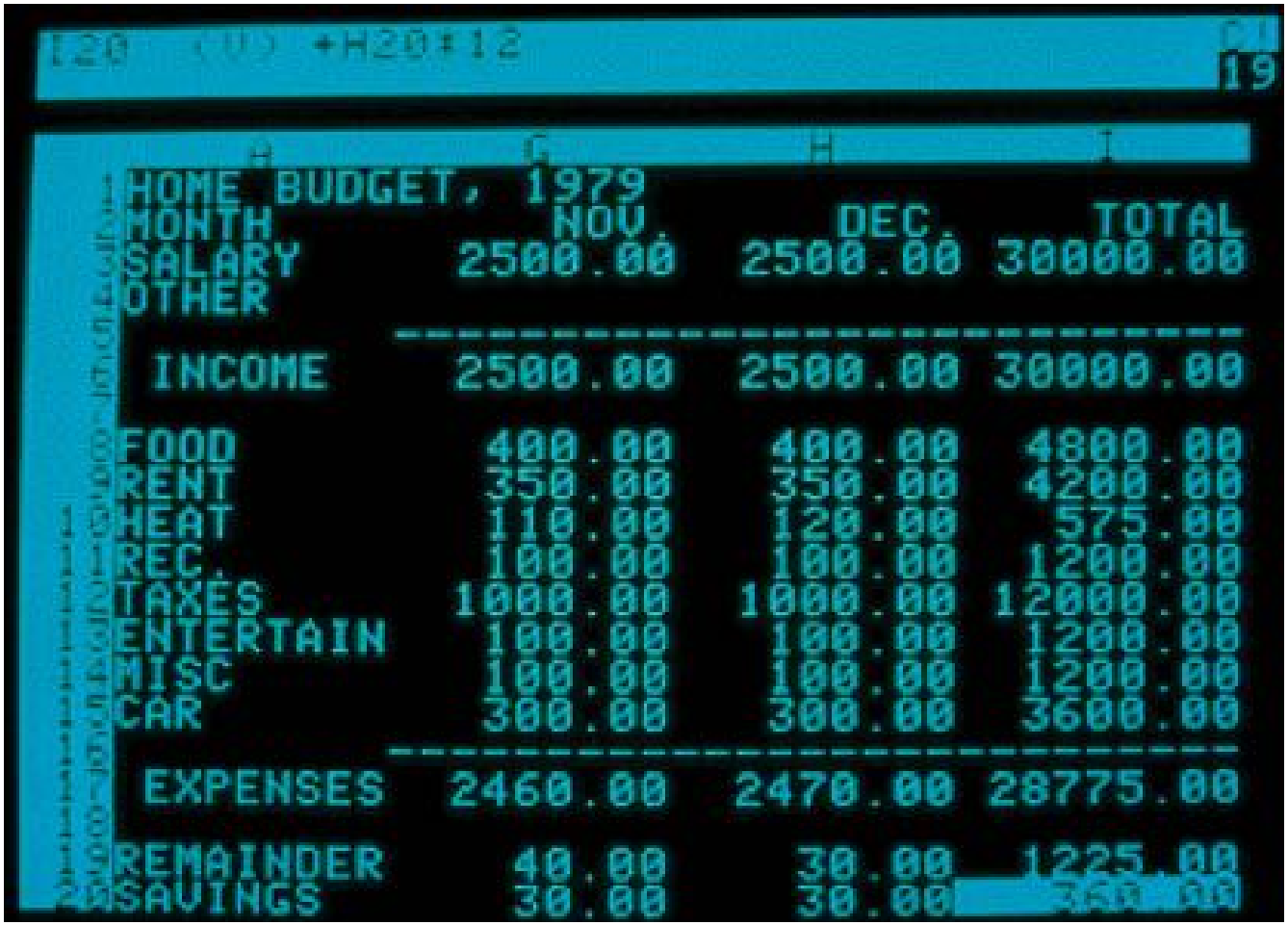
first multitouch screen

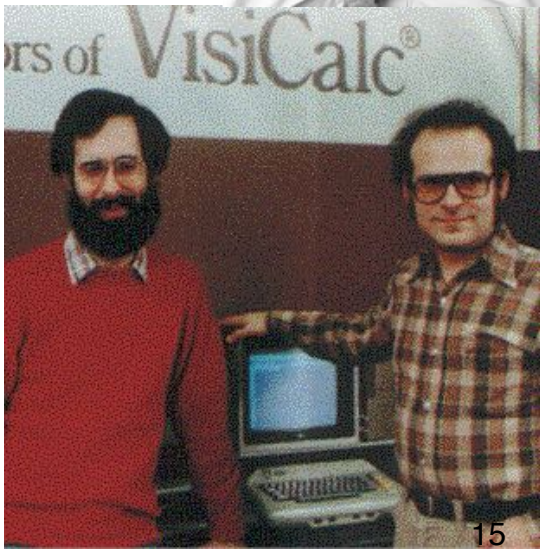
Bell Labs, 1985



Visicalc - Dan Bricklin,Bob Frankston (1979)

First spreadsheet (Apple][)



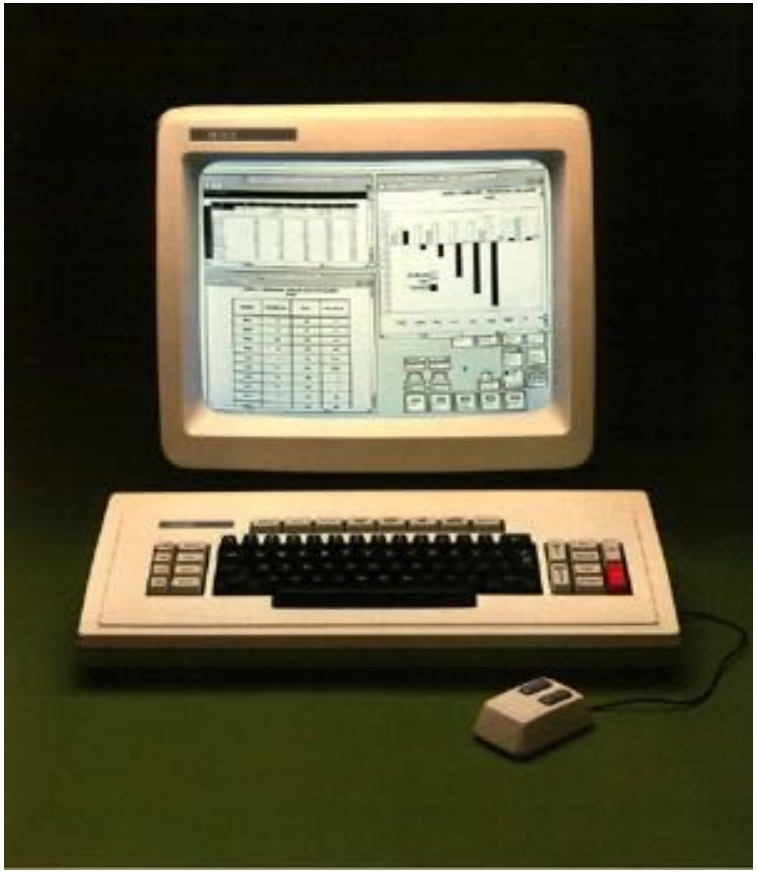


Xerox Star - Xerox PARC (1981)

First commercial graphical workstation

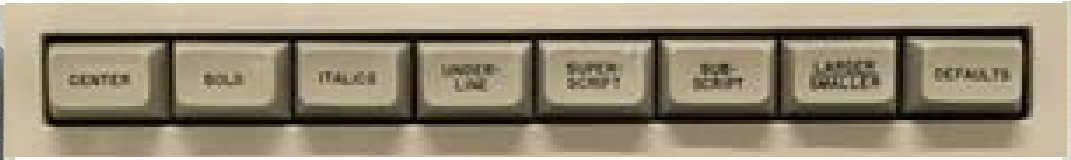
Document-centric approach

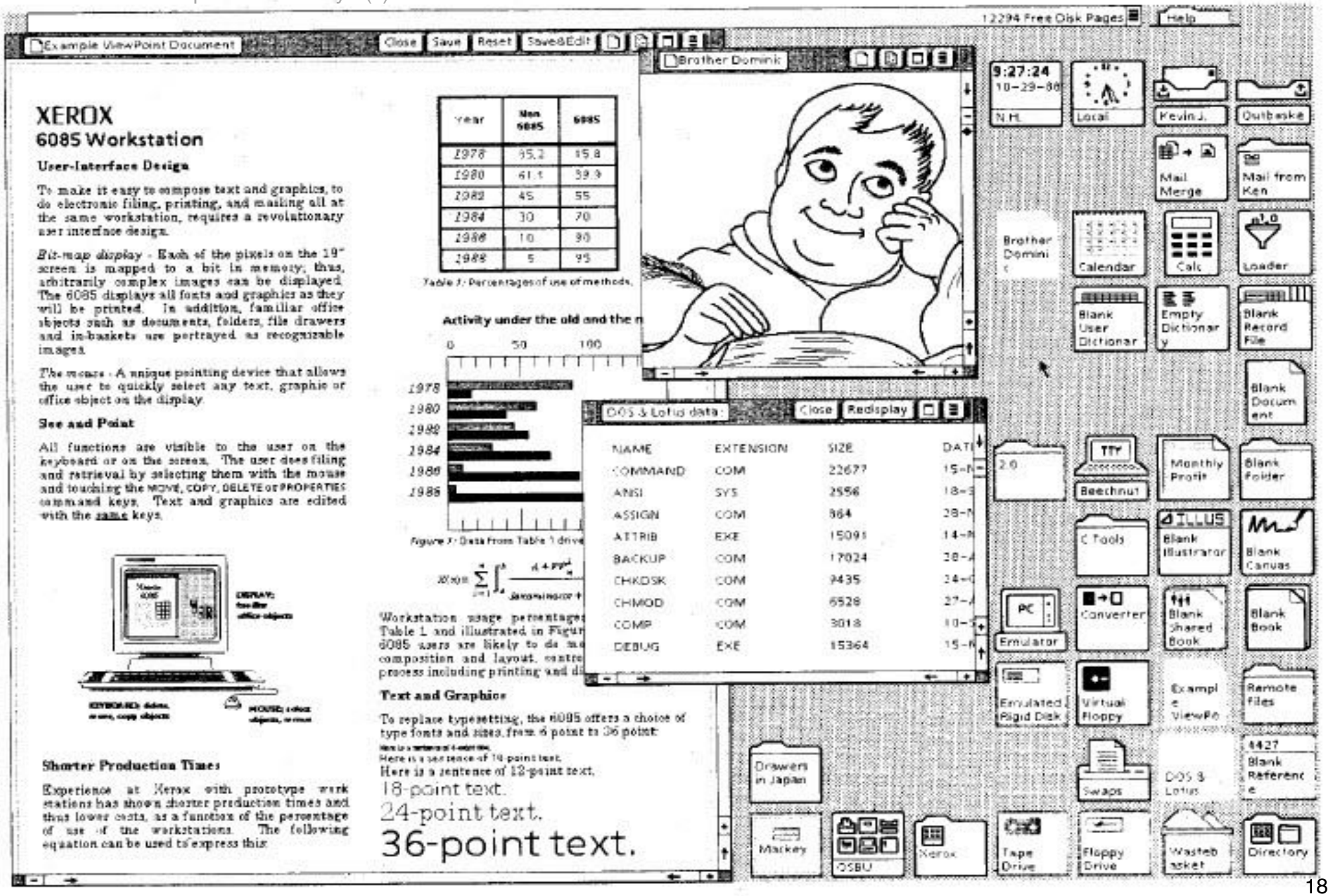
Xerox Alto (1972)



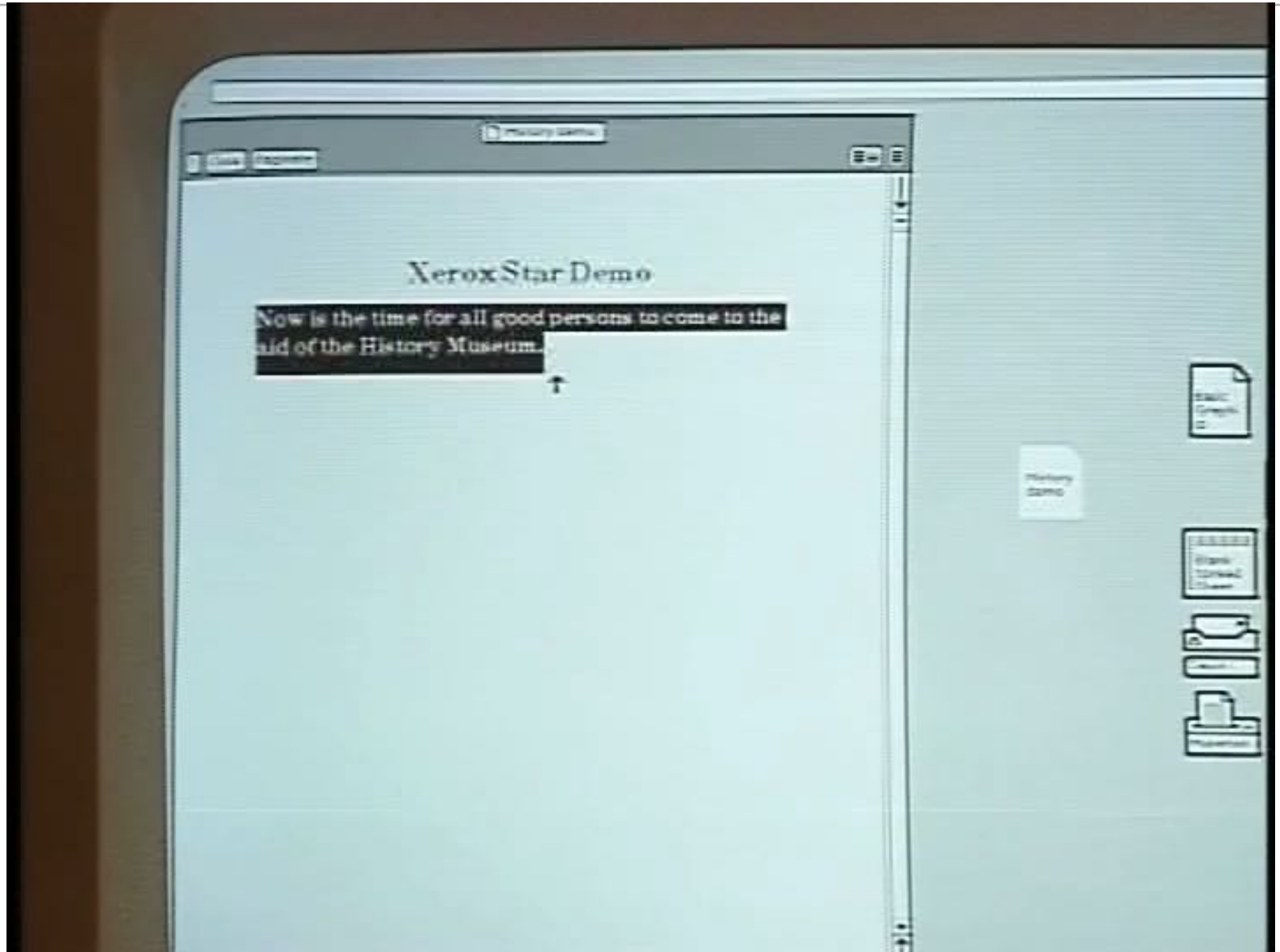
Xerox Star - Xerox PARC (1981)

- First commercial graphical workstation
- Custom hardware
- Custom display
- Custom keyboard and mouse




Example ViewPoint Document
Close
Save
Reset
Save&Edit
12294 Free Disk Pages
Help
Brother Domink
XEROX
6085 Workstation
User-Interface Design
To make it easy to compose text and graphics, to do electronic filing, printing, and masking all at the same workstation, requires a revolutionary user interface design.
Bit-map display - Each of the pixels on the 19" screen is mapped to a bit in memory; thus, arbitrarily complex images can be displayed. The 6085 displays all fonts and graphics as they will be printed. In addition, familiar office objects such as documents, folders, file drawers and in-baskets are portrayed as recognizable images.
The mouse - A unique pointing device that allows the user to quickly select any text, graphic or office object on the display.
See and Point
All functions are visible to the user on the keyboard or on the screen. The user does filing and retrieval by selecting them with the mouse and touching the MOVE, COPY, DELETE or PROPERTIES command keys. Text and graphics are edited with the same keys.
Year
Non 6085
6085
1978 35.2 15.8
1980 61.1 39.9
1982 45 55
1984 30 70
1986 10 90
1988 5 95
Table 1: Percentages of use of methods.
Activity under the old and the n
0
50
100
1978
1980
1982
1984
1986
1988
Figure 1: Data from Table 1 drive
Workstation usage percentages
Table 1, and illustrated in Figur
6085 users are likely to do ma
composition and layout, contra
process including printing and di
Text and Graphics
To replace typesetting, the 6085 offers a choice of type fonts and sizes from 6 point to 36 point:
Here is a sentence of 12-point text.
18-point text.
24-point text.
36-point text.
Shorter Production Times
Experience at Xerox with prototype work stations has shown shorter production times and thus lower costs, as a function of the percentage of use of the workstations. The following equation can be used to express this:
DOS 3 Lotus data:
Close
Redisplay
NAME EXTENSION SIZE
COMMAND COM 22677
ANSI SYS 2556
ASSIGN COM 864
ATTRIB EXE 15091
BACKUP COM 17024
CHKDSK COM 9435
CHMOD COM 6528
COMP COM 3018
DEBUG EXE 15364
9:27:24
N.H.
Local
Kevin J.
Outbaske
Mail Merge
Mail from Ken
Brother Domini
Calendar
Calc
Loader
Blank User Dictionar
Empty Dictionar y
Blank Record File
Blank Docum ent
2.0
TTY
Beechnut
Monthly Profit
Blank Folder
C Tools
ILLUS
Blank Illustrator
Blank Canvas
PC
Emulator
Converter
Blank Shared Book
Blank Book
Emulated Rigid Disk
Virtual Floppy
Exampl e ViewPo
Remote Files
Drawers in Japan
Swaps
DOS 3 Lotus
4427
Blank Referenc e
Markey
OSBU
Xerox
Tape Drive
Floppy Drive
Wasteb asket
Directory

Xerox Star - Xerox PARC (1981)

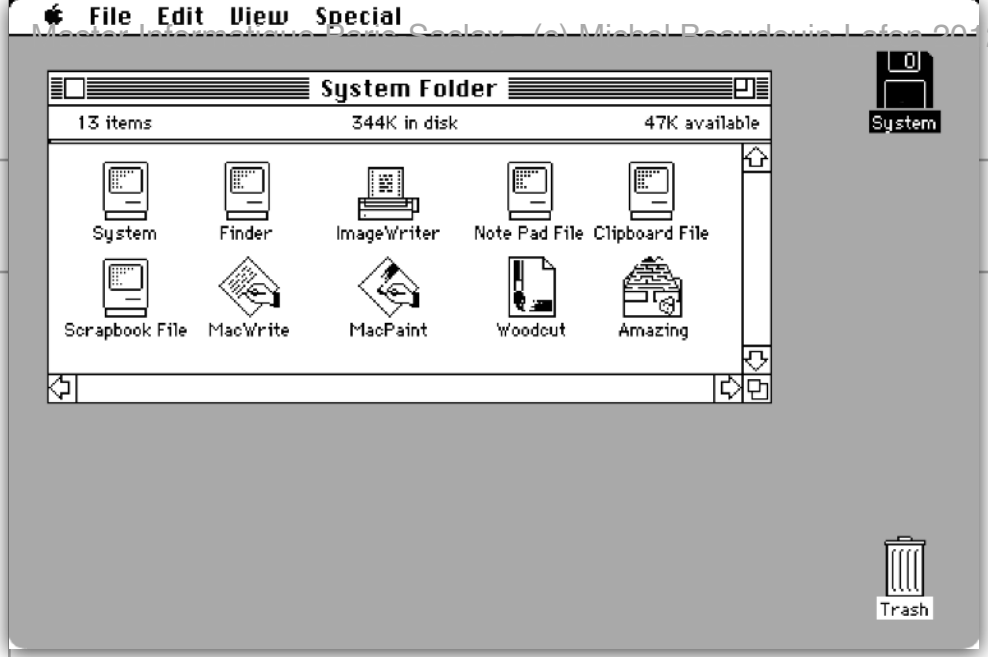


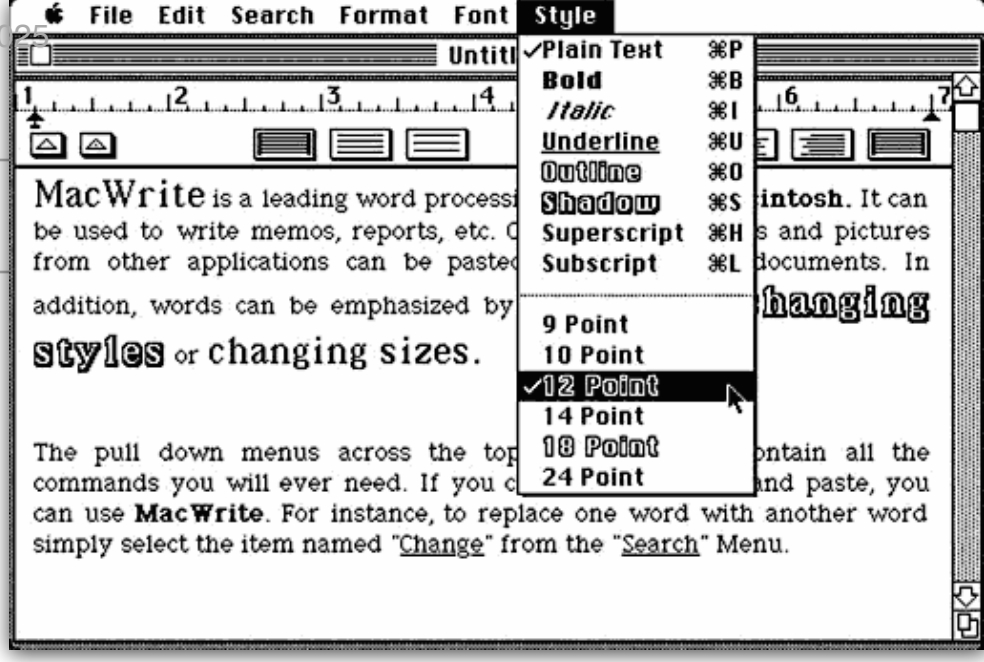
Macintosh - Apple (1984)

Graphical personal computer

- Finder
- MacPaint
- MacWrite

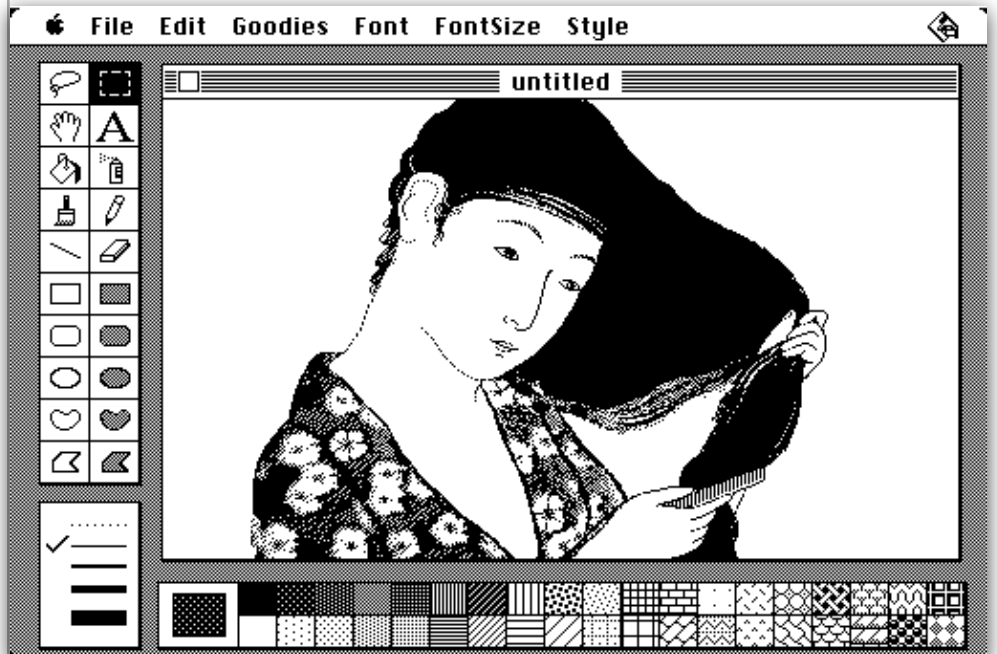
Hardware + software design

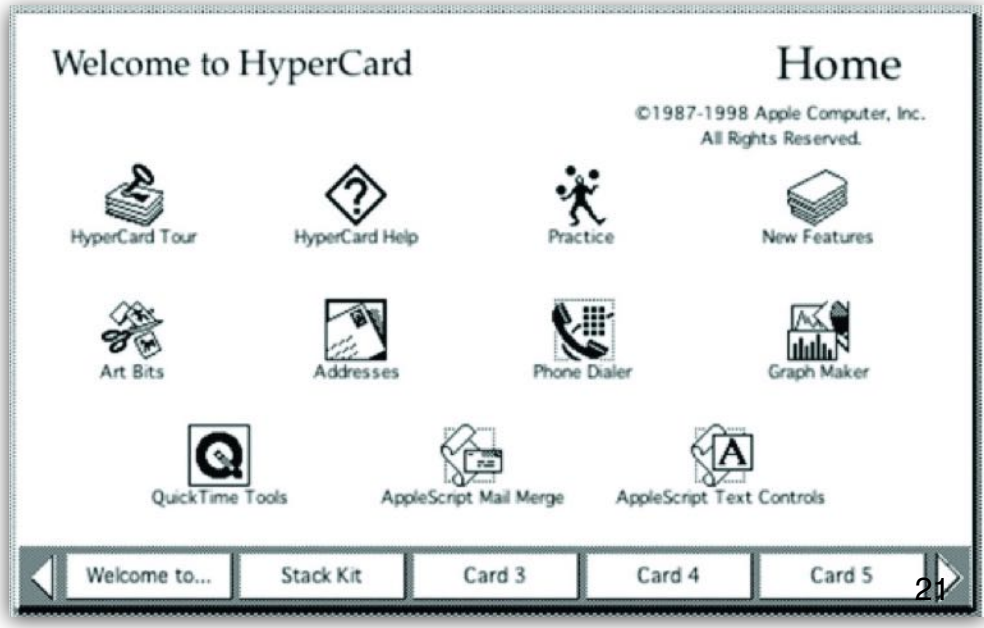


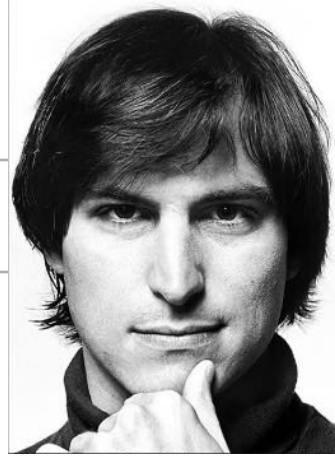


Finder
MacPaint

MacWrite
Hypercard (1987)

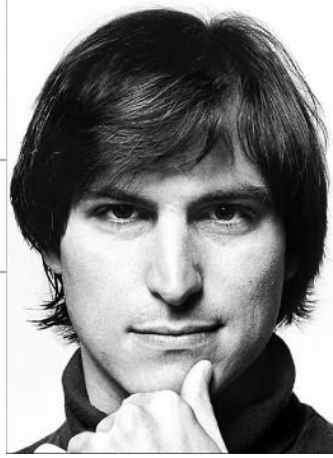






“A computer is like a bicycle for the mind”

Steve Jobs



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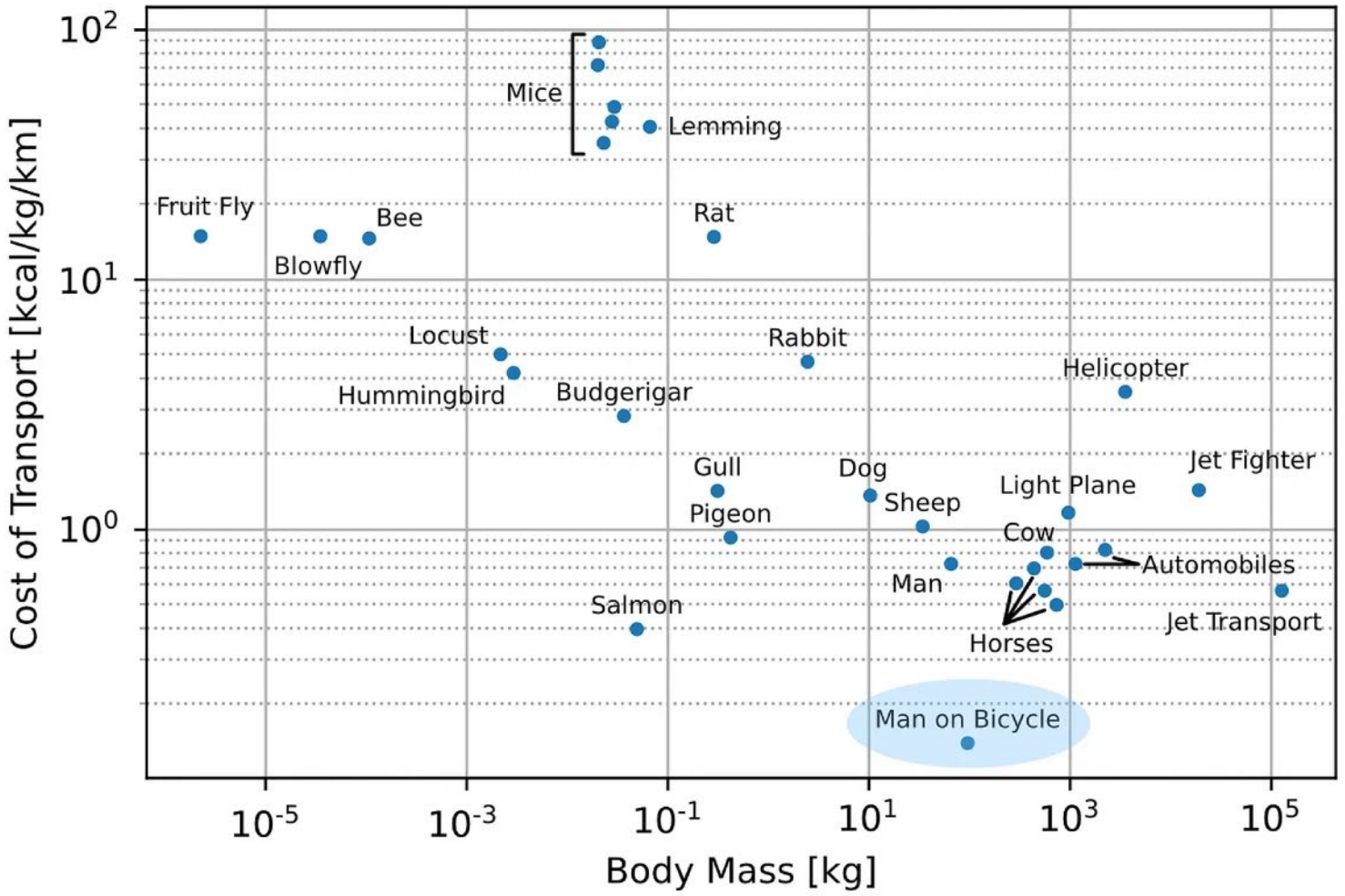
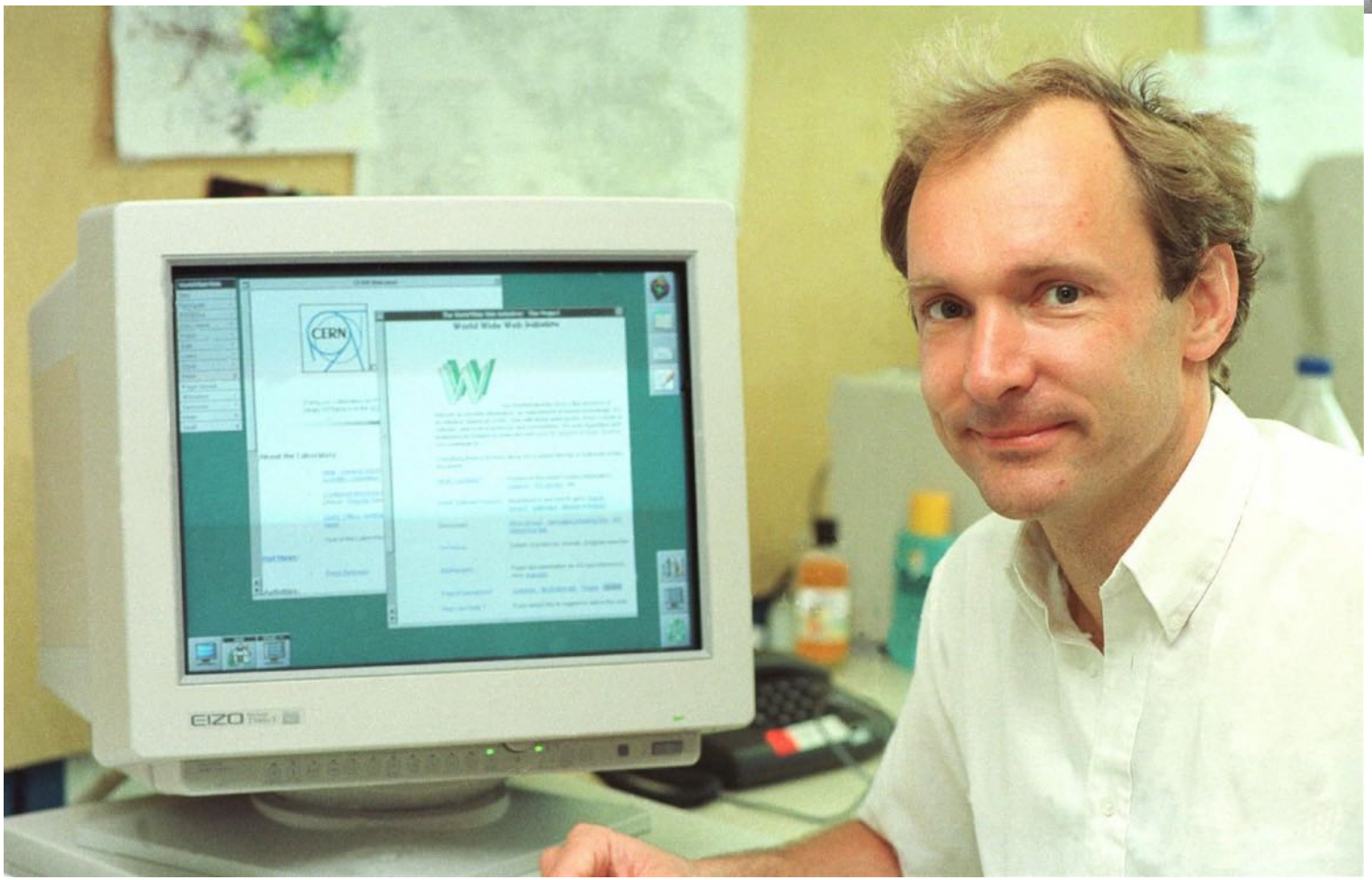


Wilson, Bicycle Technology, Scientifc American, March 1973

World-Wide Web - Tim Berners-Lee (1990)

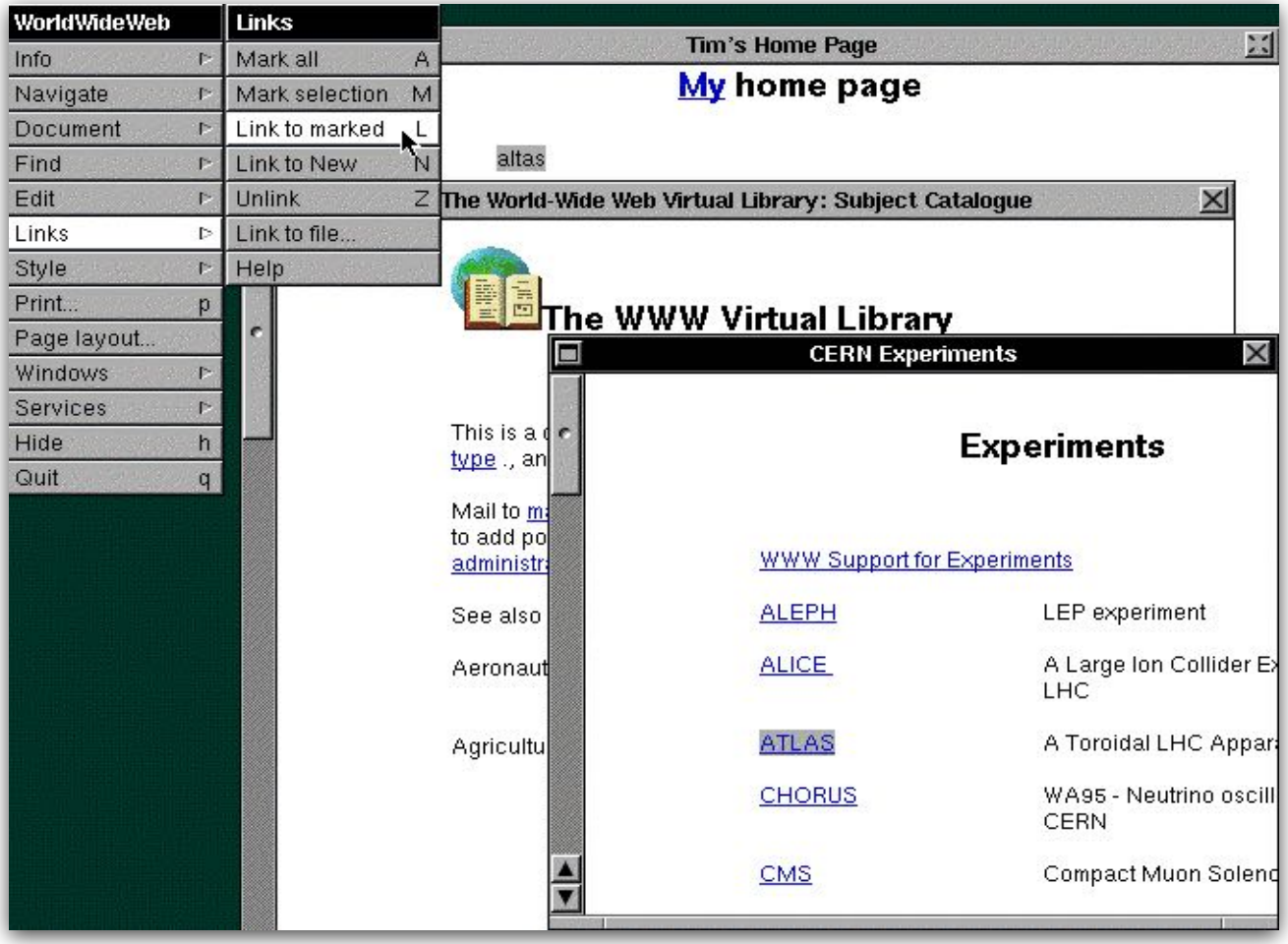
Networked hypertext



World-Wide Web - Tim Berners-Lee (1990)

Networked hypertex

Integrated browser + editor

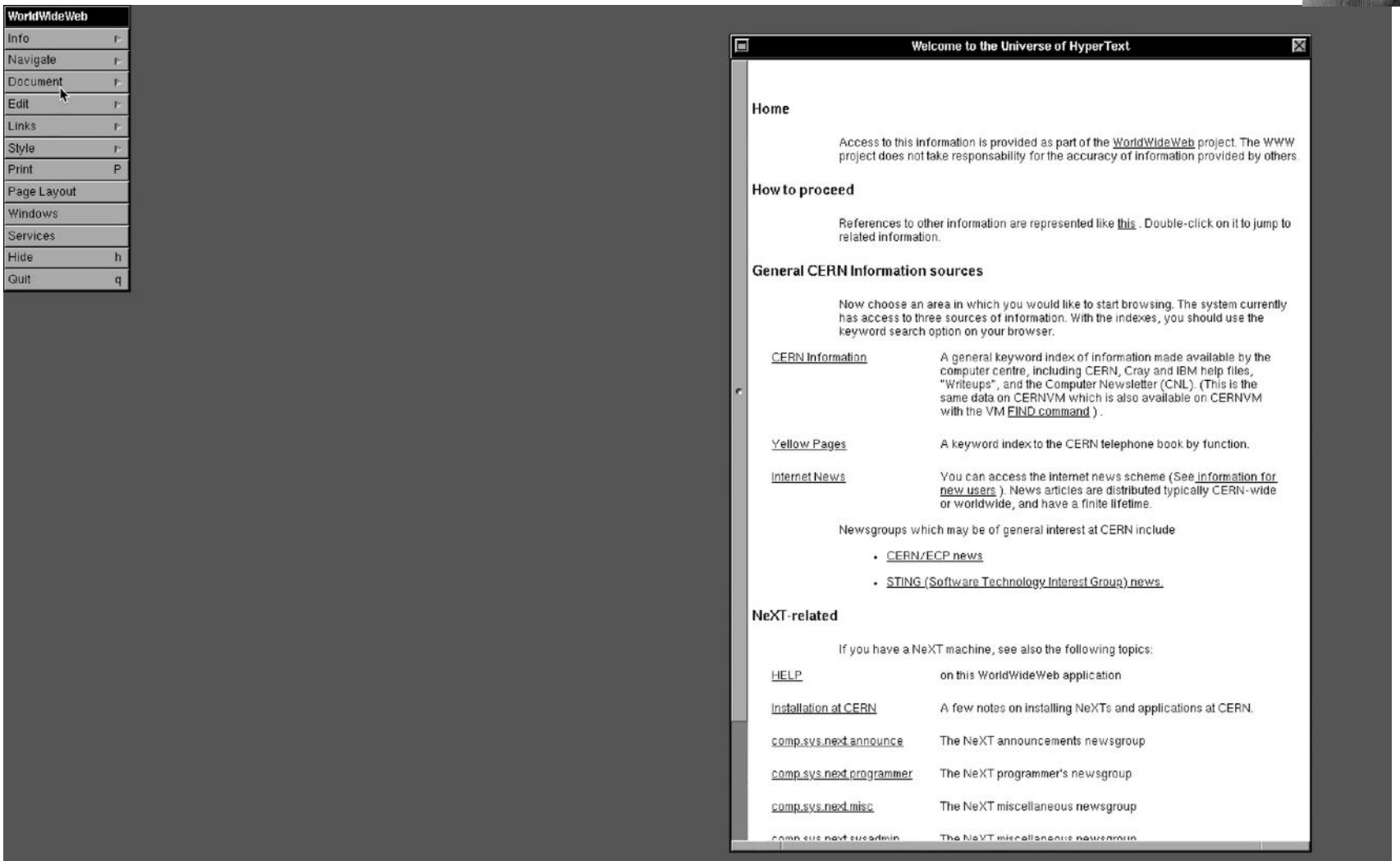


Experience it at https://worldwideweb30.com/browser

World-Wide Web - Tim Berners-Lee (1990)

Editing a page in the browser

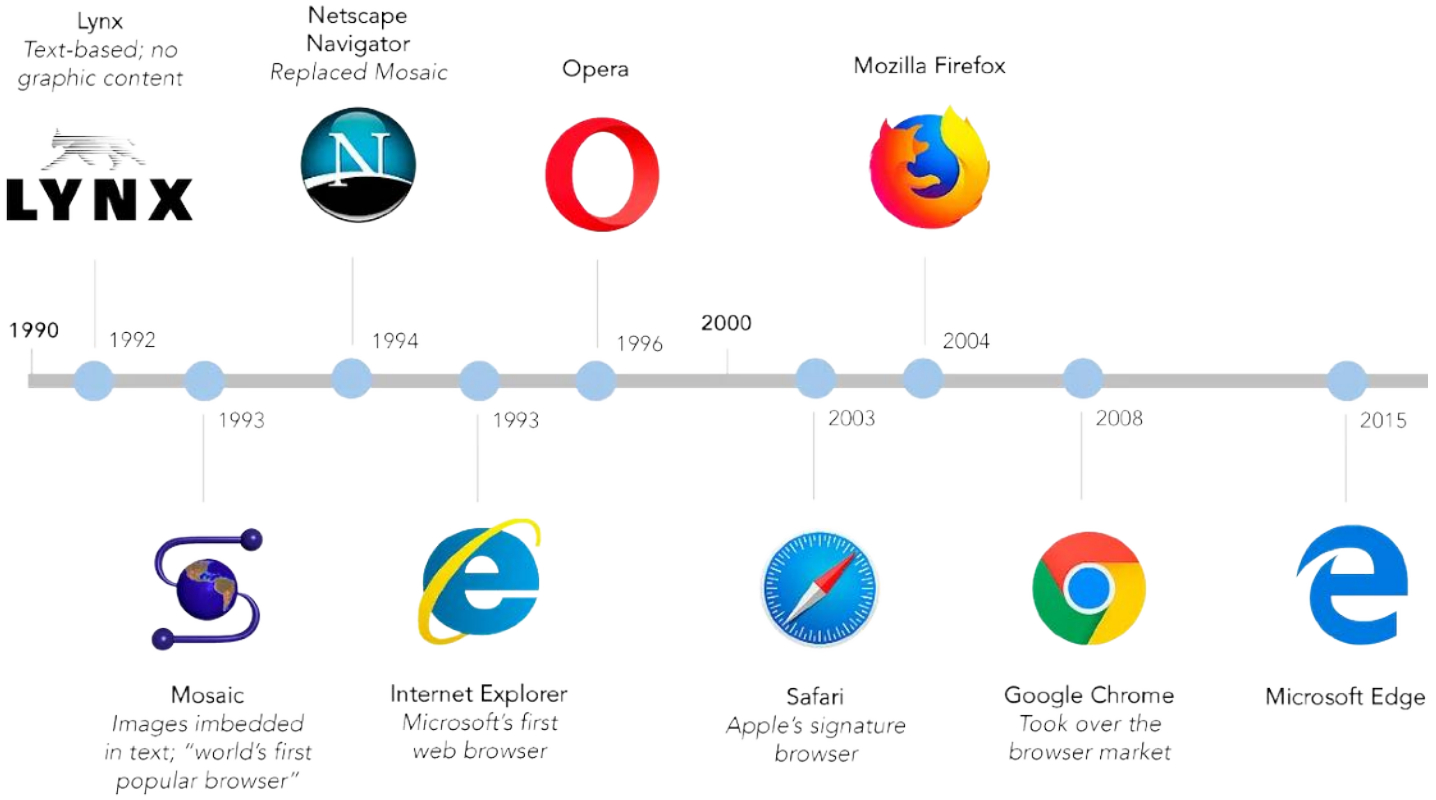
https://worldwideweb30.com/



Web browsers history

None implement editing facilities

Instead: download large amounts of (JavaScript) code



https://medium.com/fulldive/a-brief-history-of-browsers-9e8f453dbf45

History of hypertext - Ted Nelson (1960)

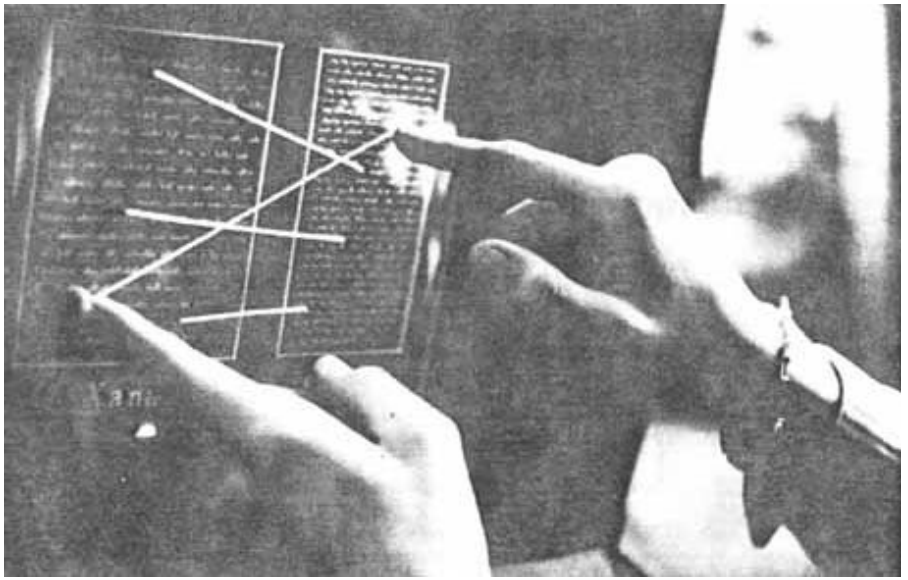
Invented the concept of hypertext

Project Xanadu (never really operational)

“A digital repository scheme for world-wide electronic publishing”

Non-sequential writing

- Zippered lists
- Transclusion



Are the visions getting more and more limited?

NLS/Augment « Augmenting human intellect »

↓ Cooperative work

Xerox Star Personal use, network transparency

↓ Document-centric

Macintosh Personal use, explicit network access

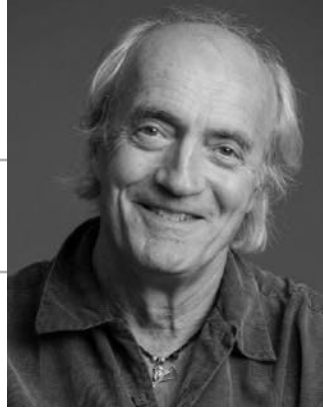
↓ Application-centric

World-Wide Web Networked, but poor user interaction

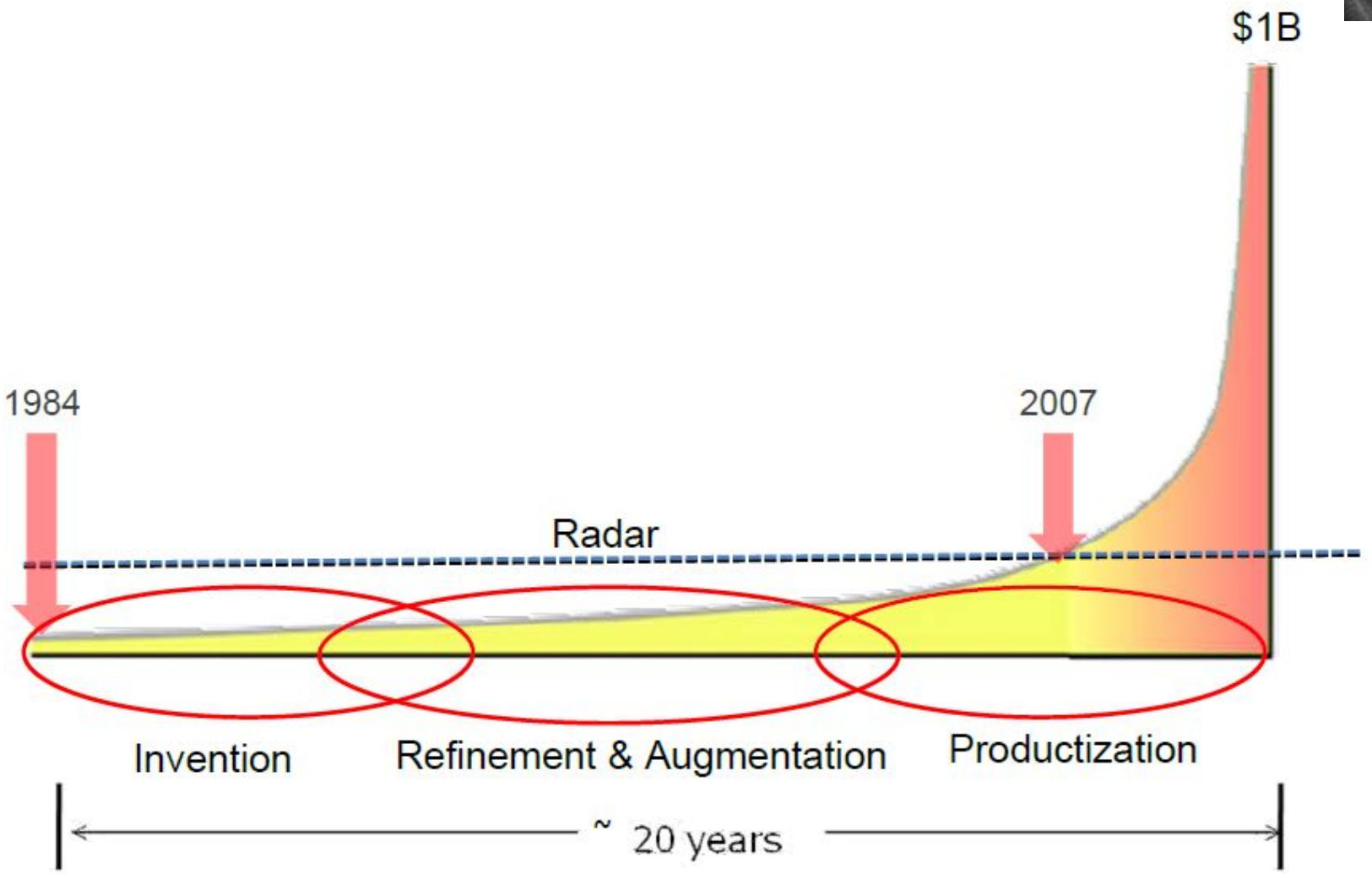
Browsing but not editing

Distinction between invention and innovation

The long nose of innovation



Bill Buxton



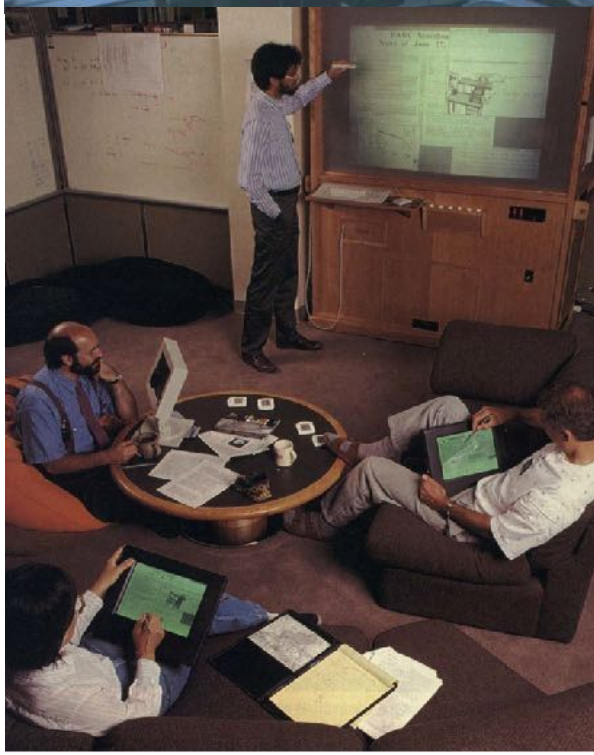
HCI does not follow Moore's law

Original Macintosh		iMac M1 24"
January 1984 - $2500	/ 6 (adj.)	September 2022 - $1300
CPU 68000 - 0.7 MIPS	x 50 000	CPU Apple M1 - 35 000 MIPS
RAM 128 kB	x 62 500	RAM 8 GB
Floppy 400 kB	x 640 000	Hard drive 256 GB
9" b&w, 512x342	x 2.7 / x64	24' colors, 4480x2520
Keyboard, mouse	same	Keyboard, mouse
WIMP desktop	same	WIMP desktop

Visions are important

Augmenting Human Intellect – Doug Engelbart

Ubiquitous Computing – Mark Weiser



BUT a vision is more
than just a video

Knowledge Navigator – Apple

Future Vision – Microsoft

Knowledge Navigator (Apple, 1987)

Microsoft Future Vision (2010)