Fundamentals of Human-Computer Interaction 2

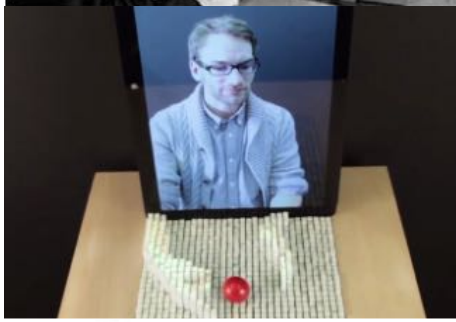
Photos/collage by Jack L. Moffet in Dan R. Olsen, « Interacting in Chaos », Interactions, sept-oct 1999.

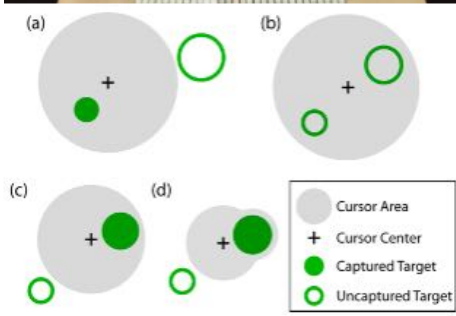
Michel Beaudouin-Lafon
Université Paris-Saclay
mbl@lisn.fr

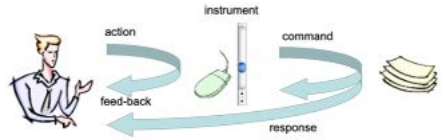
Master Informatique - Université Paris-Saclay

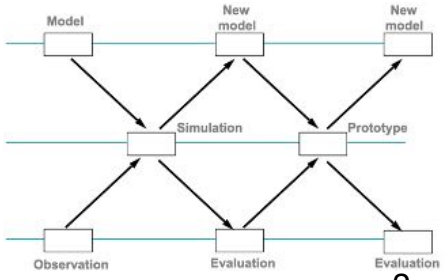
Outline

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









A short history of Human-Computer Interaction

Michel Beaudouin-Lafon
Université Paris-Saclay
mbl@lisn.fr

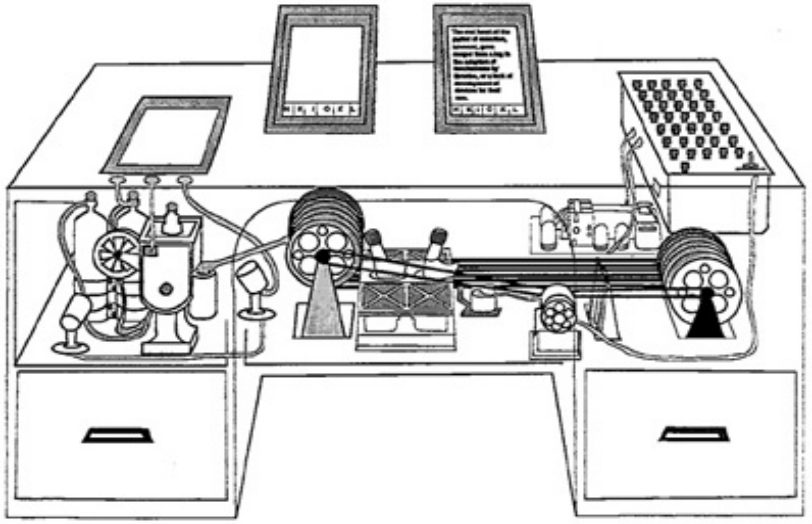
See Michel Beaudouin-Lafon, *50 ans d'Interaction Homme-Machine : retours vers le futur*, 2016, Interstices
https://interstices.info/50-ans-dinteraction-homme-machine-retours-vers-le-futur/

Memex - Vannevar Bush (1945)

Vision for a desktop information management system

Electromechanical system

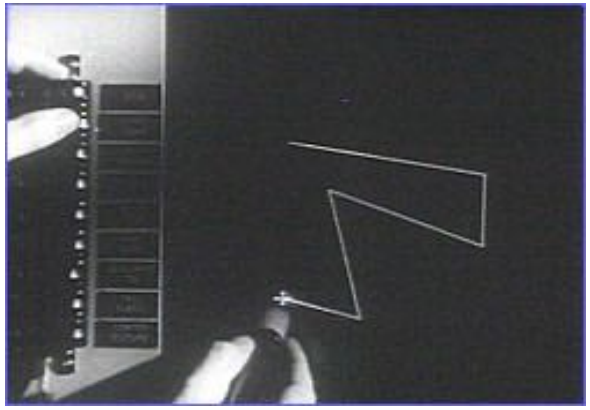
Seen as the ancestor of the notion of hypertext

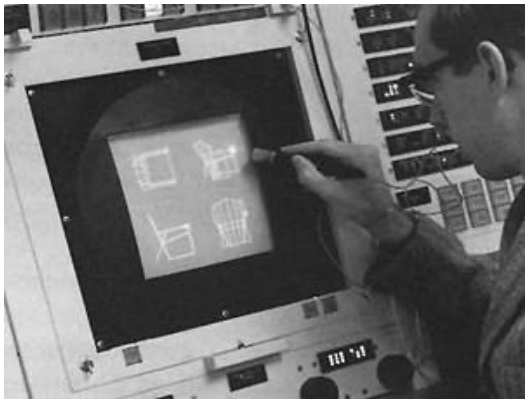


Sketchpad - Ivan Sutherland (1963)

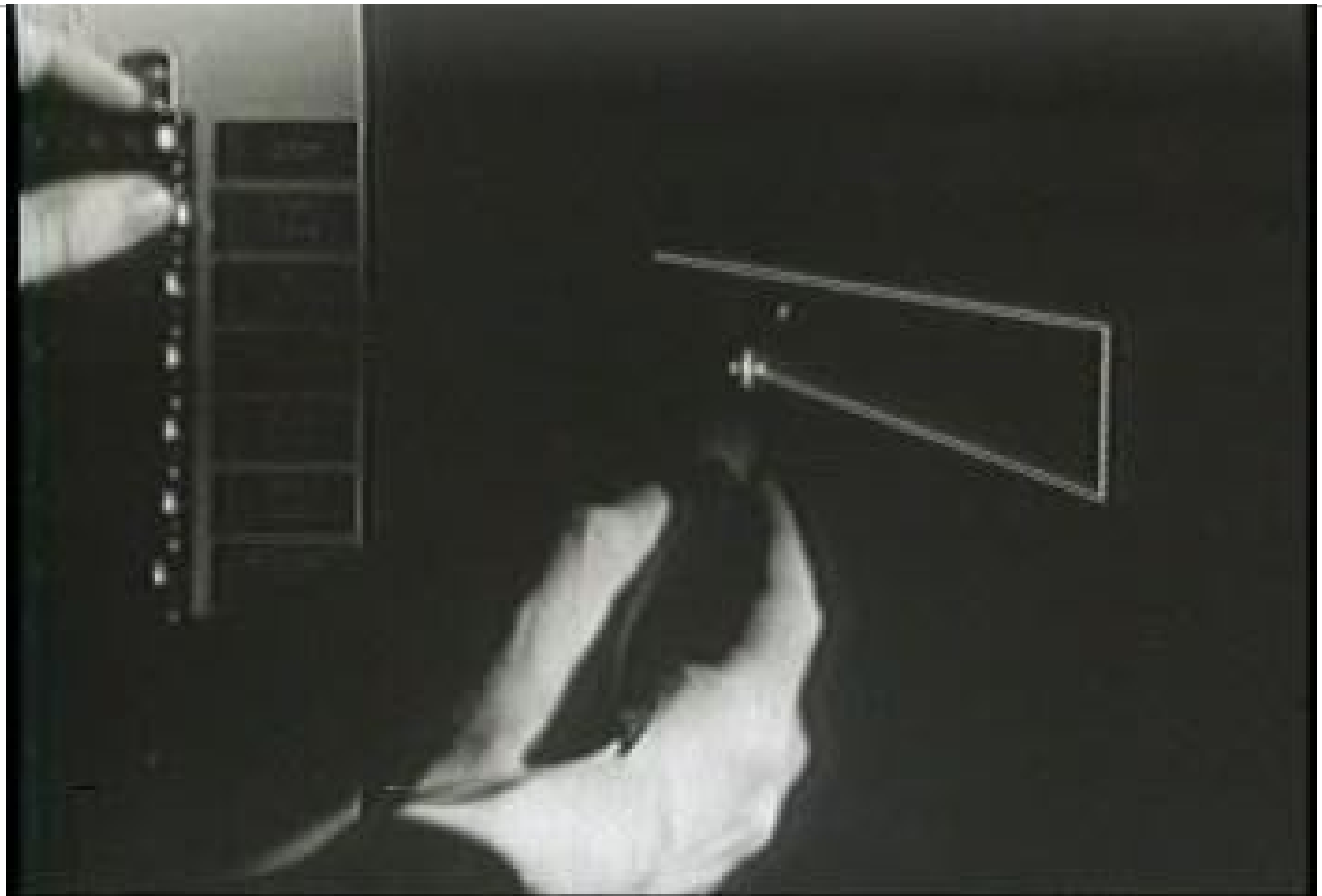
Direct manipulation geometric shapes

Geometric constraints, zoom, click-drag

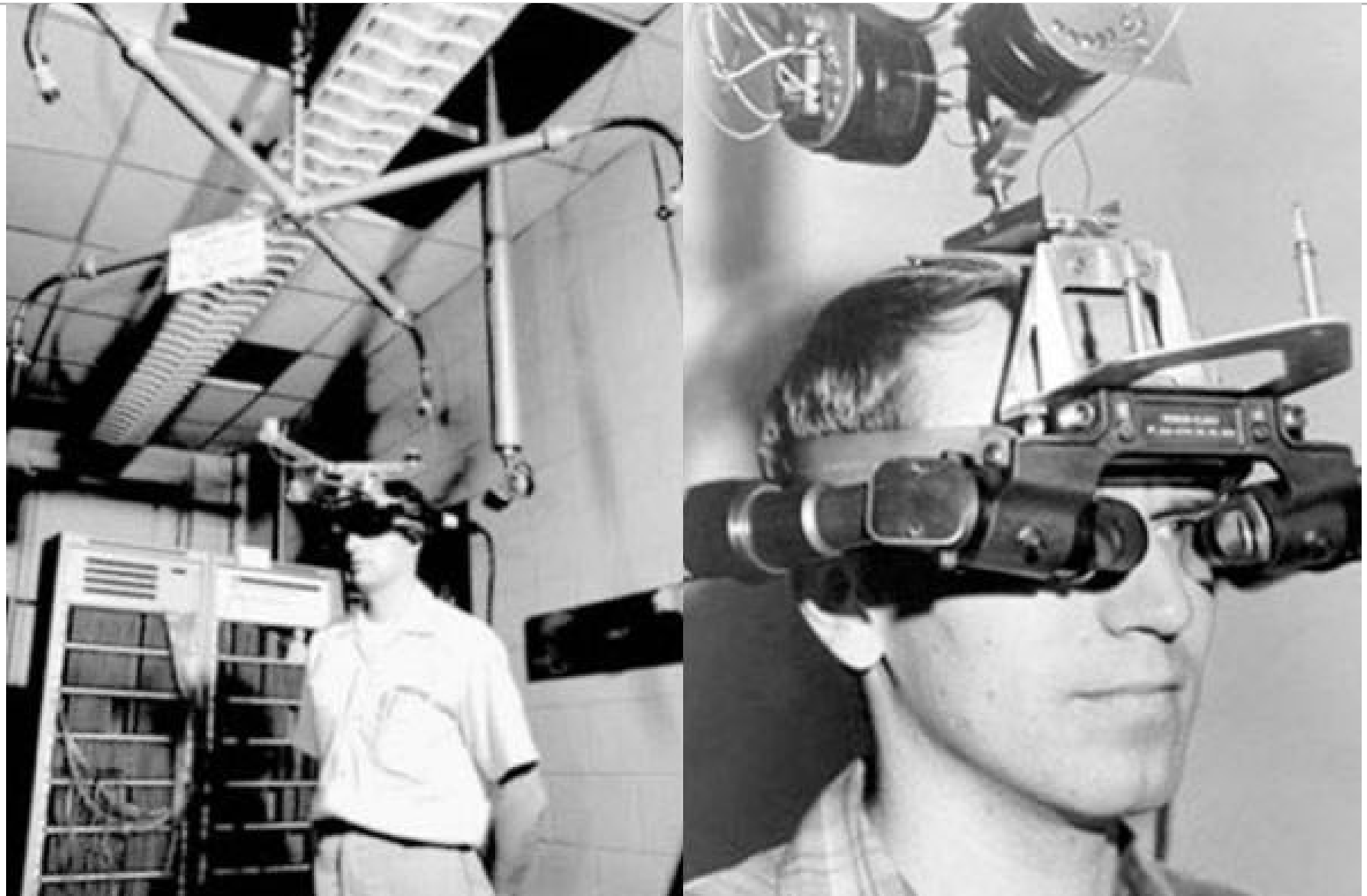




Sketchpad - Ivan Sutherland (1963)



Virtual Reality - Ivan Sutherland (1968)



NLS / Augment - Douglas Engelbart (1968)

Inventor of the mouse (1963)

Bimanual interaction

Hypertext, cooperative work,
document sharing, video-conferencing

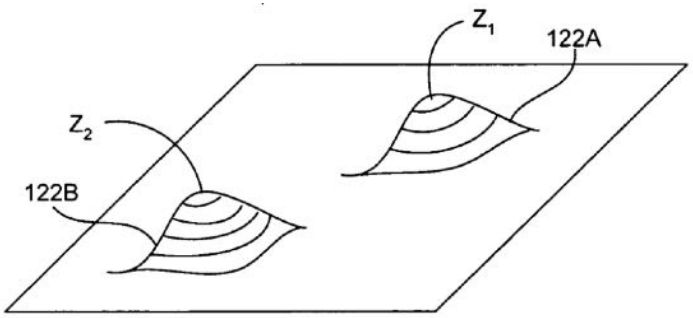
NLS / Augment - Bill English

NLS / Augment

PLATO IV touchscreen - CDC (1972)

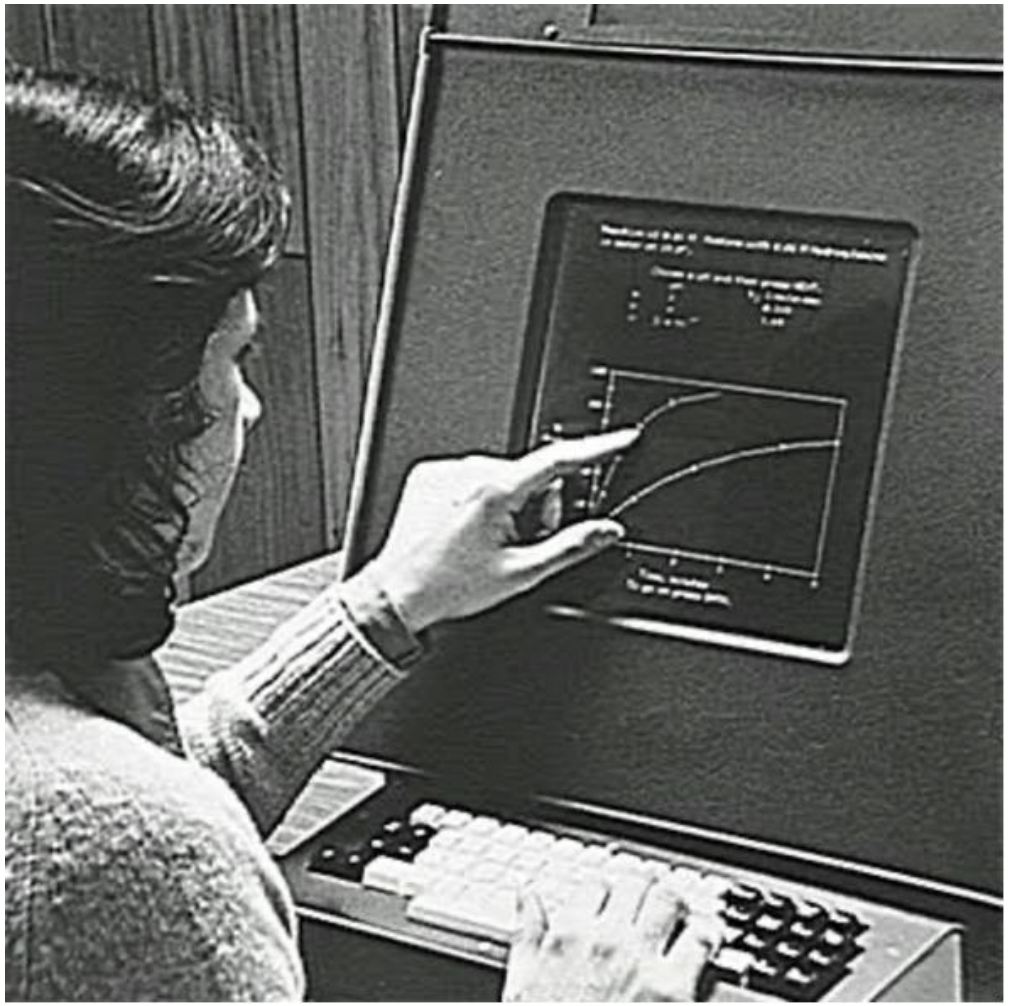
first touch screen

E.A. Johnson (UK), 1965



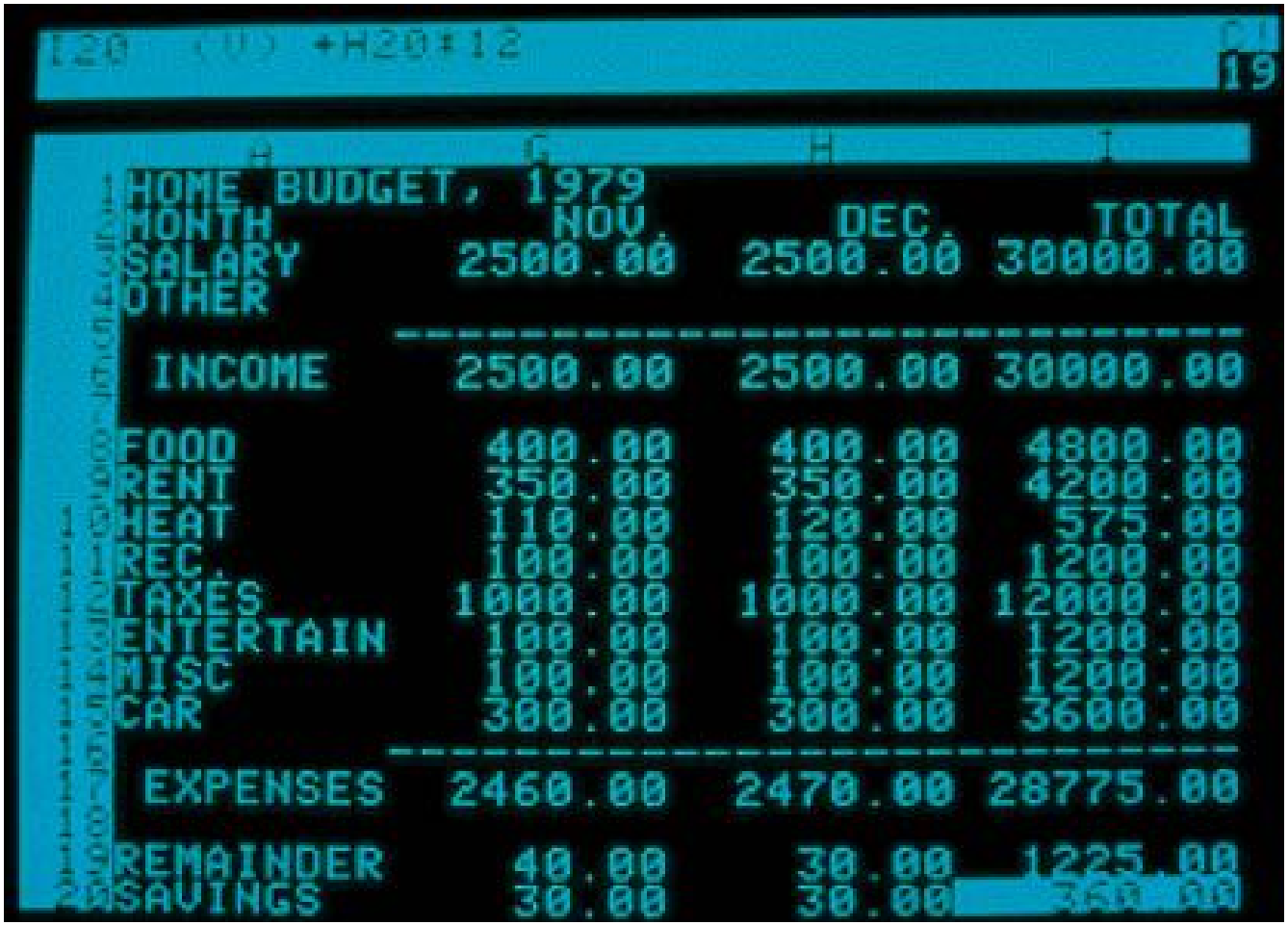
first multitouch screen

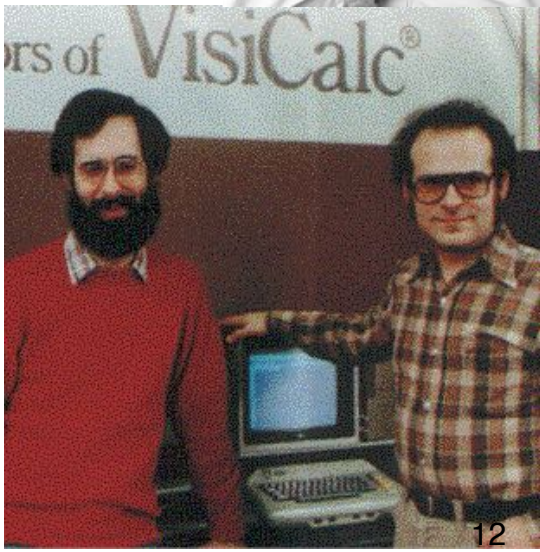
Bell Labs, 1985



Visicalc - Dan Bricklin,Bob Frankston (1979)

First spreadsheet (Apple][)



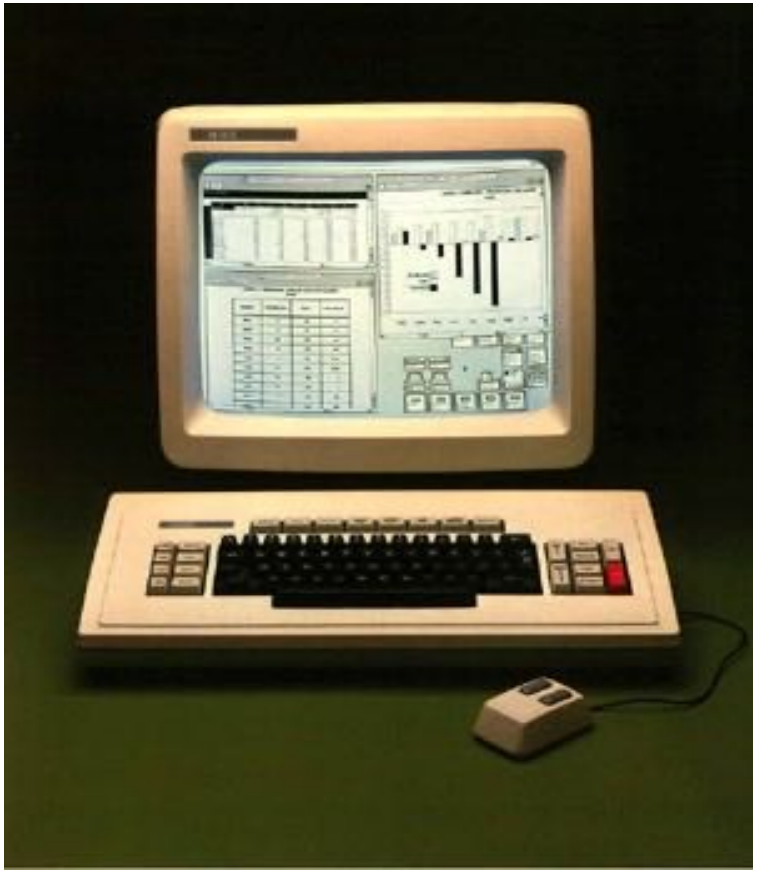


Xerox Star - Xerox PARC (1981)

First commercial graphical workstation

Document-centric approach

Xerox Alto (1972)



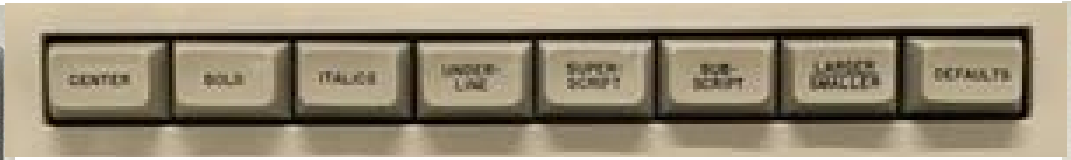
Xerox Star - Xerox PARC (1981)

First commercial graphical workstation

Custom hardware

Custom display

Custom keyboard and mouse



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.

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:

Year	Non 6085	6085
1978	95.2	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

Figure 1: Data from Table 1 drive

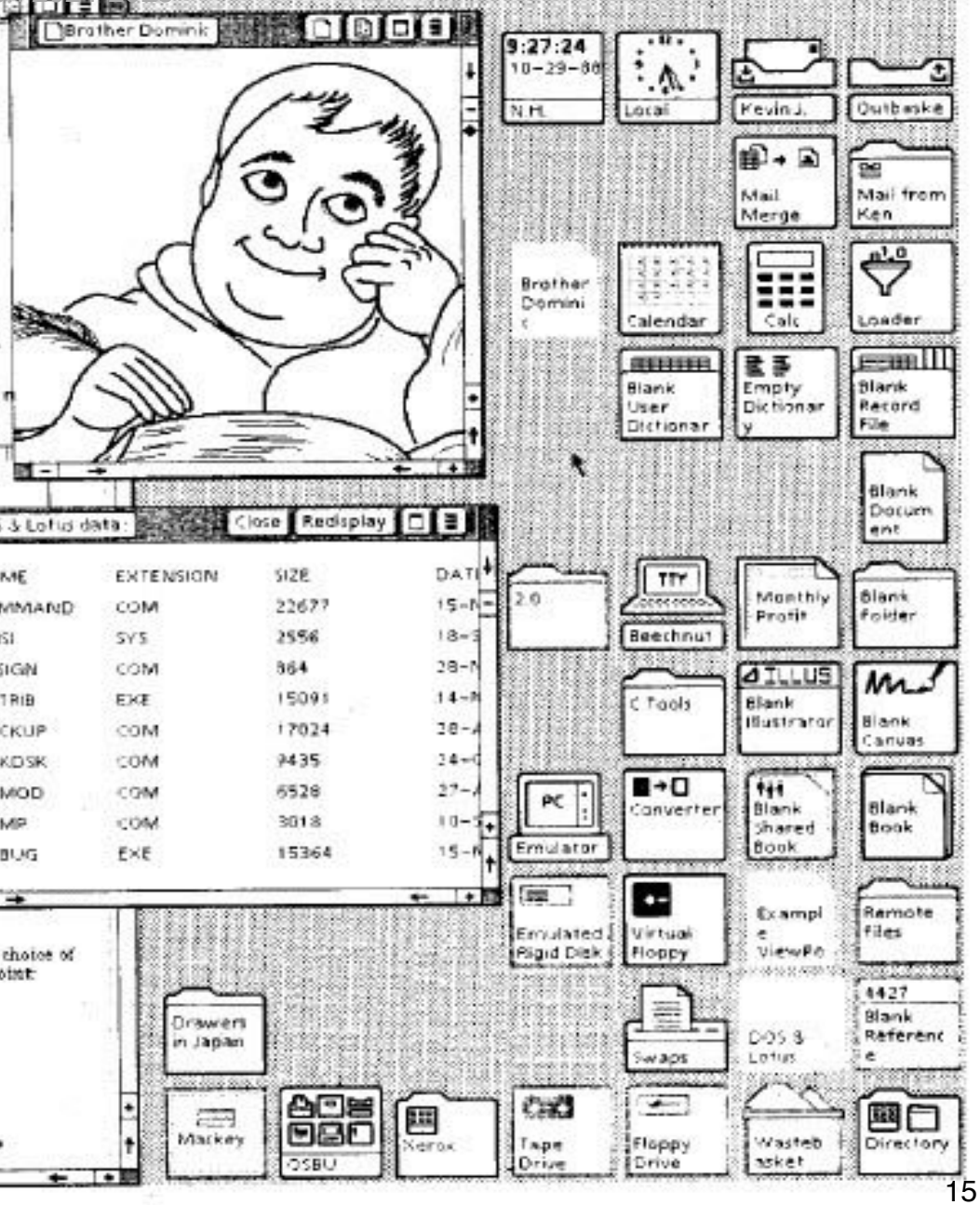
$$X(x) = \sum_{i=1}^{n} \int_{a}^{b} \frac{d + Pp^{i}}{\text{denominator}} \, dx$$

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

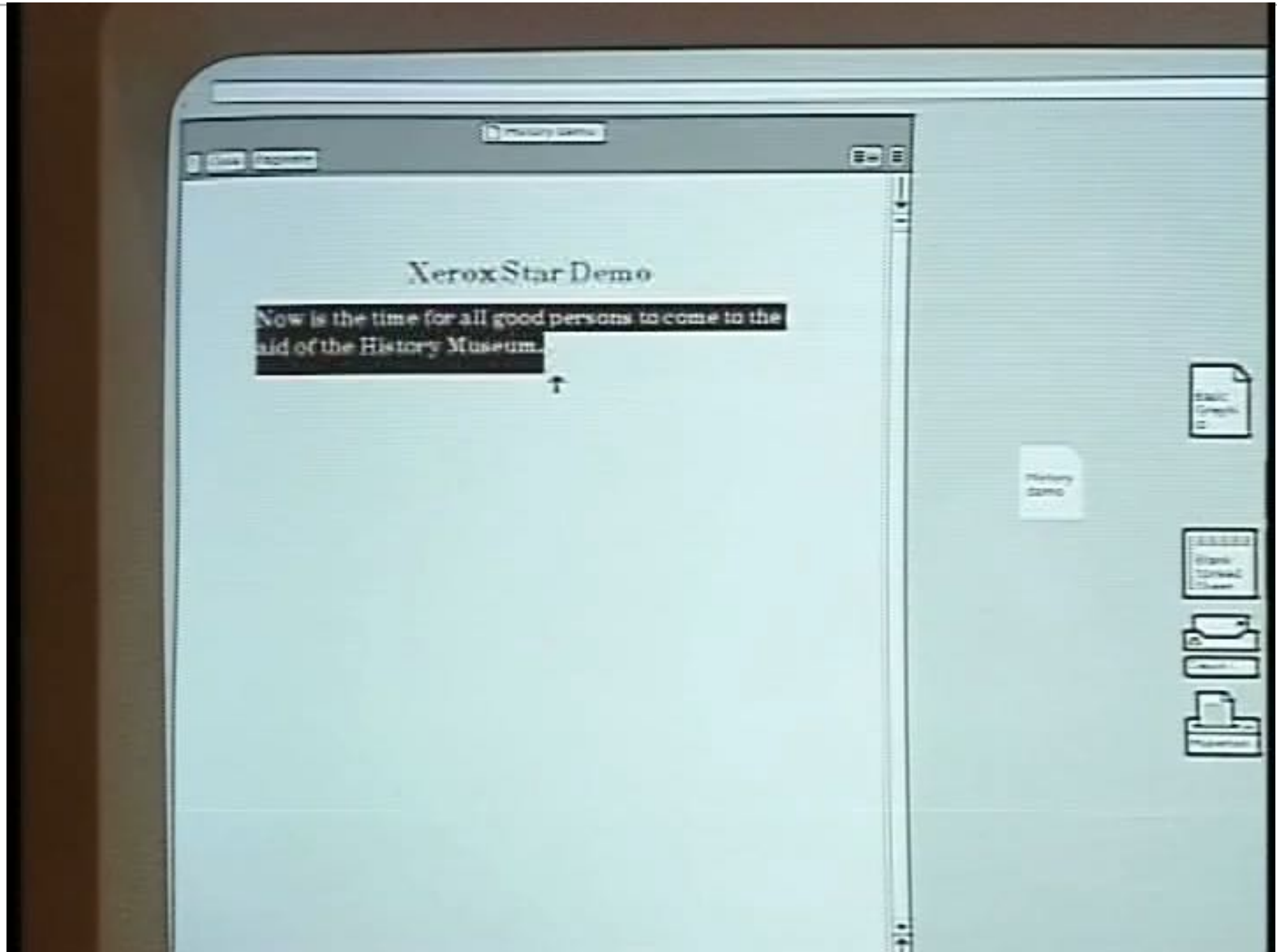
Text and Graphics

To replace typesetting, the 6085 offers a choice of type fonts and sizes from 6 point to 36 point:

Here is a sentence of 10 point text.
Here is a sentence of 12-point text.
18-point text.
24-point text.
36-point text.



Xerox Star - Xerox PARC (1981)



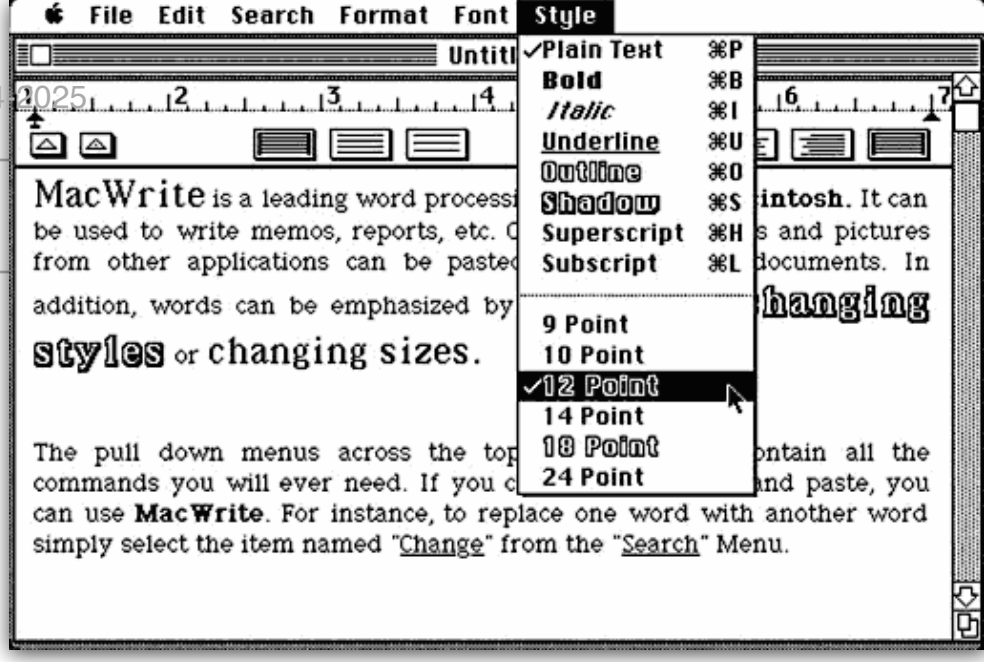
Macintosh - Apple (1984)

Graphical personal computer

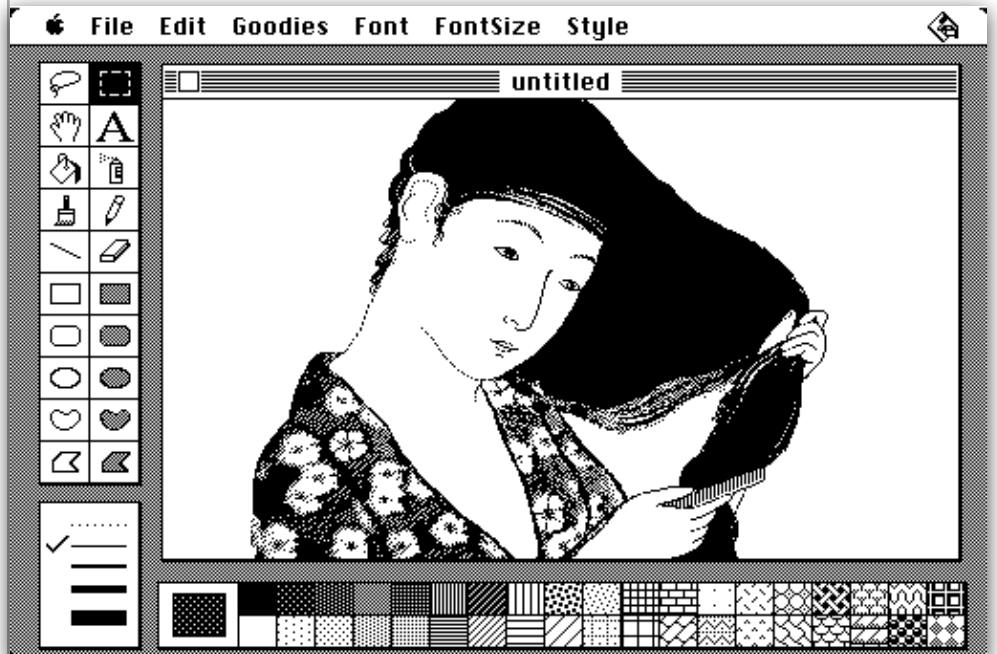
- Finder
- MacPaint
- MacWrite

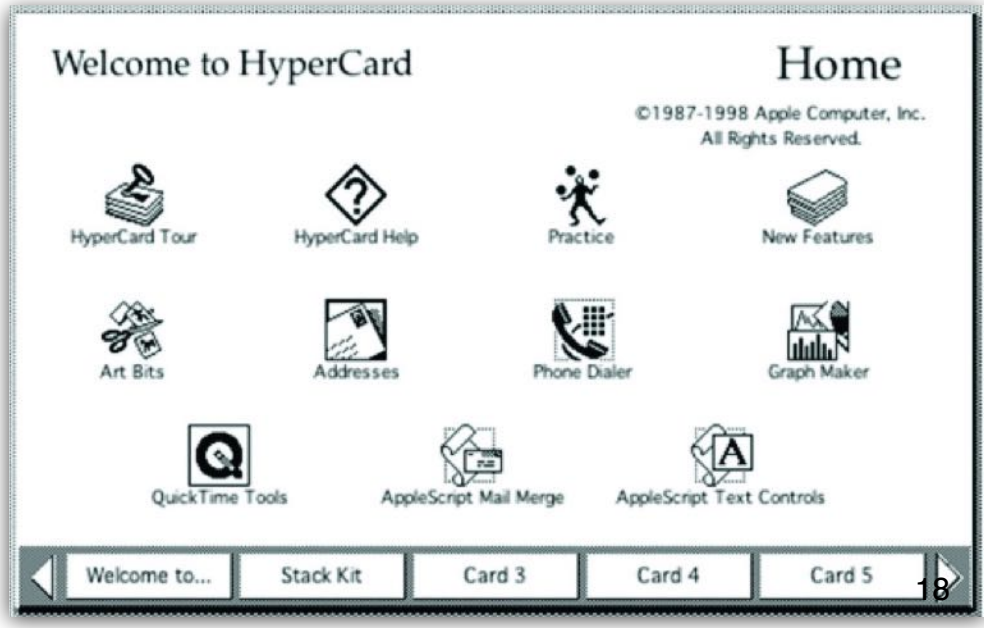
Hardware + software design

Finder
MacPaint



MacWrite
Hypercard (1987)

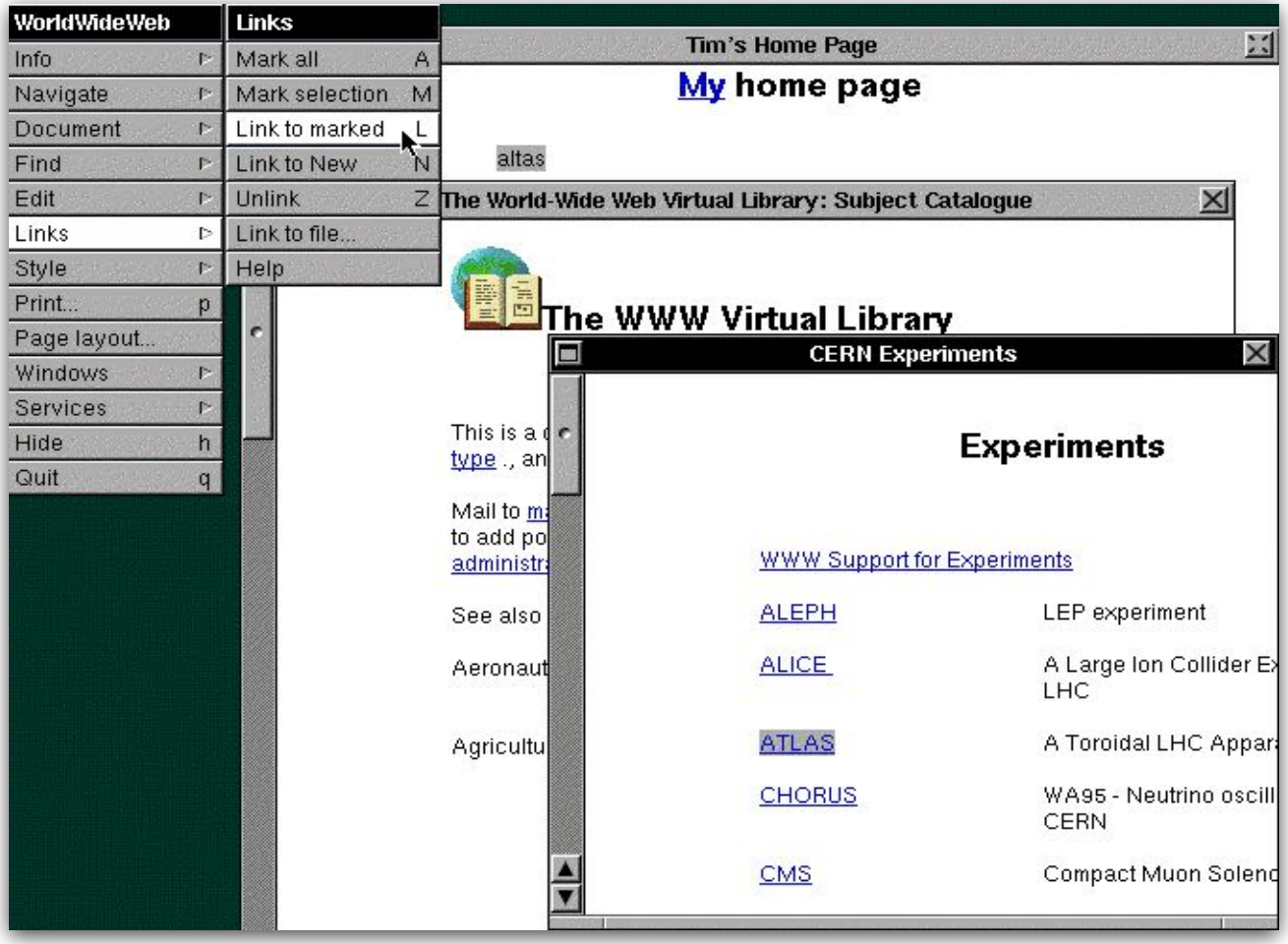




World-Wide Web - Tim Berners-Lee (1990)

Networked hypertex

Integrated browser + editor

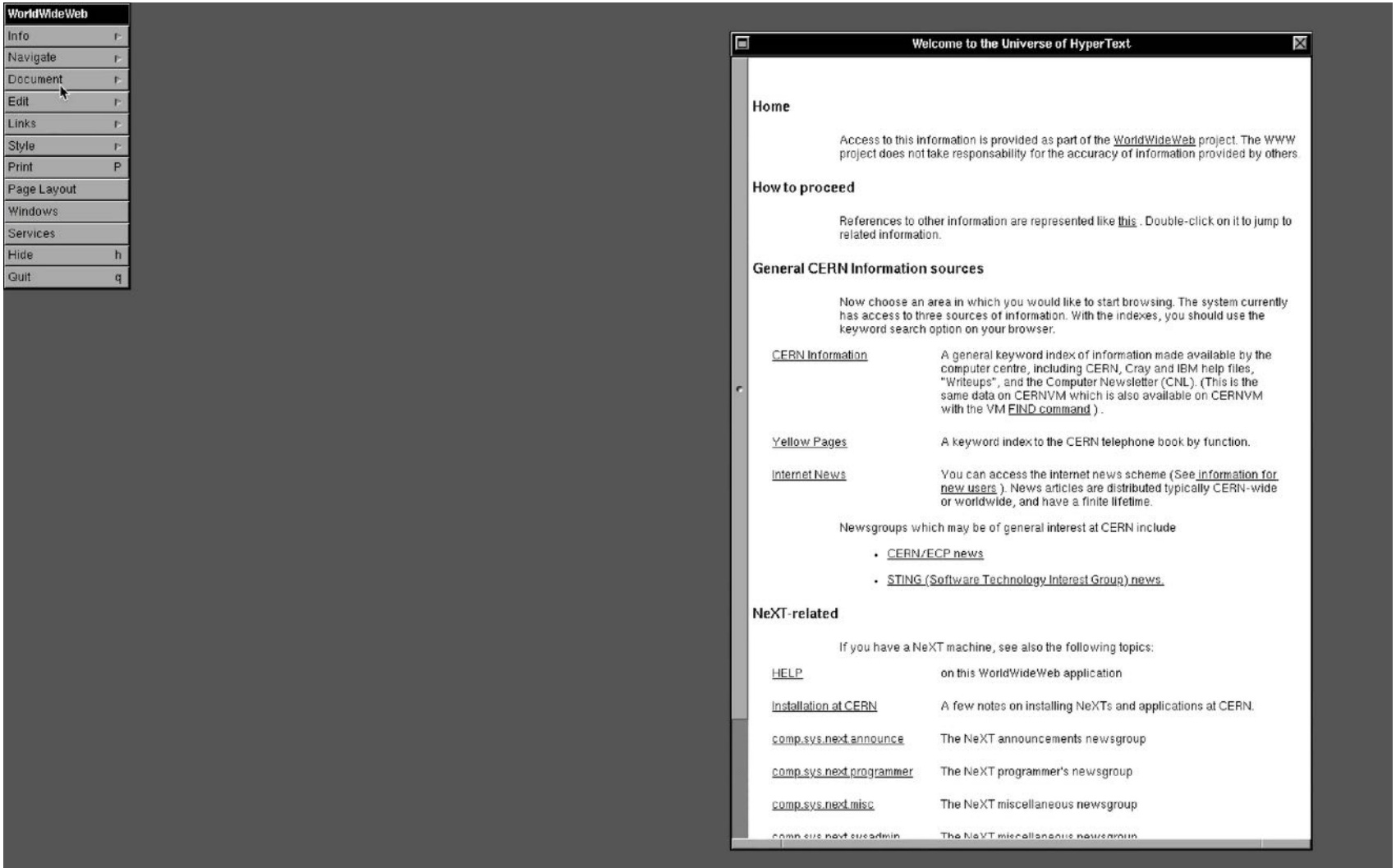


Experience it at https://worldwideweb30.com/browser

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

Editing a page in the browser

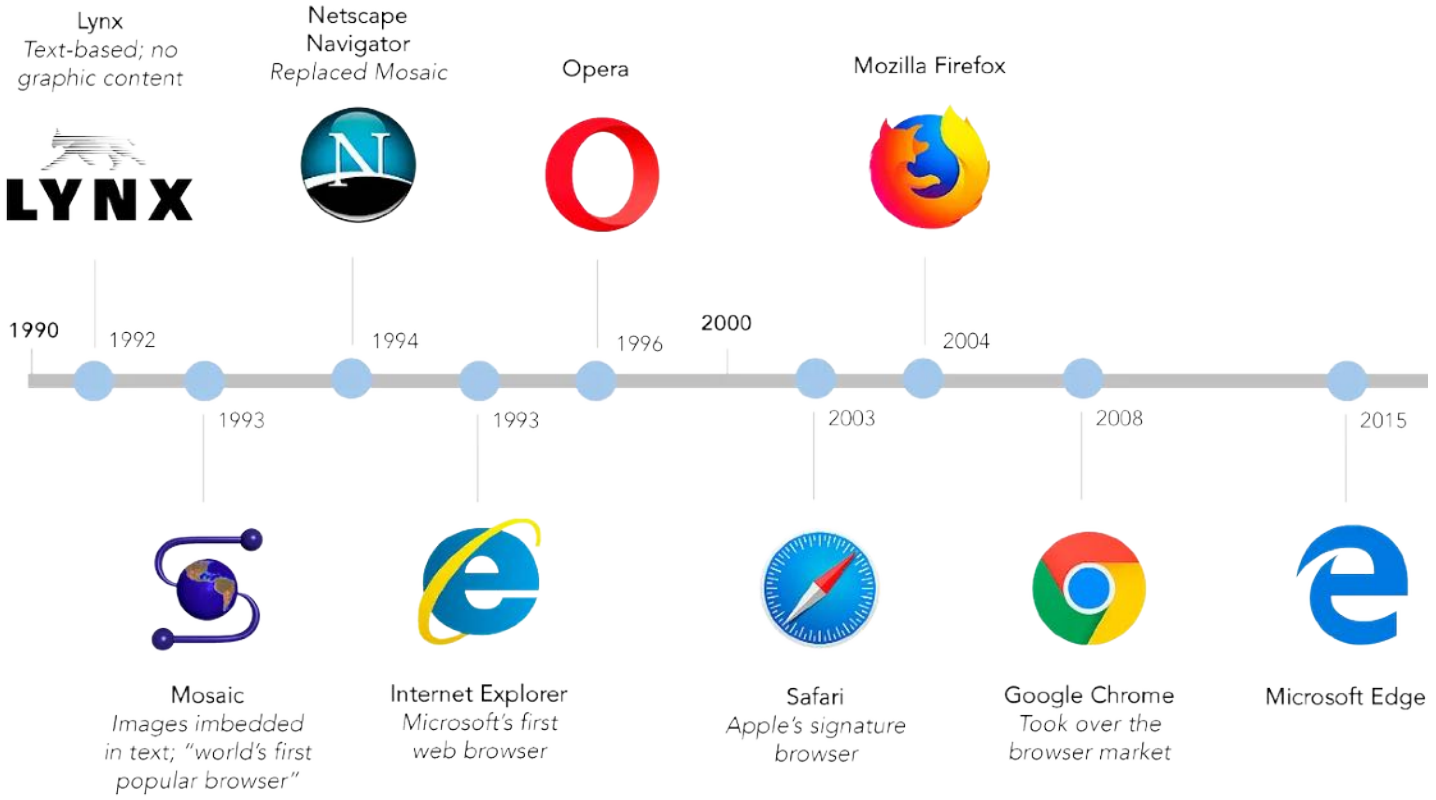
https://worldwideweb30.com/



Web browsers history

None implement editing facilities

Instead: download large amounts of (JavaScript) code



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

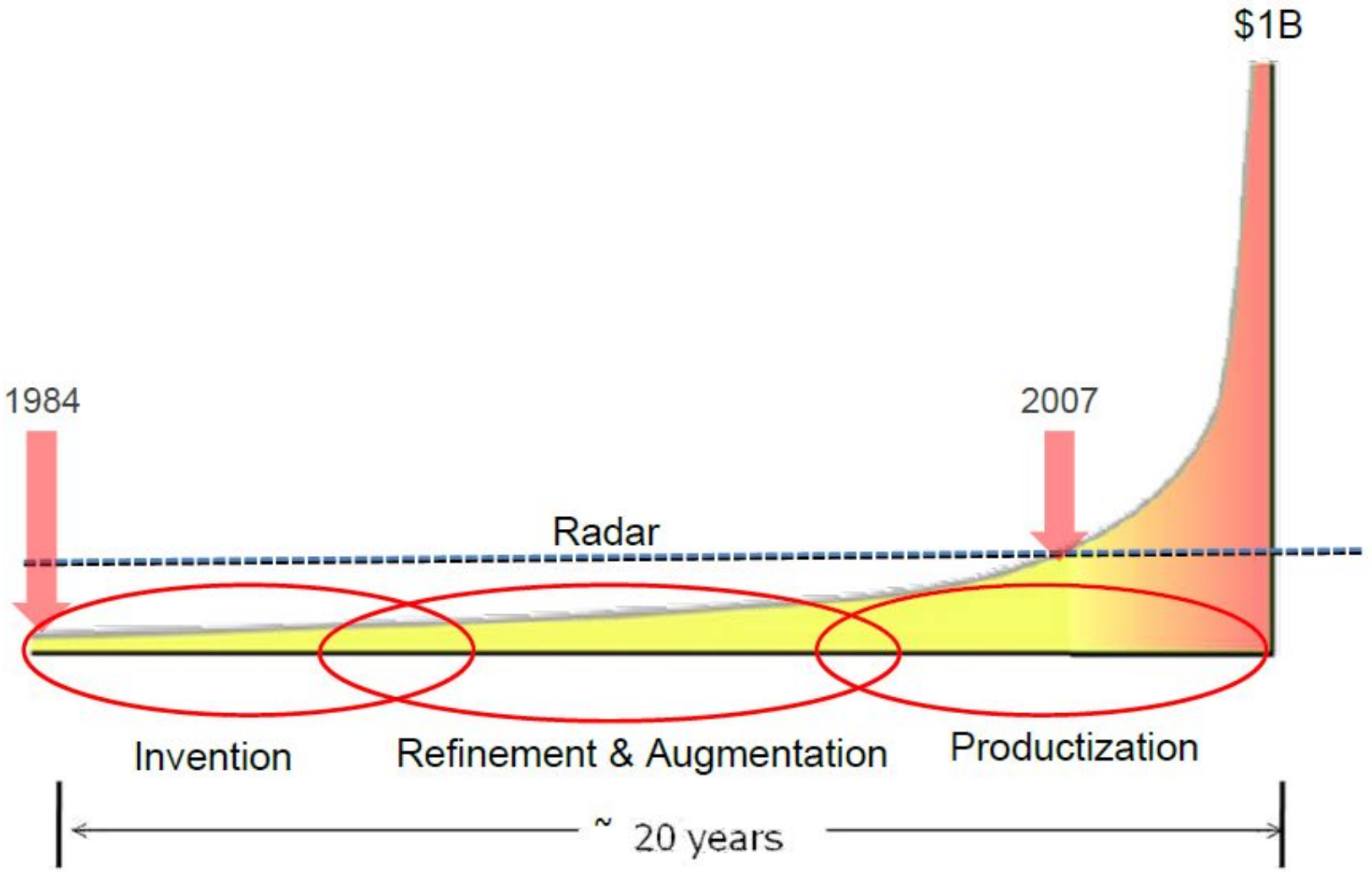
Are the visions getting more and more limited?

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

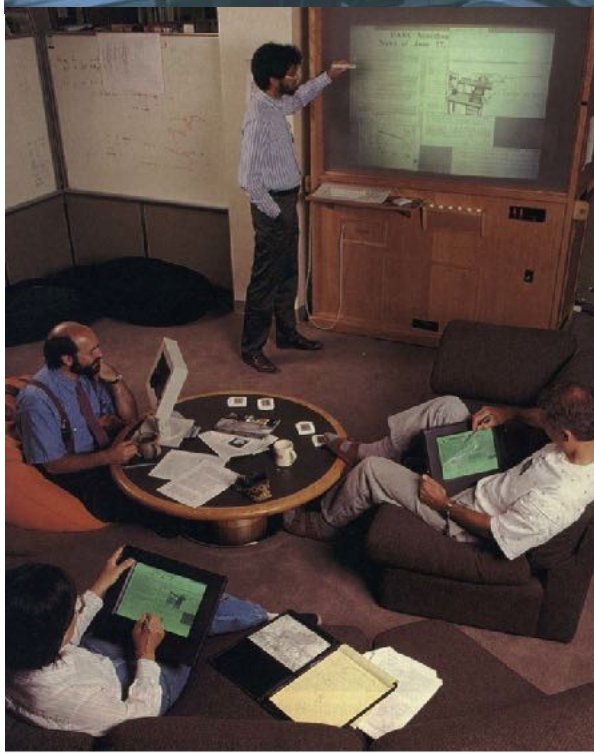


HCI does not follow Moore's law

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)