

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation

Lecture 17:
HCI History

James Fogarty
Alex Fiannaca
Lauren Milne
Saba Kawas
Kelsey Munsell

Tuesday/Thursday
12:00 to 1:20



Today

For Presentations

PowerPoint or PDF

Mind Your Time Limits

Reading Due Friday

Video Prototypes Due Tuesday

Today

Presentations on Thursday

Neat

Poliscope

SchoolView

Sitless

SmartClothing

Timeout

Presentations on Friday Morning

Balance

Ecotopia

FoodPic

MiPhone

Social Reconnection

TagLine

No Section Friday Afternoon

Exam Grading and Review

Exams will not be returned

Can inspect your exam during James's office hours

Consistent grading process

Put your time into your remaining assignments

Redundant data entry process

There are no mistakes in tallying your points

Why do we do HCI in CSE?

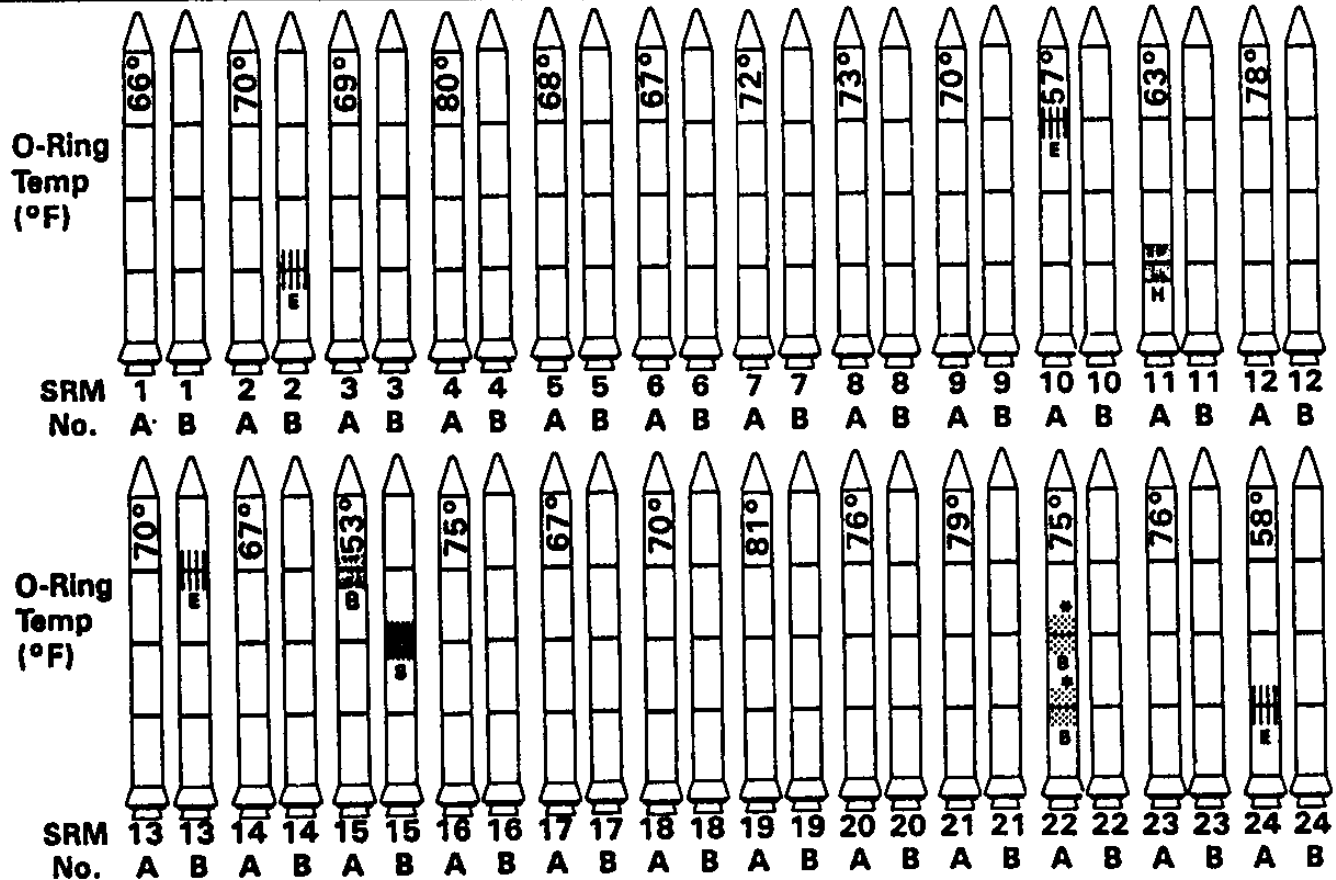
Every engineering discipline includes the study of breakdowns and the design of improved solutions that address those breakdowns

Tacoma Narrows



O-Rings

History of O-Ring Damage in Field Joints (Cont)



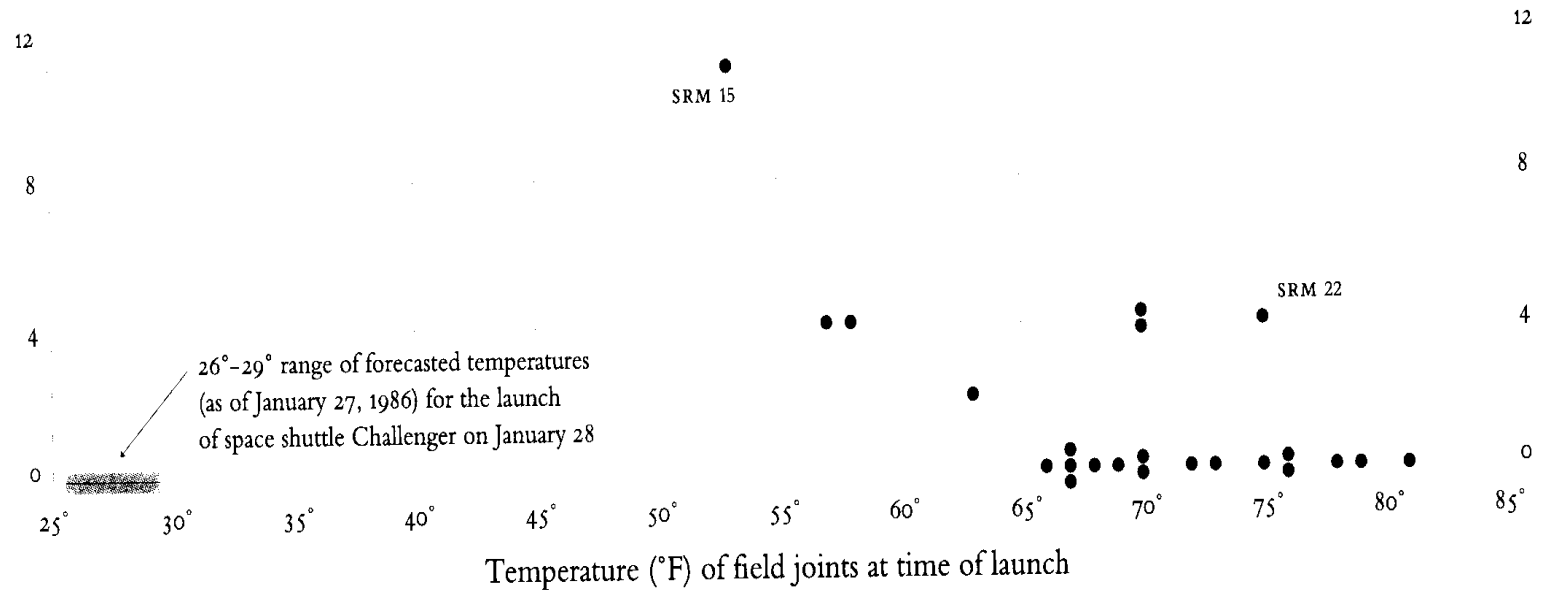
MORTON THIOKOL, INC.
Wasatch Operations

* No Erosion

INFORMATION ON THIS PAGE WAS PREPARED TO SUPPORT AN ORAL PRESENTATION
AND CANNOT BE CONSIDERED COMPLETE WITHOUT THE ORAL DISCUSSION

O-Rings

O-ring damage index, each launch



Tractors



Tractors



Tractors

National Agricultural Safety Database Quotes



Older tractors with narrow front ends are easily upset

Tractor upsets cause more fatalities than other farm accidents

Injuries often include a broken or crushed pelvis

Tractors

Tractor upsets used to be dismissed as driver error

But such accidents are less frequent because modern designs have:

roll cage

low center of gravity

wider wheel bases



Human Factors Tradition

Emerges during and after WWII, as highly trained people are failing to effectively control the machinery they operate

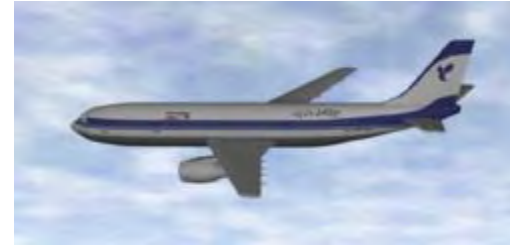
(pilots are crashing planes)

The phrase “human factors” now often has a connotation of studying factory workers, ergonomics, or other physical tasks

(ask me about Grudin article if you're interested)

1988: Iran Air Flight 655

In 1987, *USS Stark* was struck by two missiles launched by an Iraqi Mirage F-1, killing 37 with no weapons fired in self-defense during the attack.

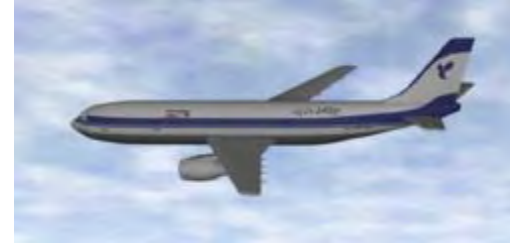


In 1988, the crew of the *USS Vincennes* Combat Information Center confusingly reported the plane as ascending and descending at the same time (there were two "camps").



1988: Iran Air Flight 655

The Airbus's original track, number 4474, had been replaced by the *Sides* track, number 4131, when the computer briefly recognized them as one and the same. Shortly thereafter, track 4474 was re-assigned by the system to an American A-6, several hundred miles away, following a descending course at the time. Apparently not all the crew in the CIC realized the track number had been switched on them.



Why do we do HCI in CSE?

Every engineering discipline includes the study of breakdowns and the design of improved solutions that address those breakdowns

Understanding how and why human interaction breaks down is fundamental to designing better computing systems

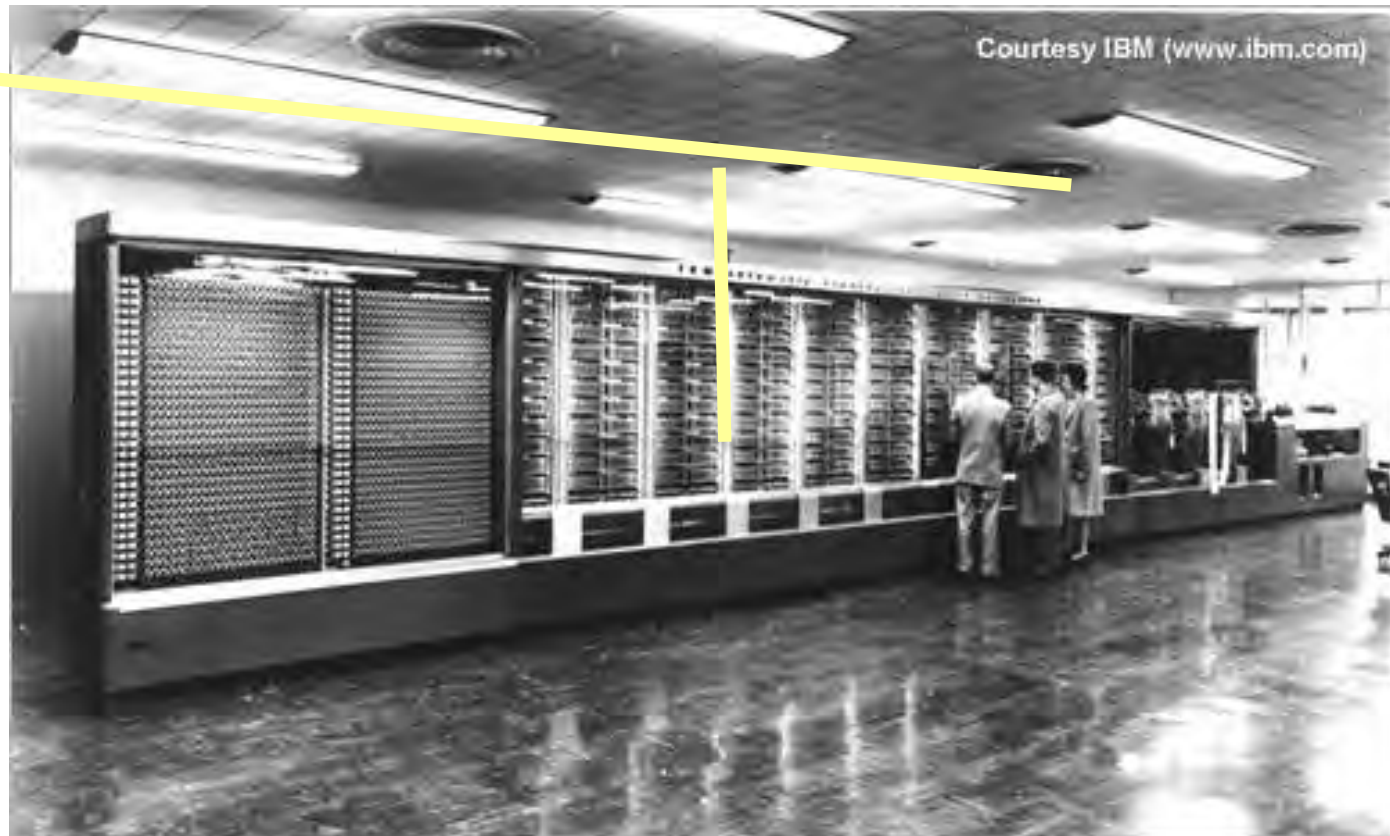
This study must include computer scientists, as we are the ones creating the technology

A History Question

Who invented hypertext? When?

Computing in 1945

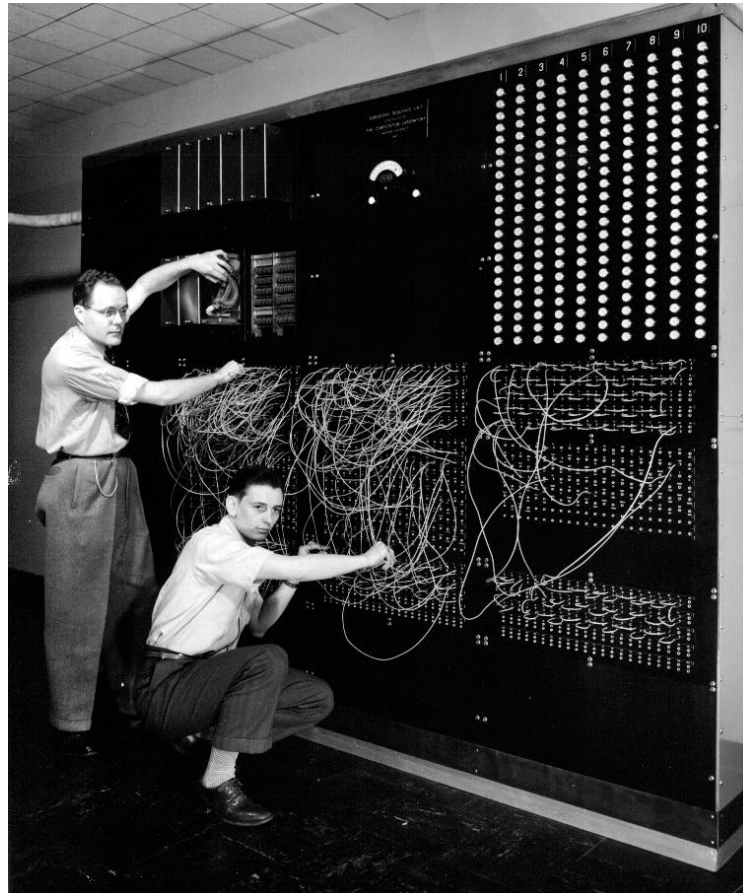
Harvard Mark I, 55 feet long, 8 feet high, 5 tons



The Harvard Mark I

Computing in 1945

Harvard Mark I, 55 feet long, 8 feet high, 5 tons



Computing in 1945

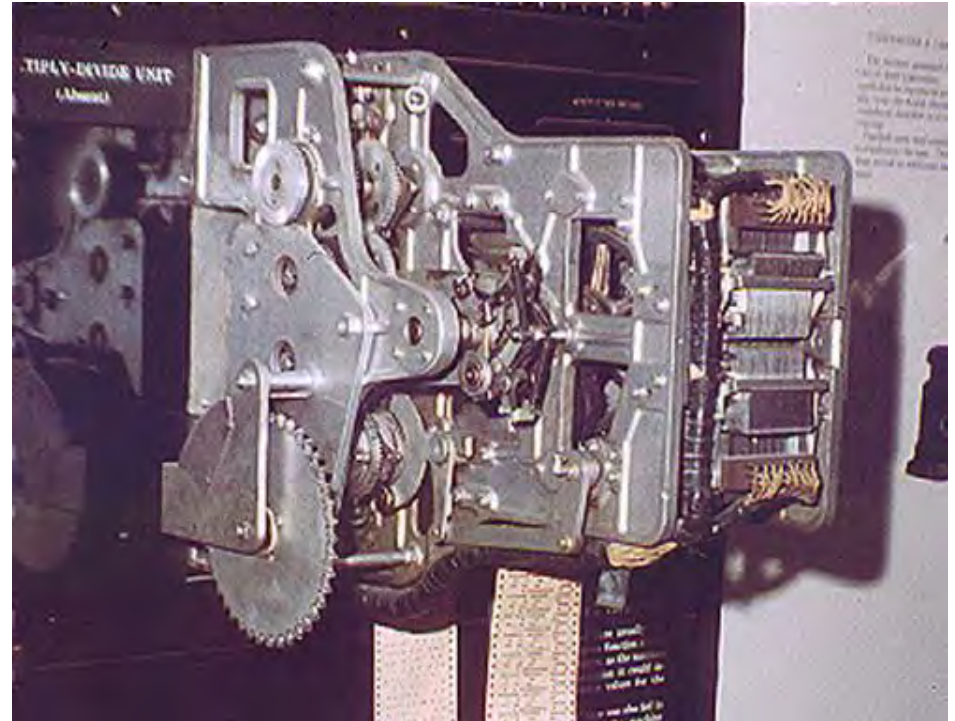
Ballistics calculations

Physical switches
(no microprocessor)

Paper tape

Simple arithmetic
& fixed calculations
(before programs)

3 sec. to multiply



Computing in 1945

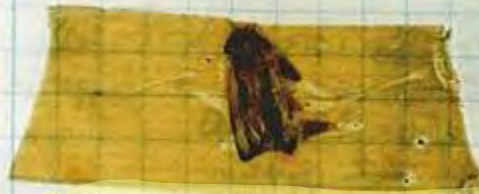
First computer bug
(Harvard Mark II)

Adm. Grace Murray Hopper



1100 Started Cosine Tape (Sine check)
1525 Started Multi-Adder Test.

1545



Relay #70 Panel F
(moth) in relay.

1700 First actual case of bug being found.
~~1630~~ 1630 arctangent started.
1700 closed down.

A Little About Vannevar Bush

Name rhymes with “Beaver”

Faculty member at MIT

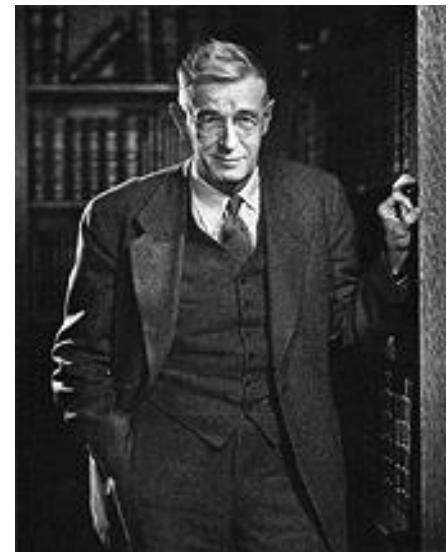
Coordinated WWII effort
with 6000 US scientists

Social contract for science

Federal government funds universities

Universities do basic research

Research helps economy and defense



As We May Think

Published in the Atlantic Monthly in 1945

<http://www.theatlantic.com/magazine/print/1945/07/as-we-may-think/3881/>

Motivated in part by defining a scientific grand challenge as WWII was ending

As We May Think

“There is a growing mountain of research. ... The investigator is staggered by the findings and conclusions of thousands of other workers—conclusions which he cannot find time to grasp, much less to remember, as they appear. Yet specialization becomes increasingly necessary for progress, and the effort to bridge between disciplines is correspondingly superficial.”

As We May Think

“The world has arrived at an age of cheap complex devices of great reliability; and something is bound to come of it.”

“Had a Pharaoh been given detailed and explicit designs of an automobile, and had he understood them completely, it would have taxed the resources of his kingdom to have fashioned the thousands of parts for a single car, and that car would have broken down on the first trip to Giza.”

MicroPhotography

Describes a combination of photocells, facsimile transmission, and electron beam technology

Enables capturing a photograph into micro form

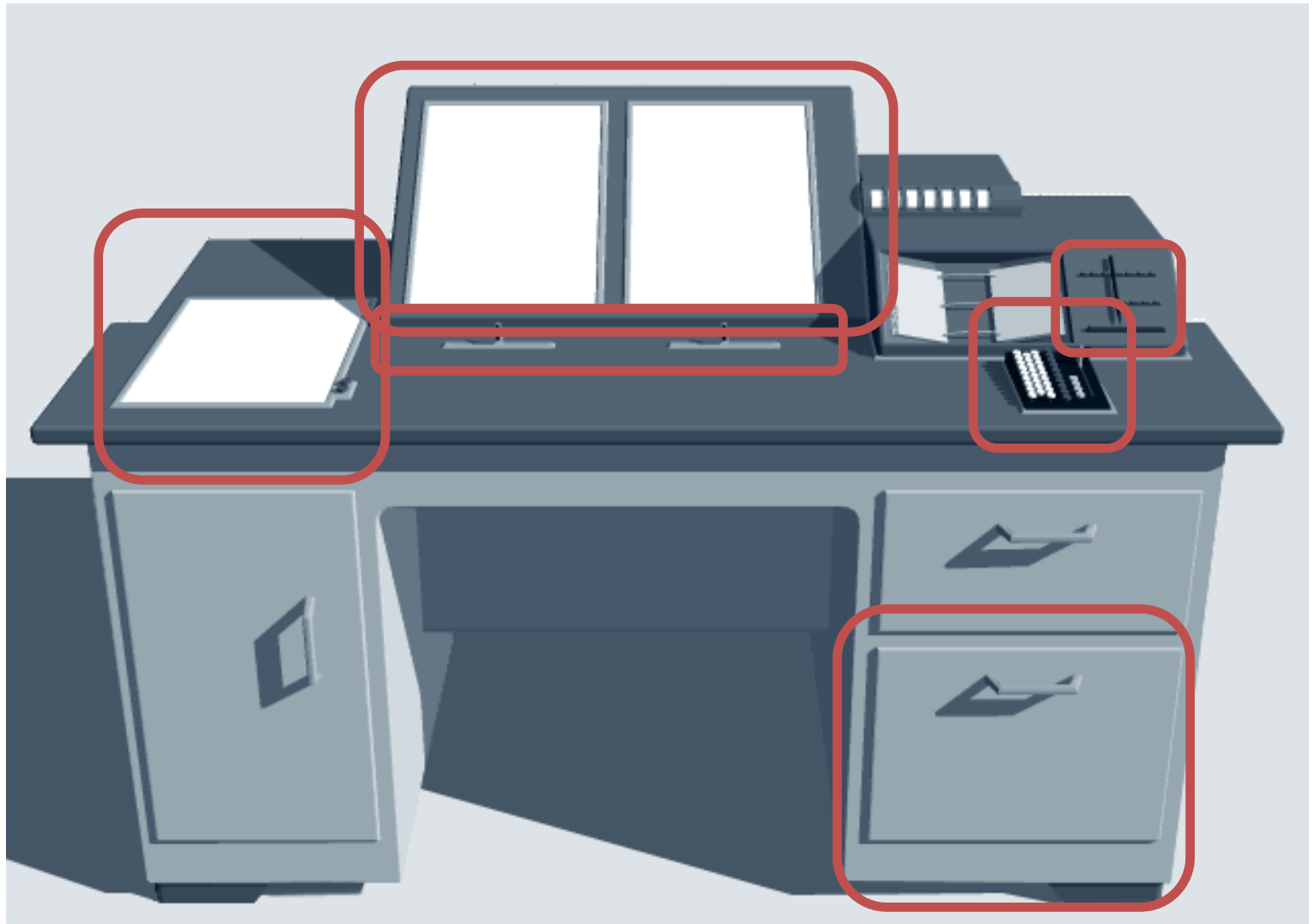
“It would be a brave man who would predict that such a process will always remain clumsy, slow, and faulty in detail.”

MicroPhotography

“Assume a linear ratio of 100 for future use. Consider film of the same thickness as paper, although thinner film will certainly be usable. Even under these conditions there would be a total factor of 10,000 between the bulk of the ordinary record on books, and its microfilm replica. The Encyclopedia Britannica could be reduced to the volume of a matchbox. A library of a million volumes could be compressed into one end of a desk.”



Memex



Memex

“If the user wishes to consult a certain book, he taps its code on the keyboard...”

“Frequently-used codes are mnemonic, so that he seldom consults his code book;”

“He can add marginal notes and comments ... even ... by a stylus scheme”

“All this is conventional...”

Memex

“It affords an immediate step, however, to associative indexing”

“tying two items together is the important thing”

“Before him are the two items to be joined, projected onto adjacent viewing positions. At the bottom of each there are a number of blank code spaces, and a pointer is set to indicate one of these on each item. The user taps a single key, and the items are permanently joined.”

Memex

“Thereafter, at any time, when one of these items is in view, the other can be instantly recalled merely by tapping a button below the corresponding code space. Moreover, when numerous items have been thus joined together to form a trail, they can be reviewed in turn, rapidly or slowly, by deflecting a lever like that used for turning the pages of a book.”

Memex

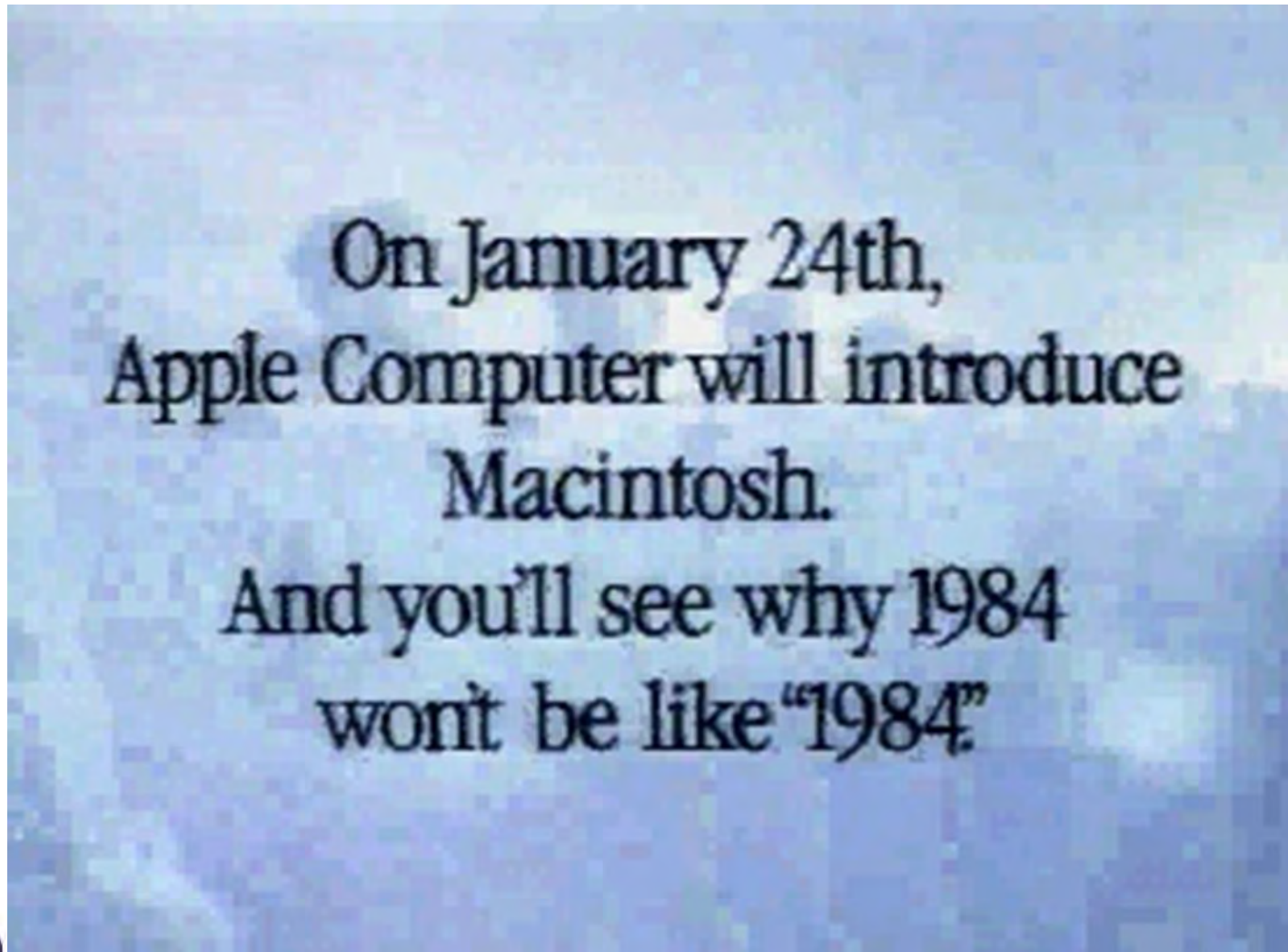
“Wholly new forms of encyclopedias will appear, ready made with a mesh of associative trails running through them, ready to be dropped into the memex and there amplified.”

Memex is the first proposed hypertext system

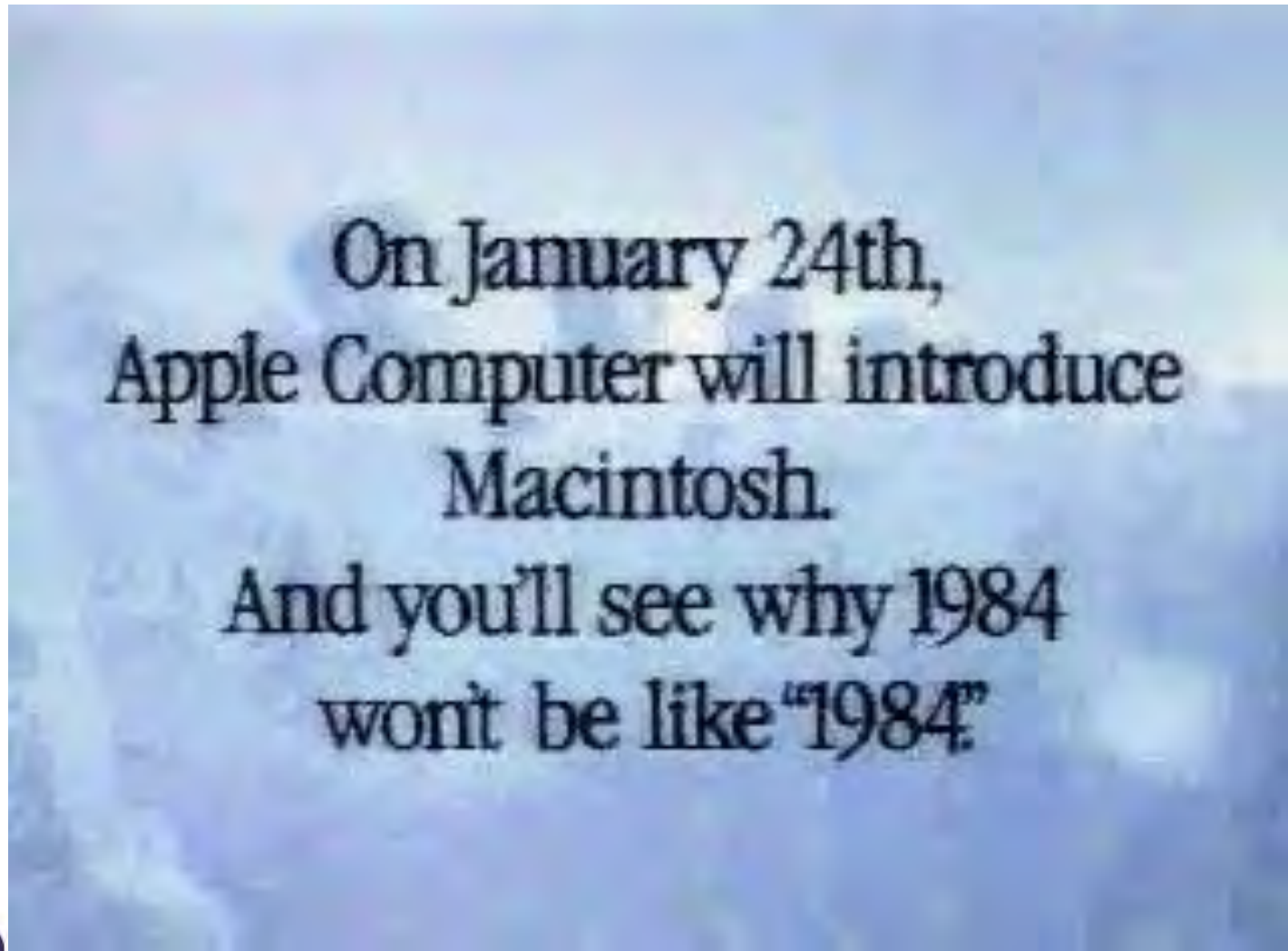
A History Question

Who invented desktop computing? When?

Macintosh in 1984 is well known



Macintosh in 1984 is well known



Alan Kay on Early Interface Work

Narrator is Alan Kay, speaking in 1987

This video is almost 20 years old

It was a historical account when it was filmed

Speaks to four systems

Sketchpad

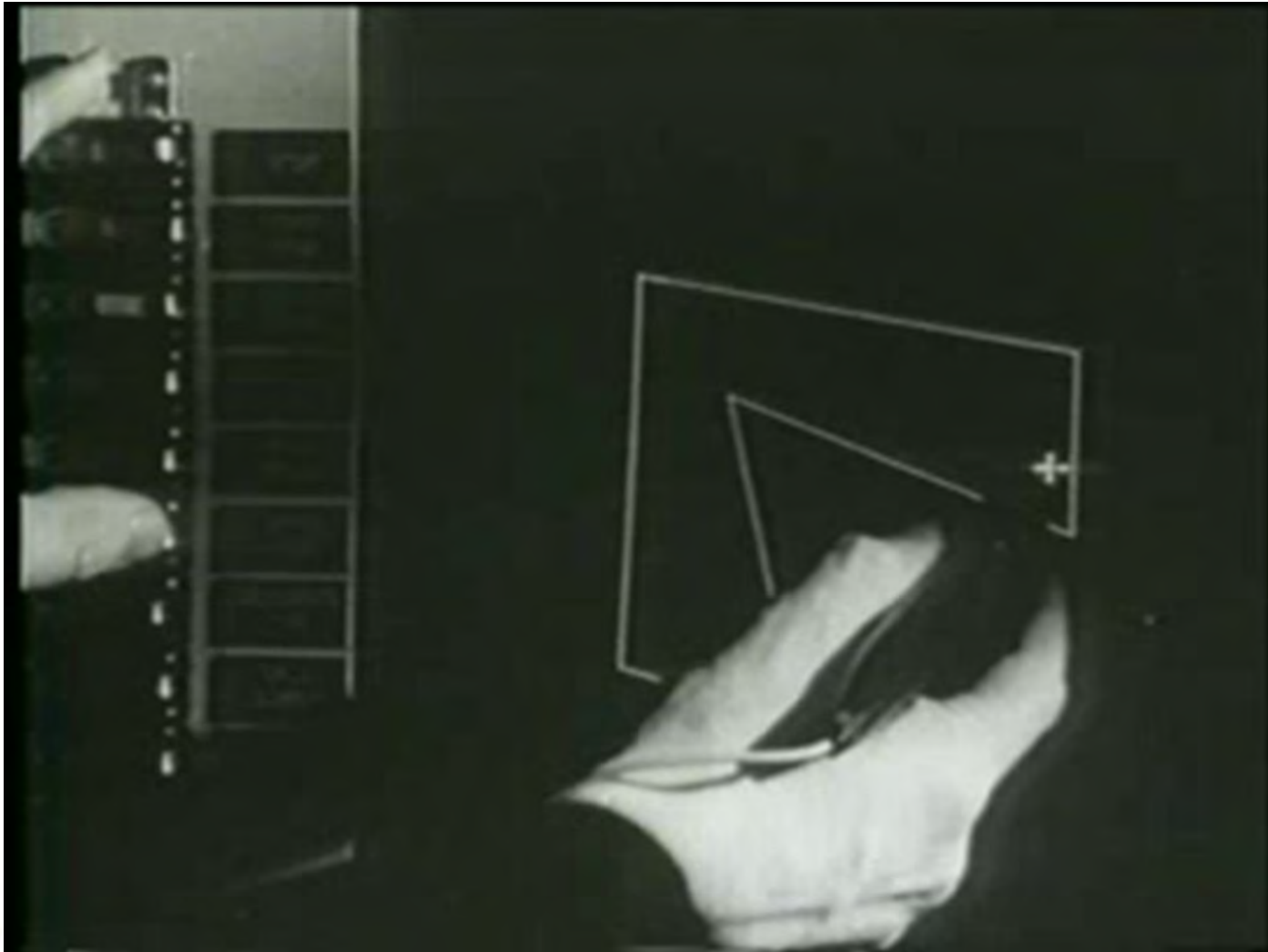
NLS

GRAIL

Dynabook

<http://courses.cs.washington.edu/courses/cse440/videos/history/AlanKay1987.m4v>

Ivan Sutherland's Sketchpad



Ivan Sutherland's Sketchpad



Ivan Sutherland's Sketchpad

When do we think this was done?



Ivan Sutherland's Sketchpad

When do we think this was done?



Ivan Sutherland's Sketchpad

When do we think this was done?



1962

Windows

Constraints

(i.e., non-procedural)

Prototype/Instance Inheritance

(i.e., object-oriented)

Doug Engelbart's NLS (Online System)

```
REPLACE CHARACTER
1
2: MARKET SEE 1
  2A: PRODUCE
    2A1: ORANGE
    2A2: APPLES
    2A3: BANANAS
    2A4: CARROTS
    2A5: LETTUCE
    2A6: BEANS
  2B: CANS
    2B1: APPLE SAUCE
    2B2: BEAN SOUP
    2B3: TOMATO SOUP
  2C: CEREALS
    2C1: BREAD
    2C2: NOODLES
    2C3: FRENCH BREAD
  2D: COLD LOCKER
    2D1: MILK
```

Doug Engelbart's NLS (Online System)



Doug Engelbart's NLS (Online System)

When do we think this was done?

Doug Engelbart's NLS (Online System)

When do we think this was done? 1968

Invention of the mouse

First working hypertext system

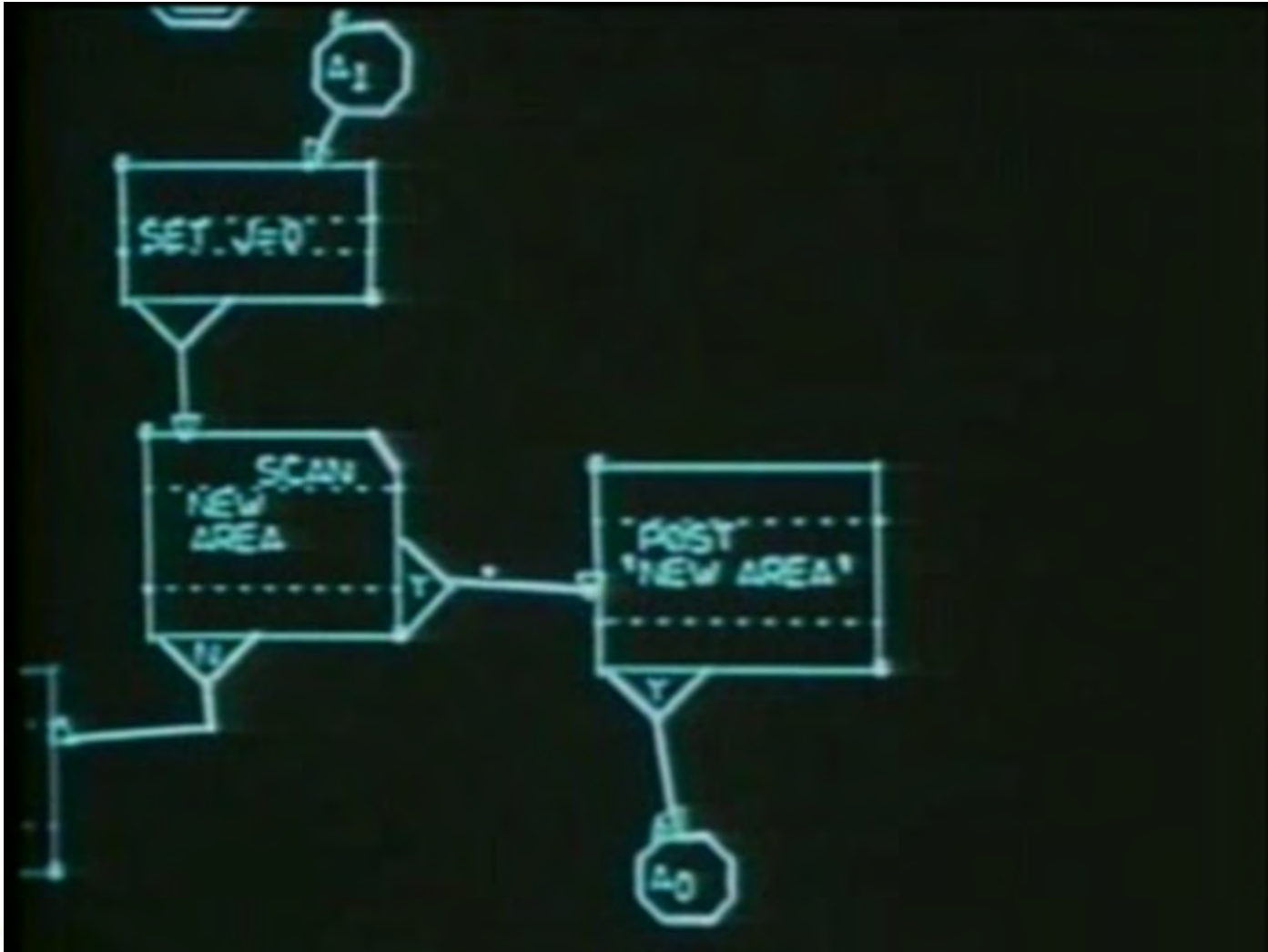
Chording keyboard to reduce hand movement

Remote collaboration

Analog Mouse leads to heavy mousing

Reactions include accusations of “faking it” and claims of irrelevance because “terminal can do that”

GRAIL



GRAIL



GRAIL

When do we think this was done?

GRAIL

When do we think this was done? 1968

Window handles

Modeless interaction via direct action

Gesture recognition

Proposed for end-user programming via flow charts

Dynabook



Dynabook



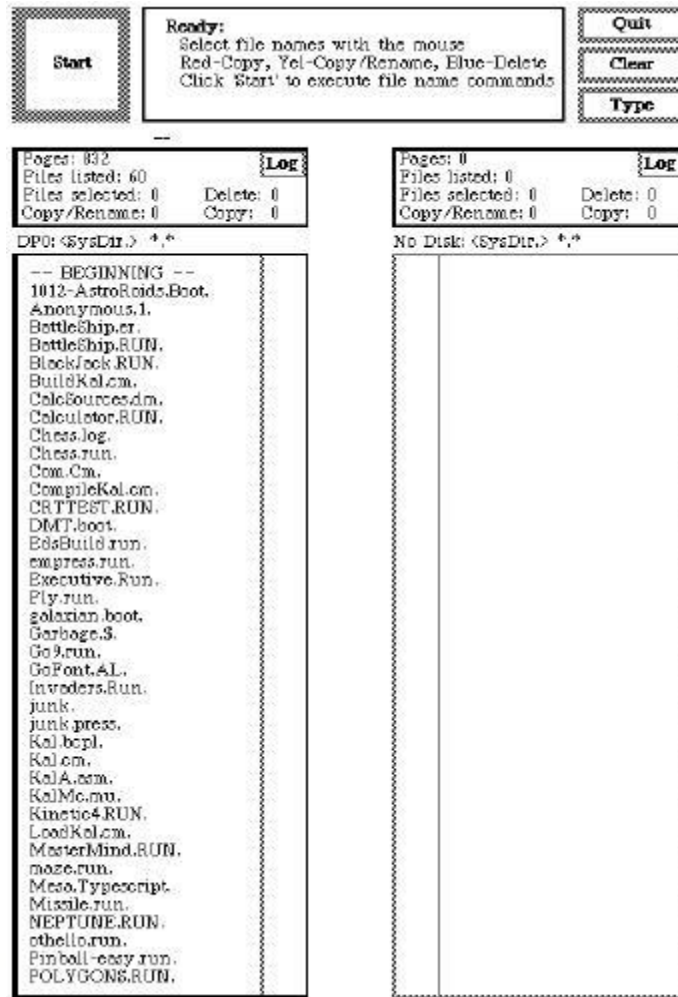
Xerox to Apple and Microsoft

XEROX Alto 1973

Xerox Alto



Xerox Alto



Xerox to Apple and Microsoft

XEROX Alto 1973

Steve Jobs visits PARC in 1979

Xerox to Apple and Microsoft

XEROX Alto 1973

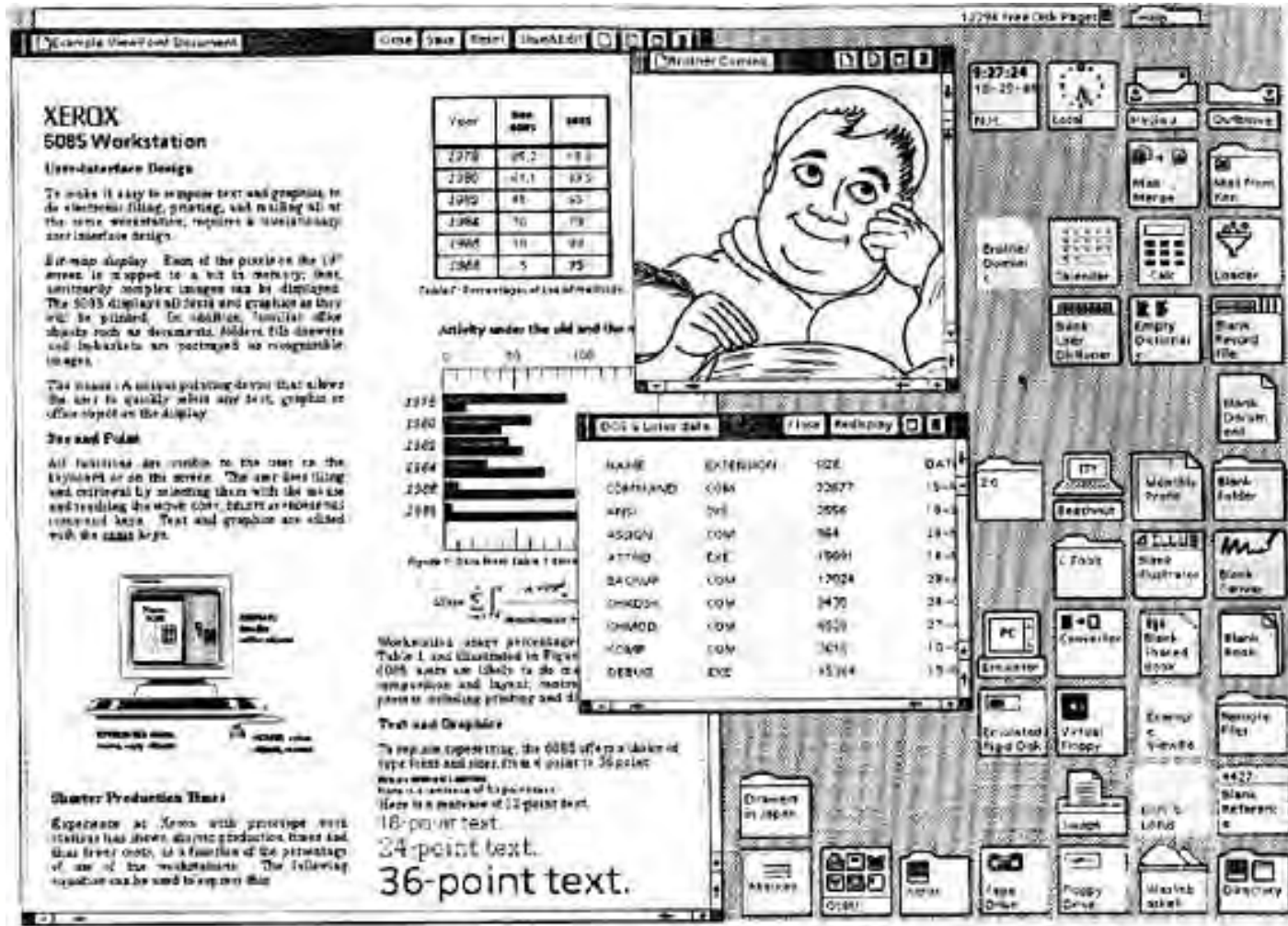
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XEROX STAR 1981

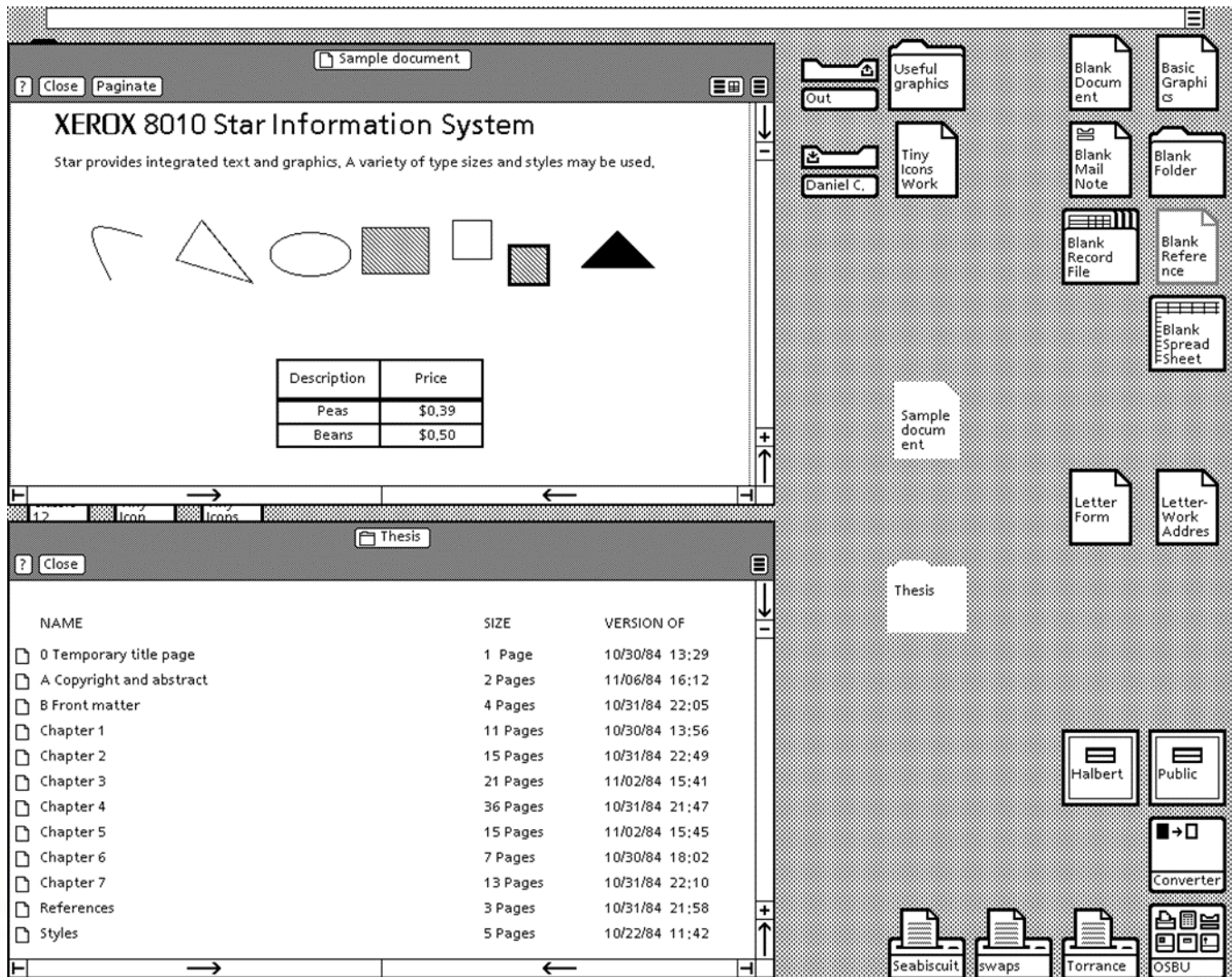
Xerox Star



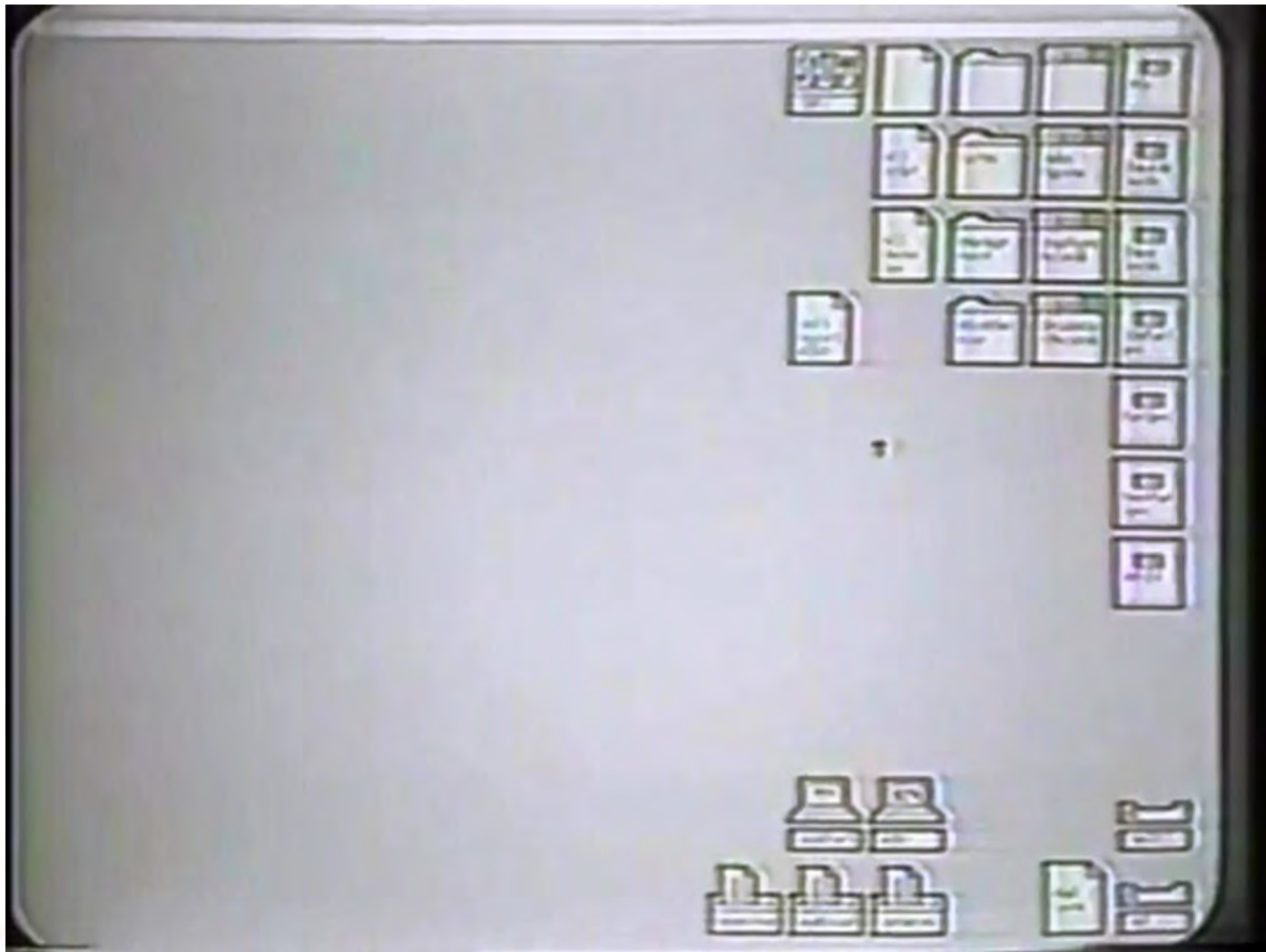
Xerox Star



Xerox Star



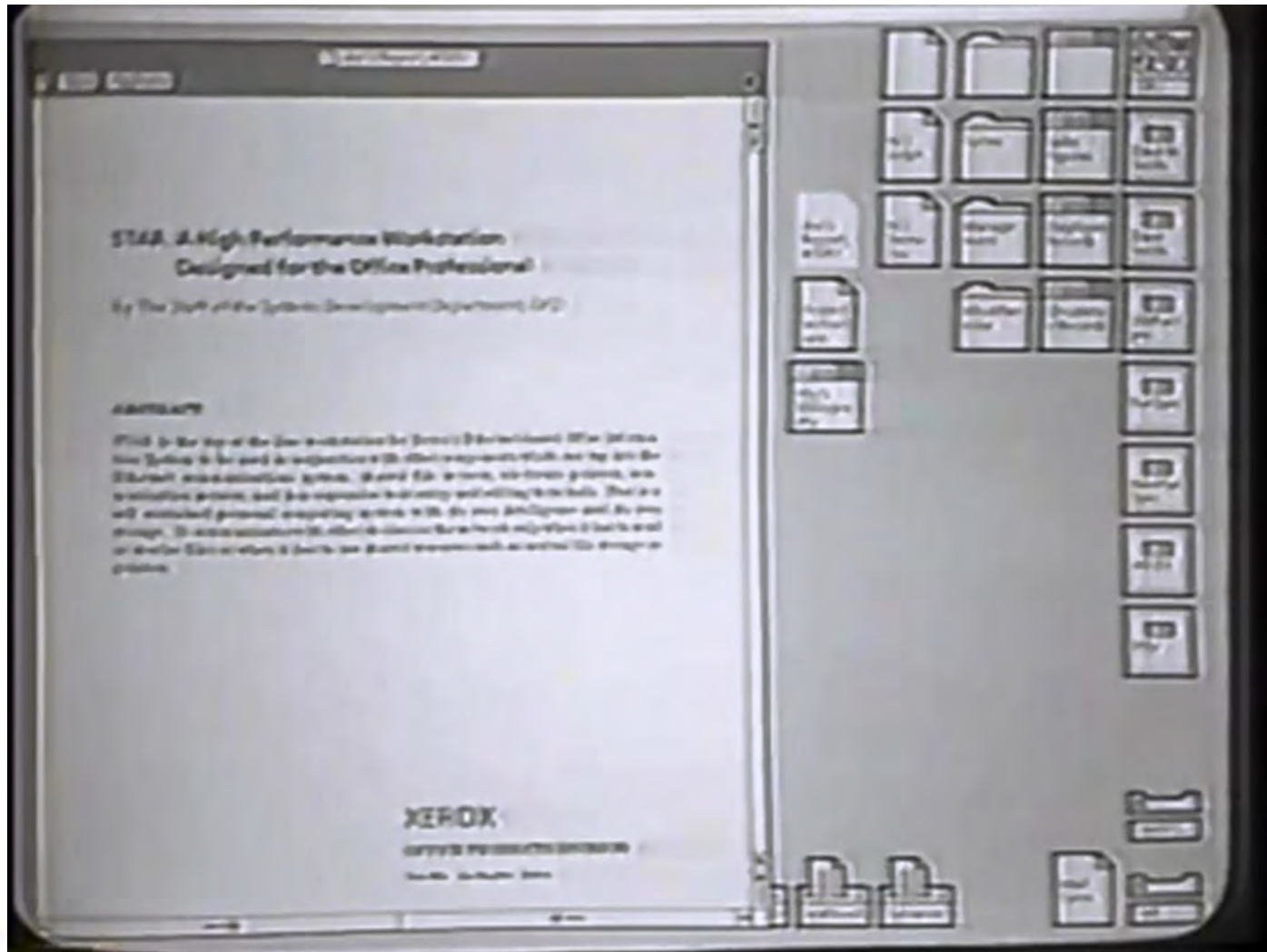
Xerox Star



Xerox Star



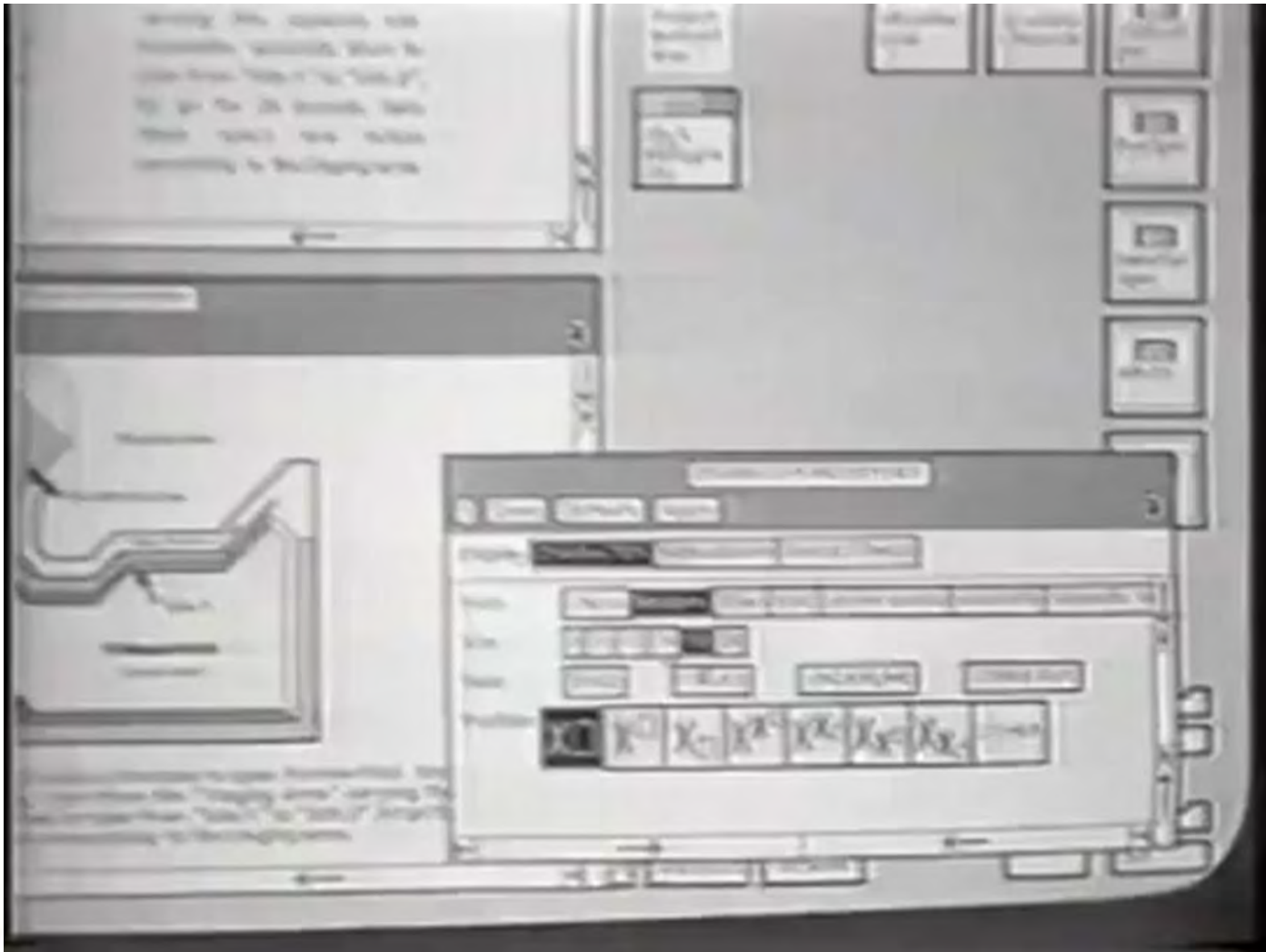
Xerox Star



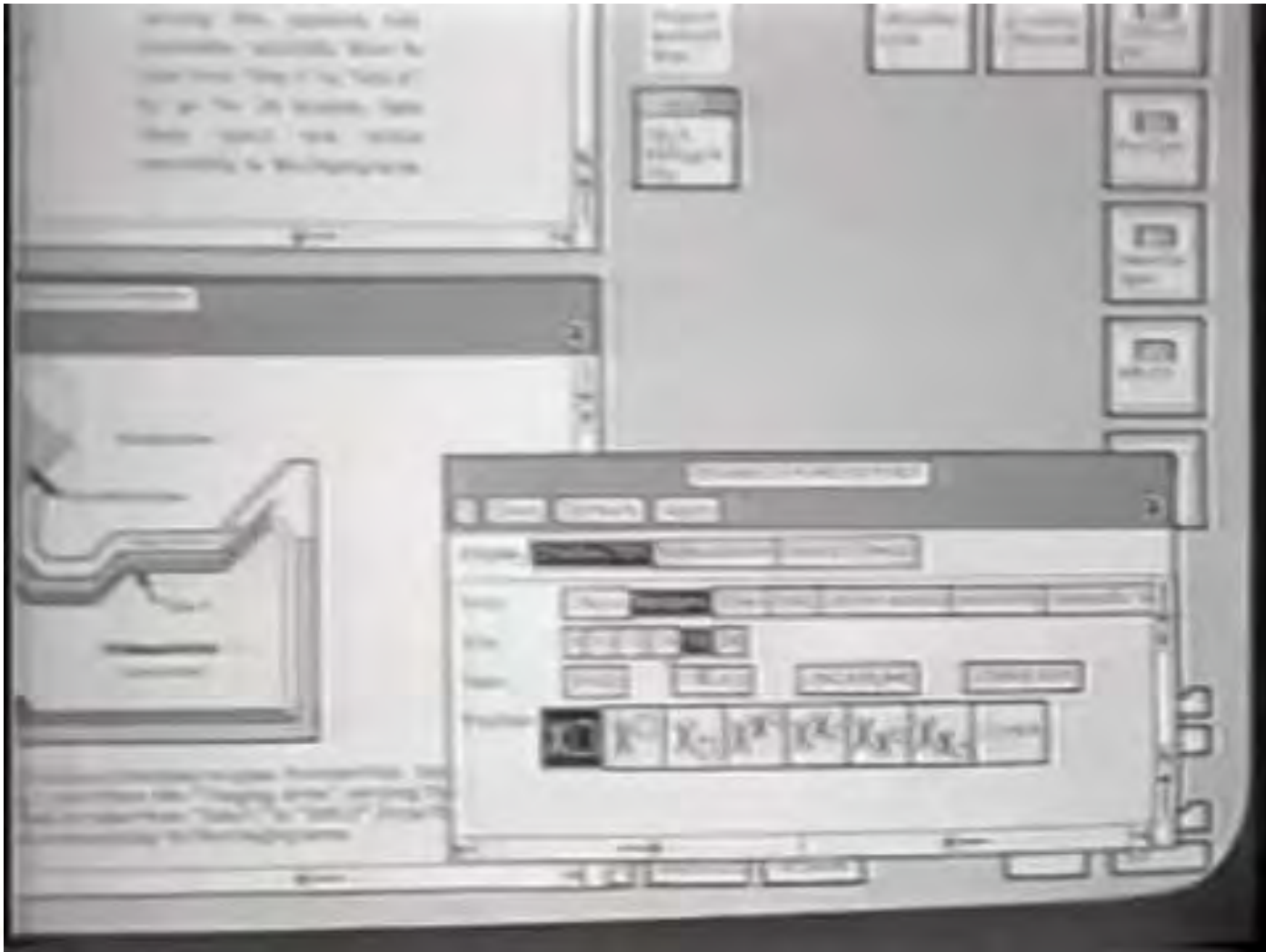
Xerox Star



Xerox Star



Xerox Star



Xerox to Apple and Microsoft

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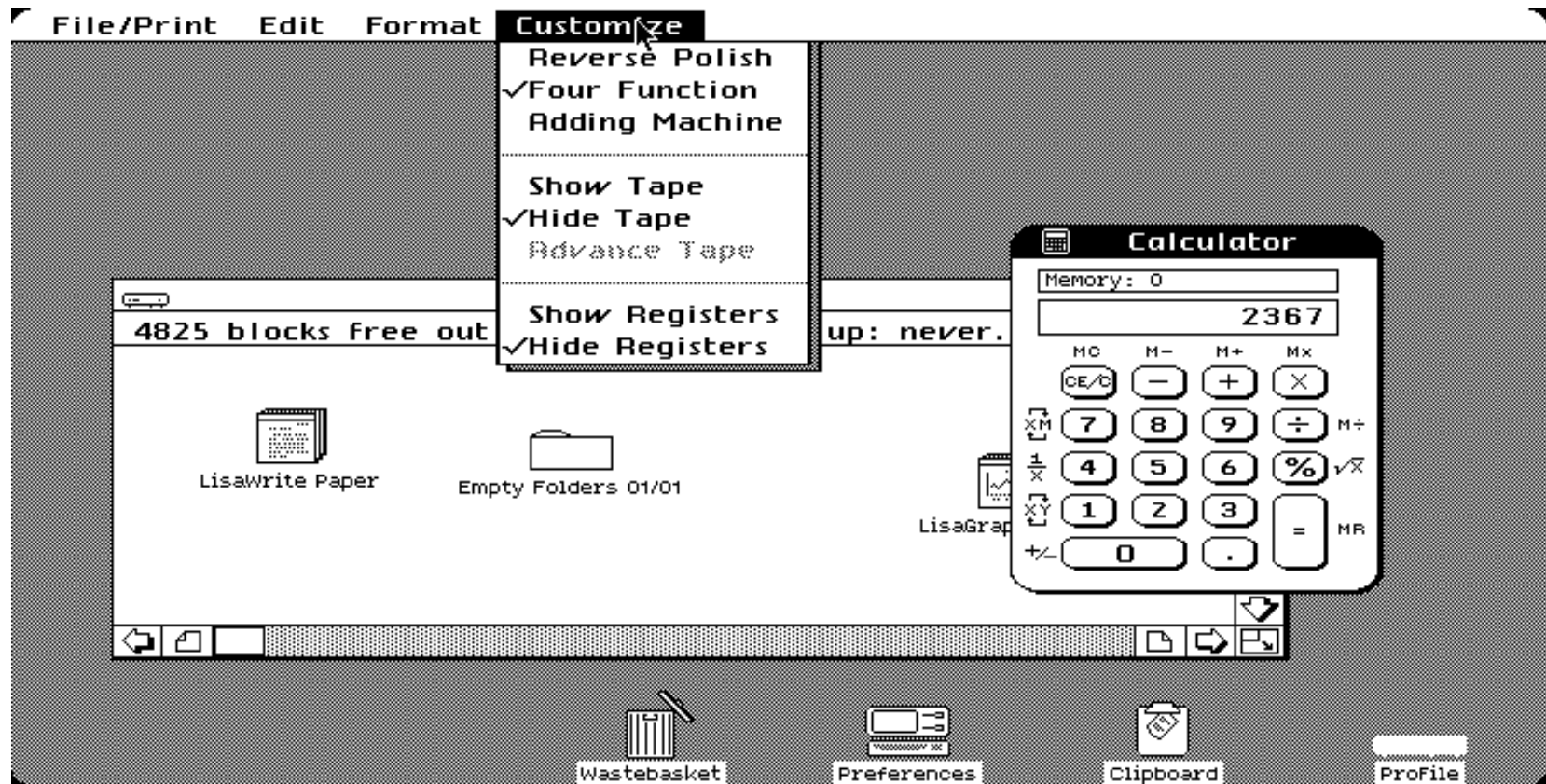
XEROX STAR 1981

Apple Lisa 1981

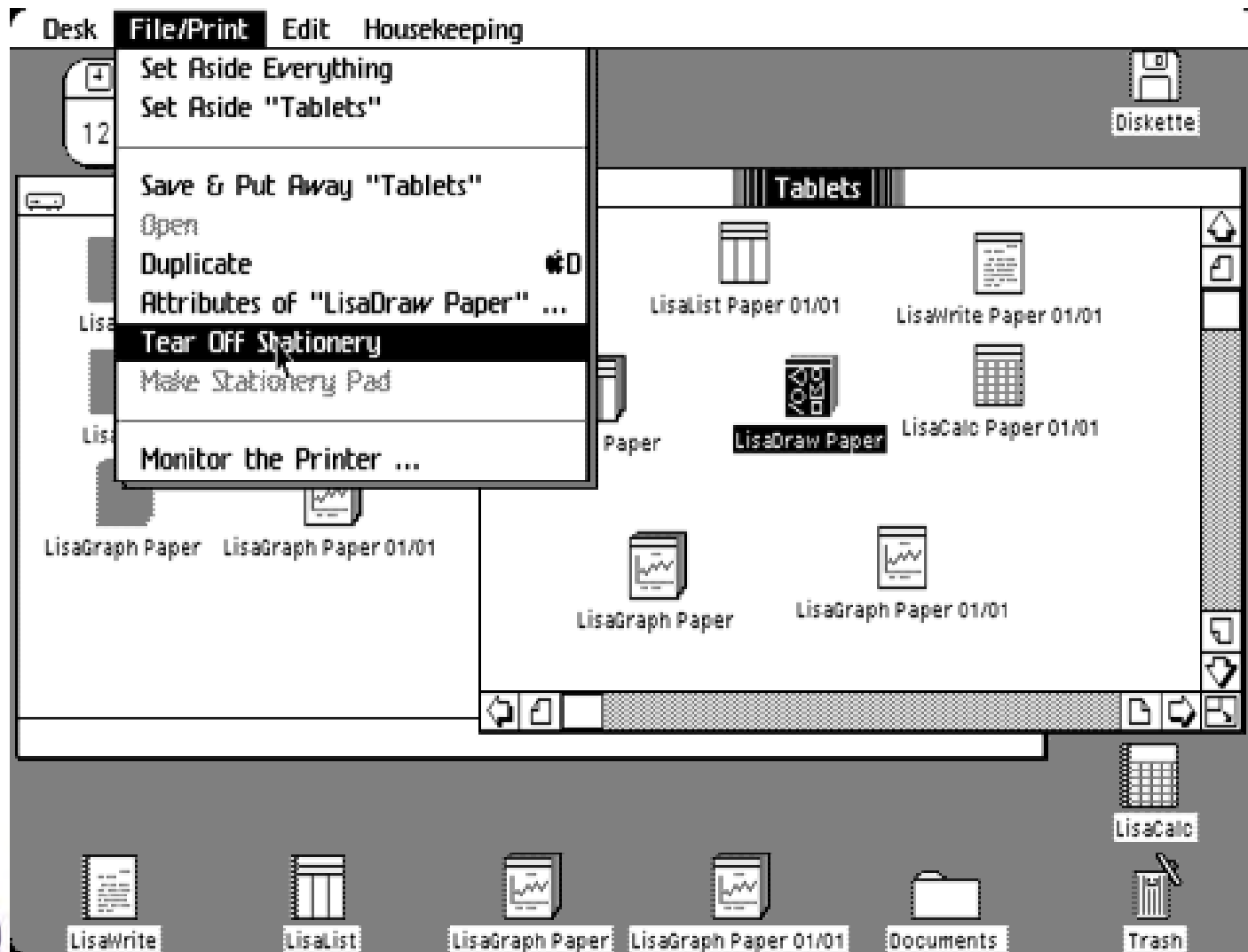
Apple Lisa



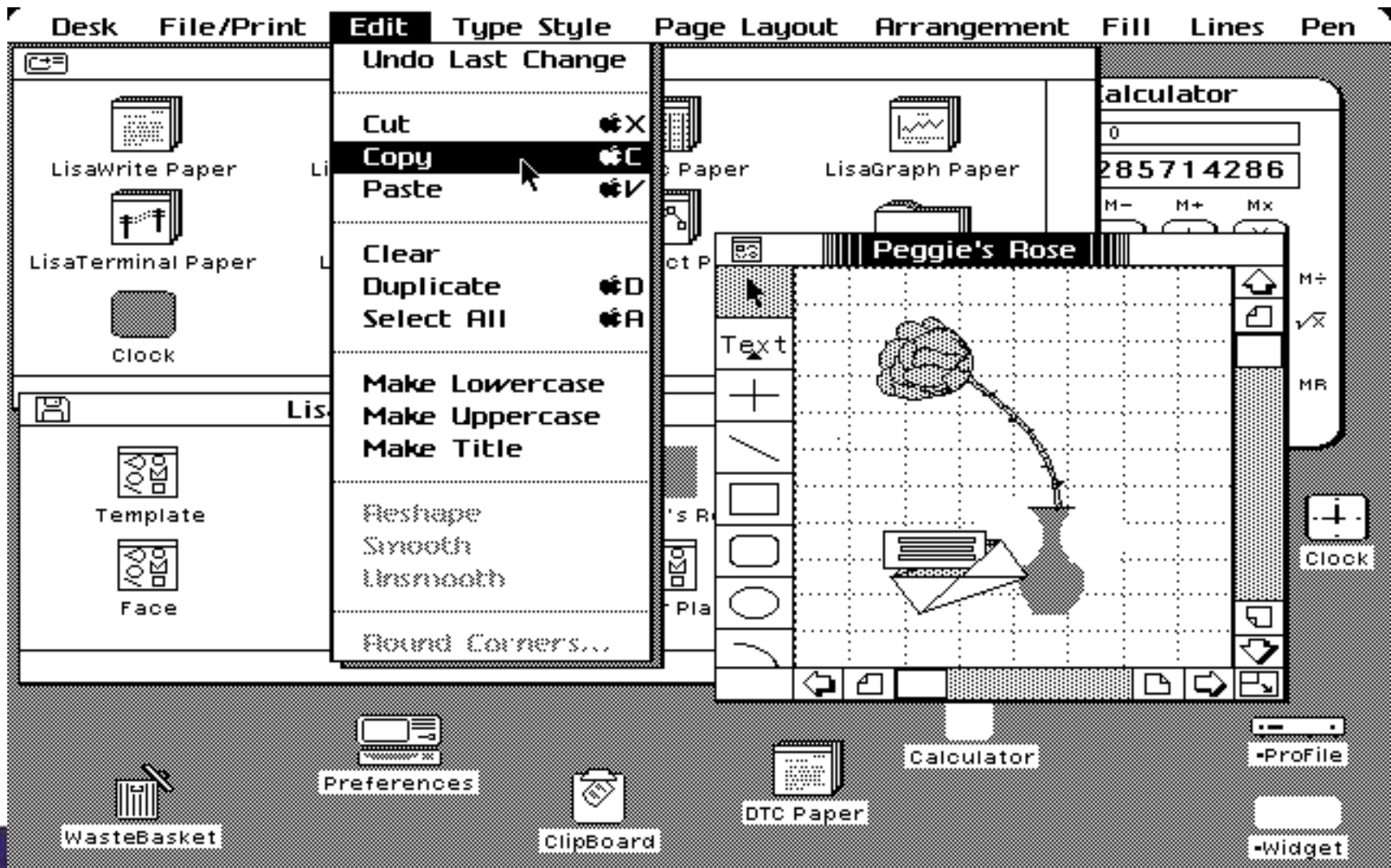
Apple Lisa



Apple Lisa



Apple Lisa



Xerox to Apple and Microsoft

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XEROX STAR 1981

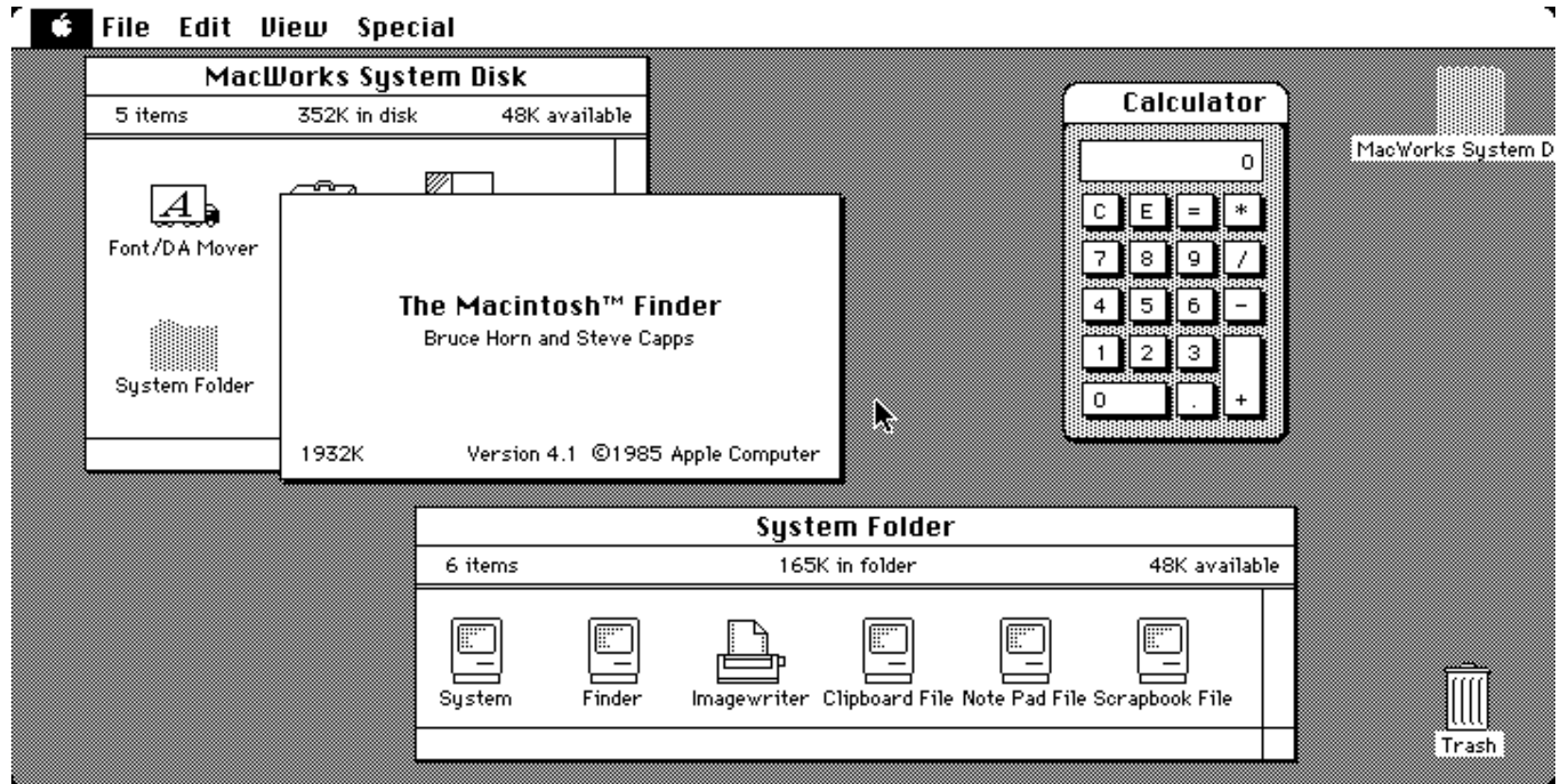
Apple Lisa 1981

Apple Macintosh 1984

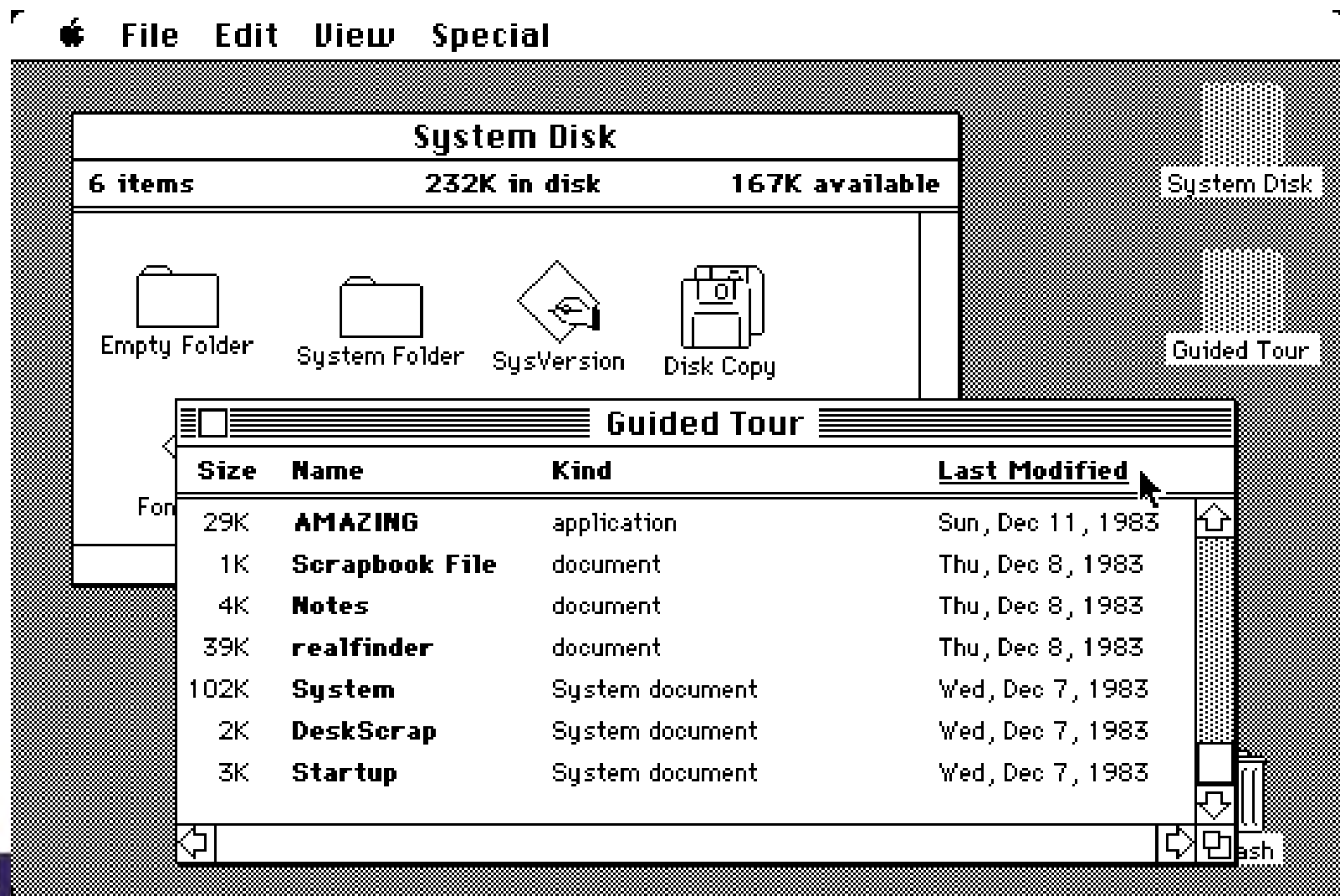
Macintosh



Macintosh



Macintosh



Xerox to Apple and Microsoft

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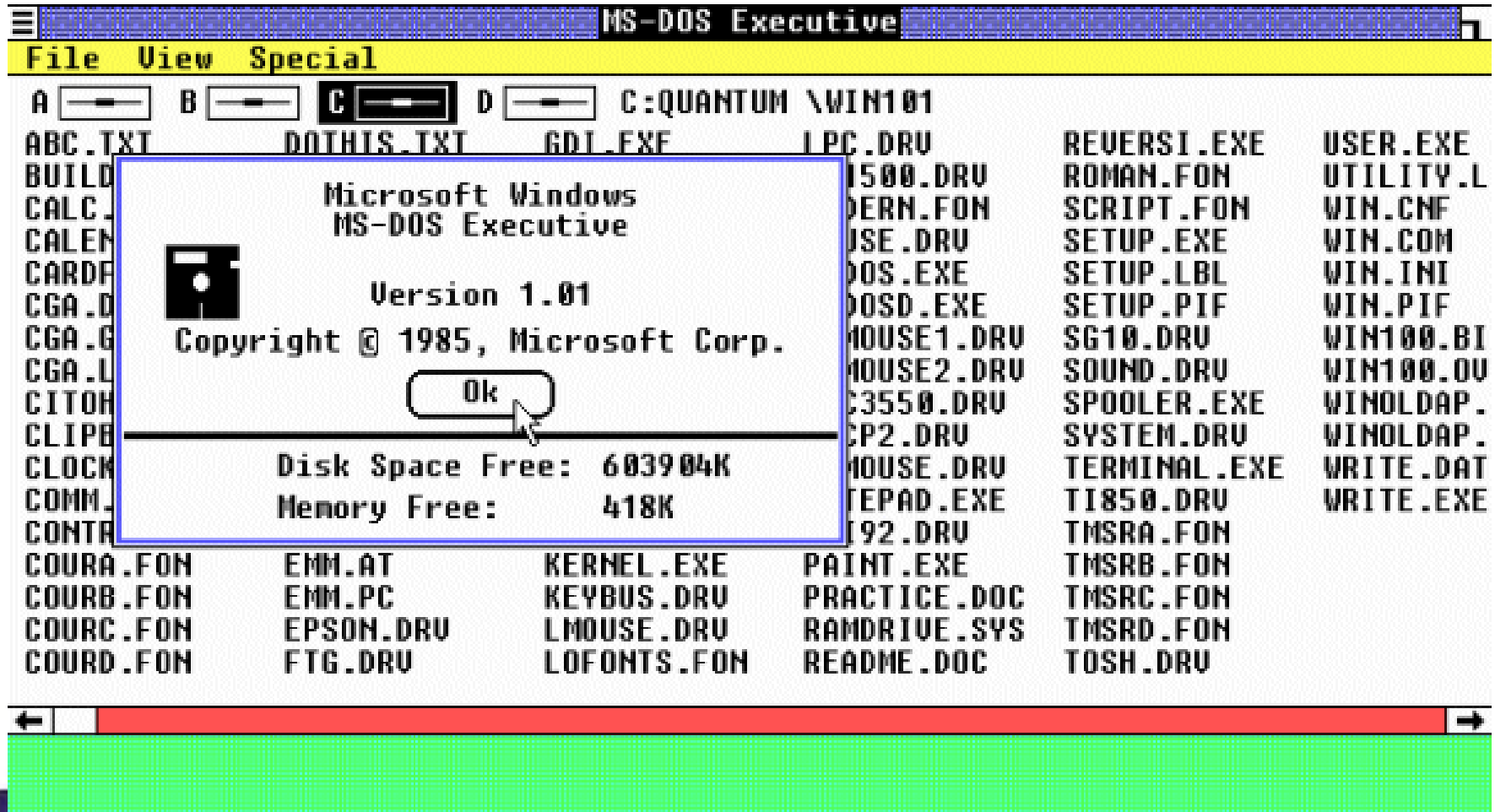
XEROX STAR 1981

Apple Lisa 1981

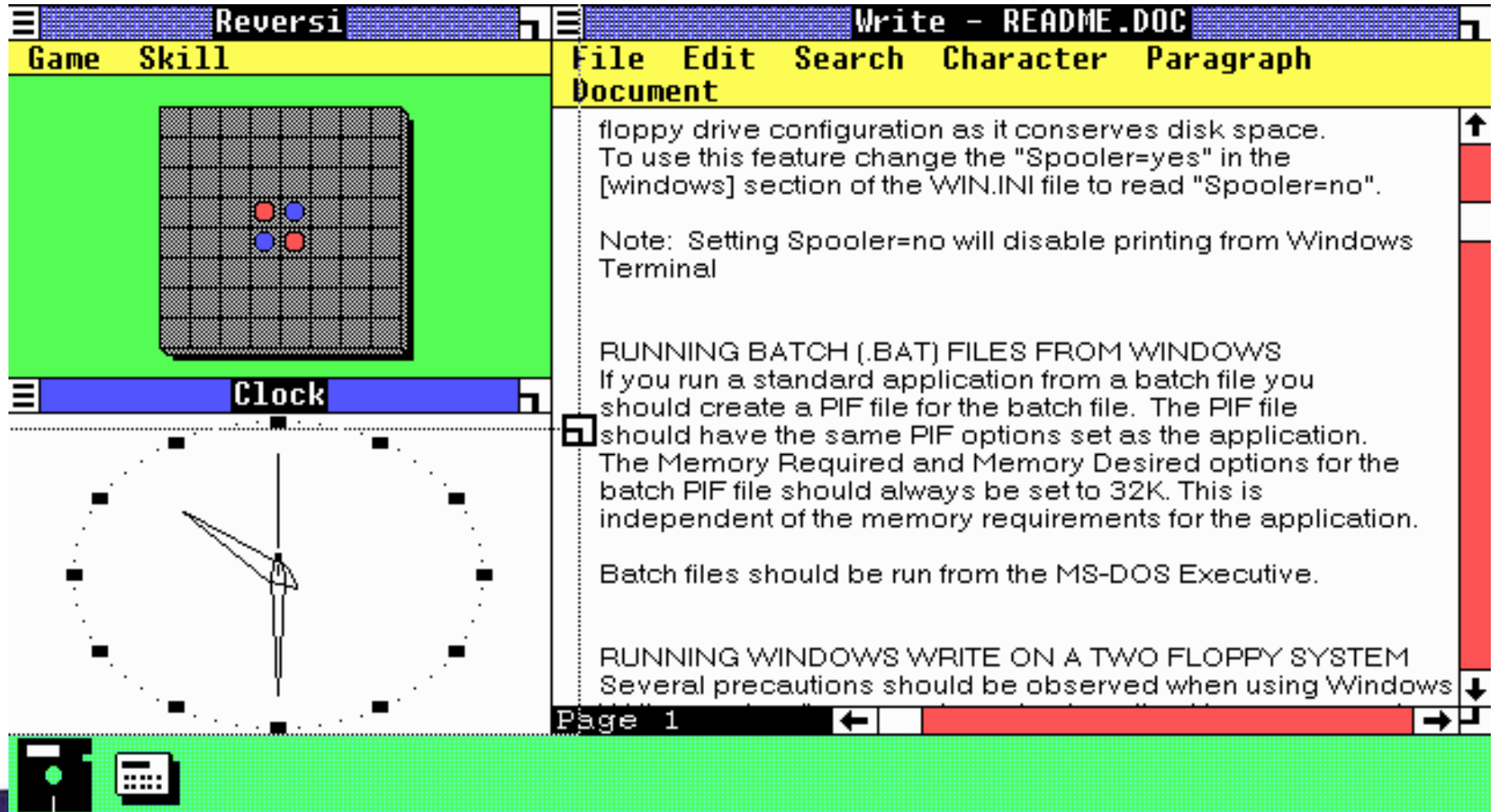
Apple Macintosh 1984

Windows 1.0 1985

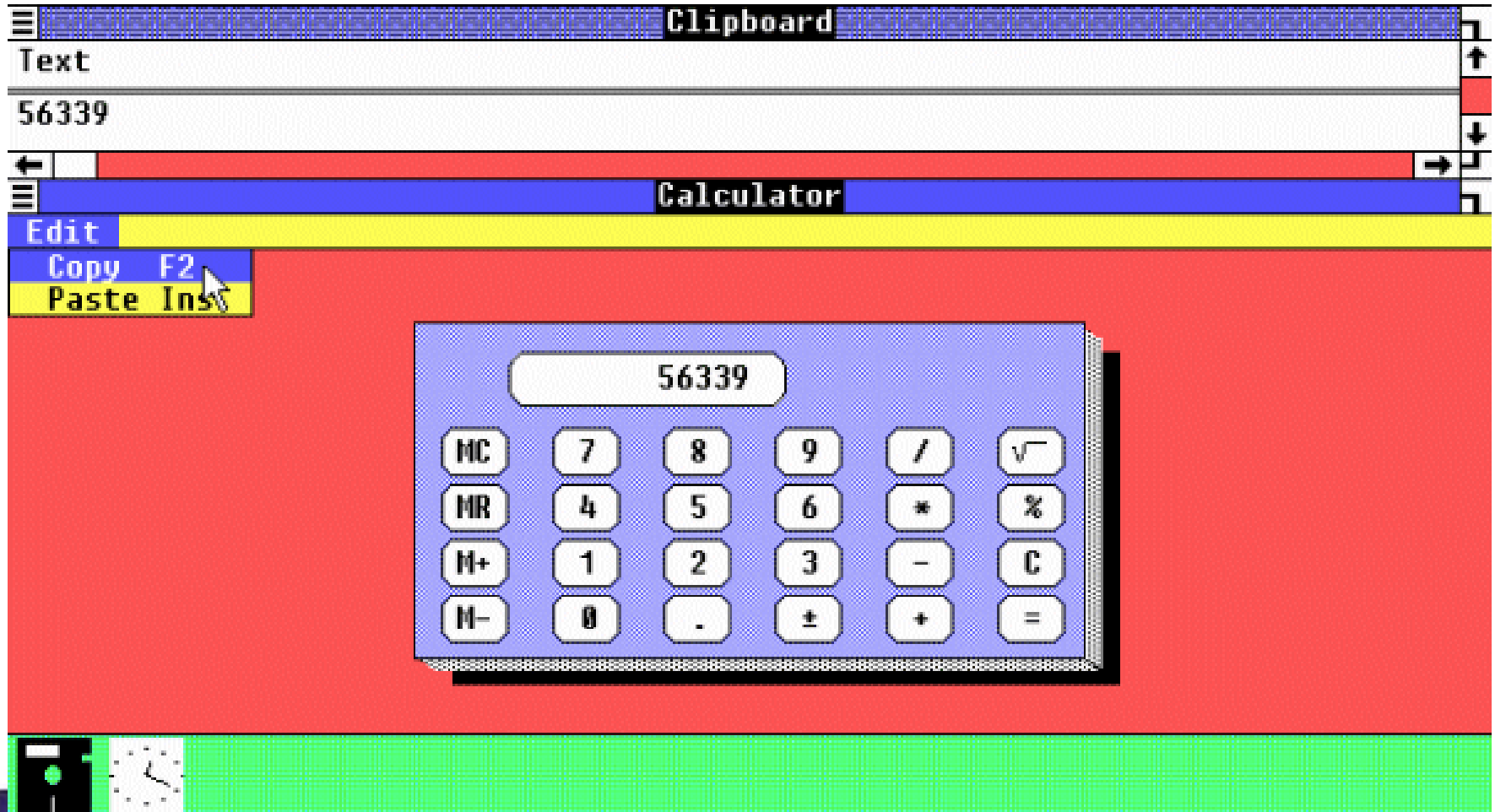
Windows 1.0



Windows 1.0



Windows 1.0



Xerox to Apple and Microsoft

XEROX Alto 1973

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XEROX STAR 1981

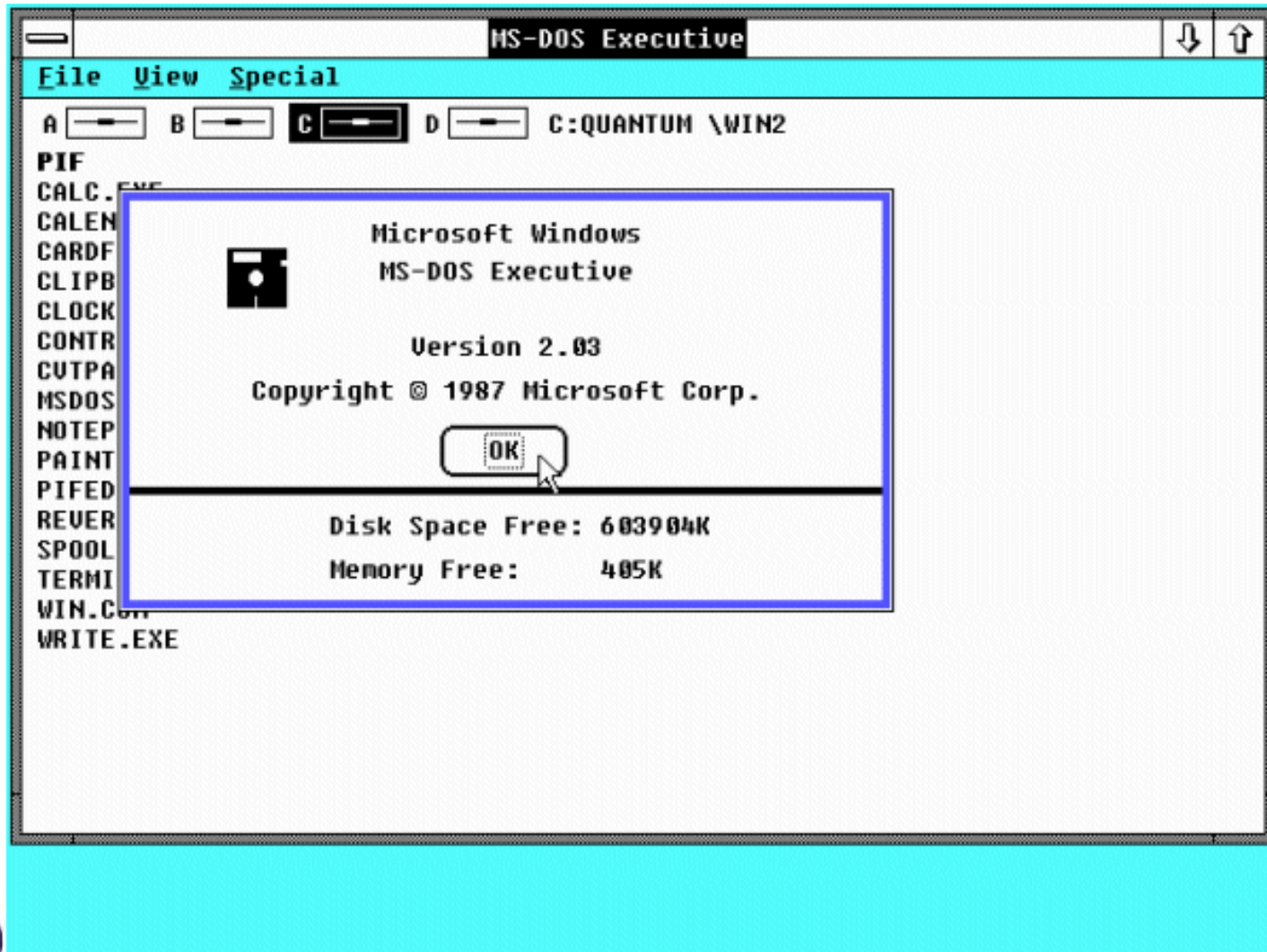
Apple Lisa 1981

Apple Macintosh 1984

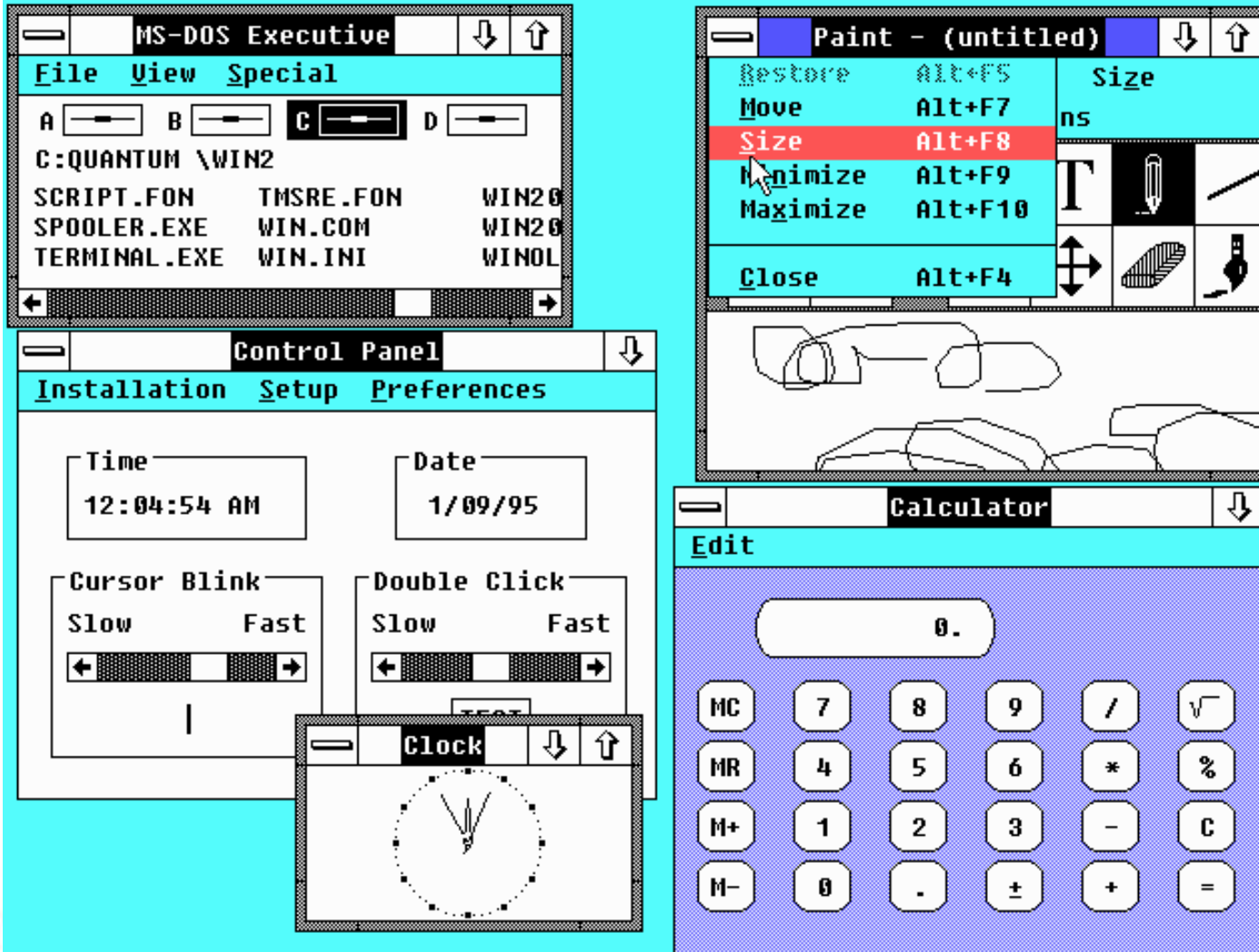
Windows 1.0 1985

Windows 2.0 1987

Windows 2.0 (1987)



Windows 2.0



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XEROX STAR 1981

Apple Lisa 1981

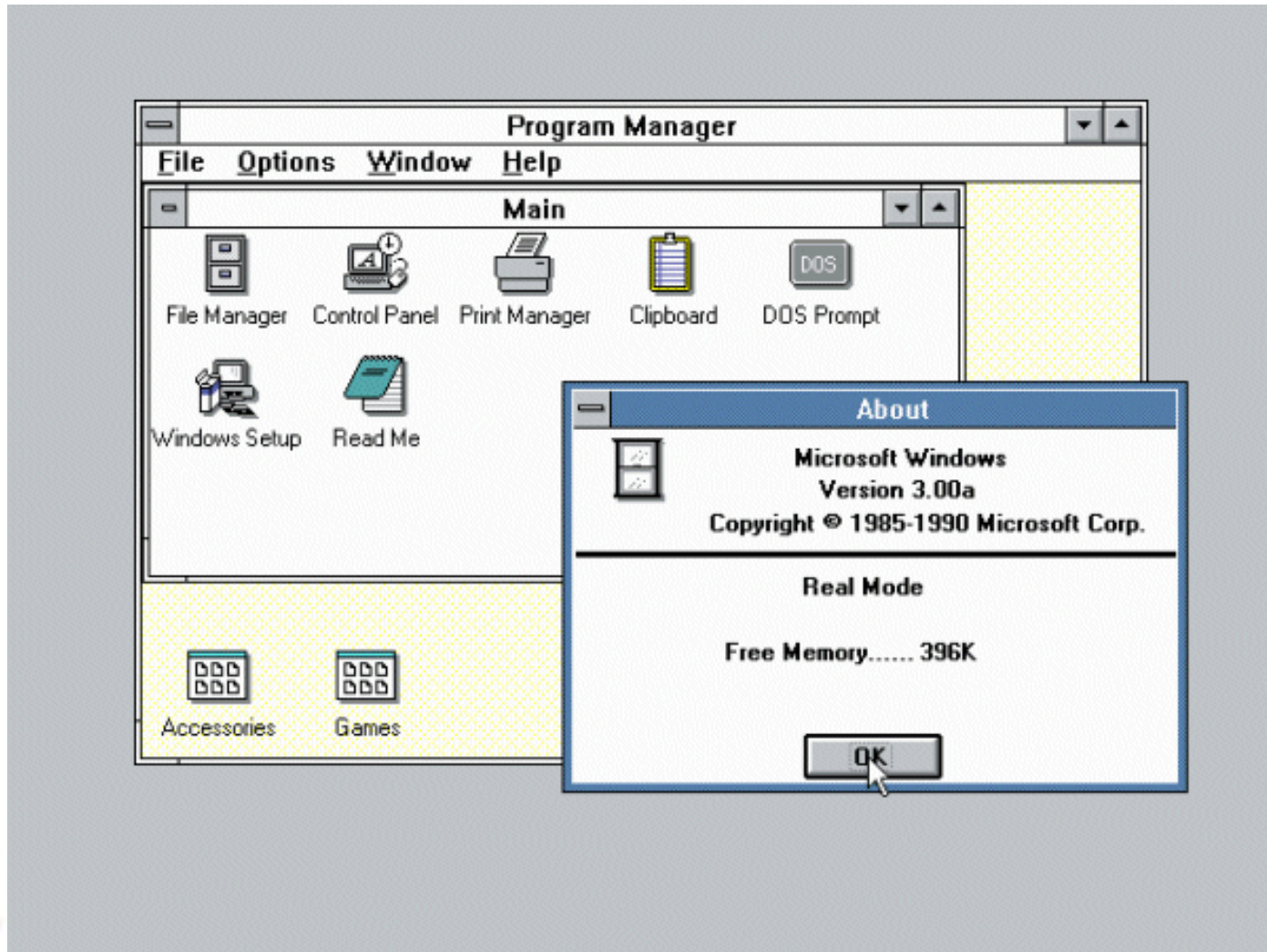
Apple Macintosh 1984

Windows 1.0 1985

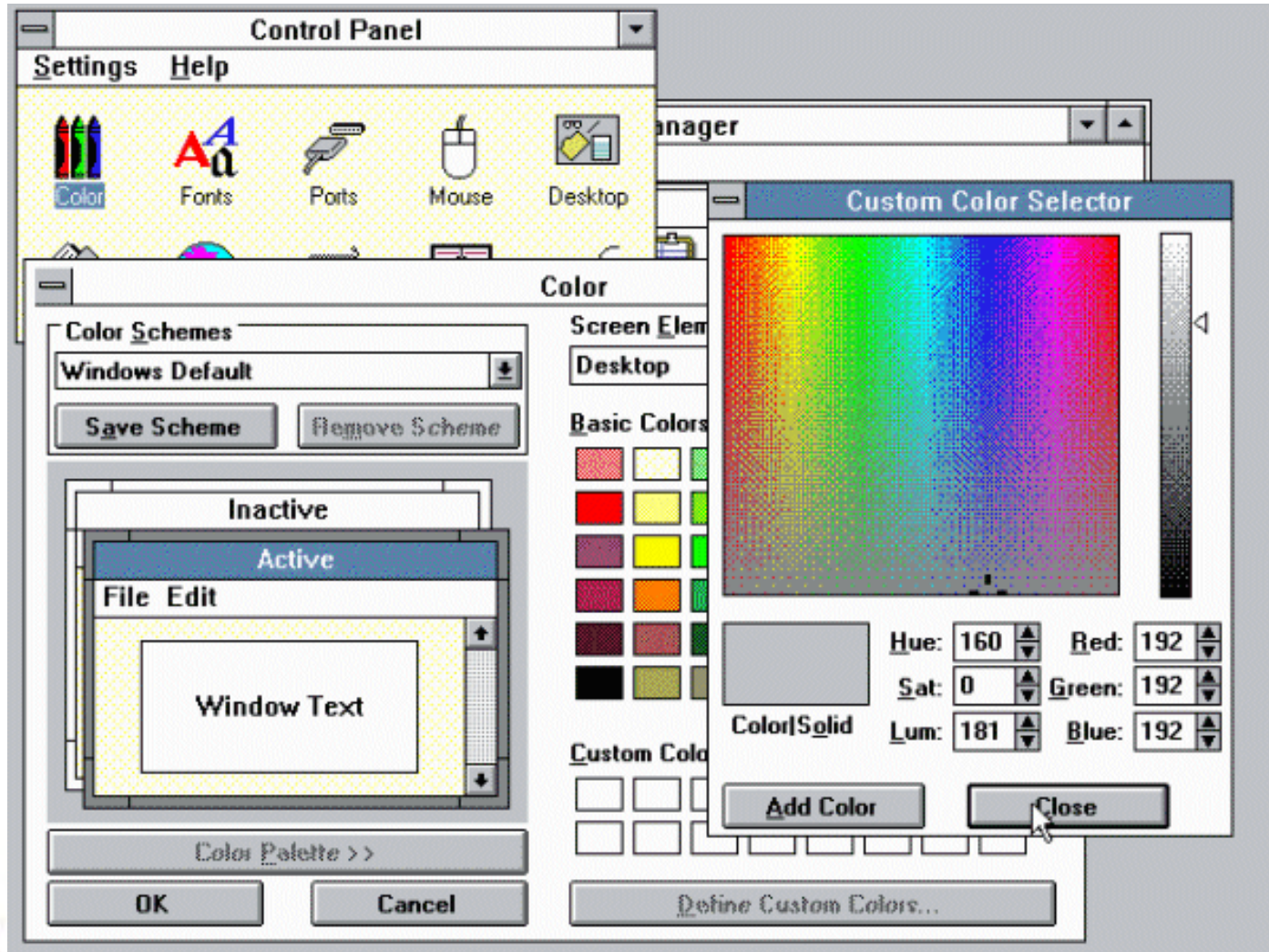
Windows 2.0 1987

Windows 3.0 1990

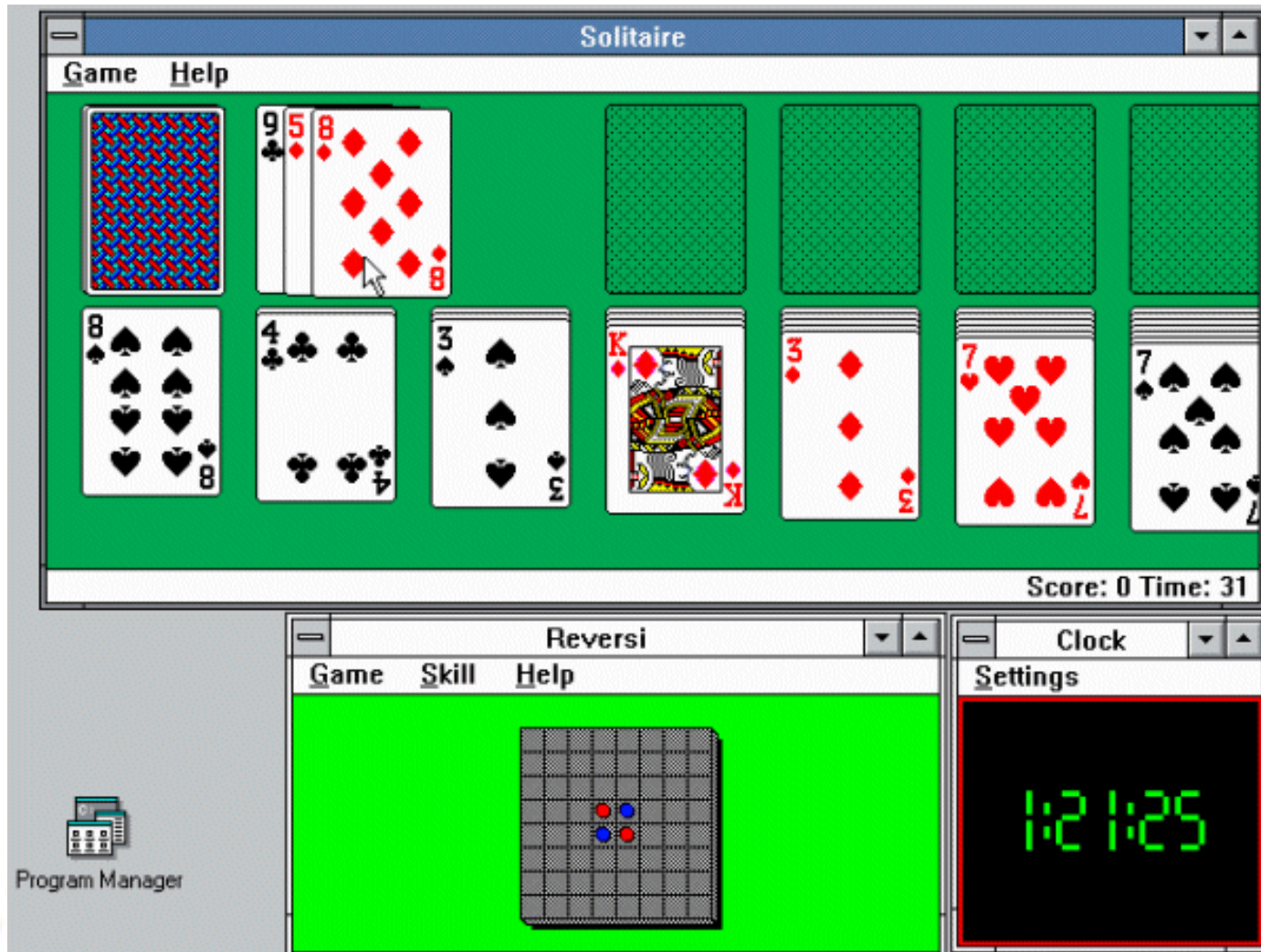
Windows 3.0



Windows 3.0



Windows 3.0



Xerox to Apple and Microsoft

XEROX Alto 1973

Steve Jobs visits PARC in 1979

XEROX STAR 1981

Apple Lisa 1981

Apple Macintosh 1984

Windows 1.0 1985

Windows 2.0 1987

Windows 3.0 1990

Bill Gates: "Hey, Steve, just because you broke into Xerox's house before I did and took the TV doesn't mean I can't go in later and take the stereo"

HCI Turing Awards

Sutherland wins 1988 Turing Award

Engelbart wins 1997 Turing Award

Alan Kay wins 2003 Turing Award

(in part for SmallTalk and OOP,
though he says OOP is linked to the GUI)

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