A Personal History of Computing Systems at Berkeley

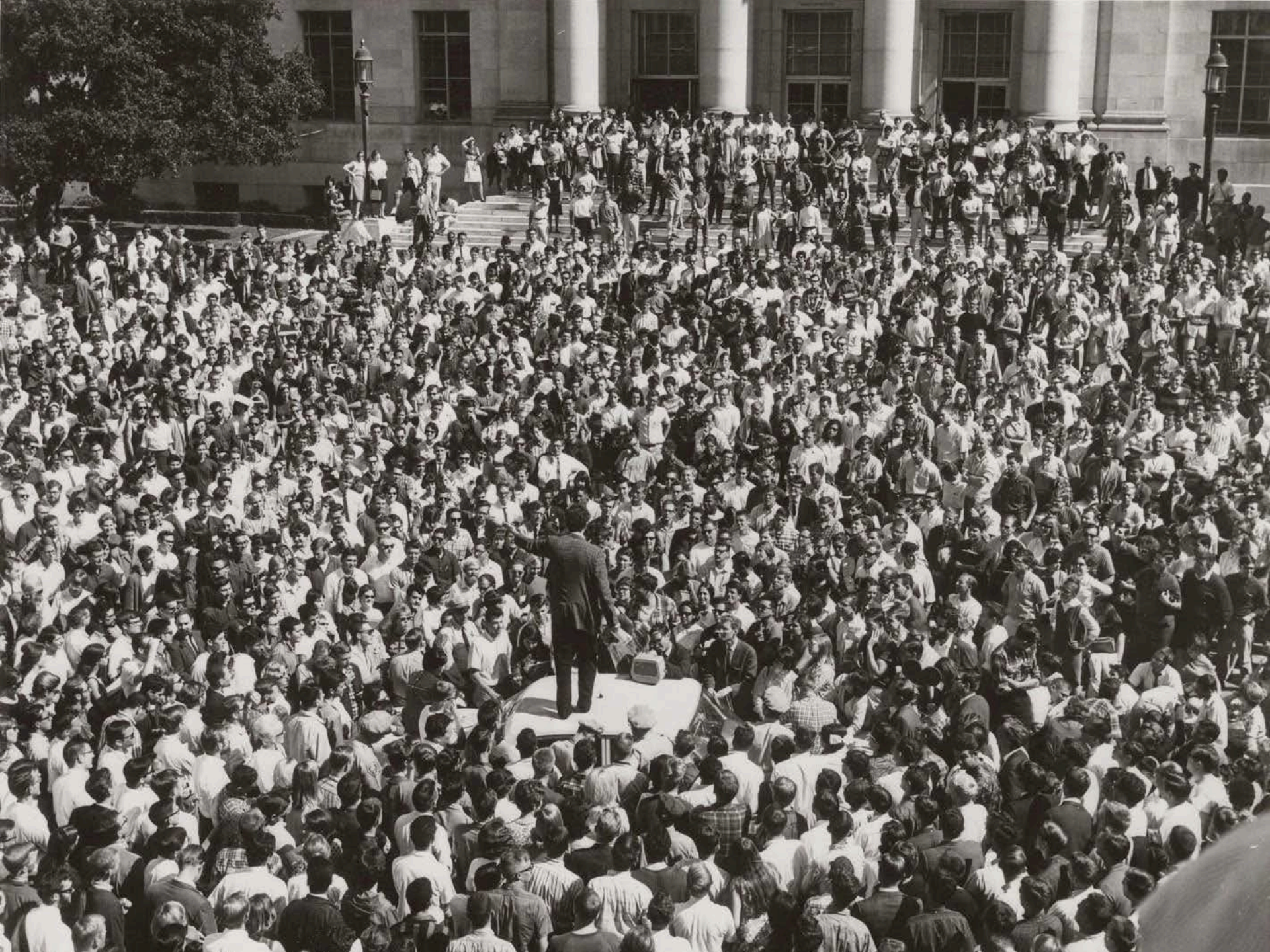
Randy H. Katz
CS Division/EECS Department
University of California, Berkeley

Disclaimer

What Makes Berkeley Great?

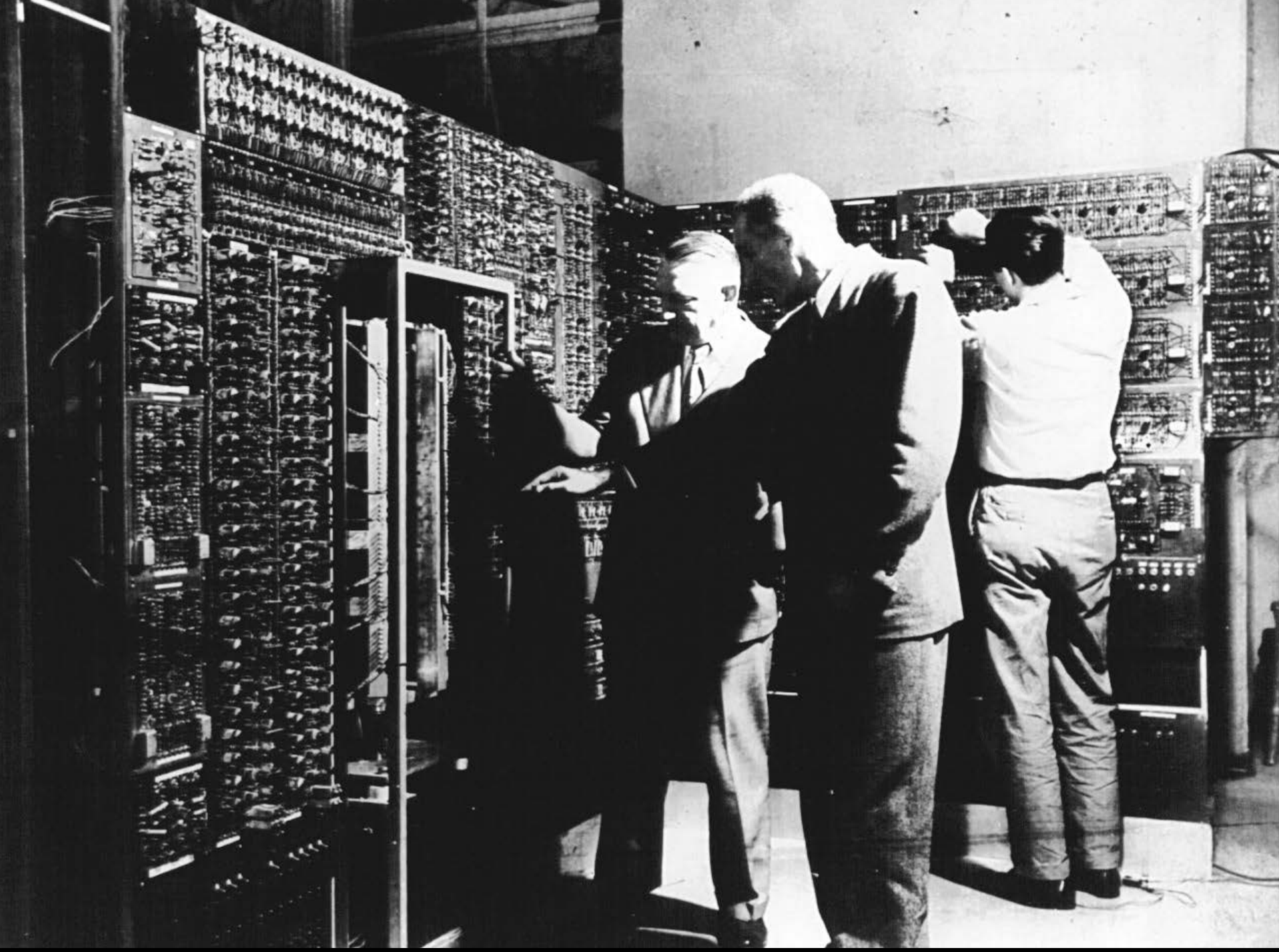
Projects

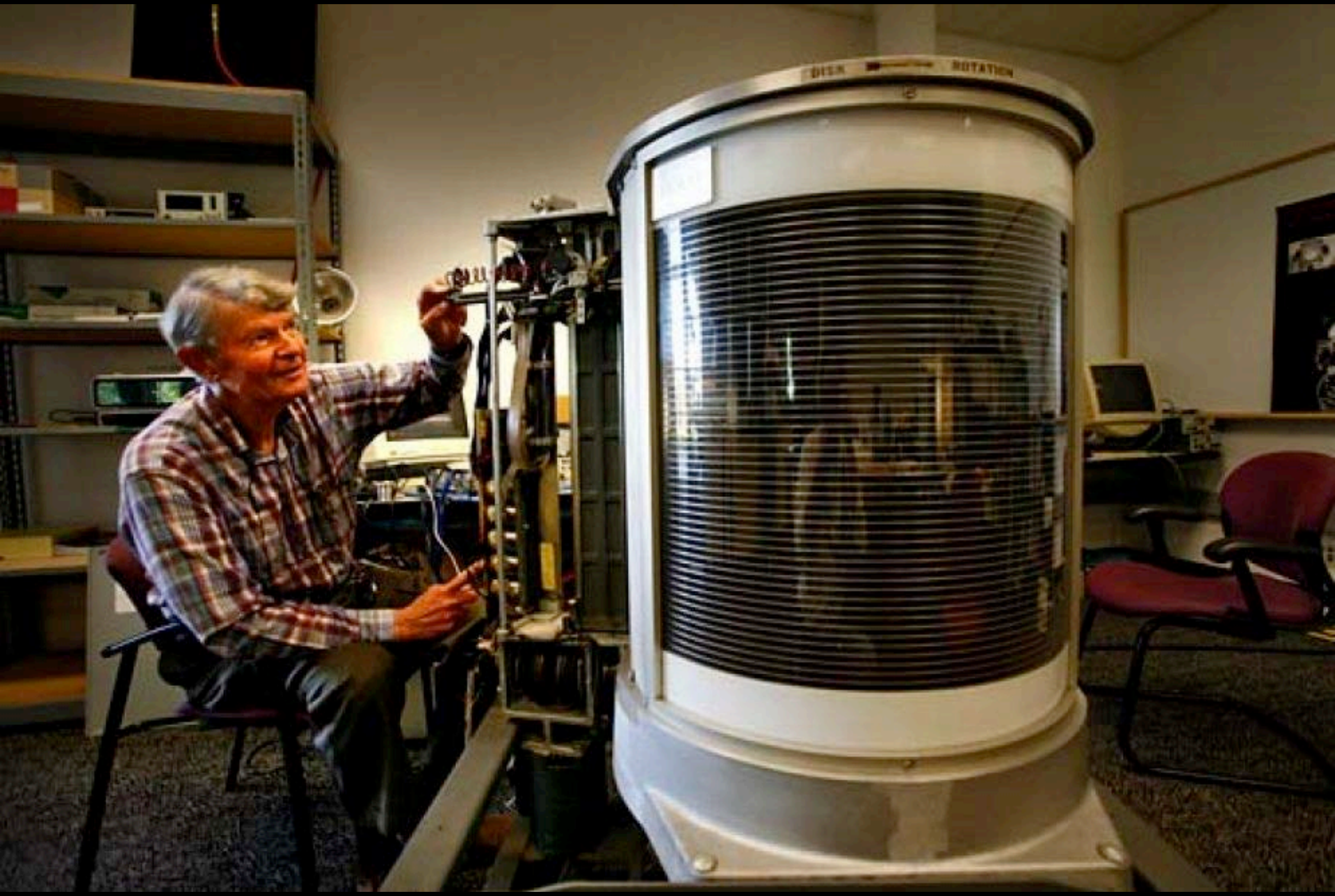
Berkeley in the 60s

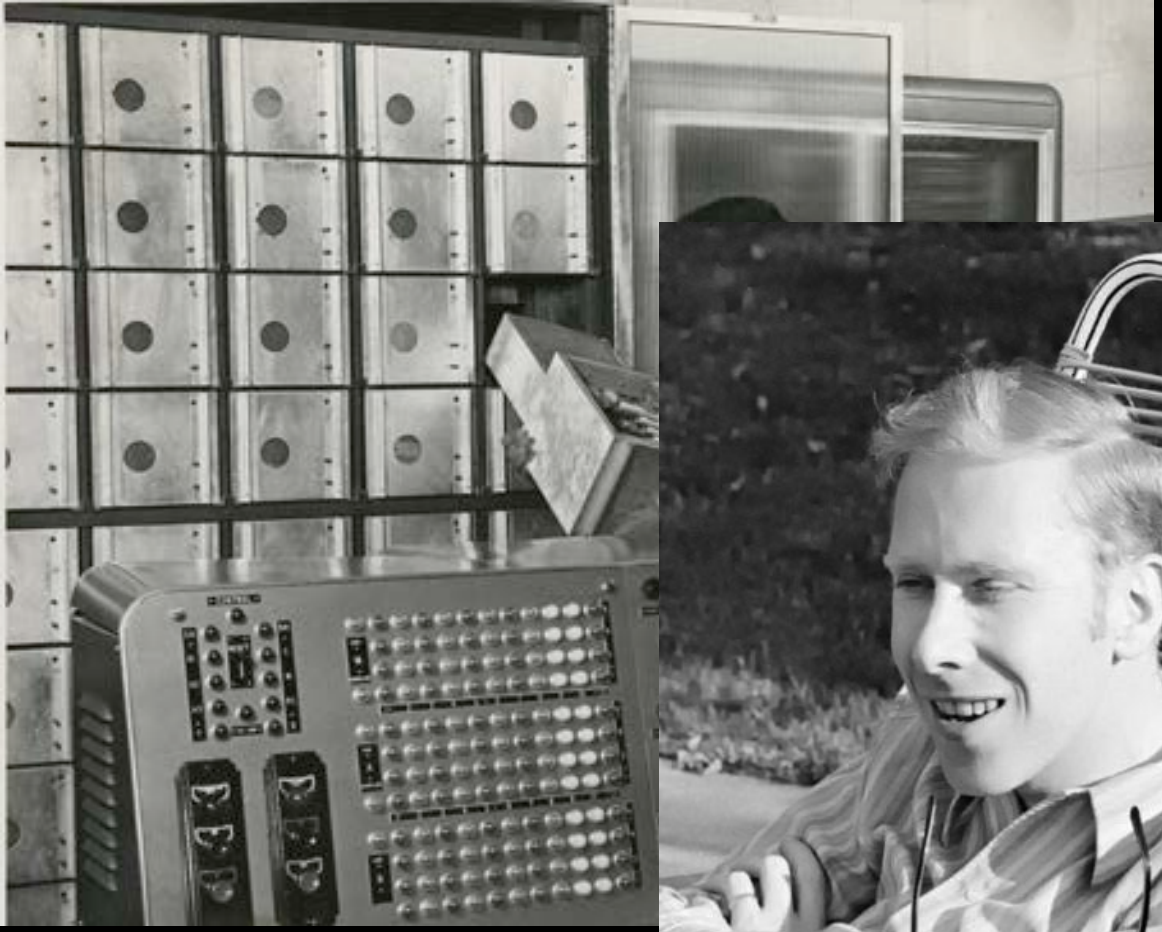


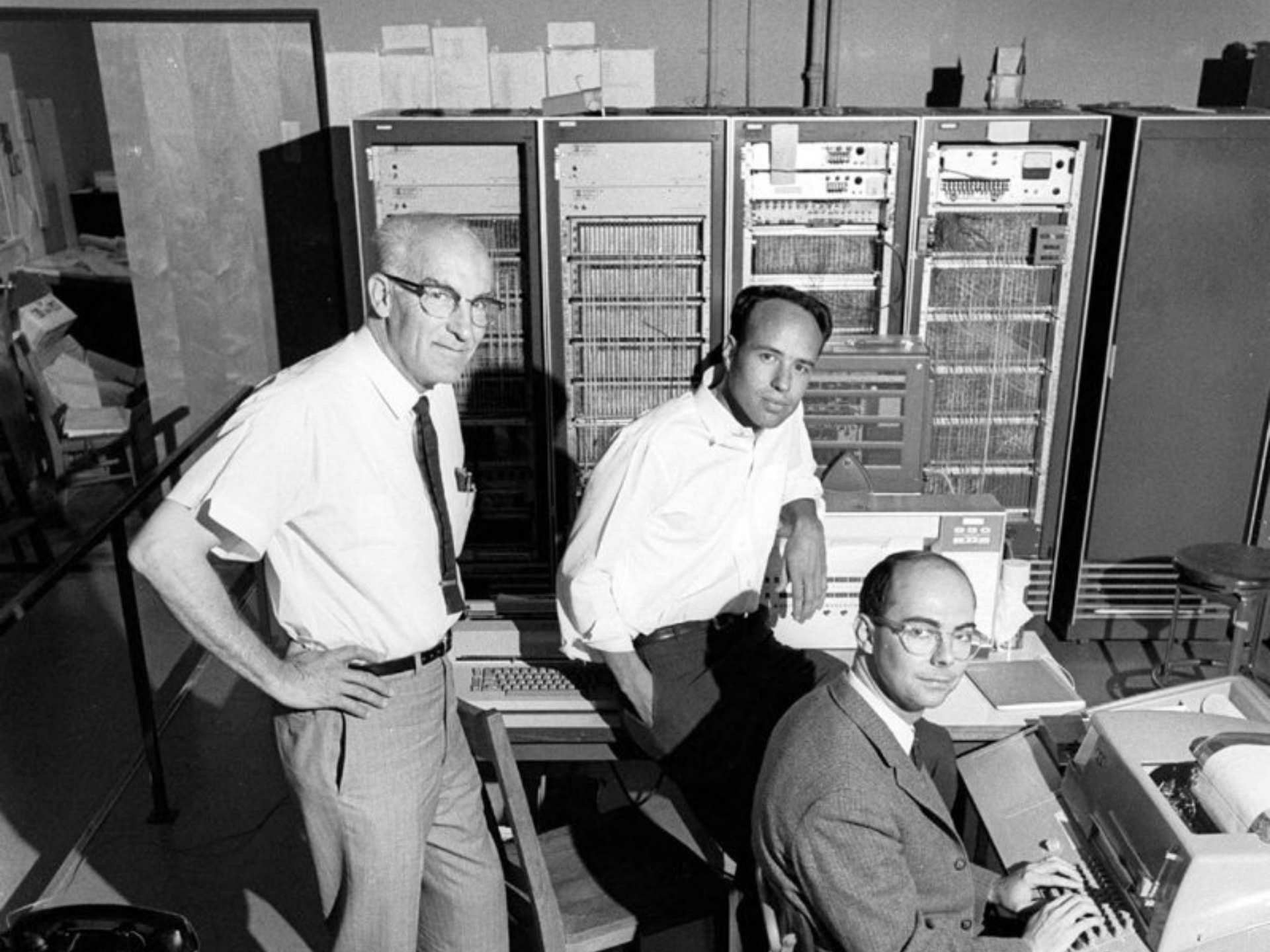
EXIT

CS Prehistory (Before 1976)




DISK
ROTATION





SCIENTIFIC DATA SYSTEMS

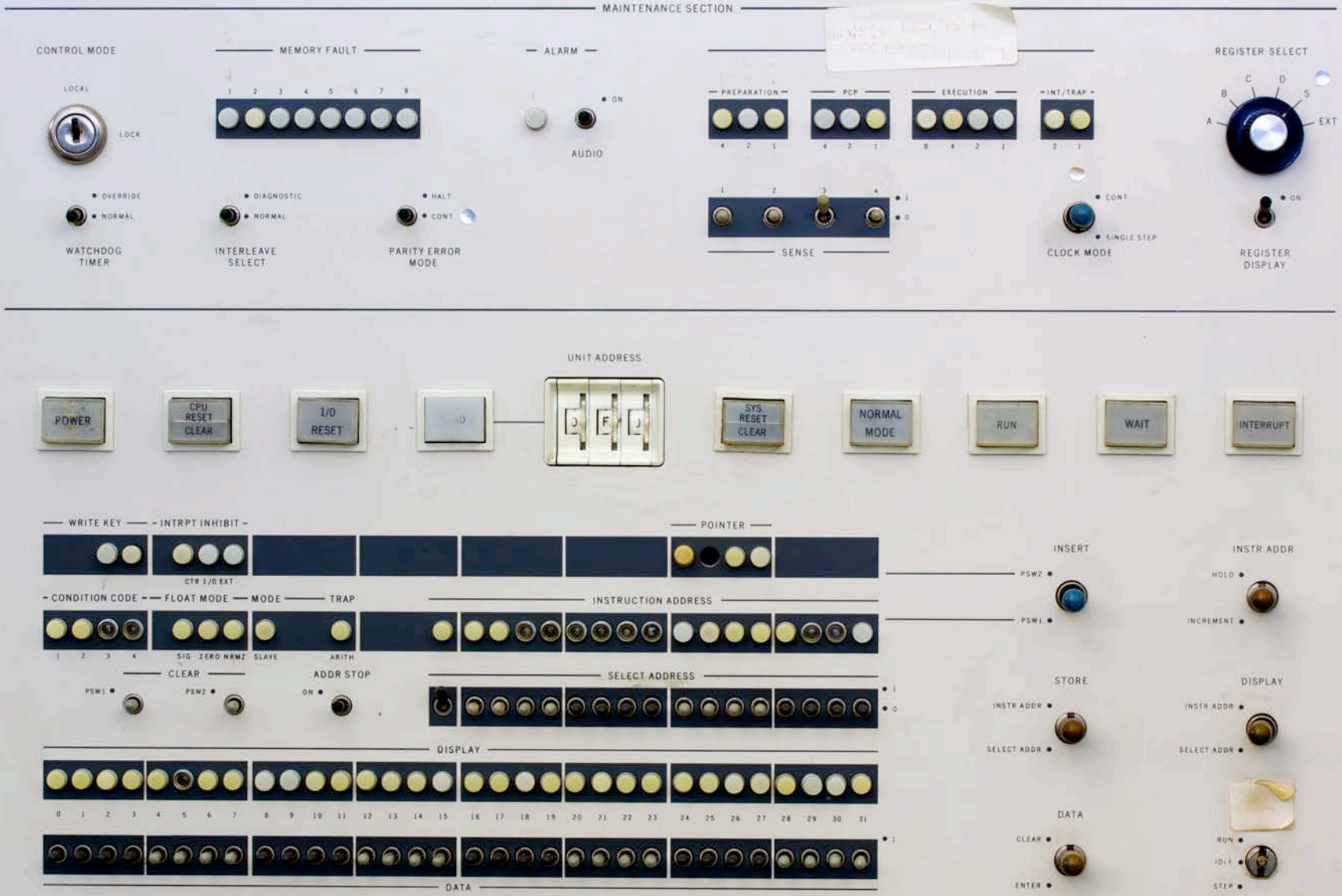


FIGURE 11.10 A very modern picture: Doug Englebart, ca. 1967

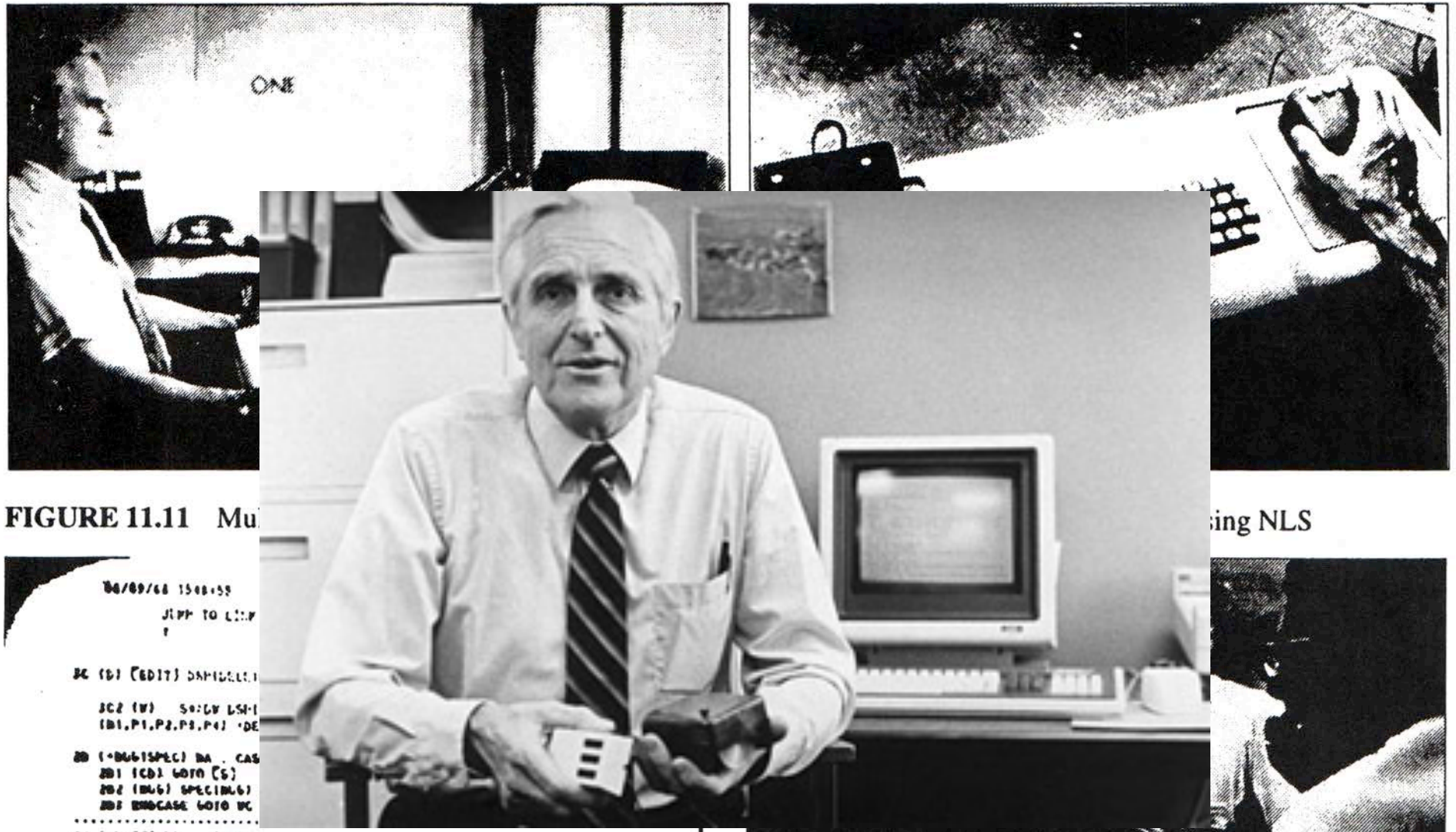


FIGURE 11.11 Mu ing NLS

KG

BERKELEY GAZETTE

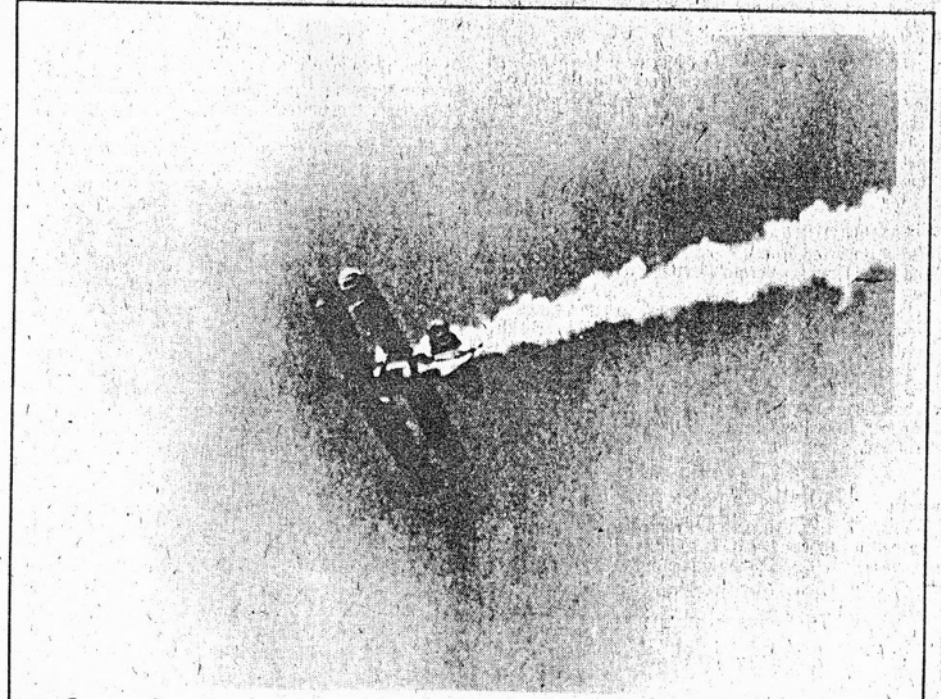
edition of the North East Bay Independent and Gazette

Publication Office: 2043 Allston Way, Berkeley, Ca. 94704
Second Class Postage Paid at Berkeley, California

BERKELEY, CALIFORNIA, FRIDAY, DECEMBER 10, 1976 ★ 100th Year 15 CENTS PER COPY $2.50 PER MONTH No. 87

Weather

Fair through tomorrow, and slightly warmer. Temperature highs in the 60s with lows in the mid-30s. Small craft advisory for Suisun Bay and the West Delta with winds northwesterly from 15 to 25 mph.



Aerial artist's UFO encounter

Steven Poleskie, who, wind permitting, creates airial art by flying a stunt plane overhead while leaving trails of colored smoke, was startled Wednesday while performing over Cal-State Sonoma. Poleskie suddenly became aware of a circular white object only 1,000 feet away. The event was also captured on Channel 9 TV cameras, and Poleskie said video-tape reruns check out and confirm the existence of a curious co-pilot in the sky. Poleskie, a visiting are professor at UC-Berkeley, may have attracted a vast new audience for his unique art forms.

Water rationing possibility here

Water rationing next year is being considered by the East Bay Municipay Utility District (EBMUD).

EBMUD directors are fearful that a lack of snow this winter may dry up their main water storage reservoir in the Sierras.

They plan to seek state legislation by Sen. John Neledly authorizing compulsory "conservation." This would be a last resort, following a dry winter and a vigorous program promoting voluntary rationing, according to David Vossbrink, EBMUD public information officer.

Preliminary planning for both voluntary and compulsory rationing will be considered at an EBMUD board meeting beginning at 1:15 p.m., Tuesday in the administration building, 2130 Adeline St., Oakland.

The proposed legislation would allow the district to require water rationing if a water crisis can be predicted as coming within six months.

Vossbrink said that at least several "good snowstorms" are needed in the Sierra this winter. If not, the Pardee Reservoir on the Mokelumne River will go dry probably next September, leaving the local reservoirs as the only sources.

Once this happens, he said , there area with some water throughout next year, even with a prolonged drought, the district will have to take precautionary action once it becomes likely that this coming winter will be dry, it was indicated.

The water district is braced for "the worst," Vossbrink said, since there is no snow on the ground in the EBMUD watershed areas in Calaveras and Amador Counties. The normal snowfall at this time of the year is 19 inches, he said.

The voluntary program would include informing customers of the possible shortage problem and explaining how to save water, he said.

Luxury water users would be discouraged, including watering lawns, washing cars and filling swimming pools which consumes one-third of the entire water supply. If this fails and the drought continues, he said, the district will schedule public hear-

(Turn to page 4, col. 3)

Scholastic aptitude

BHS seniors rank third in state tests

Berkeley High School seniors are rated third among all senior classes in California on the basis of national preliminary Scholastic Aptitude Tests (SAT) taken last year when they were juniors.

The Berkeley High School (BHS) showing in last year's preliminary

Female students scored 471 in math as compared to a national mean of 446, and to their previous year's score of 468.

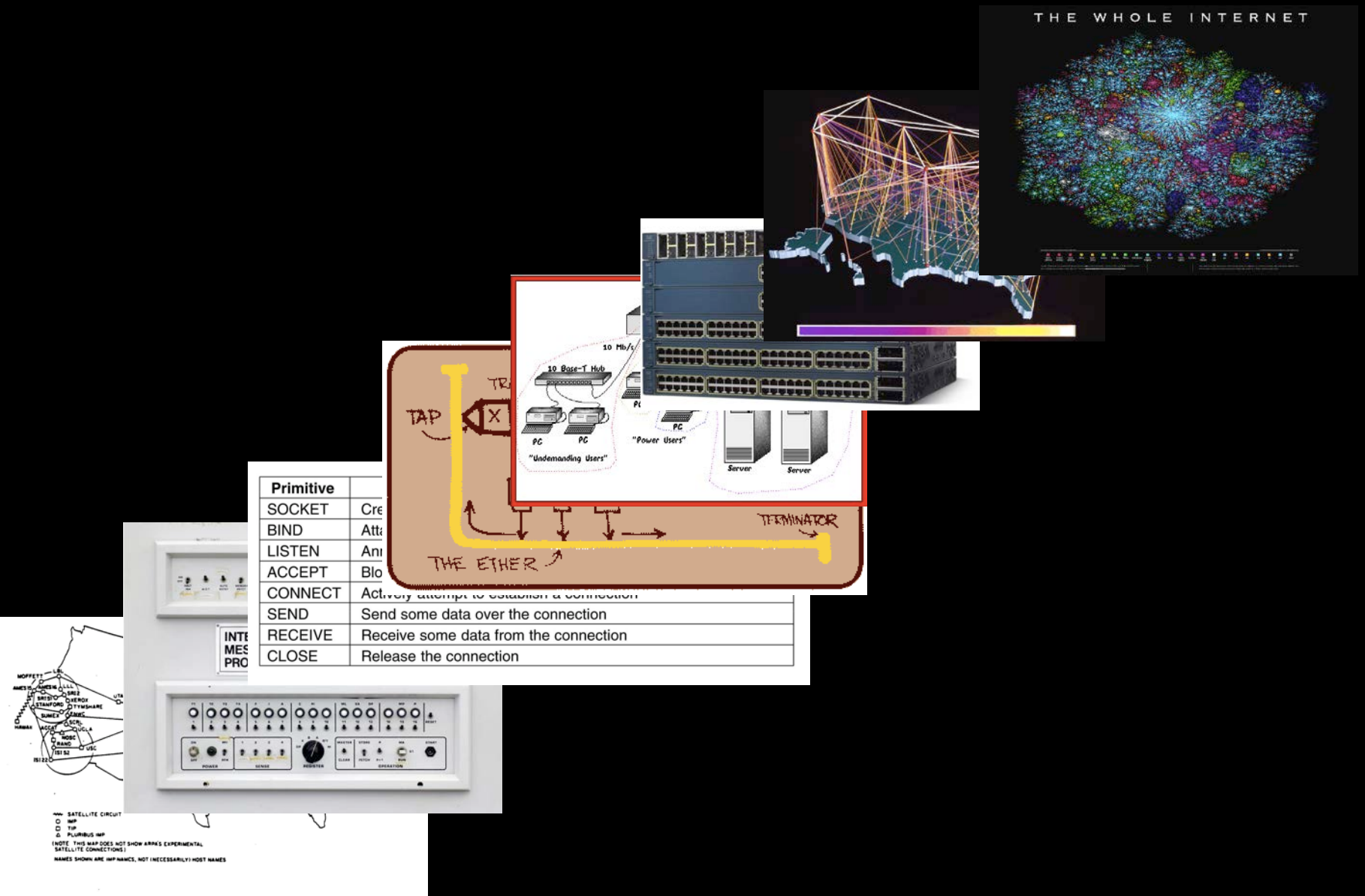
In English achievements, where scores are not broken down by gender, Berkeley High students scored 559; the national mean was 532 and

Computers—Then and Now

Software—Then and Now

Storage—Then and Now

Networks—Then and Now



Berkeley Systems CS in the 70s

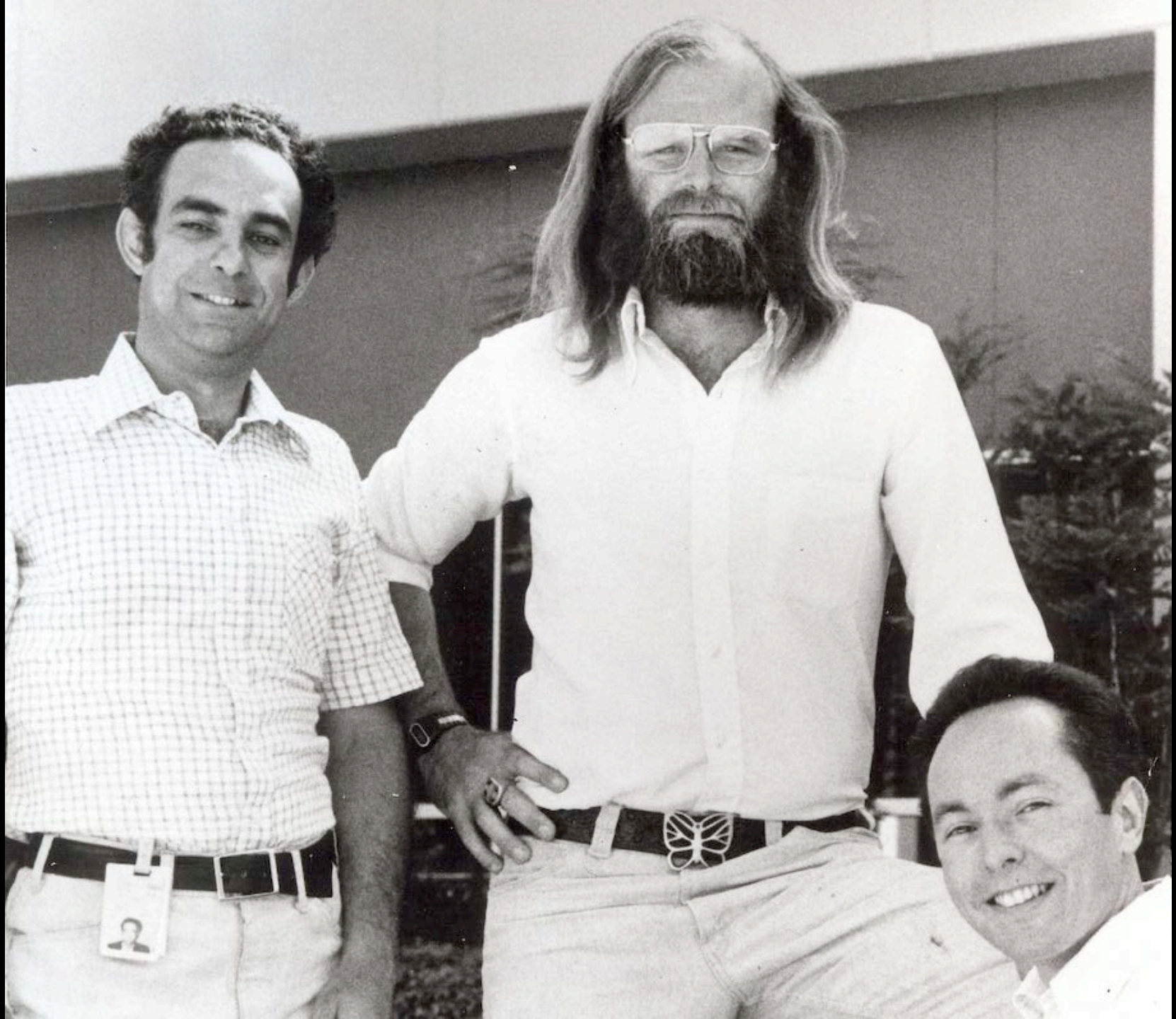
N6EK

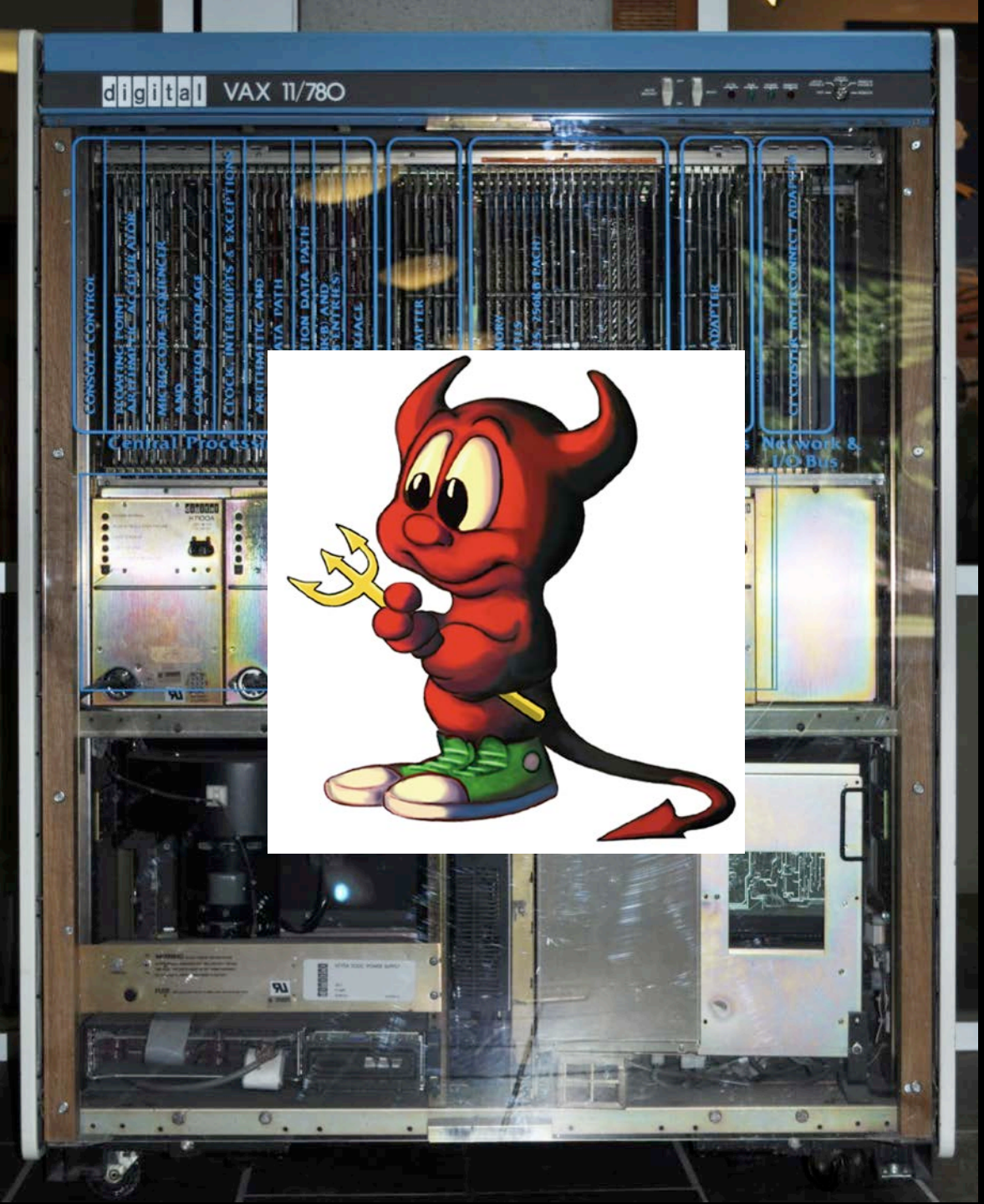
TCP/IP

INGRES 30th

mac

CONFERENCE • 1984




digital VAX 11/780
CONSOLE CONTROL
Network &
I/O Bus

5 ♥

Ken Thompson

5 ♥

K ♠

Bob Fabry

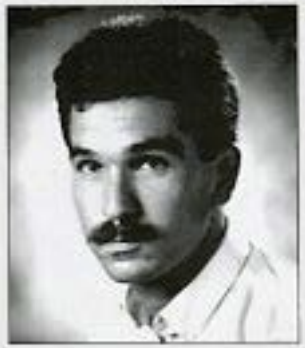
K ♠

10 ♦

Bill Joy

10 ♦

K ♦



Ozalp Babaoglu

K ♦

7 ♥

Eric Allman

7 ♥

10 ♠

Kirk McKusick

10 ♠

7 ♠

Mike Karels

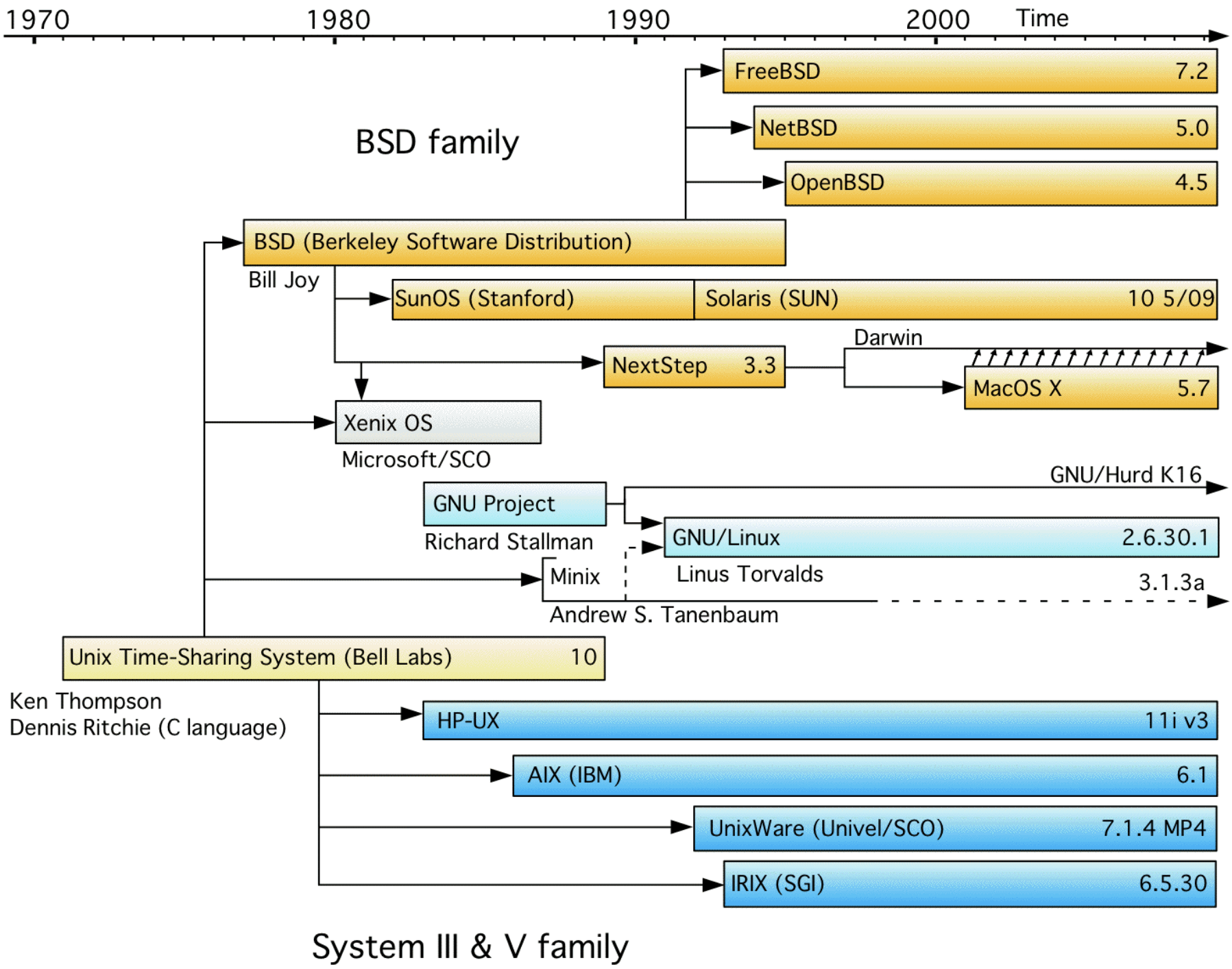
7 ♠

6 ♠

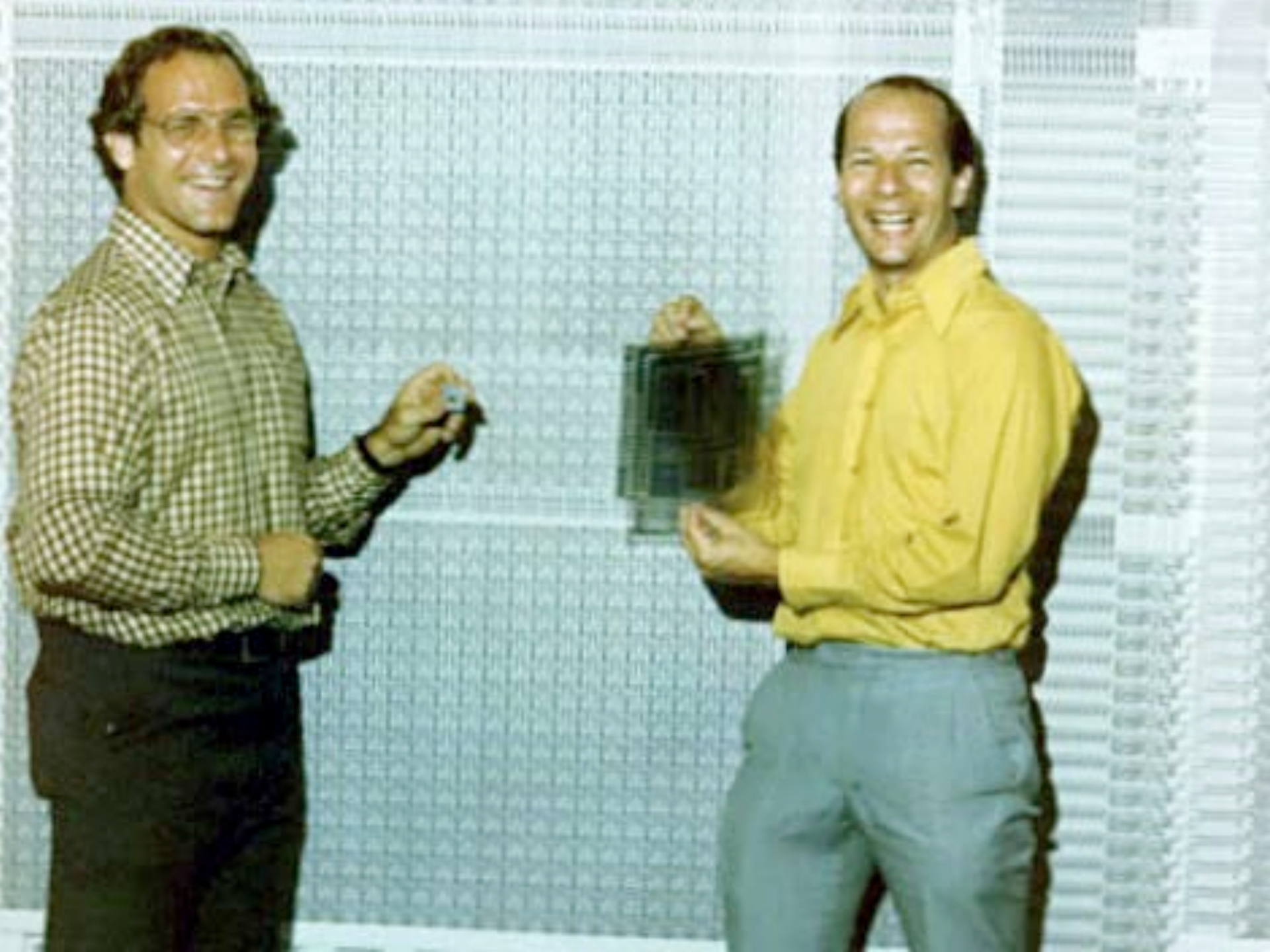
Keith Bostic

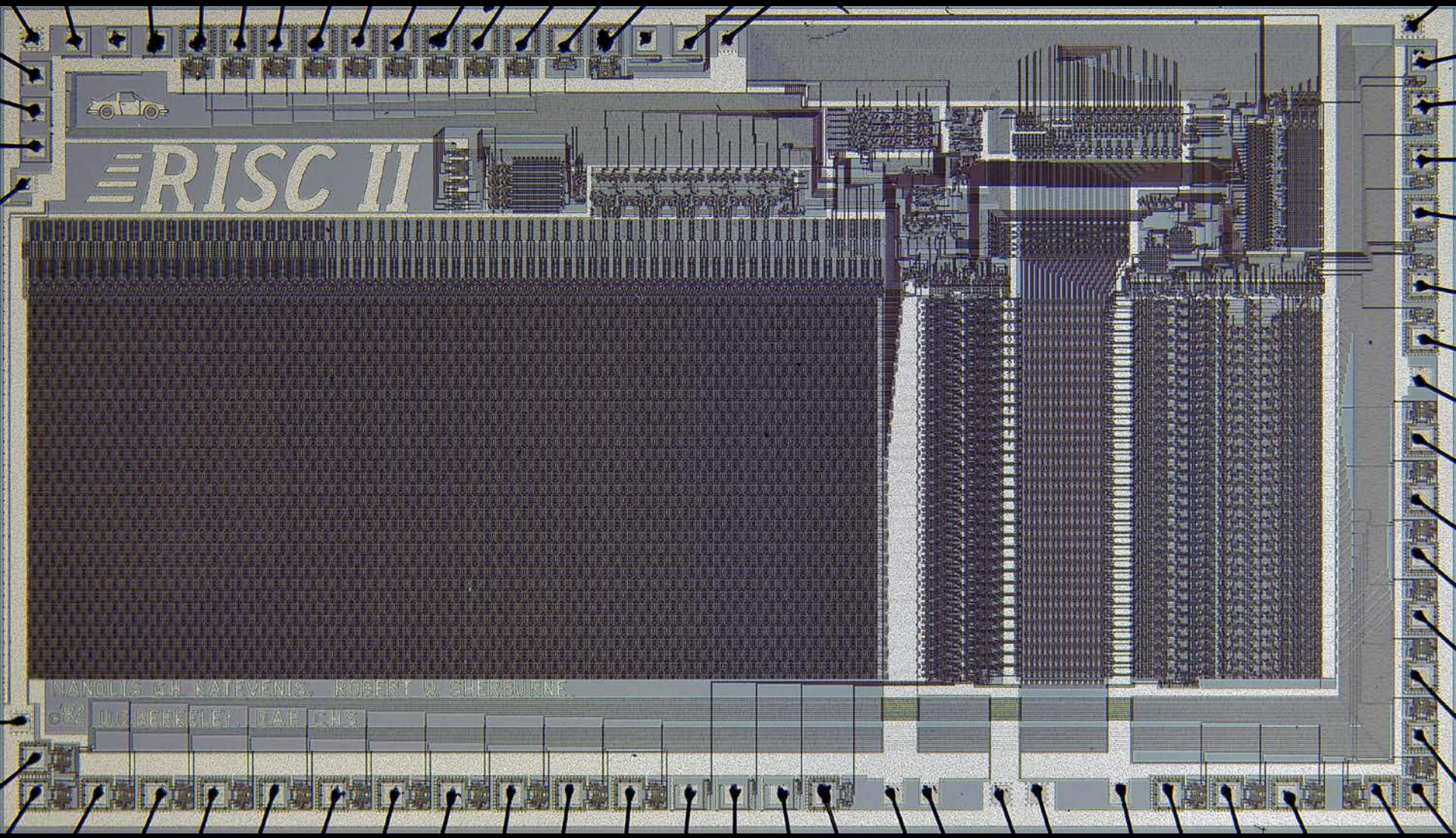
6 ♠

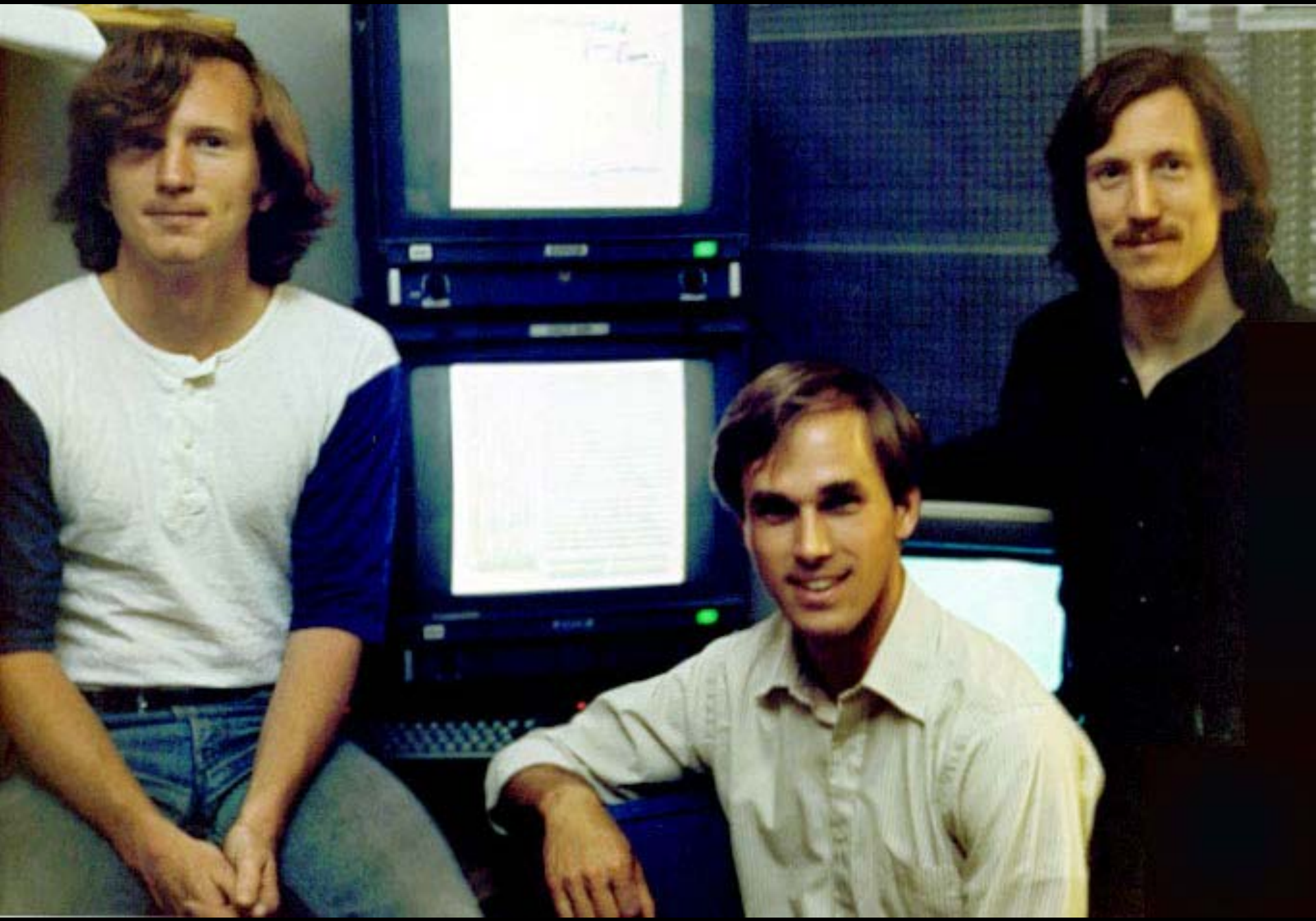
BRIE

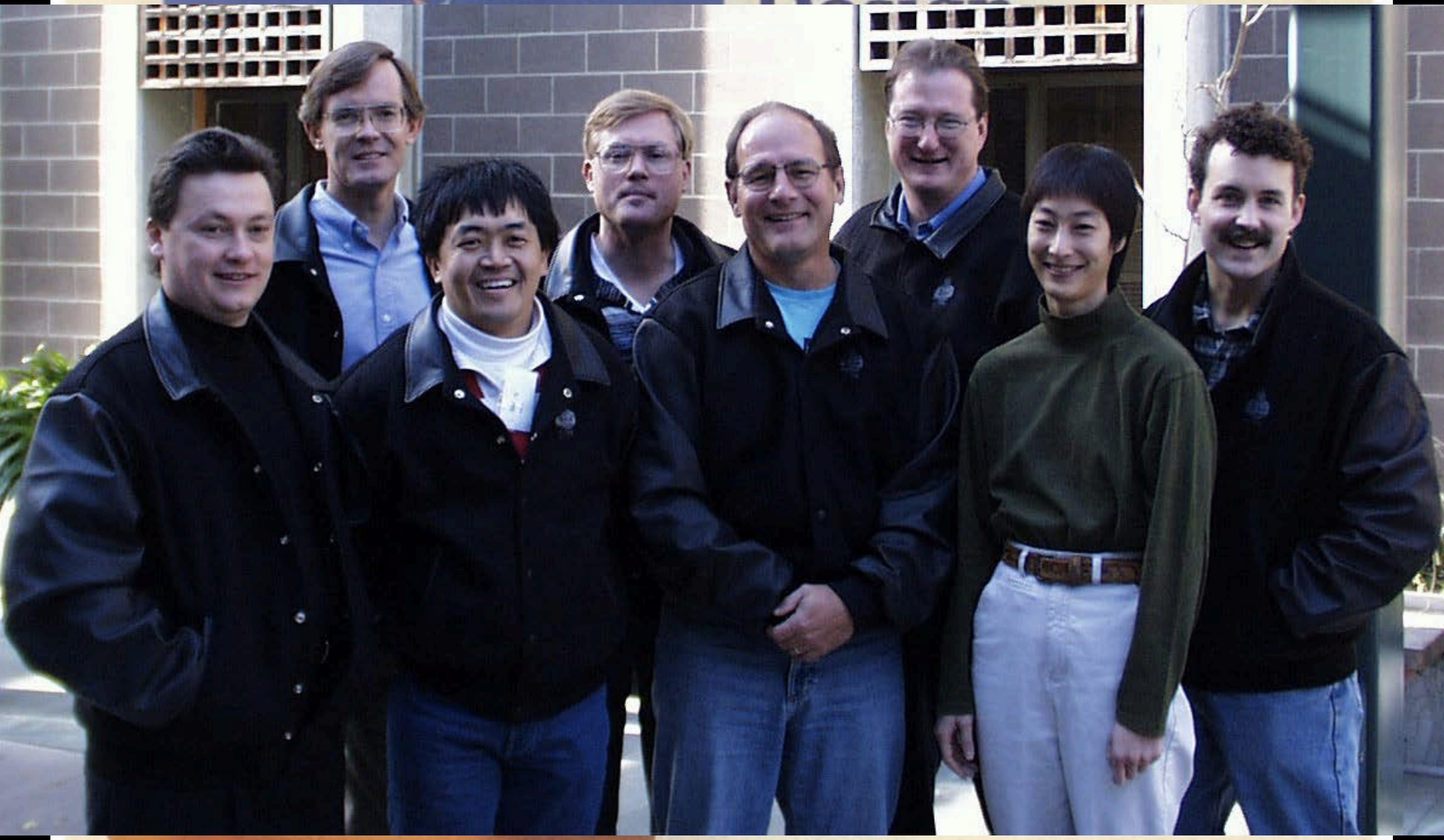

1970
1980
1990
2000
Time
BSD family
FreeBSD 7.2
NetBSD 5.0
OpenBSD 4.5
BSD (Berkeley Software Distribution)
Bill Joy
SunOS (Stanford)
Solaris (SUN) 10 5/09
NextStep 3.3
Darwin
MacOS X 5.7
Xenix OS
Microsoft/SCO
GNU Project
Richard Stallman
GNU/Hurd K16
GNU/Linux 2.6.30.1
Linus Torvalds
Minix 3.1.3a
Andrew S. Tanenbaum
Unix Time-Sharing System (Bell Labs) 10
Ken Thompson
Dennis Ritchie (C language)
HP-UX 11i v3
AIX (IBM) 6.1
UnixWare (Univel/SCO) 7.1.4 MP4
IRIX (SGI) 6.5.30
System III & V family

Berkeley CS Systems in the 80s




RISC II
MANOLIS G.H. KATEVENIS, ROBERT W. SHERBURNE.
©'82 U.C.BERKELEY, DAP CHS.





Randy

A Case for Redundant Arrays of Inexpensive Disks (RAID)

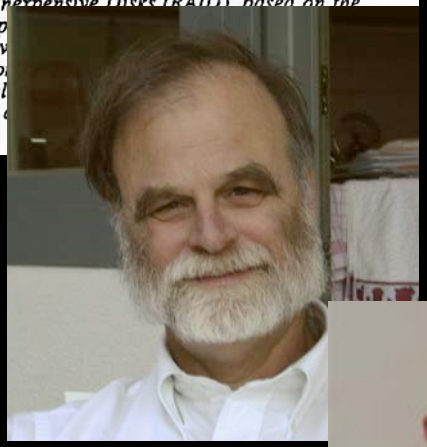
David A. Patterson, Garth Gibson, and Randy H. Katz

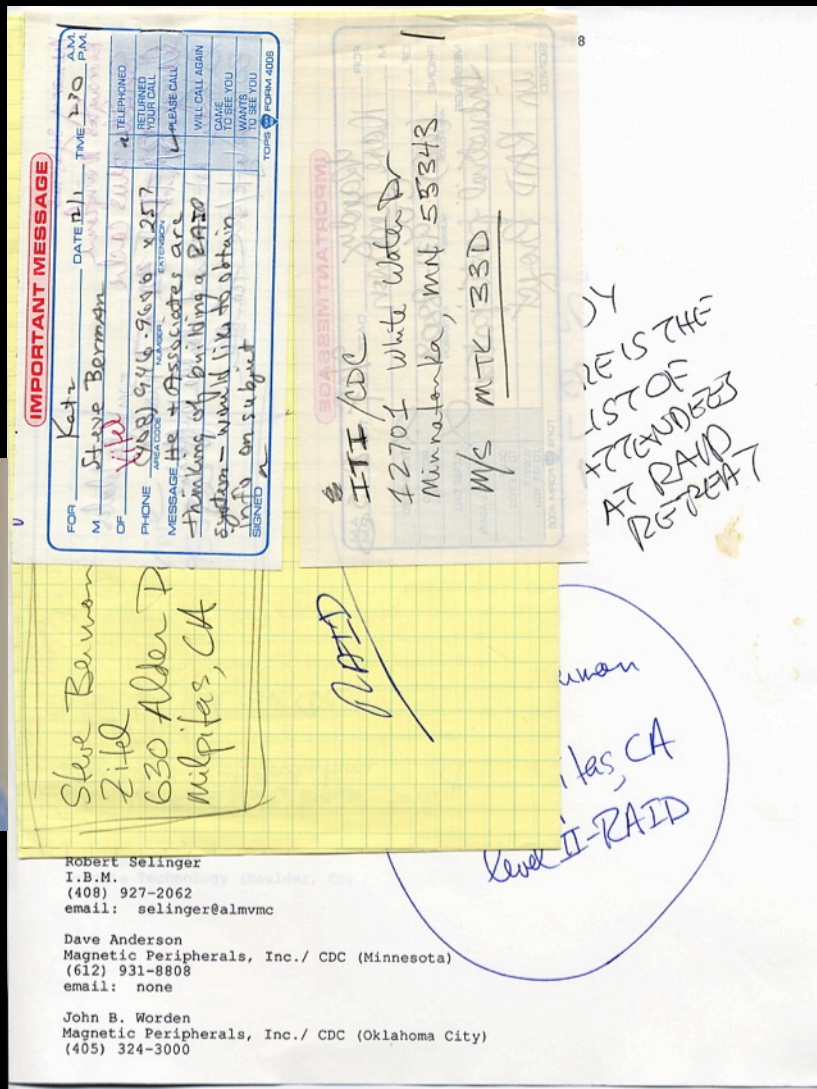
Computer Science Division
Department of Electrical Engineering and Computer Sciences
571 Evans Hall
University of California
Berkeley, CA 94720
(pattrsn@pepper.berkeley.edu)

Abstract

Increasing performance of CPUs and memories will be squandered if not matched by a similar performance increase in I/O. While the capacity of Single Large Expensive Disk (SLED) has grown rapidly, the performance improvement of SLED has been modest. Redundant Arrays of Inexpensive Disks (RAID), based on the magnetic disk technology developed for p alternative to SLED, promising improv performance, reliability, power consumptio

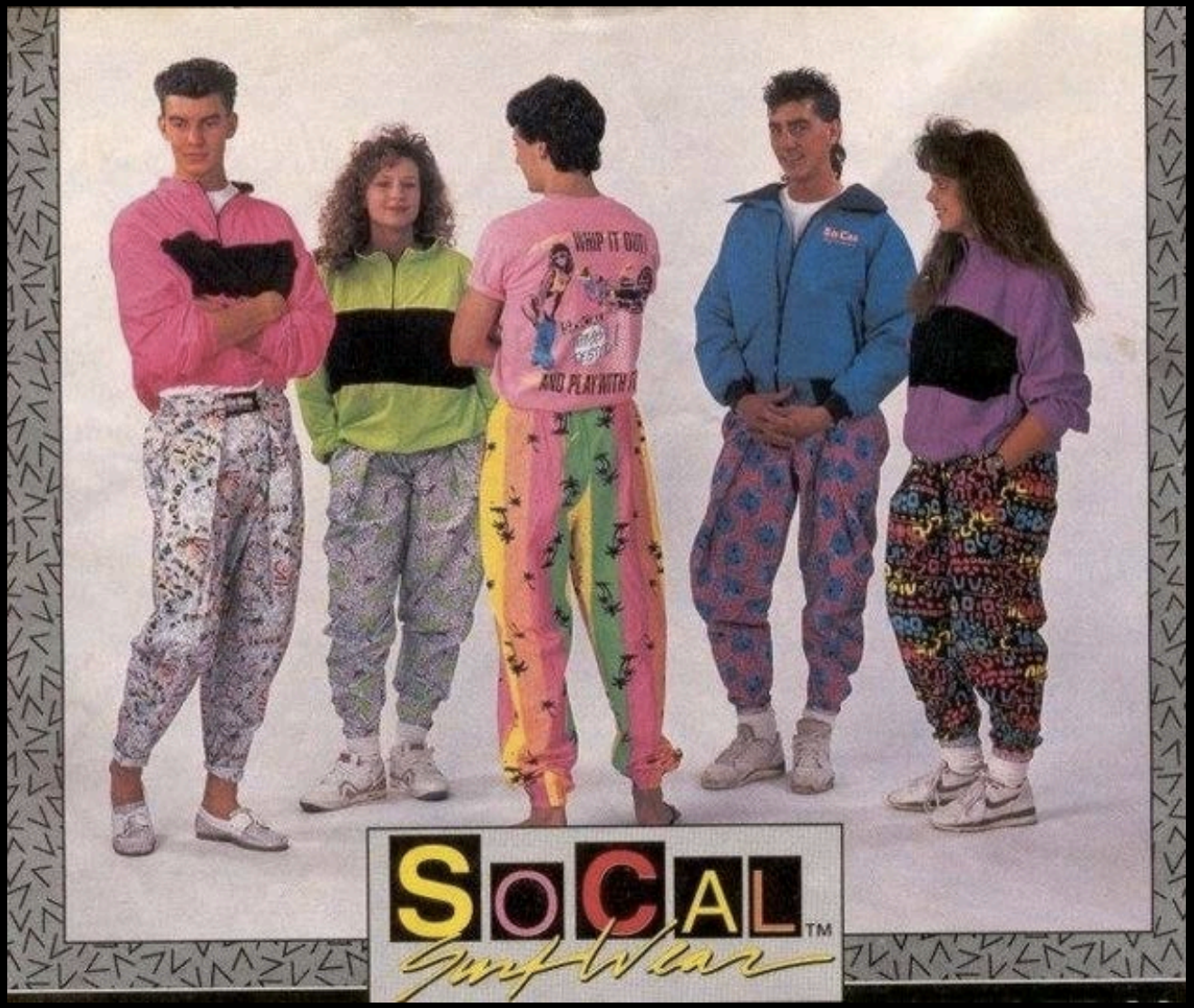
This paper introduces five level cost/performance, and compares RAIDs to

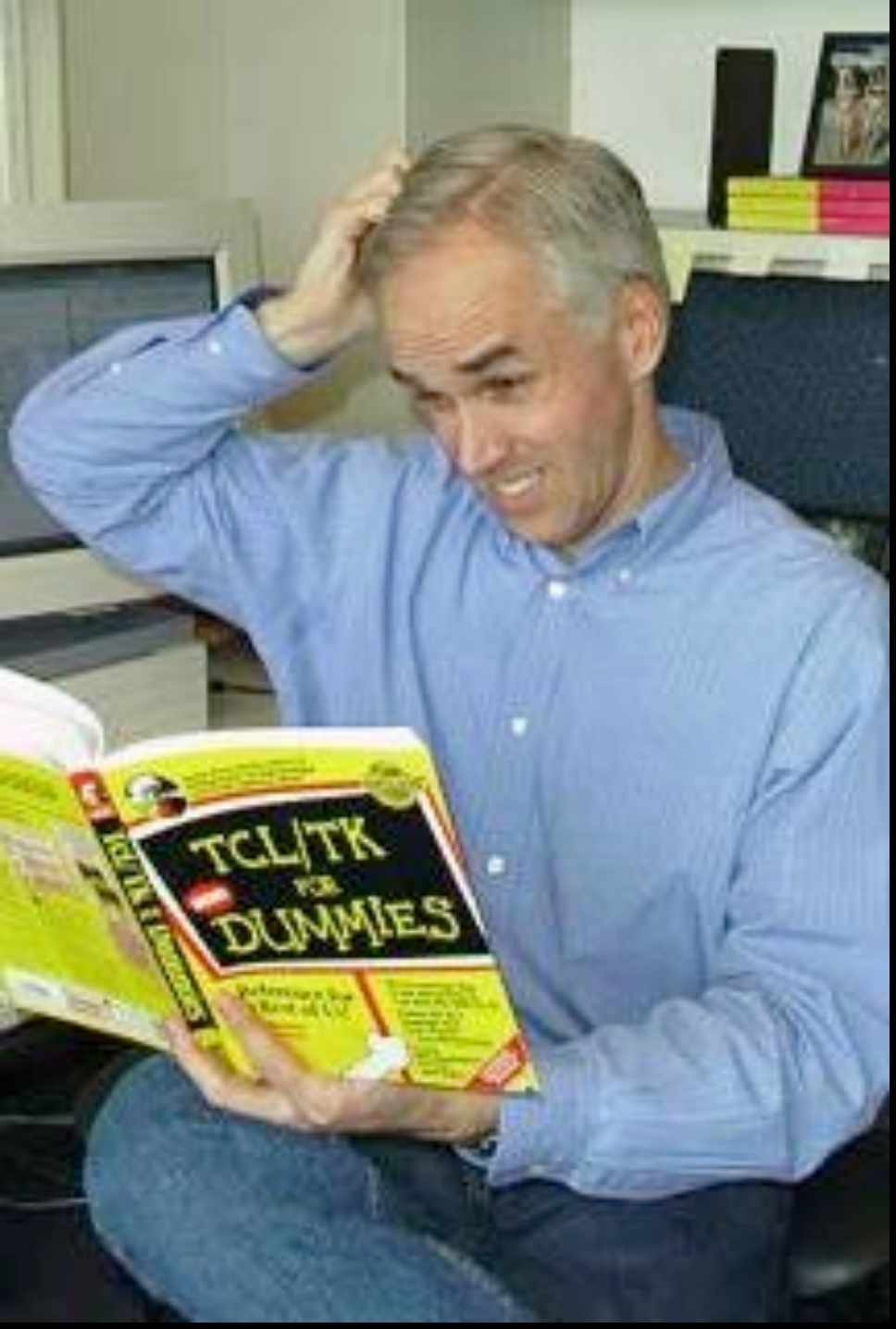




RAID The First

Berkeley CS Systems in the 90s





Tcl and the Tk Toolkit

John K. Ousterhout

DATABASE RESEARCH GROUP

University of California at Berkeley

*POSTGRES * Tioga browser * Mariposa DDBMS * S2K storage system research*

IBM WebExplorer - Welcome to the White House

File Options Configure Navigate QuickList Help

Choose this for a textual representation of this page.

feedback@www.whitehouse.gov

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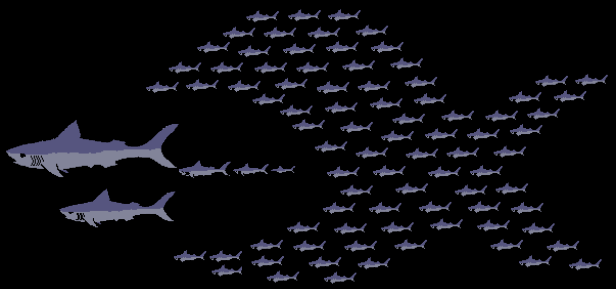
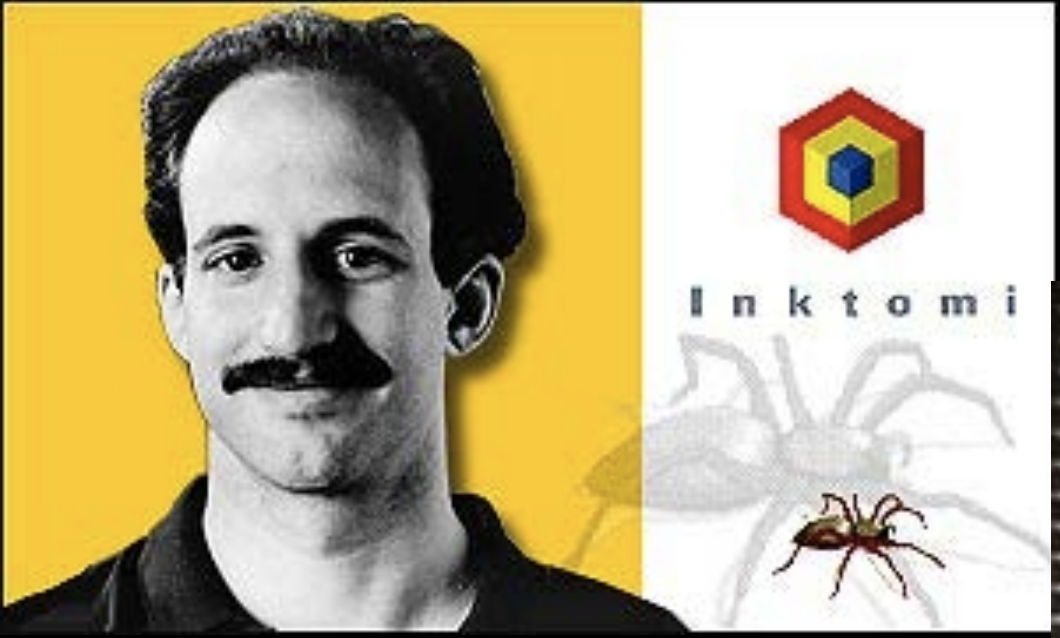
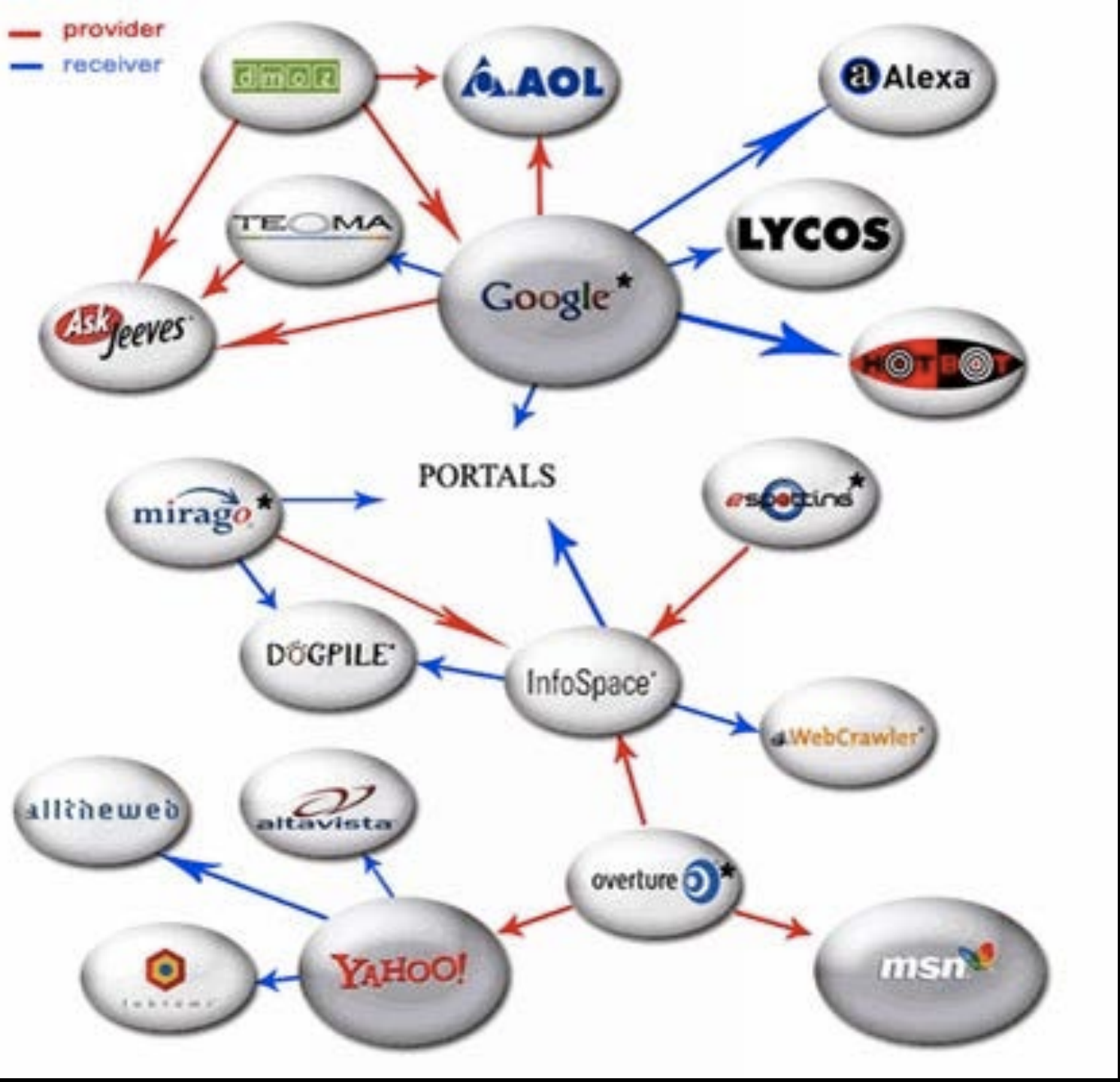


NOW-2



Inktomi

HOTBOT


provider
receiver
dmoz
AOL
Alexa
TEOMA
LYCOS
Google
Ask Jeeves
HOTBOT
PORTALS
mirago
espotting
DOGPILE
InfoSpace
WebCrawler
alltheweb
altavista
overture
YAHOO!
msn

berc@chocolate.pa.dec.com
192.6.28.26/jpeg
14 f/s 1.1 Mb/s (34%)
mute | color | stats

Steven McCanne (LBL)
mccanne@128.3.112.153/h261
9.1 f/s 51 kb/s (0%)
mute | color | stats

Elan Amir (UC Berkeley)
elan@128.32.33.58/h261
5.1 f/s 111 kb/s (35%)
mute | color | stats

VIC v2.7a13 | Menu | Help | Quit

Size... | Modes... | Dismiss

Size... | Modes... | Dismiss

Size... | Modes... | Dismiss

Transmission

Transmit | Lock | Release

Rate Control 9.1 f/s 51 kb/s

128 kbps

10 fps

Encoder

Device... | Port... | Signal...

nv | jpeg | small
cellb | h261 | normal
bvc | mpeg | large

Quality 20

Session

Dest: 224.2.8.88 Port: 8888 ID: 2955997023 TTL: 40

Name: Steven McCanne (LBL)

Key:

Mute New Sources | Sending Slides

Tile... | Members | Colors | Dismiss

spade.CS.Berkeley.EDU: /vmash/archive
drwxr-xr-x 2 schuett mash 1536 Mar 2
1024 Mar 2
10772480 Mar 2
vic:UCB Playback: CSCW Using CSCW
Recorded Source:Colab, Club, Red Camera
tecklee@128.32.130.23/h261
6.0 f/s 161 kb/s (0%)
mute color info...
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Recorded Source:Valia Chavalhe
vechi@128.32.130.20/h261
29 f/s 53 kb/s (0%)
Recorded Source:Cynthia Romer
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14 f/s 127 kb/s (0%)
Recorded Source:Colab, Diamond, Blue Camera
tecklee@128.32.130.25/h261
19 f/s 259 kb/s (0%)
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1.2 f/s 73 kb/s (0%)
vic v5.8a11
Menu Help Quit
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Cynthia Romer (UC Berkeley)
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listen talk
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Menu Help Quit
Recorded Source:Colab, Club, Red Camera
Size... Modes... Dismiss
Recorded Source:Angela Schuett (UCB)
Size... Modes... Dismiss
PAL
Encoder
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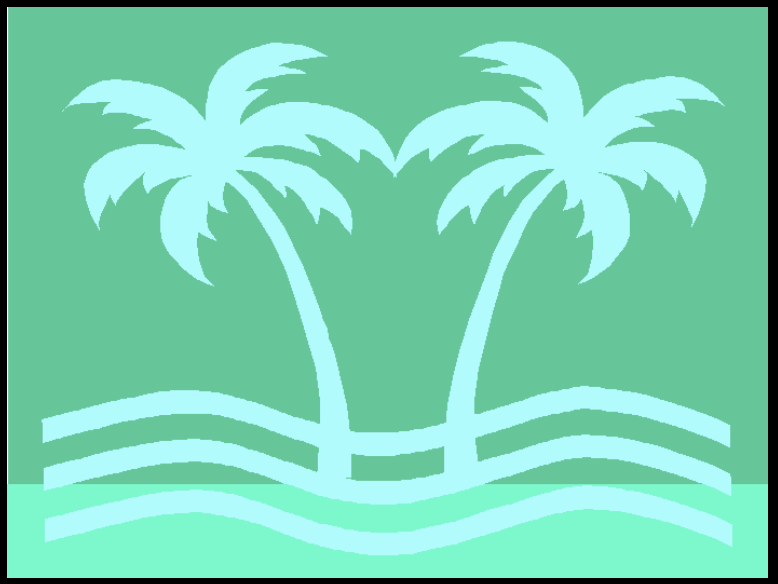
nv jpeg
cvdct h261
cellb pvh
Display
Options...
Tile...
Session
Dest: 224.0.0.1 Port: 8000 8000 ID: 914710277
Name: Cynthia Romer (UC Berkeley)
Note:
Encryption Key:
Members
Dismiss
CameraCtrl
position zoom
pan
tilt
zoom
1 2 3 4
set
Class ... Online
"I thought as long as we were
100% of 27K (at 4 bytes/
vic -scuba -maxsbw 1000000 -f h261 -t "31"
Desk 0
Desk 1
Desk 2
Desk 3
Netscape
Flogin
Lock
Calc
Ssh
Quit

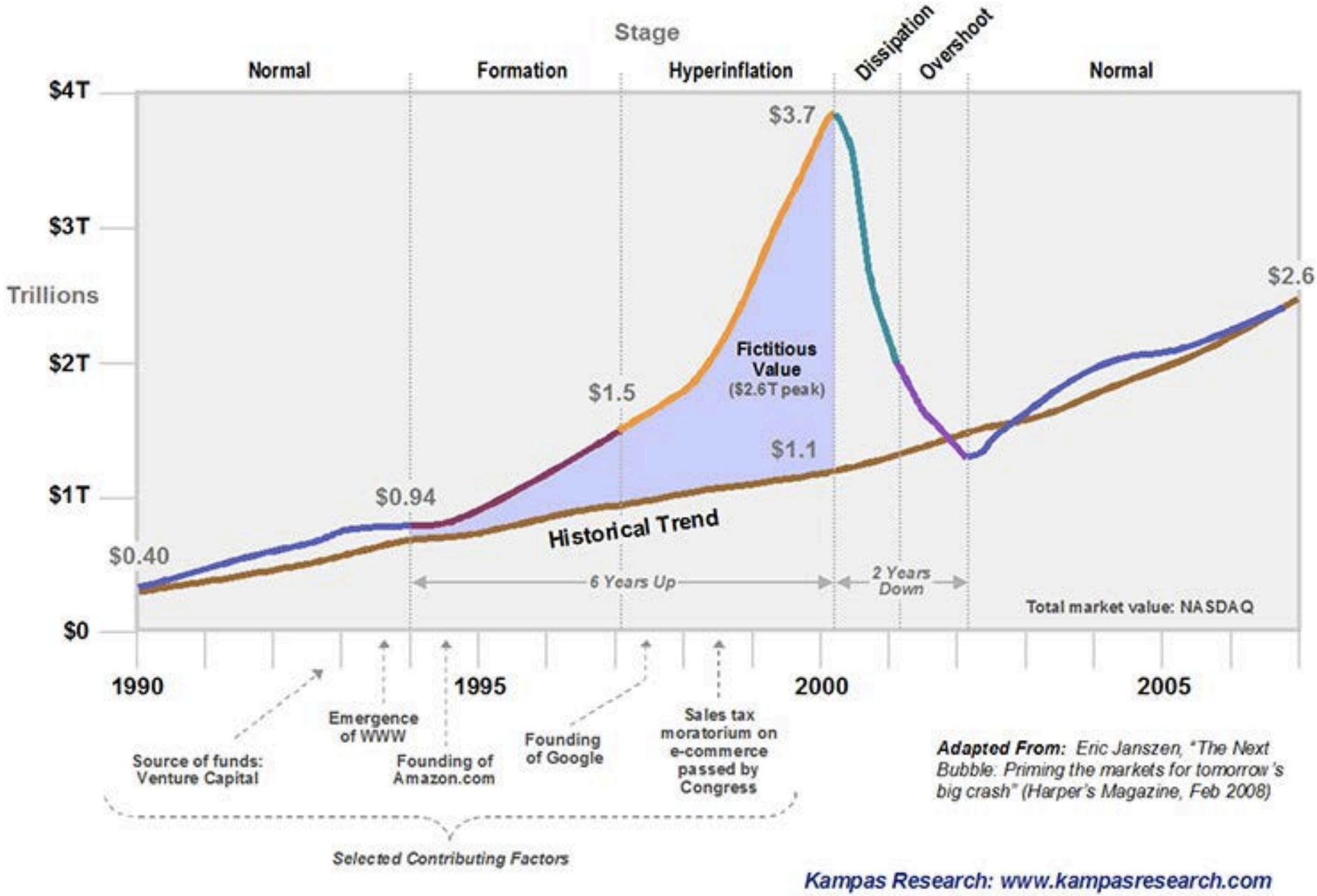
Berkeley CS Systems in the 2000s

ICEBERG 1998-2001



SAHARA 2001-2004

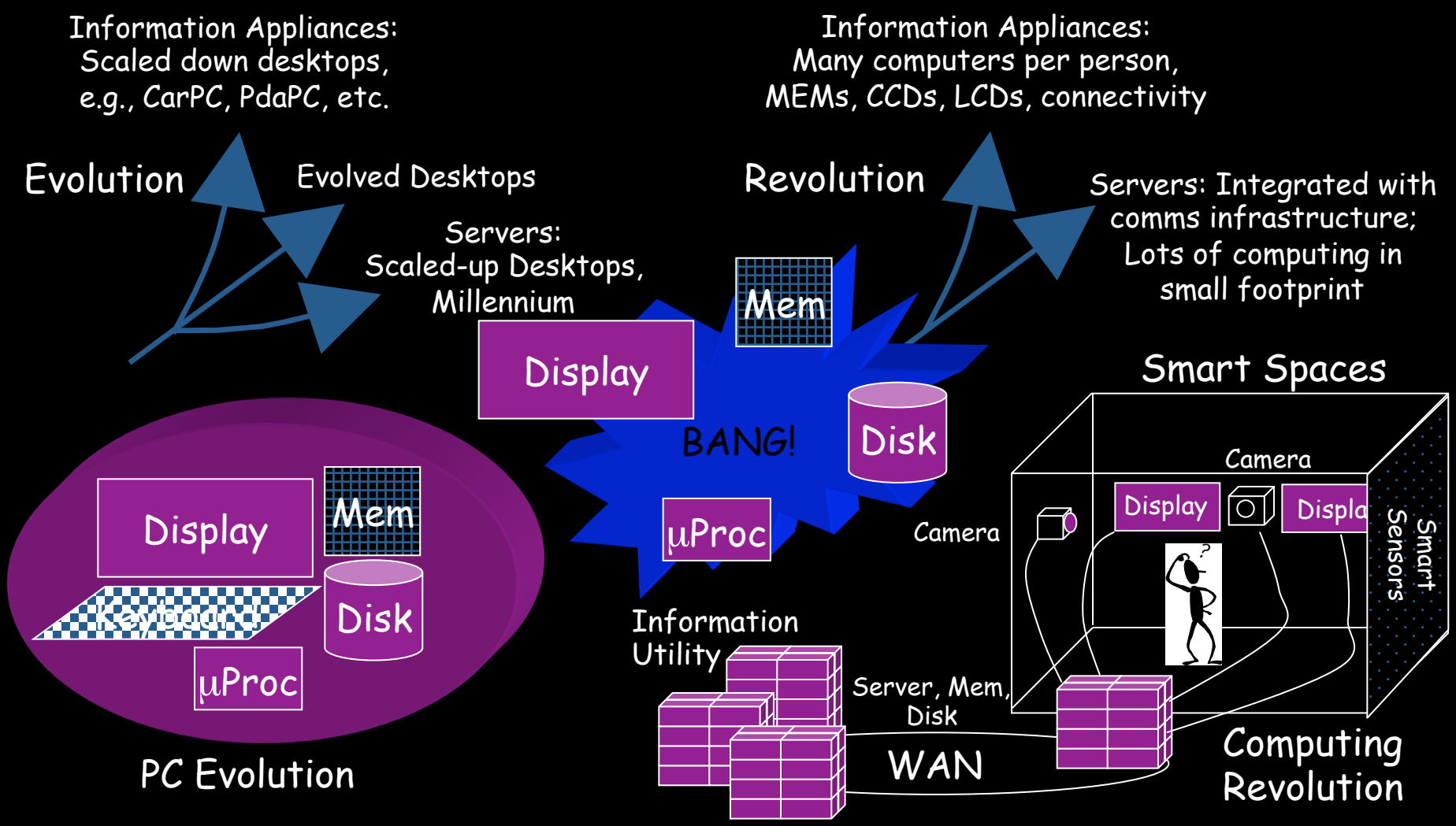
Dot.com Technology Bubble: 1994-2002

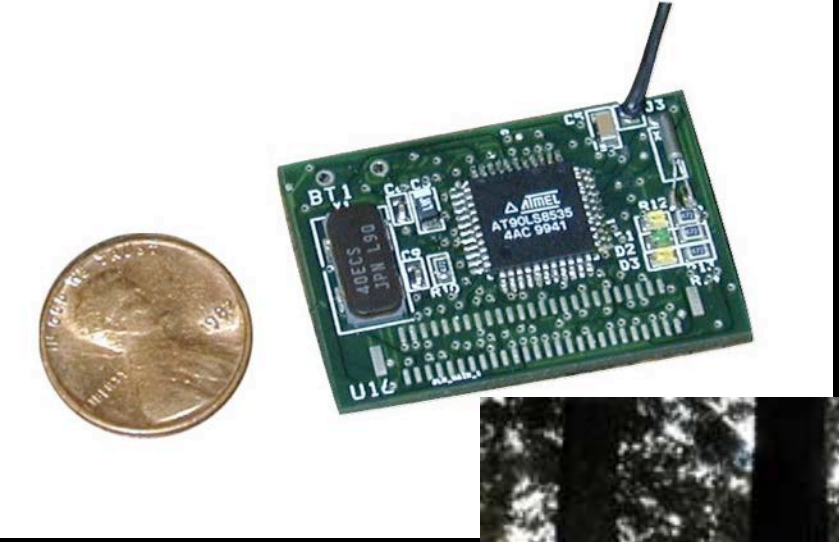


Adapted From: *Eric Janszen, "The Next Bubble: Priming the markets for tomorrow's big crash" (Harper's Magazine, Feb 2008)*

Kampas Research: www.kampasresearch.com

DARPA Endeavour Expedition

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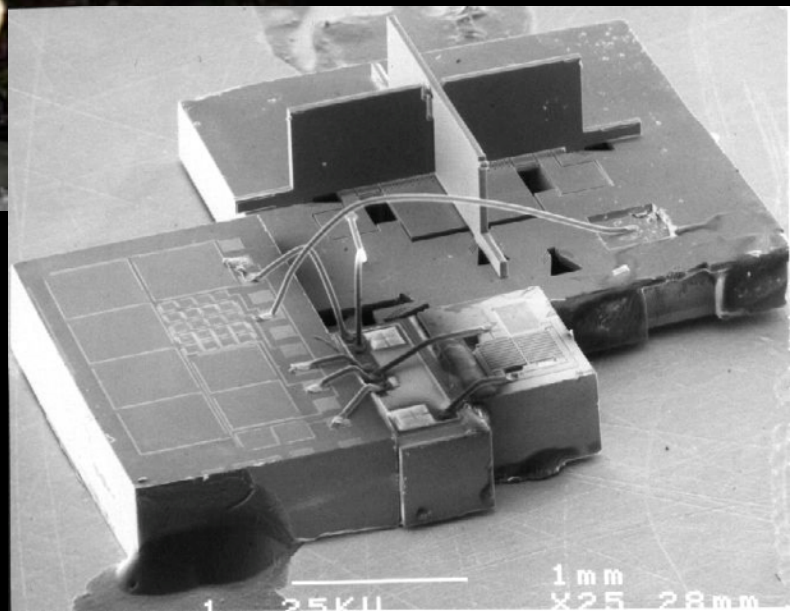
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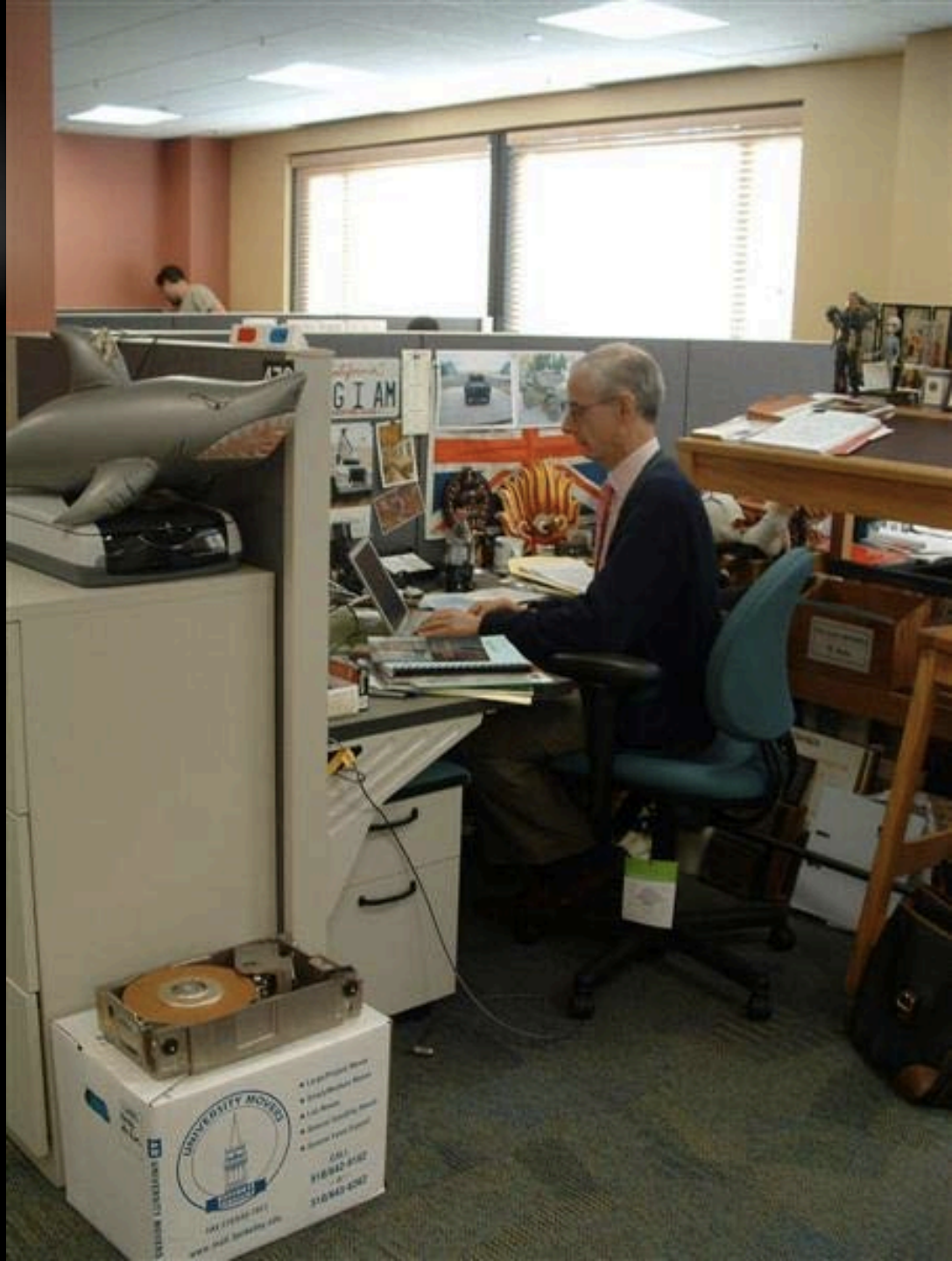
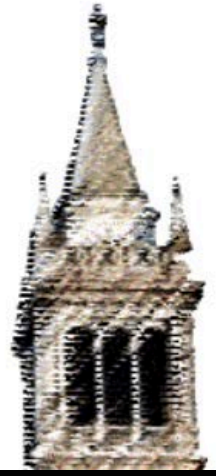
RAD Lab



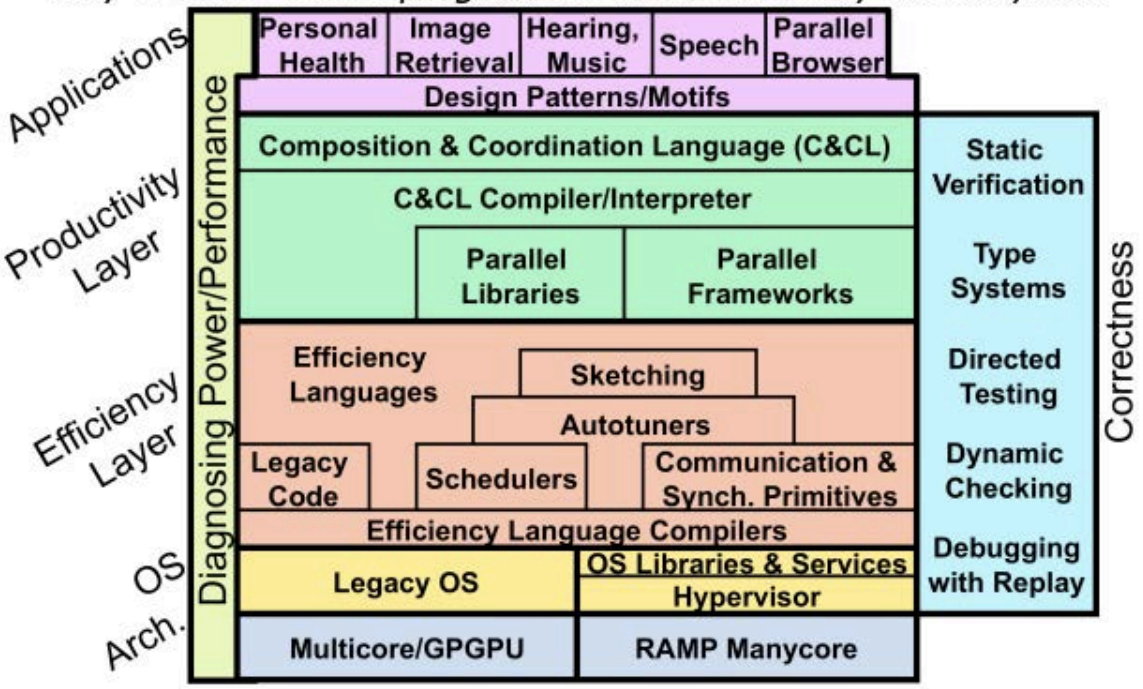
The Parallel Computing Laboratory

The Landscape of Parallel Computing Research: A View from Berkeley



Krste Asanov
Ras Bodik
Bryan Christ
Joseph Jame
Parry Husba
Kurt Keutzer
David A. Pat
William Leste
John Shalf
Samuel Web
Katherine A.

Easy to write correct programs that run efficiently on manycore



Above the Clouds: A Berkeley View of Cloud Computing

Technical Report No. UCB/EECS-2009-28
http://www.eecs.berkeley.edu/Pubs/TechRpts/2009/EECS-2009-28.html

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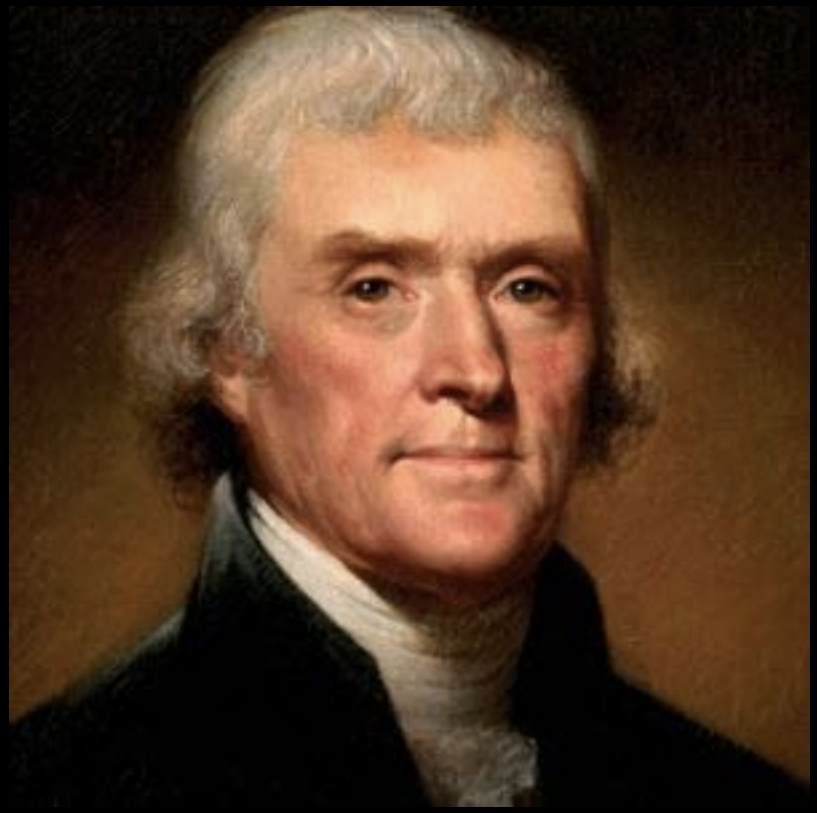
CISCO
cloudera
ebay
facebook
FUJITSU
hp invent
intel
NetApp
SAP
vmware
YAHOO! RESEARCH

LoCal

amplab
UC BERKELEY

MESOS

Spark



He who receives an idea from me, receives instruction himself without lessening mine; as he who lights his taper at mine, receives light without darkening me.

That ideas should freely spread from one to another over the globe, for the moral and mutual instruction of man, and improvement of his condition, seems to have been peculiarly and benevolently designed by nature, when she made them, like fire, expansible over all space, without lessening their density in any point, and like the air in which we breathe, move, and have our physical being, incapable of confinement or exclusive appropriation.

The project was important in contributing to the evolution of computer design, but was even more so in its education of a generation of master's and doctoral students who were to become leaders in the rapidly growing computer industry.

Paul Morton's 1995 Obituary, about his early 1950s CALDIC Project

Thank You!

- Program Committee:
  - Hari Balakrishnan, Chen-Nee Chuah, Z. Morley Mao, George Porter Lakshmi Subramanian, David Wood (and Gaetano Borriello)
- Speakers:
  - Elan Amir, Yan Chen, Yanpei Chen, Ann Chervenak, Tzi-cker Chiueh, Weidong Cui, Todd Hodes, Andy Konwinski, Edward Lee, Gunho Lee, Ethan Miller, Giao Nguyen, Venkat Padmanabhan, Ariel S. Rabkin, Mark Stemm, Doug Terry, Helen Wang, Fang Yu, Shelley Zhuang
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- College of Engineering Facilities
- Dean Shankar Sastry
- EECS Department & Facilities
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  - Christian Legg
  - Elizabeth Soo
  - Boban Zarkovich