EECE416 :Microcomputer Fundamentals and Design ("Microcomputer & Microprocessor")

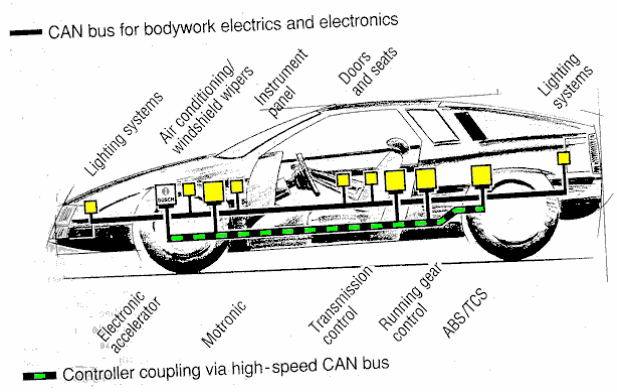
COMPUTER HISTORY

Compiled by Charles Kim

Howard University

Computers and Microprocessors

- Everywhere
  - PC, VCR, DVD,Toys
  - Phones, Cars, etc
- Hardware and Software
- Embedded Computing
- Mobile Computing
- Computers and Microprocessors



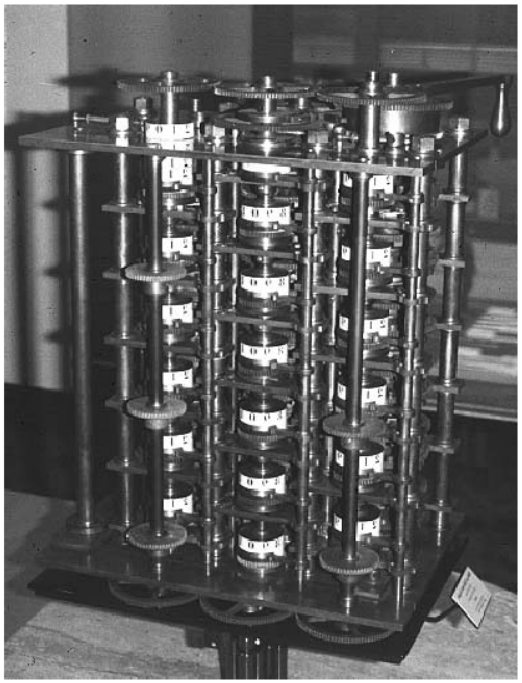
Evolution of Microprocessor

- First Generation
  - 10s of Vacuum Tubes
- Second Generation
  - Advent of Transistors (solid-state)
- Third Generation
  - Advent of IC (Integrated Circuit)
  - Chips
- Fourth Generation
  - VLSI(Very Large Scale Integration)
- Advent of uP
  - Intel 8080→8086→80186→286→386→486→Pentium
  - Motorola 6800→68000→68020
  - Zilog Z80 series
- And the rest is, rapidly changing technology history

Charles Babbage's Differential Engine

- To solve 6th degree differential equation (1842)
- Incompletion

$$f(x) = \sum_{i=0}^{n} a_i x^i$$



$$\Delta^i y_{j+1} = \Delta^i y_j + \Delta^{i+1} y_j$$

IBM

International Business Machines Corp. (IBM)

1890, Herman Hollerith (1860 - 1926, USA), (1890 Census)

– **Punching Cards, Tabulating Machine**

Electric Tabulating System

⇩

Tabulating Machine Co. (1896)

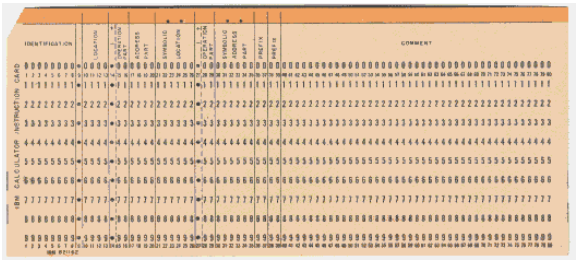
⇩

Computation-Tabulating Recording Co. (1911)

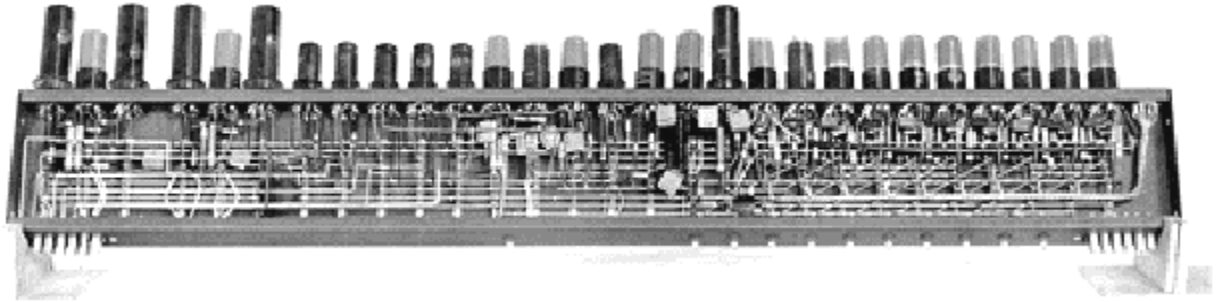
⇩

International Business Machines Corp. (IBM) (1924)

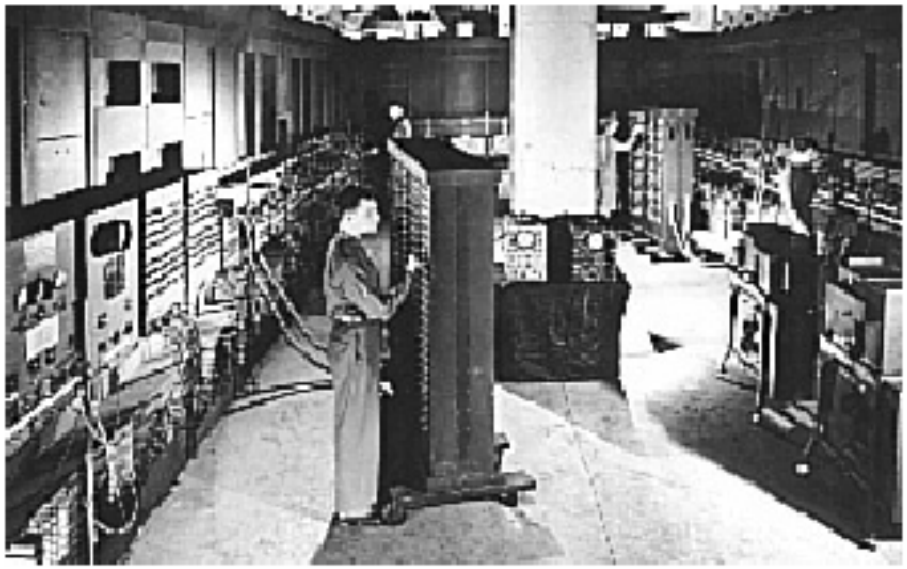
Tom Watson

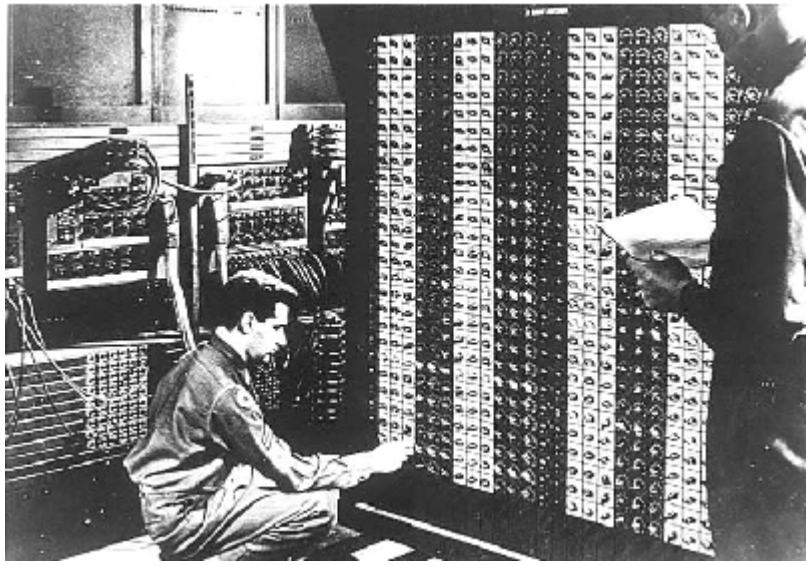


ENIAC



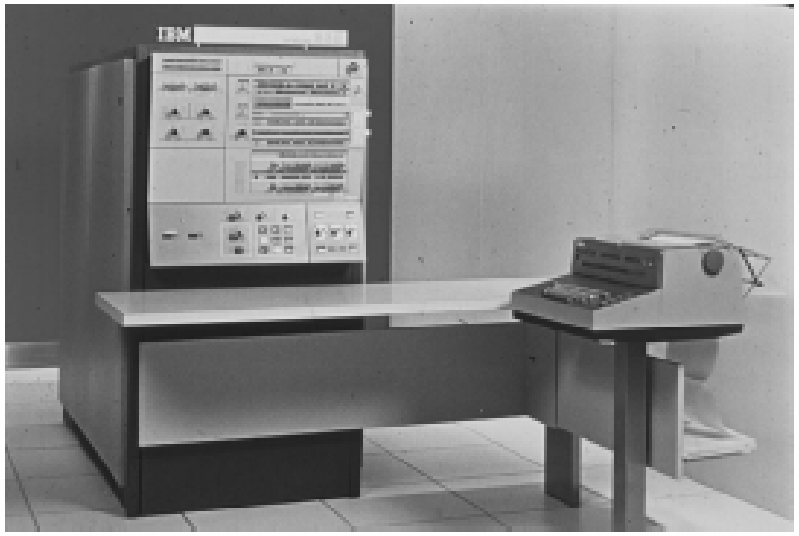
- Electronic Numerical Integrator and Calculator, 1943-46.
- Designed by John W. Mauchly and J. Presper Eckert (Upenn)
- First general purpose electronic computer – Artillery firing tables for US Army's Ballistic Research Lab
- Smithonian Museum of American History

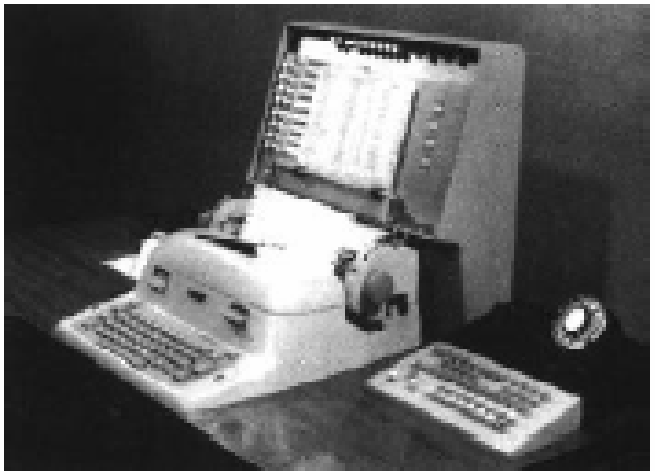




IBM, 1964

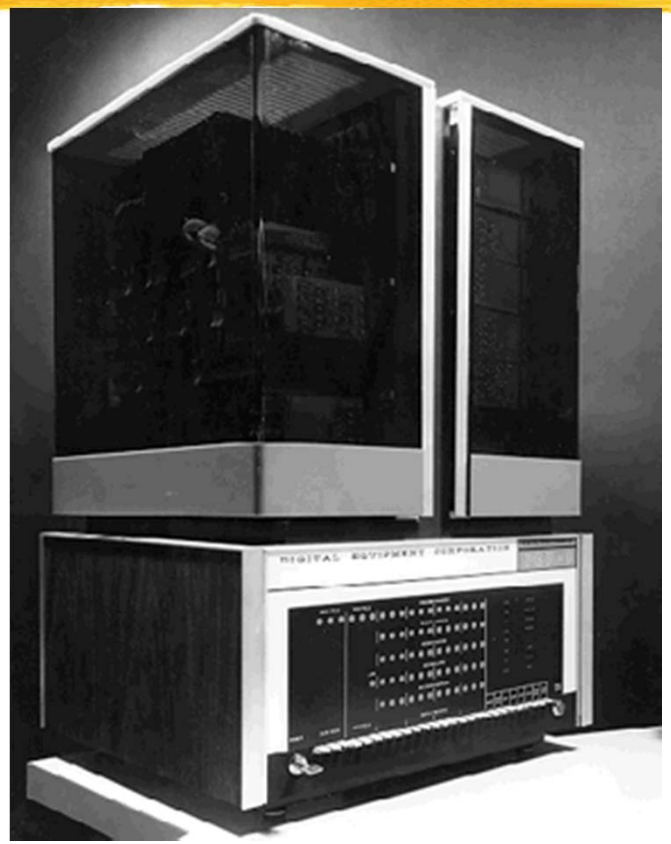
- System/360
  - "third-generation" computer
  - 7 Year long Sabre project for World wide airline reservation – fully implemented



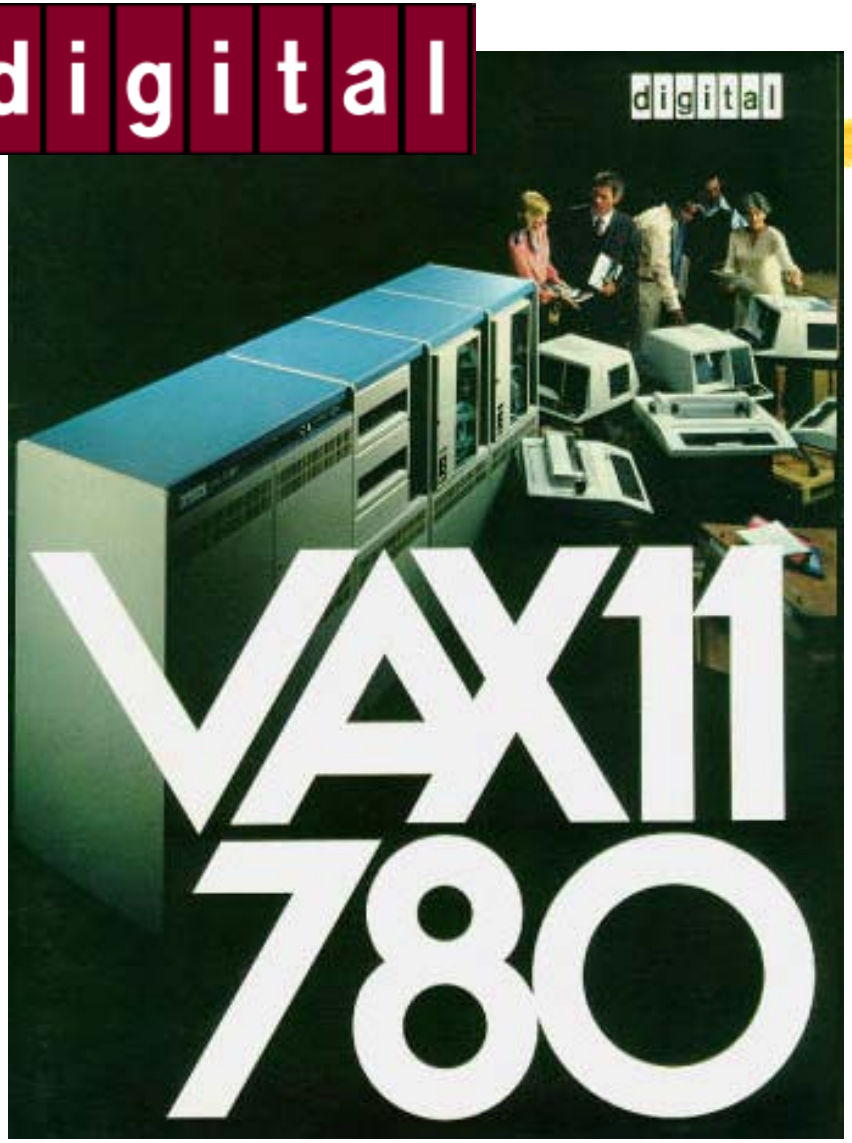


DEC, 1965

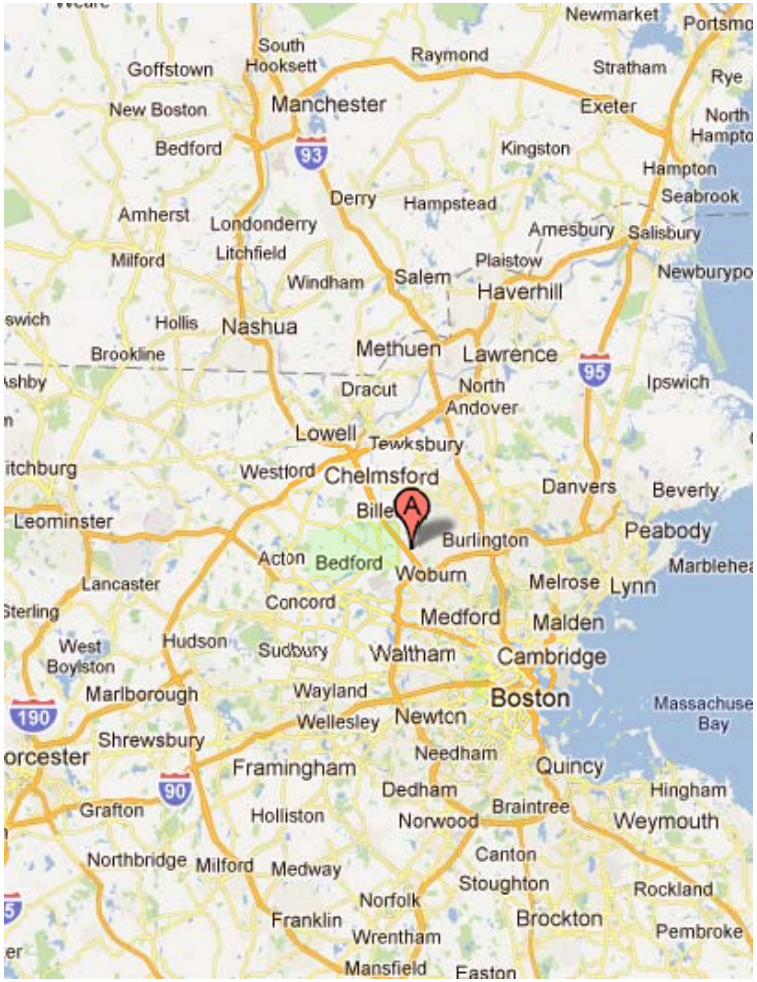
- **Digital Equipment Corp (DEC)**
  - Founded in 1957 by Ken Olsen and Harlan Anderson (both worked for MIT Lincoln Lab)
  - Brain: C. Gordon Bell
  - **Focus: "Interactive Computing" than batch-job of IBM**
  - **PDP-8** ("programmed Data Processor")
  - **first commercially** successful minicomputer
  - **$18,000** - one-fifth the price of a small IBM 360 mainframe.
  - **A great success by**
    - Speed
    - small size
    - reasonable cost
  - **Well accepted by**
    - manufacturing plants
    - small businesses
    - scientific laboratories.
- **DEC (1957) → Compaq (1998)→ HP (2002) → No Computer Business (2011?) or Yes? (2013)**



DEC VAX 11/780 – My Experience in early 1980s

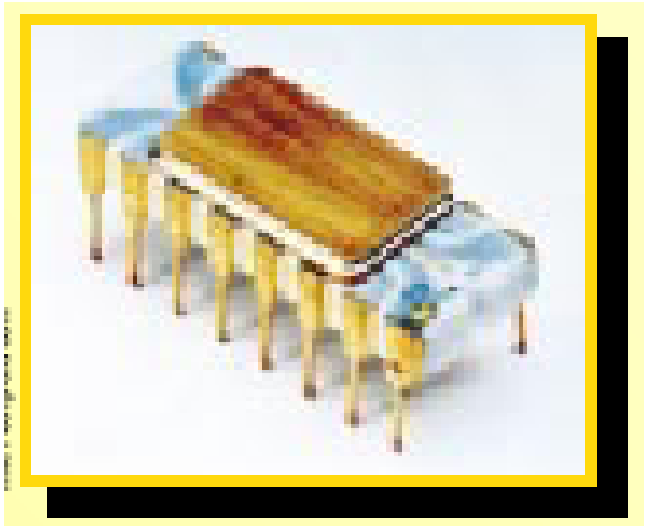


- VAX (Virtual Address eXtension) :16 → 32
- To accommodate 16-bit PDP : backward compatibility



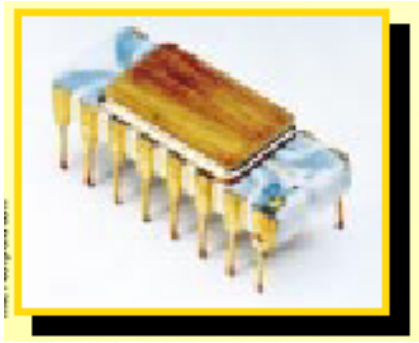
INTEL, 1971 (“computer in a chip”)

- Intel
  - introduced 4-bit Microprocessor (4004)

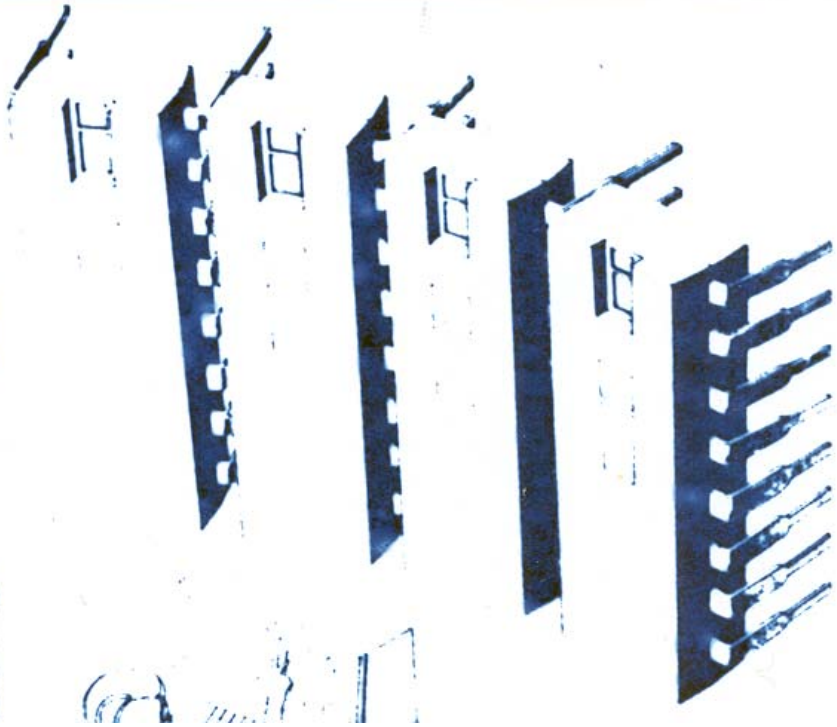


Intel 4004 (Yr 1971)

Intel's first advertisement for the 4004 microprocessor appeared in the 15 November 1971 issue of Electronic News.



Announcing a new era of integrated electronics



A micro-programmable computer on a chip!

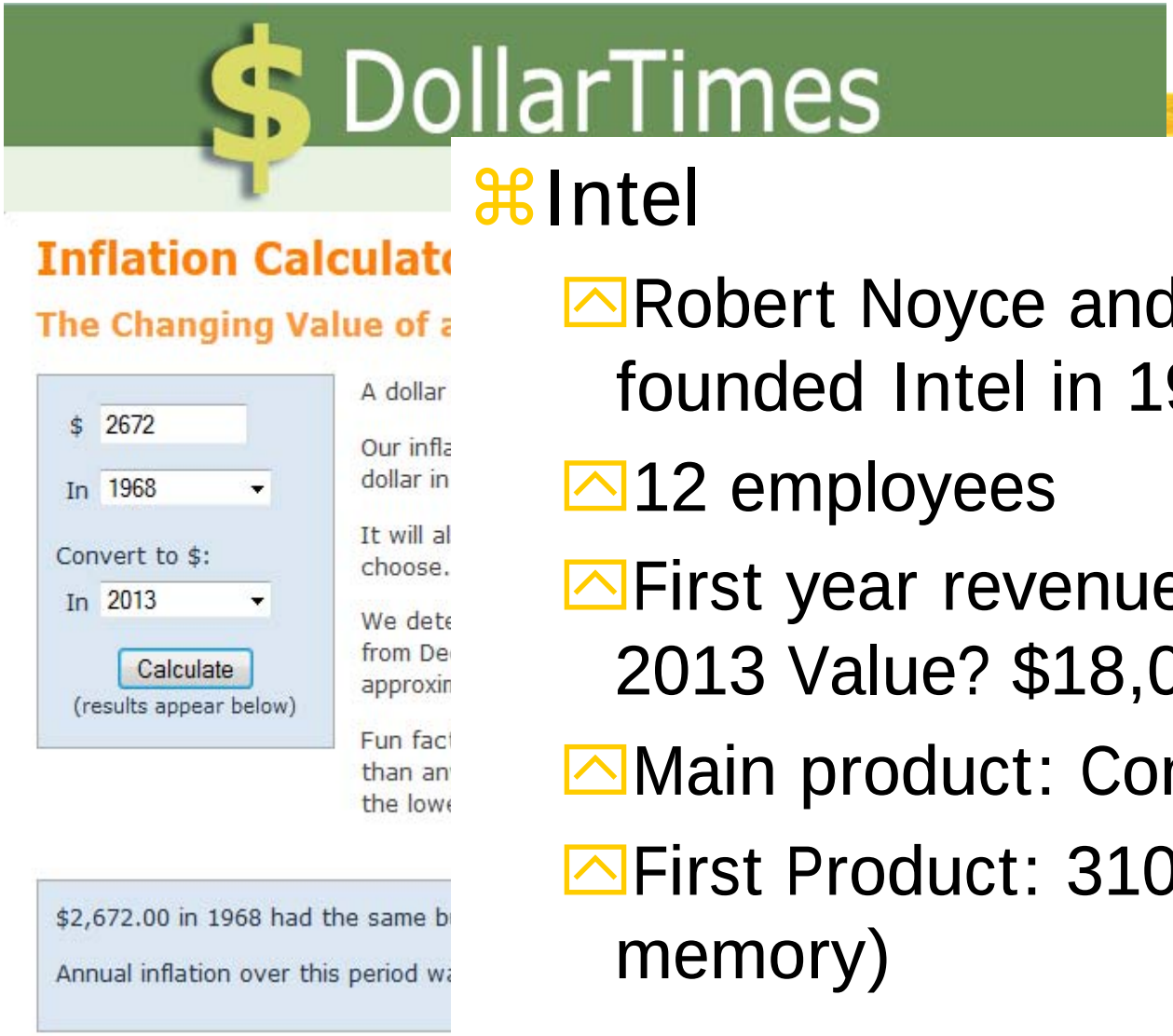
Intel introduces an integrated CPU complete with a 4-bit parallel adder, sixteen 4-bit registers, an accumulator and a push-down stack on one chip. It's one of a family of four new ICs which comprise the MCS-4 micro computer system -- the first system to bring you the power and flexibility of a dedicated general-purpose computer at low cost in as few as two dual in-line packages.

MCS-4 systems provide complete computing and control functions for test systems, data terminals, billing machines, measuring systems, numeric control systems and process control systems.

The heart of any MCS-4 system is a Type 4004 CPU, which includes a powerful set of 45 instructions. Adding one or more Type 4001 ROMs for program storage and data tables gives you a fully functioning micro-programmed computer. To this you may add Type 4002 RAMs for read-write memory and Type 4003 registers to expand the output ports.

Using no circuitry other than ICs from this family of four, you can create a system with 4096 8-bit bytes of ROM storage and 5120 bits of RAM storage. When you require rapid turn-around or need only a few systems, Intel's erasable and re-programmable ROM, Type 1701, may be substituted for the Type 4001 mask-programmed ROM.

Behind Story of 4004



- Intel
  - Robert Noyce and Gordon Moore founded Intel in 1968
  - 12 employees
  - First year revenue: $2,672 → 2013 Value? $18,097.
  - Main product: Computer Memory
  - First Product: 3101 (64-bit memory)

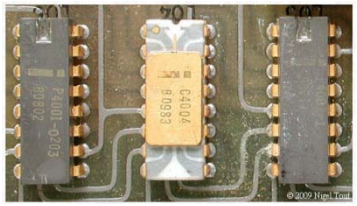
Story-Continued

- 1969: Busicom (Japanese Co) order “A set of chips for a programmable calculator” with advanced money of $60,000.→ multiple custom chips.

NCM/Busicom *HL21* mechanical pinwheel calculator.

Story-Continued

- Ted Hoff (designer): “single-chip, general purpose logic device, which would retrieve its instructions from memory”
- Result: Intel 4004 Microprocessor
  - 1/8”x 1/6”
  - 2300 transistors

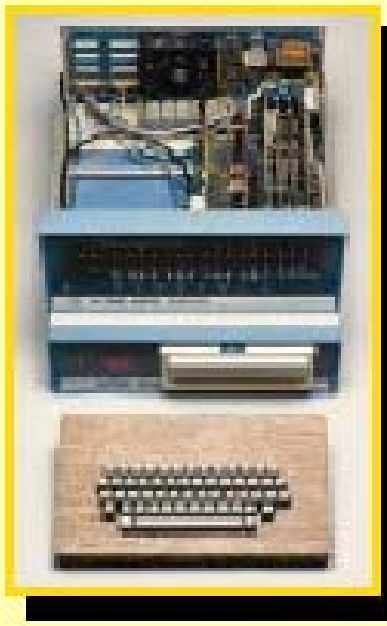


- Busicom under financial problem→ Intel bought back the right
- And, the rest is history
- 1971: Intel 4004, $200
- 1972: Intel 8008, 8-bit, $360

Computer based on 8080

- Altair 8800 Computer
  - Intel 8080
  - Ed Roberts
  - His daughter's name
  - $397
  - Intel supplied the chip for $75 each

The January 1975 cover of



1975 *The first PC, an Altair 8800, available as a kit, appears on the cover of Popular Electronics in January.*

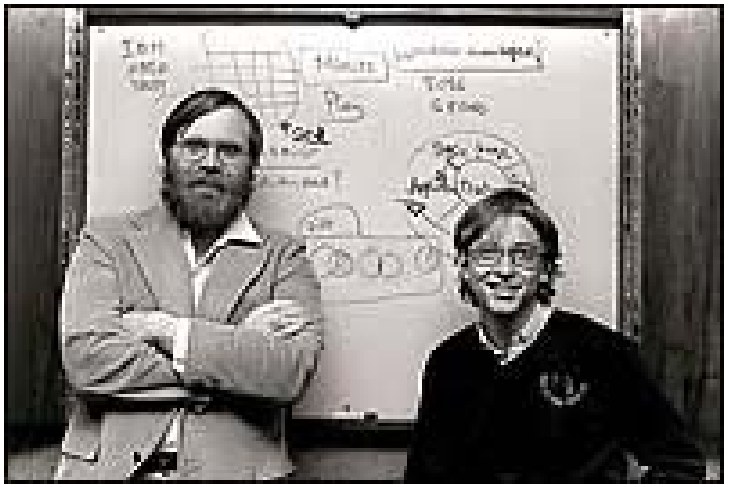
The Computer Museum

Seattle Connection and "Micro Soft"

- 1968: Mother's group at Lakeside School raised money for Math class project ($3000)
- Arranged to buy some time on a computer for the class ("time-sharing")
- Old teletype machine →Telephone →DEC Minicomputer (owned by General Electric) in downtown Seattle
- 2 gifted students: 10th grader (Paul Allen) and 8th grader (Bill Gates) → computer nerds
- Learned how to program using **Basic** (**b**eginner's **a**ll purpose **s**ymbolic **i**nstruction **c**ode; developed at Dartmouth College in 1964)
- 1971:Paul Allen went to Washington State University, and Bill Gates, later in 1973, to Harvard.
- 1971: Started a part-time company, Traf-O-Data.
- 1972: They bought one of the first Intel 8008 chip for $360. Added some electronics for traffic data collection in digital format

Altair 8800 and Micro Soft

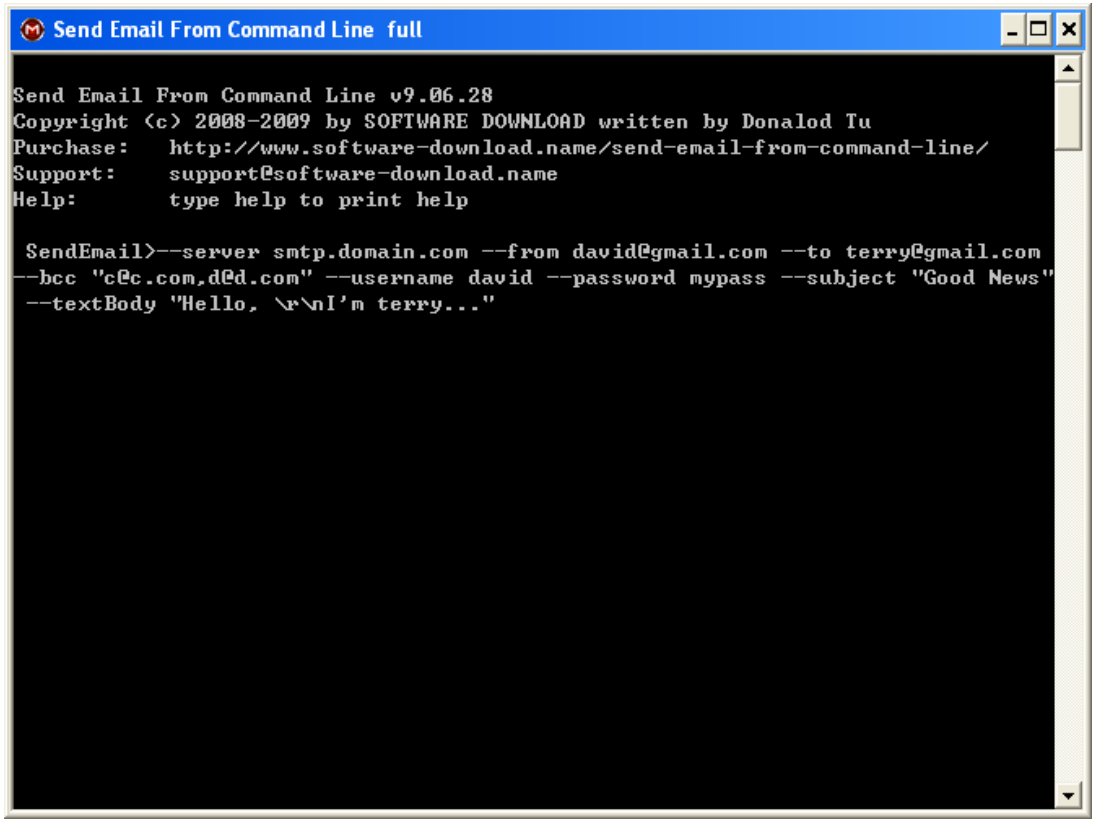
- Altair8800 needed software
- Ed Roberts received letter from a company: “they already created a version of Basic for Altai 8800”
- Within 30 days they [Gates and Allen] finished the version.
- They also regained the right to market in themselves.
- Formed Micro Soft in 1977.



Micro soft - main IBM PC software provider

MS-DOS

- or Micro soft Disk Operating System
- the basic software for the newly released IBM PC
- Start of a long partnership between IBM and Microsoft



Behind Story of MS-DOS

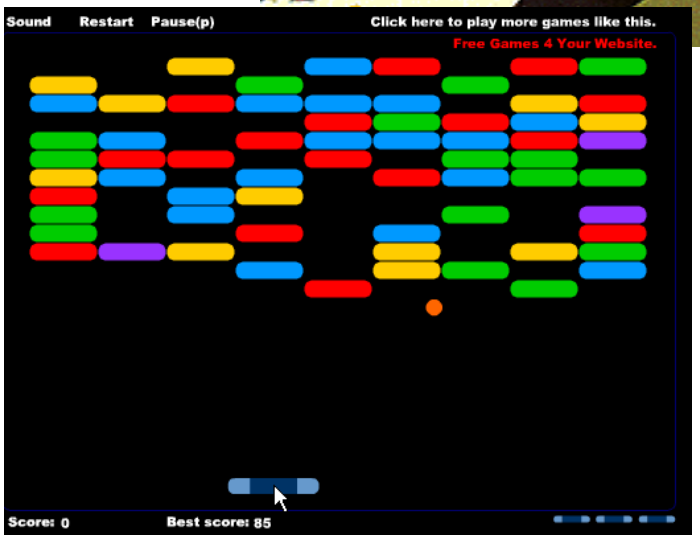
- IBM: Manhattan Project for PC
  - Approached Microsoft
  - Intel 8086 suggested
  - *Basic* for PC project offered
  - Operating System needed
- Bill Gates
  - Contacted Tim Patterson (of Seattle Computer Products): File Allocation for Basic→QDOS(quick and dirty operating system)
  - Deal of the Century
    - Bought QDOS for $50,000.
    - Supplied it to IBM as MS-DOS

Commodore, 1977

- The Commodore PET ("Personal Electronic Transactor")
  - first of several personal computers released in 1977
  - straightforward to operate.

1977: Apple II

- Steve Jobs + Steve Wozniak
- Apple II
  - instant success when released in 1977
  - printed circuit motherboard
  - switching power supply
  - Keyboard
  - case assembly
  - Manual
  - game paddles
  - cassette tape
  - computer game "Breakout”



1977: TRS-80

- **TRS-80**
- **Tandy Radio Shack**
- **In the first month after its release, sold 10,000 units**
- **company's projected sales for 1 year: 3,000 units**

1981: IBM PC

- IBM 5150 PC Personal Computer
  - 4.77-MHz Intel 8088 CPU
  - 64KB RAM
  - 40KB ROM
  - one 5.25-inch floppy drive (160KB capacity)
  - PC-DOS 1.0 (Microsoft's MS-DOS)
  - US$3000
  - Microsoft BASIC
  - CP/M-86
  - Easywriter 1.0. A fully loaded version with color graphics costs US$6000.
  - CGA graphics card for the PC, giving 640x200 resolution with 16 colors.

1981: big portable

- **Adam Osborne**
- **first portable computer**
- **the Osborne I**
  - **weighed 24 pounds**
  - **cost $1,795**
  - **Used Z80 (NOT IBM-PC clone (yet)!)**

1981: Apollo - First Workstations

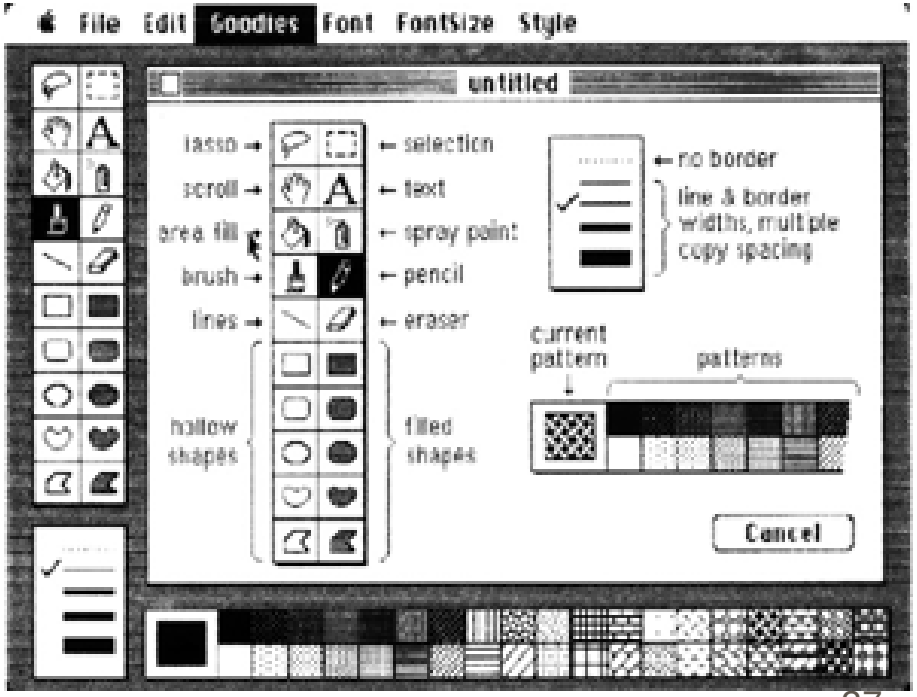
- **Apollo Computer**
  - **first workstation**
  - **offering more power than some minicomputers at a fraction of the price.**

1982: SUN Microsystems

- Sun Microsystems is founded in 1982.
  "SUN" - Stanford University Network.
- Motto: “Network is the computer”.
- Four employees.
- The SUN-2 features
  - a Motorola 68010 processor.
  - 4MB of memory
  - 400MB Fujitsu M2351 disk.

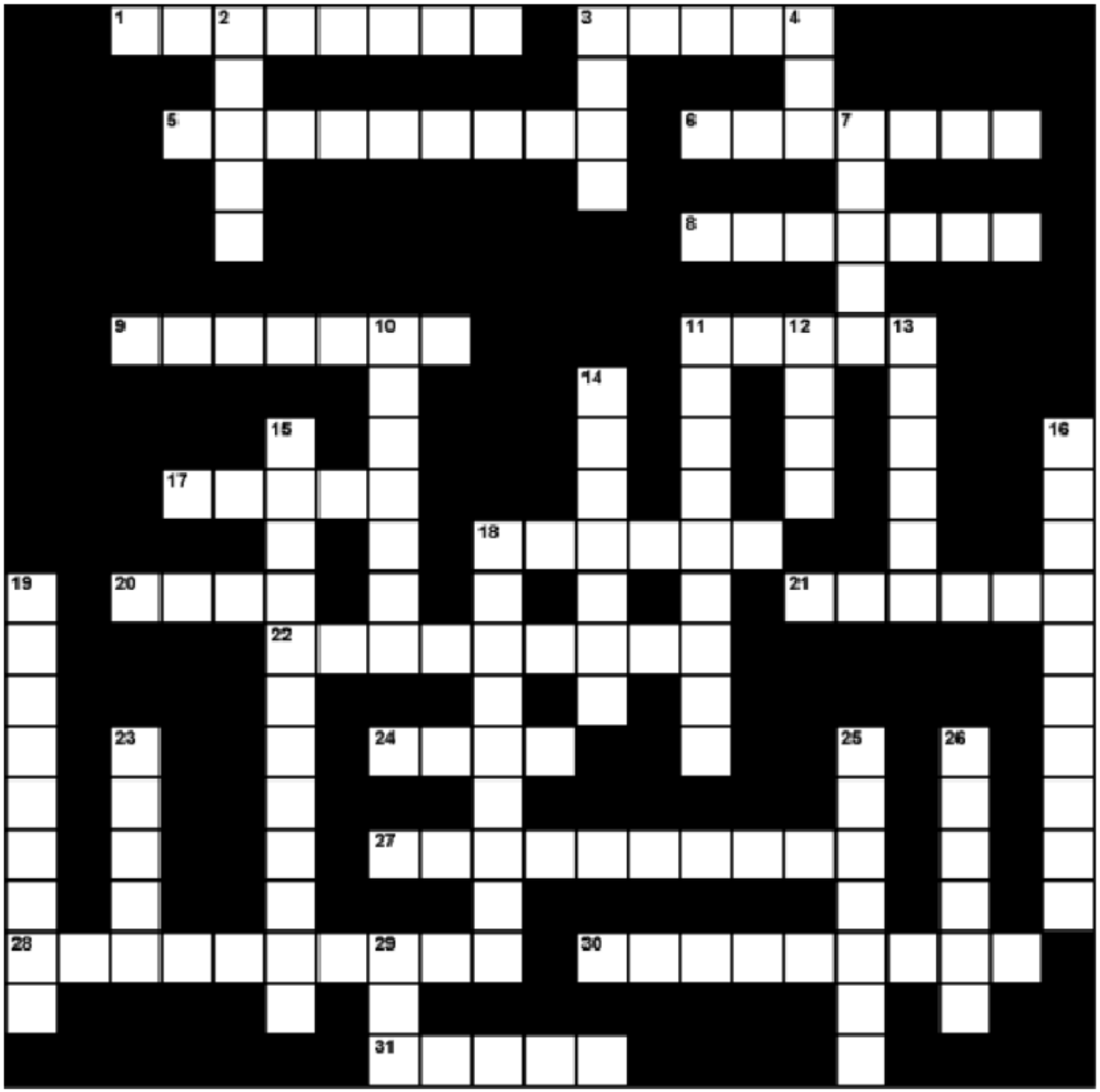
1984: Apple Macintosh

- **Apple Macintosh:**
  - **8-MHz 32-bit Motorola 68000 CPU**
  - **built-in 9-inch B/W screen**
  - **512x342 graphics**
  - **400KB 3.5-inch floppy disk drive**
  - **Mouse**
  - **128KB RAM**
  - **weighs 20 pounds**
  - **Price: $2500.**

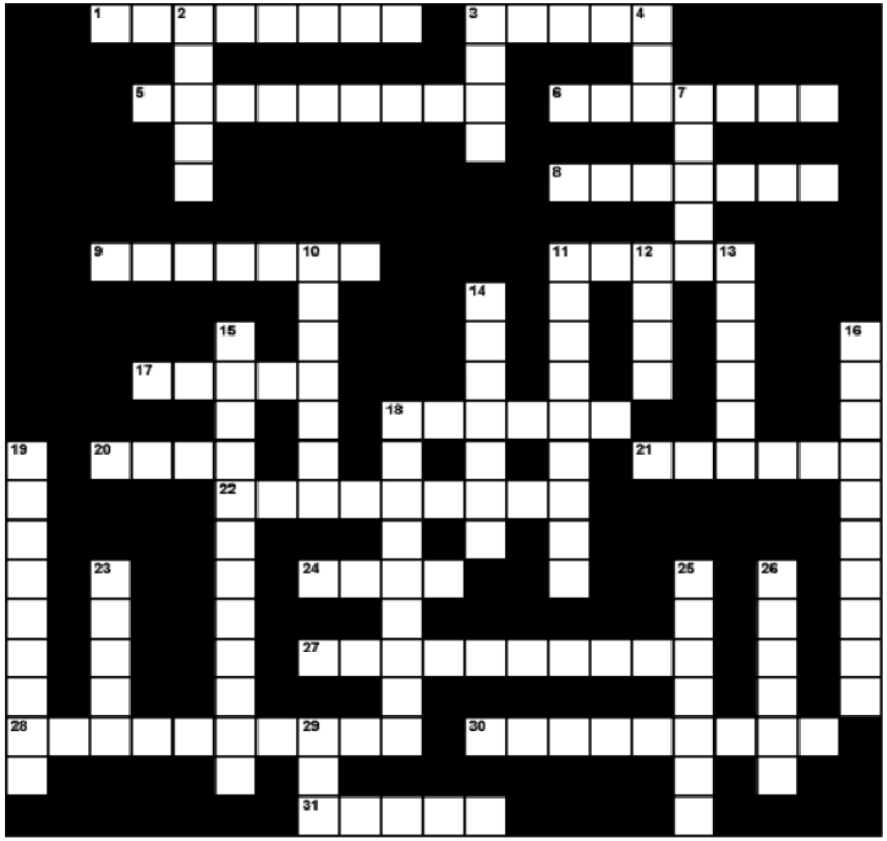


Computing History Puzzle

- **By Adrian Hoad-Reddick**



By Adrian Hoad-Reddick



Across

1. The information superhighway
3. Simple programming language for beginners
5. Windows company
6. He developed the UNIVAC computer (with 13 Down)
8. His Analytical Engine and Difference Engines were early mechanical computers
9. Microsoft's GUI operating system modelled after the Mac's
11. Company that introduced the Macintosh in 1984
17. Pioneering computer games company
18. The number system used by computers
20. Physics lab in Geneva now famous for being the home of the World Wide Web
21. Presidents of IBM, Thomas _____ Sr., and Thomas _____ Jr.
22. He pioneered the mouse as a pointing device (in 1965!)
24. Errors in programs are called these
27. He developed Lotus 1-2-3 and revolutionized the spreadsheet (2 words)
28. The science of flight dynamics — wartime calculations in this required computers
30. Punched card pioneer who started the Tabulating Machine Company
31. A pointing device (they now come in wireless and optical varieties)

by Adrian Hoad-Reddick Challenge your knowledge of computer history

Down

2. IBM's motto
3. 8 bits = 1 _____
4. The part of a computer (a microprocessor chip) that does most of the data processing
7. Early programming language, specifically for business applications
10. Term for systems that render text and images on screen as they will appear in print.
11. A step-by-step solution to a problem
12. Early Atari video game introduced in 1974
13. EDVAC/UNIVAC developer (with 6 Across)
14. Apple co-founder – one of the Steves
15. Analog computing ace who wrote "As We May Think" in the 1945 Atlantic Monthly – envisioning a 'memex' which is strikingly similar to today's computer and Internet (2 words)
16. It replaced the vacuum tube, and ushered in the era of integrated chips
18. He developed MS-DOS and heads up one of the world's largest companies. (2 words)
19. Apple co-founder, with 14 Down (2 words)
23. International computer language eclipsed by FORTRAN.
25. Computer language – FORmula TRANslator – developed by John Backus in 1953
26. Name given to the most popular keyboard configuration (named after the arrangement of keys in the top row…)
29. Acronym by which we now know the Tabulating Machine Company