THE COMPUTER MUSEUM REPORT

NUMBER 10 FALL 1984

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Cover and back cover:

The Computer Museum would like to thank the hundreds of individuals (listed on the cover) and corporations (listed on the back cover) who gave more than $250 or $2500 respectively during the Museum's first two years.

The Founders program was in effect until June 24, 1984. It provided an opportunity for the Museum to become a widely-supported public institution so it could be designated a public, non-profit charitable foundation by the IRS.

With the Founders program complete, there are now new membership categories available. These new membership categories can be found elsewhere in this issue.

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THE COMPUTER MUSEUM

The Computer Museum is the only museum of its kind in the world. It dramatically illustrates the impact of the Information Revolution through interactive exhibits of state-of-the-art computers, films and creations of vintage computer installations.

The Museum hours will be: 11 a.m.–6 p.m. Wednesday, Saturday and Sunday and 11 a.m.–9 p.m. Thursday and Friday. It will be closed Mondays, Tuesdays, Christmas, New Years and Thanksgiving. Its new location at 300 Congress Street is minutes from Logan International Airport and just a short walk from Boston's financial district and such historic landmarks as Faneuil Hall and the Freedom Trail.

The Museum offers individual memberships for $30. Other membership categories are available for corporations and those individuals seeking a higher level of participation. All members receive a free subscription to The Computer Museum Report, a 10% discount on merchandise from The Computer Museum Store, free admission and invitations to Museum previews.

For more information, contact Jana Buchholz, Membership Coordinator at The Computer Museum, 300 Congress Street, Boston, MA 02210, (617) 426-2800.

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Design and production of the Report is done by Benson and Clemons.

The Computer Museum
300 Congress Street
Boston
Massachusetts
02210

The Director's Letter

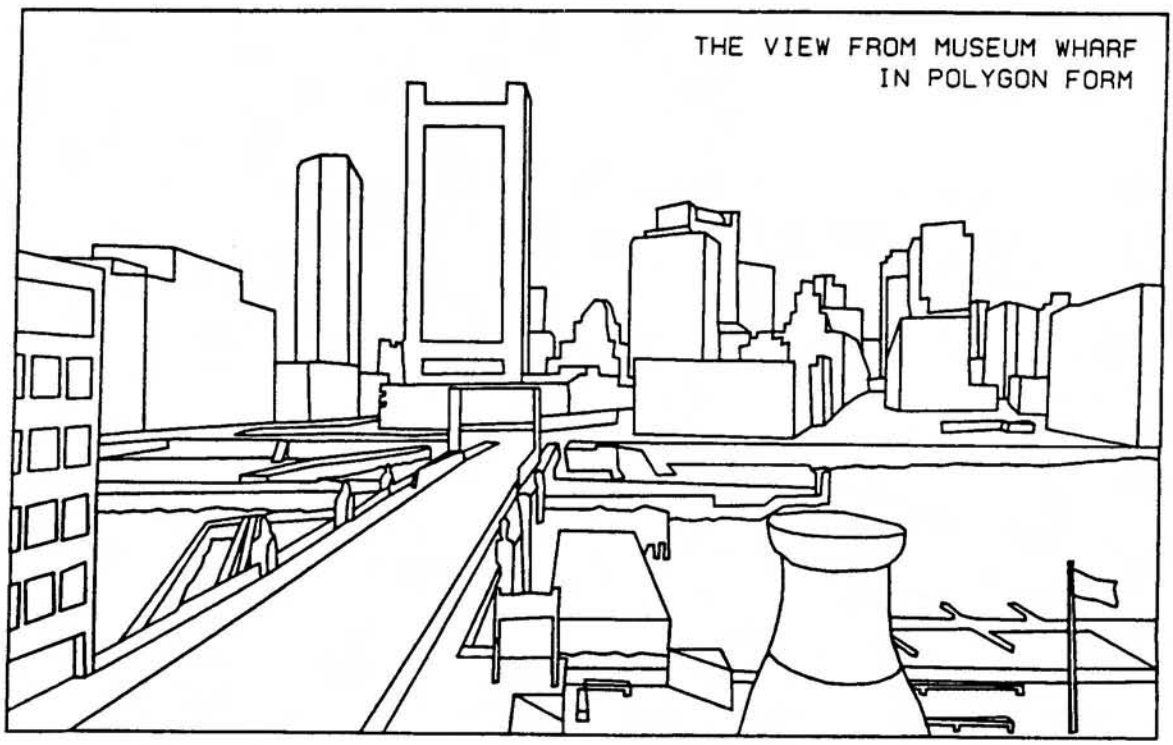
In our countdown to opening the Museum, I am pleased to have the opportunity via the report to reflect on the evolution of the Museum. Five years ago, I was charged with the task of creating a "computer museum." The only models at that time were IBM's dismantled history wall done by Charles Eames in the sixties, the small exhibit of historic machines at the Smithsonian, and the interactive and historic collections at the Science Museum in London. None of these could be collected and brought back. And I felt as though I had been told to "Go fetch a rock." Every time I brought an idea back, the feedback was quick: "That's not the rock," or "How did you ever get that—it's just great."

Two and a half years ago, on June 10, 1982, The Computer Museum opened its doors for the first time: we had 50 Founders, 200 members and 3,000 square feet of dedicated exhibit space. Our goals were to develop an international collection, create exciting exhibitions, sponsor educational programs, and attract a worldwide membership. On June 24, 1984, at the end of our Founding period, we will boast 504 individuals and corporate Founders. I am glad to extend special thanks to the individuals listed on the front cover and the corporations listed on the back cover helping to found the Museum.

The Second Opening

On Wednesday, November 14, 1984 at 11:00 a.m., the Museum will formally open its doors a second time to the public. This time we will have 16,000 square feet of exhibitions of both historic computers and state-of-the-art interactive displays; another 8,000 square feet of exhibit space and 4,000 square feet for library/study collections will be developed later. As we approach our opening we can be pleased that we have by far the largest exhibition area devoted to computing and information processing at any museum.

Let me give you a brief tour of our plans for the exhibitions: After rising to the Museum on a large, glass-enclosed elevator overlooking downtown Boston, the visitor is confronted by the Whirlwind, a vacuum tube computer that seems to go on forever.



Going around the corner, the visitor enters the SAGE computer room. Here the major components of the world's largest and longest lived computer simulate their installed environment. The visitor can "start" the console and see its banks of lights cycle-up. Beside each component, such as the 30-foot-long accumulator, today's equivalent chip (or part of a chip) has been placed for comparison. This arrangement reinforces an awareness of decreasing size and power and increasing programming capabilities.

For the history buff, a year-by-year timeline from 1950 to 1970 shows the fundamental inventions, the major computers, major software developments and benchmark applications.

The CW Communications "See It Then" theater shows films of operational computers, starting in the 1920's and ending in the 1960's with the IBM Stretch. The films are complemented by a 1965 IBM 1401 computer room, where the visitor can punch cards, and an operating PDP-89, the classic (but now very slow) minicomputer.

The evolution of Seymour Cray's work illustrates a single hardware contributor and his philosophy. The story begins with the NTDS-17 that he built for the Navy at UNIVAC in Minneapolis, which Greg Mellen, who is still at Sperry Univac, helped the Museum acquire; after that Cray built the Little Character, his first machine at CDC, presented by Control Data Corporation; then to the 6600, Serial Number 1, presented by Lawrence Livermore Laboratories; and finally to components of a Cray I, presented by the Cray Corporation. We have two videotapes of Seymour Cray, one from Lawrence Livermore Laboratories and another given to us by Joe Clarke, a former employee of CDC, who bought a two inch video tape player at a company sale and found on it a tape of Seymour Cray.

The next gallery focuses on chips and their place in the computer revolution, and the process of manufacturing computers. The inside of the "black box" is revealed, and an important, hidden part of the process is illustrated.

This collection of personal computers goes back to the very first one, the 1962 LINC, and extends to the latest models. The ring of live machines, each showing off an aspect of its special input/output, include DECTALK, a touch sensitive screen HP 150 and others.

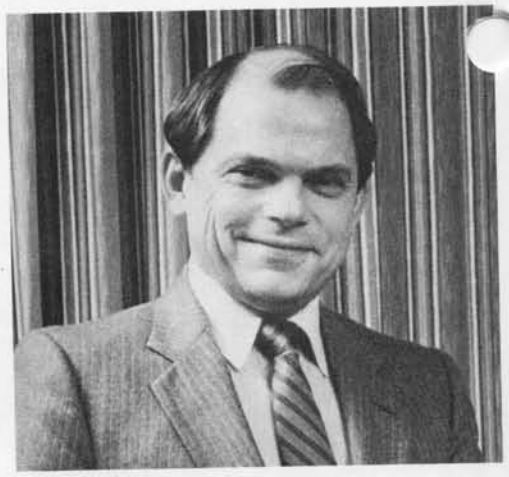
The final gallery, is devoted to "the computer and the image." Here, the visitor will be able to explore image processing by computer, such as evaluation of landsat data, and image creation by computer, such as computer-aided design. Without much trouble, the visitor could spend two hours in this room experimenting and viewing.

The exhibits are only the tip of the iceberg of our collection of artifacts, working machines, software, documentation, photographs and films. The listing in this report represents one year's accumulation and the collection is rapidly growing.

The Evolving Board of Directors

At the first meeting of the board of directors in 1982, two decisions were made: one was to have non-renewable four-year terms and the other was to limit the number to 24 people. This year five directors retired, I was made an ex-officio director, and five new directors were elected.

The five retiring directors each played a significant role in our growth to date: Charles Bachman served as chairman of the executive committee through our critical first two years; Andrew Knowles provided our initial space in Marlboro; Robert Noyce was key in starting our semiconductor collection and gave a wonderful lecture at our pre-preview party; Michael Spock, director of the Children's Museum, had the idea of our move to the Wharf and continues to counsel us on a day-to-day basis as our closest neighbor; and the Honorable Paul Tsongas helped bring us recognition at a national level.



John William Poduska, Sr.
Apollo Computer, Inc.

Mitchell Kapor
Lotus Development Corporation

Dr. An Wang
Wang Laboratories, Inc.

Dr. Koji Kobayashi
NEC Corporation

Dr. Arthur P. Molella
The National Museum of American History, Smithsonian Institution

The new directors bring a new set of talents. Bill Poduska, the new chairman of the board, is chief executive officer and chairman of the board of Apollo Computer, Inc. which he founded in 1980. He came to MIT as an undergraduate and stayed through a Ph.D. in electrical engineering, which he taught for four years. Then he went on to become the director of the Honeywell Information Science Center before founding Prime Computer and Apollo Computer.

Mitch Kapor, president and co-founder of Lotus Development Corporation, looks at the role of computers from the point of view of a non-technical user. A pyschology major from Yale with what he calls "three-quarters of a masters degree" from MIT's Sloan School of Management, he developed VisiPlot and VisiTrend for VisiCorp before working on "1-2-3," the business applications program for personal computers, that became the basis for Lotus. Mitch has expressed his concern for the end user, saying, "When we stop listening we will cease to be viable." This is equally true for the Museum when we open our doors to the public.

Dr. Koji Kobayashi, chairman and chief executive officer of NEC Corporation, began his life-long career with them in 1929. NEC preserved Japan's first transistor business computer the NEAC 2201 which they agreed to give to the Museum. This represents an important acquisition in our goal to develop an international collection. Dr. Kobayashi is also interested in the current technology, especially communications and computers, and will provide an important link to Japan.

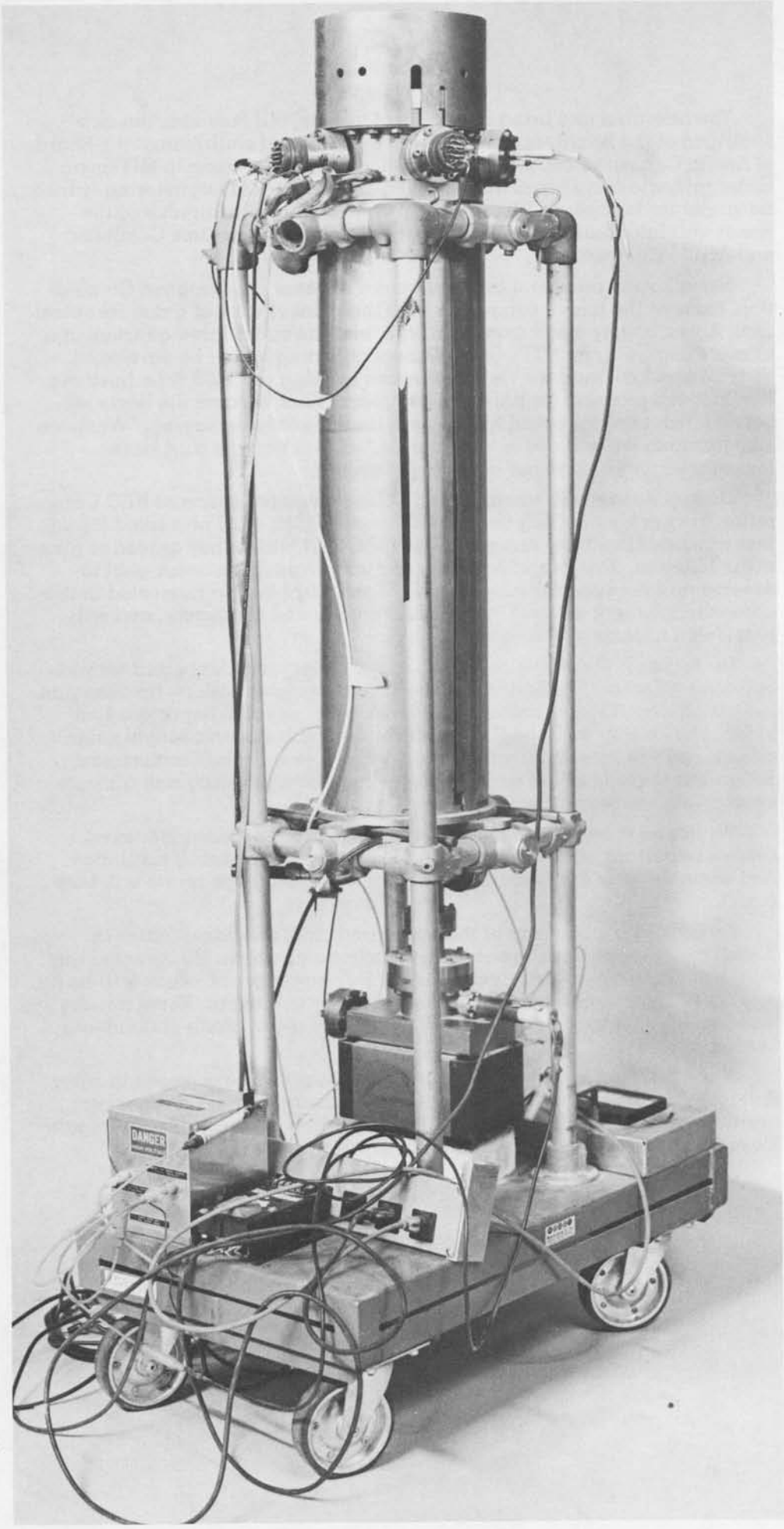
Dr. Arthur P. Molella is chairman of the history of science and technology department at The National Museum of American History, Smithsonian Institution. Specialized museums, such as ours, have an important symbiotic relationship with the Smithsonian. We can focus on a single subject, collect, carry out research and prepare exhibitions. At the Smithsonian, Arthur has to trade off all aspects of science and technology and allocate appropriate space and personnel.

We intend to help each other, the Smithsonian has already loaned several important pieces from their collection for our opening exhibition. And when the new Smithsonian exhibit on computing opens, we will help them.

Dr. An Wang, chairman of the board and chief executive officer of Wang Laboratories, Inc., is one of the computer pioneers. He invented the magnetic pulse controlling device for the Harvard Mark IV which will be on display in the timeline planned for our opening exhibition. Wang not ony founded Wang Laboratories, Inc. but also the Wang Institute of Graduate Studies in 1979.

Since 1982, the course of The Computer Museum has changed in ways that I would never have predicted, but new directions that, in retrospect, always made sense. This distinguished new class of directors will help the Museum become a strong institution as it opens to the public.

Gwen Bell



The Collection

The following listing of the Museum's collection includes all new artifacts and archival material received between April 10, 1983 and June 13, 1984. The number of artifacts and films has grown to 900 catalogued items. The artifacts range from a single chip to the multiple components of a single large-scale computer. In addition, the document and photograph collection has also increased dramatically. Archival donations are catalogued as complete collections.

Artifacts

Each artifact is described according to its manufacturer, date, and characteristics according to the PMS notation system developed in *Computer Structures* by Gordon Bell and Allen Newell. The PMS notation divides computer structures into processors (calculators), memory, links and switches, transducers, and control devices. Robots have been added. This system was then used to divide the list of artifacts in order to provide a better picture of the collection.

Archives

The archives supply supporting materials for the artifacts. They help the scholar reconstruct the development and use of any of the artifacts. For example, old textbooks provide significant insight into the principles and uses of a machine from the same period. Similarly, films and photographs often illustrate the working environment of artifacts.

Micro-bit Electron Beam Access Memory. *This memory device is Micro-bit's Electron Beam Access Memory affectionately known as ALICE. Although this device was never marketed, it got up and running at the end of December 1971. It took, recorded and played back the following message: "Merry Christmas. Send more money."*

TRS-80. *TRS-80 Model I's, like the one pictured here, were introduced by Tandy Radio Shack Corporation in 1977. During that same year the Apple II and the Commodore Pet 2001 were introduced, establishing the first three personal computer designs to come assembled with BASIC built into the firmware, which allowed them to achieve a BASIC operating mode on power up. The TRS-80 Model I is one of several PC's that will be featured in the Personal Computer exhibit when the Museum opens November 14, 1984.*

Apple Computer Company,
Apple 1 (X210.83)
Gift of Dysan Corporation

Burroughs Corporation,
Burroughs B-500 (X312.84–X321.84)
Loan from Design Pak, Inc.

Burroughs Corporation,
Burroughs TC500 (X309.84)
Gift of LADDIS Corporation

Digital Equipment Corporation,
DEC Digital Trainer (X220.83)
Gift of Jerrold Petrofsky

Digital Equipment Corporation,
Digital Music Synthesizer
(XD388.83)
Gift of Digital Equipment Corporation

Digital Equipment Corporation,
PDP-1 (D379.83); PDP-1 Oscilloscope, Soroban and Microtape 555 (D382.83) (D385.83)
Gift of Digital Equipment Corporation

Digital Equipment Corporation,
PDP-8 (X231.84)
Gift of Jim Selder

Digital Equipment Corporation,
PDP-8 (D378.83) (D381.83) (XD356.82)
Gift of Digital Equipment Corporation

Digital Equipment Corporation,
PDP-9 (D389.83)
Gift of Digital Equipment Corporation

Franklin Computer Corporation,
Franklin Ace 100 (X340.83)
Gift of Franklin Computer Corporation

International Business Machines,
IBM 083 Sorter (X291.83); IBM 088 Collator (X290.83); IBM 519 Reproducer (X292.83); IBM 557 Interpreter (X289.83)
Gift of Burndy Corporation

International Business Machines,
SAGE: AN/FSQ-7 Duplex and Simplex Maintenance Consoles (X260.83) (X269.83); Left Arithmetic Unit (X274.83); Magnetic Drum Unit (X261.83) (X273.83); 64K Core Memory Plane (X272.83); IBM 728 Tape Drives (X268.83); IBM 718 Printer (X262.83); IBM 20 Card Punch (X266.83); IBM 723 Card Recorder (X267.83); IBM Card Reader (X270.83); Display and Auxiliary Consoles (X263.83) (X264.83) (X265.83) (X271.83)
Gift of National Museum of Science and Technology, Ottawa

International Business Machines,
SAGE: AN/FSQ-7 Left Arithmetic Unit (X311.83); Core Memory Stack 2 (X310.83)
Gift of Hancock Field Air Force Base, New York

International Business Machines,
IBM System 3 (SYS/3) (X192.83)
Gift of Hesser College

International Business Machines,
IBM 1401 System (X233.83)
Gift of American Computer Group, Inc.

Kurzweil Computer Products, Inc.,
Kurzweil Reading Machine
(X236.83)
Gift of Kurzweil Computer Products, Inc.

Mathatronics, Inc.,
Mathatron (X283.83)
Gift of Yutaka Kobayashi

MITS,
MITS CT 256 (X334.84)
Gift of Geoff Feldman

Olivetti-Underwood, Inc.,
Olivetti-Underwood Programma 101C (X300.83)
Gift of GTE

Sperry Rand Corporation,
UNIVAC 494 (X343.84)
Gift of Travelers Insurance Company

Sphere Corporation,
SPHERE System 320 (X297.83); SPHERE System 330 (X295.83)
Gift of Roger J. Spott

Tandy Corporation,
TRS-80, Model I (X348.84)
Gift of Samuel M. Gerber

Terak Corporation,
Terak Model 8510 (X351.84–X353.84); Terak Model 8512 (X354.84)
Gift of Douglas Ross

Viatron Computer Systems Corporation,
Viatron System 21 (X350.84)
Gift of Fred De Bros

Burroughs B-500. *The front control panel of a Burroughs B-500 Central Processing Unit. Released in 1968, it was the small-scale end of the Burroughs "500" family.*

Air Force Cambridge Research Laboratories,
Trigger Pair V EMS Circuit Boards, Pulse Generator Circuit Boards (X226.83) (X275.83)
Gift of Gunars Zaghars

Bendix Corporation,
Bendix G-15 Logic Modules (X235.83)
Gift of Ron Resch

Burroughs Corporation,
Electrodata Division,
Electrodata Plug Board (X209.83)
Gift of Claude A. R. Kagan

Digital Equipment Corporation,
MicroVAX I Data Path (X326.84); MicroVAX I Memory Controller (X325.84)
Gift of Digital Equipment Corporation/DECwest Engineering

Digital Equipment Corporation,
Unibus NI Adapter Breadboard (D386.83)
Gift of Digital Equipment Corporation

Ferranti Corporation,
ARGUS 200 Pegboard Program Tray (X337-84)
Loan from Science Museum, London

International Business Machines,
IBM BLT Logic Card (X221.83)
Gift of John Shriver

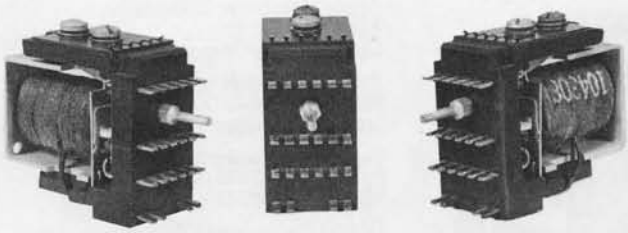
International Business Machines,
IBM SSEC Mercury Wetted Contact Relay (X194.83); IBM SSEC Wire Contact Relay (X195.83)
Gift of A. Wayne Brooke

International Business Machines,
IBM Plug Board (X339.84)
Gift of LaSalle National Bank

Institute for Numerical Analysis,
National Bureau of Standards,
SWAC Chassis Unit (X228.83)
Loan from the Smithsonian Institution, National Museum of American History

Kollmorgen Corporation,
Multiwire Division,
Multiwire Boards (X237.83)
Gift of Multiwire Division, Kollmorgen Corporation

Kollmorgen Corporation,
PCK Technology,
Wiring Head (X196.83); Discrete Wired Circuit Boards (X226.83)
Gift of PCK Technology Division, Kollmorgen Corporation



Logistics Research, Inc.,
ALWAC III Control Panel, (X306.84); ALWAC III Logic Boards (X307.84)
Gift of Eugene Usdin

MIT Lincoln Laboratory,
TX-2 Module Test Panel (D384.83)
Gift of Digital Equipment Corporation

MIT Lincoln Laboratory,
TX-2 Flip-flop (X218.83)
Gift of Alan V. Oppenheim

Moore School of Electrical Engineering,
ENIAC Function Table (X338.84)
Loan from The Smithsonian Institution, National Museum of American History

Motorola, Inc.,
MC6800 Microprocessors (X224.83)
Gift of Motorola, Inc.

Mullard, Ltd.,
Logic Boards from the Elliot 803B British Germanium Transistor Computer (X278.83)
Gift of Mr. Soper

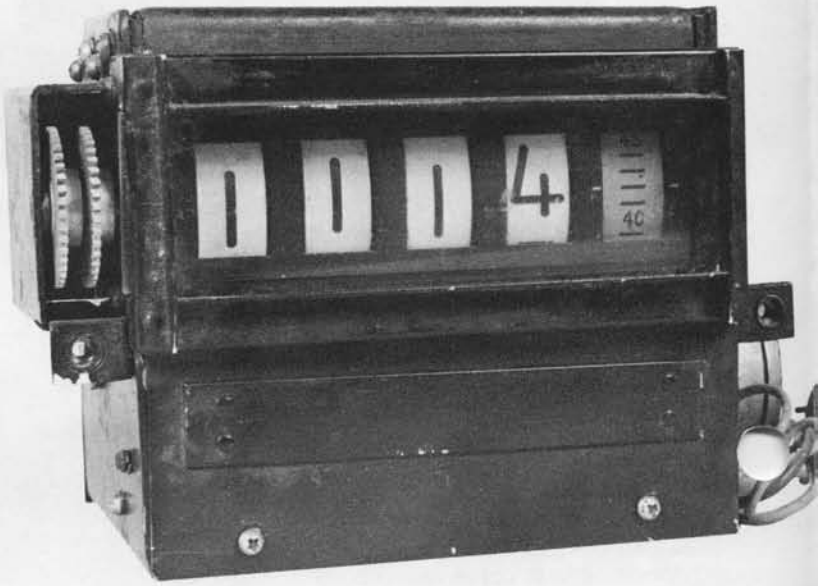
National Semiconductor Corporation,
NS32032 Microprocesor (X344.84)
Gift of National Semiconductor Corporation

Phillips (N.V. Electrologica),
Electrologica X-8 Circuit Boards, (X219.83)
Gift of Gordon Bell

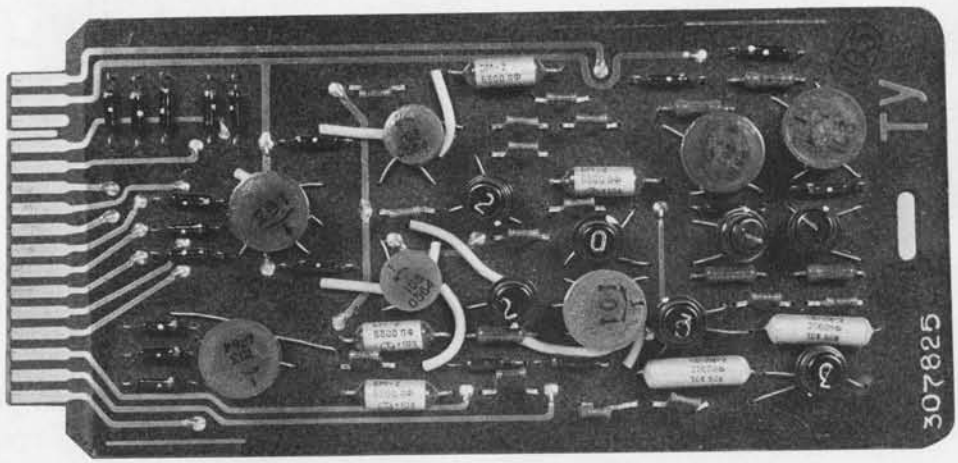
Raytheon Company,
RAYDAC Logic Module (X234.83)
Gift of Bert Larey

Scientific Data Systems,
SDS 940 Modules (X285.83)
Gift of Systems Concepts

IBM SSEC Wire Contact Relays. *The wire contact relays pictured here are from the IBM SSEC (Selective Sequence Controlled Electronic Calculator). The IBM SSEC was the first machine that could control its calculating sequence by modifiying its own instructions. However, it was disputed whether or not the IBM SSEC was wholly electronic, because the machine had 13,500 vacuum tubes and 21,400 electromechanical relays.*



BIZMAC Clock. *The BIZMAC was the result of an early attempt by RCA to produce a large-scale general-purpose computer for business applications. With its 29,000 tubes and 63,000 diodes, it was certainly one of the largest first generation computers ever built. The BIZMAC was one of the first commercial computers to use magnetic core memory. Later computers with full-scale core memories made BIZMAC obsolete.*



USSR GOVERNMENT, MINSK-2 Logic PC Board. *Introduced in 1962, the MINSK-2 became one of the most heavily used general-purpose computers in Russia. Each computer had a set of 107 two-address instructions and a word length of 37 bits. Their computing speed was 5,000 instructions per second and a floating-point addition took 72 microseconds. The main memory on the MINSK-2 was on ferrite cores, with either 4,000 or 8,000 words and secondary memory was on magnetic tapes.*

Memories

Sperry Univac Corporation,
Univac Solid State 80/90
Experimental Board, Magnetic
Amplifier and Amplifier
Components (X238.83)
Gift of Ted Bonn

Sylvania Electric Products, Inc.,
MOBIDIC Logic Boards (X188.83)
Gift of Jack Stevens

University of Illinois,
ILLIAC I Semi-Cylindrical Vacuum Tube Chassis (X255.83); ILLIAC II Chassis (X259.83); ILLIAC II Circuit Board (X247.83); ILLIAC II Sense Amplifier (X280.83); ILLIAC III Circuit Boards (X246.83)
Gift of University of Illinois

Unknown,
Triode Power Supply Control Rectifier (D391.83)
Gift of Gordon Bell

USSR Government,
MINSK-2 Logic Board (X327.84)
Gift of Dileep Bandaker

Wickes Engineering and Construction Company,
BIZMAC Clock (X305.84)
Gift of Nell Kleinberg

Analex Corporation,
Analex Core Drive 200 Module (XD234.81)
Gift of Digital Equipment Corporation

Cambridge University Computation Laboratory,
EDSAC Memory Driver (X335.84); EDSAC Mercury Memory Tank Cover (X336.83)
Loan from Science Museum, London

Control Data Corporation,
Microbit Division,
Electron-beam Accessed Memory Tube, (X215.83)
Loan from Charles A. Brown

Digital Equipment Corporation,
Magnetic Tape Unit (D380.83); Tape Drive (D395.83)
Gift of Digital Equipment Corporation

Digital Equipment Corporation,
PDP-10 Core Memory Board (X286.83)
Gift of Systems Concepts

Digital Equipment Corporation,
PDP-12 Core Memory Stack (X223.83)
Gift of Peter Sredojevic

Digital Equipment Corporation,
Plasma Cell Memory (X206.83)
Gift of Ron Nuebling

Digital Equipment Corporation,
Read Only Rope Memory (X294.83)

Ford Motor Company,
Aeronutronic Division,
10 Megacycle BIAX Cores (X242.83)
Gift of G.B. Westrom

Goodchild, C.W.,
"Complete Mathematical Chart" (X245.83)
Gift of University of Illinois, Department of Computer Science

Hewlett-Packard Company,
Fixed-head Drum Memory 2771A (X207.83)
Gift of TSC Computer Ltd.

International Business Machines,
IBM 610 Programmable Calculator Drum (X179.83)
Gift of Richard E. Smith

Institute for Numerical Analysis,
National Bureau of Standards,
SWAC William's Tube (X227.83)
Loan from The Smithsonian Institution, National Museum of American History

Micro-bit Corporation,
Electron Beam Access Memory: ALICE I (X329.84)
Gift of Micro-bit Corporation

MIT Instrumentation Laboratory,
Apollo Memory Stack Module (X186.83)
Gift of Boguslaw Frackiewicz

Mullard, Ltd.,
Ferrite Core Memory from Elliot 803B British Germanium Transistor Computer, (X277.83)
Gift of Mr. Soper

Rand Corporation,
Johnniac Selectron Tube (X281.83)
Gift of Fred Gruenberger

Radio Corporation of America,
Electron Tube (X301.83)

Radio Corporation of America,
RCA 3488 Magnetic Cards (X232.83)
Gift of Daniel Klein

Radio Corporation of America,
RCA 128 × 136 3-wire Core Memory Plane (X190.83);
RCA 64 × 64 4-wire Core Memory Plane (X189.83) (X191.83)
Gift of Boguslaw Frackiewicz

Remington Rand, Inc.,
Eckert-Mauchly Division,
Uniservo (X284.83)
Gift of R. S. Nelson

Roman Art Company,
Punched paper tape from contemporary Jacquard loom (X276.83)

Scheutz, George and Edward,
Specimens of Tables, Calculated, Stereomoulded, and Printed by Machinery. (X187.83)
Loan from Frederick J. Beutler

Union Label Company,
McBee Keysort Needle Cards and Punch (X328.84)
Gift of Gordon Bell

Unknown,
Mercury Delay Line (X282.83)
Gift of Arthur Uhlir

Transducers

Anderson Jacobson,
Anderson Jacobson Acoustic Data Coupler 260 (D392.83)
Gift of Digital Equipment Corporation

Coxhead Corporation, Ralph C.,
Vari-typer (X240.83)
Gift of Lee Swanson

Friden Corporation,
Flexowriter (XD325.81)
Gift of Digital Equipment Corporation

Harvard University,
Division of Applied Science,
Color Viewing Helmet for the Space Pen (X197.83)
Gift of Harvard University, Division of Applied Science

International Business Machines,
IBM 01 Typewriter (X199.83)
Gift of Richard Boylan

International Business Machines,
IBM 26 Printing Card Punch (X322.84)
Loan from Design Pak, Inc.

National Data Industries, Inc.,
DIABLO HYTYPE I Daisywheel Printer (X299.83)
Gift of Roger J. Spott

Sanders Technology, Inc.,
Sanders Media 12/7 Printer (X355.84)
Gift of Douglas Ross

Southwest Technical Products Corporation,
Alphanumeric Parallel Printer PR-40 (X298.83)
Gift of Roger J. Spott

Sperry Rand Corporation,
UNIVAC keyboard (D394.83)

Telesensory Sytems, Inc.,
Optacon Print Reading System (X229.83)
Gift of Telesensory Systems, Inc.

Teletype Corporation,
Bell System Model 12 Page Printer (X202.83)
Gift of John LeProux

Acoustic Data Coupler. *This Anderson Jacobson Acoustic Data Coupler 260 (circa 1963) is one of the earliest modems. A modem is an acronym for MOdulator DEModulator unit, a device that converts data from a form that is compatible with data processing equipment to a form that is compatible with transmission facilities, and vice-versa.*

Baby Calculator,
Baby Calculator (X213.83)
Gift of Gordon and Gwen Bell

Bachman, Charles,
Circular Slide Rule (X342.84)
Gift of Charles Bachman

Bowmar Instrument Corporation,
Bowmar MX70 Memory Calculator (X216.83)
Gift of Ian Gunn

Carbic, Ltd.,
Otis King's Pocket Calculator (X214.83)
Gift of I. Bernard Cohen

Dennert & Pape Company,
Aristo Darmstadt Slide Rule (X333.84)
Gift of I. Bernard Cohen

Dietzgen Company,
Smith's Improved Protractor (X243-83)
Gift of University of Illinois, Department of Computer Science

Dietzgen Company,
Dietzgen Redirule Slide Rule (X331.84)
Gift of I. Bernard Cohen

Egli, Hans,
Millionaire Calculator (X211.83)
Gift of Paul J. Harrington

Egli, Hans,
Millionaire Calculator (X252.83)
Gift of University of Illinois, Department of Computer Science

Faber-Castell Company,
Slide Rule (X332.84)
Gift of I. Bernard Cohen

Felt & Tarrant Manufacturing Company,
Comptometer (X349.84)
Gift of Herbert and Virginia Eldridge

Friden Calculating Machine Company,
Friden Model D8 Calculator (X304.84)
Gift of Lee Bauer

Friden Corporation,
Friden Calculator (X230.83)
Gift of Dave Stone

General Business Machines Corporation,
Automatic Printing Calculator (X200.83)
Gift of Peter Stalker

Harmann Manus,
De Te We (XD190.80)
Loan from Declan and Margrit Kennedy

Hewlett-Packard Company,
HP-55 Calculator (X198.83)
Gift of Randolph S. Canham

Hewlett-Packard Company,
HP-65 Programmable Calculator (X241.83)
Gift of Stephen and Barbara Gross

Keuffel & Esser Company,
Fuller's Cylindrical Slide Rule (X250.83); Thacher's Cylindrical Slide Rule (X253.83); Planimeters (X248.83) (X249.83) (X251.83); Drawing instruments (X257.83) (X258.83)
Gift of University of Illinois, Department of Computer Science

Marchant Calculating Machine Company,
Marchant Calculator (X347.84)
Gift of Fred Gruenberger

Monroe Calculating Machine Company,
Monroe High Speed Adding Calculator (X239.83)
Gift of Lee Swanson

National Semiconductor Corporation,
NOVUS 650
Fixed Point Calculator (X302.83)
Gift of Harriet and Martin Agulnek

Reliable Typewriter and Adding Machine Corporation,
VE-PO-AD (Vest Pocket Adder) (X204.83)
Gift of M.M. Cragon

Reliable Typewriter & Adding Machine Company,
Addometer (X323.84)
Gift of George J. Kelly

Riefler Nessel Wang and Munchen Company,
Drawing Instrument (X254.83)
Gift of University of Illinois, Department of Computer Science

Shure Brothers, Inc.,
Reactance Slide Rule (X303.83)
Gift of Claude A.R. Kagan

Tasco Industries,
Pocket Arithmometer (X208.83)
Gift of J. M. Shag Graetz

Tasco Industries,
Pocket Arithmometer (X288.83)
Gift of Jacquiline Tyrwhitt

Texas Instruments, Inc.,
TI-2500 Datamath Electronic Calculator (X217.83)
Gift of Ian Gunn

Unknown,
Binary Slide Rule (X287.83)
Gift of Jacquiline Tyrwhitt

Unknown,
Drawing Instrument (X244.83); Pantographe (X256.83)
Gift of University of Illinois, Department of Computer Science

Victor Adding Machine Company,
Victor Adding Machine (X201.83)
Gift of Henry Merrill, III

Wang Laboratories,
Wang Model 360K Electronic Calculator (X308.84)
Gift of Robert Caron

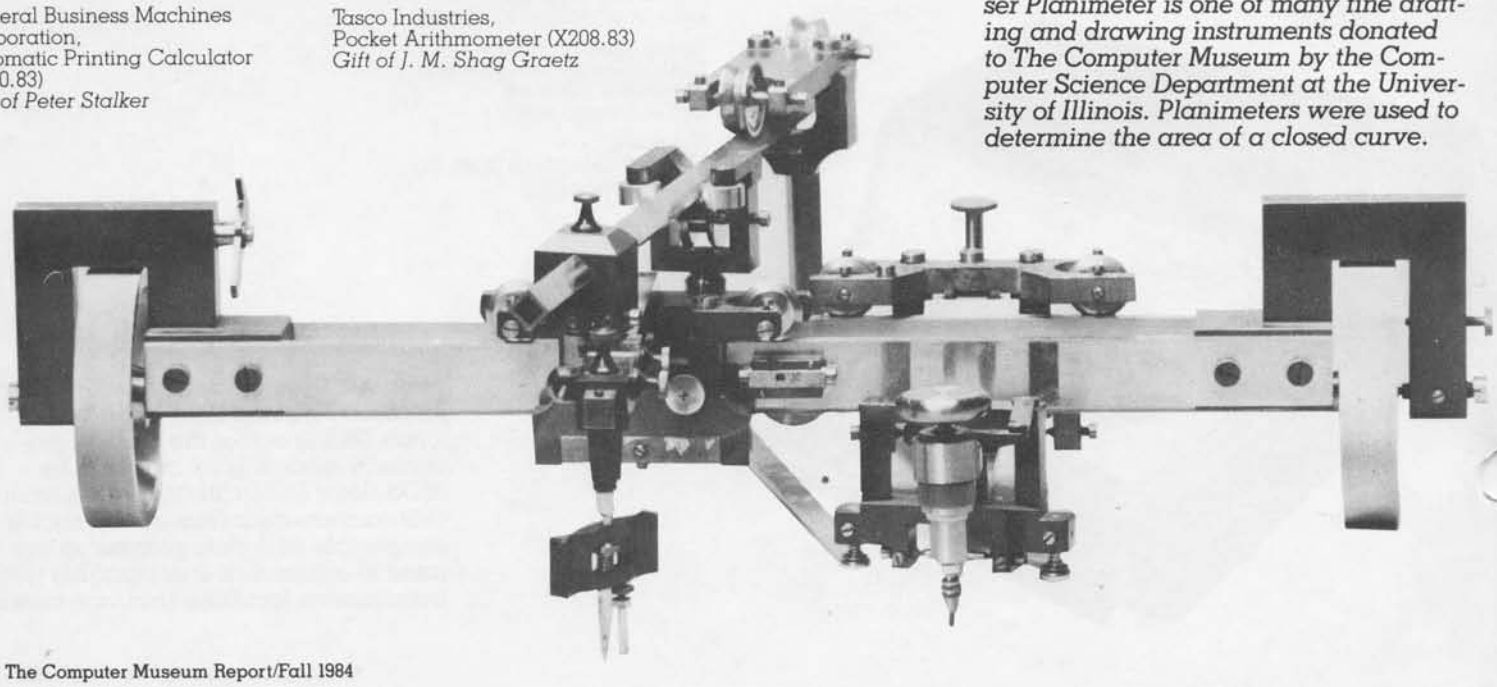
Wang Laboratories,
Wang Model 500-0 Programmable Calculator (X222.83)
Gift of Ocean Data Systems

Western Electric Company,
Hollerith Tabulating Machine Counter (X193.83)
Gift of A. Wayne Brooke

Wolf Research and Development Corporation,
Pert VIP Time Data Converter Circular Slide Rule (X330.83)
Gift of Wolf Research and Development Corporation

Wyle Laboratories,
Wyle SCIENTIFIC Electronic Calculator (X212.83)
Gift of Glenn C. Stewart

Planimeter. *This exquisite Keuffel & Esser Planimeter is one of many fine drafting and drawing instruments donated to The Computer Museum by the Computer Science Department at the University of Illinois. Planimeters were used to determine the area of a closed curve.*



Ashtray. *This aluminum ashtray donated by Douglas Ross, was made in February 1959 at MIT and is the first object produced using computer-aided design. Upon its announcement, the* New Yorker *ran this quote from the* San Francisco Chronicle:

> *"The Air Force announced today that it has a machine that can receive instructions in English, figure out how to make whatever is wanted, and teach other machines how to make it. An Air Force general said it will enable the United States to 'build a war machine that nobody would want to tackle.' Today it made an ashtray."*

Miscellaneous Artifacts

Comet Metal Products Company, Model of Sylvania MOBIDIC (Mobile Digital Computer) (X205.83)
Gift of Frederick W. Paget

Ecole municipale de tissage de Lyon Dessin de Ch-Michel d'apres C-Bonnefond, Jacquard portrait woven in silk, (X341.84)
Loan from Gordon and Gwen Bell

MIT and USAF, Ashtray: APT II (X356.84)
Gift of Douglas Ross

NASA, Jet Propulsion Laboratory, Mariner 4 First Computer Image of Mars, (X346.84)
Loan from Jet Propulsion Laboratory

Robots

Automatix, Inc., Autovision 2 (X203.83)
Gift of Automatix, Inc.

Stanford Research Institute (SRI), SHAKEY the Robot, (X279.83)
Loan from SRI International

Manuals and Documentation

ALWAC III Manuals and Drawings, (84.3)
Gift of Eugene Usdin

Amdahl 470 Reference Manuals, (83.23)
Gift of Lloyd Dickman

AN/FSQ-7 Programming Cards, (84.28)
Gift of Computer Systems Division, Griffiss Air Force Base

Burroughs B-500 Manuals and Documentation, (84.5)
Gift of Design Pak, Inc.

Byte, Interface Age, Kilobaud Magazines, et. al. periodicals, software, manuals and books, (83.18)
Gift of Dr. Roger J. Spott

Computer, Data Communication, and Programming books and manuals, (83.22)
Gift of Gordon and Gwen Bell

Computer Science Press, Computer Science Textbooks and other recent publications, (83.24)
Gift of Computer Science Press

Datamation (1957–1981), Creative Computing, Terak and other documentation, (84.26)
Gift of Douglas Ross

DECsystem 10 & 20 and TOPS Manuals, (84.8)
Gift of Sharon Lipp

Electron Beam Memories Papers and Drawings, (84.7)
Gift of Sterling Newberry

Hewlett-Packard and IBM Reference Data Cards, (84.18)
Gift of Harvey Morgan

IBM AN/FSQ-7 and IBM 704 Programmer cards, (83.21)
Gift of Alexander Vanderburgh, Jr.

IBM Punched Card Machine Manuals, (84.11)
Gift of Marjorie Canto

IBM, Control Data Corporation, and Digital Manuals. Correspondence relating to early programming timing results, (84.17)
Gift of Dr. Melvin Klerer

IBM, General Electric, Univac, Burroughs, Digital, Honeywell, et. al. Manuals, (84.1)
Gift of Neil R. Karl

IBM and other manuals, (84.25)
Gift of Frank C. Bequaert

Microcomputing (Kilobaud) 1977–1982, (84.27)
Gift of Joseph Clarke

NTDS CP-642 Naval System Operator's and Programmer's Manuals, (83.25)
Gift of Sperry Corporation and H. Stanwood Foote

Packard Bell, Raytheon, et. al. manuals, (83.20)
Gift of Claude A. R. Kagan

Personal Computer and Calculator Brochures, Pamphlets, Catalogs and other documentation, (84.20)
Gift of Harley R. Schneider

Reston Publishing Company, *How to buy Business Computers, Microcomputer Resource Book For Special Education, VAX Pascal,* and *Programmer Productivity,* (84.16)
Gift of Reston Publishing Company, Inc.

SAGE and Varian Computer Documentation, (84.13)
Gift of Computer Systems Division, Griffiss Air Force Base

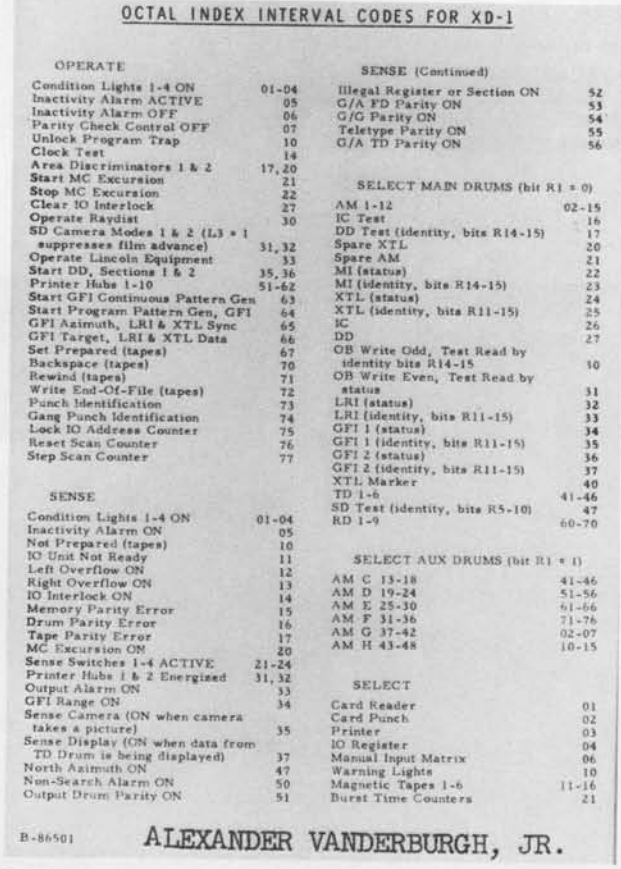
Symbolic Logic, Boolean Algebra and the Design of Digital Systems, (84.9)
Gift of M. J. Gettleson

TRS-80 manuals, (84.23)
Gift of Samuel M. Gerber

UNIVAC and Remington Rand Manuals, (84.6)
Gift of G. Murl Mohr

Viatron manuals and papers, (84.24)
Gift of Fred De Bros

Wang Laboratory Manuals, (84.4)
Gift of Robert Caron



OCTAL INDEX INTERVAL CODES FOR XD-1

OPERATE	
Condition Lights 1-4 ON	01-04
Inactivity Alarm ACTIVE	05
Inactivity Alarm OFF	06
Parity Check Control OFF	07
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Start Program Pattern Gen, GFI	64
GFI Azimuth, LRI & XTL Sync	65
GFI Target, LRI & XTL Data	66
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Write End-Of-File (tapes)	72
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Gang Punch Identification	74
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Printer Hubs 1 & 2 Energized	31, 32
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Sense Display (ON when data from TD Drum is being displayed)	37
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G/G Parity ON	54
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SELECT MAIN DRUMS (bit R1 = 0)	
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Spare XTL	20
Spare AM	21
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GFI 1 (identity, bits R11-15)	35
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SD Test (identity, bits R5-10)	47
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Printer	03
IO Register	04
Manual Input Matrix	06
Warning Lights	10
Magnetic Tapes 1-6	11-16
Burst Time Counters	21

B-86501 ALEXANDER VANDERBURGH, JR.

SAGE Programmer Cards. *These cards are from the SAGE, the U.S. air defense system from 1958-1983. Museum member Alexander Vanderburgh, Jr. recalls that these cards were used to interpret memory dumps that could be translated from numerical format to command format. They also contained the mnemonic code for the instruction set.*

Film:

". . . from one John V. Atansoff," Iowa State University Media Services, 1983.
Gift of Iowa State University

"A CAM Update," Automatix, 1980.
Gift of Automatix

"Ford Tempo Advertisement," 1983.
Gift of Ford Motor Company

"F.P. Brooks, APPLE Computer Science Lecture Series," 1982.
Gift of Apple Video Services

"Computers That Build Computers," Fujitsu, 1979.
Gift of Fujitsu

"Graphic Rocket," The Rand Corporation, 1965.
Gift of Willis Ware

"Hollerith Punched Cards," "Punched Cards"
Gift of Bill Luebbert

"PEGASUS: A New Electronic Digital Computer," Film Surveys Ltd. for Ferranti, 1955.
Gift of Brian Randell

"POGO: Programmer–Oriented Graphics Orientation," The Rand Corporation, 1965.
Gift of Willis Ware

"SHAKEY: Experimentation in Robot Planning and Learning," SRI International ca. 1970.
Gift of SRI International

"UNIVAC . . ." Seymode Zwiebel Production for Remington Rand's Eckert-Mauchly Division.
Gift of Sperry Rand Corporation

Investigating Computer Systems, 15 filmstrips and 10 Card Computing Films.
Gift of the Charles Babbage Institute, (84.10)

Newsclip of CDC 7600 announcement with Norris, Cray, et. al.
Gift of Joseph Clarke, (84.27)

Photographs:

Harold Cohen, photographs (84.12)
Gift of Harold and Beckey Cohen

Cray, Seymour, CDC 6600
Gift of Lawrence Livermore Laboratories

Ford Tempo Ads
Gift of Ford Motor Company

Pilot Ace
Gift of National Physical Laboratory

Punched Card Room, 2 b/w photographs.
Gift of The Travelers Insurance Company

US Navy
Gift of Naval Tactical Data Systems

JSS ROCC System: 5 color transparencies.
Gift of Computer Systems Division, Griffiss Air Force Base, (84.28)

SAGE, 13 photographs.
Gift of System Development Corporation, (84.21)

SAGE, 4 photographs and LIFE magazine 2/11/57.
Gift of IBM Communications, Kingston, (84.19)

SAGE-North Bay Installation, 5 photographs.
Gift of Hanscom Field Air Force Base, (84.14)

Stibitz, George
Gift of Bell Labs

TRADIC Computer
Gift of Bell Labs

UNIVAC 494, 2 color photographs.
Gift of The Travelers Insurance Company, (84.15)

Equipment:

Sony BVU 200B videotape player.
Gift of Sony Corporation of America, (84.22)

Pioneers. *This photograph is part of The Computer Museum's archival collection. Pictured are British computer pioneers and other distinguished guests at the opening of the Science Museum's computing gallery in London, December 1975.*

Back row, left to right: Donald Davis, Tom Flowers, Grace Hopper (USA), Jim Wilkinson, Tom Kilburn, Raymond Thompson, Maurice Wilkes, Cecil Marks, Allen Coombs. Front row: Mrs. Douglas Hartree, Fred Williams, Max Newman, David Wheeler, Konrad Zuse (Germany).

The Apple I

by Brenda A. Erie

When the Museum opens at its new quarters in downtown Boston on November 14th, 1984 an Apple I board will be part of the Museum's Personal Computer exhibit. Surrounded by a ring of state-of-the-art operational machines, the Apple I board will be exhibited with other personal computer ancestors such as the Altair and the Xerox Alto.

It is too difficult to put a price tag on the Apple I's current value because "only 210 to 220 Apple I's were ever manufactured," according to Stacey Farmer, of Apple Computer, Inc. This reliable microcomputer, which needed little assembly, was built in 1975 by Apple co-founders Steven P. Jobs and Stephen G. Wozniak. Primarily bought by computer experimenters and home computer novices the Apple I could be used for developing programs, playing games or running BASIC.

When the Apple I was inaugurated into the marketplace, the "two Steve's," (as they were nicknamed by their employees) had already established a design philosophy that still exists today at Apple—dedication to making their computers easy to use, understandable and inexpensive. They also recognized the need to incorporate suggestions from Apple I users to improve the production and sales of the machine.

The home computer market liked the Apple I because it was easy to assemble unlike some of the kits that were around in the mid-1970's. Rich Travis, a sales representative at the Sunshine Computer Company in Southern California did not directly promote the Apple I in 1977, but made the machine "easy to buy" for his customers because they were "looking for a complete, ready-to-run system that was inexpensive."

The Apple I was sold at computer stores throughout the United States. In 1977, *Kilobaud Magazine* ran an article by Sheila Clarke a computer hobbyist writer who found that owning the Apple I did not "require you to be either an electronics buff or a millionaire."

For instance if you had walked into the Byte Computer Store in San Jose, California to purchase an Apple I in 1977, you would have gotten a fully-guaranteed computer kit for $666.66 that included: a printed circuit board with video terminal electronics, 8K bytes of RAM, 4 regulated power supplies, a keyboard interface and a hex monitor in PROM.

However, other purchases were also required in order to get your Apple I operating. These totaled $122.00 and included: an ASCII keyboard, a video monitor (if you didn't use your own TV set), and two transformers. If you did use your own television, a simple modification was required like a Pixe-verter or switch box and an rf modulator. In order to store programs, a two inch high cassette interface (ACI) was also available which came fully assembled and burned-in with a tape of APPLE BASIC for $75.00. Jobs and Wozniak both agreed

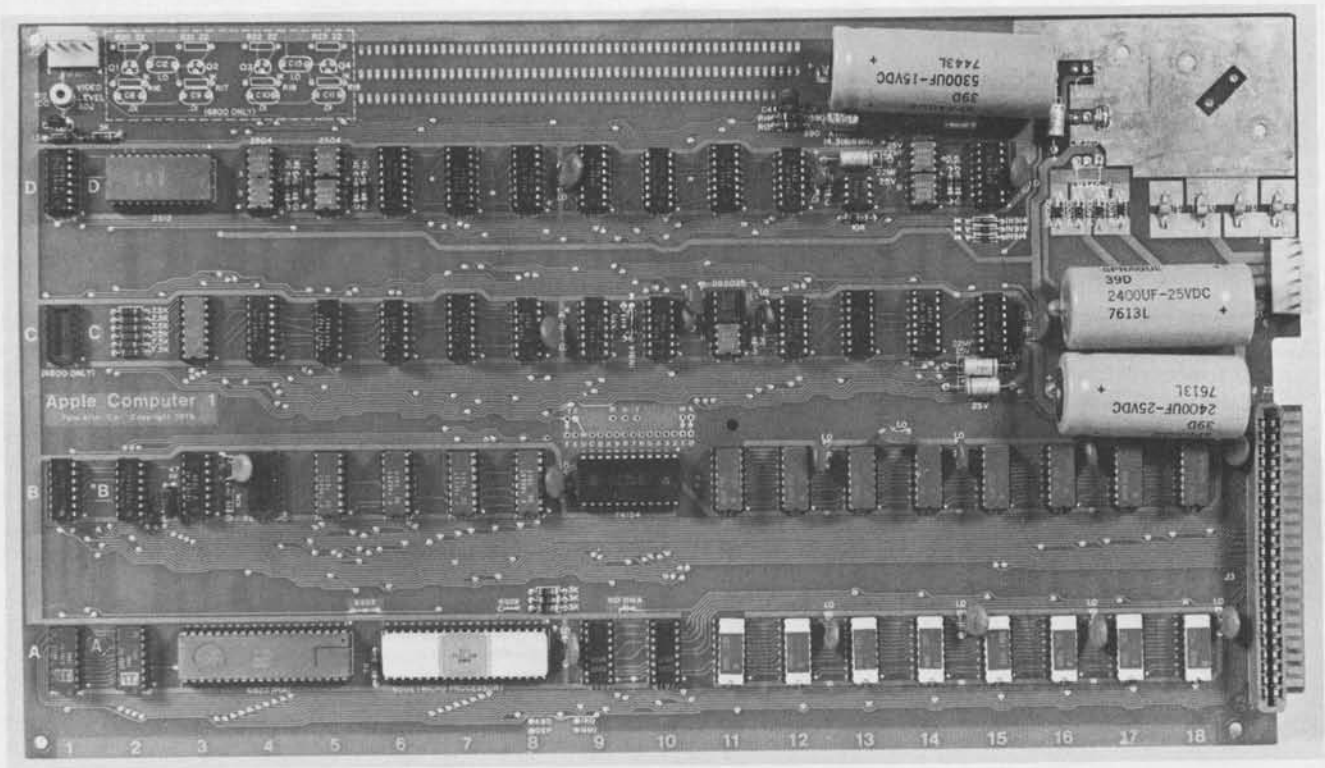
that BASIC at this time was the language of the people because it was easy to use.

In 1977, Apple I advertisements claimed that, "unlike many other cassette boards on the marketplace, ours works every time." So if you also bought a tape recorder you were in luck because the Apple I worked reliably with almost any inexpensive audio-grade cassette recorder. Your total cost for the machine, $903.66.

Relatively few Apple I's were sold compared to personal computers on the market today. However, the Apple I gained enough popularity because it was essentially "hassle free" and could be purchased for under $1,000. Hobbyists, home computing novices and the computer store dealers themselves applauded its reliability.

It was this microcomputer, the Apple I that enabled Apple Computer, Inc. to quicky turn from a small, single-product private company to the multi-product, multi-national, public company that it is today. As the Apple I's sales increased in 1977, Jobs and Wozniak began to spend much time perfecting the design of the Apple I and their future product the Apple II. But as the company bloomed, it was necessary for Jobs and Wozniak to go to the outside for help.

They recruited A.C. Markkula who had been marketing manager at Intel. He was fascinated with what both Jobs and Wozniak had already accomplished. To show his confidence in the duo he put up $91,000, secured a credit line, and then found $600,000 from other venture capitalists to help put Apple Computer Company on its feet. Shortly after, in May 1977, Markkula became chairman of the board, and Michael Scott, who took a 50 percent pay cut to join Apple from National Semiconductor became the company's first president.



The Apple I. *This Apple I board will be part of the Museum's Personal Computer exhibit opening November 14, 1984. Apple Computer, Inc. co-founders Steven P. Jobs and Stephen G. Wozniak designed the Apple I in 1975 to meet the requirements of computer hobbyists. Priced at $666.66, it met their needs as an easy-to-use computer system that was inexpensive.*

Pre-Preview Party

The Computer Museum held a Pre-Preview Party on May 11 at its new location in downtown Boston. The festive evening commenced with a talk on the invention of the integrated circuit by Intel founder Dr. Robert N. Noyce. Dancing and a screening of the film "Metropolis" followed dinner for party guests from industry and Museum Members.

Pre-Preview Party Lecture. Talking on the invention of the integrated circuit, Intel's Dr. Robert N. Noyce recalled,

"When I was in college, I could slave over something, finally get the right answer, hand in my paper and it would come back with these big red markings on it. My physics professor would say I did it the hard way. Then he'd jot down a couple of sentences which clearly made it much easier for me by using some other method. I guess that is what stuck with me, because one of the characteristics of an inventor I think is that he is lazy and doesn't like to do it the hard way."

Ascending to the sixth floor. *Attendees at The Computer Museum's May 11 Pre-Preview Party climb the new central stairway between the fifth and sixth floors. The stairway was completed just days before the party. The $100 benefit dinner kicked off The Computer Museum's $10,000,000 capital campaign.*

Multiwire machine. *Barbara T. Mastro and Curtis P. Hoffman familiarize themselves with a recent gift to the Museum from Kollmorgen's PCK Technology Division during the Pre-Preview Party. The Multiwire machine can "write" wire pat-*

terns at rates of 100 inches per minute making it possible to reduce the size of computers.

Computing Relic. *Talking by the 1958 SAGE display console are Peter Hirshberg (left) and Michael Poe. The console is part of the SAGE, the U.S. air defense computer that could use a light gun to track down enemy bombers.*

Admiring *the SAGE's duplex maintenance console during the pre-preview of the Museum's new 55,000-square-foot facilities in downtown Boston are Mr. and Mrs. Strump.*

Janice Stone and Ned Forrester *examine the core memory stack from the Whirlwind, an early vacuum tube*

computer developed at MIT. Forrester's father Jay W. Forrester directed the design of the computer which was the first to use magnetic core memory.

The mini-museum. *Stephanie Haack, (right center) communications director at The Computer Museum explains to party guests the concept behind the Museum's 20,000 square feet of exhibits scheduled to open on November 14.*

Greetings. *Mr. and Mrs. Phillip Pyburn meet a unique guest, "Shakey," the first fully-mobile robot with artificial intelligence, 1969, at The Computer Museum's Pre-Preview Party. The collection browsing followed Dr. Robert N. Noyce's talk on the invention of the integrated circuit.*

Dear Editor:

I've enjoyed reading the *Computer Museum Report* for the past few months. It's good to see that people are preserving the older computers so that others will have an understanding of the family tree of today's Apples and IBM PCs.

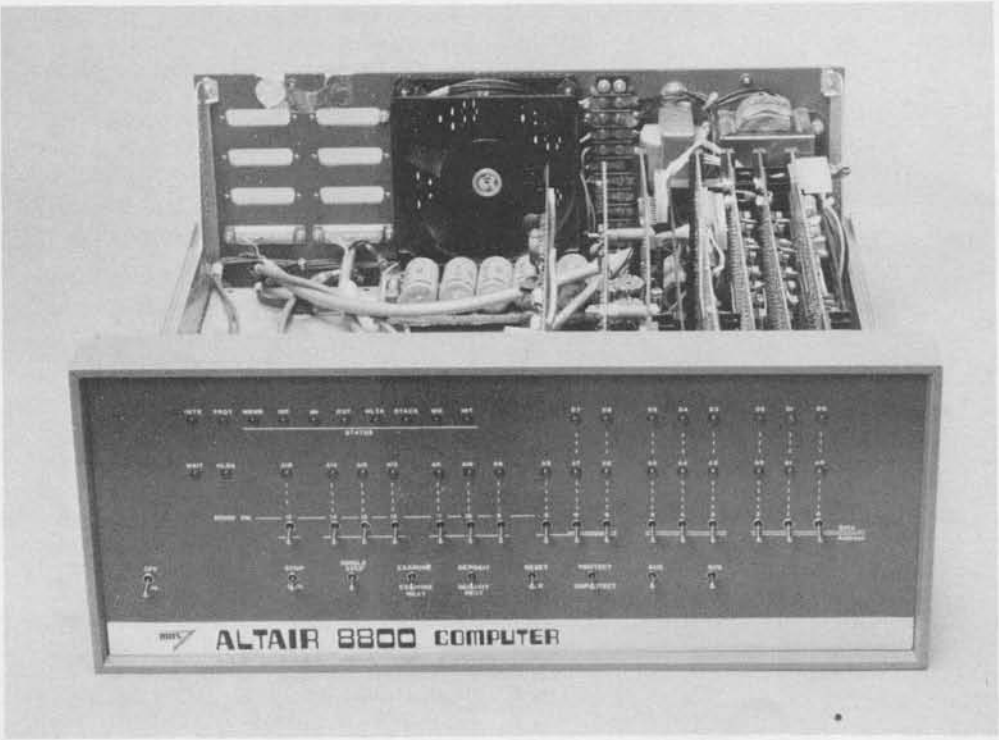
Your note in "The End Bit" in Volume 9 noted that the MITS Altair was the first computer to use cassette tape as auxiliary memory. I don't think this is correct. I remember using several PDP-8 minicomputers in the 1971–1973 period and an 8-track audio cassette was used to save programs. The cassette unit was manufactured by Tennecomp and I think it was basically the type of cassette or cartridge system used by radio stations for advertisements or other short messages. It was an endless loop cassette and worked quite well. We had many programs stored on it and it was much, much easier than loading (and reloading) paper tapes.

There were several other microcomputer-based computers available to hobbyists and experimenters prior to the MITS Altair. One of the better known units was the Mark-8, an 8008-based computer that I designed and that was described in *Radio-Electronics* magazine in July 1974. After being available for several months, a group of experimenters in the Denver area came up with a modem board that allowed an audio cassette recorder to be used for program storage. This group eventually formed themselves into the Digital Group, which manufactured several types of computers. I think they were the first ones to use an audio cassette for storage of programs as modem tones.

I have a packet of information that the Digital Group published and distributed. It is undated, but I recall that it was put out in late 1974 or early 1975. It includes a schematic of the modem used for the cassette storage. The modem was made available prior to the publication of this technical information. The modem board is small, measuring 4½ by 2 inches.

There may have been other systems that used a cassette recorder for data and program storage at about this time. I know that Scelbi Computer Consulting, Milford, CT put together an 8008-based computer but I don't know if it had a cassette add-on. The early documentation I have does not show one.

With best wishes,
THE BLACKSBURG GROUP, INC.
Jonathan A. Titus, Ph.D
President



IBM System/360 in Conclusion

In the Spring issue of The Computer Museum Report, Number 9 the Museum printed a transcript of a lecture on the IBM System/360 given by Bob O. Evans, IBM vice-president of engineering, programming and technology. The conclusion was inadvertently left out. It follows:

Immediately other companies thought they had been damaged too and filed their own law suits—TransAmerica, Memorex, Calcomp, and others. So, with much senior management and lawyers time expended, IBM went through the gauntlet of several anti-trust trials. That story is over for now, and I hope forever. We won every case on the merits and, recently, the last one, the TransAmerica case went to the Supreme Court which refused to hear it, thus upholding the lower court's decision. And a little over a year ago, the government dropped their anti-trust suit as being without merit. So that enormous weight has been lifted and we are back to getting on with life.

Yet the debate goes on that, had we not standardized and designed the System/360, we would not have had these kinds of copies, and we would not have had those lawsuits, and thus would not have had such difficulties. Thus, was it all worth it?

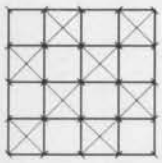
Of course my bias is that the driver of our products is the end user, and we have an accountability to that user. We also have an accountability to conduct ourselves in an ethical manner. Overall I believe devotedly the 360 decision was the right decision.

I can tell you that if I were faced with that decision today, we would make the 360 decision again, although I am certain it would be much tougher these days.

The net is: System/360 was conceived, born of a need, weathered a lot of tough gauntlets and went on to be a success for IBM and to be a significant part of the computer industry.

Museum Offers New Membership Categories

To celebrate its fall opening, the Museum is offering new membership categories and benefits for individuals and corporations. All individual members receive: a 10% discount on catalog purchases, a year's subscription to the Museum's quarterly magazine, invitations to openings, free admission to the Museum, notification of events, priority admission to special lectures and full library privileges with access to the Museum's extensive print and video archives.



Please send this coupon and your check, money order, or charge information to:

Jana Buchholz
Membership Coordinator
The Computer Museum
300 Congress Street
Boston, MA 02210

All memberships and donations are tax-deductible within the limits provided by law.

Check the appropriate membership category:

☐ Individual Member $30
All benefits listed above.

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Individual benefits for two people at the same address.

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Invitations to two "meet the speaker" receptions following major lectures plus Double Member benefits.

☐ Micro Patron $250
Recognition in the Museum Report plus Participating Member benefits.

☐ Mini Patron $500
A guided tour of the Museum by the Director plus Micro Patron benefits.

☐ Mainframe Patron $1000
Mainframe Patrons receive an original, signed computer generated drawing by artist Harold Cohen plus Mini Patron benefits.

☐ Super Patron $5000
Recognition in the Museum as a "core contributor to the capital campaign and Mainframe Patron benefits.

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Corporate Memberships

For information concerning corporate membership contact Michael Oleksiw, Development Director. New corporate benefits include free admission tickets for employees, rental privileges of Museum facilities, and eligibility to participate in the Museum's Collection Loan program.

Museum Hours

On Wednesday November 14, when the Museum opens its doors to the public at Museum Wharf in downtown Boston the hours will be: 11 a.m. to 6 p.m. Wednesday, Saturday and Sunday and 11 a.m. to 9 p.m. Thursday and Friday. It will be closed Mondays, Tuesdays, Christmas, New Years and Thanksgiving.

Upcoming Events

November

November 7—Members Association Meeting, 7 p.m.
November 13—Member's Preview
November 14—Public Opening

December

December 5—Members Association Meeting, 7 p.m.
December 13—Engelman lecture on Artificial Intelligence 7:30 p.m.

January

January 2— Members Association Meeting, 7 p.m.

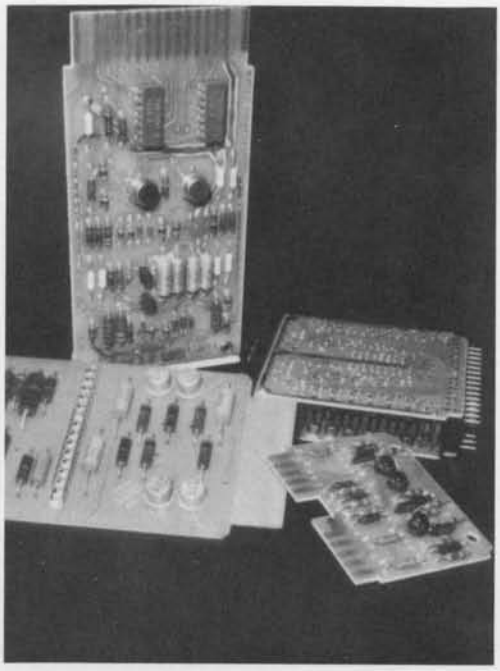
Catalog Corner

Original Modules. An educational and nostalgic collection of actual computer modules. Includes one each of the following: an IBM SMS module; a module from a PDP-8 an early Digital Equipment Corporation computer; a Control Data 6600 module of unusual "cord wood construction"; and a Philco 212 module from 1958. Modules and circuit boards may vary slightly.

To order a set of original modules send $19.95 ($1795 for Museum members) plus $4.00 for shipping and handling to Mail Order Department, The Computer Museum Store, 300 Congress Street, Boston, MA 02210.

Please add 5% Massachusetts sales tax for all Massachusetts shipping destinations.

You may also order over the phone using MasterCard, Visa or American Express. Just call (617) 542-0476 from 10 a.m. to 6 p.m. EST.



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