Museo degli Strumenti per il Calcolo

Il calcolo personale, la storia del PC

Storia dell'Informatica
Ciclo di seminari, a.a. 2014/15

contenuti

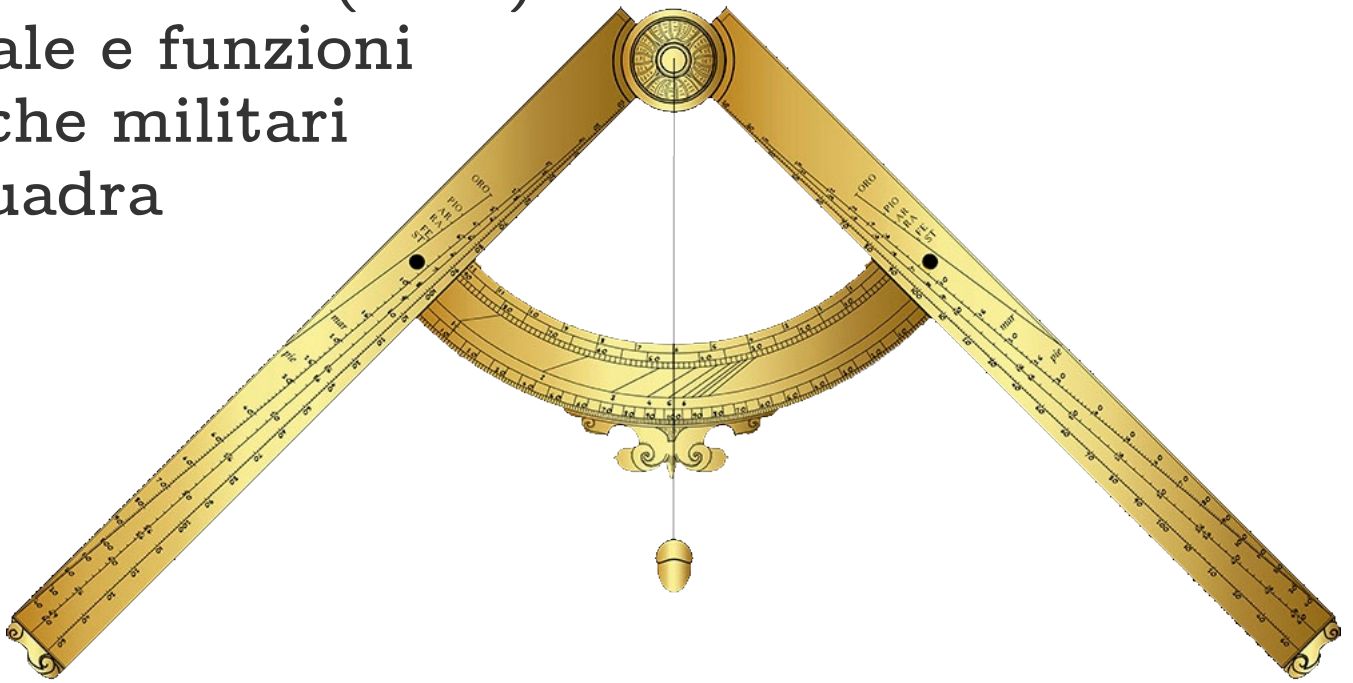
- L'informatica, personalmente
- Strumenti personali, Galileo in affari
- Regoli e calcolatrici cui affezionarsi
- Il primo PC?
- Il trionfo del calcolatore per distinguersi

strumenti personali

- Hardware
  - Sempre più portatili, sempre più propri
  - Smartphone, tablet, con custodie e accessori
  - Notebook, per chi lavora, sempre e ovunque :(
  - Il vecchio desktop (tower) solo per smanettoni
- Software e servizi
  - Facebook, Twitter, Instagram (i selfie!)...
  - Le *app*, Flixter, EasilyDo, Cloze...
  - Produttività personale, ieri suite da ufficio
  - I videogiochi, almeno lì rimane la sfida tecnologica
- Un tempo più "seri", comunque personali

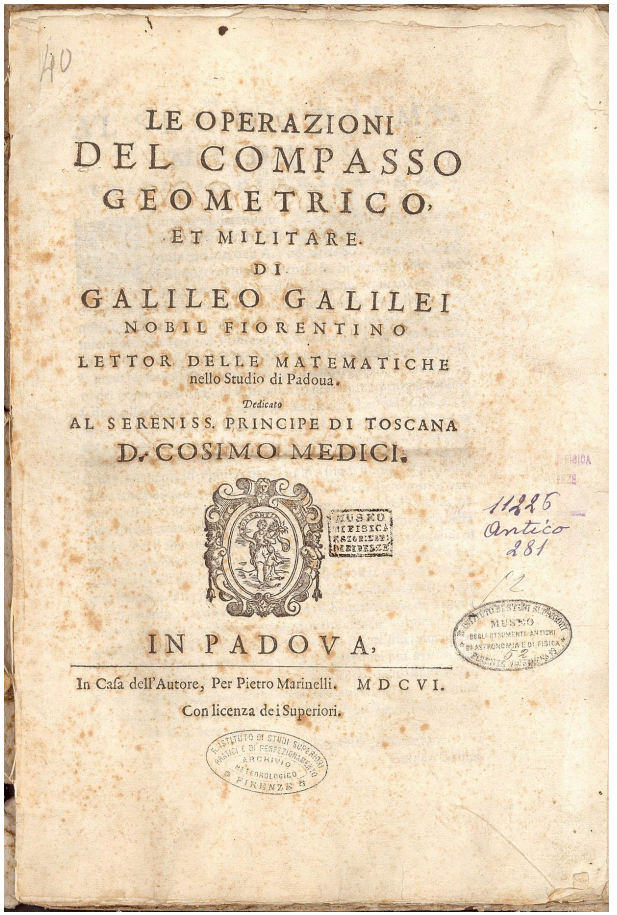
il compasso di Galileo

- Il coltellino svizzero del calcolo (1597)
  - Compassi calcolatori già ben noti
  - Compasso di Mordente (1567)
  - Unisce più scale e funzioni
  - Usi sia civili che militari
  - Sestante e squadra
  - Goniometro



un tentativo d'impresa...

- A Padova, 1592-1610
  - Dopo la morte del padre (1591)
  - Imprenditore per necessità
- La bottega
  - Con Marcantonio Mazzoleni
  - Costruzione su commissione
- Il manuale
  - Solo d'uso
  - Quasi inutile senza compasso
  - Dedicato a Cosimo Medici

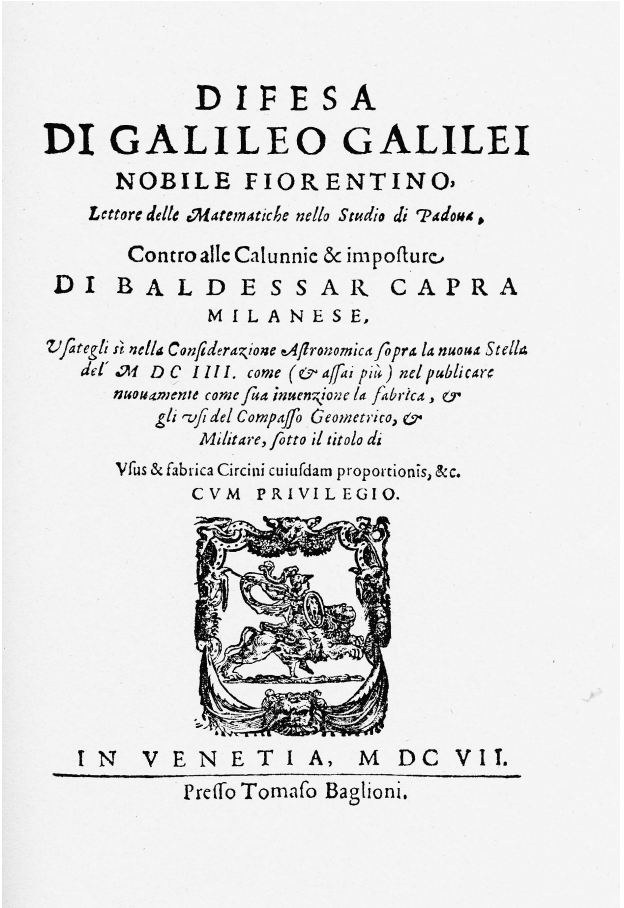


LE OPERAZIONI
DEL COMPASSO
GEOMETRICO,
ET MILITARE.
DI
GALILEO GALILEI
NOBIL FIORENTINO
LETTOR DELLE MATEMATICHE
nello Studio di Padoua.
Dedicato
AL SERENISS. PRINCIPE DI TOSCANA
D. COSIMO MEDICI.

IN PADOVA,
In Casa dell'Autore, Per Pietro Marinelli. M D C VI.
Con licenza de i Superiori.

… difeso con i denti

- Baldassarre Capra
  - Già in polemica con Galileo sulla "nova stella" di Keplero
  - Plagiò il manuale traducendolo in latino
- La risposta di Galileo
  - Sfidato in cimento
  - Di fronte ai Riformatori dello Studio di Padova



DIFESA
DI GALILEO GALILEI
NOBILE FIORENTINO,
Lettore delle Matematiche nello Studio di Padoua,

Contro alle Calunnie & impoſture
DI BALDESSAR CAPRA
MILANESE,

Vſategli sì nella Conſiderazione Aſtronomica ſopra la nouua Stella del M DC IIII. come (& aſſai più) nel publicare nouamente come ſua inuenzione la fabrica, & gli vſi del Compaſſo Geometrico, & Militare, ſotto il titolo di

Vſus & fabrica Circini cuiuſdam proportionis, &c.
CVM PRIVILEGIO.

IN VENETIA, M DC VII.
Preſſo Tomaſo Baglioni.

la prosa di Galileo

... un tavolino da potervi posar sopra un libro, un compasso, un poco di carta, con penna ed inchiostro... finalmente, instandolo io e sfuggendo ogn'altro diverticolo, al preparato tavolino lo condussi...

... a questo si trovò egli più che mai inviluppato: e finalmente, per distrigarlo di là ond'ei mai non si averebbe sviluppato, bisognò che io gli dicessi come l'error suo era...

... quelli Illustrissimi ed Eccellentissimi Signori, chiarissimi ormai della verità del fatto, forse compassionando al tormento nel quale io ritenevo il malarrivato Capra, fecero cenno che tanto bastava...
... domandai ancora al Capra, chiesta buona licenza a quei Signori, quanto fusser grandi gli angoli di un triangolo...

le calcolatrici digitali

- Una lunga stagione
  - Dalla metà del ’800 agli anni ’70
  - Produzioni da migliaia a milioni di unità
- Sempre professionali
  - Spesso portatili
  - Alcune si aprono e si chiudono
- Personali
  - Simili, ma differenti
  - Richiedono impegno, dedizione, anche abilità
  - Ci si affeziona, si difendono

gli amori di Fermi

ancora analogici

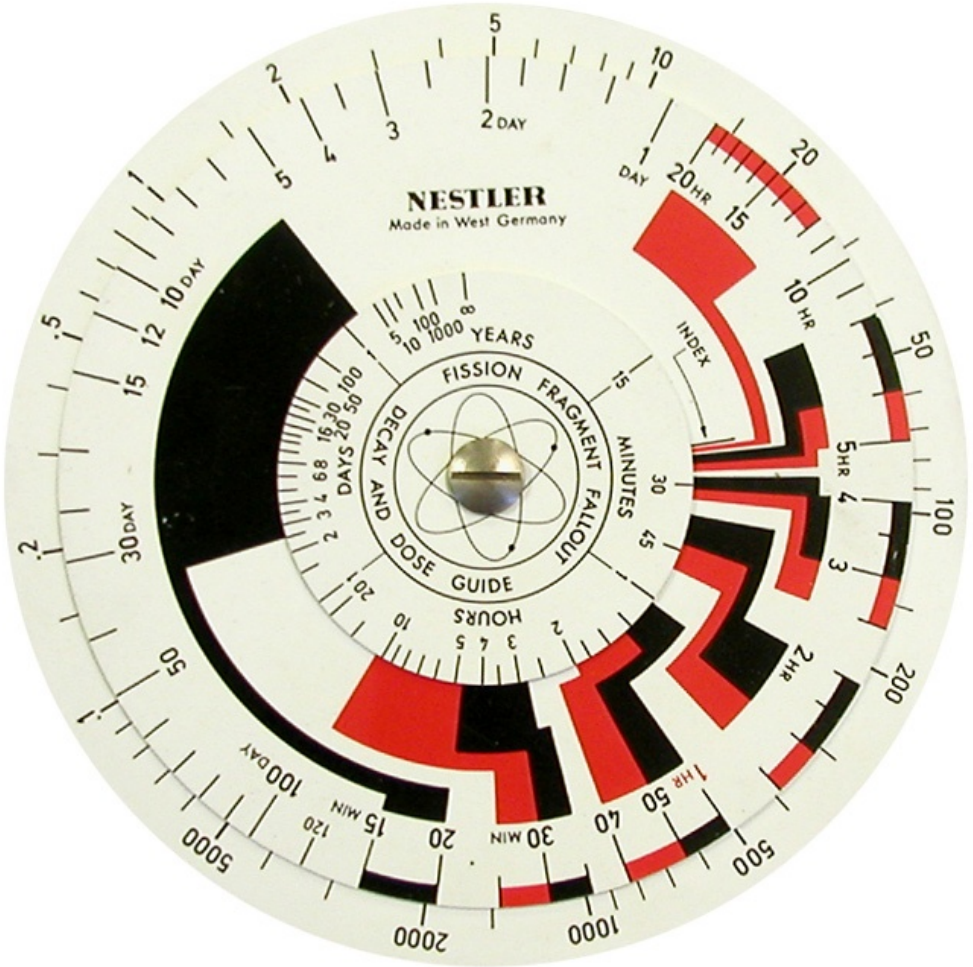
- I regoli, da Napier in poi
  - *Mirifici Logarithmorum Canonis Descriptio*, 1614
  - 1620ca, Edmund Gunter, Oxford, protoregolo circolare
  - 1632, William Oughtred, Cambridge, doppio Gunter
  - 1859, Amédée Mannheim, per l'artiglieria francese

- Forme, misure, materiali, specializzazioni
  - Lineari, circolari, cilindrici
  - Da scrivania, ma soprattutto da taschino
  - Legno, legno e celluloide, bambù...
  - Generici, ingegneria civile, astronomia, aeronautica...

strumenti e personaggi

... Well let's see now ah... aa... nn... Radioactive halflife of uh... hmm...
I would think that uh... possibly uh... one hundred years...

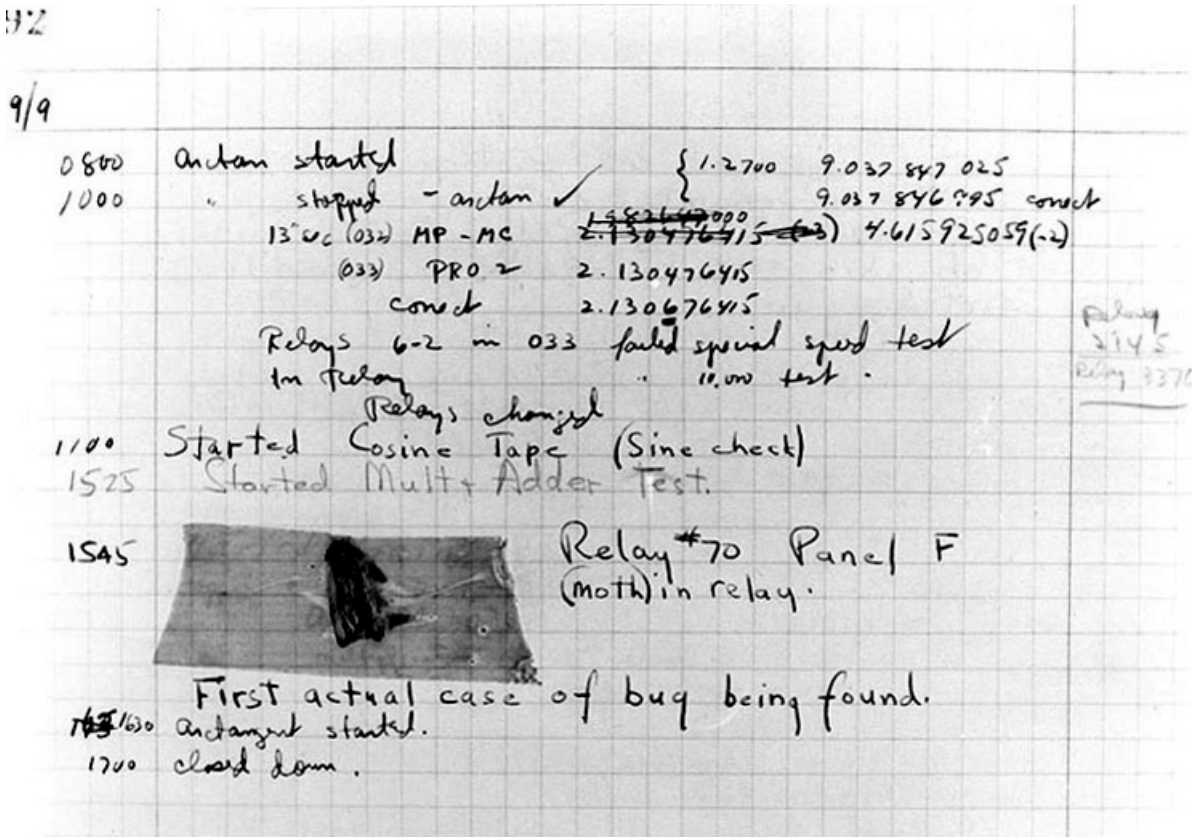
nessuno può non averlo



dalle stanze alle scrivanie

- Dalla calcolatrice al calcolatore
  - Oltre alle operazioni, gestire il procedimento
  - La soluzione meccanica era inadeguata
  - Babbage? forse ce lo dirà Plan 28
  - Zuse? qualcosa con la Z1, ma passò subito ai relé
- La soluzione elettronica
  - Risolve memoria, operazioni, istruzioni
  - È ugualmente veloce su tutti e tre i fronti
  - Non ha parti in movimento
  - Può affrontare calcoli lunghi, e in tempi brevi
- Inizialmente è ingombrante e costosa

problemi dei relé

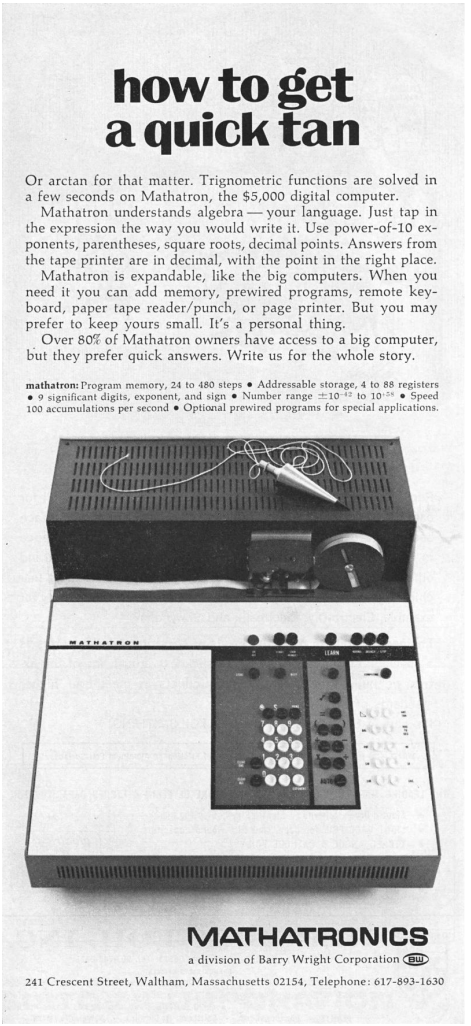


Harvard Mk II, 1947

falsi amici, 1963

1964, Mathatron

William Kahn
Roy Reach
David Shapiro



how to get a quick tan

Or arctan for that matter. Trignometric functions are solved in a few seconds on Mathatron, the $5,000 digital computer.

Mathatron understands algebra — your language. Just tap in the expression the way you would write it. Use power-of-10 exponents, parentheses, square roots, decimal points. Answers from the tape printer are in decimal, with the point in the right place.

Mathatron is expandable, like the big computers. When you need it you can add memory, prewired programs, remote keyboard, paper tape reader/punch, or page printer. But you may prefer to keep yours small. It's a personal thing.

Over 80% of Mathatron owners have access to a big computer, but they prefer quick answers. Write us for the whole story.

mathatron: Program memory, 24 to 480 steps • Addressable storage, 4 to 88 registers • 9 significant digits, exponent, and sign • Number range $\pm 10^{-65}$ to 10^{+65} • Speed 100 accumulations per second • Optional prewired programs for special applications.

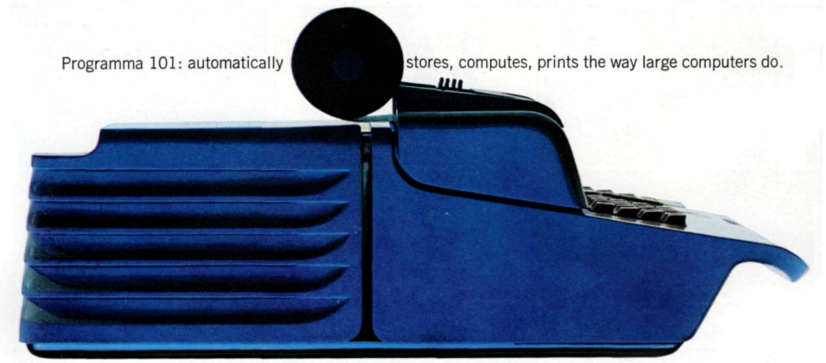
MATHATRONICS
a division of Barry Wright Corporation BW
241 Crescent Street, Waltham, Massachusetts 02154, Telephone: 617-893-1630

1965, Programma 101

Pier Giorgio Perotto
Giovanni De Sandre
Gastone Garzera
Franco Bretti
Edoardo Ecclesia
Mario Bellini (design)

Olivetti Underwood innovates: the world's first desk-top computer, $3200

This is the world premiere of the Programma 101, the computer that brings a new dimension to business. Now for less than one month's rental of a large computer, businessmen, scientists and technicians can own the Programma 101 outright. Not much bigger than a typewriter, it sits on your desk. Like the large computers, it thinks in milliseconds, makes logical decisions. You can program it to compute logarithms, even print out complex mortgage plans. Automatic printout provides a permanent record. Programs can be stored off the machine on magnetic cards, reentered in seconds. And Olivetti Underwood's program library offers virtually limitless applications. Ask us for a demonstration. Total price, $3200.



1967, IME 86S

Massimo Rinaldi

1968, HP 9100

Tom Osborne

Powerful Computing Genie: $4900

READY, WILLING AND ABLE.

Ready—to relieve you of waiting to get on the big computer.
Constantly available. At your fingertips whenever you need it.
Ready to abolish tedium from scientific and engineering computation.
Ready to slash through long routines
and come up with answers in milliseconds.
The new Hewlett-Packard 9100A personal computer.

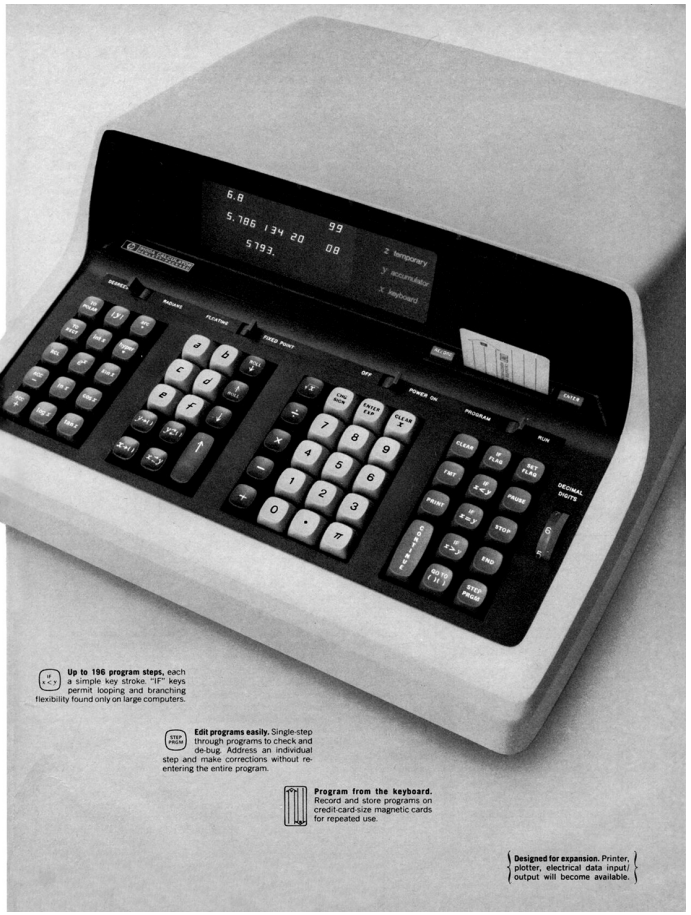
Willing—to perform log and trig functions,
even hyperbolics and coordinate transformations,
at the touch of a key. Willing to work
with extremely large and small numbers simultaneously.
Willing to take your programming commands
in mathematical language.
No computer language or programming specialist required.
Willing to communicate with you on *your* terms.
The new Hewlett-Packard 9100A computing marvel.

Able—to take on the most complex problems:
roots of a fifth-degree polynomial . . .
solutions to three simultaneous equations . . .
Bessel functions . . . Fourier analysis . . . elliptic integrals . . .
real and complex polynomial evaluation . . .
coordinate geometry . . . regression analysis . . .
numerical integration . . . vector analysis . . .
and many, many more!
Able to be your fast, responsive mathematical servant.

Dynamic range 10 ⁻⁹⁹ to 10⁹⁹, nearly 200 decades. Observation of math operations on 3 displayed registers. Up to 16 more registers for data storage.

Complex and vector arithmetic simplified with coordinate transformation keys, rectangular-to-polar and vice-versa, in milliseconds.

Trig functions covering all quadrants and any size angle in degrees or radians.



Up to 196 program steps, each a simple key stroke. "IF" keys permit looping and branching flexibility found only on large computers.

Edit programs easily. Single-step through programs to check and de-bug. Address an individual step and make corrections without re-entering the entire program.

Program from the keyboard. Record and store programs on credit-card-size magnetic cards for repeated use.

Designed for expansion. Printer, plotter, electrical data input/output will become available.

1969, Honeywell 316

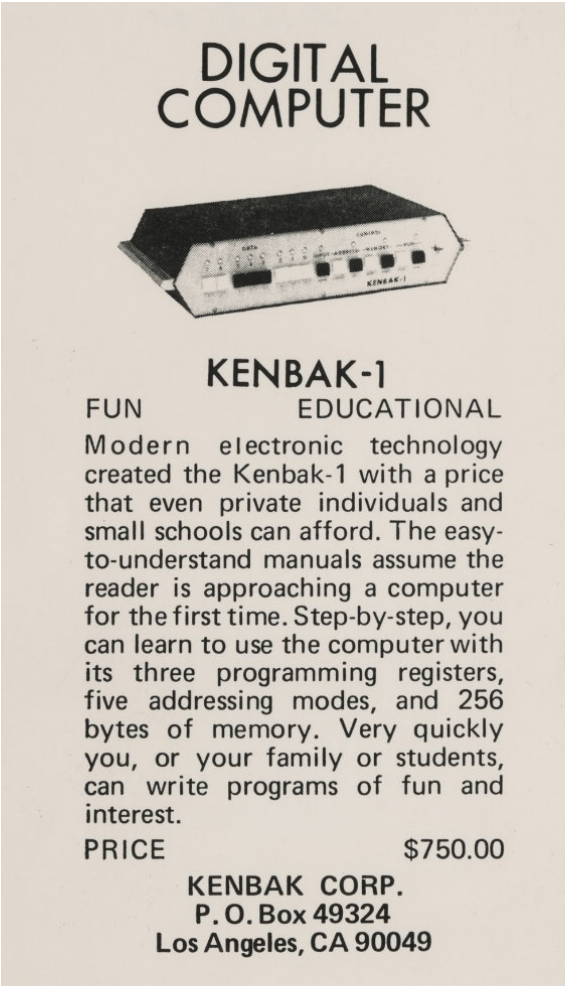
Gardner Hendrie
Neiman & Marcus

If she can only cook as well as Honeywell can compute.

Her souffles are supreme, her meal planning a challenge? She's what the Honeywell people had in mind when they devised our Kitchen Computer. She'll learn to program it with a cross-reference to her favorite recipes by N-M's own Helen Corbitt. Then by simply pushing a few buttons obtain a complete menu organized around the entrée. And if she pales at reckoning her lunch tab, she can program it to balance the family checkbook. **84A** 10,600.00 complete with two week programming course **84B Fed with Corbitt data:** the original Helen Corbitt cookbook with over 1,000 recipes 5.00 (.75) **84C** Her Potluck, 375 of our famed Zodiac restaurant's best kept secret recipes 3.95 (.75) Epicure **84D Her tabard apron,** one-size, ours alone by Garden House in multi-pastel provincial cotton 28.00 (.90) Trophy Room

1971, Kenbak-1

John V. Blakenbaker



1973, Xerox Alto

Charles P. “Chuck” Thacker
Butler W. Lampson

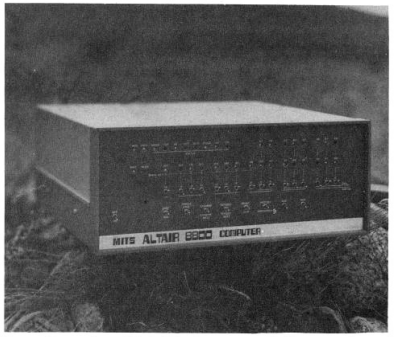
Alan Kay
Douglas Carl Engelbart
Ivan Edward Sutherland

1974, Altair 8800

Henry “Ed” Roberts
Forest Mims

MITS

A COMPUTER CONCEPT BECOMES AN EXCITING REALITY.



Not too long ago, the thought of an honest, full-blown computer that sells for less than $500 would have been considered a mere pipe dream.

Everyone knows that computers are monstrous, box-shaped machines that sell for 10's and 100's of thousands of dollars.

Pipe dream or not, *MITS*, the quality engineering oriented company that pioneered the calculator market, has made the *Altair 8800* a reality. It is the realization of that day when computers are accessible to almost anyone who wants one.

The heart (and the secret) of the *MITS Altair 8800* is the *Intell 8080* processor chip. Thanks to rapid advances in integrated circuit technology, this one IC chip can now do what once took thousands of electronic components (including 100's of IC's) and miles of wire.

Make no mistake about it. The *MITS Altair 8800* is a lot of brain power. Its parallel, 8-bit processor uses a 16-bit address. It has 78 basic machine instructions with variances up to 200 instructions. That's more than enough to program all the street lights in a major city.

And the *MITS Altair 8800 Computer* is fast. Very fast. It's basic instruction cycle time is 2 microseconds.

Combine this speed and power with the *Altair's* flexibility (it can directly address 256 input and 256 output devices) and you have a computer that's competitive with most mini's on the market today. And sells for a fraction of their cost.

The Altair 8800 has been designed to fulfill a wide variety of computer needs. It is ideal for the hobbyist who wants to get involved with computers. Yet, it has the power and versatility for the most advanced data processing requirements.

It's basic memory of 256 words of static RAM memory can be expanded to 65,000 words of directly addressable memory. Static OR dynamic memory. OR PROM or ROM memory. OR a floppy disc system. All supplied by *MITS*.

Using standard *MITS* interface cards, the *Altair 8800* can be connected to *MITS* peripherals (computer terminals, line printers, audio-cassette interface) to form the core of a sophisticated time-share system.

The *Altair 8800* can be a process controller. It can be an educational device. Or it can be expanded to be an advanced, custom intrusion system. A programmable scientific calculator. Automatic IC tester. Automated automobile test analyzer. Complete accounting system. "Smart" computer terminal. Sound and light system controller.

OR it can be all of these things at *the same time*. It could be the beginning of new business opportunities. The list of applications is literally endless.

MITS wants to service your individual computer needs.

You can buy an assembled *Altair 8800*. Or you can start by building the computer yourself. The *MITS Altair 8800* is the ultimate kit. Its assembly isn't much more difficult than assembling a desktop calculator.

OR you can start with an *Altair 8800* complete data processing system. *Altair Systems* come in 4 basic configurations.

For those users who are not familiar with computers, *MITS* offers free consultation service. Just describe your requirements to our engineering staff and we will specify the additional cards and the system configuration you need to do the job.

The MITS Altair 8800 is backed by complete peripheral and software development programs. There is even a high level language available.

Order your Altair 8800 Computer today. As a special introductory offer, *MITS* is offering the *Altair 8800* at a discount of $100. This offer is good on all orders postmarked prior to March 1, 1975.

PRICES:
Altair 8800 Computer (assembled with complete operation instructions) **$750.00**
Altair 8800 Computer (kit form) **$495.00**
Subtract $100.00 from above prices on all orders postmarked prior to March 1, 1975.

MITS INC.
"Creative Electronics"

Warranty: 90 days on parts and labor for assembled units. 90 days on parts for kits. Prices, specifications and delivery subject to change without notice.

☐ Enclosed is a Check for $ _____
or ☐ Bank Americard # _____
or ☐ Master Charge # _____
Credit Card Expiration Date _____
Include $8.00 for Postage and Handling
☐ ALTAIR 8800 ☐ Kit ☐ Assembled
☐ Please send complete Altair System Catalogue.
NAME _____
ADDRESS _____
City _____
STATE & ZIP _____
MITS / 6328 Linn, N.E., Albuquerque, New Mexico 87108 505/265-7553

CIRCLE NO. 23 ON READER SERVICE CARD

LEN SHUSTER

NEWSLETTER

Issue number one Fred Moore, editor, 2100 Santa Cruz Ave., Menlo Park, Ca. 94025 March 15, 1975

AMATEUR COMPUTER USERS GROUP
HOMEBREW COMPUTER CLUB . . . you name it.

Are you building your own computer? Terminal? T V Typewriter? I/O device? or some other digital black-magic box?

Or are you buying time on a time-sharing service?

If so, you might like to come to a gathering of people with likeminded interests. Exchange information, swap ideas, talk shop, help work on a project, whatever . . .

This simple announcement brought 32 enthusiastic people together March 5th at Gordon's garage. We arrived from all over the Bay Area---Berkeley to Los Gatos. After a quick round of introductions, the questions, comments, reports, info on supply sources, etc., poured forth in a spontaneous spirit of sharing. Six in the group already had homebrew systems up and running. Some were designing theirs around the 8008 microprocessor chip; several had sent for the Altair 8800 kit. The group contained a good cross section of both hardware experts and software programmers.

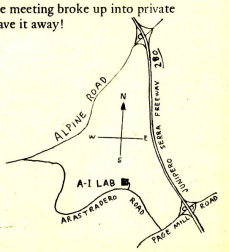
We got into a short dispute over HEX or Octal until someone mentioned that if you are setting the switches by hand it doesn't make any difference. Talked about other standards: re-start locations? input ports? better operating code for the 8080? paper tape or cassettes or paper & pencil listings? Even ASCII should not be assumed the standard: many 5 channel Model 15 TTYs are about and in use by RTTY folks. Home computing is a hobby for the experimenter and explorer of what can be done cheaply. I doubt that standards will ever be completely agreed on because of the trade-offs in design and because what's available for one amateur may not be obtainable for another.

Talked about what we want to do as a club: quantity buying, cooperation on software, need to develop a cross assembler, share experience in hardware design, classes possibly, tips on what's currently available where, etc. Marty passed out M.I.'s Application Manual on the MF8008 and let it be known that he could get anything we want. Steve gave a report on his recent visit to MITS. About 1500 Altairs have been shipped out so far. MITS expects to send out 1100 more this month. No interfaces or peripherals are available until they catch up with the mainframe back orders. Bob passed out the latest PCC and showed the Altair 8800 which had arrived that week (the red LEDs blink and flash nicely). Ken unboxed and demonstrated the impressive Phi-Deck tape transport.

What will people do with a computer in their home? Well, we asked that question and the variety of responses show that the imagination of people has been underestimated. Uses ranged from the private secretary functions: text editing, mass storage, memory, etc., to control of house utilities: heating, alarms, sprinkler system, auto tune-up, cooking, etc., to GAMES: all kinds, TV graphics, x - y plotting, making music, small robots and turtles, and other educational uses, to small business applications and neighborhood memory networks. I expect home computers will be used in unconventional ways---most of which no one has thought of yet.

We decided to start a newsletter and meet again in two weeks. As the meeting broke up into private conversations, Marty held up an 8008 chip, asked who could use it, and gave it away!

NEXT MEETING WEDNESDAY, MARCH 19th, 7 PM at Stanford's Artificial Intellegence Laboratory, Conference room, Arastradero Road in Portola Valley. Look for this road sign: D C Power Lab

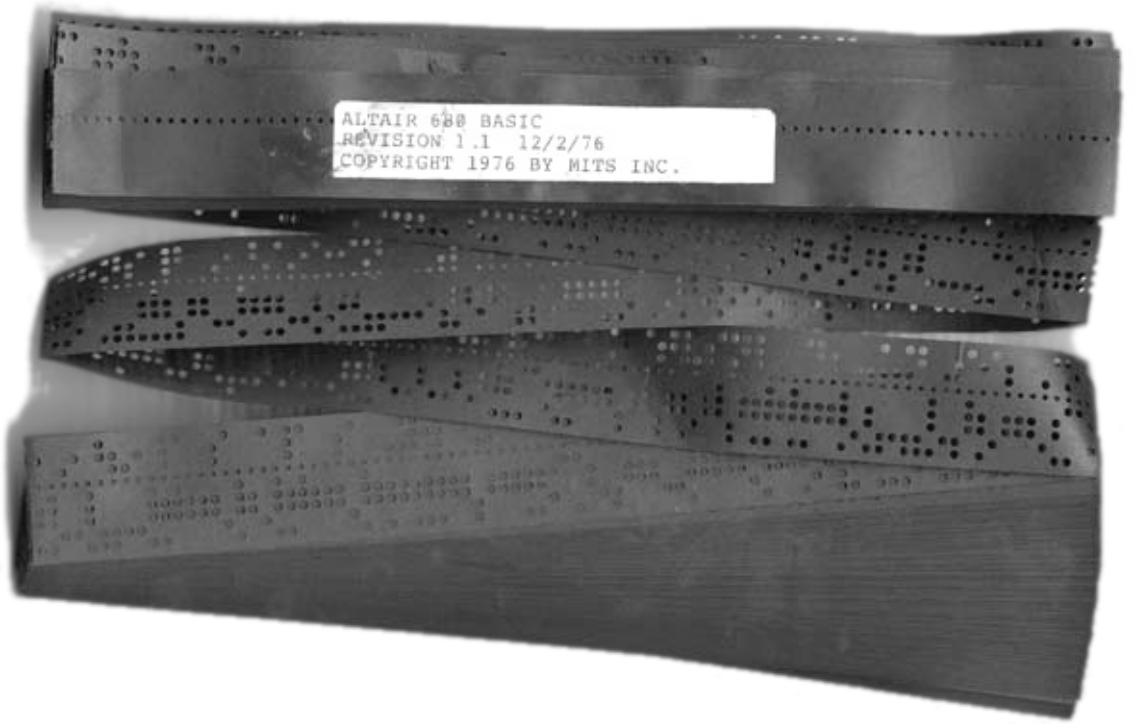


Announcement:

Texas Instruments Learning Center is presenting an early morning home television series, April 15 - 18, on "Introduction to Microprocessors." In the San Jose - Bay Area this program will be on channel 11 at 6:00 AM.

1975, Micro-Soft

William H. “Bill” Gates
Paul Gardner Allen



1975, IBM 5100

IBM announces the new 5100 Portable Computer

A compact problem-solving aid for engineers, statisticians, scientists and financial and business analysts.

Now you can have a computer right on your desk. Exactly where you need it. When you need it.

The new IBM 5100 Portable Computer incorporates the latest in semi-conductor technology. It features a typewriter-like keyboard and numeric key-pad for simplified data entry, a 1024 character display screen, an integrated magnetic tape drive, and 16K characters of memory.

Options available with the 5100 include a bi-directional 80-characters per second printer, a second magnetic tape drive, and additional memory up to a maximum of 64K characters. Also available is a communications feature which allows the 5100 to be used as a terminal.

The IBM 5100 comes with either APL or BASIC language or both.

Over 100 often-used analytical routines in mathematical, statistical and financial calculations are available for such functions as forecasting, modeling, matrix arithmetic, engineering and design calculations, regression and correlation analysis, return on investment and cash flow analysis.

In addition, the 5100 features a self-study training package that makes it easy to learn and easy to use without taking any classes or relying on specially trained experts.

If you'd like to find out more about IBM's new 5100 Portable Computer and arrange for a demonstration right at your desk, call your IBM General Systems Division office or fill out this coupon.

SA

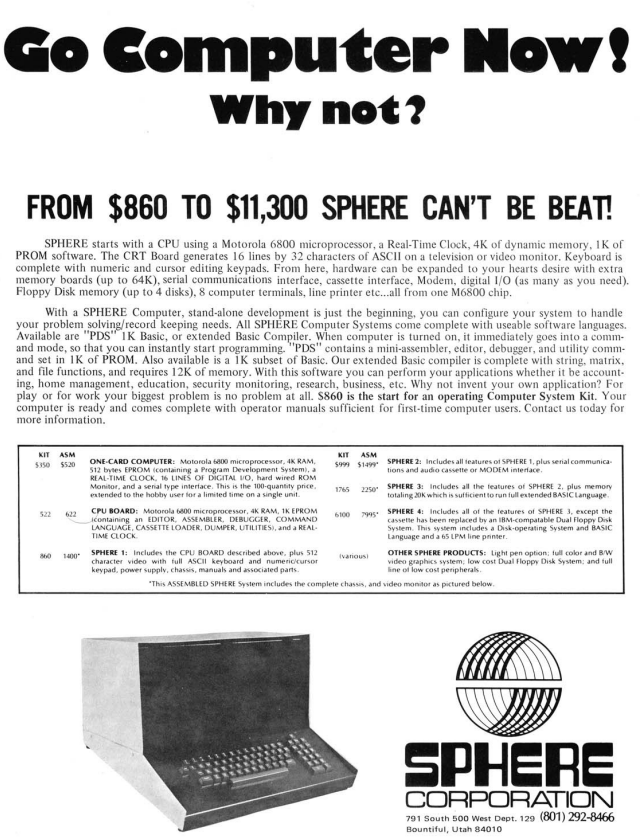
IBM. IBM General Systems Division
P.O. Box 2068, Atlanta, Georgia 30301

☐ I would like more information about IBM's new 5100.
☐ I would like a demonstration of IBM's new 5100.
My major area of interest is:
☐ Engineering/Scientific ☐ Statistical Analysis
☐ Business/Financial Analysis

Name_____
Title_____
Company_____
Address_____
City_____ State_____ Zip_____
Phone_____

altri fra il 1974 e il 1975

- Radio Electronics Mark 8
  - Progetto su rivista, su 8008
- R2E Micral
  - Francese, usato come controllore
- Sphere 1
  - Completo, in kit o assemblato
- Sol 20
  - Da un terminale intelligente
- IMSAI 8080
  - clone dell'Altair 8800



Go Computer Now!

Why not?

FROM $860 TO $11,300 SPHERE CAN'T BE BEAT!

SPHERE starts with a CPU using a Motorola 6800 microprocessor, a Real-Time Clock, 4K of dynamic memory, 1K of PROM software. The CRT Board generates 16 lines by 32 characters of ASCII on a television or video monitor. Keyboard is complete with numeric and cursor editing keypads. From here, hardware can be expanded to your hearts desire with extra memory boards (up to 64K), serial communications interface, cassette interface, Modem, digital I/O (as many as you need). Floppy Disk memory (up to 4 disks), 8 computer terminals, line printer etc...all from one M6800 chip.

With a SPHERE Computer, stand-alone development is just the beginning, you can configure your system to handle your problem solving/record keeping needs. All SPHERE Computer Systems come complete with useable software languages. Available are "PDS" 1K Basic, or extended Basic Compiler. When computer is turned on, it immediately goes into a command mode, so that you can instantly start programming. "PDS" contains a mini-assembler, editor, debugger, and utility command set in 1K of PROM. Also available is a 1K subset of Basic. Our extended Basic compiler is complete with string, matrix, and file functions, and requires 12K of memory. With this software you can perform your applications whether it be accounting, home management, education, security monitoring, research, business, etc. Why not invent your own application? For play or for work your biggest problem is no problem at all. **$860 is the start for an operating Computer System Kit.** Your computer is ready and comes complete with operator manuals sufficient for first-time computer users. Contact us today for more information.

KIT	ASM	
$350	$520	**ONE-CARD COMPUTER:** Motorola 6800 microprocessor, 4K RAM, 512 bytes EPROM (containing a Program Development System), a REAL-TIME CLOCK, 16 LINES OF DIGITAL I/O, hard wired ROM Monitor, and a serial type interface. This is the 100-quantity price, extended to the hobby user for a limited time on a single unit.
522	622	**CPU BOARD:** Motorola 6800 microprocessor, 4K RAM, 1K EPROM (containing an EDITOR, ASSEMBLER, DEBUGGER, COMMAND LANGUAGE, CASSETTE LOADER, DUMPER, UTILITIES), and a REAL-TIME CLOCK.
860	1400*	**SPHERE 1:** Includes the CPU BOARD described above, plus 512 character video with full ASCII keyboard and numeric/cursor keypad, power supply, chassis, manuals and associated parts.

KIT	ASM	
$999	$1499*	**SPHERE 2:** Includes all features of SPHERE 1, plus serial communications and audio cassette or MODEM interface.
1765	2250*	**SPHERE 3:** Includes all the features of SPHERE 2, plus memory totaling 20K which is sufficient to run full extended BASIC Language.
6100	7995*	**SPHERE 4:** Includes all of the features of SPHERE 3, except the cassette has been replaced by an IBM-compatable Dual Floppy Disk System. This system includes a Disk-operating System and BASIC Language and a 65 LPM line printer.
(various)		**OTHER SPHERE PRODUCTS:** Light pen option; full color and B/W video graphics system; low cost Dual Floppy Disk System; and full line of low cost peripherals.

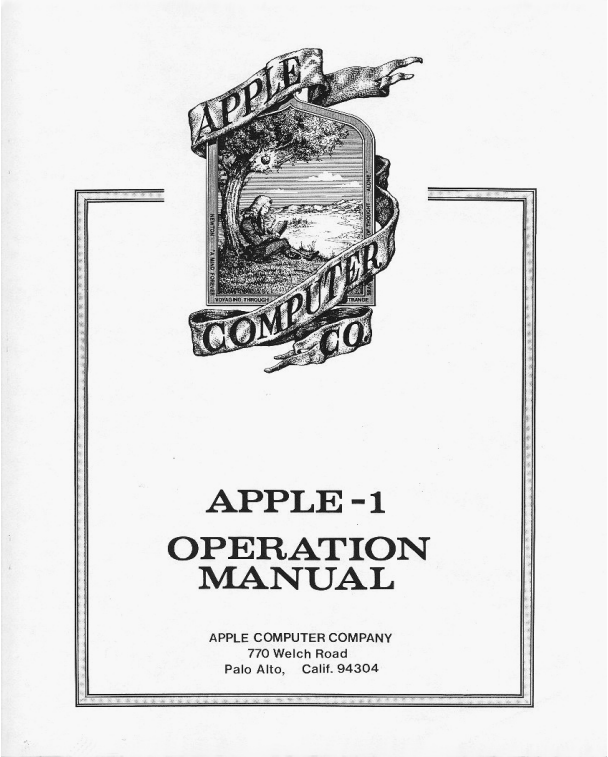
*This ASSEMBLED SPHERE System includes the complete chassis, and video monitor as pictured below.

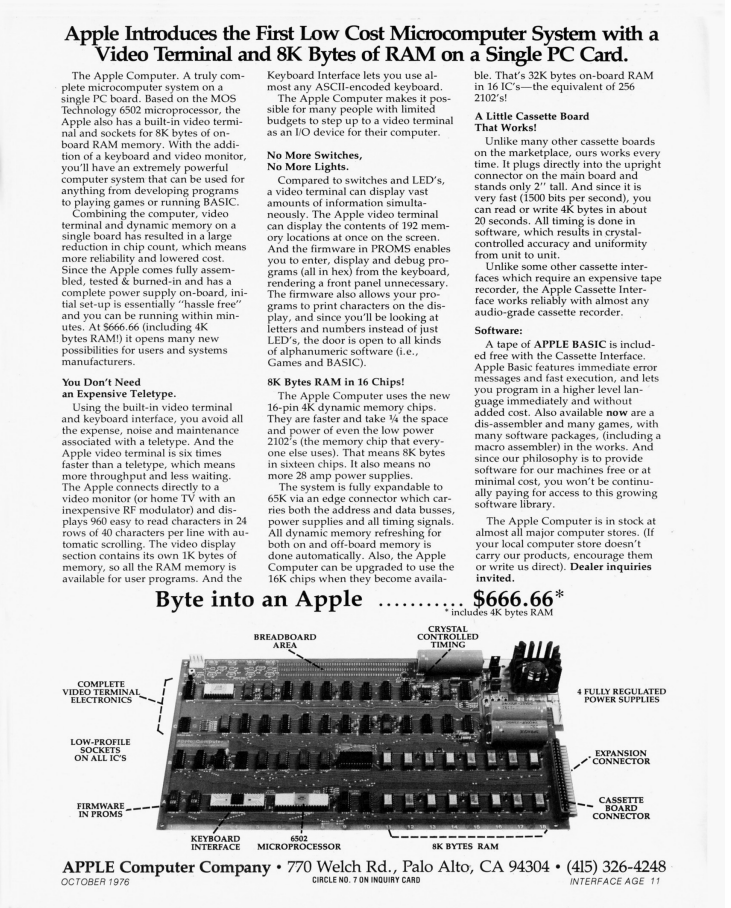
SPHERE CORPORATION
791 South 500 West Dept. 129 (801) 292-8466
Bountiful, Utah 84010

23

1976, Apple I

Stephen G. “Woz” Wozniak
Steven P. Jobs
Ronald G. Wayne





Apple Introduces the First Low Cost Microcomputer System with a Video Terminal and 8K Bytes of RAM on a Single PC Card.

The Apple Computer. A truly complete microcomputer system on a single PC board. Based on the MOS Technology 6502 microprocessor, the Apple also has a built-in video terminal and sockets for 8K bytes of on-board RAM memory. With the addition of a keyboard and video monitor, you'll have an extremely powerful computer system that can be used for anything from developing programs to playing games or running BASIC.

Combining the computer, video terminal and dynamic memory on a single board has resulted in a large reduction in chip count, which means more reliability and lowered cost. Since the Apple comes fully assembled, tested & burned-in and has a complete power supply on-board, initial set-up is essentially "hassle free" and you can be running within minutes. At $666.66 (including 4K bytes RAM!) it opens many new possibilities for users and systems manufacturers.

You Don't Need an Expensive Teletype.

Using the built-in video terminal and keyboard interface, you avoid all the expense, noise and maintenance associated with a teletype. And the Apple video terminal is six times faster than a teletype, which means more throughput and less waiting. The Apple connects directly to a video monitor (or home TV with an inexpensive RF modulator) and displays 960 easy to read characters in 24 rows of 40 characters per line with automatic scrolling. The video display section contains its own 1K bytes of memory, so all the RAM memory is available for user programs. And the Keyboard Interface lets you use almost any ASCII-encoded keyboard.

The Apple Computer makes it possible for many people with limited budgets to step up to a video terminal as an I/O device for their computer.

No More Switches, No More Lights.

Compared to switches and LED's, a video terminal can display vast amounts of information simultaneously. The Apple video terminal can display the contents of 192 memory locations at once on the screen. And the firmware in PROMS enables you to enter, display and debug programs (all in hex) from the keyboard, rendering a front panel unnecessary. The firmware also allows your programs to print characters on the display, and since you'll be looking at letters and numbers instead of just LED's, the door is open to all kinds of alphanumeric software (i.e., Games and BASIC).

8K Bytes RAM in 16 Chips!

The Apple Computer uses the new 16-pin 4K dynamic memory chips. They are faster and take ¼ the space and power of even the low power 2102's (the memory chip that everyone else uses). That means 8K bytes in sixteen chips. It also means no more 28 amp power supplies.

The system is fully expandable to 65K via an edge connector which carries both the address and data busses, power supplies and all timing signals. All dynamic memory refreshing for both on and off-board memory is done automatically. Also, the Apple Computer can be upgraded to use the 16K chips when they become available. That's 32K bytes on-board RAM in 16 IC's—the equivalent of 256 2102's!

A Little Cassette Board That Works!

Unlike many other cassette boards on the marketplace, ours works every time. It plugs directly into the upright connector on the main board and stands only 2" tall. And since it is very fast (1500 bits per second), you can read or write 4K bytes in about 20 seconds. All timing is done in software, which results in crystal-controlled accuracy and uniformity from unit to unit.

Unlike some other cassette interfaces which require an expensive tape recorder, the Apple Cassette Interface works reliably with almost any audio-grade cassette recorder.

Software:

A tape of **APPLE BASIC** is included free with the Cassette Interface. Apple Basic features immediate error messages and fast execution, and lets you program in a higher level language immediately and without added cost. Also available **now** are a dis-assembler and many games, with many software packages, (including a macro assembler) in the works. And since our philosophy is to provide software for our machines free or at minimal cost, you won't be continually paying for access to this growing software library.

The Apple Computer is in stock at almost all major computer stores. (If your local computer store doesn't carry our products, encourage them or write us direct). **Dealer inquiries invited.**

Byte into an Apple $666.66*

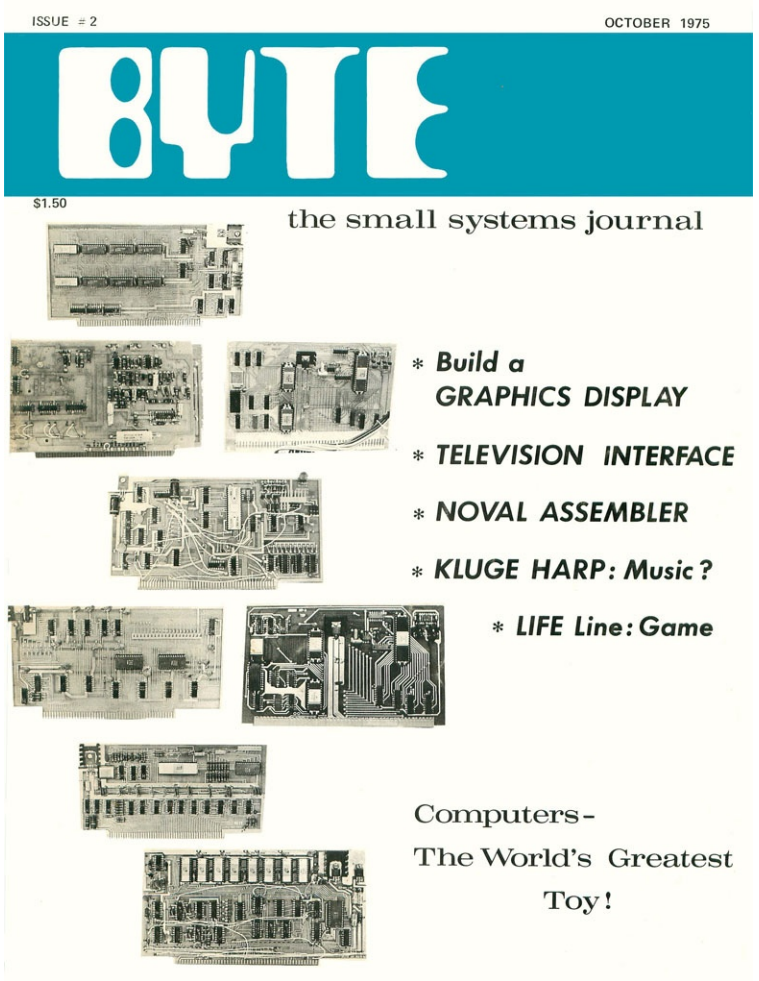
* includes 4K bytes RAM

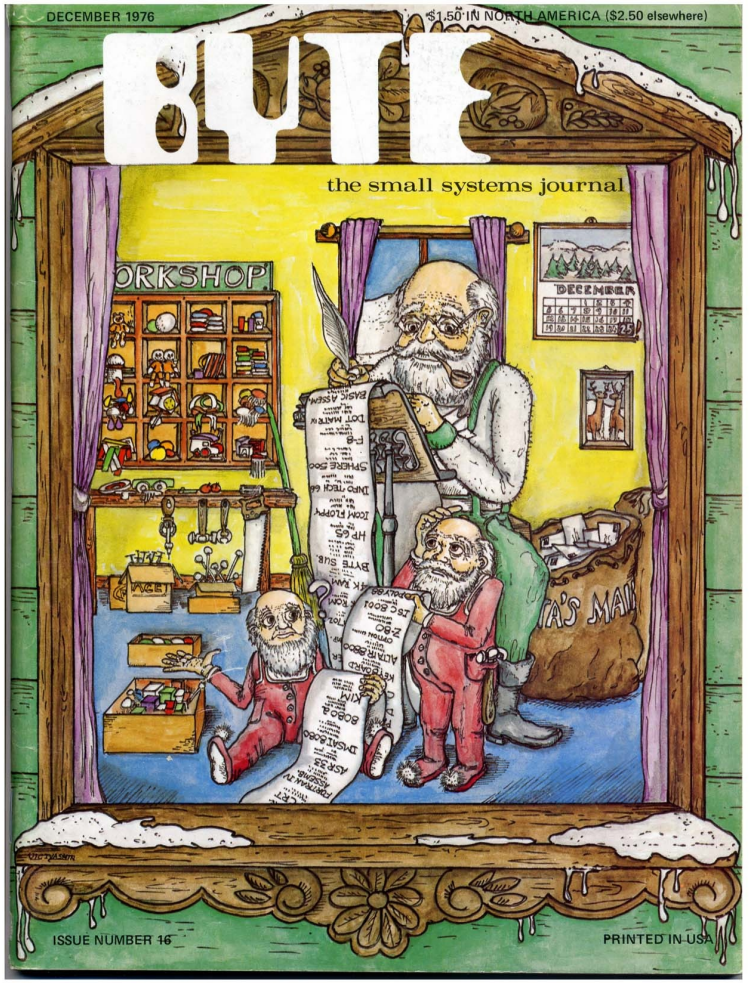
BREADBOARD AREA
CRYSTAL CONTROLLED TIMING
COMPLETE VIDEO TERMINAL ELECTRONICS
4 FULLY REGULATED POWER SUPPLIES
LOW-PROFILE SOCKETS ON ALL IC'S
EXPANSION CONNECTOR
FIRMWARE IN PROMS
CASSETTE BOARD CONNECTOR
KEYBOARD INTERFACE
6502 MICROPROCESSOR
8K BYTES RAM

APPLE Computer Company • 770 Welch Rd., Palo Alto, CA 94304 • (415) 326-4248

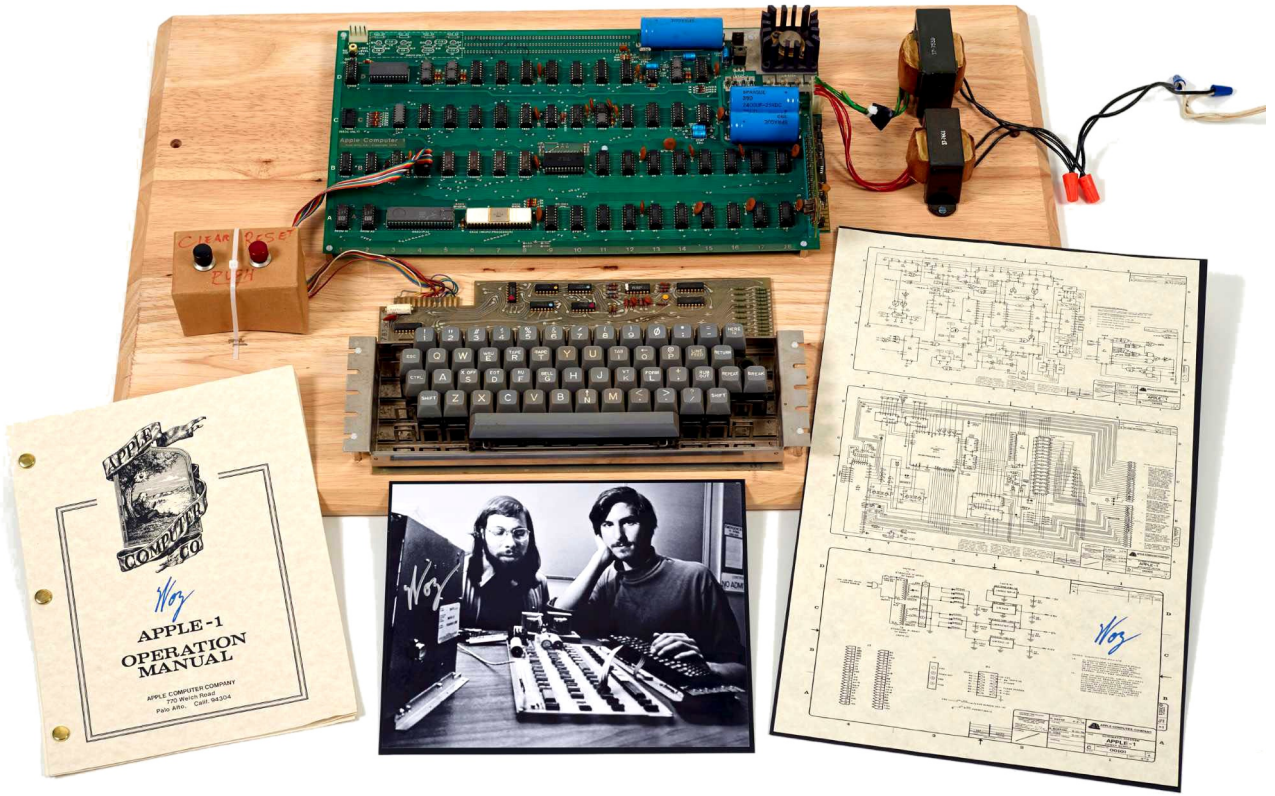
OCTOBER 1976 — CIRCLE NO. 7 ON INQUIRY CARD — INTERFACE AGE 11

innovativo? di successo?





... oggi, per le case d'asta



Bolaffi, luglio 2013, 390000$, da Christie's

1977, Apple][

1977, TRS80 Model I

Don French
Steve Leininger

1981, Osborne 1

Adam Osborne
Lee Felsenstein

Alan Kay (Note Taker 1978)

1981, IBM PC

Philip Donald Estridge

Tim Paterson (QDOS)

1982, GRiD Compass

John Ellenby (Xerox Parc)
Glenn Edens
Dave Paulsen

W.G. “Bill” Moggridge (design)

1983, Gavilan

THIS IS NOT THE MOST AMAZING PART OF MOBILE COMPUTING.

The requirements of mobile computing demand nothing less than a complete 16-bit computer with the largest possible display screen, full-sized keyboard, large and expandable memory, removable storage, and a correspondence-quality 8½" x 11" or legal page printer.

But the criteria of necessity was only our starting point in designing the mobile computer's hardware. The end result takes the idea much farther as a solid combination of some of the most highly evolved microcomputer technologies ever to appear in the same package.

THIS 9 POUND COMPUTER IS NO LIGHTWEIGHT.

The decision to incorporate the power of a full 16-bit processor over the 8-bit approach wasn't a tough decision. From the outset, we saw that for the Gavilan mobile computer to offer the highest degree of software capability and flexibility, it would have to use a 16-bit processor. Eight bits just can't run the software and interface required. Additionally, most of the software innovations of the '80s will be in 16-bit packages.

The LCD screen is a bit-mapped 80 character per line display with plenty of room to zoom in and out for viewing entire documents and scroll through letters, tables and spreadsheets easily. Horizontal and vertical scroll is standard. We also equipped the Gavilan with an adapter for a 24 line x 80 character video monitor.

The keyboard is a full-sized typewriter layout with an integrated 10-key numeric pad—the best ergonomic arrangement possible for serious word processing and number entry.

THE PRINTER FOR THE COMPLETE, PORTABLE OFFICE.

Putting your work on paper in the field means having a good lightweight printer. So the mobile computer comes with a true technological advancement: a 5 pound printer that produces correspondence-quality 8½" x 11" and legal (or continuous) documents at the rate of 50 characters per second. Its self-contained battery pack will print up to 60,000 characters between charges. It attaches compactly and securely onto the back of the portable main unit and was designed as an integrated part of the computer for regular daily use, rather than as a dangling cable-attached accessory. With printer attached, the entire computer weighs only 14 pounds.

A 3½" FILE CABINET HOLDS IT ALL.

The Gavilan mobile computer is made possible in part by two of the newest miniaturizations in memory devices: the 3½" floppy disk drive and plug-in memory expansion capsules. Both memory components are contained within the portable main unit of the computer behind the display screen, adding no additional volume to the computer.

The 3½" microfloppy disk drive provides 360,000 characters of formatted memory. Adding a second disk provides an additional 360,000 characters of formatted storage. That's more than 100 pages of text per disk.

The plug-in memory capsules contain both expansion memory capability and software programs. The standard 80 Kbytes of system memory can be expanded by additional capsules. Further, external memory options can boost it to 336 Kbytes.

For field communications between computers, the Gavilan incorporates an integrated modem offering direct connection, auto-dialing and auto-answering.

An RS-232 port allows direct link data transfer at 9600 baud rate.

WHAT COULD BE EASIER THAN A KEYBOARD? A TOUCH PAD.

But the one piece of hardware that orchestrates all of the rest—the fully integrated solid state mouse—is the single most significant advancement in easy-to-use computer hardware available today.

It's a touch-sensitive panel located below the display screen at the top of the keyboard. The touch panel, as it's called, is the means by which the user directs practically all of the computer's selection capabilities. With it, we've eliminated keyboard operation for all but number entry and word typing. The rest of the operation is "menu driven," meaning that selection menus containing commands for the computer are displayed on the screen, and you run the computer by simply using the touch panel to select the capabilities you want from the menus.

All of this, including 8-hour continuous-use rechargeable batteries, weighs in at 14 pounds. The portable main unit itself—including display, keyboard, central processing unit, memory plug-in capsules and batteries—is only 9 pounds.

But, the hardware, as state-of-the-art as it is, is not the most amazing part of mobile computing.

1984, Macintosh

Jef Raskin
Bill Atkinson
Burrell Carver Smith

1984, lo spot

Ridley Scott

la pubblicità, IBM...

How to move with modern times and take your PC with you.

Introducing the IBM *Portable* Personal Computer.

It's a complete PC. In a case. With a handle. And a welcome addition to the family.

The IBM *Portable* Personal Computer is the first IBM PC system you can pick up and take with you. Across town or across the hall. Or put away easily for another day.

It's a powerful system, with 256KB of user memory (expandable to 512KB) and a slimline double-sided 5¼" diskette drive (and room for another). Plus a built-in 9" monitor with easy-to-read amber characters. Text and graphics capability. And an 83-key keyboard.

All fitted into a sturdy, transportable case that's easy to handle. And park.

The IBM® of portable personal computers. Make no mistake about it, this is a true IBM PC.

Which means it is part of the same dependable family as the IBM Personal Computer, the IBM PC/XT and the new IBM PC*jr*. And that means you can use many IBM Personal Computer Software programs to help you reach your goals.

All this and five expansion slots, ready to accept expanded memory, printers and other useful IBM Personal Computer options. Which should keep you rolling far into the future.

Pick one up at a store near you. You can see the new IBM *Portable* Personal Computer at any authorized IBM PC dealer or IBM Product Center.

To find the store nearest you, call 1-800-447-4700. In Alaska or Hawaii, call 1-800-447-0890. IBM®

... e quella Apple

riferimenti

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