Storia dell'Informatica, seriamente

Seminari di Cultura Digitale
Dipartimento di Informatica
2 ottobre 2013

perché e cosa

- L'informatica tutti la usano,
  bene, anzi benone
- Tutti hanno confidenza con gli strumenti,
  bello, anzi bellissimo
- Prendersi confidenze con la disciplina e la sua storia,
  né bello, né bene
- Alcuni esempi, tre fra tanti

Hackerando la Macchina Ridotta

- Dal 2006, @di.unipi.it
- Storia dell'informatica partendo dalle tecnologie
  - per comprenderle a fondo (con compiaciuto diletto)
  - per valutarle e confrontarle (per ricerca storica)
  - per mostrarle in funzione (per divulgazione)
- La Macchina Ridotta
  - il primo calcolatore costruito in Italia, a Pisa, nel 1957
  - quasi dimenticata, poi compresa, riscoperta e rivalutata
  - a oggi la soddisfazione più grande di HMR

questione di metodo

- Il metodo usato per la MR è un caso particolare
  - per competenze (simulazione, elettronica del passato)
  - per costi e impegno
  - necessario quando i fatti sono davvero nascosti
- Spesso basta molto meno
  - accurate ricerca storica, d'archivio e selezione delle fonti
  - equilibrata disposizione d'animo (nei limiti del possibile)
- Errori (comprensibili) e vizi di partenza

vizi o esigenze?

- Una esigenza di fondo: semplificare
  - per pigrizia di chi dovrebbe spiegare
  - per paura di spaventare il pubblico
- Più altre motivazioni
  - assecondare una versione dei fatti che piace (diplomazia)
  - rendere i fatti più interessanti con espedienti retorici (eroi)
  - soddisfare vincoli scenici del mezzo (effetti speciali)
- Via con i tre casi...

Caso n. 1

L'inventore del PC

personaggi di moda

inventori à gogo

- Non solo una visione popolare
- E.g. P. Ferri, già massacrato su questi schermi
  - "Tim Berners-Lee, l'inventore di Internet..."
  - "Bill Gates, l'inventore dei moderni sistemi operativi..."
  - "Steve Jobs, l'inventore del primo personal computer..."
  - "Mark Zuckerberg, l'inventore di Facebook..."
    (in Nativi Digitali, Bruno Mondadori, 2011, p. 88)
- La necessità dell'inventore
  - l'impresa del singolo vs la big science
  - perché assecondare il culto di un personaggio paga

Jobs ha inventato il PC?

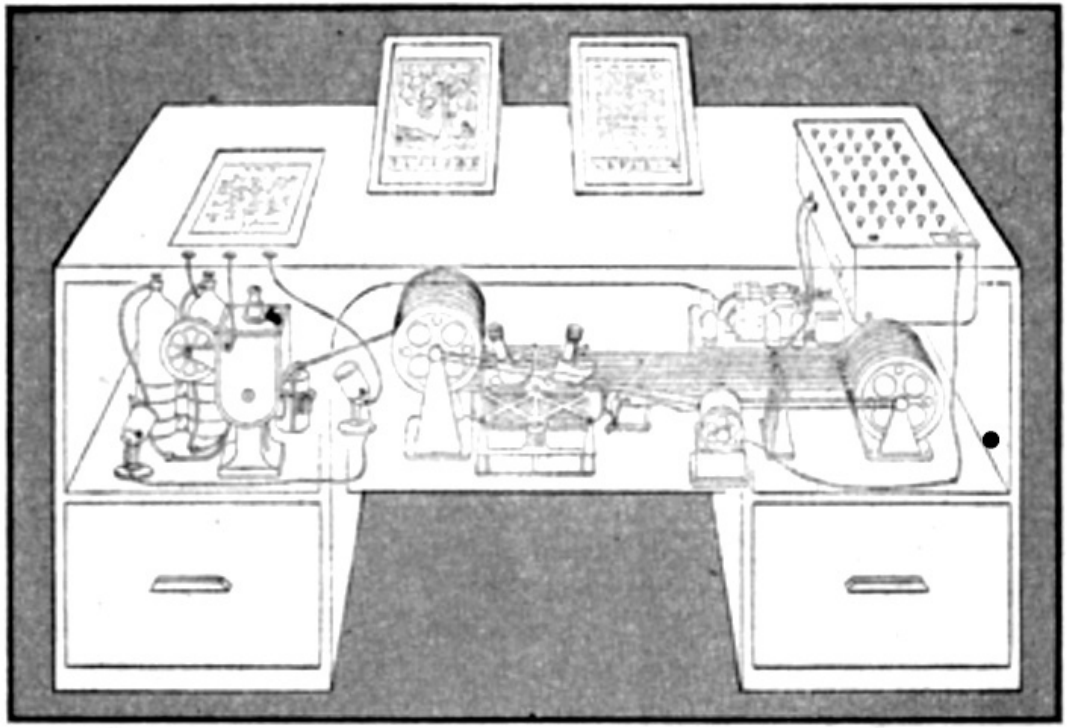
- Cosa ha fatto Jobs
  - si è accorto di cosa si era costruito Steve Wozniak
  - ha venduto il suo Bulli come contributo al capitale iniziale
  - ha convinto
    - Wozniak a vendere anche la sua HP-35
    - Ronald Wayne a fare da garante
    - Paul Terrell a comprare sulla carta i primi 50 pezzi
- Indubbiamente un Imprenditore
- Ma è l'atto di nascita del personal computing?

1851, aritmometri di serie

1898, Brunsviga B, portatile

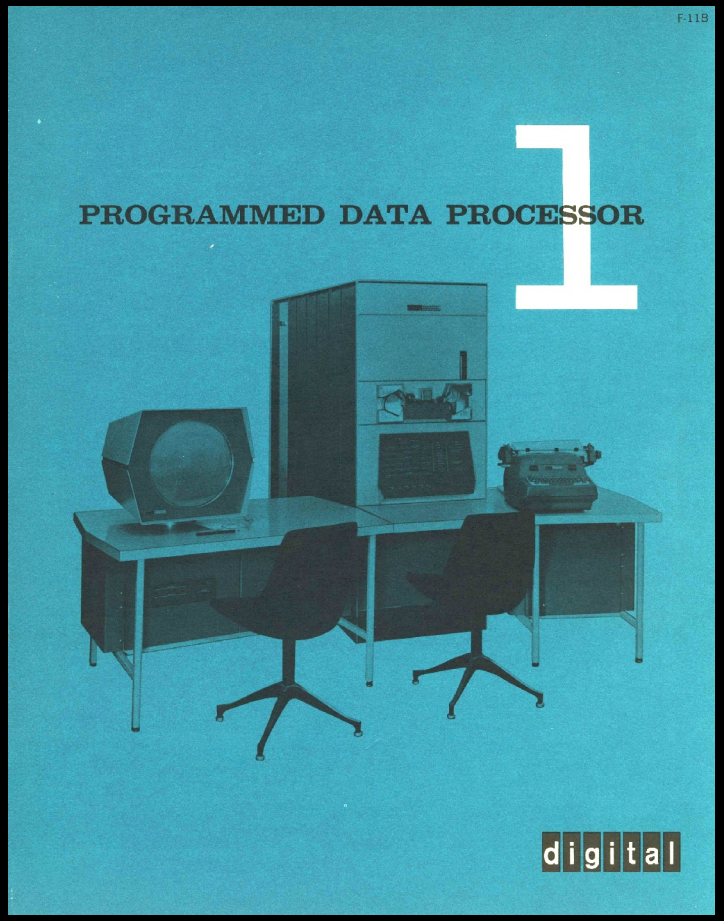
1934, Olivetti M1P

1945, Bush, Memex (concept)



MEMEX in the form of a desk would instantly bring files and material on any subject to the operator's fingertips. Slanting translucent viewing screens magnify supermicrofilm filed by code numbers. At left is a mechanism which automatically photographs longhand notes, pictures and letters, then files them in the desk for future reference.

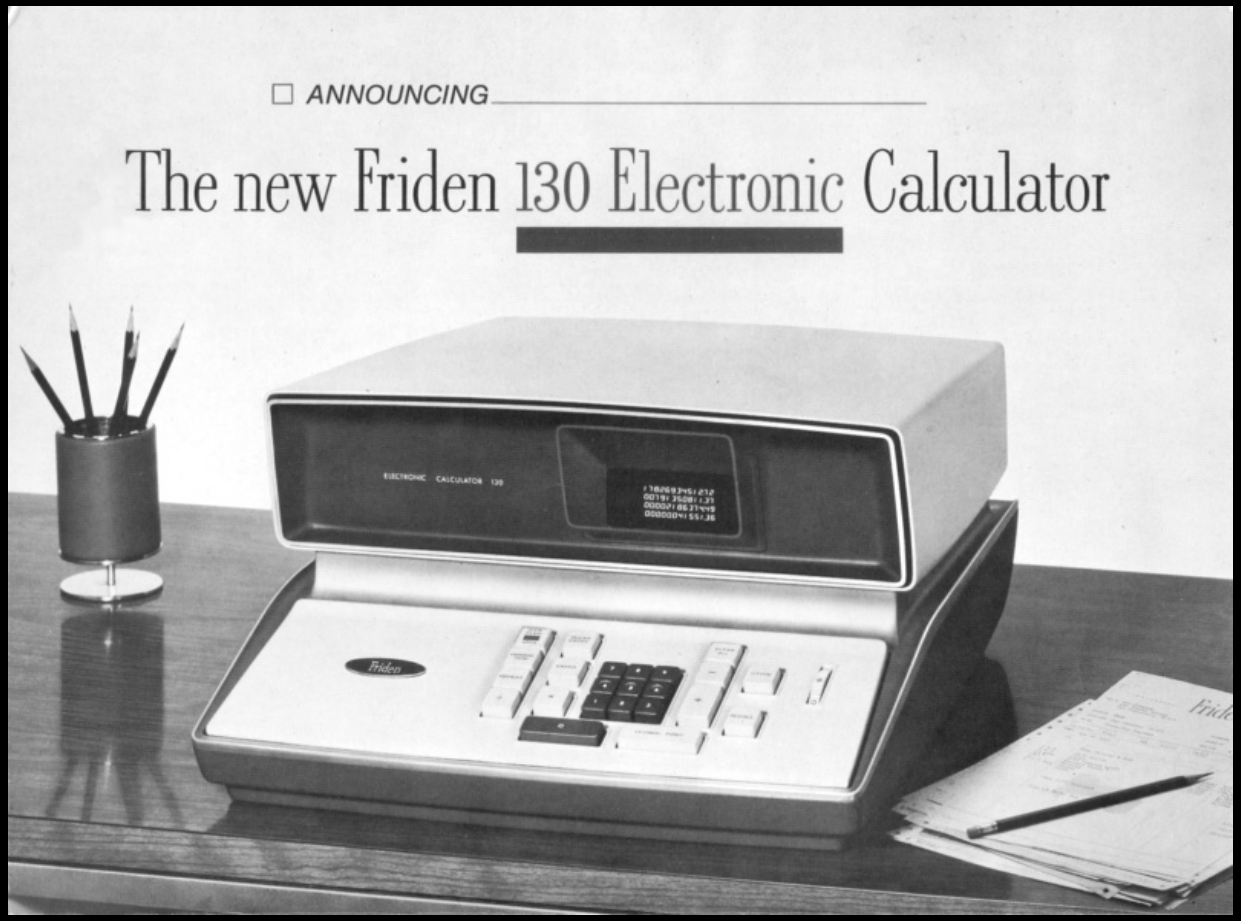
1960, PDP1



1962, Spacewar!

1963, Sutherland, Sketchpad

1963, Friden 130



1964, Mathatron

how to get a quick tan

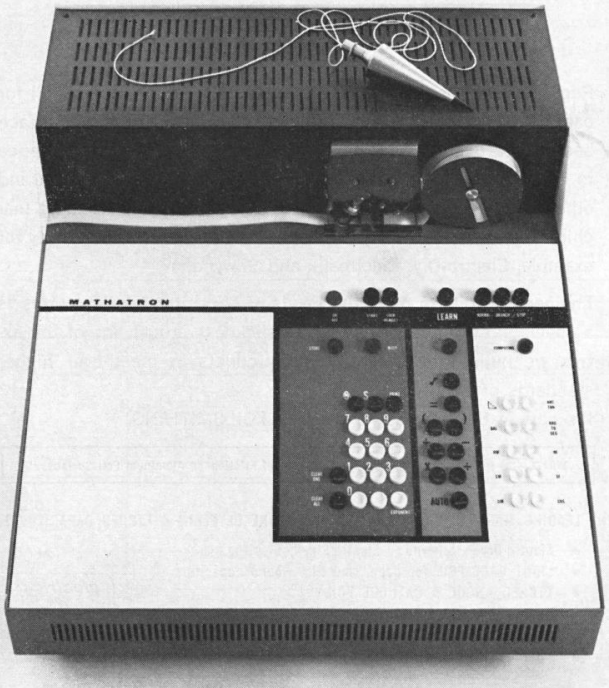
Or arctan for that matter. Trignometric functions are solved in a few seconds on Mathatron, the $5,000 digital computer.

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 $\pm 10^{-42}$ to 10^{+58} • Speed 100 accumulations per second • Optional prewired programs for special applications.



MATHATRONICS

a division of Barry Wright Corporation BW

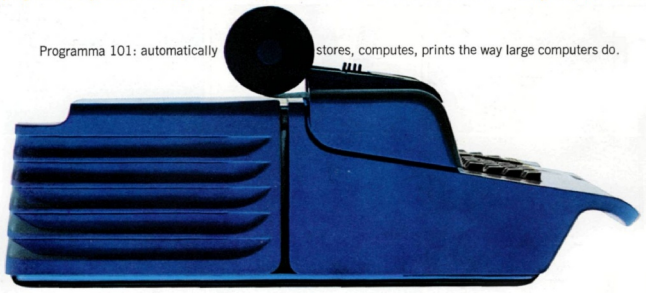
241 Crescent Street, Waltham, Massachusetts 02154, Telephone: 617-893-1630

1965, Olivetti Programma 101...

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.

Programma 101: automatically stores, computes, prints the way large computers do.



... presentato personale

1966, Engelbart workstation

1968, HP 9100

$4900

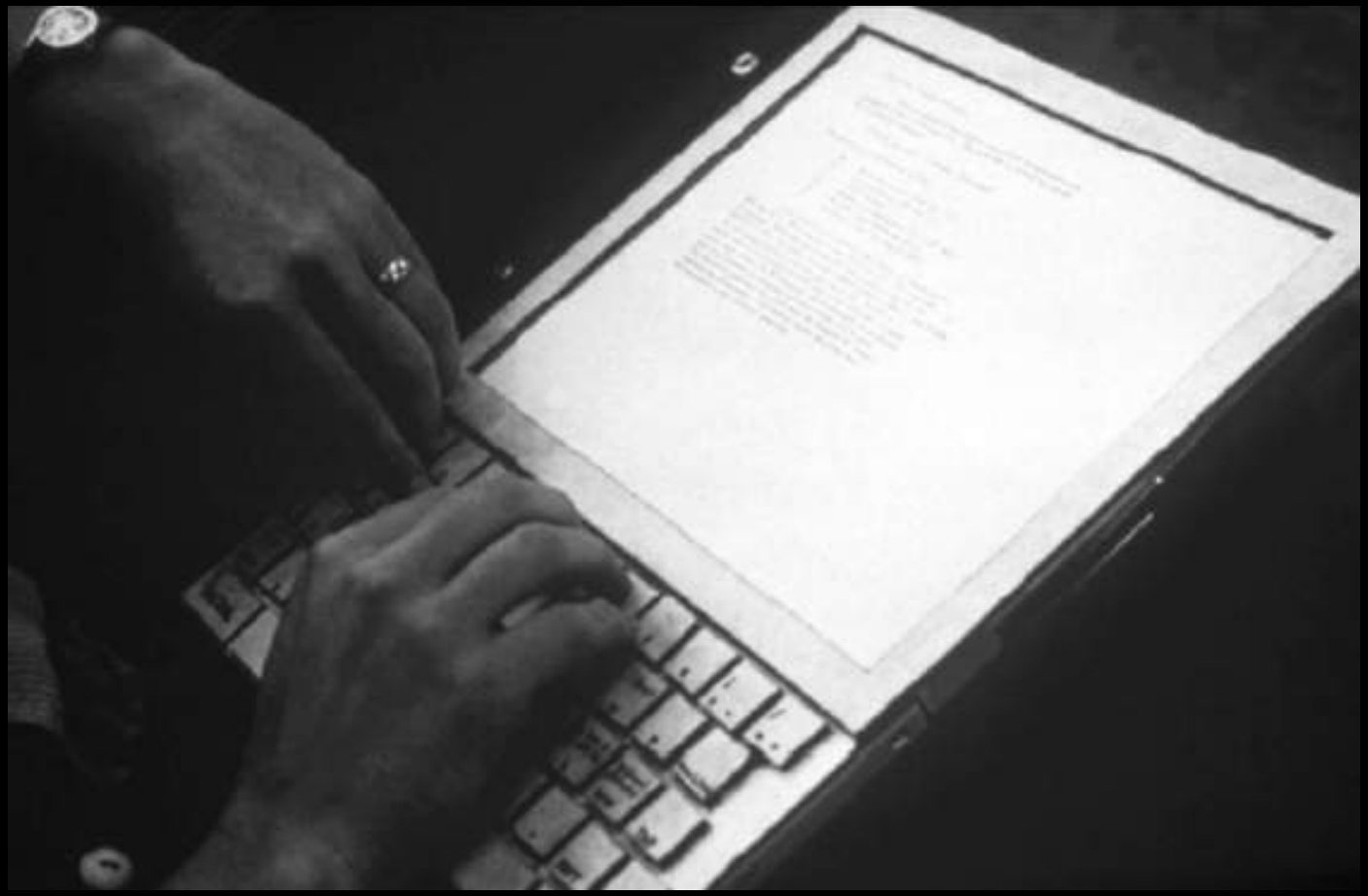
READY, WILLING AND ABLE.

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.
The new Hewlett-Packard 9100A electronic genie.

1972, Kay, Dynabook (concept)



1973, Xerox Alto

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

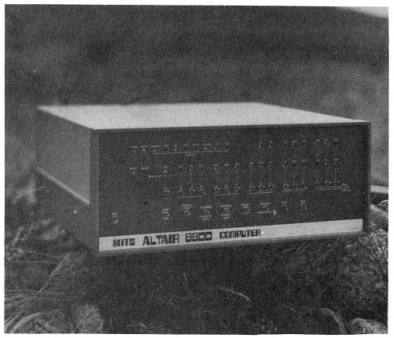
☐ I would like more information about IBM's new 5100.
☐ I would like a demonstration of IBM's new 5100.
My major area of interest is:
☐ Engineering/Scientific ☐ Statistical Analysis
☐ Business/Financial Analysis

Name_____
Title_____
Company_____
Address_____
City_____ State_____ Zip_____
Phone_____

1975, Altair 8800

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 fullfill 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.

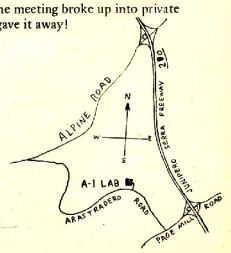
We got into a short dispute over HEX or Octal until someone mentioned that if you are setting the switches by hand it doesn't make any difference. Talked about other standards: re-start locations? input ports? better operating code for the 8080? paper tape or cassettes or paper & pencil listings? Even 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!

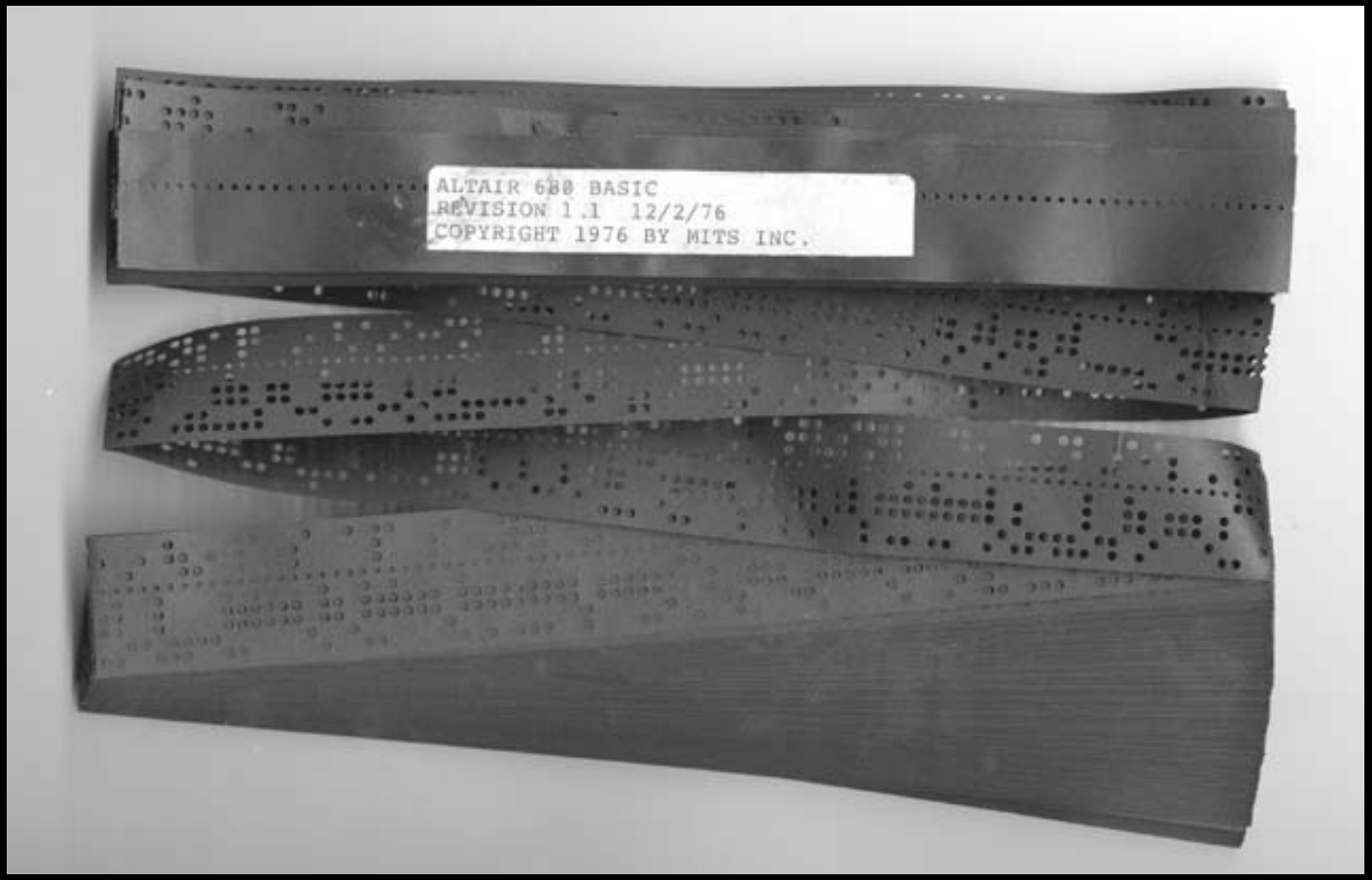
NEXT MEETING WEDNESDAY, MARCH 19th, 7 PM at Stanford's Artificial Intellegence Laboratory, Conference room, Arastradero Road in Portola Valley. Look for this road sign: D C Power Lab



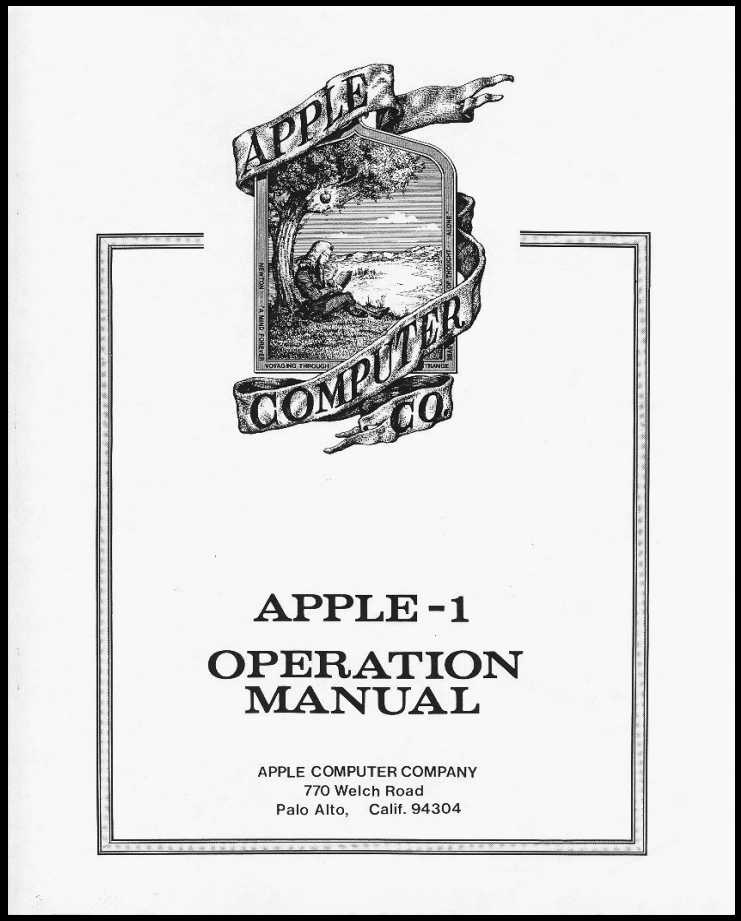
Announcement:

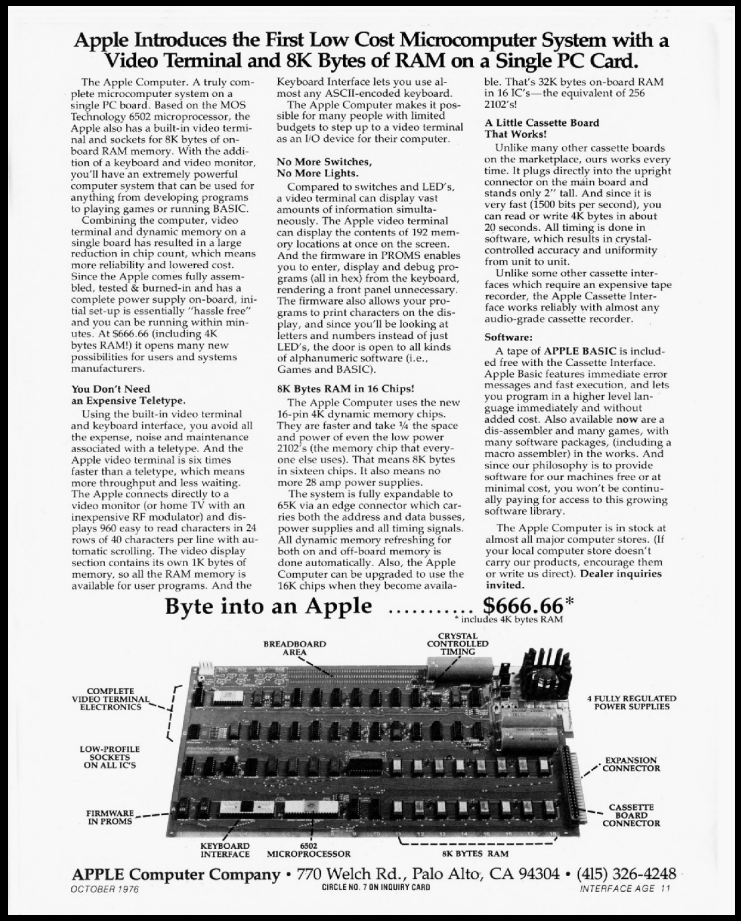
Texas Instruments Learning Center is presenting an early morning home television series, April 15 - 18, on "Introduction to Microprocessors." In the San Jose - Bay Area this program will be on channel 11 at 6:00 AM.

1975, Microsoft



1976, Apple





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

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

CIRCLE NO. 7 ON INQUIRY CARD

ma allora, chi ha inventato il PC?

- Nessuno “ha inventato” il PC
- Molti hanno partecipato
  - a definire l’idea di calcolatore personale
  - a porre le basi scientifiche che la rendono fattibile
  - a mettere a punto le tante tecnologie che la realizzano
  - a costruire le imprese che l’hanno diffusa come prodotto
- Fra l’altro
  - non si può sostenere che la ricerca ha bisogno di risorse alimentando la fede nei colpi di genio dei singoli :)

Caso n. 2

Fermi e la CEP

retorica e convenienza

"l'ultimo dono di Fermi"

- Citazione da Giulio Racah
  - espressione usata in un seminario a Fisica a Pisa, nel 1958
  - ripresa poi da molti, con qualche aggiunta

> Passiamo ora al terzo caso, la CEP - ossia Calcolatrice Elettronica Pisana - realizzata all'Università di Pisa. All'origine di questa iniziativa c'è Enrico Fermi, ex studente dell'università, che nel '54, durante una visita alla sua Alma Mater, suggerì appunto di costruire un calcolatore elettronico. Ma ecco in breve l'antefatto. L'Università aveva ricevuto dei fondi da alcuni enti locali per realizzare nell'area pisana un sincrotrone, un acceleratore di particelle per ricerche di fisica nucleare. Fermi suggerì invece di utilizzare questi fondi per progettare un calcolatore elettronico.

(Filippazzi, 2008, Udine)

Fermi scrisse...

Fermi
ad Avanzi,
11.08.54

Caro Professore,

in occasione del mio soggiorno alla Scuola di Varenna i professori Conversi e Salvini mi hanno accennato la possibilità che l'Università di Pisa possa disporre di una somma veramente ingente destinata a favorire il progresso e lo sviluppo della ricerca in Italia.

Interrogato circa le varie possibilità di impiego di tale somma, quella di costruire in Pisa una macchina calcolatrice elettronica mi è sembrata, fra le altre, di gran lunga la migliore.

Essa costituirebbe un mezzo di ricerca di cui si avvantaggerebbero in modo, oggi quasi inestimabile, tutte le scienze e tutti gli indirizzi di ricerca.

Mi consta che l'Istituto per le Applicazioni del Calcolo, diretta dal prof. Picone, ha in corso di acquisto una macchina del genere . Non mi sembra però che questa circostanza diminuisca il bisogno che di tale macchina verrà ad avere un centro di studi come l'Università di Pisa. L'esperienza dimostra che la possibilità di eseguire con estrema speditezza e precisione calcoli elaborati crea ben presto una sì grande domanda di tali servizi che una macchina sola viene presto saturata. A questo si aggiungono i vantaggi che ne verrebbero agli studenti e agli studiosi che avrebbero modo di conoscere e di addestrarsi nell'uso di questi nuovi mezzi di calcolo.

Con molti cordiali e distinti saluti.

... su richiesta

Conversi a Picone e altri colleghi, 07.10.54

Nella lettera che, su richiesta del Prof. Ber=
nardini e mia, il Prof. Fermi ha inviato al Rettore dell'Univer=
sita' di Pisa per caldeggiare l'impiego della somma disponibi=
le a favore di una calcolatrice elettronica, egli precisa co=
me la "possibilita' di eseguire con estrema prontezza e pre=
cisione calcoli elaborati, crea ben presto una si' grande do=
manda di tali servizi che una macchina sola vien presto satura=
ta".

il contesto

- Politici titubanti: ah, il sincrotrone
  - “esercitava maggior influsso sull’opinione pubblica”
  - “spettacolare per la propaganda che facilmente si fatta”
  - Pagni e Maccarrone, riunione in Rettorato, 04.10.1954
- Resistenze interne
  - dubbi sulle competenze, opportunità per l’edilizia
  - carteggio Pistolesi-Avanzi, 21-31.01.55
- Resistenze esterne
  - Picone e l’INAC di Roma: 2 calcolatori anzi 3! Troppi!
  - lettera Ghizzetti-Conversi 26.10.54

la regia di Conversi/Bernardini

- Alla scuola estiva di Varenna
  - coinvolgere tutta la comunità dei fisici nella scelta
  - ottenere l'appoggio concreto (e sincero) di Fermi
- Prevenire Picone
  - la seconda parte della lettera di Fermi è per Picone
  - e così è usata nella lettera preventiva di Conversi (07.10.54)
  - e in quella successiva di Bernardini a Picone (11.11.54)
- Giocare la carta Fermi
  - "il suggerimento del compianto prof. Enrico Fermi"
  - così si apre la decisiva riunione a Fisica del 12-13.01.55

un resoconto ufficiale

da Notizie concernenti il CSCE, 26.03.58

Il Centro Studi Calcolatrici Elettroniche dell'Università di Pisa è stato istituito nella primavera del 1955 utilizzando un congruo finanziamento che le Province ed i Comuni di Pisa, Livorno e Lucca avevano a suo tempo generosamente offerto per contribuire alla costruzione, in prossimità di Pisa, dell'elettrosincrotrone nazionale da un miliardo di volteletttroni. Dopo la scelta di Frascati (Roma) come sede dell'elettrosincrotrone nazionale ed in seguito alle consultazioni che i professori di Fisica dell'Università di Pisa ebbero a Varenna nel luglio 1954 con vari fisici di fama internazionale, tra i quali è doveroso ricordare, in particolare, il nome di Enrico Fermi, il finanziamento offerto dagli Enti Locali per avere il Sincrotrone in prossimità di Pisa, fu devoluto a favore della nuova iniziativa.

il dono di Fermi

- La partecipazione e, soprattutto, la lettera
  - probabilmente decisiva per sostenere una scelta difficile
  - e in effetti così l'intendeva Racah
- Ma è una storia complicata
- L'altra sceneggiatura scorre meglio
  - il genius ex machina che sorprende – invece del sincrotrone
  - non si espongono le dialettiche interne all'Ateneo
  - né le rivalità fra istituzioni di ricerca
  - non occorre svelare i dubbi e i calcoli dei politici

Caso n. 3

Le lampadine parlanti

rappresentazione scenografica

dannati calcolatori

- Quando lavorano non si vede!
- E invece qualcosa deve succedere
  - i bip funzionano sempre (anche su Repubblica)
  - i nastri scattosi, un peccato non si usino più
- L'ultima moda sono i megaschermi touch/kinect
  - spopolano in film e telefilm
  - una pietra miliare: Minority Report
  - con un'ulteriore chicca

Minority Report, 2002, Spielberg

il vero classico

- Lampadine!
- Luci, lucine e lucette
  - si accendono e si spengono, lampeggiano
  - spesso secondo pattern regolari e geometrici
  - esprimono modernità e complessità
  - ma l'ordine sottointende una logica comprensibile
  - una comunicazione per pochi
- Peccato che nella realtà non fossero proprio così

Desk Set, 1957, W. Lang

Alien, 1979, R. Scott

Macchina Ridotta, 1957-2012

una realtà improponibile

- Le luci c'erano
  - ma il loro comportamento era caotico e incomprensibile
- I calcolatori erano "più veloci delle luci"
  - sulla MR i bit cambiavano ogni 4 o 8 μs
  - mentre a uno Z50T, che pure era veloce, occorrevano
    - 50 μs per accendersi
    - e 200 μs per spengersi
  - le luci si leggevano solo a macchina ferma e bit stabili
- Quindi largo alle licenze sceniche

riferimenti e appuntamenti

- Materiale
  - presentazioni
  - articoli
  - documenti di archivio
  - simulatori
- Museo
  degli Strumenti
  per il Calcolo