Computer Ethics
Historical Notes

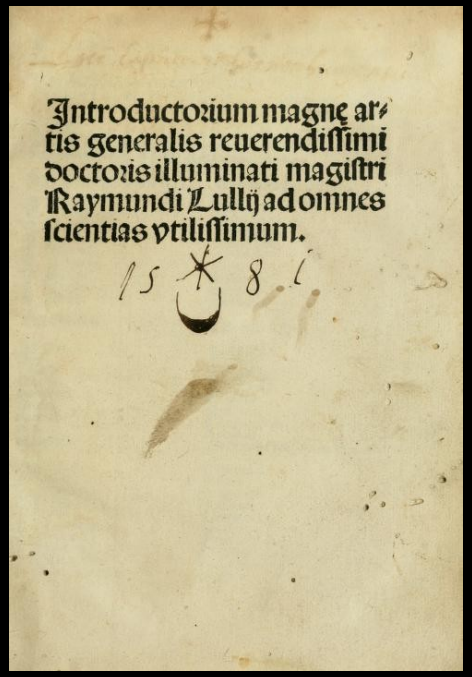
Norberto Patrignani

The Dream of a "*Reasoning*" Machine

1274: Ramon Lull

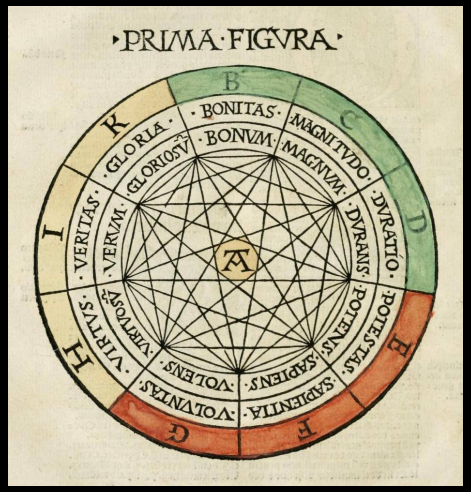
Ars Magna

Ramon Lull
(Raimundo Lulio)
(1232-1315)



Introductorium magnę artis generalis reuerendissimi doctoris illuminati magistri Raymundi Lullij ad omnes scientias vtilissimum.

1581



- Ars Magna: a Logical Device/Method for arriving at T**rue Knowledge** ...
- Logical Machines ... by moving a lever

the Propositions would prove themselves to be True or False!

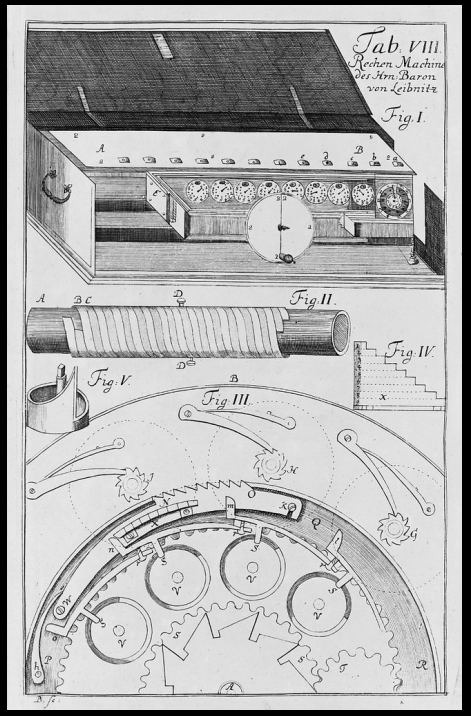
Source: Gardner, Martin. "The Ars Magna of Ramon Lull." In Logic Machines, Diagrams and Boolean Algebra. New York: Dover Publications, 1968

1671: Leibniz Machine

A system for Human Knowledge

Gottfried W. Leibniz
(1646 - 1716)

- Binary System
- Calculus (at the same time of Newton!)
- A system to collate all human knowledge
- All reasoning and discovery = A combination of basic elements such as numbers, letters, sounds and colors (inspired by Lull)
- Mathematics is the language of nature
- Everything can be understood through numbers (Pythagoras)
- Universe = a clock without maintenance and support



"The only way to rectify our reasonings is to make them as tangible as those of the Mathematicians, so that we can find our error at a glance, and when there are disputes among persons, we can simply say: ***Let us calculate****, without further ado, to see who is right"*

Leibniz

Source: (1951), Leibniz: Selections, P. P. Wiener (Ed. Trans.), New York: Scribner, p. 51

Source: "Dissertatio de arte combinatoria", 1666; "Leibniz: A Biography", E.J.Aiton, Hilger (UK), 1985

1714: Leibniz
The ideas of his youth never left him

Gottfried W. Leibniz
(1646 - 1716)

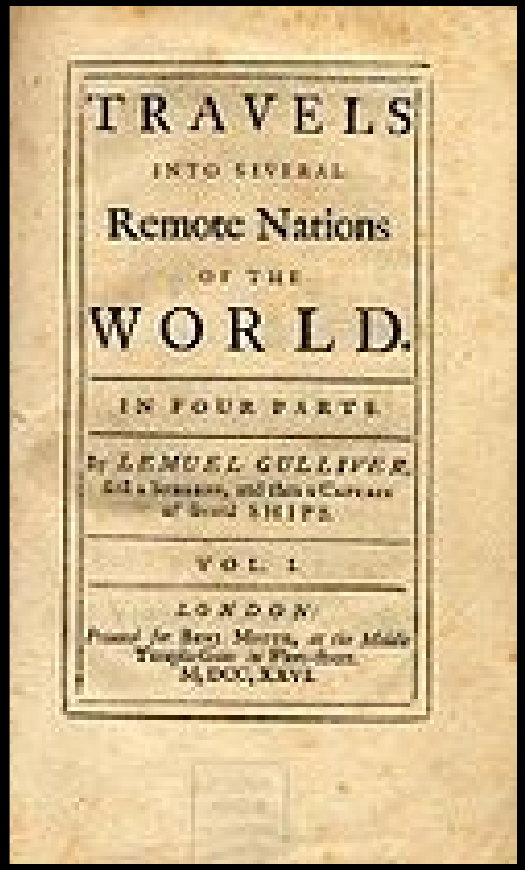
"... I should venture to add that if I had been less distracted, or if I were younger or had talented young men to help me, I should still hope to create a kind of spécieuse générale, in which <u>all truths of reason would be reduced to a kind of calculus</u>. At the same time this could be <u>a kind of universal language</u> ..."

Gottfried Leibniz, 1714
(2 years before his death)

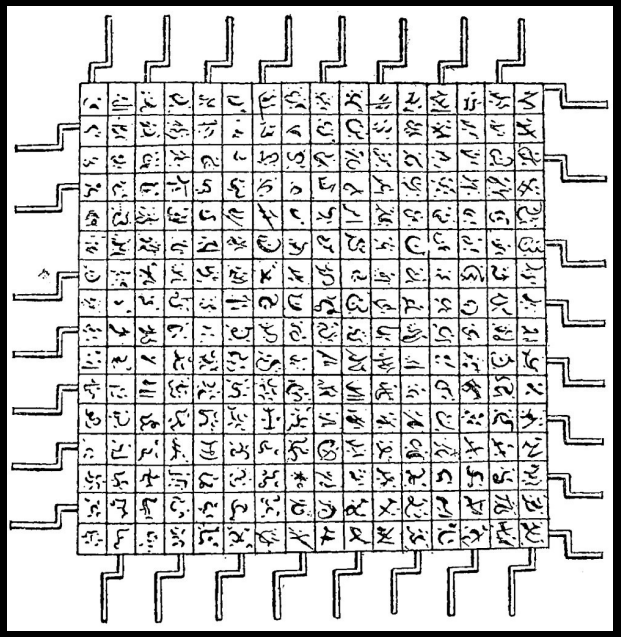
Source: Quoted in Rutherford, D. (1995) "Philosophy and Language in Leibniz" in The Cambridge Companion to Leibniz, N. Jolley (Ed.), Cambridge, UK: Cambridge University Press, p. 239

1726: Gulliver's Travels by Jonathan Swift

JonathanSwift
(1667-1745)



TRAVELS
INTO SEVERAL
Remote Nations
OF THE
WORLD.
IN FOUR PARTS.
By LEMUEL GULLIVER,
VOL. I.
LONDON:
MDCCXXVI.



"***the engine***"

Jonathan Swift's satirical classic Gulliver's Travels (1726) parodied the mechanical conception of invention advanced by Llull and Leibniz.
In the fictional city of Lagado, the protagonist encounters a **device** known as "***the engine***" which is intended by its inventor to enable anyone to
"*... write books in philosophy, poetry, politics, laws, mathematics, and theology, without the least assistance from genius or study*"

Source: Jonathan Swift (1899) Gulliver's Travels into Several Remote Nations of the World, London, George Bell and Sons, pp. 191-192.

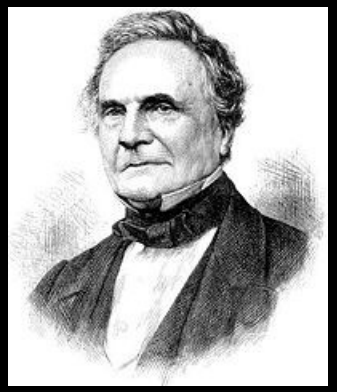
1831: Torino!

1831: Calendario Meccanico Universale

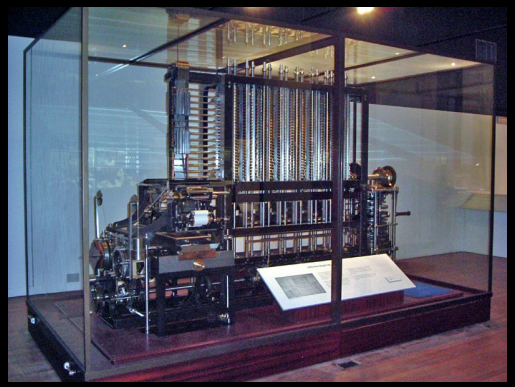
Giovanni Plana
(1781 - 1864)

Calendario Meccanico Universale, 1831-1835, Cappella dei Mercanti, Via Garibaldi 25, Torino
Studio dei 3 studenti del Politecnico di Torino: Cappato Roberto, Spano Sergio, Nasiri Meysam
http://www.cappelladeimercanti.it/calendariouniversale/

1834: The Analytical Engine



Charles Babbage
(London, England, 1791 - 1871)



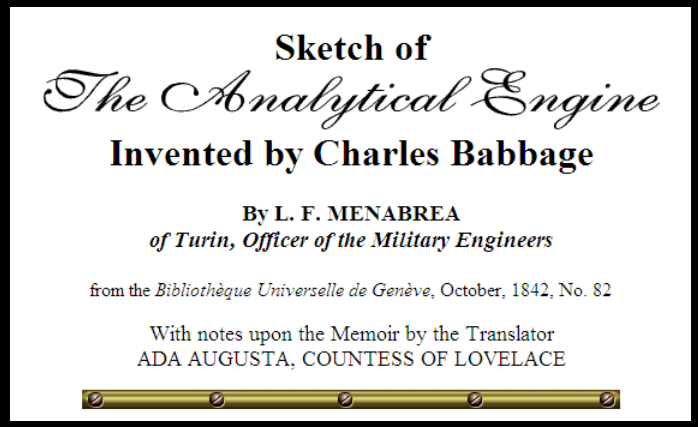
Difference Engine (replica), London Science Museum

<u>Computer</u>
Latin origin: "*cum-putare*" (that is, "*together-cut*", "*compare and extract a result*")

1842: Luigi Federico Menabrea

Giovanni Plana
(1781 - 1864)

Luigi Federico Menabrea
(1809-1896)



Sketch of

The Analytical Engine

Invented by Charles Babbage

By L. F. MENABREA
of Turin, Officer of the Military Engineers

from the *Bibliothèque Universelle de Genève*, October, 1842, No. 82

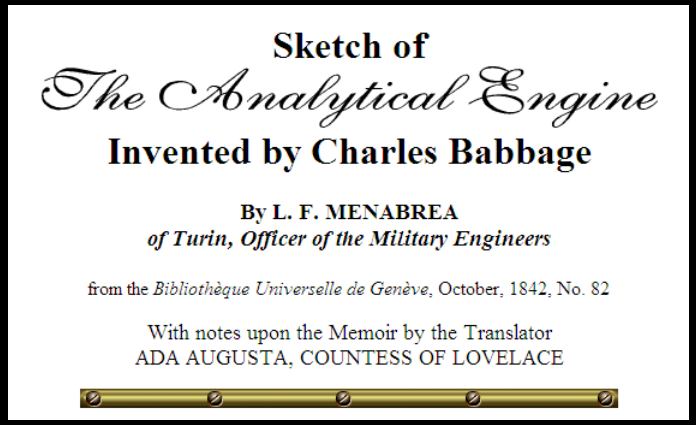
With notes upon the Memoir by the Translator
ADA AUGUSTA, COUNTESS OF LOVELACE

1840, Torino
II Congresso Scienziati Italiani
invita Charles Babbage

1843: The 1st Programmer in History

Ada Byron
(1815 - 1852)

(daughter Anne Isabella Milbanke - George Gordon Byron)



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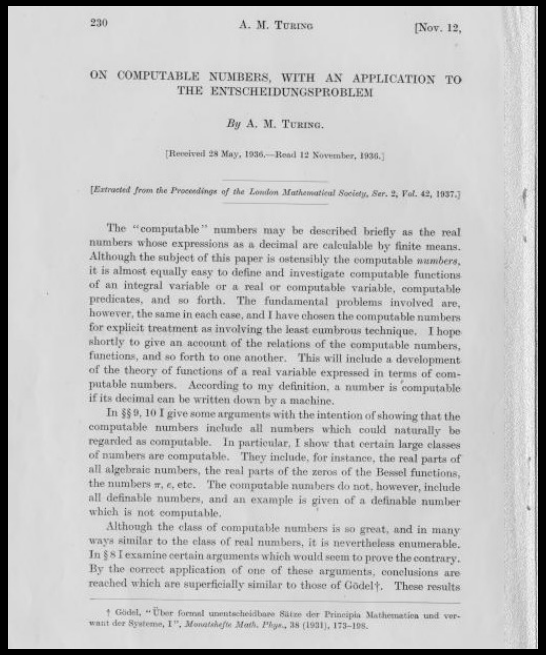
Poetical Science: ability by using imagination and metaphor
to evaluate accurately a concept or an idea.
Babbage was focused on number crunching
She developed a **vision of the capability of computers to go beyond mere calculating**

Source: Ada Byron, Notes by the Translator on L. F. Menabrea's Sketch of the Analytical Engine Invented by Charles Babbage. 1842.

1937: Turing Machine



230 A. M. TURING [Nov. 12,

ON COMPUTABLE NUMBERS, WITH AN APPLICATION TO THE ENTSCHEIDUNGSPROBLEM

By A. M. TURING.

[Received 28 May, 1936.—Read 12 November, 1936.]

[*Extracted from the Proceedings of the London Mathematical Society, Ser. 2, Vol.* 42, 1937.]

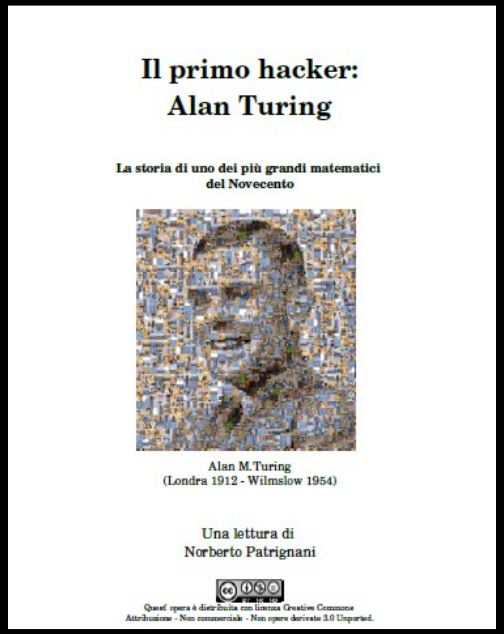
The "computable" numbers may be described briefly as the real numbers whose expressions as a decimal are calculable by finite means. Although the subject of this paper is ostensibly the computable *numbers*, it is almost equally easy to define and investigate computable functions of an integral variable or a real or computable variable, computable predicates, and so forth. The fundamental problems involved are, however, the same in each case, and I have chosen the computable numbers for explicit treatment as involving the least cumbrous technique. I hope shortly to give an account of the relations of the computable numbers, functions, and so forth to one another. This will include a development of the theory of functions of a real variable expressed in terms of computable numbers. According to my definition, a number is computable if its decimal can be written down by a machine.

In §§ 9, 10 I give some arguments with the intention of showing that the computable numbers include all numbers which could naturally be regarded as computable. In particular, I show that certain large classes of numbers are computable. They include, for instance, the real parts of all algebraic numbers, the real parts of the zeros of the Bessel functions, the numbers π, e, etc. The computable numbers do not, however, include all definable numbers, and an example is given of a definable number which is not computable.

Although the class of computable numbers is so great, and in many ways similar to the class of real numbers, it is nevertheless enumerable. In § 8 I examine certain arguments which would seem to prove the contrary. By the correct application of one of these arguments, conclusions are reached which are superficially similar to those of Gödel†. These results

† Gödel, "Über formal unentscheidbare Sätze der Principia Mathematica und verwandt der Systeme, I", *Monatshefte Math. Phys.*, 38 (1931), 173–198.

Alan Turing
(London, UK, 1912 - Wilmslow, UK, 1954)



Il primo hacker: Alan Turing

La storia di uno dei più grandi matematici del Novecento

Alan M.Turing
(Londra 1912 - Wilmslow 1954)

Una lettura di
Norberto Patrignani

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www.bookliners.com

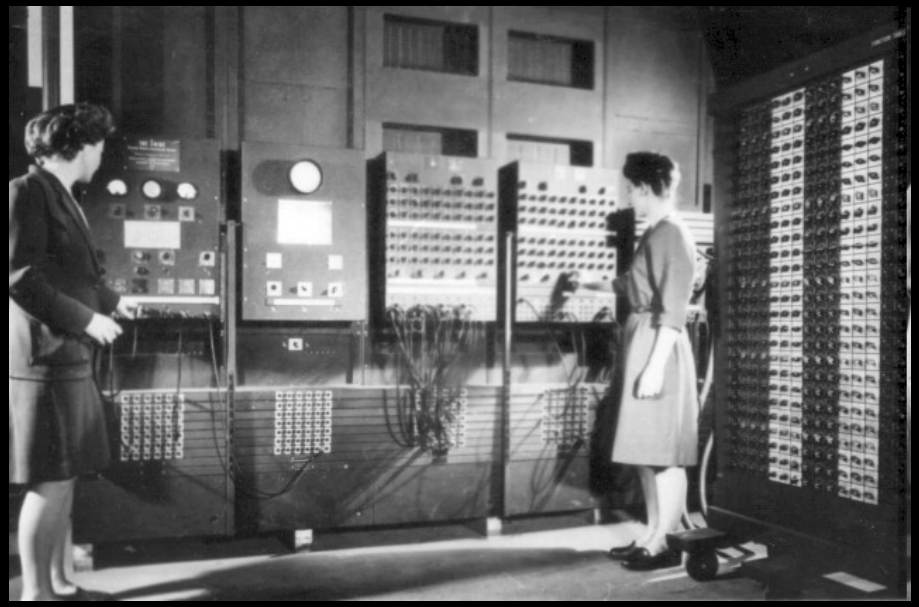
Source: Turing A., "On computable numbers, with an application to the Entscheidungsproblem" from Proceedings of the London Mathematical Society, (Ser. 2, Vol. 42, 1937)

1943: ENIAC

1943, US Army Ballistic Research Lab commissioned ENIAC (Electronic Numerical Integrator Analyzer and Computer) Commissioned to University of Pennsylvania

Source: Edwards, Paul. The Closed World: Computers and the Politics of Discourse in Cold War America. Cambridge, MA: MIT Press, 1997

1945, ENIAC's First 6 Programmers



U.S.Army Photo - Left: Jean Bartik, Right: Frances Spence

Kay Antonelli

Betty Holberton

Frances Spence

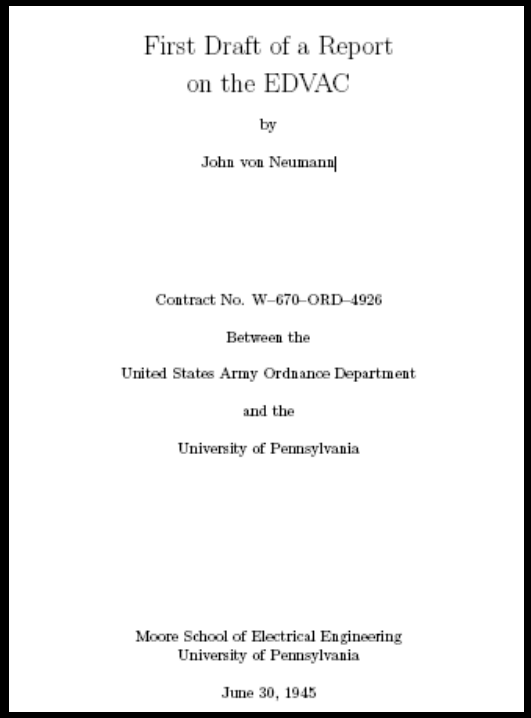
Marlyn Meltzer

Ruth Teitelbaum

Jean Bartik

1945: Von Neumann Architecture

John Von Neumann
(Budapest, 1903 - Washington, USA, 1957)



First Draft of a Report
on the EDVAC

by

John von Neumann

Contract No. W–670–ORD–4926

Between the

United States Army Ordnance Department

and the

University of Pennsylvania

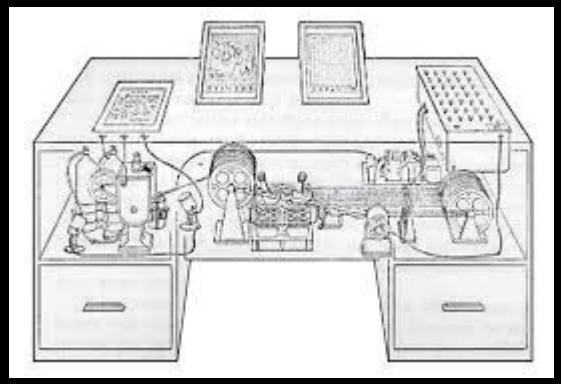
Moore School of Electrical Engineering
University of Pennsylvania

June 30, 1945

Source: "First Draft of a Report on the EDVAC", J.V.Neumann Moore School of Electrical Engineering, University of Pennsylvania, 1945

1945: Vannevar Bush's MEMEX

Vannevar Bush
(1890-1974)



A kind of "*personal knowledge management system*"
an hypotetical "hypertext" system in which people could *store* all their books, records, communications, etc. and then that could be used for
retrieving such information... (the Web 50 years before!)

Source: Bush V. (1945), "As we may think", *The Atlantic*, July 1945

1947: BIT (Binary digIT)

John Tukey
(1915 - 2000)

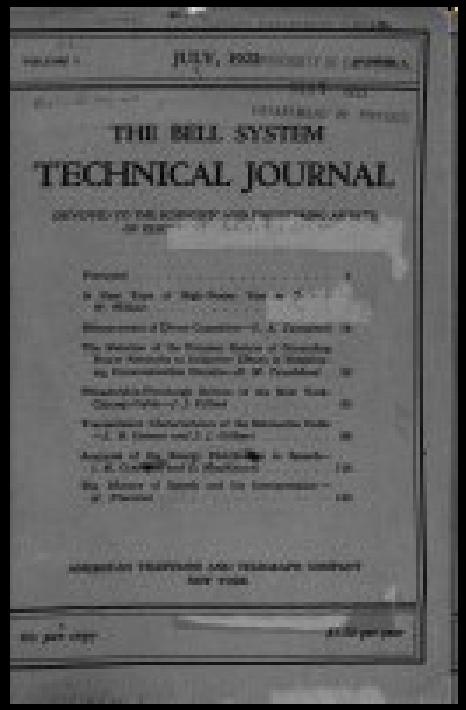
Bell Labs, Internal Memo, 9 January 1947

1947: Transistor

Source: 1947: December, Bell Labs First practical point-contact transistor, William Shockley, John Bardeen, Walter Brattain

1948: Information Theory

Claude Shannon
(Petoskey, MI, USA, 1916 - Medford, MA, USA, 2001)



Source: Shannon C., "A Mathematical Theory of Communication", C.Shannon, Bell System Technical Journal, 1948

Shannon Entropy

$$\mathrm{H}(X) = \sum_i \mathrm{P}(x_i)\,\mathrm{I}(x_i) = -\sum_i \mathrm{P}(x_i)\log_b \mathrm{P}(x_i)$$ (bits)

Shannon Entropy = Expected Value (average) of the Information Contained in Each Message

$b=2,\ \mathrm{P}(x_i) = 2^{-n},\ m=2^n$

$$\mathrm{H}(X) = -\sum_{i=1}^{m} \mathrm{P}(x_i)\log_2 \mathrm{P}(x_i) = -\sum_{i=1}^{m} (2^{-n})\log_2(2^{-n}) = -\log_2(2^{-n})\boxed{\sum_{i=1}^{m}(2^{-n})}$$

$$\boxed{\sum_{i=1}^{m} \mathrm{P}(x_i) = \sum_{i=1}^{2^n}(2^{-n}) = 1}$$

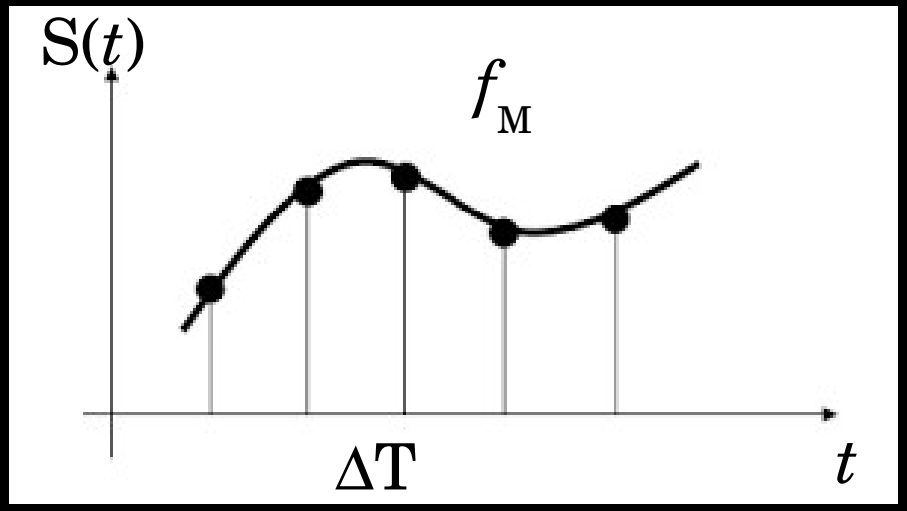
$$\mathrm{H}(X) = -\log_2(2^{-n})\,(1) = -(-n)\log_2(2)\,(1) = -(-n)\,(1)\,(1) = n$$ **(bits)**

$\log_2(\boldsymbol{m})$ bits needed to represent a variable that can take one of $\boldsymbol{m}$ values

if $\boldsymbol{m}$ is a power of 2, $\boldsymbol{m}=2^{\mathbf{n}}$, if these values are <u>equally probable</u>,
the Entropy equal to the number of bits **n**

1949: Teorema di Nyquist-Shannon

Harry Nyquist
(1889–1976)

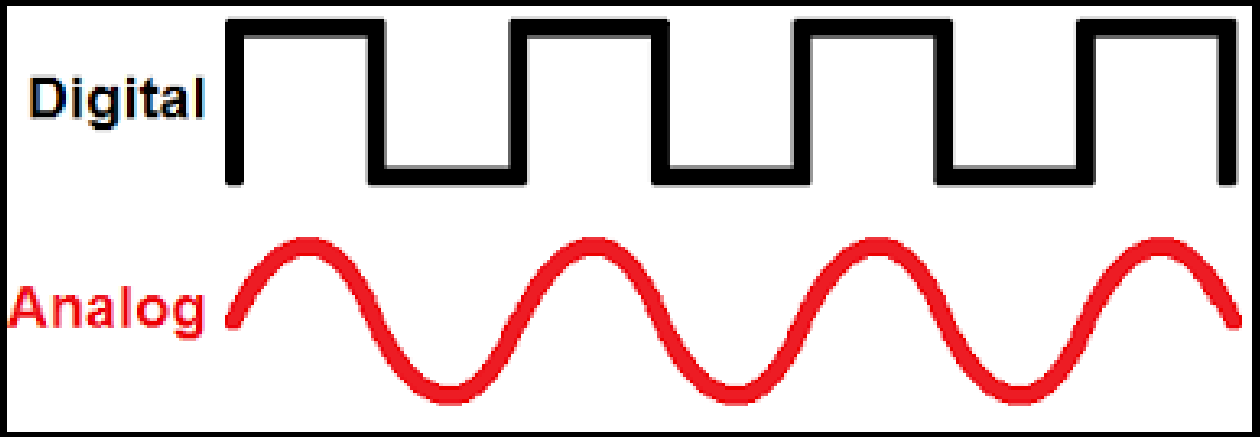


Claude Shannon
(1916 - 2001)

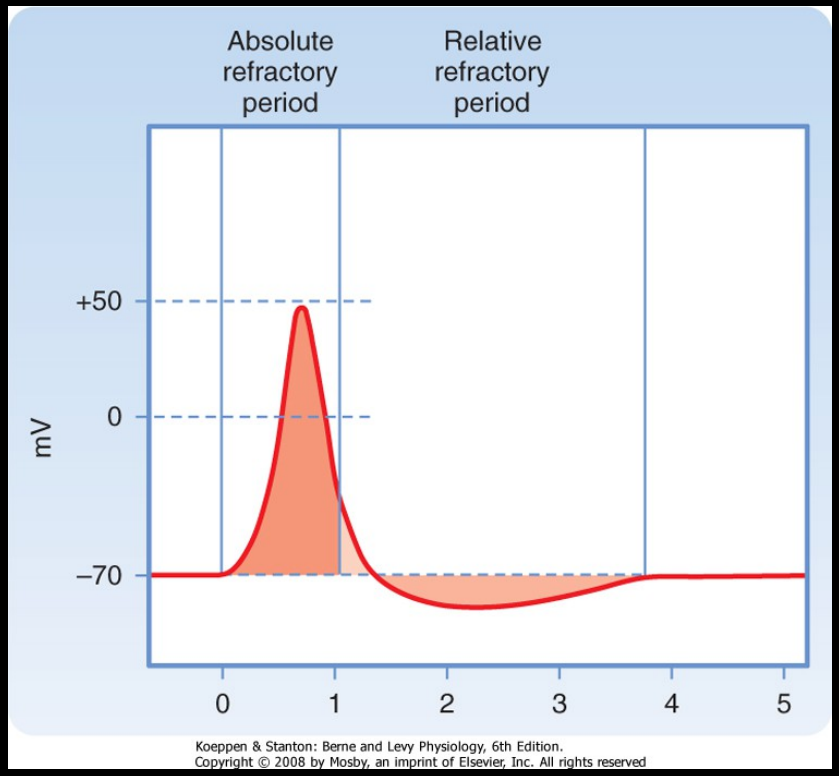
Dato un segnale analogico S(t)
la cui banda di frequenze sia limitata dalla frequenza f_M,
il segnale S(t) puo' essere univocamente ricostruito
a partire dai suoi campioni
presi a frequenza $f_S = 1 / \Delta T$ se $f_S > 2 f_M$

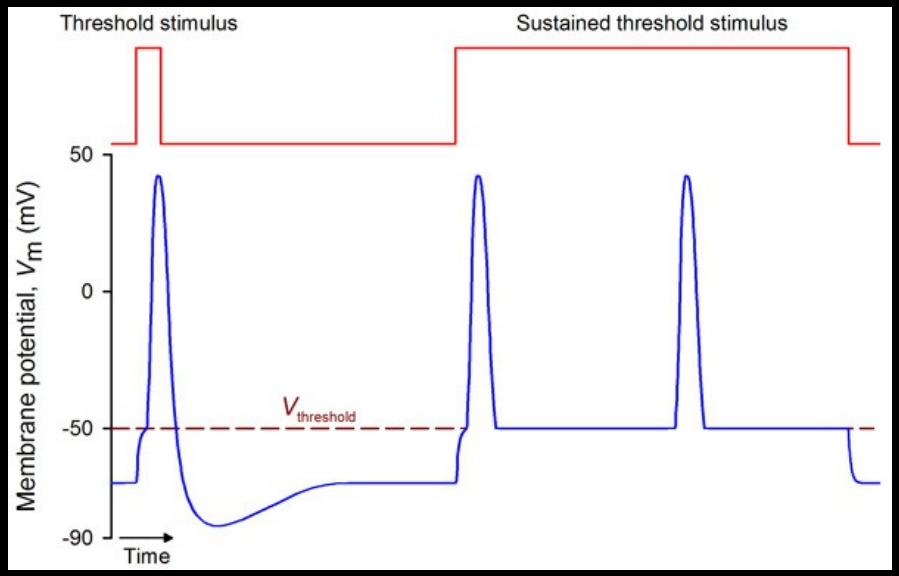
(es. f_M = 20 KHz, f_S > 40 KHz, $\Delta T < 1/40.000 = 2.5\ 10^{-5}$ sec. = 25 μsec)

Analogico - Digitale

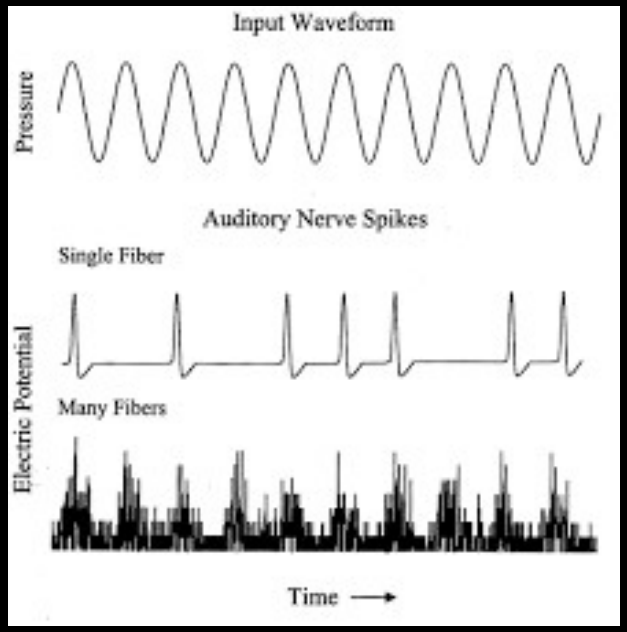


Nervous Spike



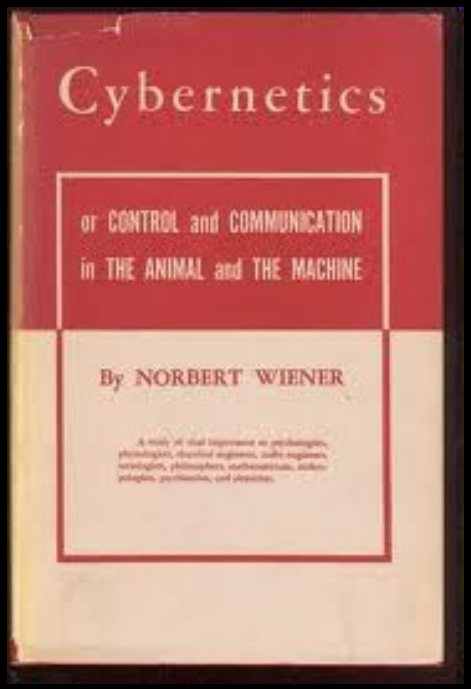


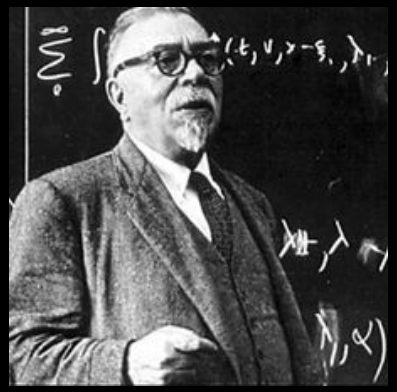
f ≈ 500 Hz



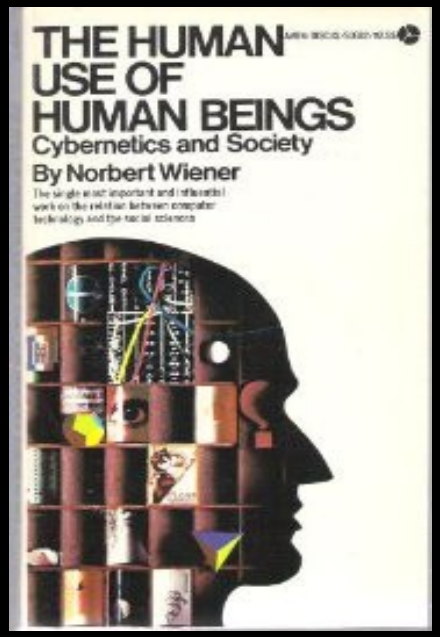
1950: Norbert Wiener
Founder of Computer Ethics

*"**Information** is neither **Matter** nor **Energy**,*
but it needs Matter for its Embodiment
and Energy for its Communication"





Norbert Wiener
(1894 - 1964)



"I do not expect to publish
any future work of mine
which may do damage
in the hands of irresponsible militarists..."

"A Scientist Rebels"
Atlantic Monthly, January, 1947

Source:
Wiener N., "Cybernetics: or Control and Communication in the Animal and the Machine", 2nd ed. Cambridge, MA: MIT Press, 1948
Wiener N., "The Human Use of Human Beings. The Riverside Press (Houghton Mifflin Co.), 1950

Deaf Prosthesis, Wiener, 1950

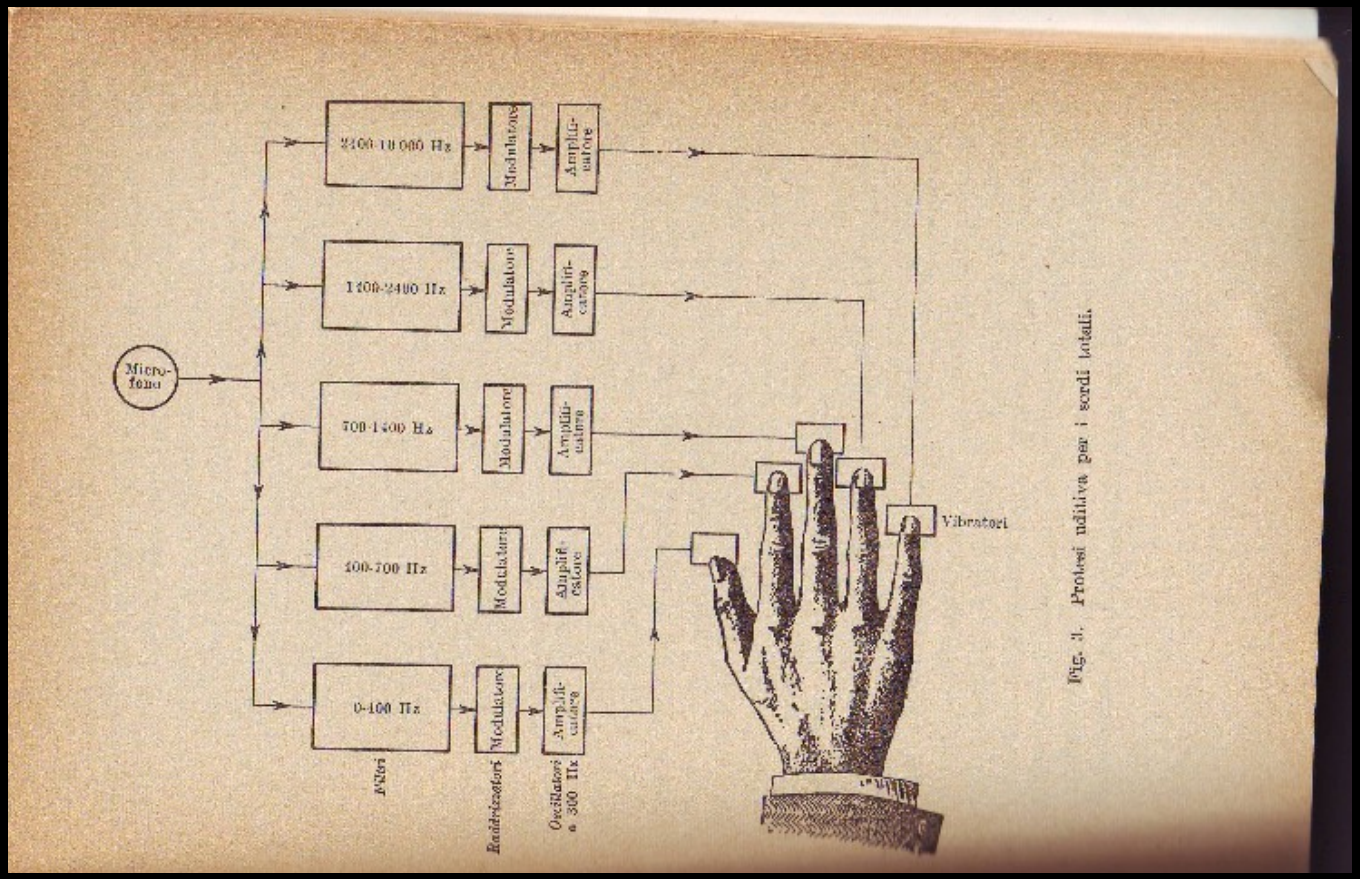


Fig. 3. Protesi uditiva per i sordi totali.

Source: Wiener N., "The Human Use of Human Beings. The Riverside Press (Houghton Mifflin Co.), 1950 (trad.it. "Introduzione alla cibernetica", Bollati-Boringhieri, 1966)

Algoritmo

(Al-Khwarizmi, c.825 d.c.)

Alan Turing
(1912 - 1954)

Kurt Godel
(1906 - 1978)

Alonzo Church
(1903–1995)

Algoritmo (1950)

Procedimento esplicito descrivibile con un **numero finito di regole** che conduce al risultato dopo un **numero finito di passi.**
Tutti i **programmi per computer** sono **algoritmi!**

Caratteristiche di un Algoritmo

1. Neutralita'

rispetto al substrato, la potenza della procedura e' dovuta alla sua struttura logica, non al materiale con cui e' realizzata, puo' essere eseguita con carta e penna oppure da ... un computer!

2. Non necessita di una mente

la procedura e' talmente semplice da essere eseguibile da un meccanismo automatico, come una *ricetta per cuochi principianti*!

3. I risultati sono garantiti

se lo si esegue senza errori

Source: Daniel C.Dennett, Strumenti per pensare, Cortina, 2014

1951: UNIVAC-I

UNIVAC I (UNIVersal Automatic Computer I), First commercial computer made in the United States, Remington Rand

1952: 1st Compiler for Computer Languages

Grace Murray Hopper
(1906 - 1992)

"A ship in port is safe;
but that is not what ships are for
- sail out to see and do new things."
Grace Murray Hopper

Source: 2006, The Yale Book of Quotations by Fred R. Shapiro, Section: John A. Shedd, Page 705, Yale University Press, New Haven.
http://amhistory.si.edu/archives/images/d8324-3.jpg

1958: Integrated Circuits

First Integrated Circuit, Jack Kilby, Texas Instruments

1954, Columbia University, New York

Roberto Olivetti, Mario Tchou

Source: matematica.unibocconi.it

1958, Laboratorio Ricerche Elettroniche Olivetti

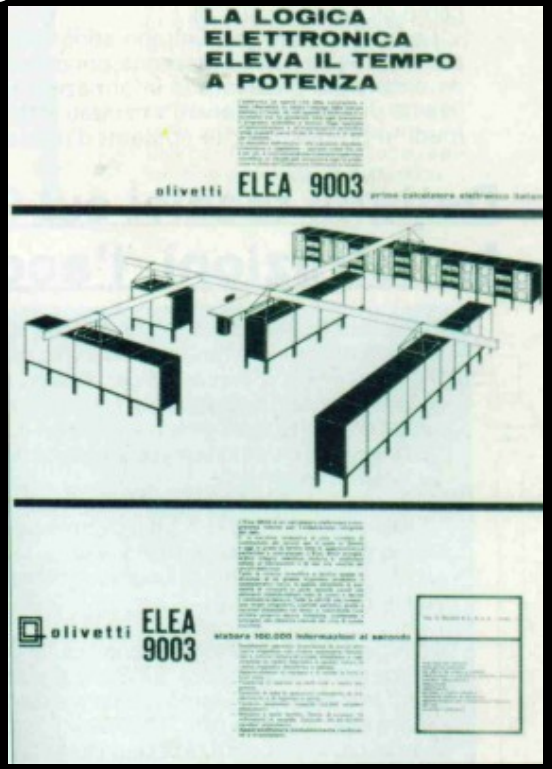
5a fila: Doug Webb, Ottavio Guarracino, Giuseppe Tarchini, Amedeo Cerrai, Lucio Borriello, Albano Guzzetti
4a fila: Sergio Sibani, Martin Friedmann, Simone Fubini, Mariano Speggiorin, Sante Caenazzo;
3a fila: Gianni Bertolini, Giampiero Riannetti, Pier Giorgio Perotto, Gianfranco Raffo, Sergio Benvenuti;
2a fila: Remo Galletti, Franco Filippazzi, Edmund Schreiner, Paolo Grossi, Giuseppe Calogero;
1a fila: Giancarlo Galantini, Giorgio Maddalena, Giorgio Sacerdoti, Mario Tchou, Ettore Sottsass Jr.

Fonte: Settimanale Epoca, 1959 - www.storiaolivetti.it

olivetti

1959: Olivetti Elea 9003

Adriano Olivetti
(Ivrea, 1901 - Aigle, 1960)



Olivetti Elea 9003
Primo Mainframe a Transistor

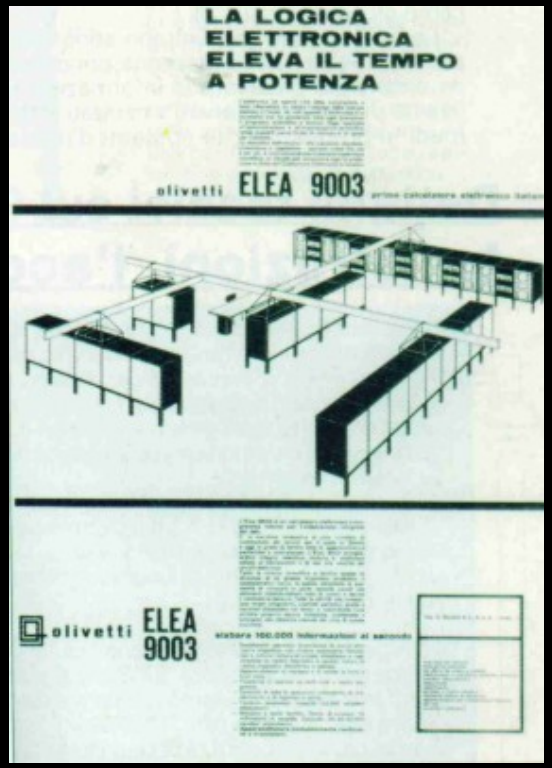
"***Con la realizzazione dell'Elea***,
la nostra Società non estende semplicemente la sua tradizionale produzione
a un nuovo settore di vastissime possibilità,
ma tocca una meta in cui direttamente ***si invera***
quello che penso sia l'inalienabile, ***più alto fine che un'industria deve porsi*** *di operare, ...*
per il progresso comune - economico, sociale, etico - della intera collettività"

Adriano Olivetti, 8 Novembre 1959
Discorso in occasione della presentazione del calcolatore Olivetti Elea 9003, in "Il mondo che nasce", Edizioni di Comunità, 2013

Source: Archivio Storico Olivetti, www.acroliv.org

1959: Olivetti Elea 9003

Adriano Olivetti
(Ivrea, 1901 - Aigle, **1960**)



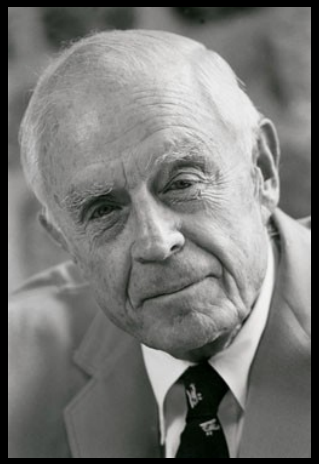
Source: Archivio Storico Olivetti, www.acroliv.org

1959: Olivetti Elea 9003

Mario Tchou
(Roma, 1924 - Santhià, **1961**)

1964:
IBM System/360 DEC PDP-8

1965: Watson - Olivetti



Thomas John Watson Jr.
(1914-1993)

IBM

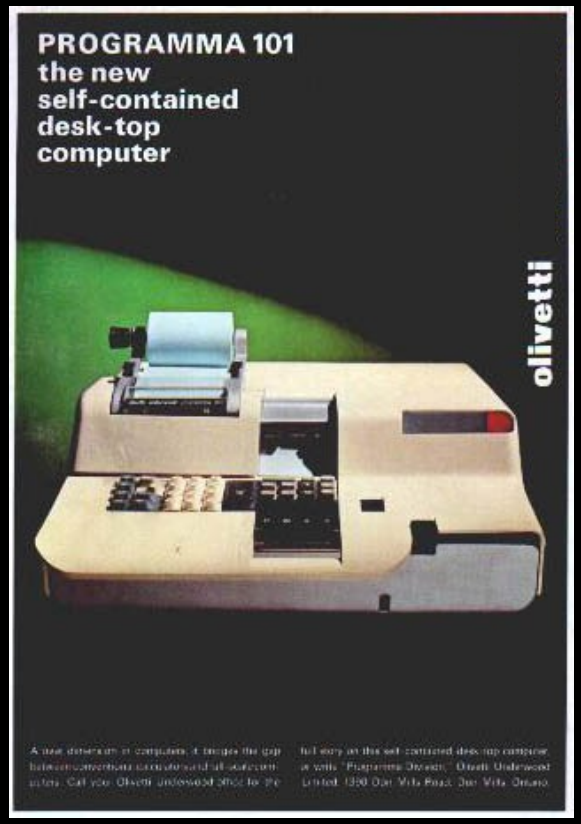
... quando nel 1965 a Thomas J. Watson jr., amministratore delegato dell'IBM,
venne assegnato a New York il premio Kaufmann, il più prestigioso riconoscimento mondiale
per il design, il grande manager americano dichiarò di essere rimasto colpito
una sera di una decina d'anni prima da un singolare negozio aperto sulla Fifth Avenue,
dove le macchine per scrivere erano colorate (e non nere come quelle IBM),
... Aveva così scoperto l'innovativo stile di questa impresa italiana
e in IBM si pensò di in qualche modo di imitarla.
Le realizzazioni del design IBM che ne seguirono valsero all'impresa il premio Kaufmann.
Ma in realtà, aggiungeva Watson, si tratta di realizzazioni che
"*provengono da una società chiamata Olivetti, da un uomo chiamato Adriano Olivetti. [...]*
Per questa ragione io mi inchino rispettoso alla sua leadership".

Source: www.storiaolivetti.it

1965: Olivetti P101

Piergiorgio Perotto
(Torino, 1930 - Genova, 2002)

Engineering - 1955
Politecnico di Torino



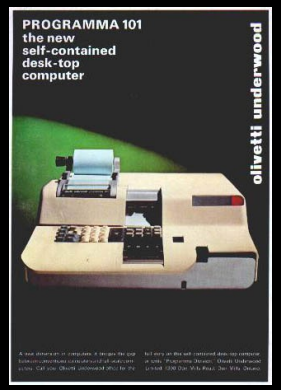
The 1st Personal Computer

Source: www.101project.eu

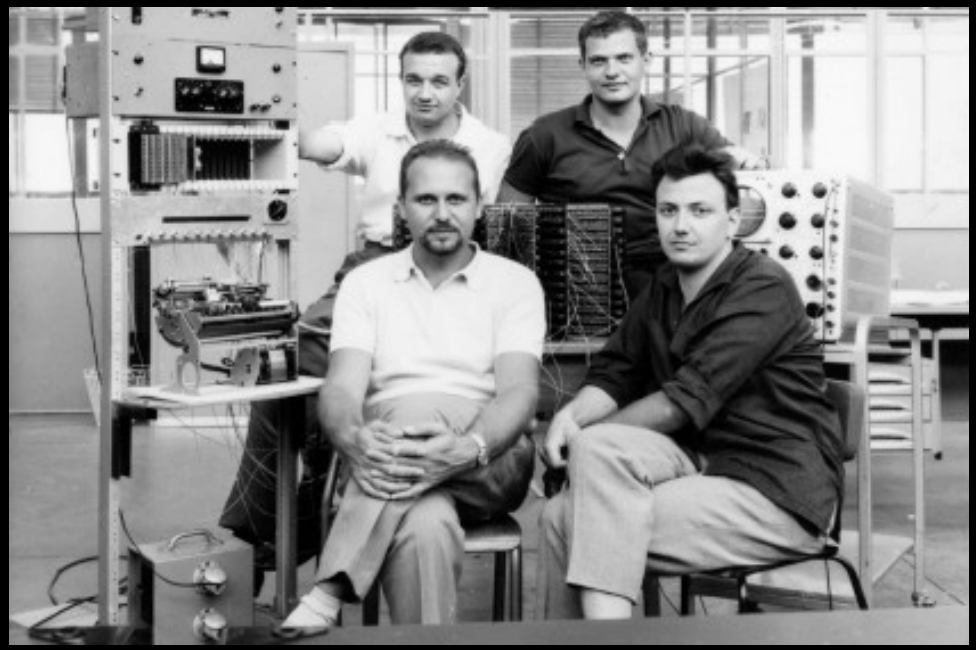
1965: the 1st Italian *bit-generation*

olivetti

Gastone Garziera

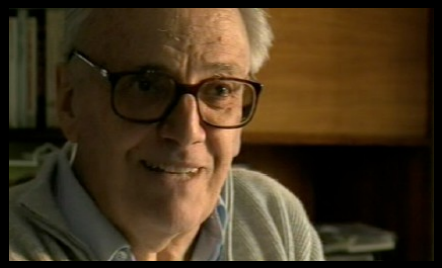


Mario Bellini



1963
Olivetti P101's *dream-team*

Piergiorgio Perotto



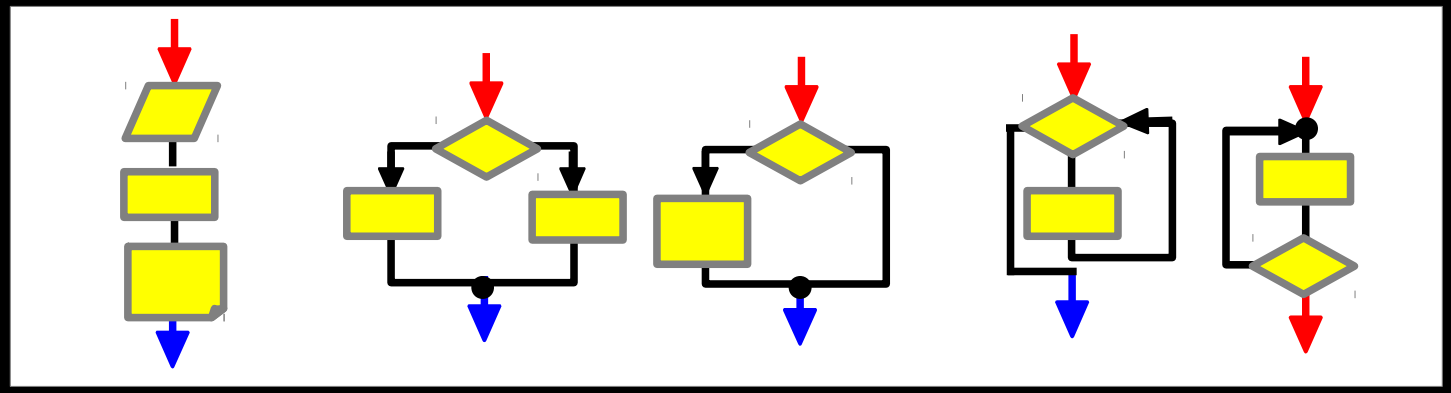
Giovanni De Sandre

Source: www.101project.eu

1966: Structured Programming Theorem
(Bohm-Jacopini Theorem)

Corrado Böhm
(Milano, 1923 -)

Professor Emeritus at the University of Rome "La Sapienza"
Computer scientist, main contribution:
the Theory of Structured Programming
with Giuseppe Jacopini (Roma, 1936 - 2001)



1966: The structured program theorem ("Böhm-Jacopini" Theorem)
Every computable function can be implemented in a programming language with only 3 control structures

1. Executing one subprogram, and then another subprogram (sequence)
2. Executing one of two subprograms according to the value of a boolean variable (selection) (if X then Y else Z
3. Executing a subprogram until a boolean variable is true (iteration) (while X do Y; or repeat Y until X)

Bohm, C., Jacopini G., "*Flow Diagrams, Turing Machines and Languages with Only Two Formation Rules*". Communications of the ACM, May 1966

1968: Ethics in Computer Rooms

Donn Parker
(San Jose, California, c.1930)

"*It seemed that*
when people entered the computer center
they left their ethics at the door"
Donn Parker

"Rules of Ethics in Information Processing"
Communications of the ACM
March 1968 (Vol. 11, No. 3)

Source: Information Systems Security Association

1968: Douglas Engelbart's "demo"

Convention Center in San Francisco,
Fall-Joint-Computer-Conference
9 December 1968

This live demo is considered historical for HCI: it was the debut of many innovations:
the mouse, the hypertext, object addressing and dynamic file-linking,
shared-screen between persons at different locations
(communicating over a network with audio and video interface!)

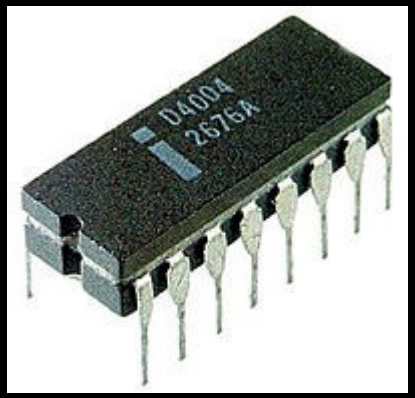
1969: Unix

Dennis Ritchie
(1941 - 2011)

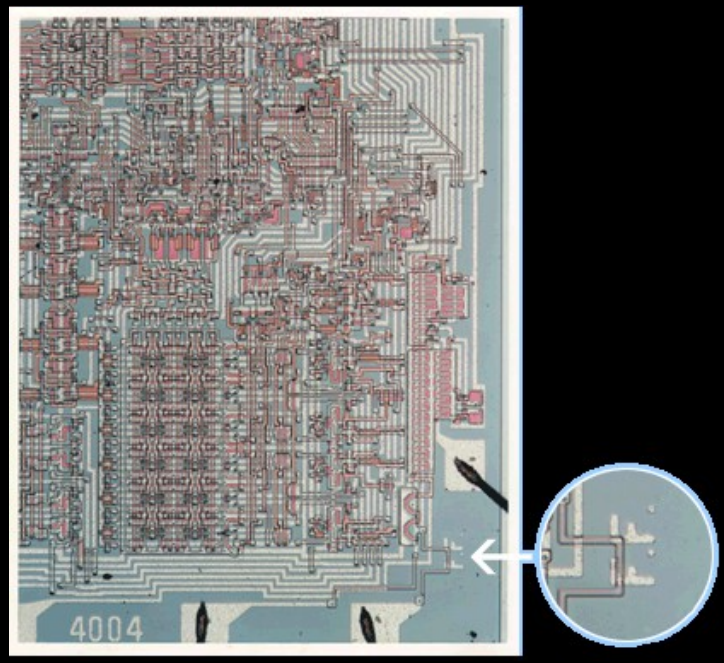
Ken Thompson
(1943 -)

Bill Joy
(1954 -)

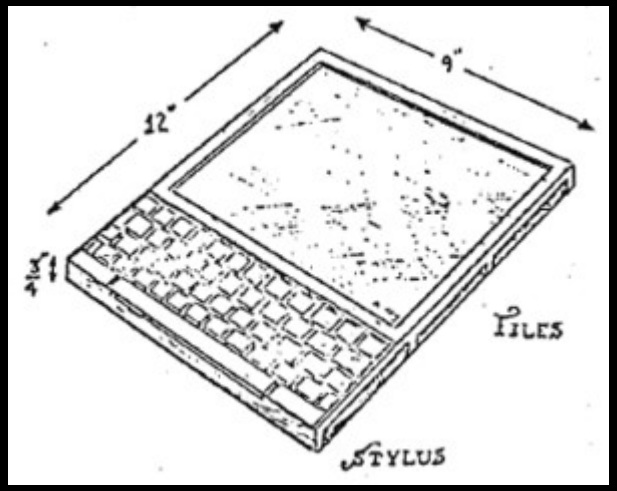
1971: Intel 4004



Federico Faggin
(Vicenza, 1941 -)



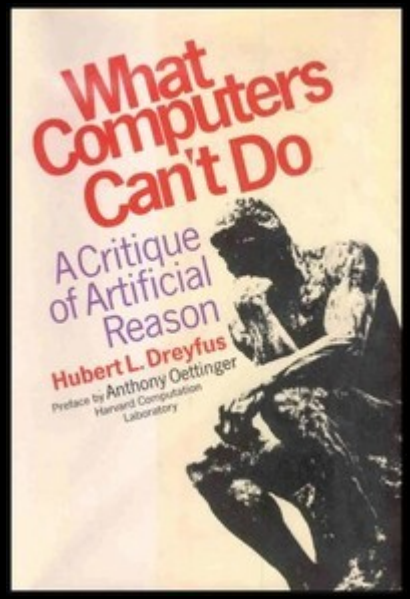
1972: Alan Kay's *Dynabook*



A "*personal computer for children of all ages*",
a portable "educational device", similar to modern laptops

Source: Kay A.C. (1972), *A Personal Computer for Children of all Ages*, Xerox Palo Alto Research Center

1972: Hubert Dreyfus critique to AI



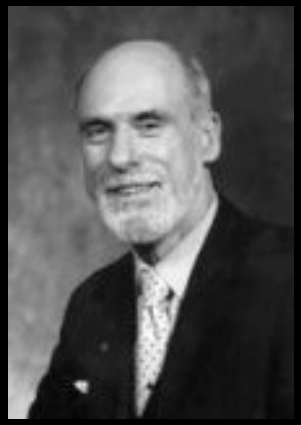
Hubert Dreyfus
(1929 -)

Dreyfus challenged the 4 main assumptions of AI researches:
- the *biological* assupmtion (the brain processes information in discrete operations by way of some biological equivalent of on/off switches);
- the *psychological* assumption (the mind can be viewed as a device operating on bits of information according to formal rules);
- the *epistemological* assumption (all knowledge can be formalized);
- the *ontological* assumption (the world consists of independent facts that can be represented by independent symbols).

Source: Dreyfus H. (1972), *What computers can't do*, MIT Press.

1973: Internet (TCP/IP)

Robert E.Kahn
(New York, 1938 -)



Vinton G.Cerf
(New Haven, 1943 -)

1975: Homebrew Computer Club, Menlo Park

Lee Felsenstein
(1945 -)

Steve Jobs (1955 - 2011) Steve Wozniak (1950 -)

1981: Osborne I
(1,795 $)

1976: Apple I
(666.66 $)

Bill Gates
(Seattle, 1955 -)

1975: Microsoft

Microsoft

1976: Apple

Steve Jobs
(San Francisco, 1955 - Palo Alto, 2011)

Steve Wozniak
(San Jose', 1950 -)

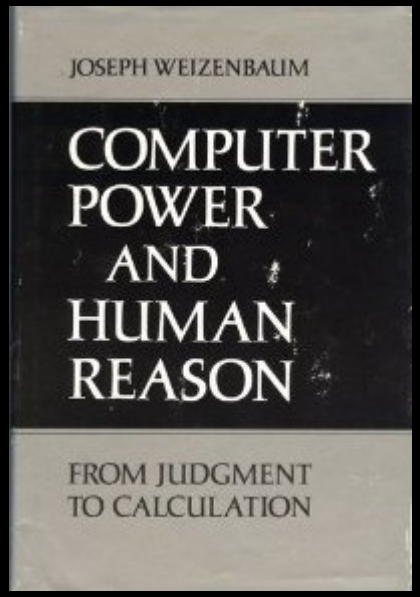
1976: Apple I
1st Personal Computer?

1975: First Woman PhD in Computer Science at MIT

Irene Greif

1984: coined the term itself "Computer Supported Cooperative Work" (CSCW)
Director of *Collaborative User Experience* at IBM Watson Research Center.
In the Woman in Technology International Hall of Fame (WITI) and
in 2008: Women Entrepreneurs in Science and Technology Leadership Award

1976: Joseph Weizenbaum



Joseph Weizenbaum
(Berlin, 1923 - Berlin, 2008)

"The key question is the control of the time.
We would need more time to take some decisions.
The rhythm of the computers and of the telecommunication systems
is not the rhythm of time which is needed to take meaningful decisions"

J.Weizenbaum, Namur Award Lecture, Namur, 11 January 1991

Source: Weizenbaum J., "Computer Power and Human Reason: From Judgment To Calculation", Freeman, 1976

1978: Walter Maner

"Computers generate wholly new ethics problems
that would not have existed if computers had not been invented
... there should be a new branch of applied ethics ...
decided to name the proposed new field Computer Ethics ...
... a new field that studies ethical problems
aggravated, transformed or created by computer technology"

W.Maner, 1978

Source: Maner, W. (1980), *Starter Kit in Computer Ethics*, Hyde Park, NY: Helvetia Press and the National Information and Resource Center for Teaching Philosophy.

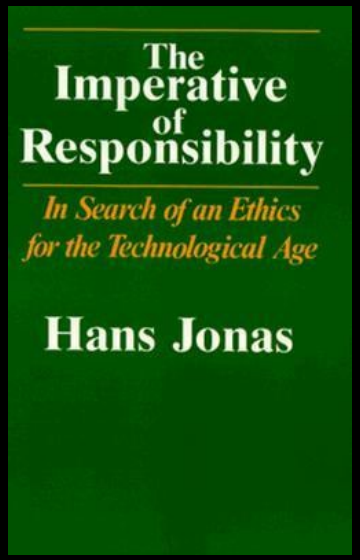
1979: Hans Jonas

Hans Jonas

(Germany, 1903 - New York, USA, 1993)

"Human survival
depends on our efforts
to care for our <u>planet</u> and its <u>future</u>"

H.Jonas



Hans Jonas, Chicago University Press; New edition edition (1 Oct 1985)

The Evolution of Computing

1963: 1st mouse
Douglas Engelbart,
Bill English

1973: 1st WIMP
Window, Icon, Menu e Pointing Computer
Xerox PARC "Alto"

1981: April, Xerox Star 8010
(16,595 $)
1st Commercial WIMP
"Personal Computer"

1981: August 12, PC IBM
(1,565 $)
MS-DOS 1.0

1981:

Xerox Star

IBM PC

The "1984" Macintosh Ad

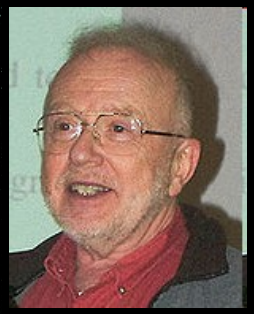
22 January 1984:
The half-time of the 1984 Super Bowl
featured a 45 second ad
that would be declared in 1995 the best ad of the last 50 years.
The commercial, directed by Ridley Scott
(The Duelist 1978, Alien, 1979, and Blade Runner, 1982)
for the Apple Corporation,
announced the imminent arrival of the Macintosh computer.
The ad cost $1.6 million to produce,
and Apple Corporation paid $500,000 for the one-minute time slot in which it ran.
It ran only once.

1984: January,
Apple MacIntosh (2,495 $)

1984: The Utopia Project

Participatory Design in Scandinavia

1985: David Parnas

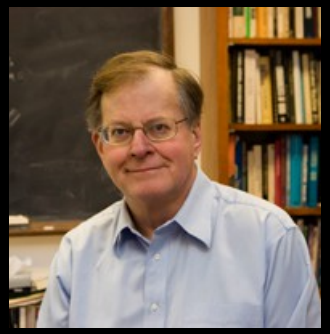


"... an example of
<u>social, ethical and professional responsibility</u>
in refusing ... the work of the (SDI) panel ...
in his concern with public education ... for the public interest..."

Terry Winograd, 1987
CPSR President, Presents "1987-Norbert Wiener Award" to David Parnas

Source: Communications of the ACM, December 1985 (Vol. 28, No. 12)

1985: James Moor



"A typical problem in Computer Ethics arises because there is a <u>policy vacuum</u> about how computer technology should be used. Computers provide us with new capabilities and these in turn give us new choices for action. Often, either no policies for conduct in these situations exist or existing policies seem inadequate. A <u>central task of Computer Ethics is to determine what we should do in such cases</u>, that is, formulate policies to guide our actions …"

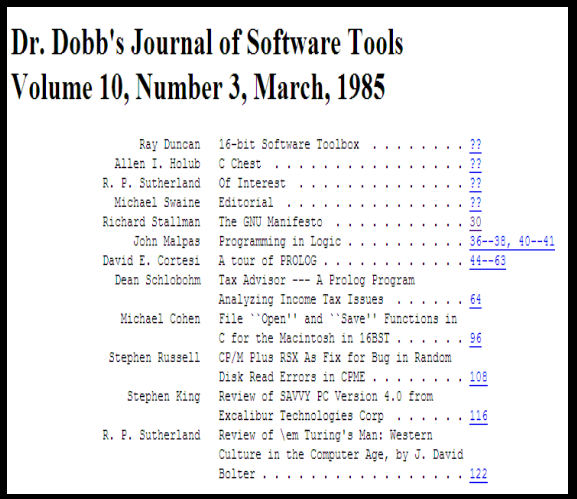
J.Moor, 1985

Source: Moor, J. (1985) "What Is Computer Ethics?" *Metaphilosophy*, 16(4): 266-75.

1985: Free Software (GNU Manifesto)

Free Software
is a matter of the
users' freedom to
run,
copy,
distribute,
study,
change and improve
the software.

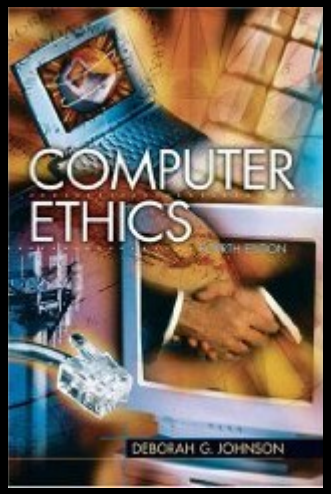
Richard M. Stallman
(New York, USA, 1953 -)



Dr. Dobb's Journal of Software Tools
Volume 10, Number 3, March, 1985

rce: www.fsf.org - http://boycottnovell.com/wp-content/uploads/2009/03/richard-stallman-young.png

1985: Deborah Johnson



"Recognition that technology is not just artifacts,
but rather artifacts embedded in social practices
and infused with social meaning,
is <u>essential</u> to understanding
the <u>connection between Ethics and IT</u>"

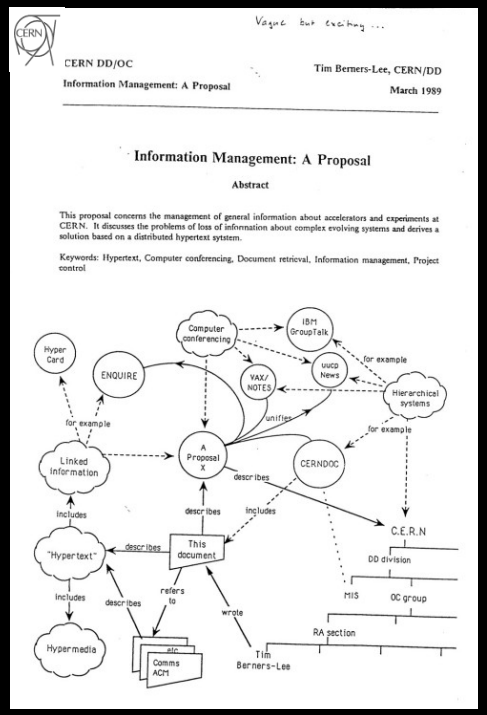
D.Johnson, 1985

Source: Johnson, D. (1985), *Computer Ethics*, First Edition, Englewood Cliffs, NJ: Prentice-Hall;

1988: Internet Worm

Robert Morris
(Massachussets, USA, 1965)

1989: The World Wide Web



Vague but exciting ...

CERN DD/OC

Tim Berners-Lee, CERN/DD

Information Management: A Proposal

March 1989

Information Management: A Proposal

Abstract

This proposal concerns the management of general information about accelerators and experiments at CERN. It discusses the problems of loss of information about complex evolving systems and derives a solution based on a distributed hypertext system.

Keywords: Hypertext, Computer conferencing, Document retrieval, Information management, Project control

Tim Berners Lee
(London, UK, 1955 -)

Robert Cailliau
(Belgium, 1947 -)

Source: public.web.cern.ch

1991: Linux

Linus Torvald
(Helsinki, Finland, 1969 -)

From: torva...@klaava.Helsinki.FI
(Linus Benedict Torvalds)
Newsgroups: comp.os.minix
Subject: What would you like to see most in minix?
Summary: small poll for my new operating system
Keywords: 386, preferences
Message-ID: <1991Aug25.205708.9541@klaava.Helsinki.FI>
Date: 25 Aug 91 20:57:08 GMT
Organization: University of Helsinki
Lines: 20

Hello everybody out there ...
I'm doing a (free) operating system, just a hobby, won't be big and professional ...
Linus Torvald

1991: Computer Ethics in Computer Science Curricula

Source; Turner, A.J. (1991), "Summary of the ACM/IEEE-CS Joint Curriculum Task Force Report: Computing Curricula, 1991," *Communications of the ACM*, 34(6): 69-84.

1993: The WWW enters the Public Domain

930430

ORGANISATION EUROPEENNE POUR LA RECHERCHE NUCLEAIRE
CERN EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

STATEMENT CONCERNING CERN W3 SOFTWARE RELEASE INTO PUBLIC DOMAIN

TO WHOM IT MAY CONCERN

Introduction

The World Wide Web, hereafter referred to as W3, is a global computer networked information system.

The W3 project provides a collaborative information system independent of hardware and software platform, and physical location. The project spans technical design notes, documentation, news, discussion, educational material, personal notes, publicity, bulletin boards, live status information and numerical data as a uniform continuum, seamlessly intergated with similar information in other disciplines.

The information is presented to the user as a web of interlinked documents .

Acces to information through W3 is:

- via a hypertext model;
- network based, world wide;
- information format independent;
- highly platform/operating system independent;
- scalable from local notes to distributed data bases.

Webs can be independent, subsets or supersets of each other. They can be local, regional or worldwide. The documents available on a web may reside on any computer supported by that web.

Declaration

The following CERN software is hereby put into the public domain:

- W 3 basic ("line-mode") client
- W 3 basic server
- W 3 library of common code.

CERN's intention in this is to further compatibility, common practices, and standards in networking and computer supported collaboration. This does not constitute a precedent to be applied to any other CERN copyright software.

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Geneva, 30 April 1993

W. Hoogland
Director of Research

H. Weber
Director of Administration

opie certifiée conforme

ait à Genève le 03-05-93

ORGANISATION EUROPEENNE POUR LA RECHERCHE NUCLEAIRE
DIVISION DES FINANCES
CERN

Source: public.web.cern.ch

1995: CCSR

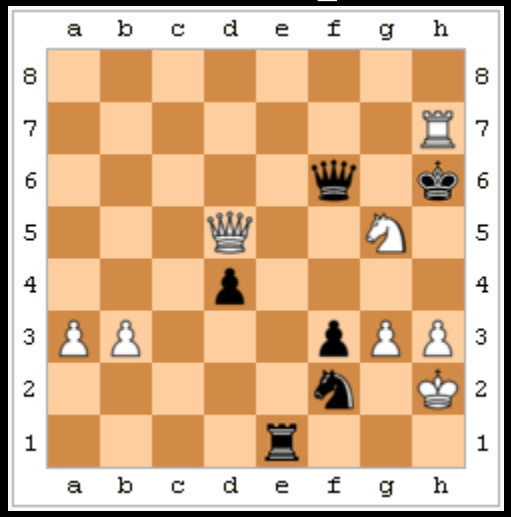
De Monfort University, Leicester, UK

Framework
for Responsible Research and Innovation in ICT

Anticipate	*Is the planned research methodology acceptable?*
Reflect	*Which mechanisms are used to reflect on process?* *How could you do it differently?*
Engage	*How to engage a wide group of stakeholders?*
Act	*How can your research structure become flexible?* *What training is required?* *What infrastructure is required?*

Source: responsible-innovation-org.uk, 2014

1996: Deep Blue



White: Deep Blue
Black: Kasparov

1996: February 10, Deep Blue 1 - Garry Kasparov 0, First computer to win with World Chess Champion

1998: Google

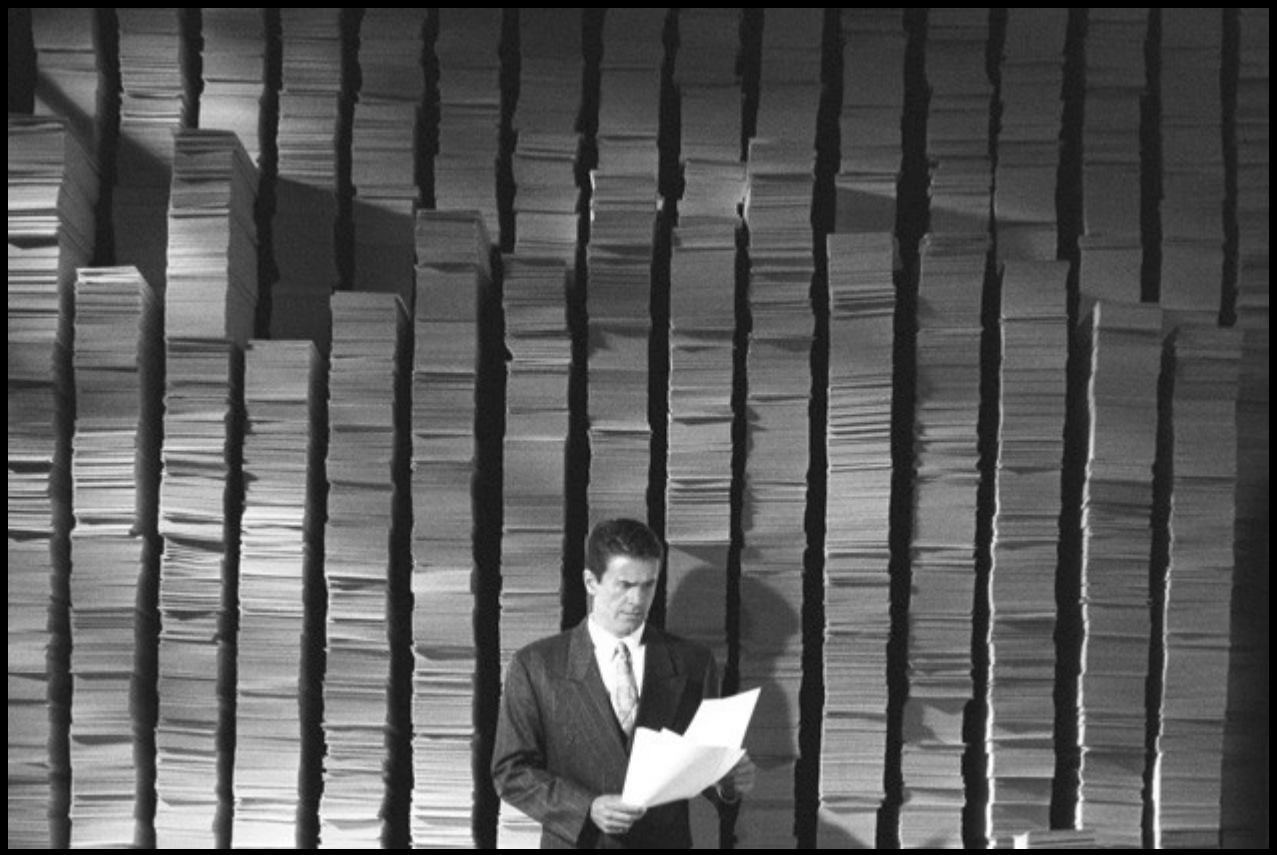
Sergej Brin
(Moscow, RU, 1973 -)

Larry Page
(Ann Arbor, Michigan, 1973 -)

"... At the heart of the change,
the next 20 years will be
intelligence drawn from information
Information will be the 'oil of the 21st century'.
... It will be the resource running our economy
in ways not possible in the past."

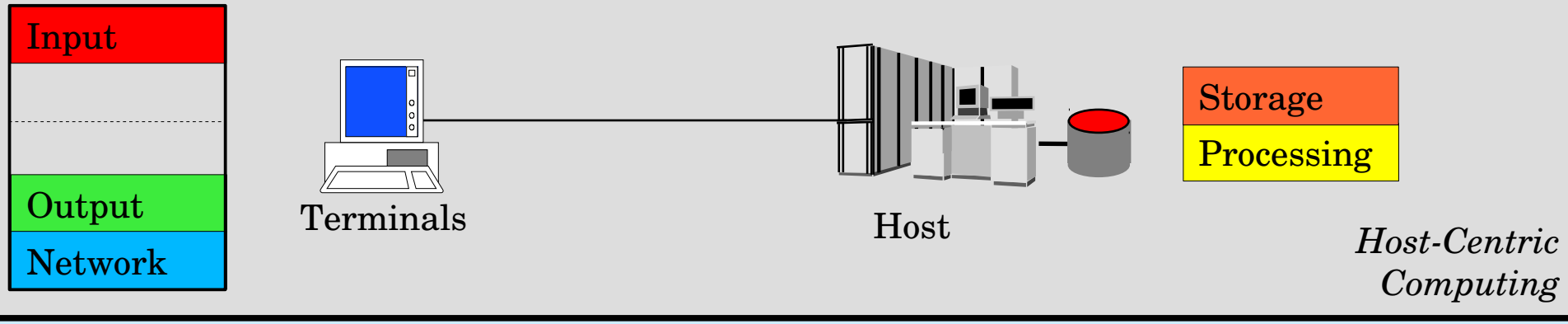
Peter Sondergaard
Gartner Symposium/ITxpo 2010,
October 17-21, Orlando

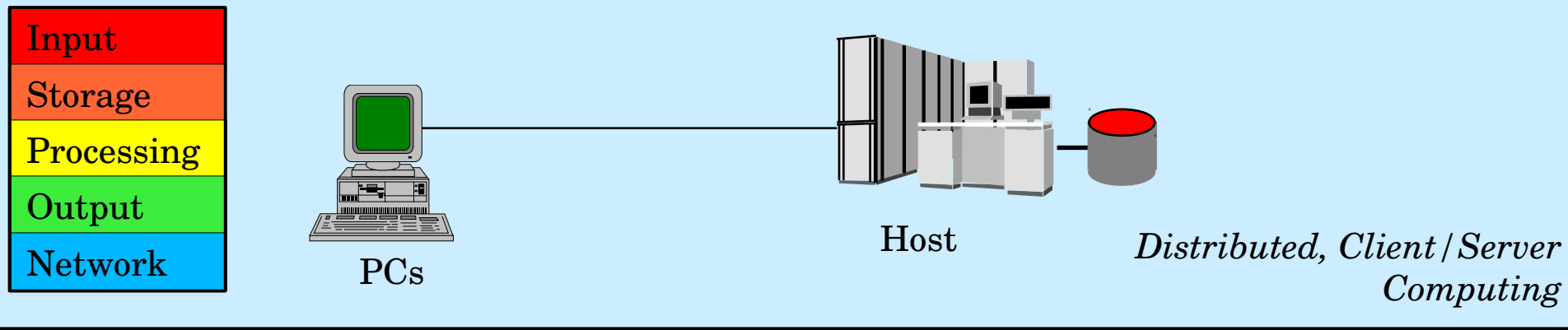
BigData (2012) = 1 Exabyte = 10^{18} byte

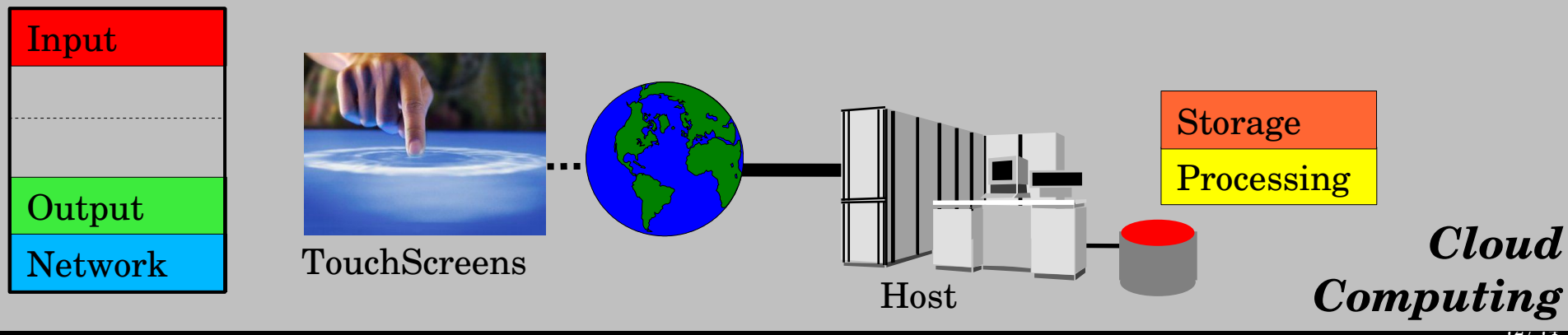


Source: marketingarena.it

Cloud Computing: Back to the Future







2013: The 5 "Big-Clouds" (silos?)

1975: Microsoft

1976: Apple

1994: Amazon

1998: Google

2004: Facebook

2015: Definition for the Computing Professional

"... Revised Definition for the Computing Professional:
Given the reach of ICT in our lives, it is important for an ICT Professional to be:

- Technically Strong

(in order **to use the Right Technology for the Relevant Problem**)

- Ethically Grounded

(to ensure that Technology is put to the Right Use),

- Socially Conscious

(so that the technical solution takes into consideration elements of Sustainability)

- Business Savvy

(to ensure commercial viability which is required for Social Prosperity and Funding of new Developments)" (pag.47).

IFIP (International Federation for Information Processing)
"Global Industry Council (GIC) 2020 - Skill Assessment Report
August 2015