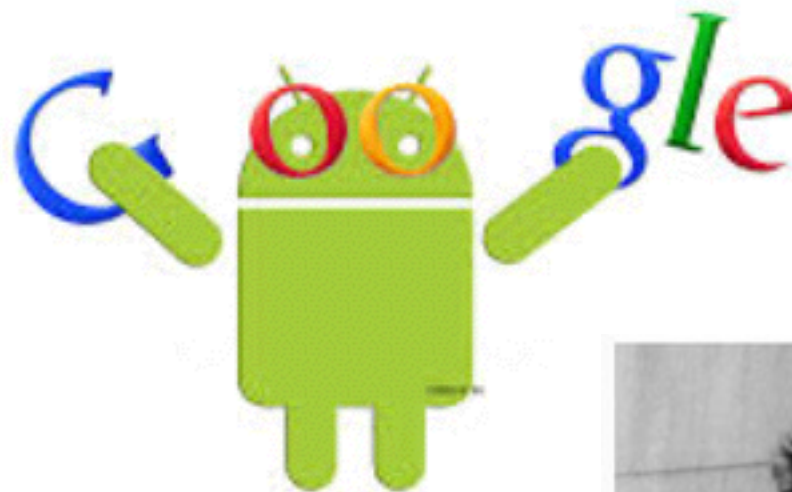


computer "revolution"



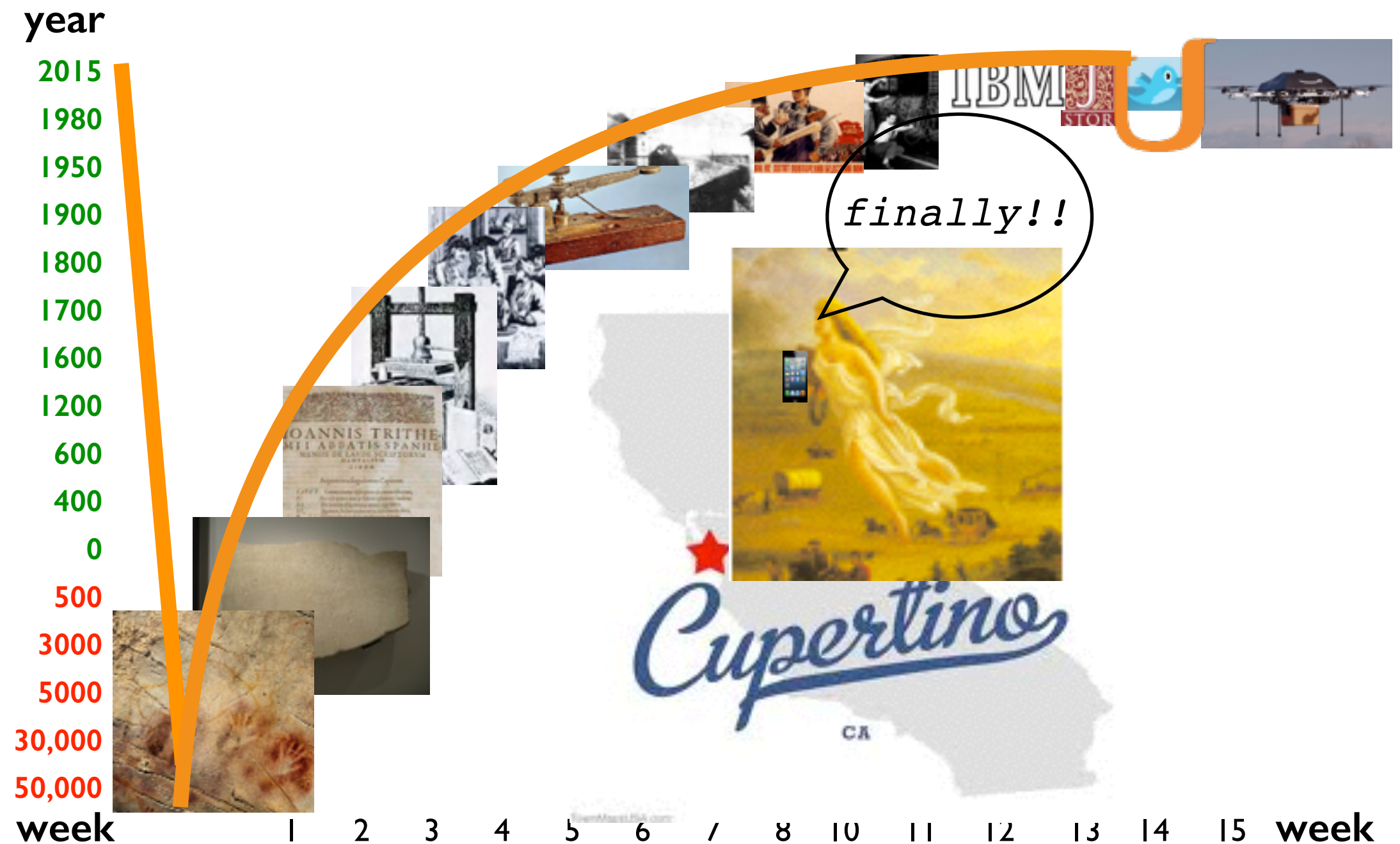
History of Information

April 3, 2014

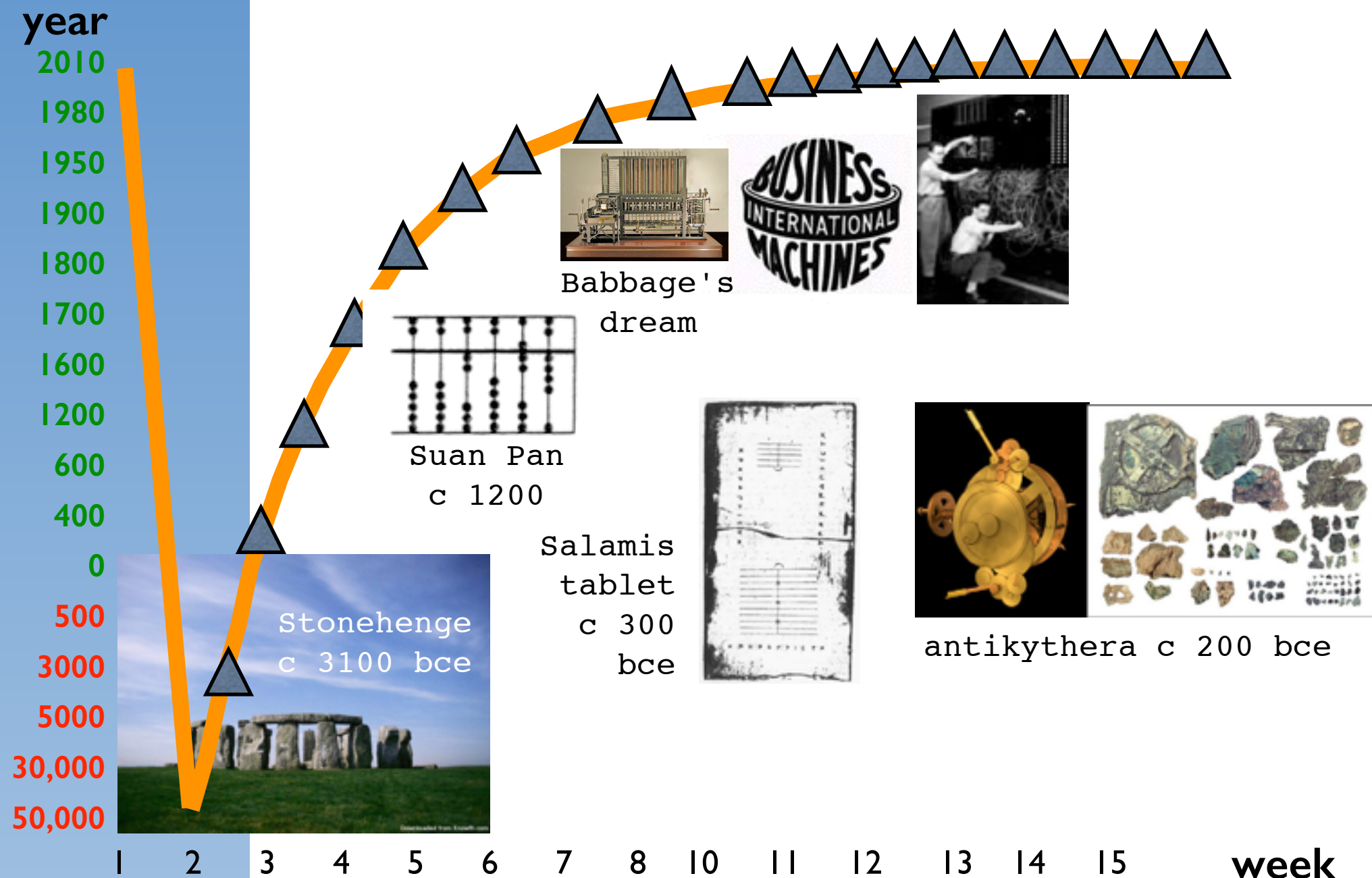


In 1942, a secret U.S. military program recruited women to work as "computers," calculating weapons trajectories for soldiers fighting World War II. This group worked at the University of Pennsylvania. Their story is shared in the documentary, "Top Secret Rosies."

where are we?

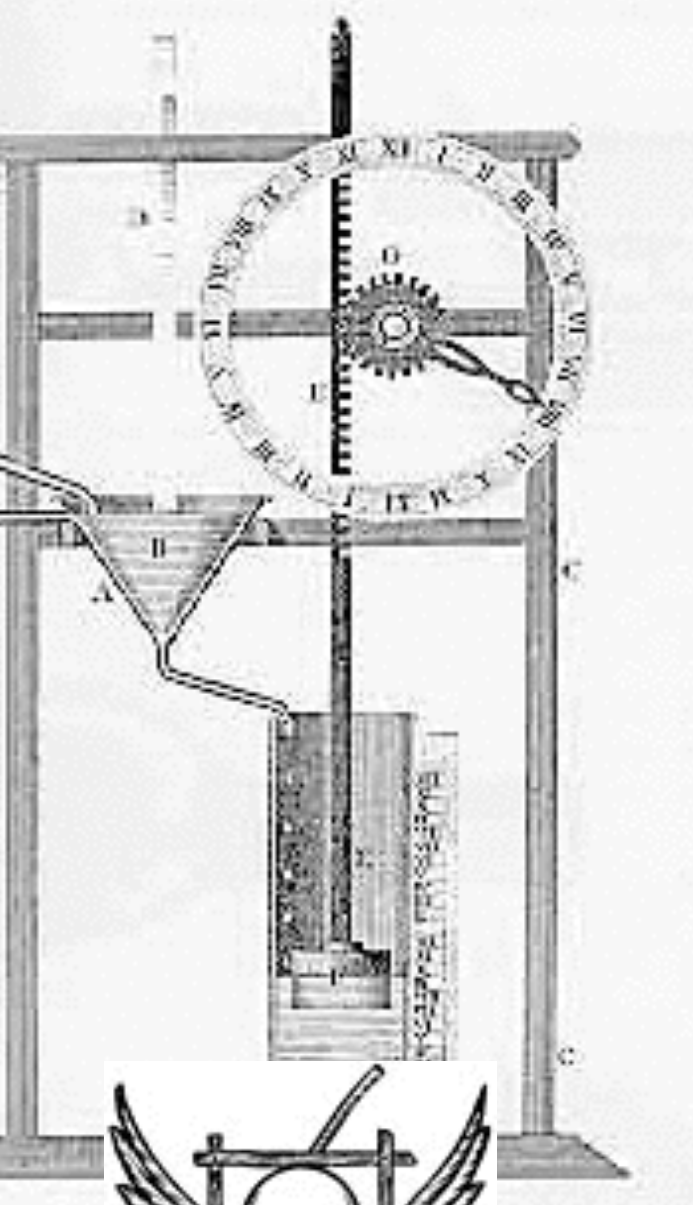


not so fast?





calculating?

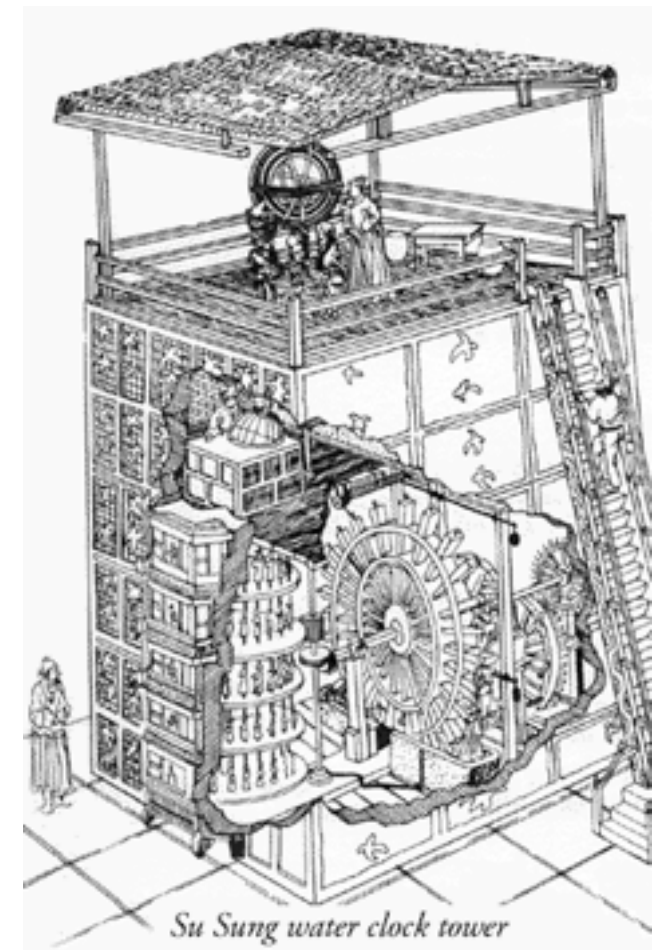


3500 bce: sundials

1400 bce: Egyptian water clocks

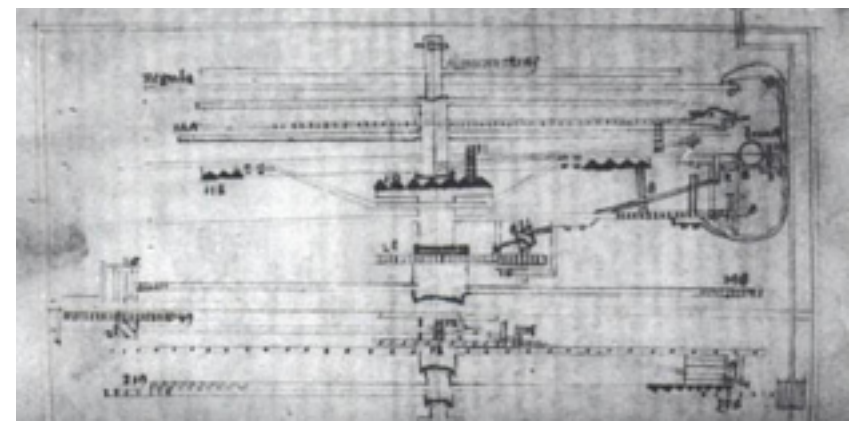
700 ce: hourglasses

1086: Su Sung's water tower



Daniel's Prophecy Vindicated.

conclude any thing from the account of *Gabriel* given unto *Daniel* in this place. This they plainly acknowledge in a Disputation which they had with a converted *Jew* before the *Bishop of Rome* recorded in their *Shebet Jehuda*. Only they would except *Daniel* himself, affirming that he was not *חֲשֹׁבֵה*, a *Computer of the time*, but *חֲזוֹן*, a *Seer*; as though the *Question* were about the way and means whereby we attain a just computation of the time, and not about the thing it self. *Daniel* received the knowledge of this time by Revelation, as he did the time of the accomplishment of the Captivity, though he made use of the computation of time limited in the Prophecy of *Jeremiah*; but in both he gives us a perfect Calculation of the time, and so cannot be exempted from the Talmudical Malediction. And I mention these things in the en-



automata

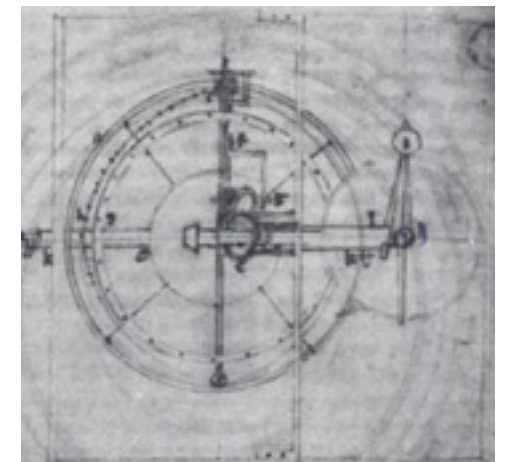


Richard of
Wallingford
1292–1336

1300: mechanical clocks

Richard of Wallingford

celestial instruments & St Albans' clock



86

The Antiquity Chap. VI.

modum dentata, quæ una motione coacta, versando faciunt effectus, varietatesque motionum: in quibus moventur Sigilla, vertuntur Metæ, calculi aut Tona projiciuntur,

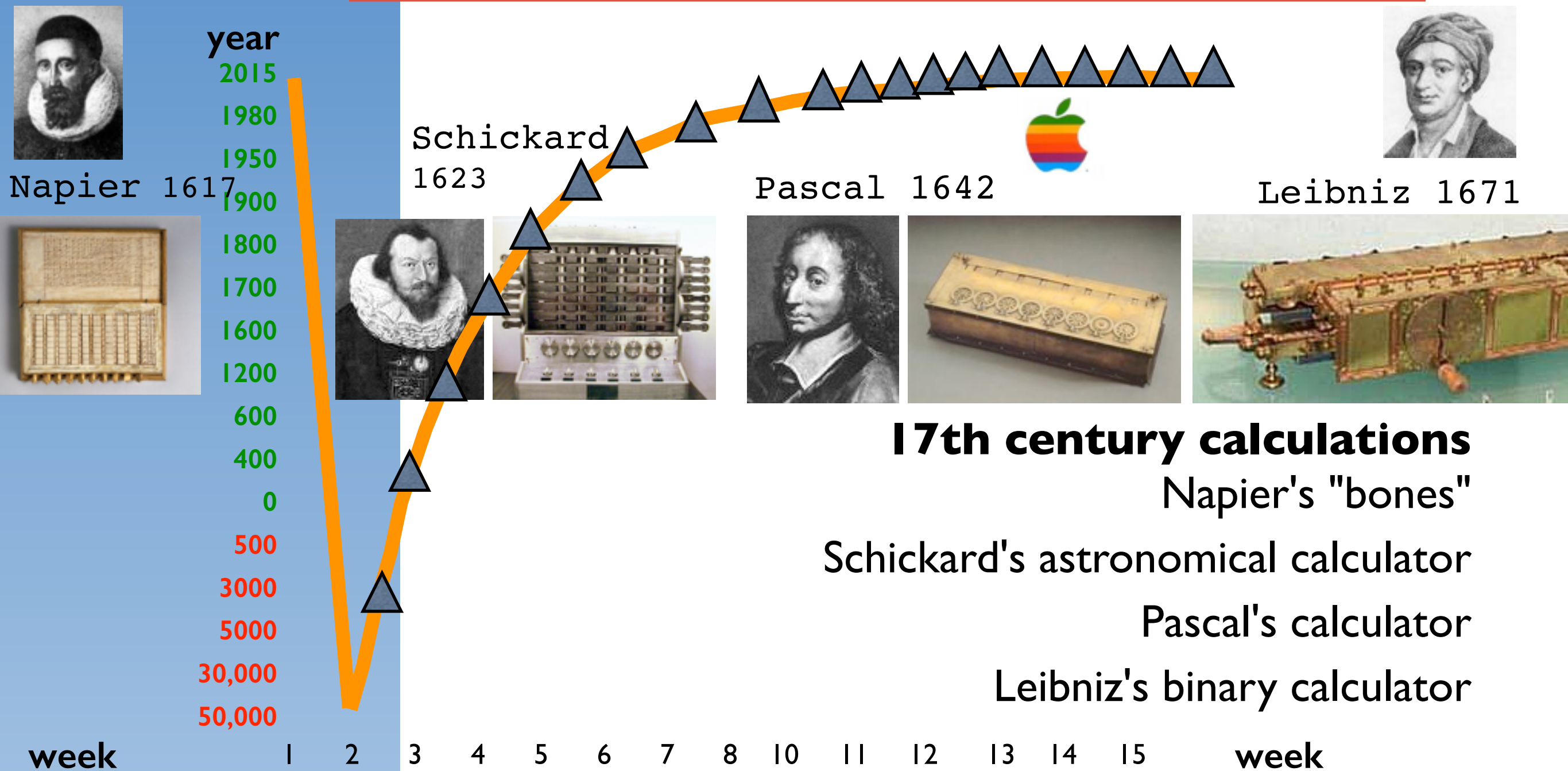
Chap. VI. of *Clock-work*.

Clocks, and some other *Automata*, might have their beginning there; or that Clock-work (which had long been buried in oblivion) might be revived there. But

87

Derham, *The Artificial Clock Maker*, 1696

beyond time



17th century calculations

Napier's "bones"

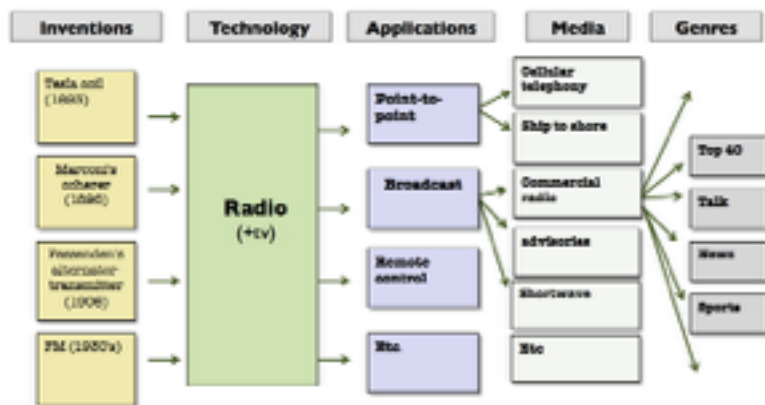
Schickard's astronomical calculator

Pascal's calculator

Leibniz's binary calculator

overview

inventions
past and future
the demand side
changing business
changing perceptions



invention to innovation

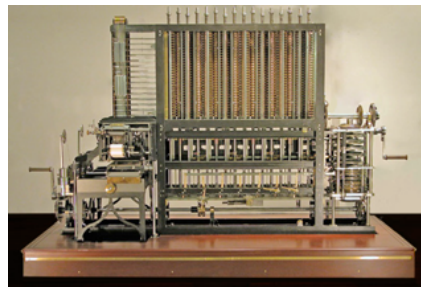
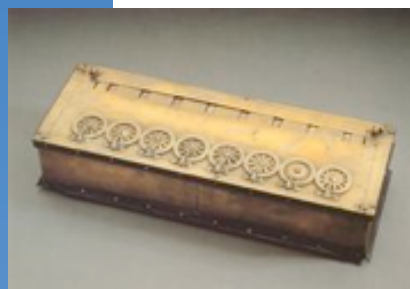
"The invention [of television] was no single event. ... a very complex interaction between new needs and new inventions ... military ... government ... corporate interests"

-- Williams, *Technology and Cultural Form*, 1973

eye witness account

"What constitutes an invention?--Few simple mechanical contrivances are new; and most combinations may be viewed as a species, and classed under genera ... [and] pronounced old or new according to the mechanical knowledge of the person who gives his opinion."

--Babbage, *On the Economy of Machinery, ...* 1832



who invented *the* computer?

Inventions

Technology

Applications

Media

Genres

clock

mill/store

logarithm

loom

governors

...

vacuum
tube

transistor

chip

...

genes

“computer”
or
“engine”

calculating

registering

sorting

controlling

...

commun-
icating

engines

mainframe

desktop

cars ...

logarithms

ballistics

accounting

registration

TECHNOLOGY

With Fire TV, Amazon Seeks a Beachhead in the Living Room

By DAVID STREETFIELD APRIL 2, 2014



VIDEO | 0:45

Amazon Unveils Fire TV

Amazon's vice president for Kindle, Peter Larsen, announced the set-top device as part of its plans to merge shopping and entertainment.

Andrew Burton/Getty Images



getting to (and beyond) the computer



individual inventors (and investors)

business / customers

government

military / intelligence

science / education



individual calculation



John Napier
1550–1617

John Napier (a 'computer')

*Mirifici Logarithmorum
Canonis Descriptio*, 1614

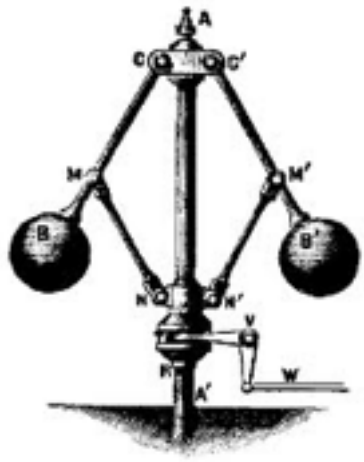


Charles Babbage RS
1791–1871

Charles Babbage

*Table of Logarithms
from 1 to 108000*
1827

"I wish to God these
calculations
had been executed by
steam" (1821)



on the economy of machinery and manufactures

chapters

1: Sources of the Advantages Arising from Machinery

2: Accumulating Power

3: Regulating Power

... that beautiful contrivance,
the steam governor ...

4: Increase and diminution of velocity

5: Extending the time of action of forces

... watches & clocks ..
automatons

6: Saving time in natural operations

7: Exerting Forces too great for human power; and
executing operations too delicate for human touch

8: Registering Operations

9: Economy of the materials employed

10: Of the identity of the work when it is of the same kind,
and its accuracy when of different kinds

11: Of copying

12: On the method of observing manufacturies

...

19: On the division of labor

20 On the mental division of labour

registering operations

pedometer

turns by the wheel of a carriage

number of strokes of a steam engine

coins struck by a press

watchman ... tell-tale

gauging of casks

gas meters

water meters

barometer

quantity of rain

traction of horses

number of vibrations

alarms

glass vase ...



Adam Smith
1723–1890



Adam Ferguson
1723–1816

divisions and combinations

the division of labor

automata, computer, copying, registering

the "hands" --manual division of labor

pin-making

— Adam Smith, *Wealth of Nations*, 1776

the "head" --mental division of labor

"And thinking itself, in this age of separations, may become a peculiar craft."

—Adam Ferguson, *An Essay on the History of Civil Society*, 1767



“C'est à un chapitre d'un ouvrage Anglais,* justement célèbre, (I.) qu'est probablement due l'existence de l'ouvrage dont le gouvernement Britannique veut faire jouir le monde savant :—

“Voici l'anecdote : M. de Prony s'était engagé, avec les comités de gouvernement, à composer pour *la division centesimale du cercle, des tables logarithmiques et trigonometriques, qui, non seulement ne laissassent rien à désirer quant à l'exactitude, mais qui formassent le monument de calcul le plus vaste et le plus imposant qui eût jamais été exécuté, ou même conçu.* Les logarithmes des nombres de 1 à 200,000 formaient à ce travail un supplément nécessaire et exigé. Il fut aisé à M. de Prony de s'assurer que même en s'associant trois ou quatre habiles co-operateurs, la plus grande durée presumable de sa vie, ne lui suffirait pas pour remplir ses engagements. Il était occupé de cette fâcheuse pensée lorsque, se trouvant devant la boutique d'un marchand de livres, il aperçut la belle édition Anglaise de Smith, donnée à Londres en 1776 ; il ouvrit le livre au hasard, et tomba sur le premier chapitre, qui traite de *la division du travail*, et où la fabrication des épingles est citée pour exemple. A peine avait-il parcouru les premières pages, que, par une espèce d'inspiration, il conçut l'expédient de mettre ses logarithmes en *manufacture* comme les épingles. Il faisait, en ce moment, à l'école polytechnique, des leçons sur une partie d'analyse liée à ce genre de travail, *la methode des differences*, et ses applications à *l'interpolation*. Il alla passer quelques jours à la campagne, et revint à Paris avec le plan de *fabrication*, qui a été suivi dans l'exécution. Il rassembla deux ateliers, qui faisaient séparément les mêmes calculs, et se servaient de vérification reciproque.”†

* *An Enquiry into the Nature and Causes of the Wealth of Nations*, by Adam Smith.

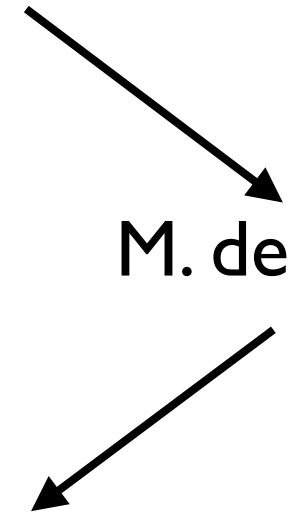
† Note sur la publication, proposée par le gouvernement

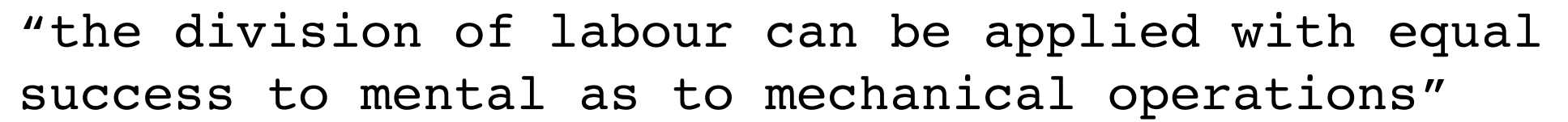
vive les differences

Adam Smith

M. de Prony

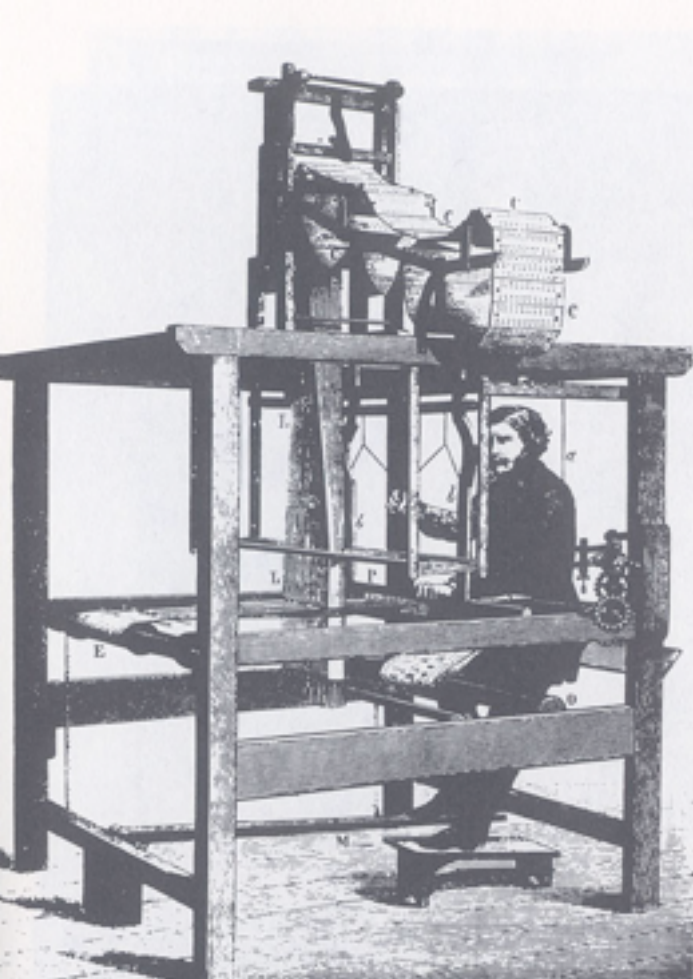
Babbage




$$f(x) = x^2 + 4$$

200 ON THE DIVISION OF MENTAL LABOUR.

x	$F(x)$	difference	difference
1	5		
2	8	3	
3	13	5	2
4	20	7	2
5	29	9	2
6	40	11	2
7	.	.	.
.	.	.	.
.	.	.	.
.	.	.	.
.	.	.	.



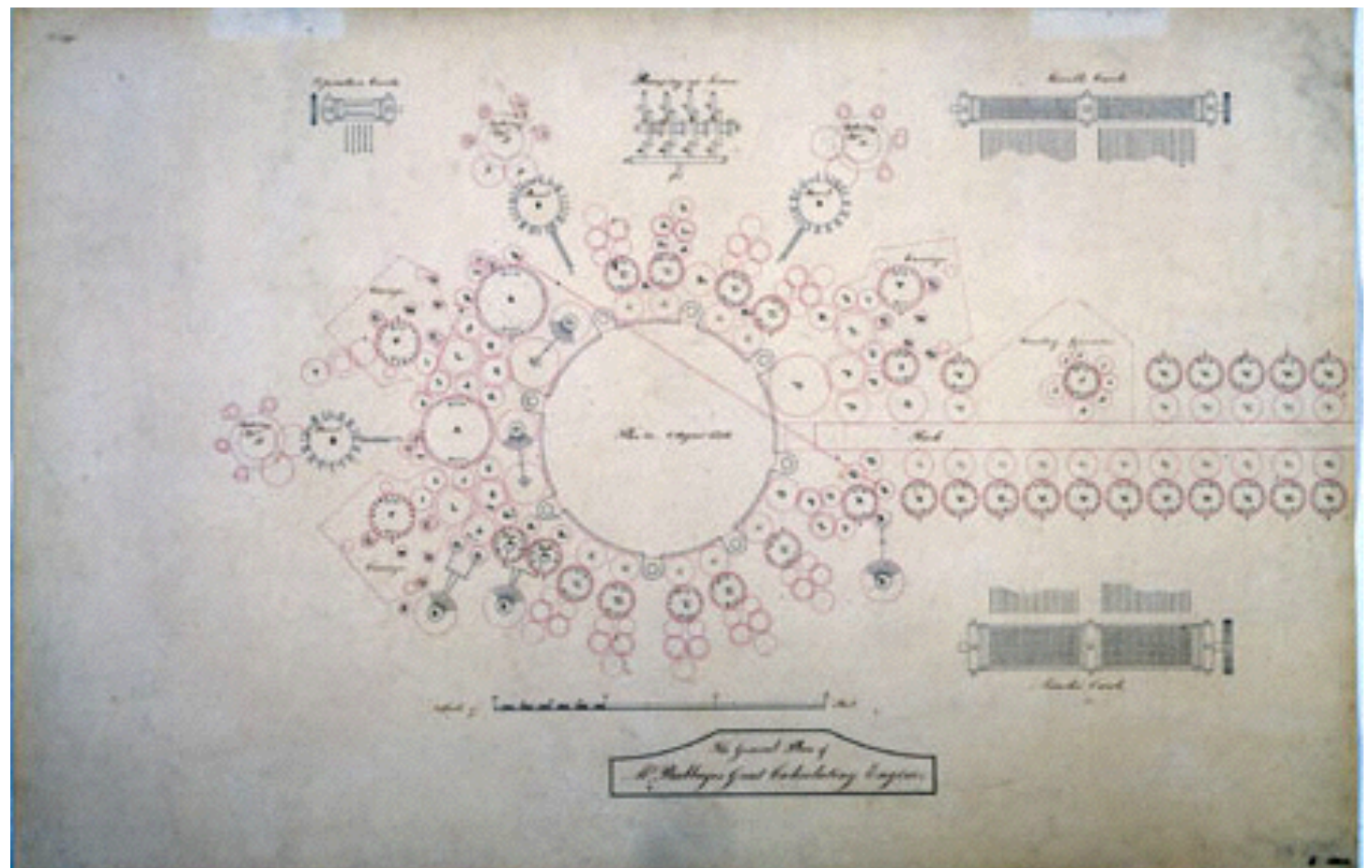
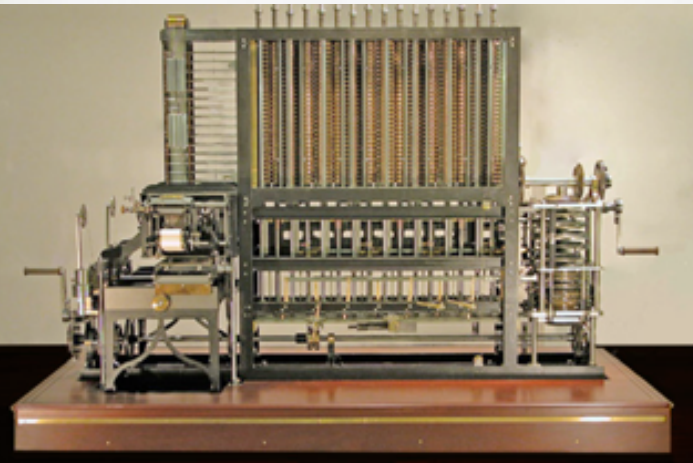
analytical engine

general purpose machine
programmable

storing

looping

branching



Ada Byron/Lovelace



Ada Lovelace
1815–1852

"a machine that not only would have foresight, but could act on that foresight"

"I want to put in something about Bernoulli's Number, in one of my notes, as an example of how an explicit function, may be worked out by the engine, without having been worked out by human head and hands first"

--Lovelace to Babbage, 1843

"Analytical Engine weaves *algebraical patterns* just as the Jacquard loom weaves flowers and leaves"

--Taylor's *Scientific Memoirs*, 1843

Thamus reborn?

[people tend to]

"first, overrate what we find to be ...

remarkable, and secondly, by a sort of natural reaction, to undervalue the true state of the case ... The Analytical Engine has no pretension whatever to originate anything"

--Ada Byron,

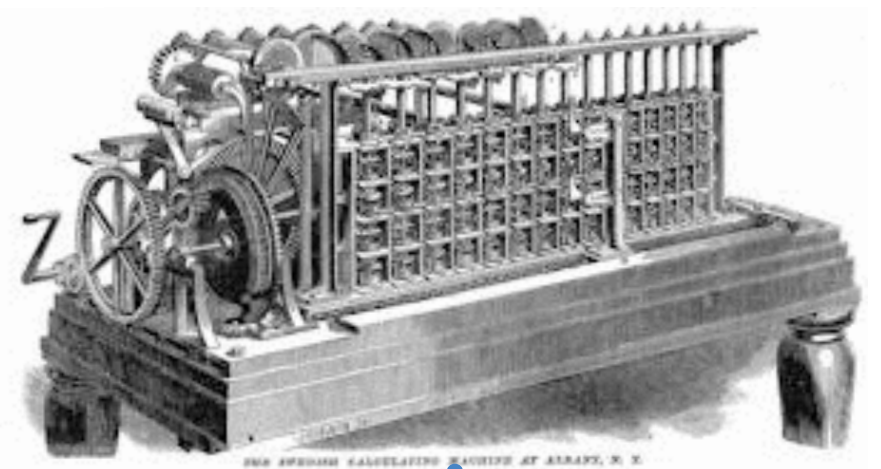
Taylor's *Scientific Memoirs*, 1843



Georg Scheutz
1785–1873



Edvard Scheutz
1822–1881



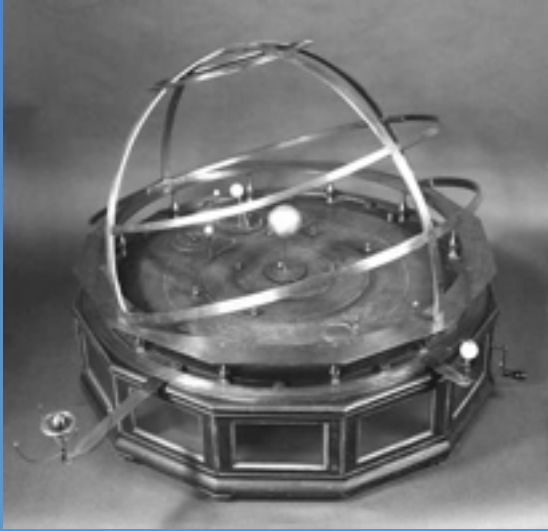
difference engines

Georg & Edvard Scheutz

Scheutz Difference Engine, with printer c 1853

Dudley Observatory, Schenectady

British Government, actuarial calculations
"English Life Table" 1864



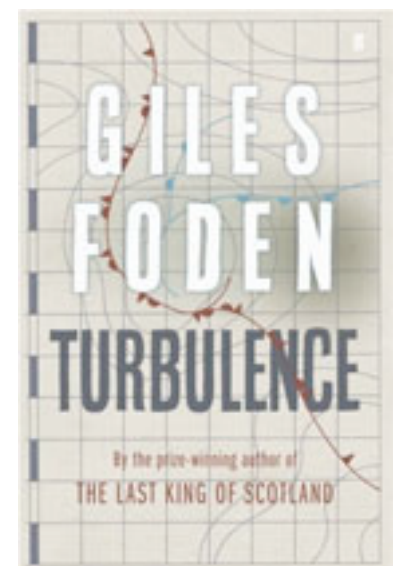
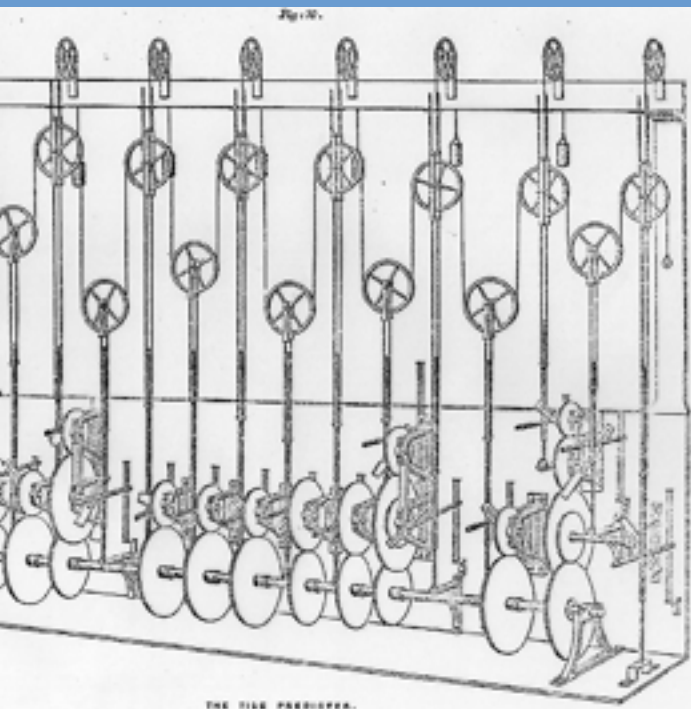
analog predictors

William Thomson, Lord Kelvin (1824-1907)

tide predictor, 1872

Lewis Fry Richardson (1881-1953)

Weather Predictions by Numerical Process,
1922 [1916]



overview

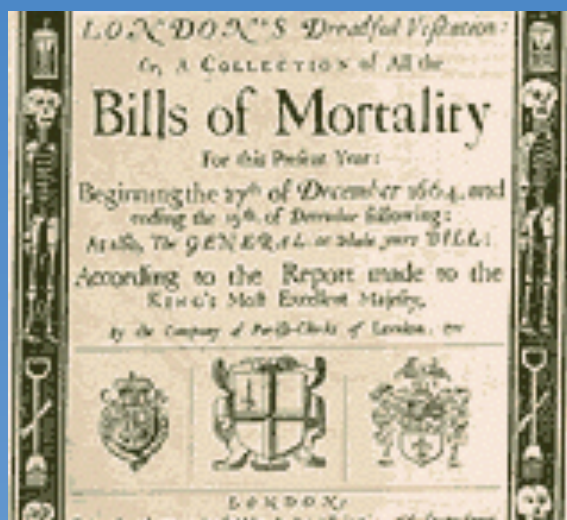
inventions
past and future
the demand side
changing business
changing perceptions

on the demand side

who might want these machines?

why?

what would they want?



"inextricably linked with our understandings of state and government"

--John Agar, *The Government Machine*, 2003

government information

A generall Bill for this present year, ending the 19 of December 1665, according to the Report made to the KING'S most Excellent Majesty, By the Company of Parish Clerks of London, &c.

The Diseases and Casualties this year.

Abortive and Stillborne	617	Executed	31	Pallie	20
Aged	1545	Flux and Small Pox	655	Plague	68538
Ajout and Peaver	537	Found dead in Streets, fields, &c.	21	Plurisie	6
Appoplex and Suddenly	218	French Pox	86	Purpore	19
Bedrie	12	Furuncul	45	Pyopurule	15
Bleeding	16	Gout and Sciatica	27	Quinsie	15
Bloody Flux, Scouring & Flux	184	Griping in the Guts	238	Riding of the Lightes	197
Burne and Scalded	8	Hanged Scumde away themselves	7	Rupture	14
Cancer	3	Headmedellor & Molefallea	14	Scurvy	17
Cancer, Gangrene and Fiftula	56	Jaundies	120	Ulceret and Swere pox	2
Canker and Thrush	12	Impothime	257	Ulcers, broken and healed	73
Childbed	62	Kill by feverall accidents	46	Lambs	73
Cholmes and Infants	1258	Nurse Evill	68	Spleen	14
Cold and Cough	62	Leprotie	2	Spotted Fevers and Purples	1529
Collick and Wende	134	Lethargy	14	Stopping of the stomack	334
Consumption and Tiflick	4888	Livergrowne	21	Stee and Stranguy	38
Convulsion and Morice	1052	Meargrom and Headach	14	Sturle	214
Diltraited	1	Mealles	7	Teeth and Worms	2614
Droote and Teapony	1478	Mothered and Stove	9	Vormiting	34
Drowned	15	Overlaid & Starved	45	Vum	1

Can. Dues. 48538
In all 9562

Male 48562
Female 4710
In all 95662

Increased in the Butalls in the 30 Parishet and at the Pest-house this year 70000
Increased of the Plague in the 132 Parishet and at the Pest-house this year 68538

registration

bills of mortality

births & marriages

parish members

population

patents, copyrights, trademarks

The Number of the Weddings, Christenings, and Burials, that were in the Parish of Crutchechurch, from March 26, 1560, to March 24, 1649, (as appeared by the Register) only in the years 1574 and 1575 the Christenings are wholly omitted, because the Register is very imperfect for the greater part of those years.

Years	Weddings	Christenings	Burials
1574	100	100	100
1575	100	100	100
1576	100	100	100
1577	100	100	100
1578	100	100	100
1579	100	100	100
1580	100	100	100
1581	100	100	100
1582	100	100	100
1583	100	100	100
1584	100	100	100
1585	100	100	100
1586	100	100	100
1587	100	100	100
1588	100	100	100
1589	100	100	100
1590	100	100	100
1591	100	100	100
1592	100	100	100
1593	100	100	100
1594	100	100	100
1595	100	100	100
1596	100	100	100
1597	100	100	100
1598	100	100	100
1599	100	100	100
1600	100	100	100
1601	100	100	100
1602	100	100	100
1603	100	100	100
1604	100	100	100
1605	100	100	100
1606	100	100	100
1607	100	100	100
1608	100	100	100
1609	100	100	100
1610	100	100	100
1611	100	100	100
1612	100	100	100
1613	100	100	100
1614	100	100	100
1615	100	100	100
1616	100	100	100
1617	100	100	100
1618	100	100	100
1619	100	100	100
1620	100	100	100
1621	100	100	100
1622	100	100	100
1623	100	100	100
1624	100	100	100
1625	100	100	100
1626	100	100	100
1627	100	100	100
1628	100	100	100
1629	100	100	100
1630	100	100	100
1631	100	100	100
1632	100	100	100
1633	100	100	100
1634	100	100	100
1635	100	100	100
1636	100	100	100
1637	100	100	100
1638	100	100	100
1639	100	100	100
1640	100	100	100
1641	100	100	100
1642	100	100	100
1643	100	100	100
1644	100	100	100
1645	100	100	100
1646	100	100	100
1647	100	100	100
1648	100	100	100
1649	100	100	100

government records

taxpayers
military eligible
aliens
racial groups
the poor
professions
midwives
prostitutes
cars
'National Insurance'
social security

U.S.

Health Enrollment Numbers Lift Democratic Hopes

By JONATHAN WEISMAN APRIL 2, 2014



WASHINGTON — After months of pummeling by Republicans and with a grim election season approaching, Democrats on Tuesday had a rare bright day. President Obama's announcement that the new health care plan had enrolled 7.1 million Americans coincided with the release by Representative [Paul D. Ryan](#) of a new Republican budget that proposes changes in [Medicare](#) and deep cuts in spending.

It's far too early to say a political turnaround is at hand, but for the first time this election year, Democrats are evincing some confidence that they have at least stanching the bleeding.



Senator Harry Reid spoke on Wednesday a Capitol about the Republican budget plan. choice is very stark," he said.
Doug Mills/The New York Times

"Statistics should reveal the quantum of happiness in a population [and] the means of further improvement."

—John Sinclair

big data

Statistics: a word lately introduced to express a view or survey of any kingdom, country, or parish

*Encyclopaedia
Britannica, 1797*

John Sinclair
1754–1835



THE
STATISTICAL ACCOUNT
OF
SCOTLAND,
DRAWN UP FROM THE COMMUNICATIONS
OF THE
MINISTERS
OF THE
DIFFERENT PARISHES.

BY SIR JOHN SINCLAIR, BART.

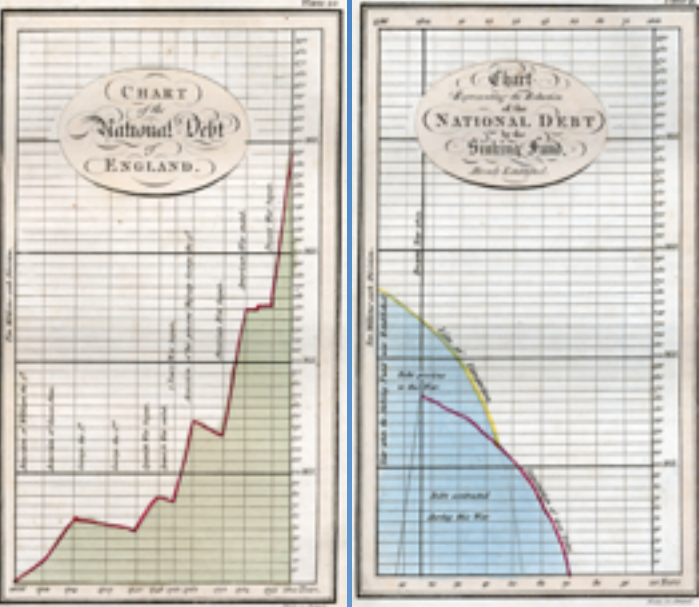
VOLUME TWENTY-FIRST.

"Ad consilium de republica dandum, caput est nosse rempublicam."
CICERO de Orat. lib. ii.

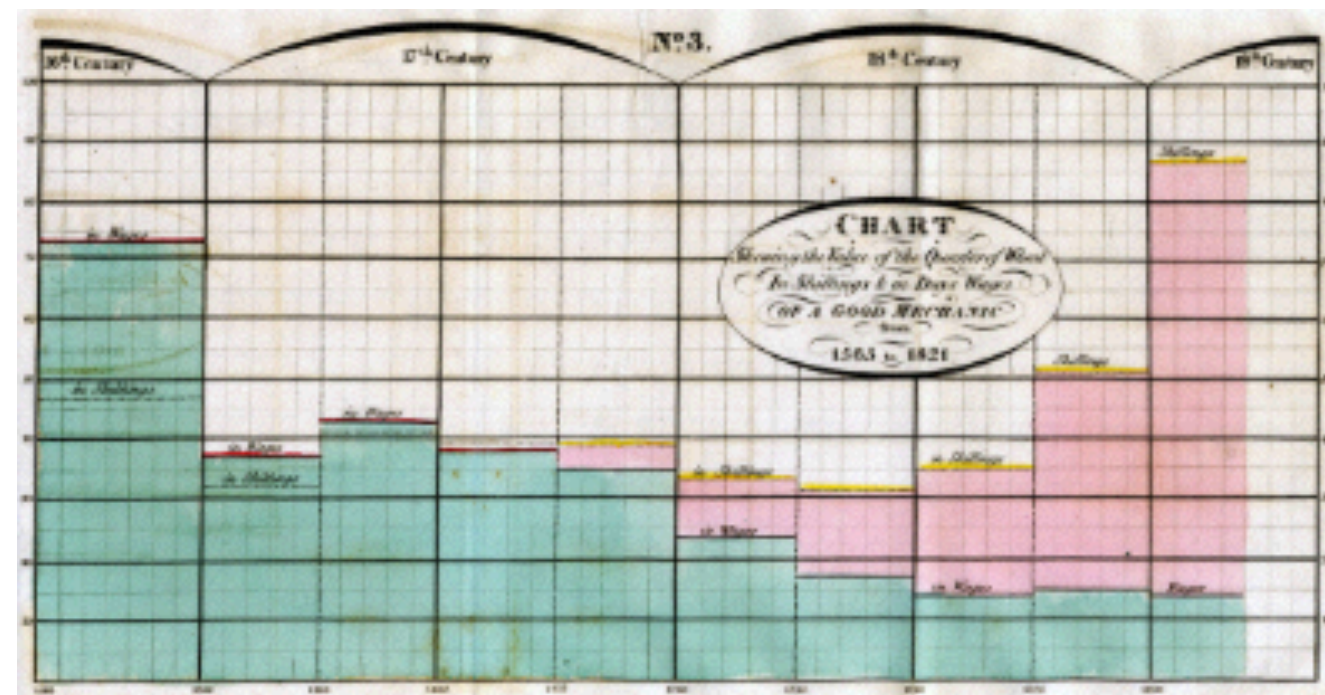
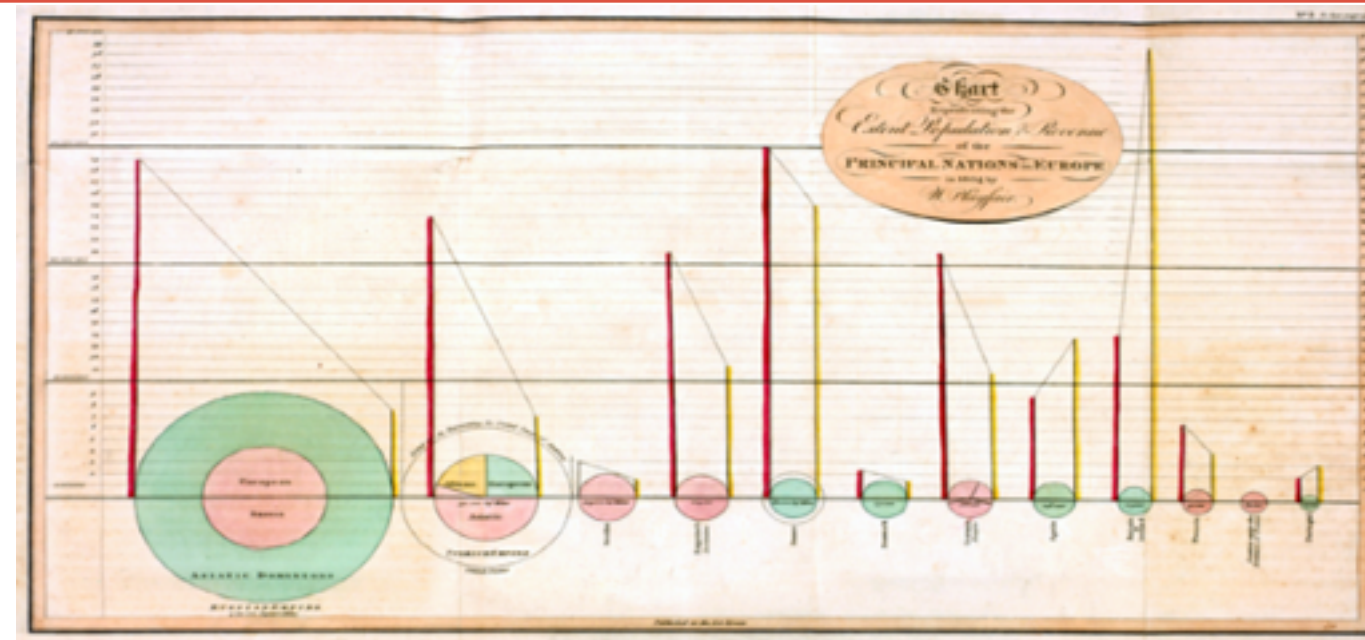
EDINBURGH:

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AND ALSO SOLD BY J. DONALDSON, A. GUTHRIE, W. LAING,
AND JO. FAIRBAIRN, EDINBURGH; T. CADELL, J. DEB-
RETT, AND J. SEWEL, LONDON; DUNLOP AND WIL-
SON, GLASGOW; ANGUS AND SON, ABERDEEN.

M,DCC,XCIX.



Scots & Statistics



THE
STATISTICAL BRIEVIARY;
SHEWING,
ON A PRINCIPLE ENTIRELY NEW,
THE RESOURCES
OF EVERY
STATE AND KINGDOM IN EUROPE;

ILLUSTRATED WITH
STAINED COPPER-PLATE CHARTS,
REPRESENTING THE
PHYSICAL POWERS OF EACH DISTINCT NATION
WITH EASE AND PERSPICUITY.

By **WILLIAM PLAYFAIR.**

TO WHICH IS ADDED,
A SIMILAR EXHIBITION OF THE RULING POWERS
OF HINDOOSTAN.

LONDON:

W. Ballin

Printed by T. BENILEY, Bolt Court, Fleet Street,
For J. WALLIS, 46, PATERNOSTER ROW; CARPENTER AND CO. BOND
STREET; FICKERTON, WHITEHALL; VERNOR AND HOOD, FOLTRY; BLACK
AND PARRY, LEADENHALL STREET; and TISSETT AND DODGE, St. James's
Street.

1801.

THE
COMMERCIAL AND POLITICAL
ATLAS,
Representing, by Means of
STAINED COPPER-PLATE CHARTS,
THE
PROGRESS OF THE COMMERCE, REVENUES, EXPENDITURE,
AND DEBTS OF ENGLAND,
DURING THE WHOLE OF THE
EIGHTEENTH CENTURY.

THE THIRD EDITION,
Corrected and brought down to the End of last Year.

By **WILLIAM PLAYFAIR.**

London

Printed by T. BURTON, Little Queen-Street, LINCOLN'S-INN FIELDS,
FOR J. WALLIS, NO. 46, PATERNOSTER-ROW; CARPENTER AND CO. BOND-
STREET; FICKERTON, WHITEHALL; VERNOR AND HOOD, FOLTRY;
BLACK AND PARRY, LEADENHALL-STREET.

1801.



making states

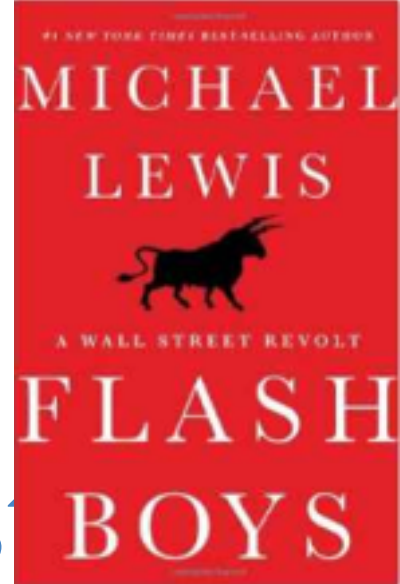
An act concerning...

1. public archive
2. state printer
3. pilots for SF
4. comptroller
5. treasurer
6. sec. of state
8. translator
11. AG
14. Supreme Court
30. incorporation of cities
36. commissioner of deeds
41. notaries
49. lawful fences
48. incorporation of towns
53. weights & measures
55. limited partners
59. recorder's office
64. officers of health
67. surveyors
69. librarian
72. register of wills
89. marks & brands
90. reporter
93. conveyances
95. common law
117. incorp. of colleges
123. assayer

—*Statutes of California, 1849-50*



business interest



sorting operation: the clearing house

"In a large room in Lombard-street, about thirty clerks from the several London bankers take their stations ... at desks placed around the room. ... From time to time other clerks from every house enter the room, and passing along, drop into the box the checks due by that firm to the house from which this distributor is sent. ... The whole of these payments are made by a double system of balance, a very small amount of bank notes passing from hand to hand.

--Babbage, *On the Economy*, 1835

"[1839] £954 million was cleared--\$250 billion in today's money."

--Campbell-Kelly & Aspray



information technology



carbon paper
Wedgewood, 1806

typewriter
Remington, 1874

calculator
Burroughs, 1892

cash register
mechanical register, 1884



"No simple economic explanation ...
America was gadget happy"

--Campbell-Kelly and Aspray, *Computer*, 1996

the office



clerks (UK)

1871: 262,100

1891: 534,622

1911: 918,186

female clerks

1891: 17,859

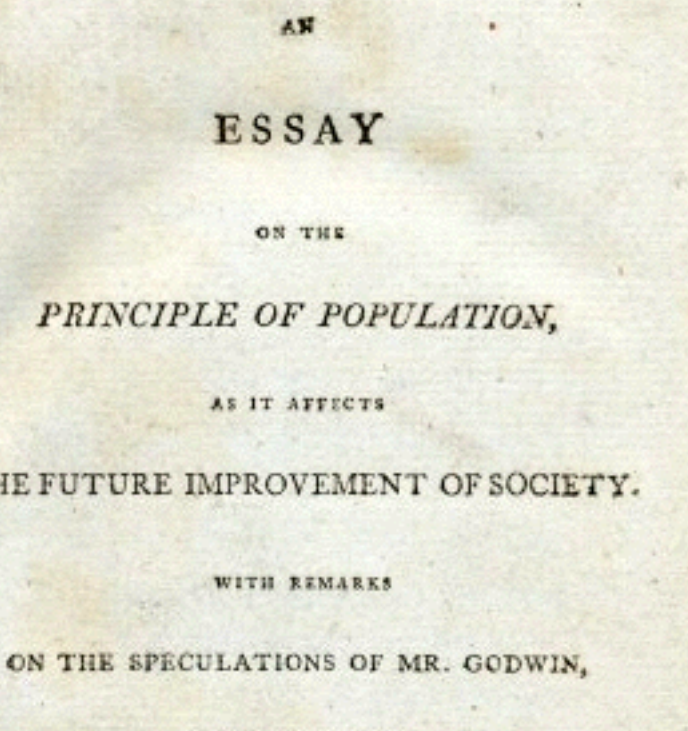
1911: 117,057

1921, women 46% of all clerks

typewriter girls

1931, 212,296 female typists

5,155 male typists



"[An] Enumeration shall be made within three Years after the first Meeting of the Congress of the United States, and within every subsequent Term of ten Years, in such Manner as they shall by Law direct."

back to government

The New York Times

Old Forecast of Famine May Yet Come True

APRIL 1, 2004



Water stored in a warehouse in Juba, the capital of South Sudan. The United Nations has warned of stressed water supplies. Andrei Pungovschii/Agence France Presse — Getty Images



Might Thomas Malthus be vindicated in the end?

Two centuries ago — only 10 years after a hungry, angry populace had ushered in the French Revolution — the dour Englishman predicted that exponential population growth would condemn humanity to the edge of subsistence.

"The power of population is so superior to the power in the earth to produce subsistence for man, that premature death must in some shape or other visit the human race," he wrote with alarm.

Year	Population	Gain	Clerks
1900	76,212,168	13,232,402	21.0
1890	62,979,766	12,790,557	25.5
1880	50,189,209	11,630,838	30.2
1870	38,558,371	7,115,050	22.6
1860	31,443,321	8,251,445	35.6
1850	23,191,876	6,128,523	35.9
1840	17,063,353	4,202,651	32.7
1830	12,860,702	3,222,249	33.4
1820	9,638,453	2,298,572	33.1
1810	7,239,881	1,931,398	36.4
1800	5,308,483	1,379,269	35.1
1790	3,929,214	-	-



Herman Hollerith
1860–1929

tabulating

Hollerith

Electronic Tabulating Machine

1890 Census

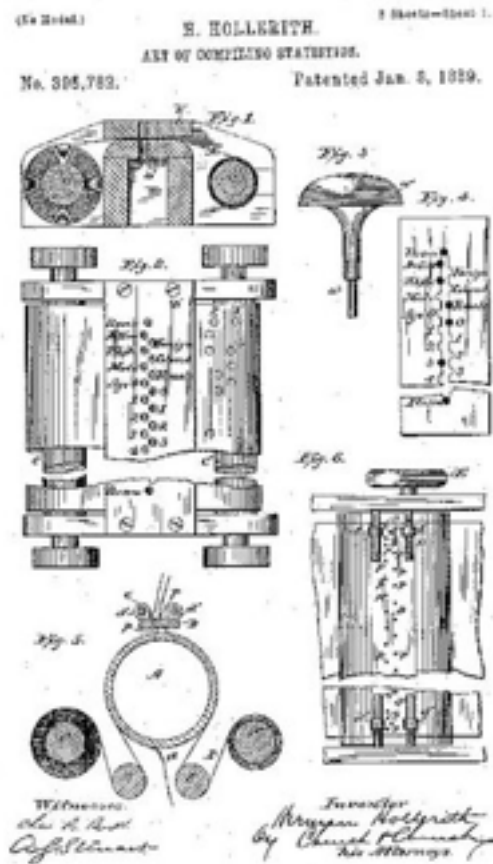
"This apparatus works unerringly as the mills of the gods, but beats them hollow as to speed."

—*The Electrical Engineer*, 11 Nov 1891



the punch card

1	2	3	4	CH	OH	Sp	Ch	On	In	20	30	80	Dv	Us	3	4	3	4	A	E	L	e	g
5	6	7	8	CL	UL	O	Ms	Qs	Mo	25	55	85	Wt	CT	1	2	1	2	B	F	H	b	b
1	2	3	4	CS	US	Ms	B	H	O	30	60	O	2	Pr	O	15	O	15	C	G	W	e	i
5	6	7	8	Mo	Id	Wt	V	F	5	35	65	1	3	Sg	5	10	5	10	D	H	O	d	k
1	2	3	4	Ph	FT	Pa	7	1	10	40	70	90	4	O	1	3	O	2	St	I	P	e	l
5	6	7	8	Th	RT	Re	8	2	15	45	75	95	100	Us	2	4	1	3	4	E	Us	F	m
1	2	3	4	X	Us	Pl	9	3	1	e	X	R	L	E	A	6	O	US	Ir	Se	US	Ir	Se
5	6	7	8	On	Bn	Ms	10	4	k	4	T	S	H	F	8	10	1	Gr	Bn	Va	Gr	Bn	Va
1	2	3	4	V	R	OK	11	5	1	e	E	T	H	G	C	15	2	Dv	PC	BC	Dv	PC	BC
5	6	7	8	7	4	1	12	6	m	F	MO	U	O	E	D	Us	3	Wv	Se	Ba	Wv	Se	Ba
1	2	3	4	8	5	2	On	O	n	e	A	V	P	I	AL	Na	4	Dk	Pr	Ts	Dk	Pr	Ts
5	6	7	8	9	6	3	O	p	e	b	b	V	Q	X	Us	Pa	5	Ru	On	Us	Ru	On	Us



"Hollerith, then IBM, managed to maintain a near monopoly by periodically filing for new key patents or by acquiring those of unsuccessful rivals."

-- Mounier-Kuhn, 2012

government & business

Hollerith

Tabulating Machine Company

CTR:

Computing-Tabulating-Recording Company

Thomas Watson

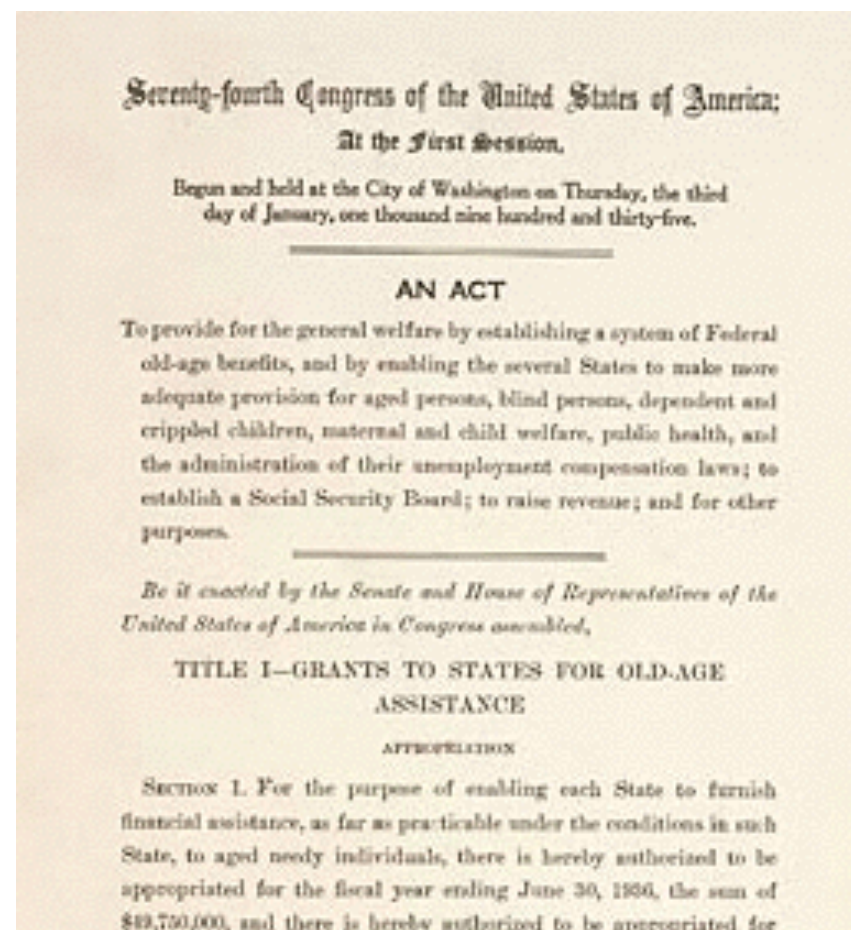
NCR to CTR to ...

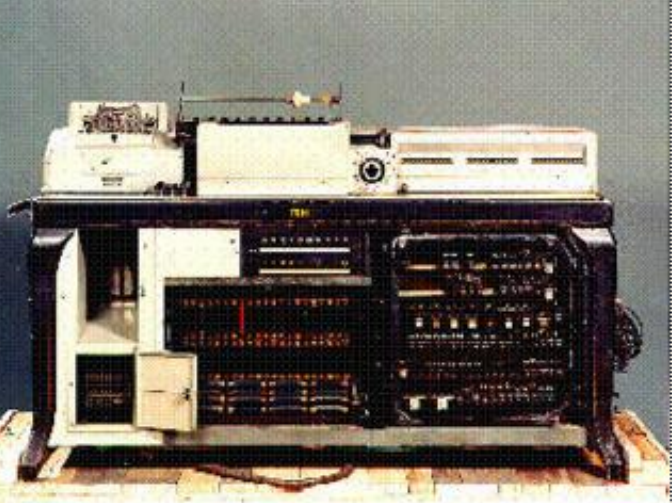


a new deal

Social Security Act, 1935

"the world's largest bookkeeping job"





Hollerith-Maschine Dehomag D11, die 1933 in Deutschland

controlling numbers

controlling people

The Nazi Census --Aly & Roth, 2004

IBM DII

Census, 1933, 1939

Labor Book, 1935

Health Pedigree book, 1936

Registry of the Populace, 1939

Blood (high, average, acceptable, inferior), 1940

Personal Identification Number, 1944



INDIA'S WAY
Scanning 2.4 Billion Eyes, India Tries to Connect Poor to Growth



Ruth Fremson/The New York Times

A migrant farm worker peers into an iris scanner in New Delhi in the first effort to officially record each Indian's identity as an individual.

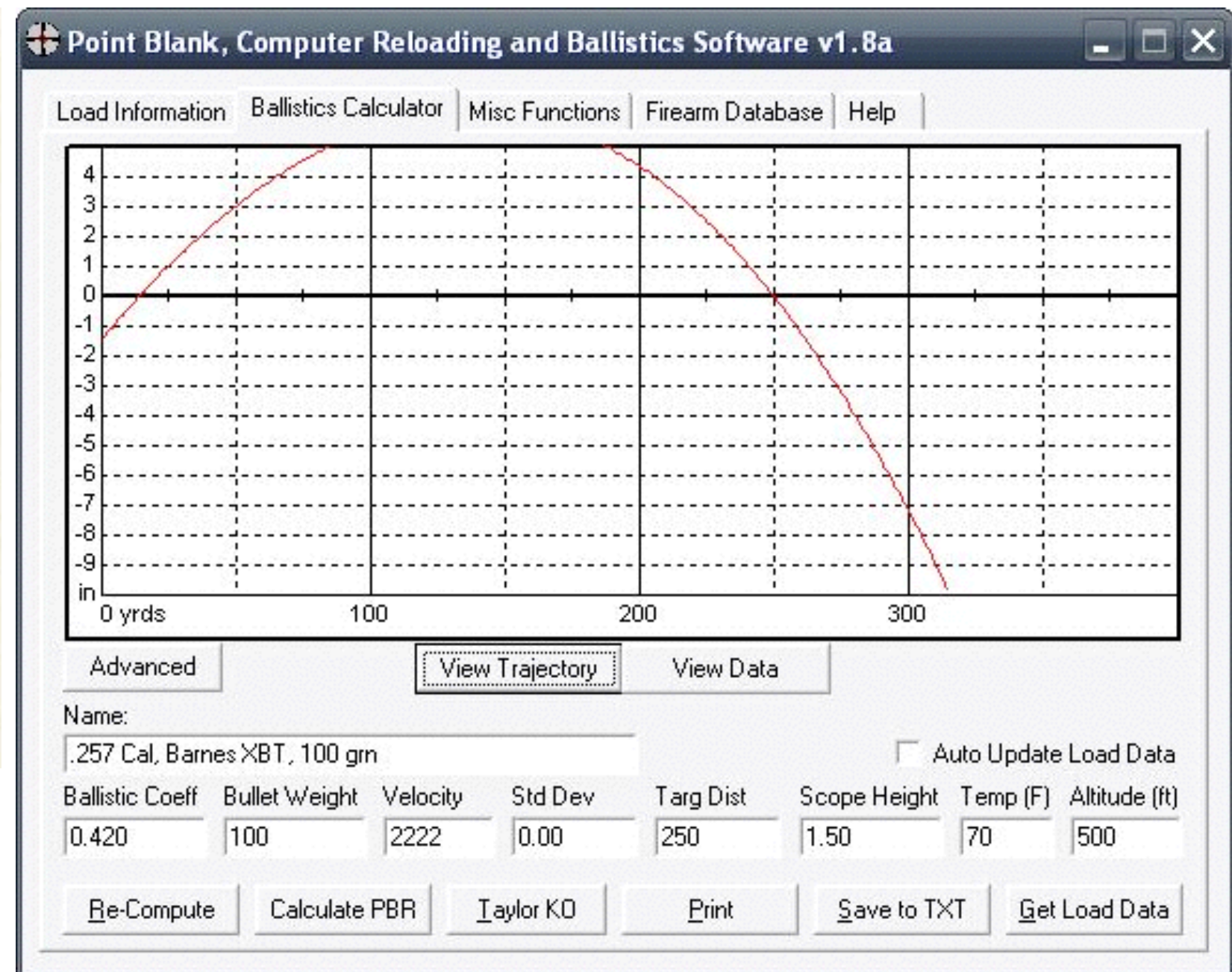
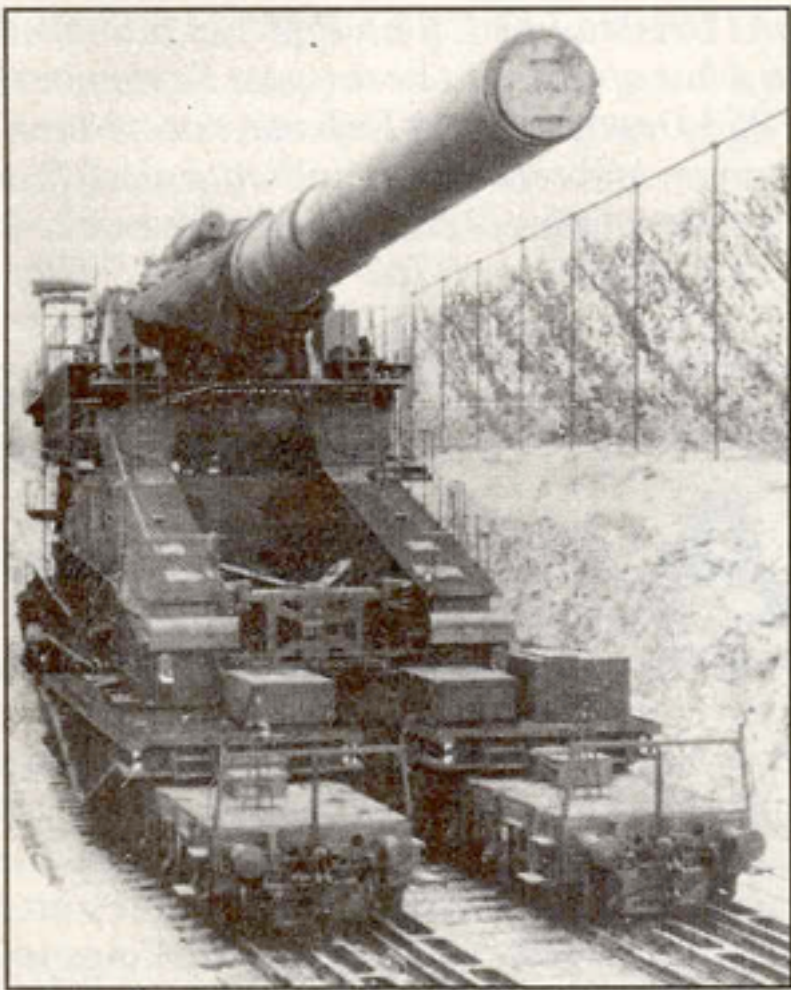
By LYDIA POLGREEN
Published: September 1, 2011

still registering

"sailors ... trace their family
.. .names upon the wrist ... If
it were possible for such a
practice to become
universal ... Who are you? ...
no room for prevarication in
the answer ... men were thus
held as it were by an invisible
chain."

-- Jeremy Bentham,
Principles of Penal Law [1843]

military takeover



military processing

ballistics "firing tables"

Vannevar Bush, 1935,

Differential Analyzer



analytical work

(Babbage)

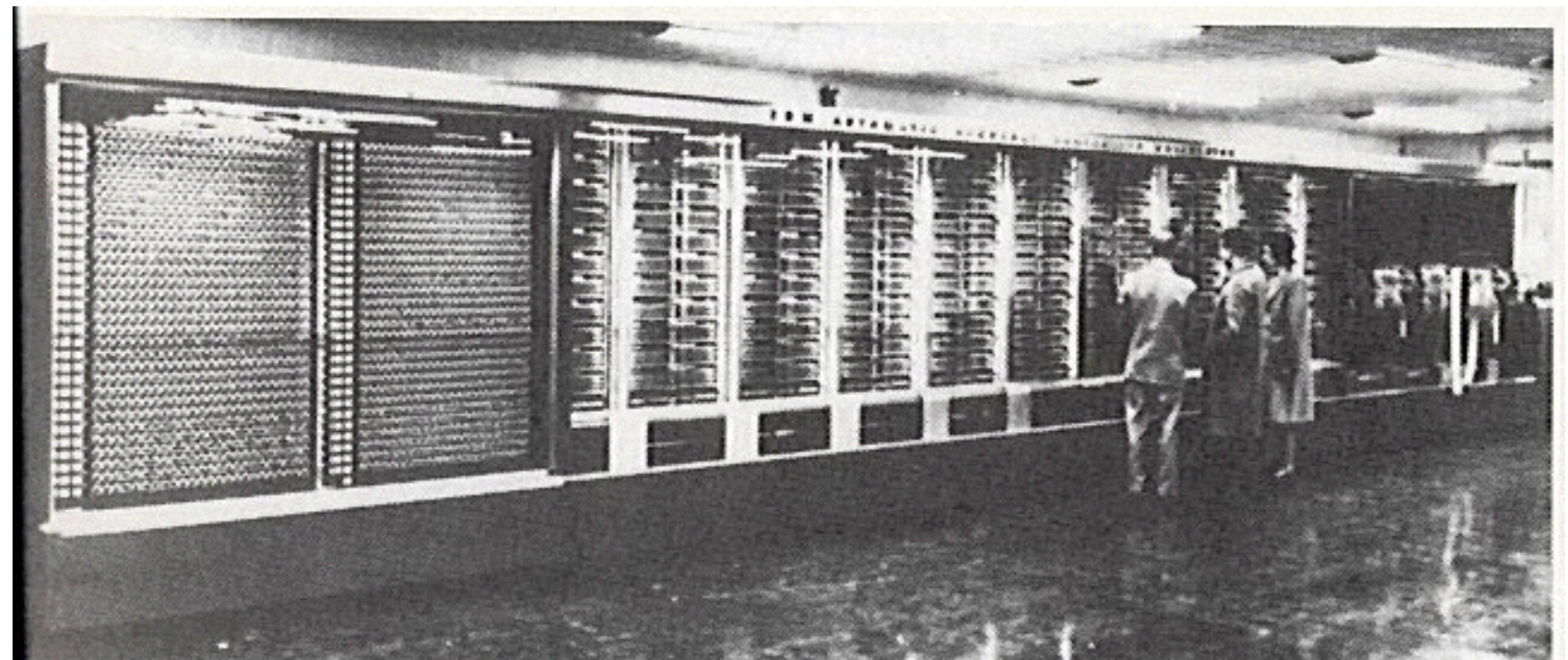
Bush

Shannon, "A Symbolic Analysis of Relay and Switching Circuits," 1937



Harvard mark I

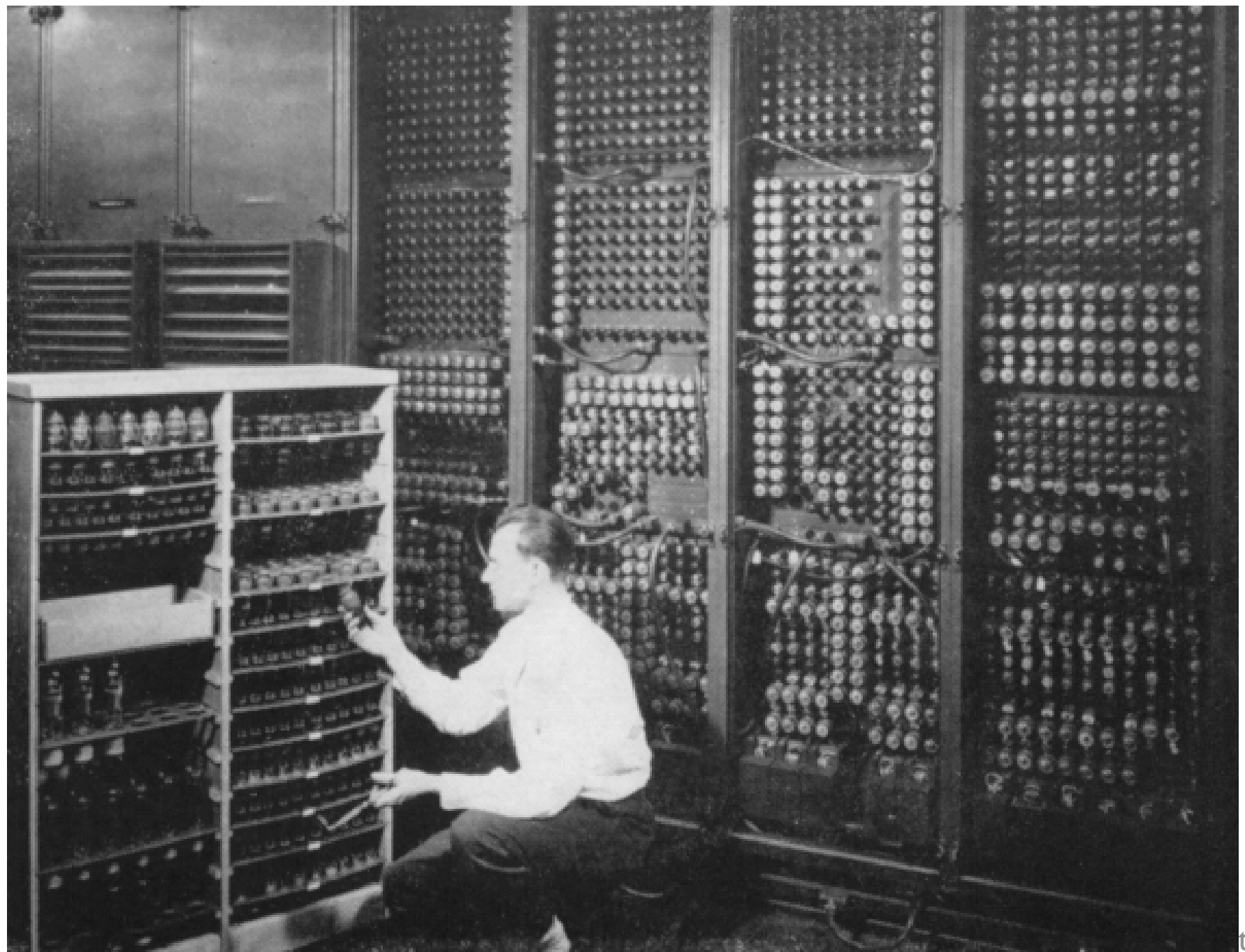
aka **IBM Automatic Sequence Controlled Calculator**





John von Neumann
1903–1957

military processing



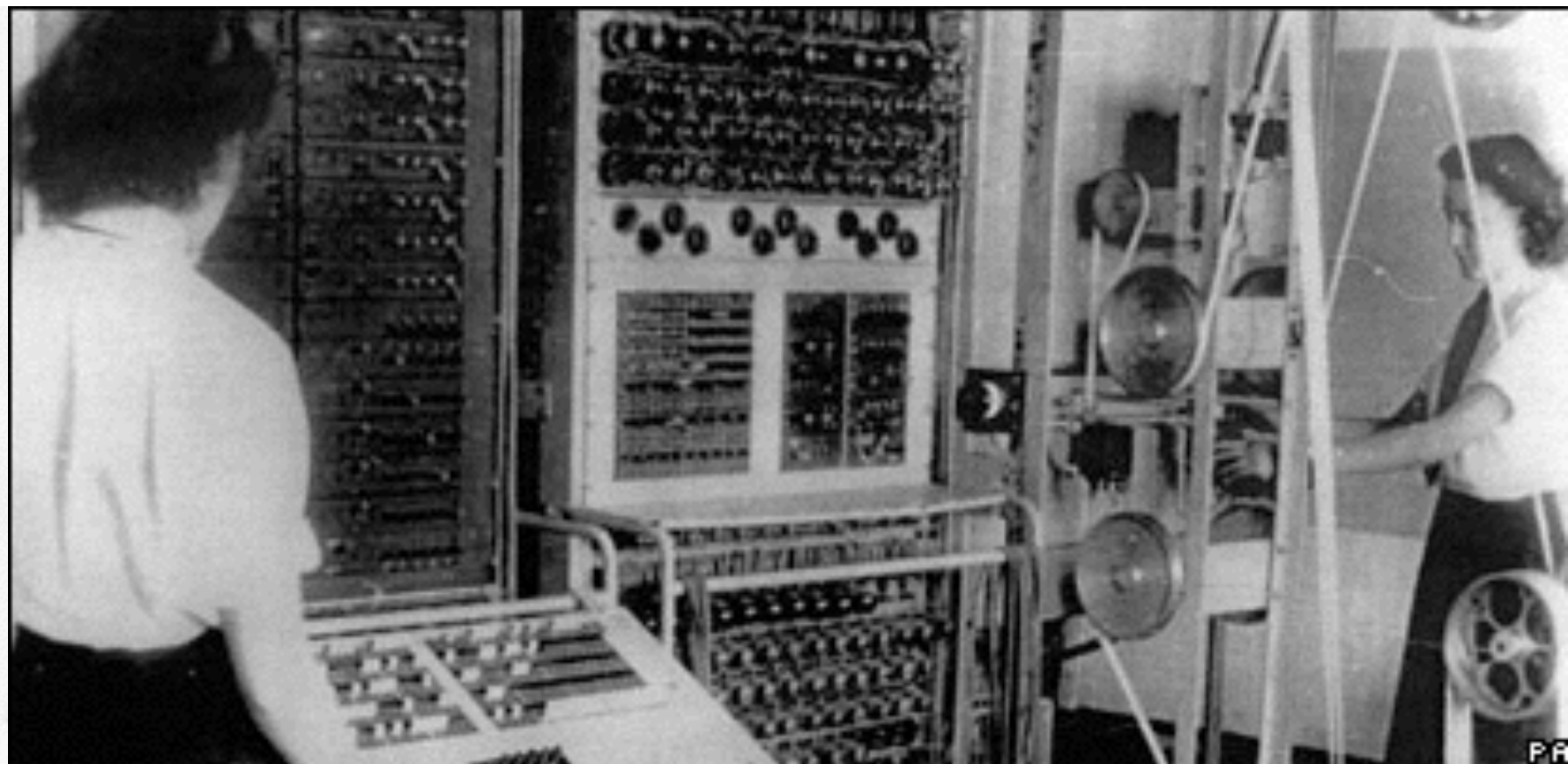
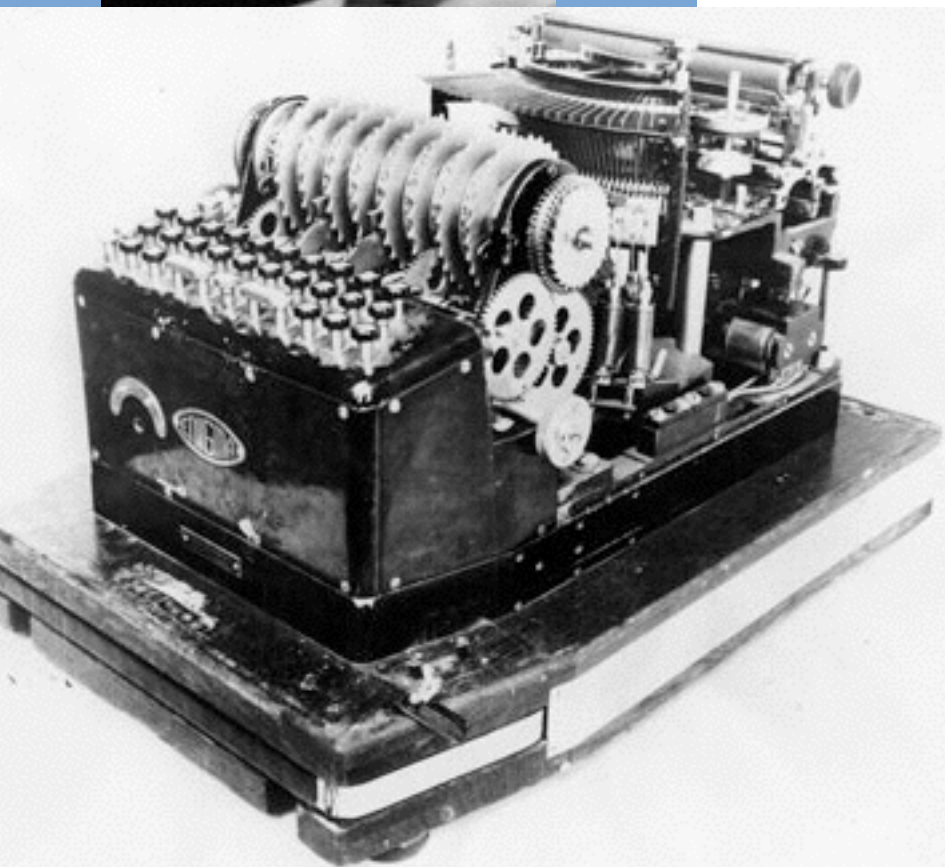


Alan Turing
1912–1954

decoding

1943, Colossus

Bletchley Park



60 years on

19 March 2014 Last updated at 11:10 ET



Alan Turing Institute to be set up to research big data

An institute named after computer pioneer and code-breaker Alan Turing is to be set up, the chancellor announced in his Budget speech on Wednesday.

The Alan Turing Institute will focus on new ways of collecting, organising and analysing large sets of data - commonly known as big data.

The government will provide £42m over five years for the project.

Universities and other interested parties will be able to bid for the funding to set up the institute.

Turing received a posthumous royal pardon last year, following a conviction for homosexual activity.

He worked at Bletchley Park during World War Two, and his work helped accelerate Allied





[just one] "would suffice the needs of
the whole world" - Georg Scheutz

back to Thamus

"I went to see Professor Douglas Hartree, who had built the first differential analyzers in England and had more experience in using these very specialized computers than anyone else. **He told me that, in his opinion, all the calculations that would ever be needed in this country could be done on the three digital computers which were then being built**—one in Cambridge, one in Teddington, and one in Manchester. No one else, he said, would ever need machines of their own, or would be able to afford to buy them."

--Lord Bowden, *American Scientist* 58 (1970) pp. 43–53

THE MECHANICAL BRAIN

ANSWER FOUND TO 300 YEAR-OLD SUM

From Our Special Correspondent

Experiments which have been in progress in this country and the United States since the end of the war to produce an efficient mechanical "brain" have been successfully completed at Manchester University, where a workable "brain" has been evolved. Not only is it working satisfactorily, but for the first time a machine has been brought to the point at which it can work out problems which it is practically impossible to execute on paper.

The Manchester "mechanical mind" was built by Professor F. C. Williams, of the Department of Electro-Technics, and is now in the hands of two university mathematicians, Professor M. H. A. Newman and Mr. A. W. Turing.

It has just completed, in a matter of weeks, a problem, the nature of which is not disclosed, which was started in the seventeenth century and is only just being completed by human calculation.

Its appearance is somewhat unprepossessing. It is composed of racks of electrical apparatus consisting of a mass of untidy wires, valves, chassis, and display tubes. When in action, the cathode ray becomes a pattern of dots which shows what information is in the machine. There is a close analogy between its structure and that of the human brain. It differs from other mechanical brains in its method of storing information. The electronic method ensures that information is more readily accessible.

CALCULUS TO SONNET

Mr. Turing said yesterday: "This is only a foretaste of what is to come, and only the shadow of what is going to be. We have to have some experience with the machine before we really know its capabilities. It may take years before we settle down to the new possibilities, but I do not see why it should not enter any one of the fields normally covered by the human intellect, and eventually compete on equal terms."

"I do not think you can even draw the line about sonnets, though the comparison is perhaps a little bit unfair because a sonnet written by a machine will be better appreciated by another machine."

Mr. Turing added that the university was really interested in the investigation of the possibilities of machines for their own sake. Their research would be directed to finding the degree of intellectual activity of which a machine was capable, and to what extent it could think for itself.

News of the experiments was disclosed by Professor Jefferson in the Lister oration reported in *The Times* yesterday.

only a foretaste

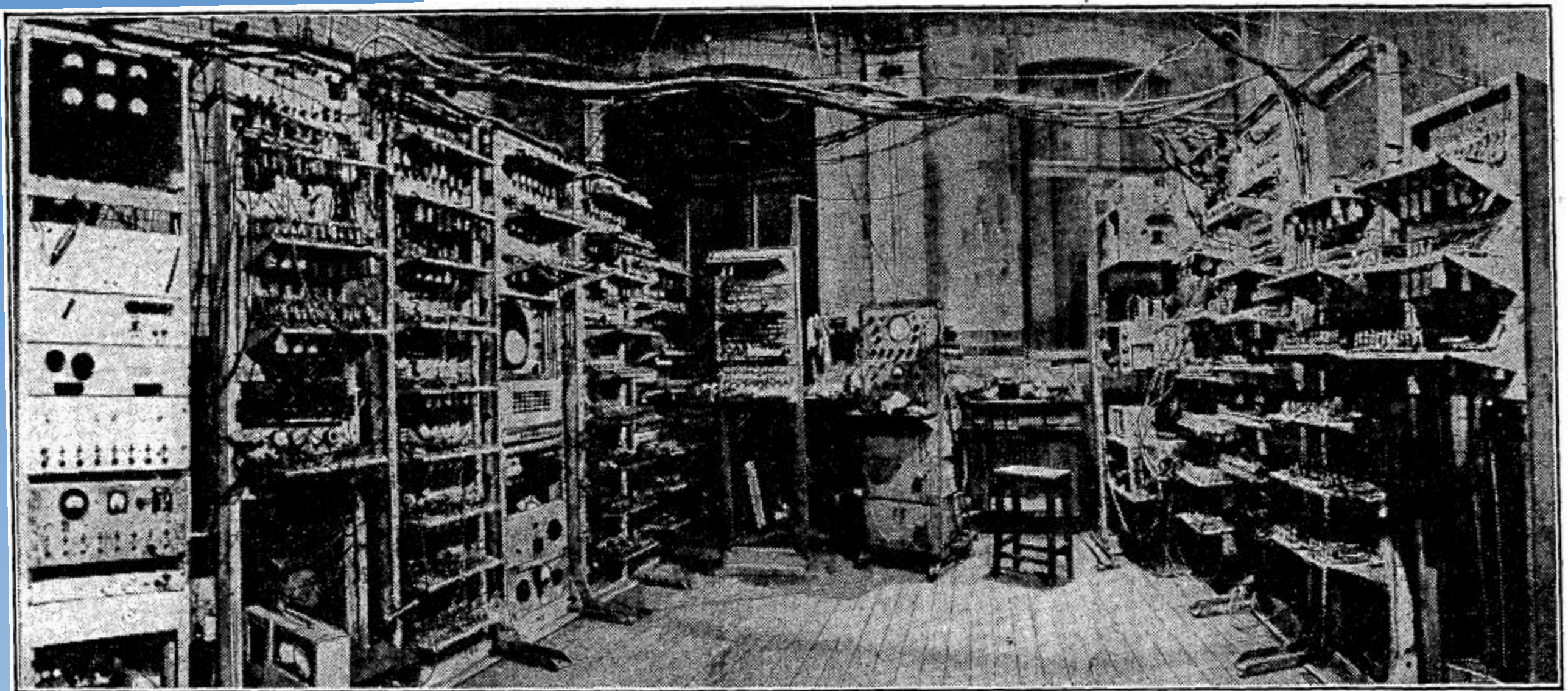
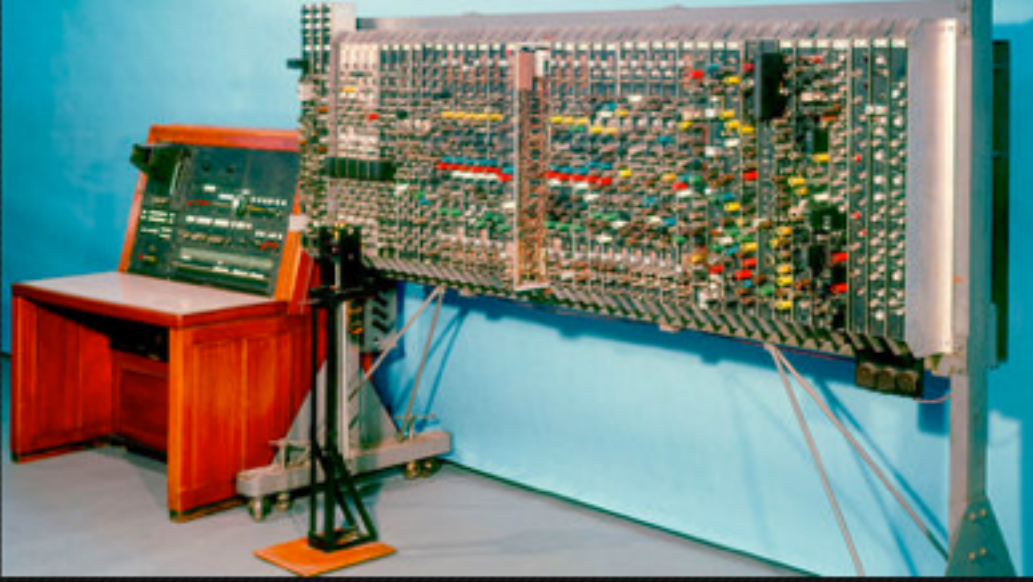
"In reports to the US government, and in funding requests to the military (to calculate the effects of thermonuclear explosions), von Neumann and his colleagues expressed the view that **'at most six or so machines should suffice for the whole country.'**

Turing, in an interview with the *Times* in 1949, declared: 'This is only a foretaste of what is to come, and only the shadow of what is going to be ... I do not see why it should not enter any one of the fields normally covered by the human intellect and eventually compete on equal terms.'"

—Philip Welch, *London Review of Books*, 2012



Manchester's mechanical brain



THE MECHANICAL BRAIN.—The apparatus which has been evolved in the electrical engineering laboratories of Manchester University to work out problems which are almost impossible to execute on paper. The section on the left contains the control circuit, in the middle rack of which is a cathode ray tube screen with (below) the control

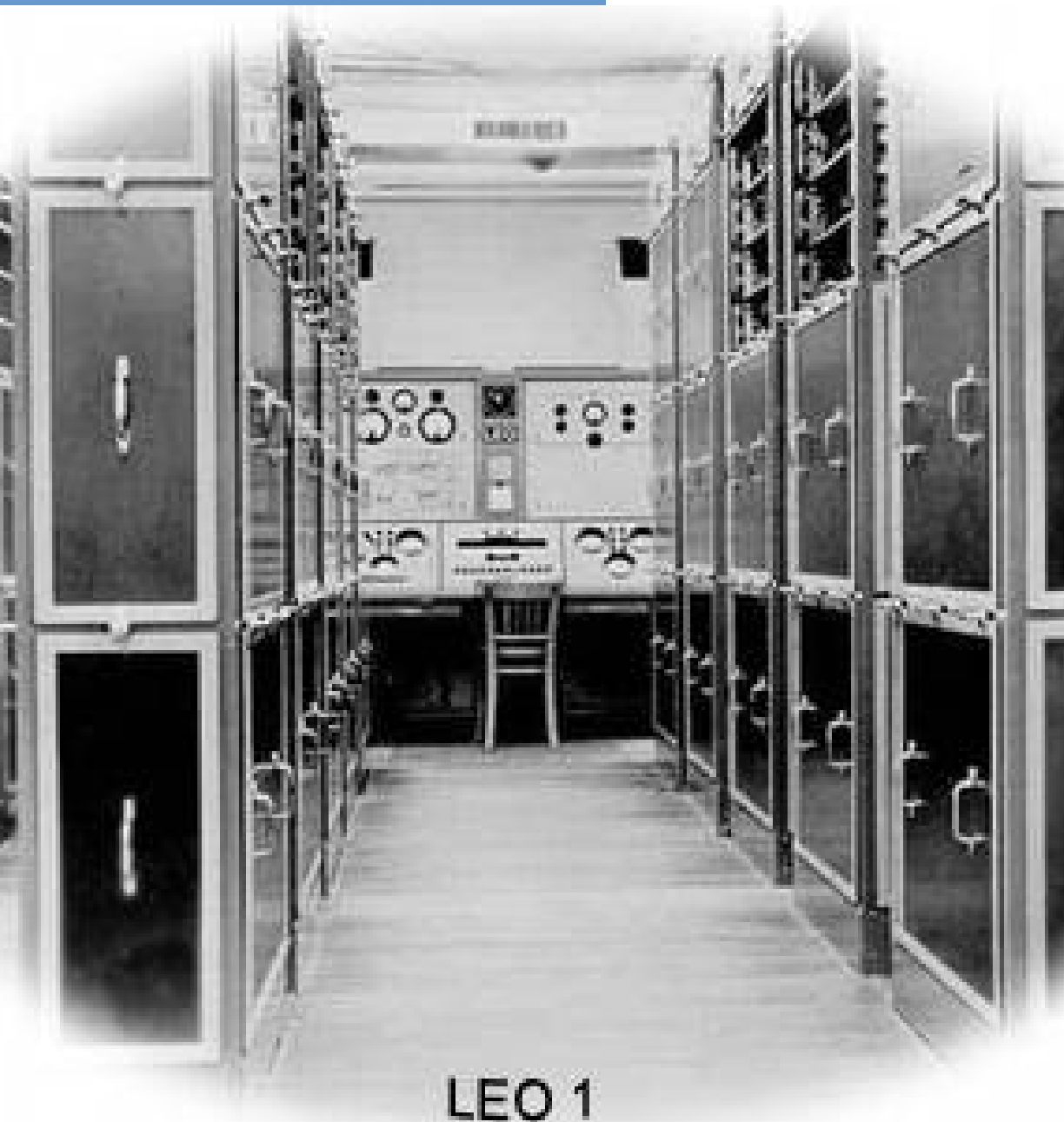
desk. The racks on the right-centre of the picture with the box-like containers provide the memory section of the machine. Nearer the camera are racks containing the calculating circuits. The machine is "fed" at the control desk and the answer is read on the cathode ray tube, which is the only visible means of showing that the brain is at work.

overview

inventions
past and future
the demand side
changing business
changing perceptions



back in business vertical integration



LEO 1

How a chain of tea shops kickstarted the computer age

In November 1951 a British company switched on the world's first business computer.



Image 1 of 3

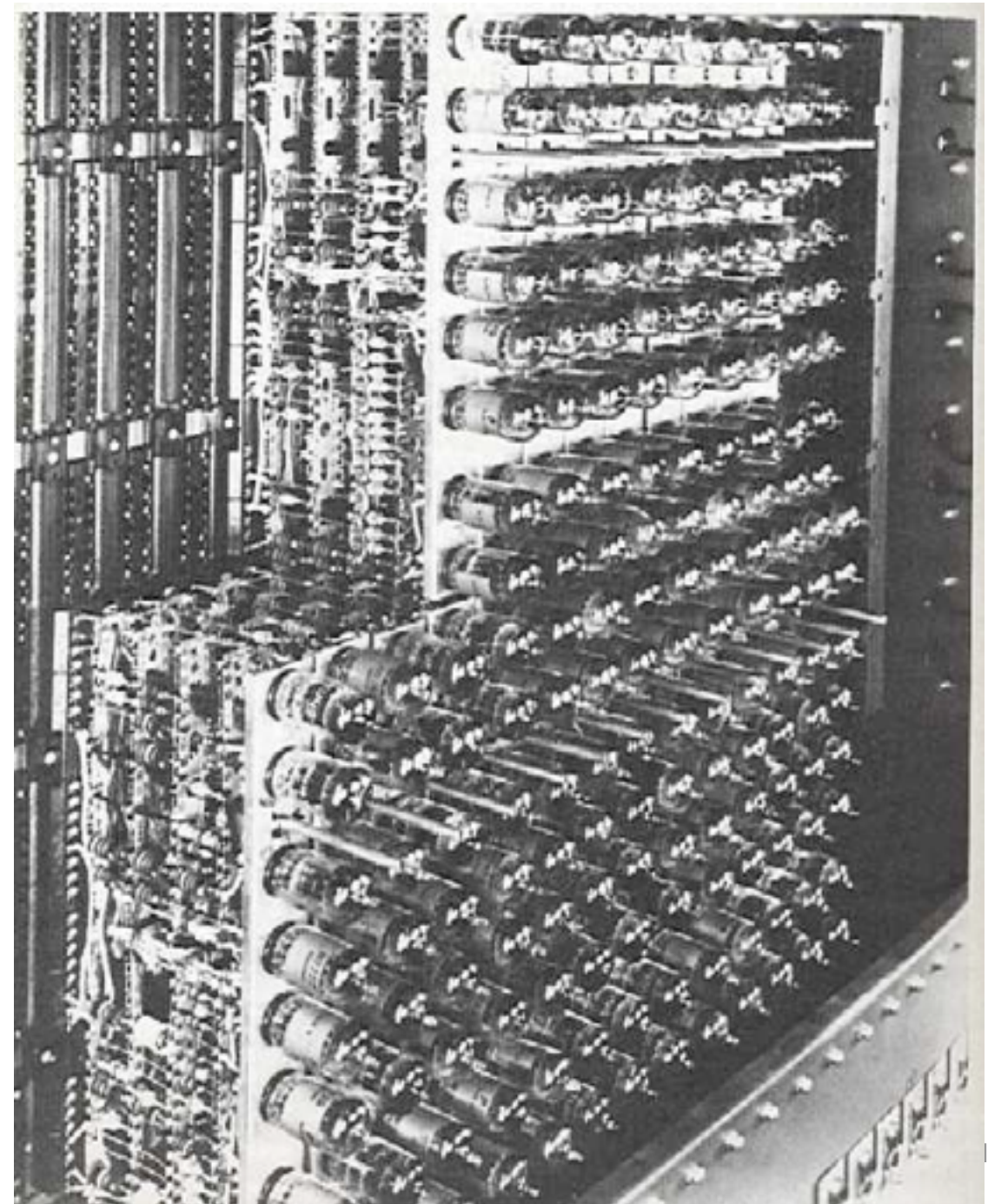
LEO at Lyons HQ in Hammersmith

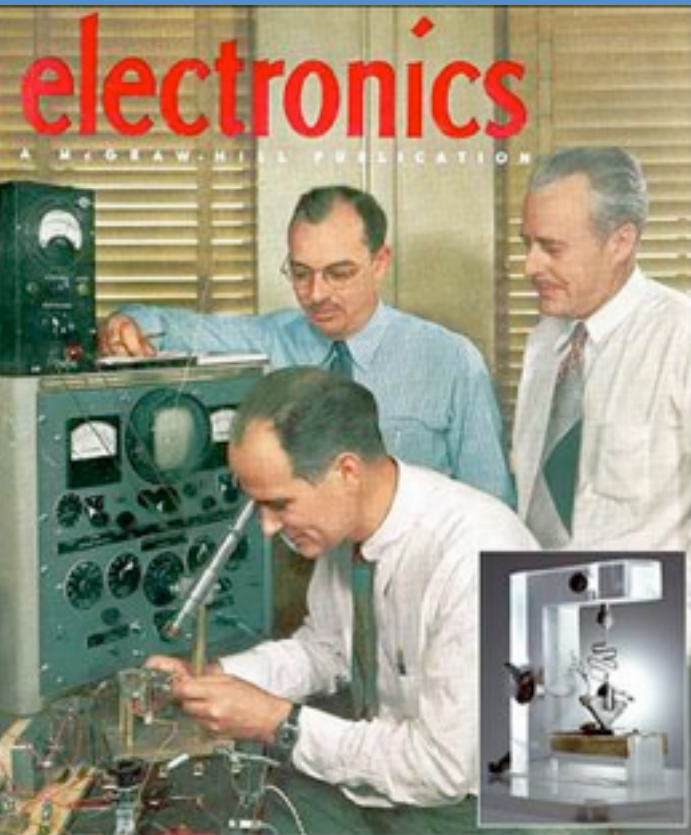
By Christopher Williams, Technology Correspondent

7:00AM GMT 10 Nov 2011

breaking down

Cathode-ray
tube memory,
from the IBM
701 Defense
Calculator,
1952





breaking things down

1947 transistor

Bell Labs

John Bardeen, William Brattain, William Shockley

1958 integrated circuit

Texas Instruments

Jack Kilby

Shockley

Fairchild

Intel





corporate computing



100. Console - IBM System/360 Model 30

1960 DEC PDP-1

"programmable data processor"

1964 IBM 360

1969 Xerox PARC

"the architecture of information"

(1946 SRI)



more breaking down

vertical disintegration 1970-1990

Software	IBM
OS	IBM
CPU	IBM
Hardware	<u>IBM</u>

overview

inventions
past and future
the demand side
changing business
changing perceptions

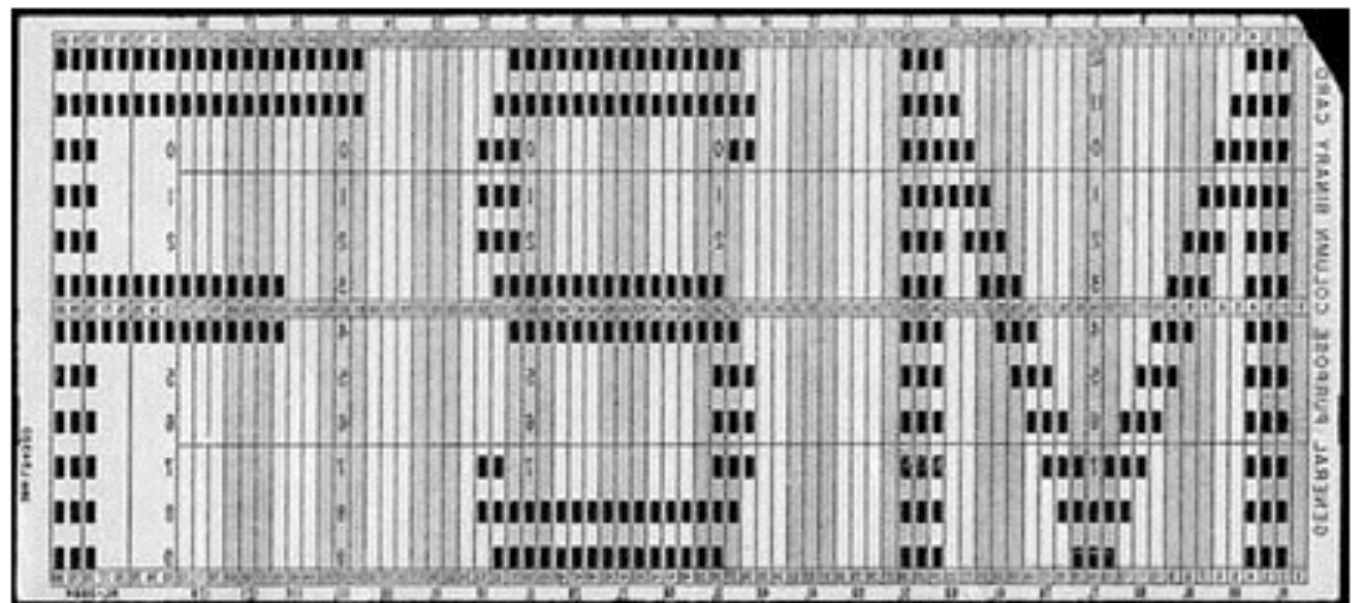
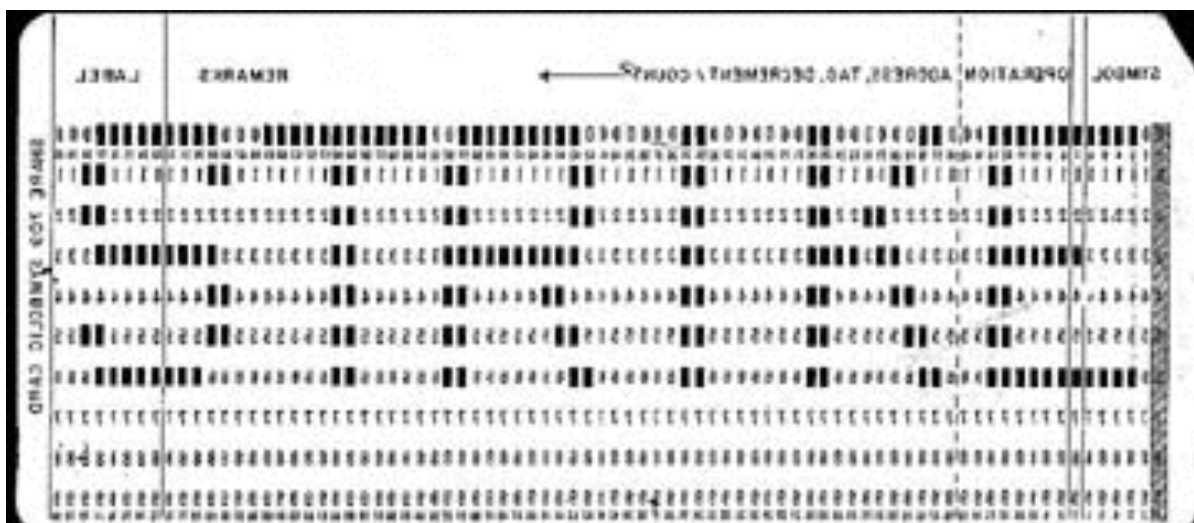


rage against the machine

FSM

"And you've got to put your bodies upon the gears and upon the wheels, upon the levers, upon all the apparatus -- and you've got to make it stop! And you've got to indicate to the people who run it, to the people who own it -- that unless you're free the machine will be prevented from working at all!!" —Mario Savio, December 2, 1964

"I am a student at the University of California. Please do not fold, spindle or mutilate me."



PROJECT BREAKTHROUGH!

**World's First Minicomputer Kit
to Rival Commercial Models...**

"ALTAIR 8800" SAVE OVER \$1000



ALSO IN THIS ISSUE:

- An Under-\$90 Scientific Calculator Project
- CCD's—TV Camera Tube Successor?
- Thyristor-Controlled Photoflashers



TEST REPORTS:

Technics 200 Speaker System
Pioneer RT-1011 Open-Reel Recorder
Tram Diamond-40 CB AM Transceiver
Edmund Scientific "Kilian" Photo Kit
Hewlett-Packard 5381 Frequency Counter



culture clash

home brew, fone freaks

1975 Altair

3 July 2013 Last updated at 18:04 ET

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1976 Apple I

Computer mouse inventor Doug Engelbart dies at 88



Richard Lister looks back at his life

The inventor of the computer mouse, Doug Engelbart, has died aged 88.

[Related Stories](#)



1983 Lisa

1984 Macintosh



fast forward

Stewart Brand, "Fanatic Life and Symbolic Death Among the Computer Bums"

--*Rolling Stone*, 7 December, 1972

a libertarian vision

Brand, Barlow, Dyson, Gilder, Kelly, Rosetto,

"the internet ... an exciting kind of metaphor for spontaneous order"—Gilder

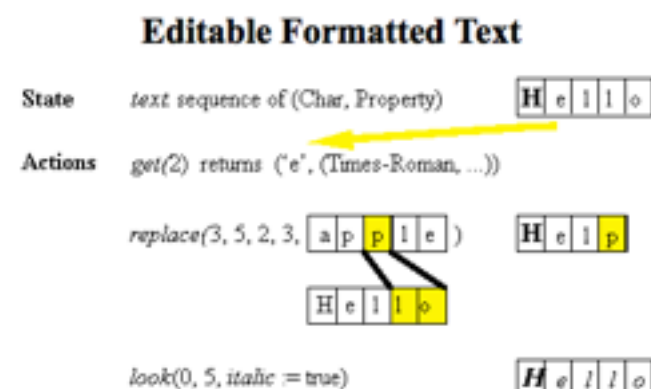
--Fred Turner, *From Cyberculture to Counterculture*, 2006

killer apps



Charles Simonyi
Xerox PARC

Bravo, 1974



Visicalc, 1978



B5 (U) +B3-B4
Command: BCDEFGIMPRSTUW-

	A	B	C	D	E
1 Year		1979	1980	1981	1982
2					
3 Sales		54321	59253	65728	72301
4 Cost		43457	47802	52583	57841
5 Profit		10864	11951	13146	14460
6					
7					
8					
9					
10					
11					
12					

Lotus 1-2-3, 1983



Dan Briklin &
Bob Frankston
HBS

Excel (for Mac), 1984





Ken Thompson
Dennis Ritchie
Bell Labs

unix

Thompson, Ritchie, & AT&T

1965: AT&T, MIT & GE work on multics

1969: multics to unix

"What we wanted to preserve was not just a good environment in which to do programming, but a system around which a fellowship could form. We knew from experience that the essence of communal computing, as supplied by remote-access, time-shared machines, is not just to type programs into a terminal instead of a keypunch, but to encourage close communication."

--Ritchie, "Evolution of the Unix Time-Sharing System"

unix at ucb



Bill Joy
UCB

1973: Thompson at Berkeley

Bill Joy develops em editor

1977: 1BSD released

1979: 3BSD (for Vax)

1981: 4.1BSD

1983: 4.2 BSD (with tcp/ip stack)

1-800-ITS-UNIX

SO ...

1991: Networking release 2; 386 BSD

1992: AT&T sues UCB

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF NEW JERSEY

UNIX SYSTEM LABORATORIES, INC.

Plaintiff,

vs.

BERKELEY SOFTWARE DESIGN, INC.,
and certain named individuals in
their collective capacity as The
Regents of the University of
California,

Defendants.

Civ. No. 92-1667

O P I N I O N

settlement

1994 settlement: USL, UCB, Novell

SETTLEMENT AGREEMENT

This Settlement Agreement is entered into between UNIX System Laboratories, Inc. ("USL"), a Delaware corporation, and The Regents of the University of California (the "University"), a California corporation.

Recitals

1. USL contends it is the owner of the intellectual property rights in portions of certain computer operating system software (the "UNIX System").

2. USL and USL's predecessor in interest, the American Telephone and Telegraph Co. ("AT&T"), have licensed the University to use certain versions of UNIX® system software,



Richard Stallman
MIT



Linus Torvalds
Helsinki

elsewhere ...

MIT 1983-GNU

Finland 1991

```
From: torvalds@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
Message-ID:
Date: 25 Aug 91 20:57:08 GMT
Organization: University of Helsinki
```

Hello everybody out there using minix -

I'm doing a (free) operating system (just a hobby, won't be big and professional like gnu) for 386(486) AT clones. This has been brewing since april, and is starting to get ready. I'd like any feedback on things people like/dislike in minix, as my OS resembles it somewhat (same physical layout of the file-system (due to practical reasons) among other things).

I've currently ported bash(1.08) and gcc(1.40), and things seem to work. This implies that I'll get something practical within a few months, and I'd like to know what features most people would want. Any suggestions are welcome, but I won't promise I'll implement them :-)

Linus (torvalds@kruuna.helsinki.fi)

PS. Yes - it's free of any minix code, and it has a multi-threaded fs. It is NOT protable (uses 386 task switching etc), and it probably never will support anything other than AT-harddisks, as that's all I have :-).

Ma Bell

1876 Bell Telephone
1885 AT&T
1894 Bell Patents expire
1899 AT&T incorporates Bell
1910 AT&T buys Western Union
1913 Kingsbury (monopoly) Commitment
1915 AT&T San Francisco
1927 transatlantic telephone
1982 break up: the Baby Bells

going open?



101 Ways to Save Apple

By James Daly

An assessment of what can be done to fix a once-great company.

Dear Apple,

In the movie *Independence Day*, a PowerBook saves the earth from destruction. Now it's time you look a little beleaguered these days: a confusing product line, little inspiration from the

But who wants to live in a world without you? Not us. So we surveyed a cross section of hard-core Apple users for their salvation. We chose not to resort to time travel or regurgitate the same old shoulda/coulda/shouldn'ta your price/performance in 1993).

We don't believe Apple is rotten to the core. Chrysler nearly went under in the late 1970s and we're here to fix your once-great company using the material at hand. Don't wait for a miracle. You have

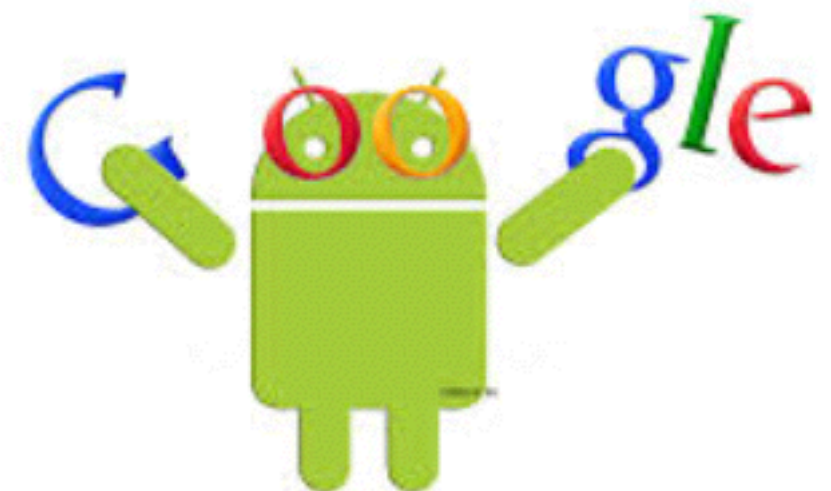
Edited by James Daly

1. Admit it. You're out of the hardware game. Outsource your hardware production, or sell your manufacturing boxes.

2. License the Apple name/technology to appliance manufacturers and build GUIs for them all use the same communications protocol. Result: you monopolize the market for sma



ANDROID



the story so far

registering

predicting

calculating

controlling

communicating

controlling again?



4/8/2014: Propaganda

"Schudson, Michael. 2003. "Where News Came From: The History of Journalism," Ch. 4 in *The Sociology of News*. Norton. Pp. 64-89.

Read: Entire chapter, [pp. 266-279 in course reader]

Source: Course reader


coming up

Marlin, Randall, 2002. "History of Propaganda," pp. 62-94 in *Propaganda and the Ethics of Persuasion*. Toronto: Broadview Press.

Read: Entire chapter, [pp. 281-297 in course reader]

Source: Course reader

Bernays, Edward L, 1928. *Propaganda*.

Read: Ch. 1-4 (pp. 9-61) Source: PDF on Canvas [[hyperlink](#) 

Additional Materials: Watch the first 10-minute segment of "Divide and Conquer," one of the "Why We Fight" films that Frank Capra made for the Office of War Information in WWII. (If you want more, there are the other segments on this page.) Watch this brief video on the background of these films.

Source: Youtube [[hyperlink](#)]

Watch the first 7-10 minutes of Leni Riefenstahl's 1934 "Triumph of the Will," and browse the rest to get the flavor of the rallies — it's pretty repetitive.

Source: Youtube [[hyperlink](#)]

assignment

Watch the segments from Frank Capra's "Why We Fight" films and Leni Riefenstahl's *Triumph of the Will* linked to on the syllabus page. Capra's film was one of a series he made for the US Army Signal Corps for showing to American troops in World War II. Riefenstahl made her film at Hitler's request as a record of the 1934 Nazi party rally in Nuremberg. Read as well Marlin's discussion of German and British propaganda in WWI. Both of these films have been described as propaganda. Here are two definitions of propaganda:

"In its true sense propaganda is a perfectly legitimate form of human activity. Any society, whether it be social, religious or political, which is possessed of certain beliefs, and sets out to make them known, either by the spoken or written words, is practicing propaganda." Scientific American, quoted by Bernays p.21.

Propaganda is "the attempt to affect the personalities and to control the behavior of individuals toward ends considered unscientific or of doubtful value in a society at a particular time." Leonard Doob <http://bit.ly/1hCLmrW>

Pick ONE of these definitions and use that definition to indicate whether it is adequate to distinguish these two films (a) from each other and (b) from films like a documentary or a newsreel. Is propaganda in the eye of the beholder — a purely subjective judgment?



2012

end of an era

Minitel (1978-2012) CEEFAX (1974-2012)

STUDY SAYS TECHNOLOGY COULD TRANSFORM SOCIETY

By ROBERT REINHOLD, Special to the New York Times
Published: June 14, 1982

WASHINGTON, June 13— A report commissioned by the National Science Foundation and made public today speculates that by the end of this century electronic information technology will have transformed American home, business, manufacturing, school, family and political life.

The report suggests that one-way and two-way home information systems, called teletext and videotex, will penetrate deeply into daily life, with an effect on society as profound as those of the automobile and commercial television earlier in this century.

It conjured a vision, at once appealing and threatening, of a style of life defined and controlled by videotex terminals throughout the house.

