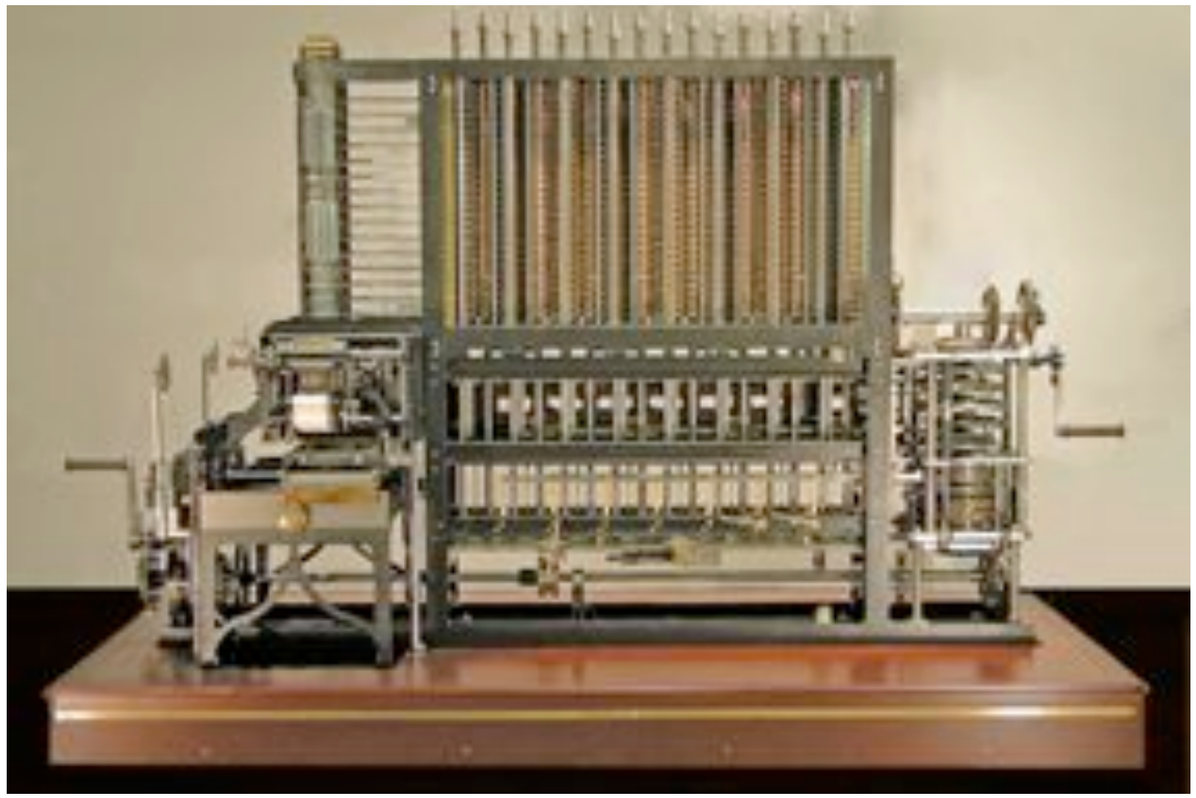
advent of the computer

History of Information

April 6, 2010



our route

aob

homework

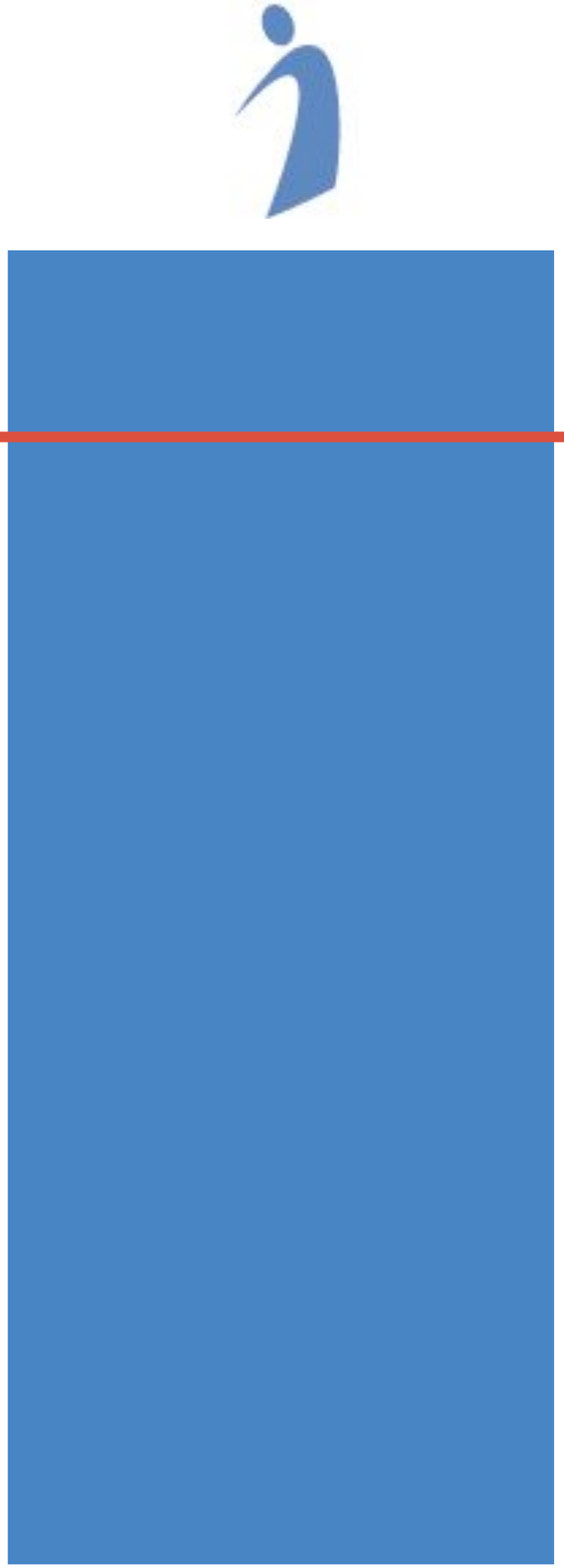
where are we?

inventions & precedents

the demand side

government
business
military

changing business



aob

exams

homework (25), midterm (30), final (45)

tactics

-do the reading

- answer the question

- cite the readings

aob

IP

Judge Invalidates Human Gene Patent

By JOHN SCHWARTZ and ANDREW POLLACK
Published: March 29, 2010

A federal judge on Monday struck down patents on two genes linked to breast and ovarian cancer. The decision, if upheld, could throw into doubt the patents covering thousands of human genes and reshape the law of intellectual property

aob

IP

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MARCH 30, 2010

NEW LITIGATION CAMPAIGN QUIETLY TARGETS TENS OF THOUSANDS OF MOVIE DOWNLOADERS

By Eriq Gardner

EXCLUSIVE: In what may be a sign of things to come, more than 20,000 individual movie torrent downloaders have been sued in the past few weeks in Washington D.C. federal court for copyright infringement. A handful of cases have already settled, and those that haven't are creating some havoc for major ISPs.

new news, old theme

Babbage's dream government right

personal

Erica Nguyen: Babbage failed to instill faith ... market not open to gambling

Daniel Wang: ... hadn't provided concrete results

Anne Sokolich: Babbage's dream ... disjointed, not focused, and too expensive ...

Valerie Arioto: ... [govt] lost confidence

ahead of his time

Sam Kravin: beyond .. Victorian Technology ...

Eric Strack: The idea was so unfathomable ....

Marco Danesi: ahead of his time

market limitations

Soheil Sazesh ... investing .. not commonplace

Joel Simone: doesn't consider the bureaucratic and technological preconditions ... perhaps Babbage needed a Bill Gates to steal his ideas

no need

Zachary Keller .. no decent reason for the govt to fund something ... not ... directly contributing to their interests

Isobel Dewey: lack of need for machine

Sanketh Katta, extremely reasonable ... did not need

Omar Yassin: ... Menabrea's proposed functions are very general

Zachary Thompson: government is not a charity .. Babbage failed to demonstrate

all of the above

Marguerite Vance: [not] reasonable to blame any one entity ...

Comrie's claims overinflated

Aaron Gonzalez: wouldn't have helped ... after all **Sweden**

Babbage's dream government wrong

failed to understand

Elliot Chan: [despite its features] ... government ... still saw it as worthless

Emiliy Bibb: could never fully make his ideas a reality ... because of lack of funding

Kasey Chiu: Comrie right but Babbage .. ahead of his time

should have understood

Jody Leung ... Comrie reasonable because British government continued to deny .... after ...

explanation

Robert Ang: [Menabrea showed] ... invention's possibilities ....

competitive world

Rachelle Federico: in a competitive world, should have funded

Babbage's dream on the one hand ...

Clara Dellenbach: Govt should have been excited ....*but* [CB] failing to appeal to his potential investors

Jimin Lee: .. Comrie reasonable ... *but* inevitable choice for government

Elisa Shieh: ... somewhat reasonable ... *but* both had very different goals

Summer Li: ... Comrie .. justified *but* ... not just the British government ... people couldn't have understood

Nicola Stathers: .. Government clearly missed a potential opportunity ... *but* ...the scientific community incapable ...

invention changing

technology

Rachel Yeung ... shift from analog to digital

Charlie Hsu: [inter] dependent on other technologies

Apin Sicoravit: [19c] inventions ... were purpose-driven

Michelle Leahy: [19c] focused on specific problem ... [not as in 20th] on gaining more knowledge

Alejandra Castellon: . came before the technical capabilities to make use of it ...

funding

Eliot Chan: govt funding needed

Marco Danesi: better sense of how to win govt funds

Zachary Keller: govt or investor dependence

Nicola Stathers: the later competitive, capitalist environment of the 20th century ... might be a better situation for invention after all.

social change

Jody Leung: ... once people began to understand [technology] ... society ... more open and accepting

Joel Simone: .. 19th century society wasn't .. intelligent enough to listen to a woman

innovative collaboration

Justin Riddle: from individual genius .... to ... collaboration

Elisa Shieh: ... many universities had .. the means ...

wars

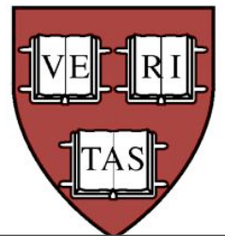
Daniel Wang: ... world wars .... the nature of invention changed rapidly

Robert ... without the major wars

unchanging

Amy Azaren: one factor remains relatively constant – politics.

determinism again?



what determines technology?

individual inventors (and investors)

business

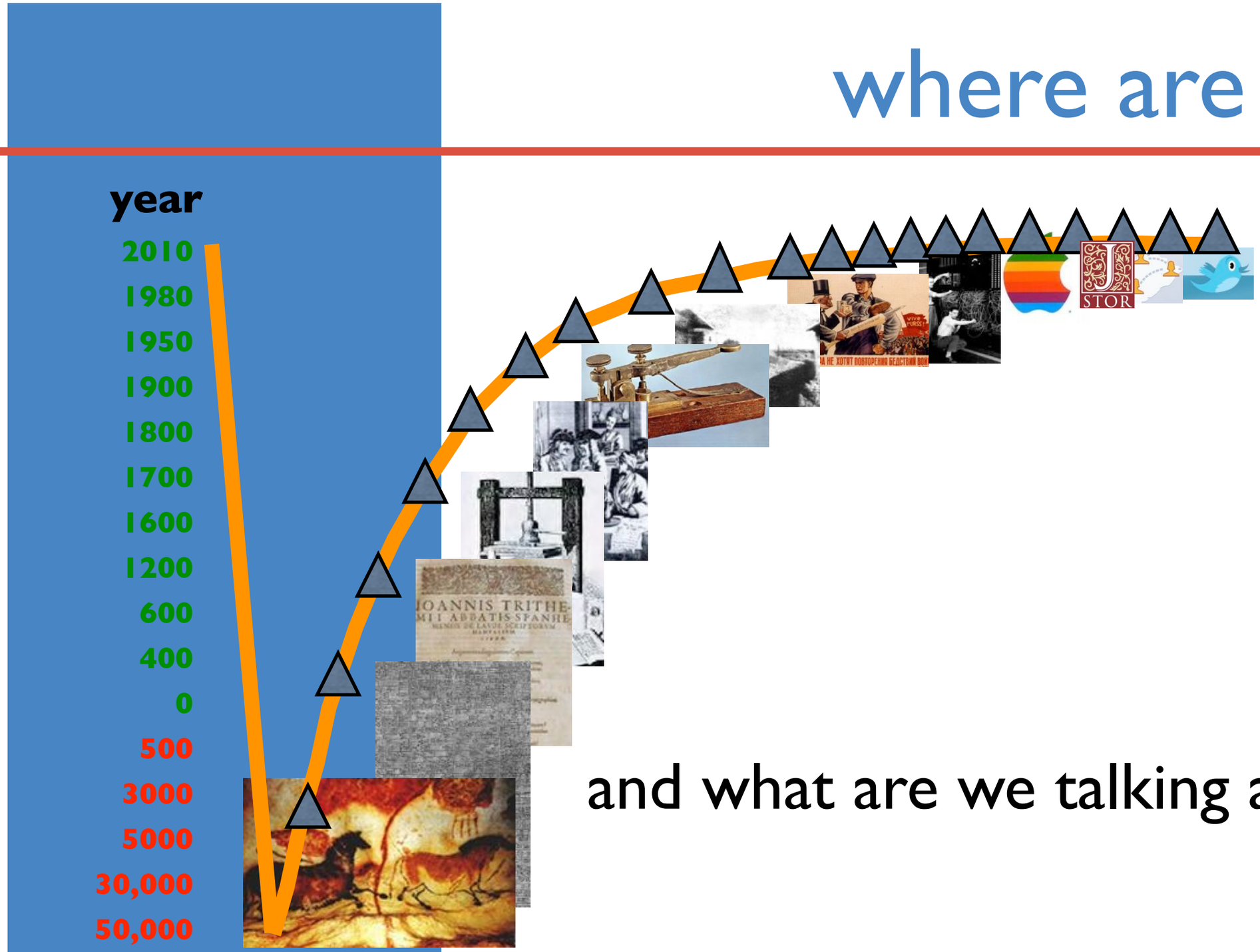
government

military / intelligence

science / university

historical shifts
changes over time

where are we?

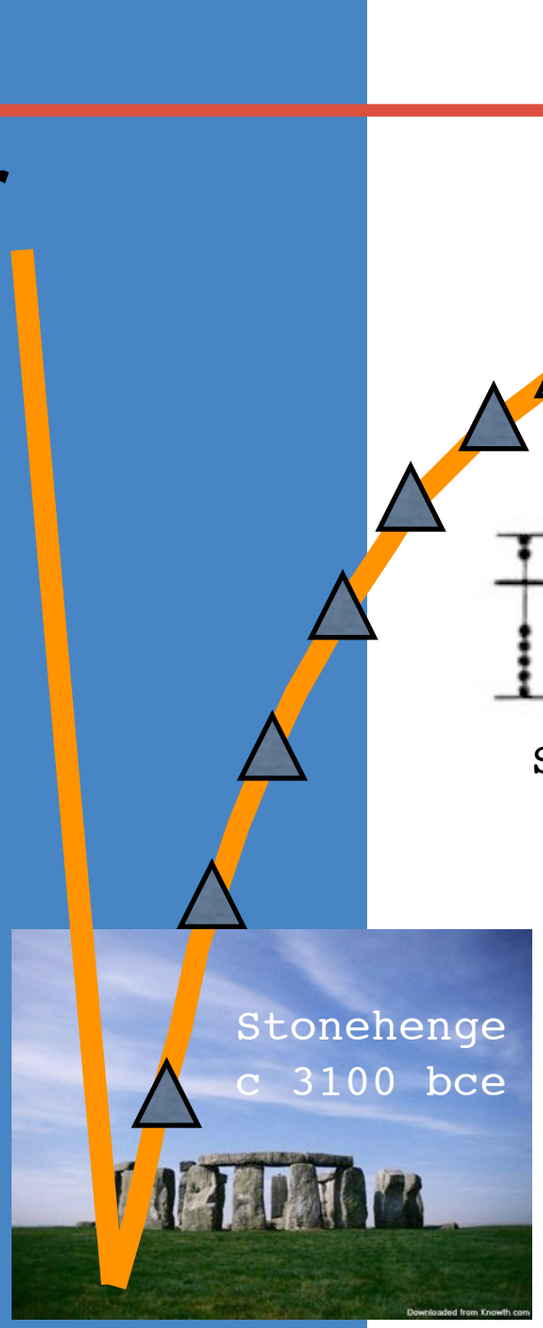


and what are we talking about?

not so fast?

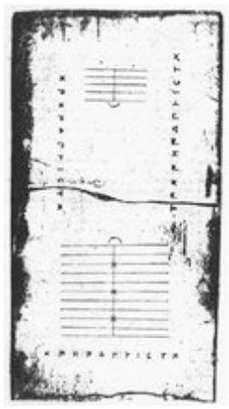
year

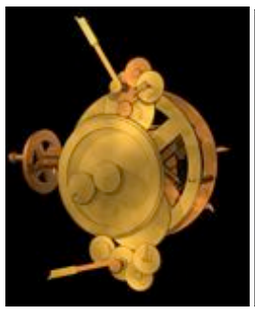
2010
1980
1950
1900
1800
1700
1600
1200
600
400
0
500
3000
5000
30,000
50,000



Suan Pan
c 1200

Salamis
tablet
c 300
bce

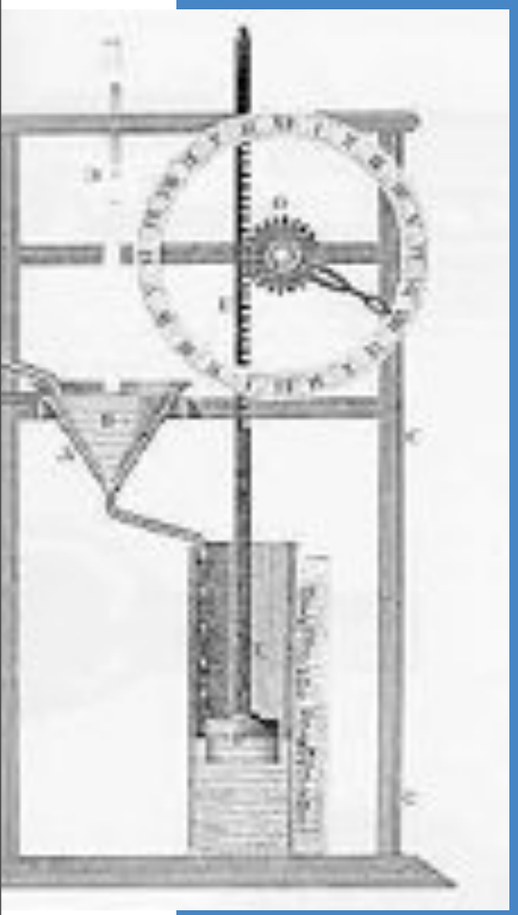


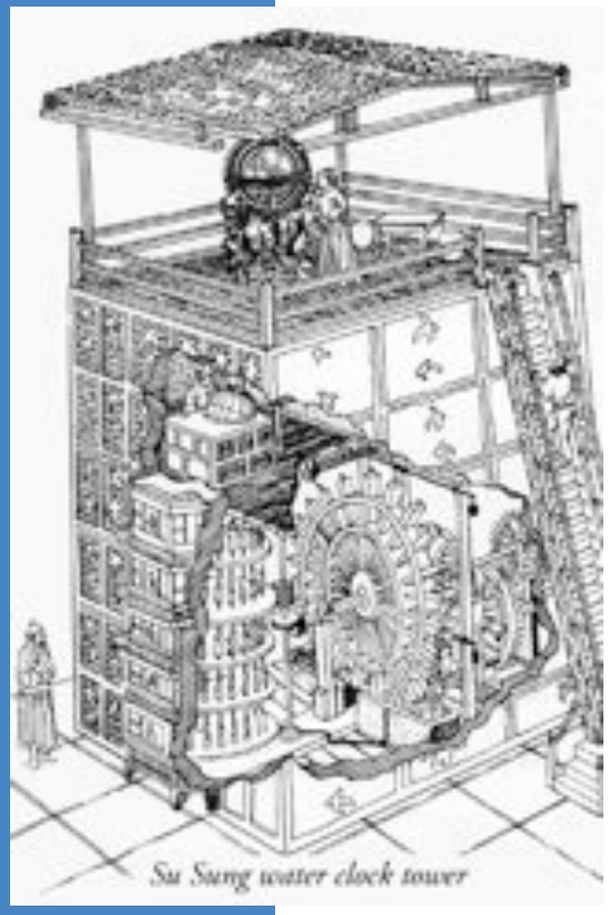


antikythera c 200 bce

week 1 2 3 4 5 6 7 8 10 11 12 13 14 15 week

calculating?



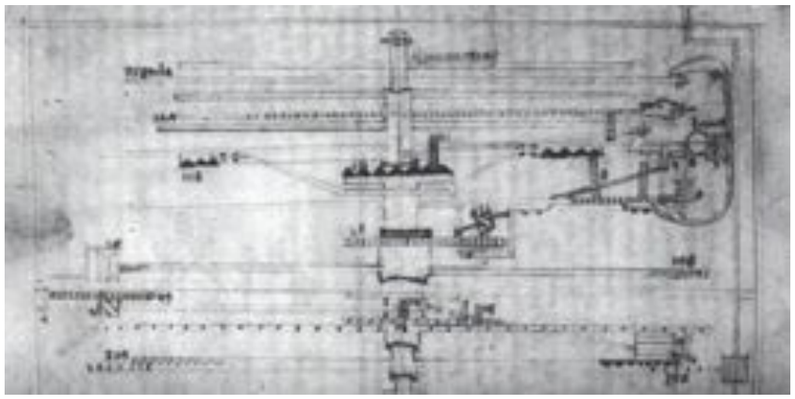


3500 bce: sundials

1400 bce: Egyptian water clocks

700 ce: hourglasses

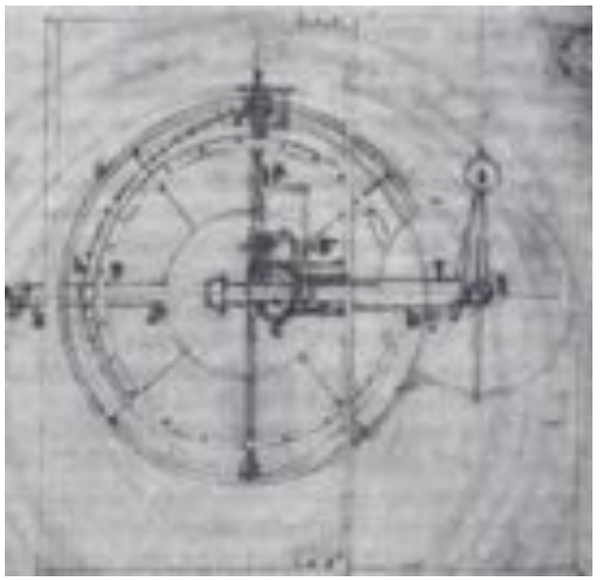
1086: Su Sung's water tower

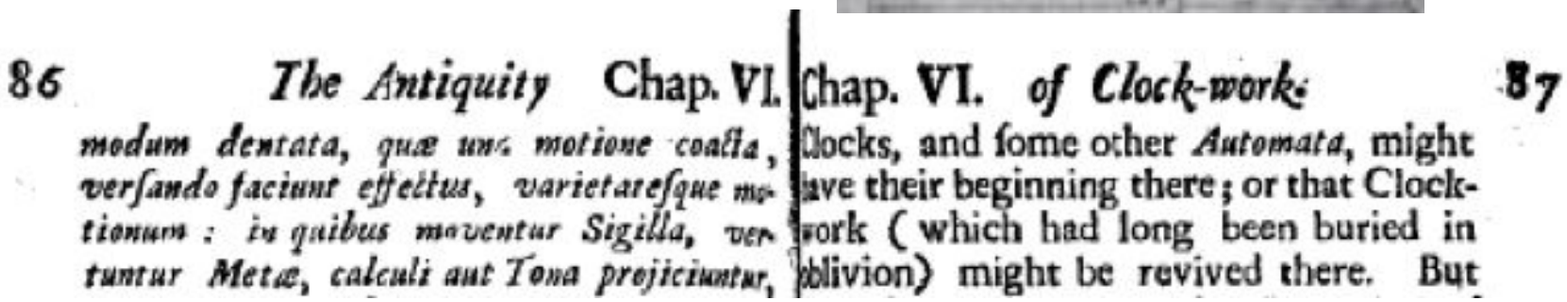


automata

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 coalia, verſando faciunt effectus, varietateſque motionum: in quibus moventur Sigilla, vertuntur Metæ, calculi aut Tona projiciuntur,

Chap. VI. *of Clock-work.* 87

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

Derham, *The Artificial Clock Maker*, 1696

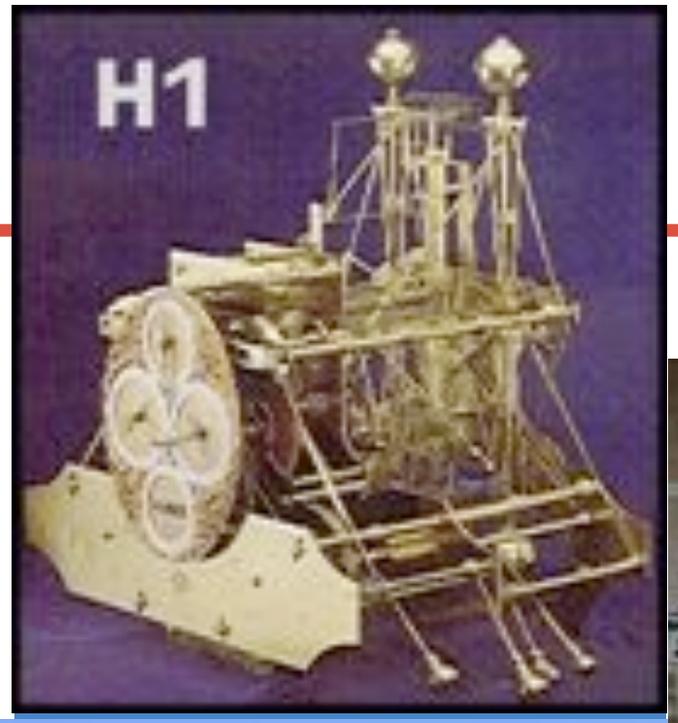
invention

1656: Huygens pendulum clock

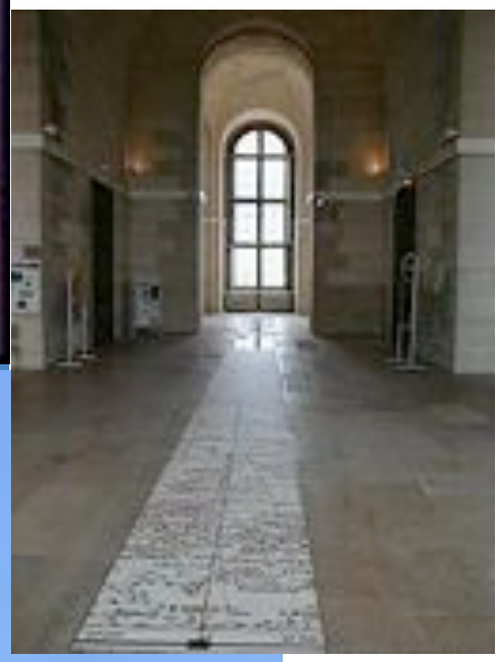
"Mr Hugens does expressly say, He was the inventor, and that if *Galilaeo* ever thought of any such thing, he never brought it to perfection," Derham

1660: Hooke & the spring watch

"The first *Inventer* herof was that ingenious and learned member of our *Royal-Society,* Dr. *Hook*, who contrived various ways of regulation," Derham



global technology



1761: Harrison's nautical clock

c1850: telegraph time

1852: Greenwich mean time

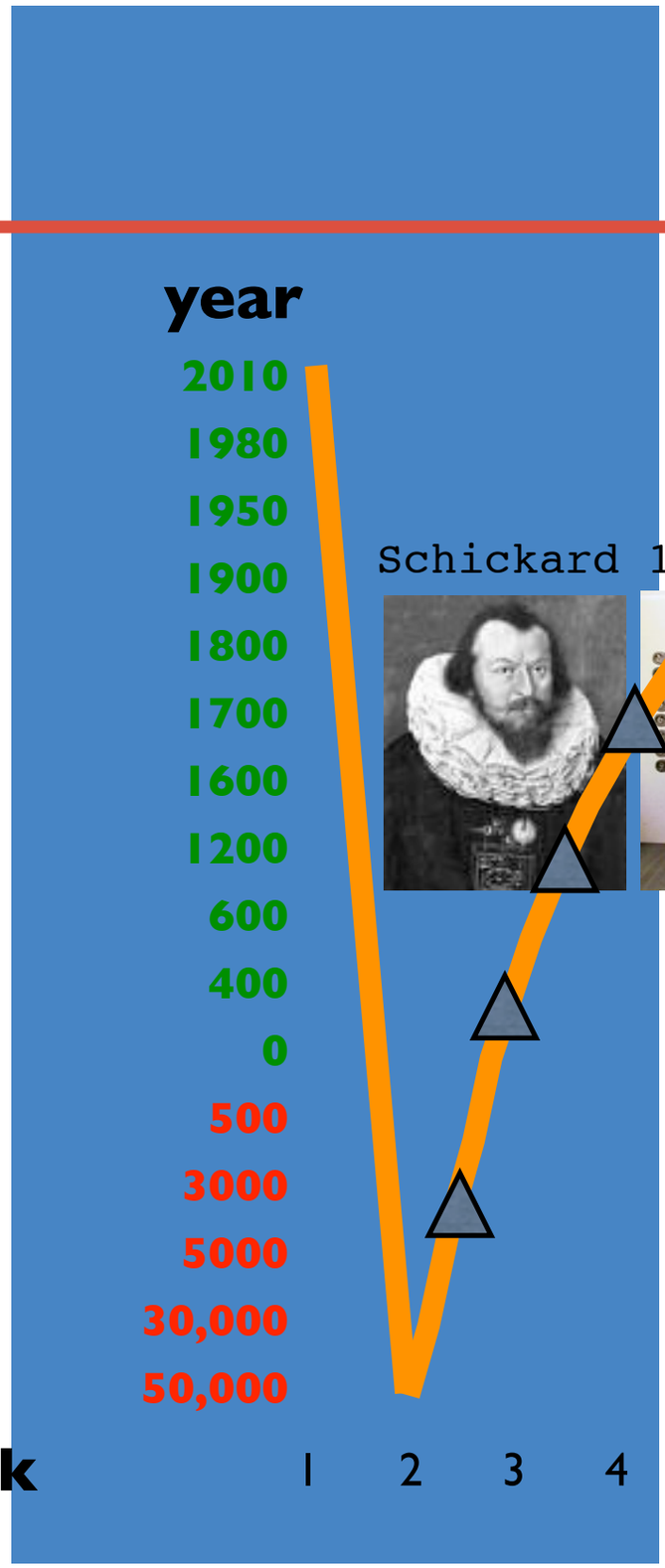
1883: US standard time

1884: Meridian Conference, DC

1911: France: Cassini Meridian

1967: US govt preempts"civil time"

beyond time



Schickard 1623

Pascal 1642

Leibniz 1671

17th century calculations

Schickard's astronomical calculator

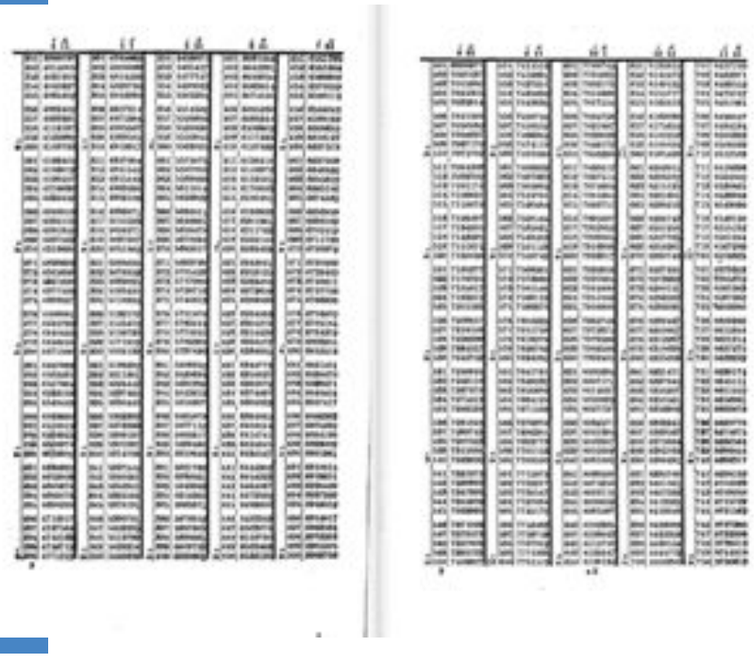
Pascal's calculator

Leibniz's binary calculator

calculating

John Napier
1550-1617

Charles Babbage
1791-1871



John Napier
Mirifici Logarithmorum
Canonis Descriptio, 1614

Charles Babbage
Table of Logarithms
from 1 to 108000
1827

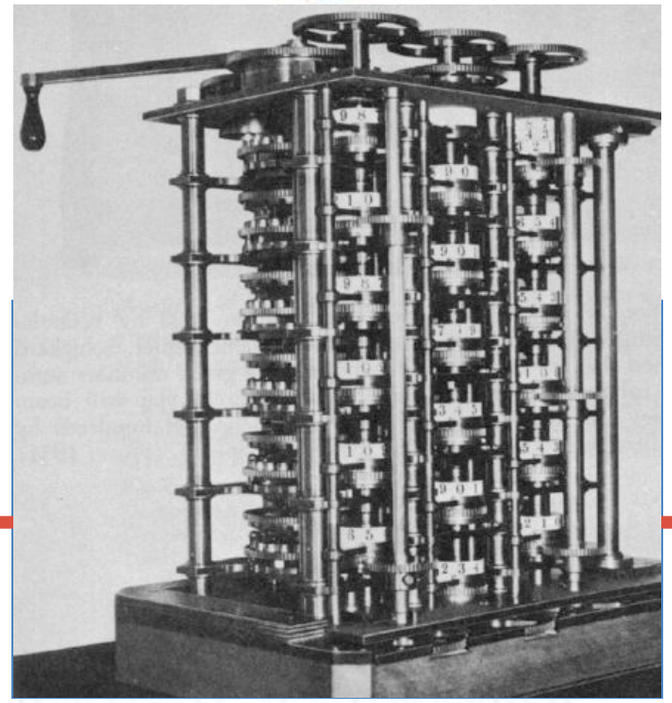
"I wish to God these calculations had been executed by steam"

1821

on the economy of machinery and manufactures

chapters

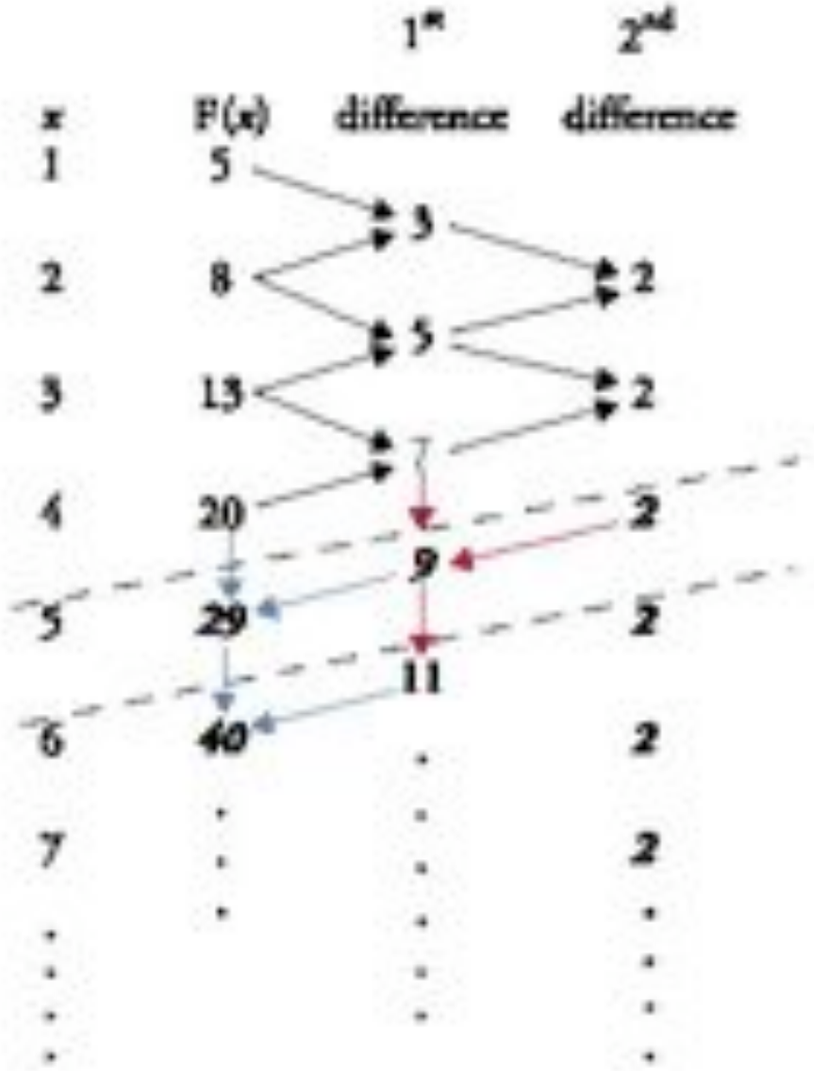
functioning



200 ON THE DIVISION OF MENTAL LABOUR.

Repetitions of Process	Move-ments.	Class A. Hand set to I.	Class B. Hand set to III.	Class C. Hand set to II.
1	Pull A.	A. strikes 1	. . . . .	. . . .
	— B.	The hand is advanced (by B.) 1 division . .	B. strikes 1	. . . .
	— C.	. . . . .	The hand is advanced (by C.) 1 division . .	C. strikes 1
2	Pull A.	A. strikes 4	. . . . .	. . . .
	— B.	The hand is advanced (by B.) 3 divisions . .	B. strikes 4	. . . .
	— C.	. . . . .	The hand is advanced (by C.) 1 division . .	C. strikes 1
3	Pull A.	A. strikes 9	. . . . .	. . . .
	— B.	The hand is advanced (by B.) 5 divisions . .	B. strikes 9	. . . .
	— C.	. . . . .	The hand is advanced (by C.) 1 division . .	C. strikes 1
4	Pull A.	A. strikes 16	. . . . .	. . . .
	— B.	The hand is advanced (by B.) 7 divisions . .	B. strikes 16	. . . .
	— C.	. . . . .	The hand is advanced (by C.) 1 division . .	C. strikes 1
5	Pull A.	A. strikes 25	. . . . .	. . . .
	— B.	The hand is advanced (by B.) 9 divisions . .	B. strikes 25	. . . .
	— C.	. . . . .	The hand is advanced (by C.) 1 division . .	C. strikes 1
6	Pull A.	A. strikes 36	. . . . .	. . . .
	— B.	The hand is advanced (by B.) 11 divisions . .	B. strikes 36	. . . .
	— C.	. . . . .	The hand is advanced (by C.) 1 division . .	C. strikes 1

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



analytical engine

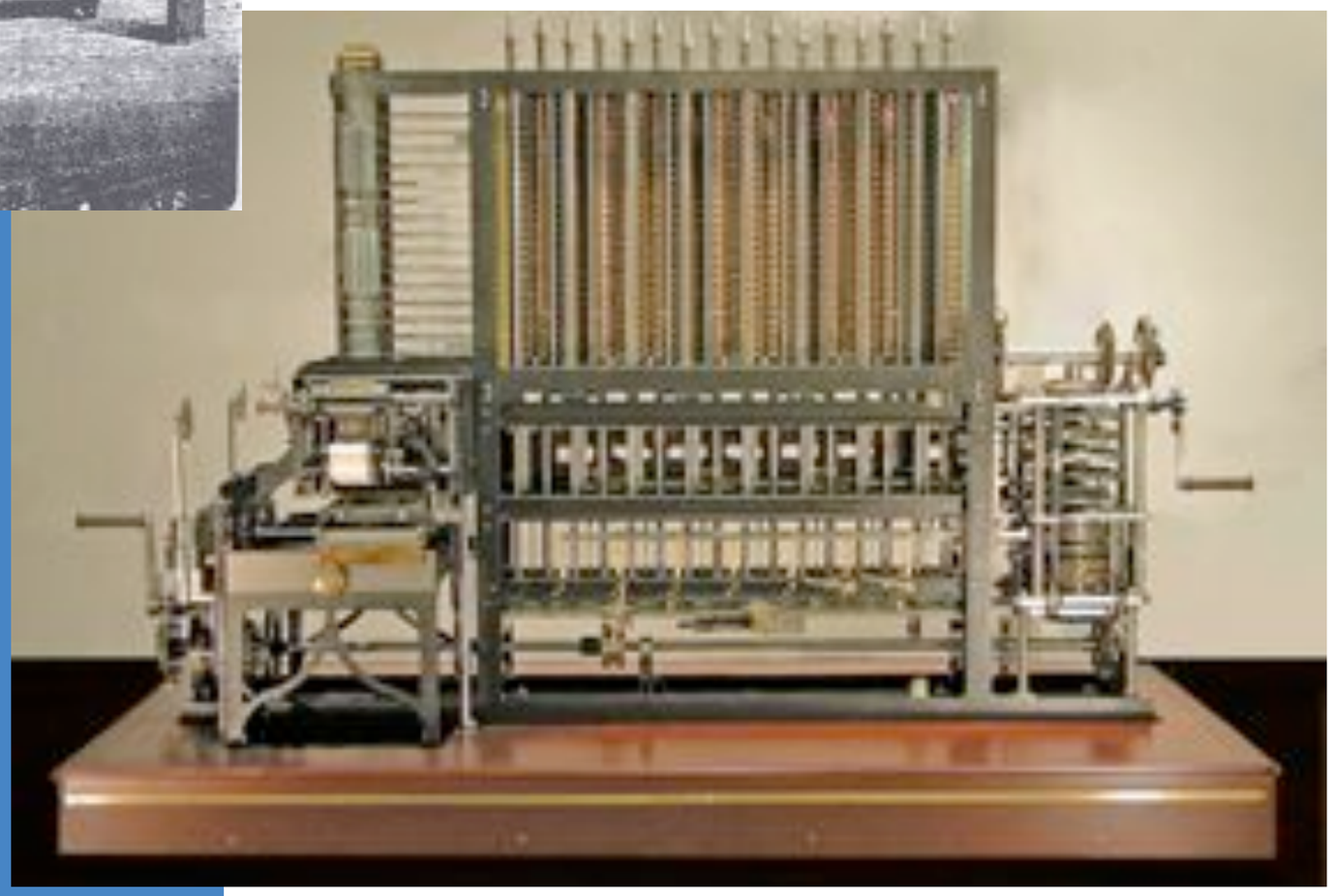
general purpose machine

programmable

storing

looping

branching



Ada Lovelace

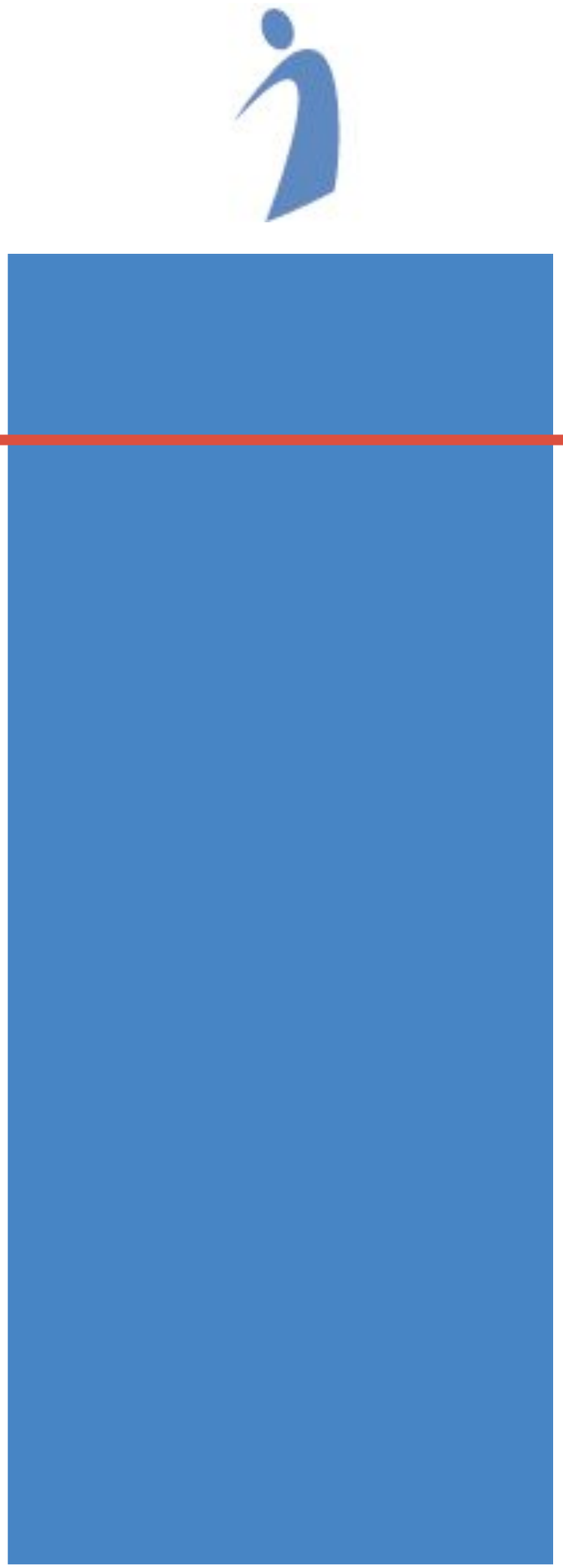
Ada Lovelace
1815-1852

Augusta Byron,
Countess of Lovelace

"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, *Scientific Memoirs*, 1843



pretensions

[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"

Taylor, *Scientific Memoirs*, 1843

Ada Lovelace voted most popular technology heroine

By Zoe Kleinman
Technology reporter, BBC News

Ada Lovelace has emerged as the most popular role model in a day dedicated to celebrating women working in the fields of science and technology.

So far, 2,239 people around the world have posted blogs, videos and podcasts online nominating their heroines.

Additionally, events were held in London, Copenhagen, Dresden, Montreal and Brazil to mark the day, named after Ada Lovelace, held on 24 March.

Ada Lovelace worked with mathematician Charles Babbage in the 1800s.

Ada Lovelace met Charles Babbage in 1833.

Mr Babbage's invention, the Analytical Engine, formed the basis of modern computing.

Ada Lovelace is therefore credited with writing the world's first computer program when she came up with a way of using the machine, which was never actually built, to calculate a mathematical sequence known as Bernoulli numbers.

Other nominees included scientist Marie Curie, mathematician-turned-actress Hedy Lamarr, programmer Grace Hopper and Lisbeth Salander, fictional creation of the late author Stieg Larsson.

Wonder women

"For years I've worked in technology, and every time you see a list of the top people in tech, it's dominated by men," said Suw Charman-Anderson, who created Ada Lovelace Day in 2009 and runs the annual event.

Per George Scheutz
1785-1873

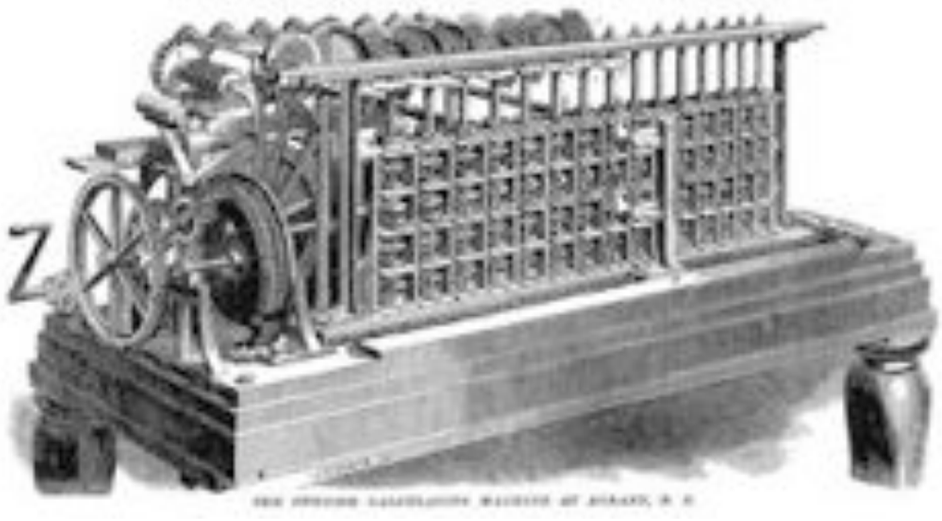
Edvard Scheutz
1822-1881

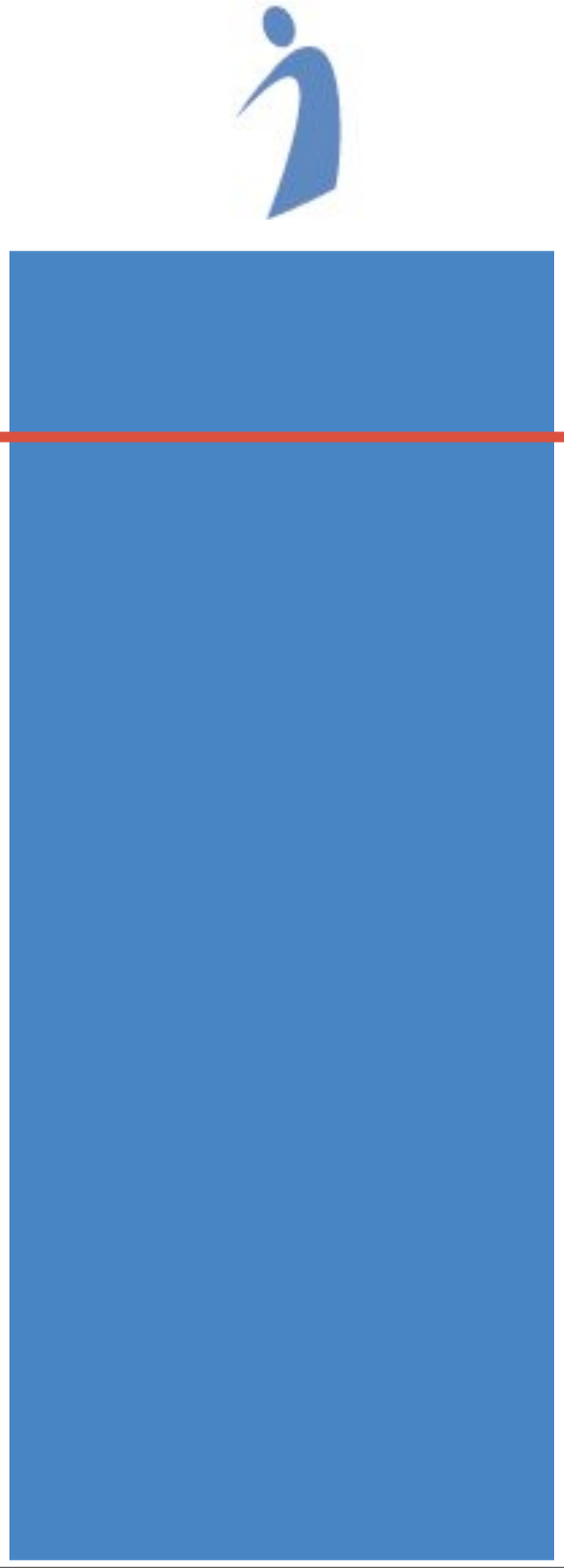
difference engines

George & Edvard Scheutz
Scheutz Difference Engine, with printer
c 1853

Dudley Observatory, Schenectady

British Government, actuarial calculations





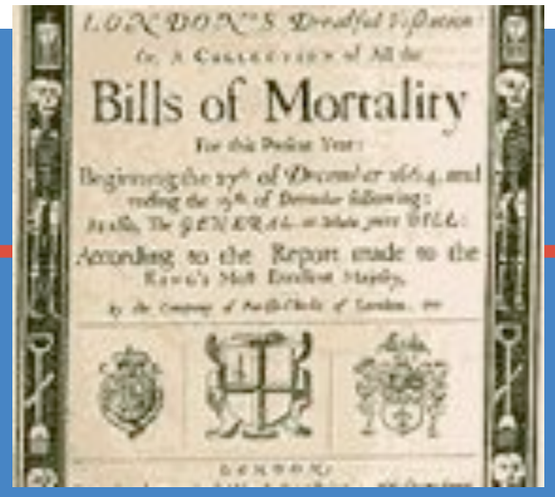
on the demand side

who wanted these machines?

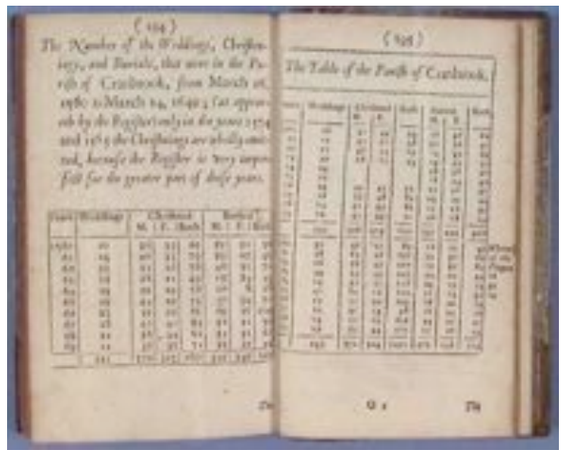
why?

what did they want?

government information: statistics and the state


LONDON'S Dreadful Visitation
Or, A Collection of All the
Bills of Mortality
For this Present Year:
Beginning the 27th of December 1664, and ending the 19th of December following:
Wherein The GENERAL or Whole year's BILL
According to the Report made to the
King's Most Excellent Majesty,
By the Company of Parish-Clerks of London, &c.
LONDON


A generall Bill for this present year, ending the 19 of December 1665. according to the Report made to the KINGS most Excellent Majest...
By the Company of Parish Clerks of London, &c.
The Diseases and Casualties this year.
A Bortive and Stillborne 438 Executed 31 Palsie 29
Aged 1545 Flox and Small Pox 655 Plague 68596
Ague and Feaver 5257 Found dead in Streets, fields, &c. 23 Plannet 6
Apoplex and Suddenly 130 French Pox 86 Purples 84
Bedrid 41 Frighted 23 Quinsie 2
Blasted 6 Gout and Sciatica 37 Quotidian 35
Bleeding 28 Grief 46 Rickets 557
Bloody Flux, Scowring & Flux 184 Griping in the Guts 1288 Rising of the Lights 1627
Burnt and Scalded 8 Hanged & made away themselves 7 Rupture 24
Calenture 3 Headmould shot & Mortified 14 Scurvy 14
Cancer, Gangrene and Fistula 56 Jaundice 420 Shingles and Swine pox 2
Canker, and Thrush 111 Impostume 217 Sores, Ulcers, broken and bruised Limbs 22
Childbed 625 Kill'd by several accidents 48 Spleen 14
Chrisomes and Infants 1258 Kings Evil 26 Spotted Feaver and Purples 1929
Cold and Cough 82 Leprosie 2 Stopping of the Stomach 331
Colick and Wind 134 Lethargy 14 Stone and Strangury 58
Consumption and Tissick 4808 Livergrown 61 Suddenly 11
Convulsion and Mother 1036 Measles 9 Teeth and Worms 2614
Dissentery 7 Murther 7 Vomiting 11
Drowned 53 Overlaid & Starved 45 Wenn 5
Males 5257 Males 48569 Of the Plague 68596
Females 4552 Buried Females 43737
in all 9809 in all 92306
Increased in the Burials in the 130 Parishes and at the Pest-house this year 72630
Increased of the Plague in the 130 Parishes and at the Pest-house this year 68590


(104)
The Number of the Weddings, Christenings, and Burials, that were in the Parish of Cranbrook, from March 21. 1580 to March 24. 1640 ; (at which time the Register only in the years 1594 and 1595 the Christenings are wholly omitted, because the Register is very imperfect for the greater part of those years.
(105)
The Table of the Parish of Cranbrook.

registration

bills of mortality

births & marriages

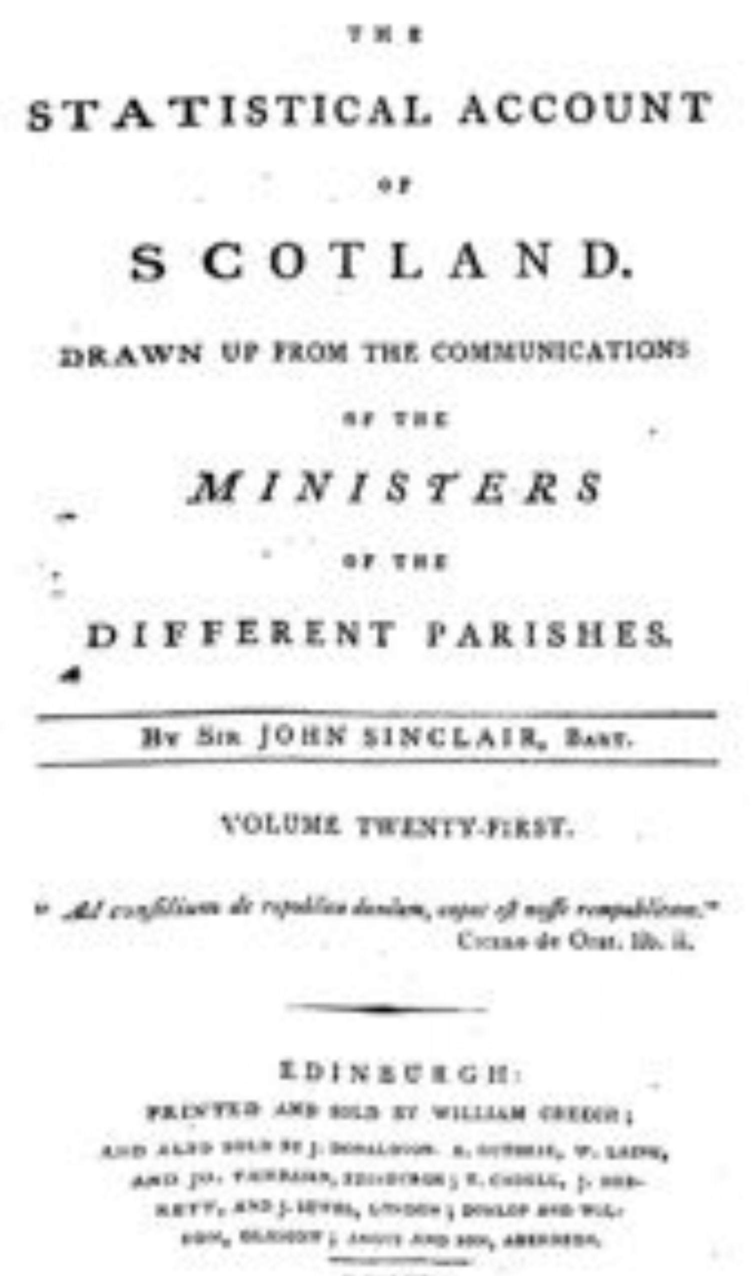
parish members

population

national statistics

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

***Encyclopaedia Britannica*, 1797**



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:

PRINTED AND SOLD BY WILLIAM CREECH;


STATUTES OF CALIFORNIA.

FIRST SESSION

LEGISLATURE

WITH AN APPENDIX AND INDEX.

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

counting

CENSUS OF 1850.

STATES AND TERRITORIES.	Whites.	Free colored.	Slaves.	Total.
Maine	[illegible]	[illegible]	....	[illegible]
New Hampshire	[illegible]	[illegible]	....	[illegible]
Massachusetts	[illegible]	[illegible]	....	[illegible]
Rhode Island	[illegible]	[illegible]	....	[illegible]
Connecticut	[illegible]	[illegible]	....	[illegible]
Vermont	[illegible]	[illegible]	....	[illegible]
New York	[illegible]	[illegible]	....	[illegible]
New Jersey	[illegible]	[illegible]	[illegible]	[illegible]
Pennsylvania	[illegible]	[illegible]	....	[illegible]
Delaware	[illegible]	[illegible]	[illegible]	[illegible]
Maryland	[illegible]	[illegible]	[illegible]	[illegible]
Virginia	[illegible]	[illegible]	[illegible]	[illegible]
North Carolina	[illegible]	[illegible]	[illegible]	[illegible]
South Carolina	[illegible]	[illegible]	[illegible]	[illegible]
Georgia	[illegible]	[illegible]	[illegible]	[illegible]
Kentucky	[illegible]	[illegible]	[illegible]	[illegible]
Tennessee	[illegible]	[illegible]	[illegible]	[illegible]
Ohio	[illegible]	[illegible]	....	[illegible]
Indiana	[illegible]	[illegible]	....	[illegible]
Mississippi	[illegible]	[illegible]	[illegible]	[illegible]
District of Columbia	[illegible]	[illegible]	[illegible]	[illegible]
Illinois	[illegible]	[illegible]	....	[illegible]
Michigan	[illegible]	[illegible]	....	[illegible]
Louisiana	[illegible]	[illegible]	[illegible]	[illegible]
Missouri	[illegible]	[illegible]	[illegible]	[illegible]
Alabama	[illegible]	[illegible]	[illegible]	[illegible]
Arkansas	[illegible]	[illegible]	[illegible]	[illegible]
Florida	[illegible]	[illegible]	[illegible]	[illegible]
Wisconsin	[illegible]	[illegible]	....	[illegible]
Iowa	[illegible]	[illegible]	....	[illegible]
Texas	[illegible]	[illegible]	[illegible]	[illegible]
California	[illegible]	[illegible]	....	[illegible]
Minnesota Territory	[illegible]	[illegible]	....	[illegible]
New Mexico Territory	[illegible]	[illegible]	....	[illegible]
Oregon Territory	[illegible]	[illegible]	....	[illegible]
Utah Territory	[illegible]	[illegible]	[illegible]	[illegible]
Aggregate	[illegible]	434,495	[illegible]	[illegible]

An Extract of two Essays in Political Arithmetick *concerning the comparative Magnitudes, &c. of* London *and* Paris *by Sr.* William Petty *Knight. R. S. S.*

The excellent Author of these two Essays, has in several former of the same Nature made it appear that Mathematical Reasoning, is not only applicable to Lines and Numbers, but affords the best means of Judging in all the concerns of humane Life. In the present he endeavours to prove *London*, as it now is, the most considerable City now in being, by shewing it much to exceed *Paris*, (which not only the *French* but foreigners have asserted to be the chief City of *Europe*.) both in People, Housing, and Wealth:

A further Assertion of the Propositions concerning the Magnitude, &c. of London, *contained in two Essays in Political Arithmetic; mentioned in* Philos. Transact. *Numb.* 183; *together with a Vindication of the said Essays from the Objections of some Learned Persons of the* French *Nation, by Sr.* W. Petty *Knt.* R.S.S.

1. IT could not be expected that an Assertion of *Londons* being bigger than *Paris* and *Rouen*, or than *Paris* and *Rome* put together, and bigger than any City of the World, should scape uncontradicted, and 'tis expected that I (if continuing in that Perswasion) should make some Reply to these contradictions.

2. I begin with the Ingenious Author of the *Nouvelles de la Republique des Lettres*, who saith that *Rey* in *Persia* is far bigger than *London*; for that in the *6th.* Century of Christianity (I suppose *An.* 550) It had 15000, or rather 44 thousand *Mosches* or *Mahometan Temples*. To which I reply, that

competitive counts

counting against the French

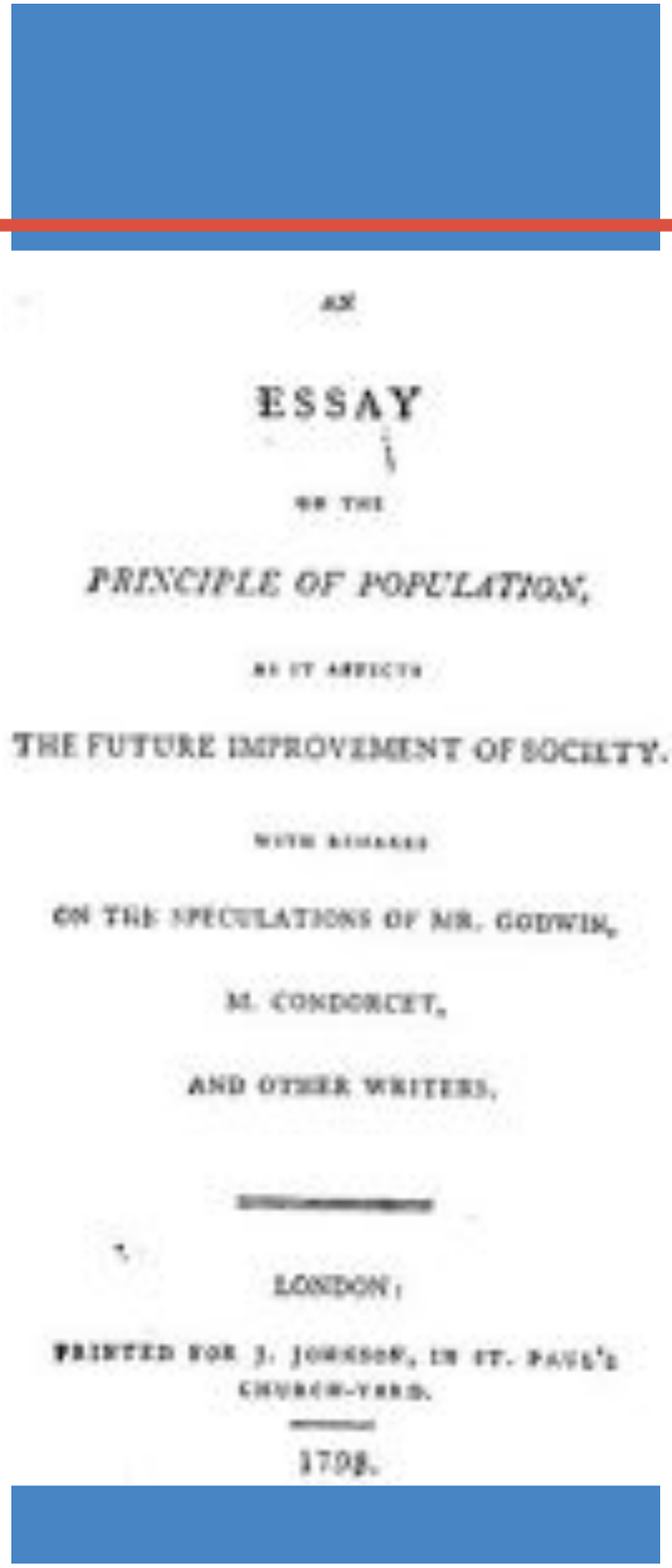
counting against 'declinists'

"Where there is room for more people they will alway arise, even without naturalization bills"

"On the Populousness of Ancient Nations"
David Hume, 1742

counted and not counted

decline to abundance



AN

ESSAY

ON THE

PRINCIPLE OF POPULATION,

AS IT AFFECTS

THE FUTURE IMPROVEMENT OF SOCIETY.

WITH REMARKS

ON THE SPECULATIONS OF MR. GODWIN,

M. CONDORCET,

AND OTHER WRITERS.

LONDON:

PRINTED FOR J. JOHNSON, IN ST. PAUL'S CHURCH-YARD.

1798.

"In Britain, however, the first census was taken, not out of a constitutional requirement, but as a way of resolving the Malthusian population controversy ... The 1800 Census Act was designed principally to determine whether or not the population was actually increasing."

Martin Campbell-Kelly, "Change in the British Census," 1996

"And it came to pass in those days, that there went out a decree from Caesar Augustus that all the world should be taxed. ... And Joseph also went up from Galilee, out of the City of Nazareth, into Judaea, unto the City of David, which is called Bethlehem; (because he was of the house of David:) to be taxed with his espoused wife, being great with child."

Luke, 2, 4-5

what we register

taxpayers
aliens
racial groups
the poor
military eligible

professions
midwives
prostitutes

cars
'National Insurance'
social security

what we register

"And it came to pass

the house of David:)
to be taxed with his
espoused wife, being
great with child."
Luke, 2, 4-5

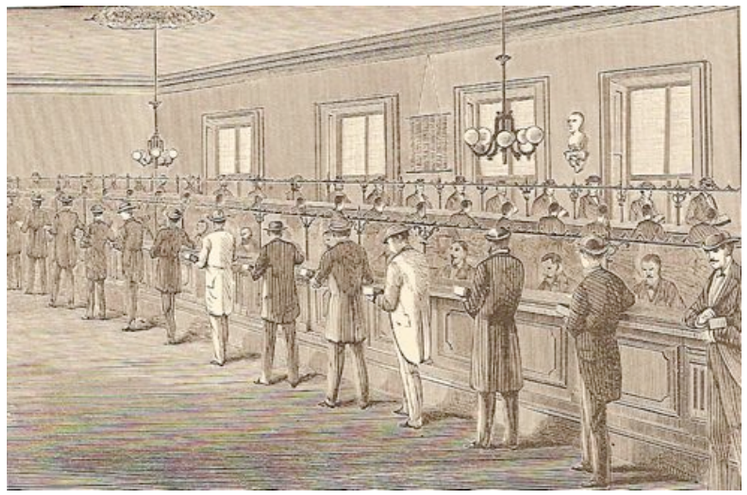
taxpayers
aliens
racial groups
the poor
military eligible

professions
midwives
prostitutes

cars
'National Insurance'
social security

business interests


On the
ECONOMY OF MACHINERY
AND
MANUFACTURES
By
CHARLES BABBAGE, ESQ.
ROGERIUS BACON



business interests

sorting information: the clearing house

"In a large capital, each bank receives, through its numerous customers, checks payable by every other; and if clerks were sent round to receive the amount in banknotes due from each, it would occupy much time, and be attended with some risk and inconvenience. ... In London this is avoided, by making all checks paid in to bankers pass through what is technically called The Clearing House. In a large room in Lombard Street, about thirty clerks from the several London bankers take their stations, in alphabetical order, at desks placed round the room; each having a small open box by his side, and the name of the firm to which he belongs in large characters on the wall above his head. 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 clerk at the table enters the amount of the several checks in a book previously prepared, under the name of the bank to which they are respectively due." --Babbage

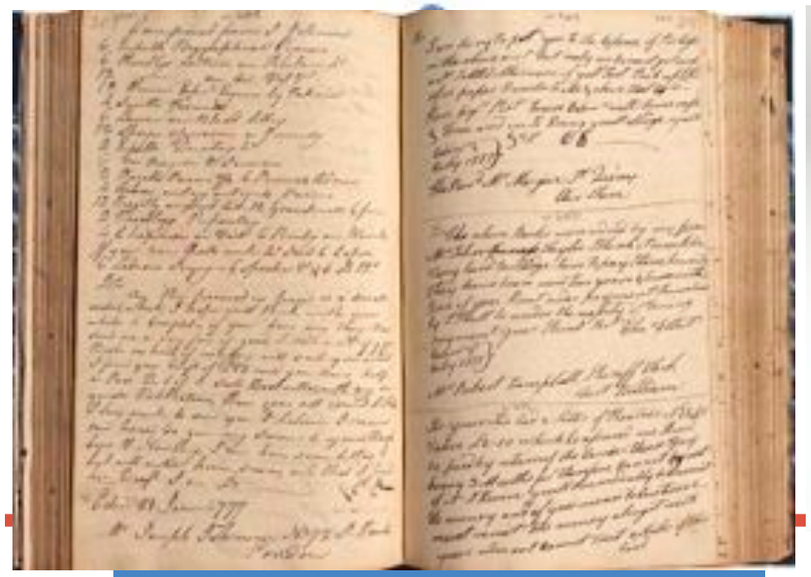
"1839, £954 million was cleared--$250 billion in today's money." --Campbell-

information workers / computers

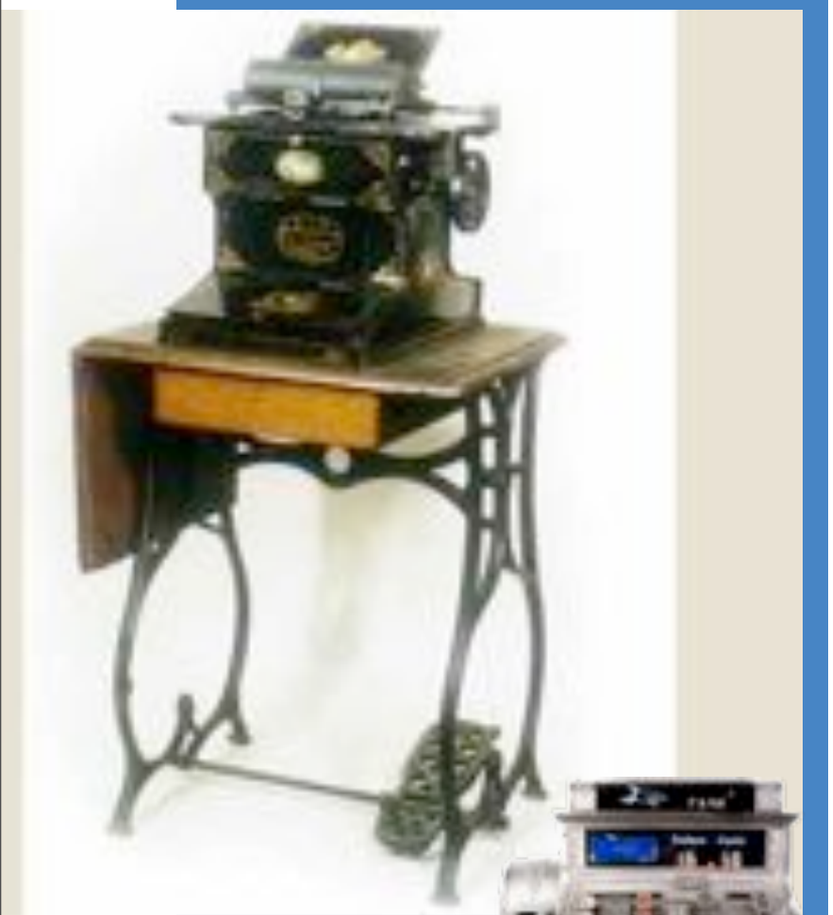
clerks (UK)
1871: 262,100
1891: 534,622
1911: 918,186

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



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

back to government

Spain, 1787

US, 1790

UK, 1801

"Vulgar and arithmetical"

Edinburgh Review, 1818

Census

"[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."

				clerks
1900	76,212,168	13,232,402	21.0	
1890	62,979,766	12,790,557	25.5	2000
1880	50,189,209	11,630,838	30.2	1495
1870	38,558,371	7,115,050	22.6	483
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	28
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	-	-	

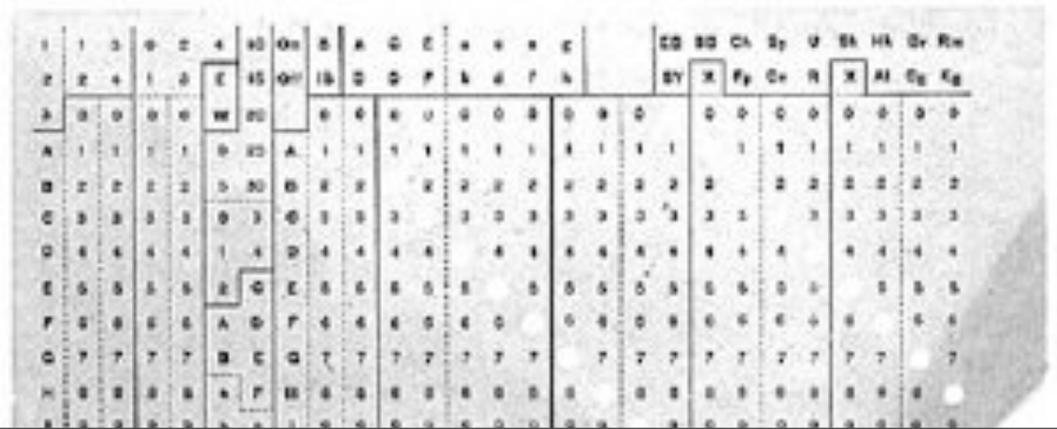
tabulating

Herman Hollerith
1860-1929

Hollerith
Electronic
Tabulating
Machine

1890 Census

the punch card
"do not fold,
spindle or
mutilate"



government to business

Hollerith

Tabulating Machine Company

CTR:
Computing-Tabulating-Recording Company

Thomas Watson
NCR to CTR

to ...

the new deal

Social Security Act, 1935

"the world's largest bookkeeping job"

Seventy-fourth Congress of the United States of America

AN ACT

controlling numbers

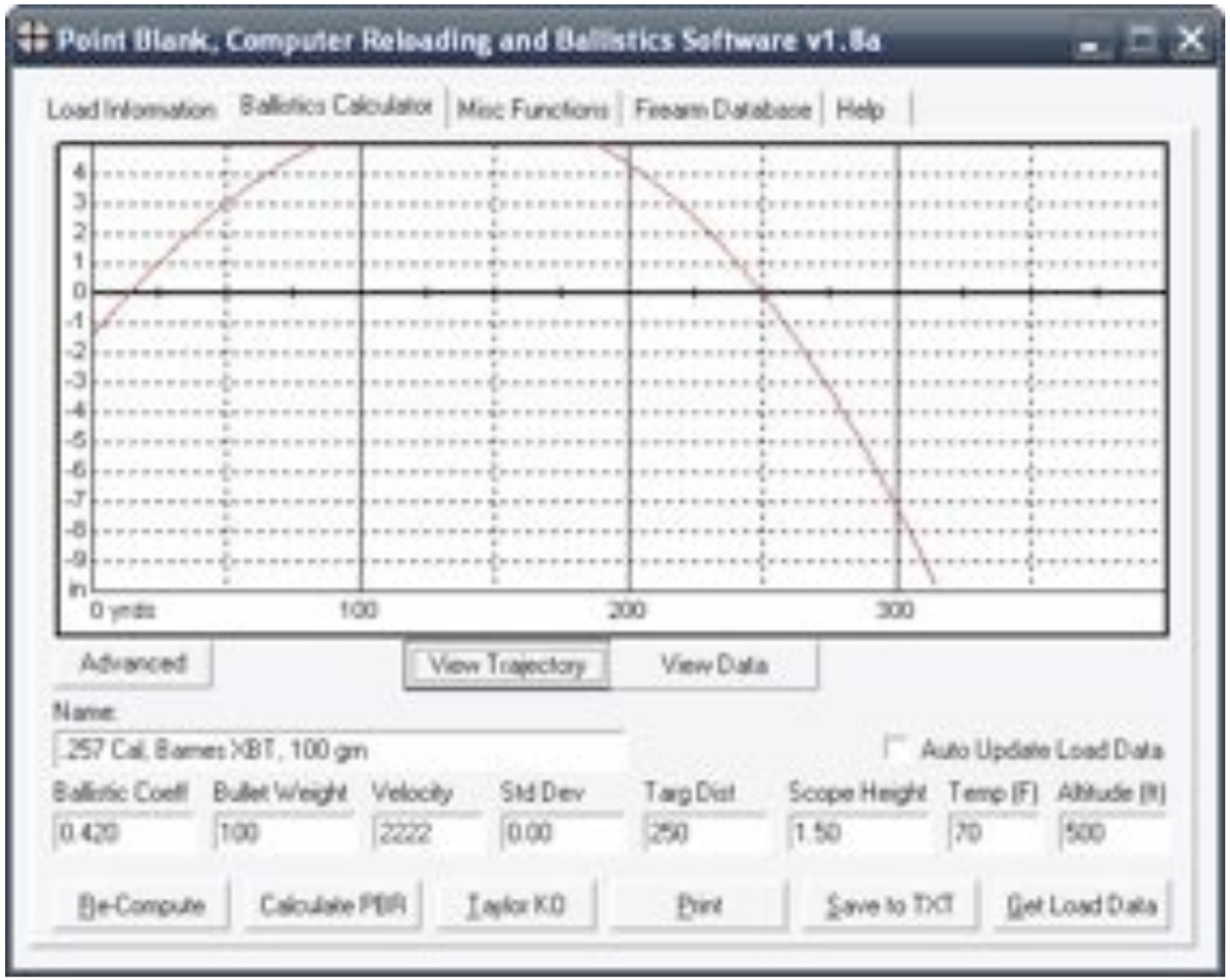
controlling people

"the Nazi census"
--Aly & Roth, 2004

IBM D11

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

military takeover



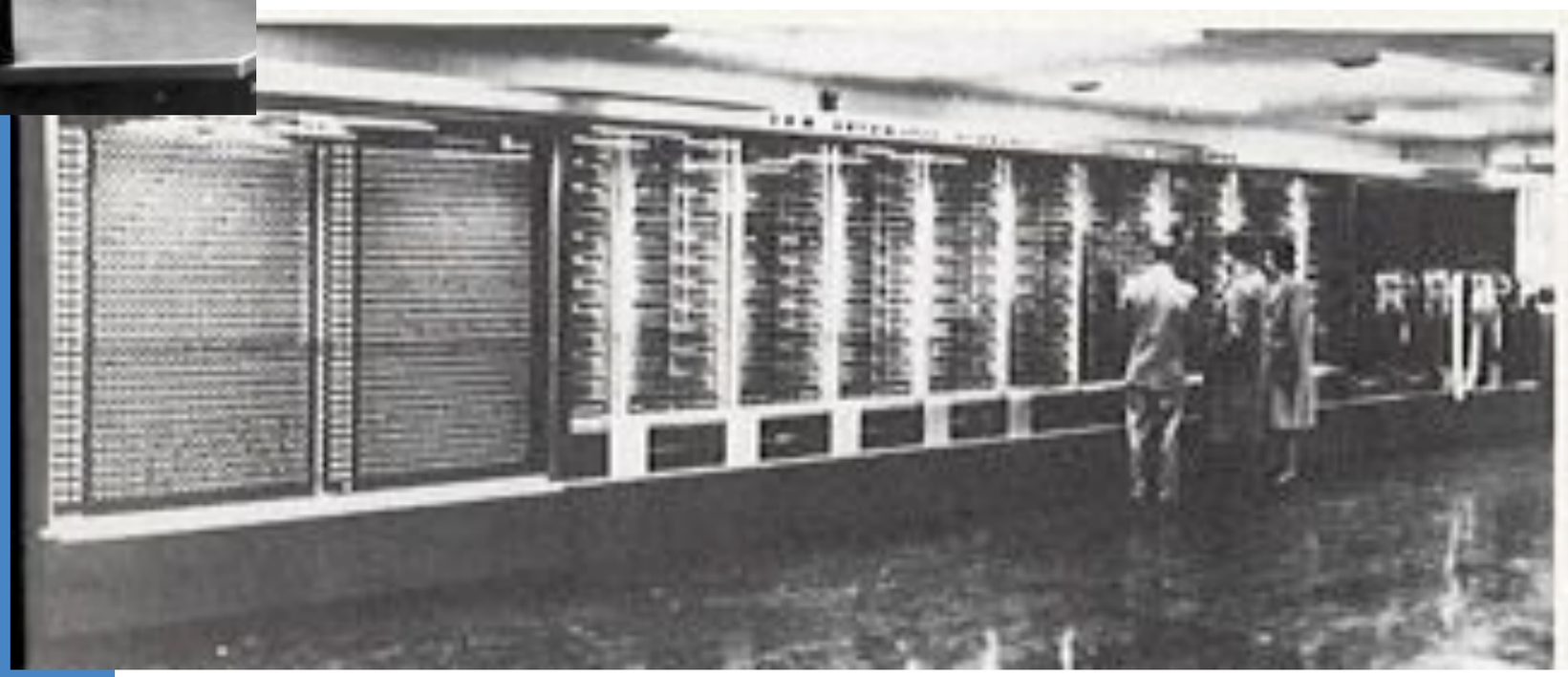
military processing

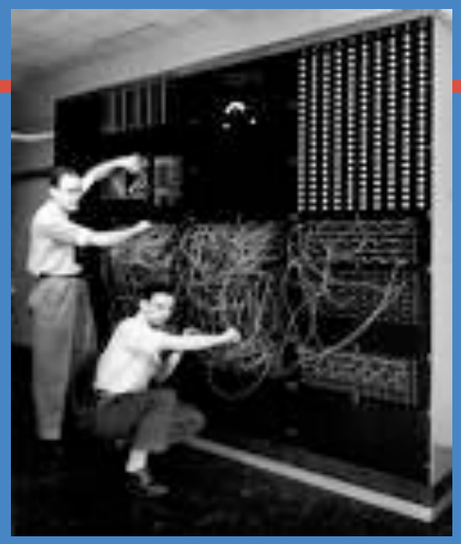
ballistics "firing tables"
human computers

Vannevar Bush
1935, Differential Analyzer

Harvard mark I

aka **IBM Automatic Sequence Controlled Calculator**





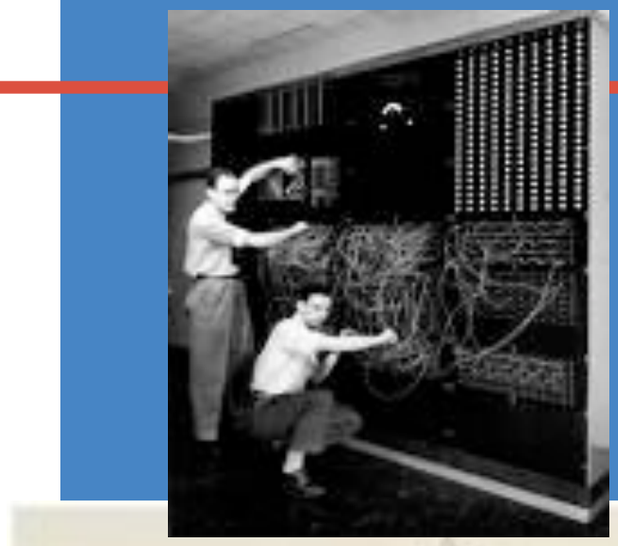
military processing

Moore School
Aberdeen Proving Ground

Eckert & Mauchly

1945, ENIAC
stored-program

(**Electronic** Numerical Integrator Computer)
18,00 vacuum tubes, 70, 000 resistors,
10,000 capacitors, 6,000 switches, 1,500 relays



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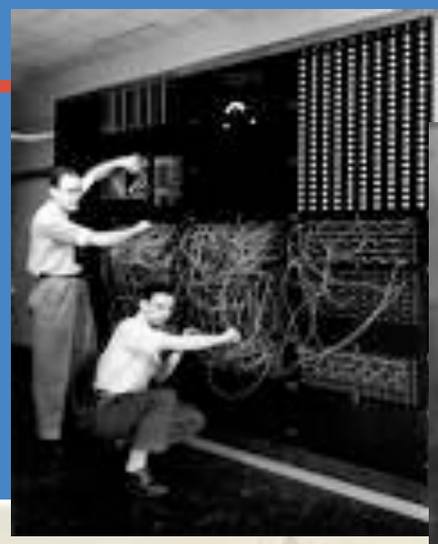
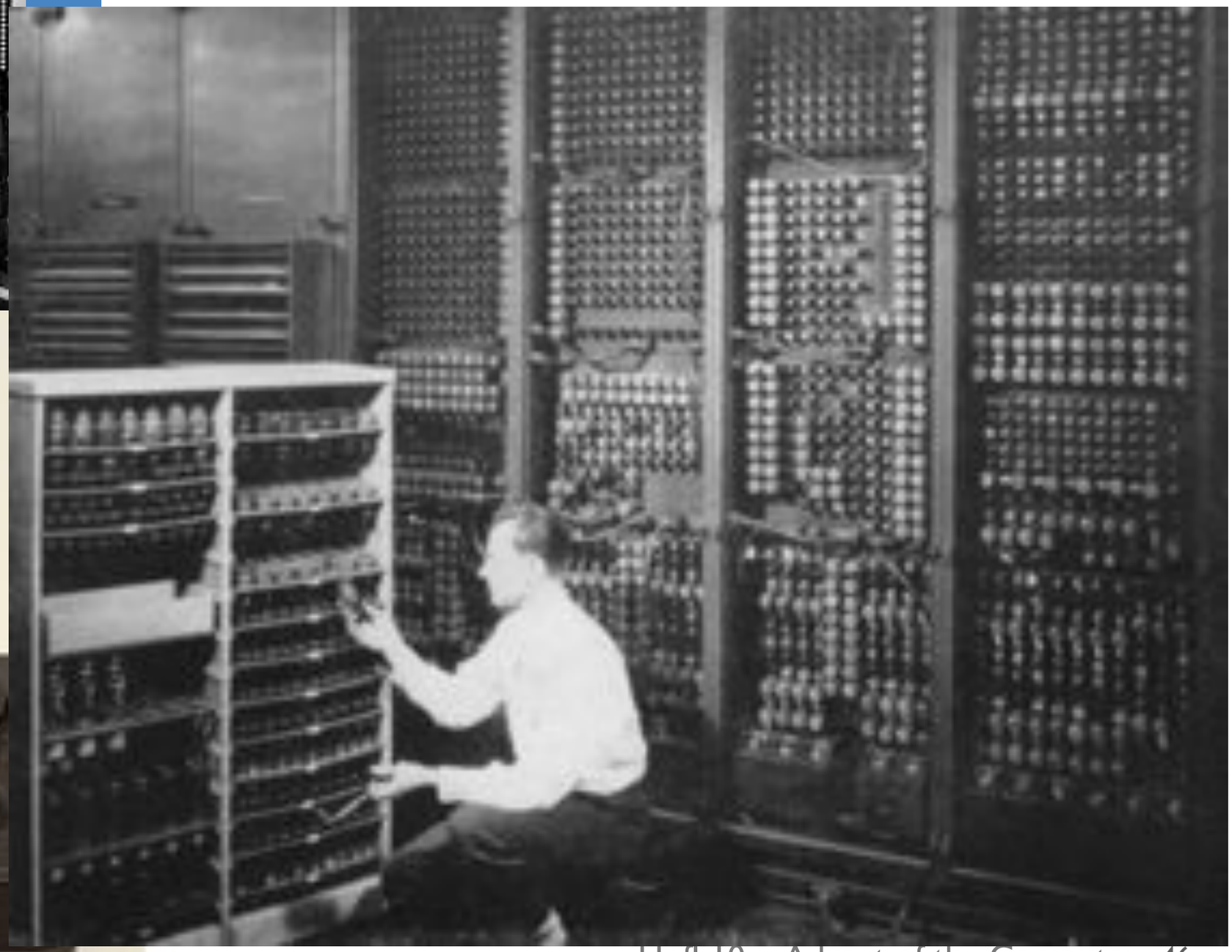
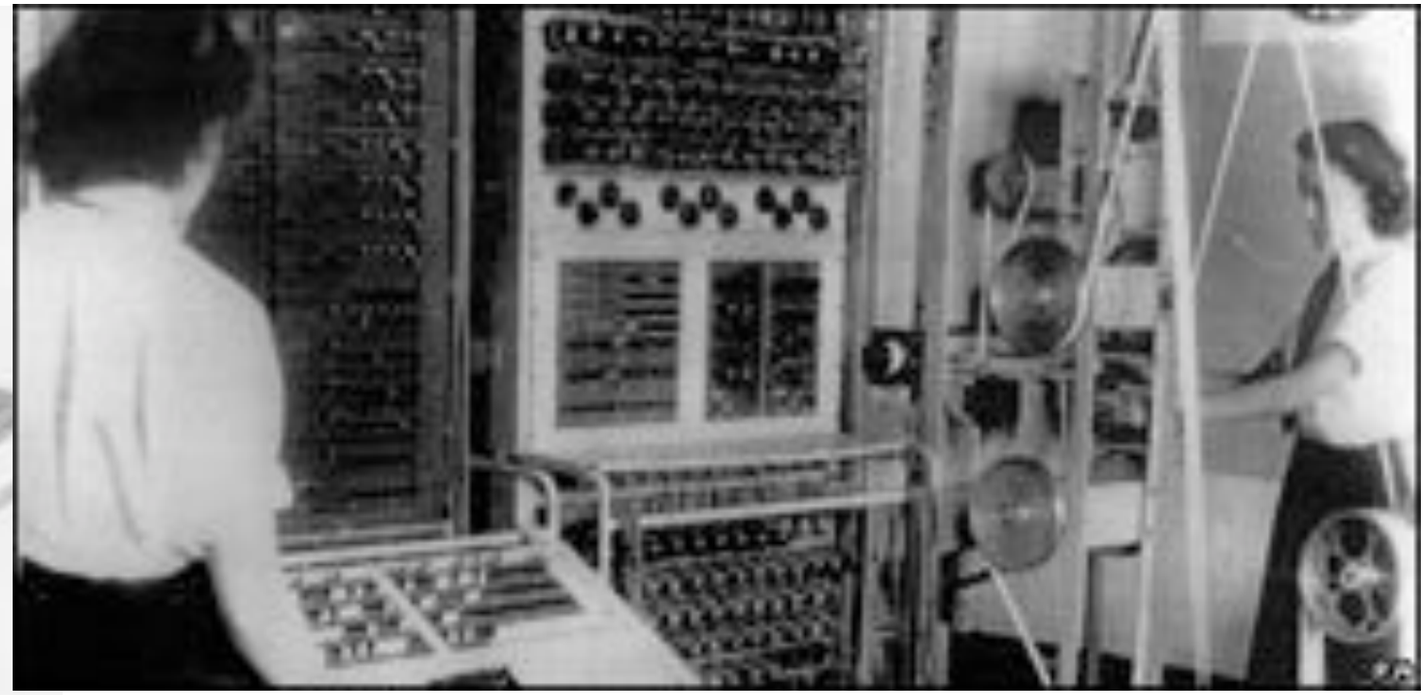




decoding

1943, Colossus
Bletchley Park
(another excuse for the Brits?)



in theory

aturingmachine.com

cybernetics

turing machines

von Neuman machines

back in business vertical integration

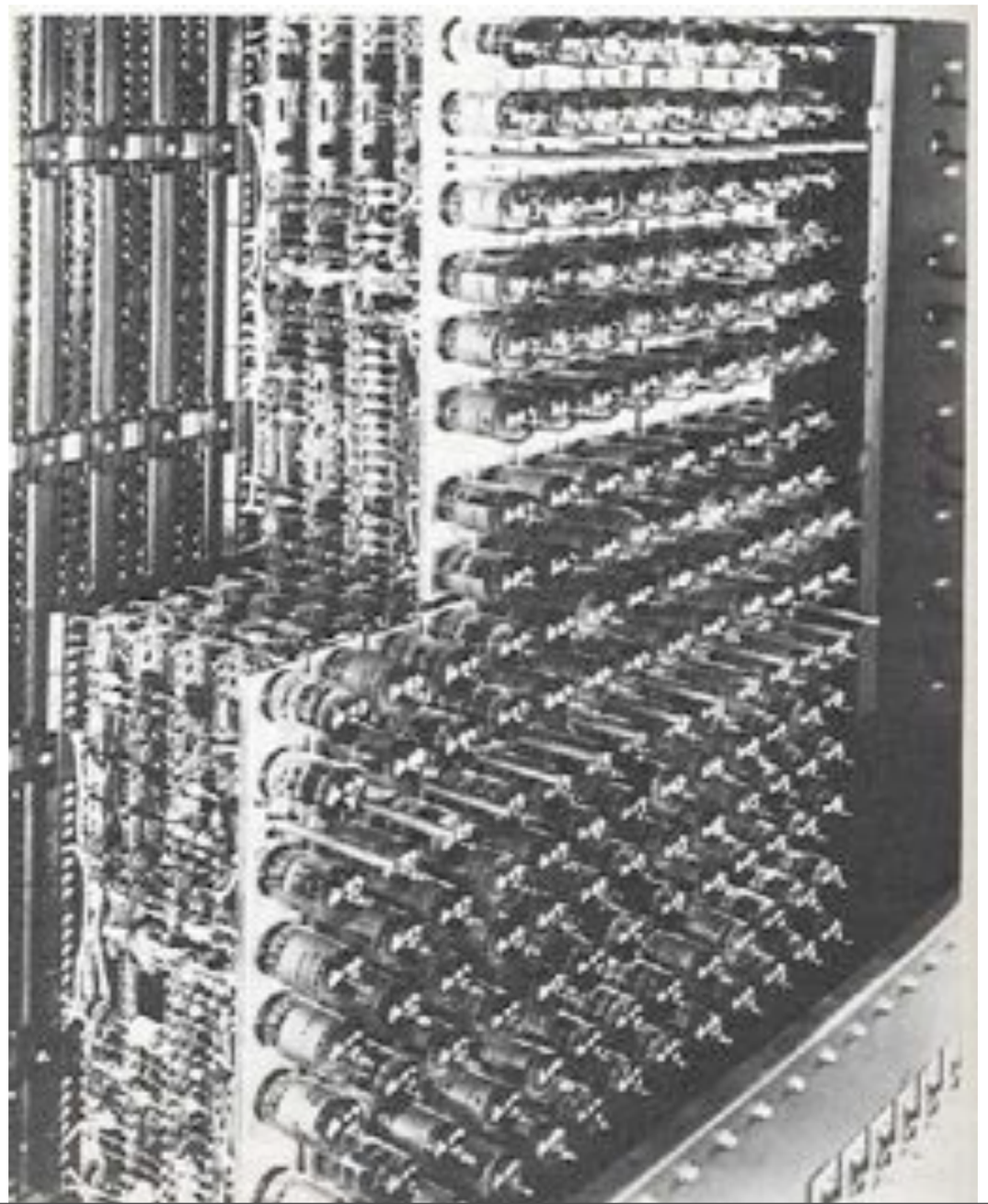
John Simmons
Lyons & Cambridge (1947)
ENIAC
EDVAC
UNIVAC
EDSAC

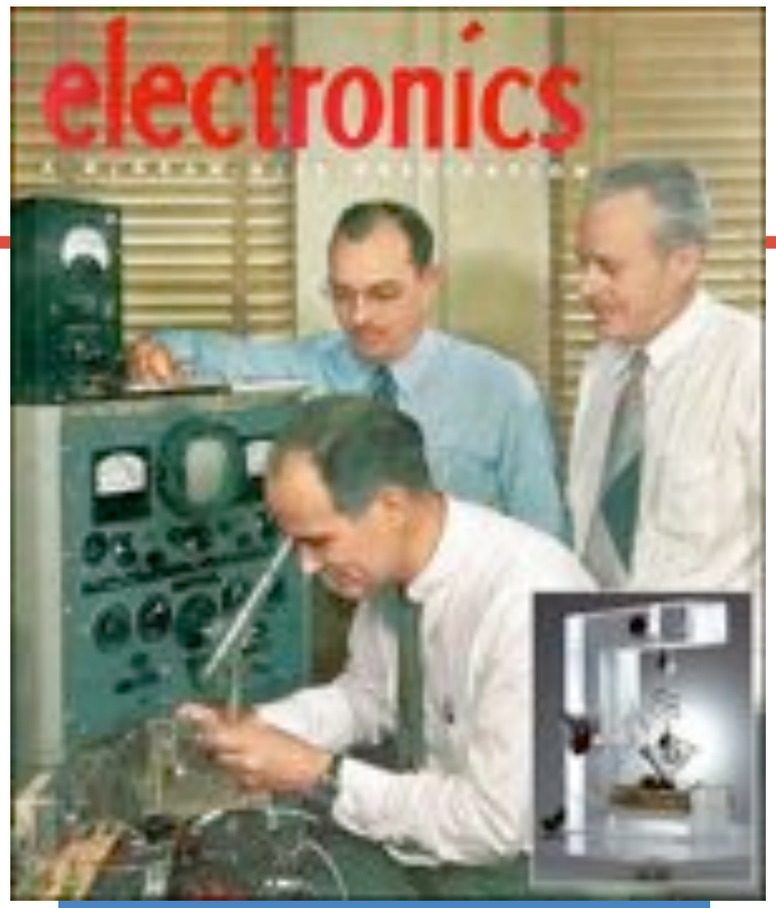
1954
LEO (Lyons electronic office)
CLEO (Clear language for expressing orders)
from payroll to baking

pros & cons?
LCL to ICL to IBM

breaking down

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





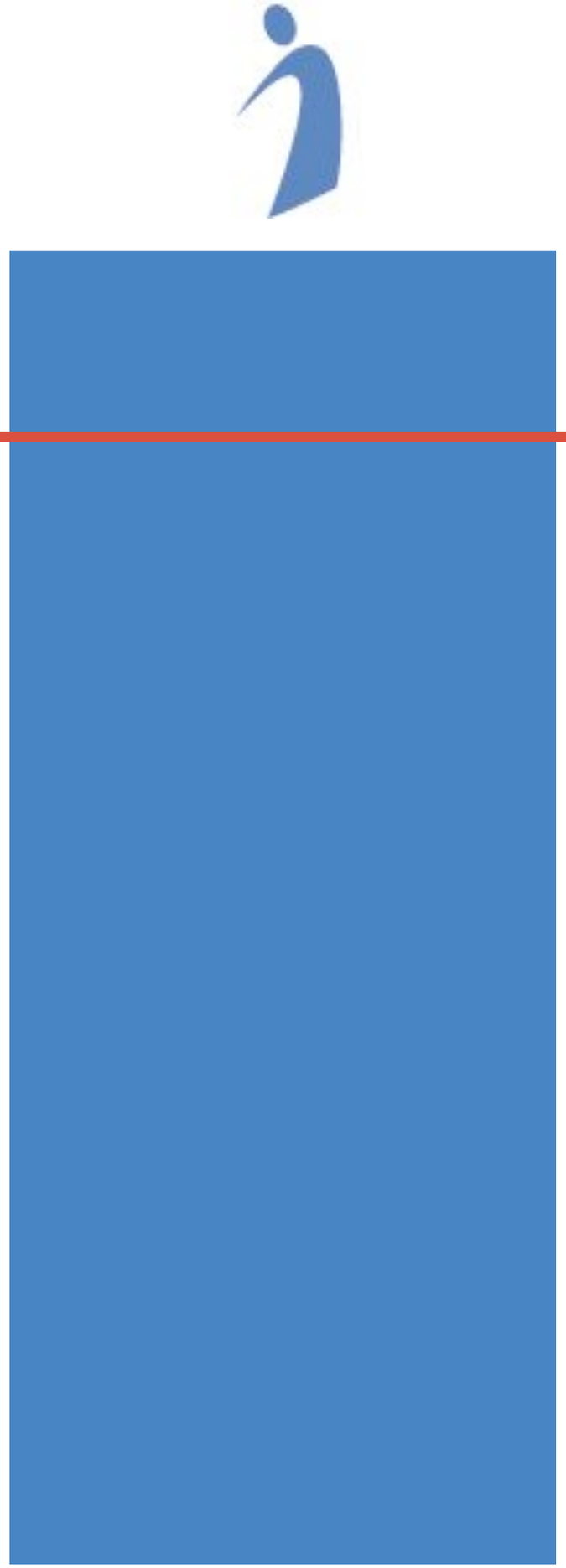
breaking things down

1947 transistor
Bell Labs
John Bardeen, William Brattain, William Shockley

1958 integrated circuit
Texas Instruments
Jack Kilby

Fairchild
Robert Noyce

Intel
Gordon Moore: Moore's Law



onward ...

1965-1969 , Packet switching,
Davies (NPL), Baran (RAND)

1968 HP 911A

1975 Altair

Hardware

H. Edward Roberts, Creator of the Personal Computer, Dies

Jason Mick [Blog] • April 5, 2010 11:25 AM

Print E-mail del.icio.us listen now

10 comment(s) - last by ggordonliddy.. on Apr 5 at 10:46 PM

Roberts helped launch the career of Bill Gates and Microsoft, delivered the first consumer PC

H. Edward Roberts died this week at age 68. If you don't know the story of how Roberts helped launch the personal computing revolution, let us fill you in.

Back in 1970, Ed Roberts had just finished serving at the Air Force Weapons Laboratory designing circuits for missiles. Along with a close friend, Forrest M. Mims III, he decided to open a business from his garage selling build-it-yourself electronics kits to hobbyists.

The new company, MITS, sold its first product, the MITS 816 calculator, in 1971 for $175 ($275 assembled). The calculator was featured in publications such as *Popular Electronics* and proved a commercial hit. Several more models followed, and to keep up with demand MITS moved to a new building with an assembly line and commercial soldering equipment.

Then disaster struck -- Texas Instruments in 1972 developed its own chip and began selling calculators at half the price of the MITS models, fully assembled. Even with $250,000 in debt and a collapsing business, Ed. Roberts didn't waver from his commitment to personal computing. He persevered building the prototype of the first personal computer, the Altair 8800, named unofficially after a planet

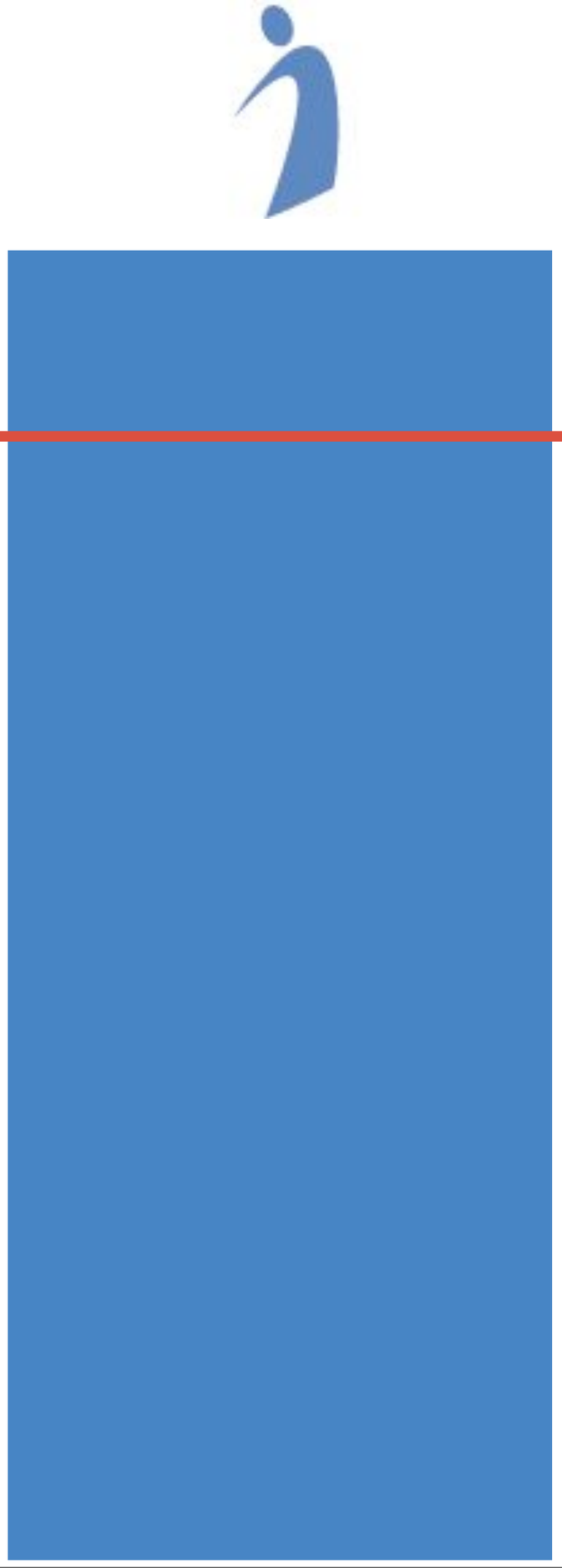
H. Edward Roberts, M.D., stands next to the first PC, the Altair 8800. (Source: ArsTechnica)

onward ...

1965-1969 , Packet switching, Davies (NPL), Baran (RAND)

1968 HP 911A

1975 Altair



culture clash

home brew, fone freaks, 'open source'

Jobs
Wozniak
Gates
Allen

....

February 3, 1976

An Open Letter to Hobbyists

To me, the most critical thing in the hobby market right now is the lack of good software courses, books and software itself. Without good software and an owner who understands programming, a hobby computer is wasted. Will quality software be written for the hobby market?

Almost a year ago, Paul Allen and myself, expecting the hobby market to expand, hired Monte Davidoff and developed Altair BASIC. Though the initial work took only two months, the three of us have spent most of the last year documenting, improving and adding features to BASIC. Now we have 4K, 8K, EXTENDED, ROM and DISK BASIC. The value of the computer time we have used exceeds $40,000.

The feedback we have gotten from the hundreds of people who say they are using BASIC has all been positive. Two surprising things are apparent, however. 1) Most of these "users" never bought BASIC (less than 10% of all Altair owners have bought BASIC), and 2) The amount of royalties we have received from sales to hobbyists makes the time spent of Altair BASIC worth less than $2 an hour.

Why is this? As the majority of hobbyists must be aware, most of you steal your software. Hardware must be paid for, but software is something to share. Who cares if the people who worked on it get paid?

Is this fair? One thing you don't do by stealing software is get back at MITS for some problem you may have had. MITS doesn't make money selling software. The royalty paid to us, the manual, the tape and the overhead make it a break-even operation. One thing you do do is prevent good software from being written. Who can afford to do professional work for nothing? What hobbyist can put 3-man years into programming, finding all bugs, documenting his product and distribute for free? The fact is, no one besides us has invested a lot of money in hobby software. We have written 6800 BASIC, and are writing 8080 APL and 6800 APL, but there is very little incentive to make this software available to hobbyists. Most directly, the thing you do is theft.

What about the guys who re-sell Altair BASIC, aren't they making money on hobby software? Yes, but those who have been reported to us may lose in the end. They are the ones who give hobbyists a bad name, and should be kicked out of any club meeting they show up at.

I would appreciate letters from any one who wants to pay up, or has a suggestion or comment. Just write me at 1180 Alvarado SE, #114, Albuquerque, New Mexico, 87108. Nothing would please me more than being able to hire ten programmers and deluge the hobby market with good software.

Bill Gates

Bill Gates
General Partner, Micro-Soft

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Joel Simone: doesn't consider the bureaucratic and technological preconditions ... perhaps Babbage needed a Bill Gates to steal his ideas

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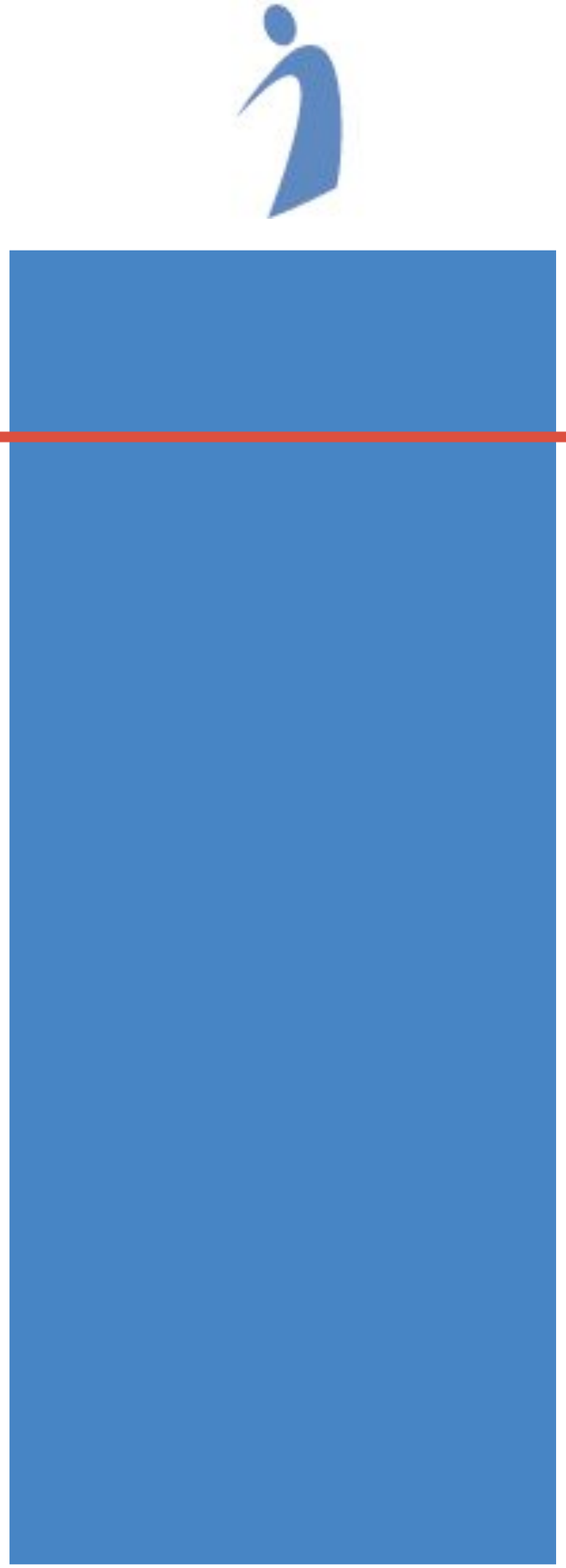


corporate computing

1946 SRI

1969 Xerox PARC

"the architecture of information"

1976 Apple I

1981 IBM PC

1984 MAC

vertical disintegration 1970-1990

Software	IBM
OS	IBM
CPU	IBM
Hardware	IBM

vertical disintegration 1970-1990

Software	IBM	DEC
OS	IBM	DEC
CPU	IBM	DEC
Hardware	IBM	DEC

vertical disintegration 1970-1990

Software	IBM	DEC	3d party
OS	IBM	DEC	Apple
CPU	IBM	DEC	Apple
Hardware	IBM	DEC	Apple

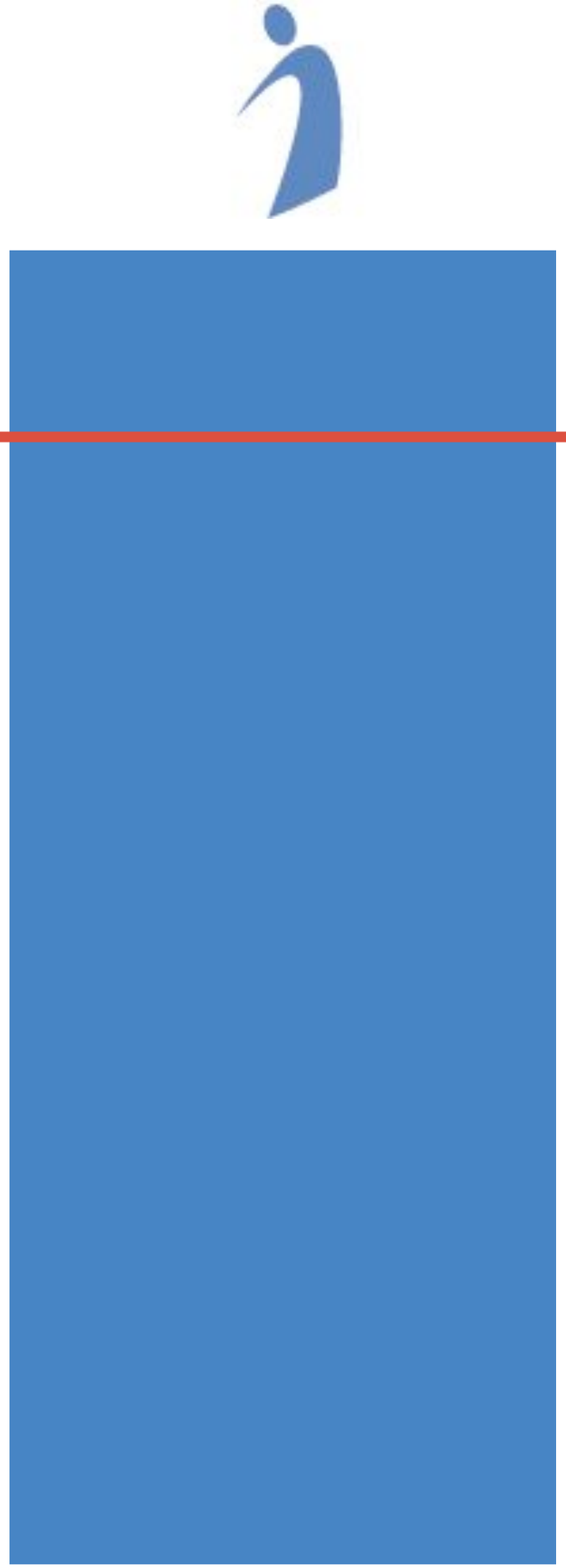
vertical disintegration 1970-1990

Software	IBM	DEC	3d party	3d party
OS	IBM	DEC	Apple	AT&T-Unix
CPU	IBM	DEC	Apple	Sun
Hardware	IBM	DEC	Apple	Sun

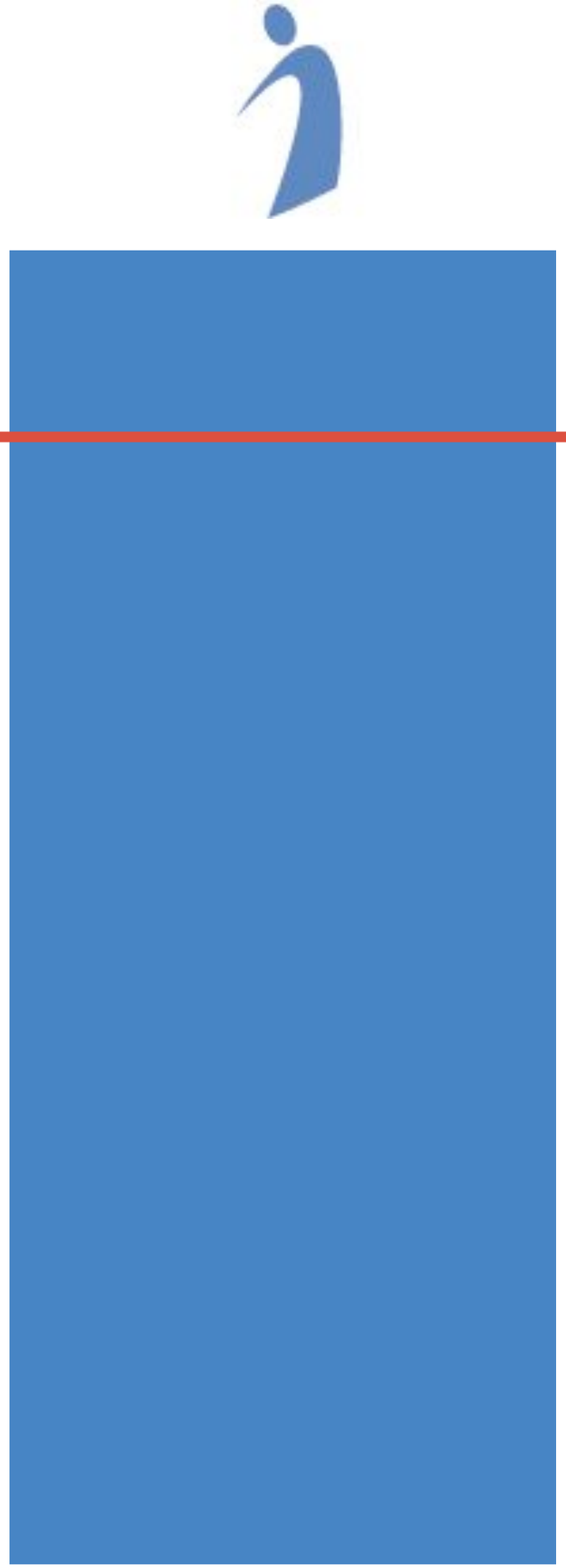
vertical disintegration 1970-1990

Software	IBM	DEC	3d party	3d party	3d party
OS	IBM	DEC	Apple	AT&T-Unix	Microsoft
CPU	IBM	DEC	Apple	Sun	Intel & co
Hardware	IBM	DEC	Apple	Sun	[IBM]/OEM

brand wars

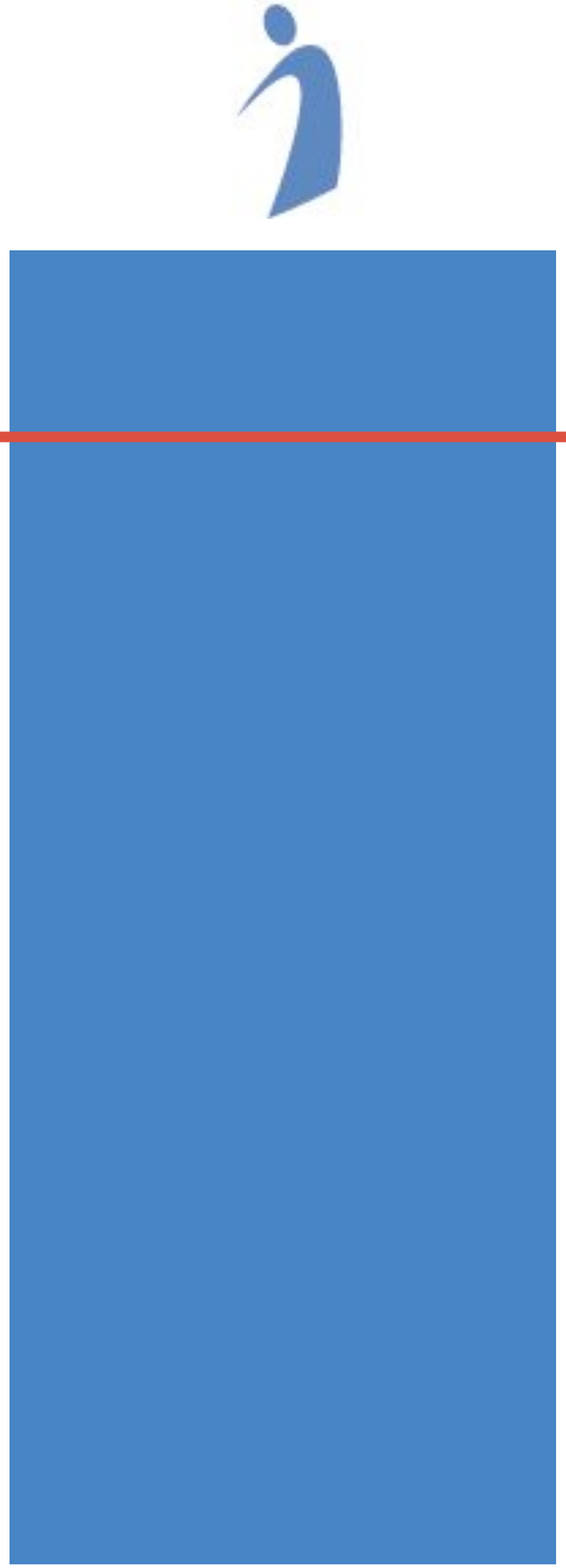


computer power



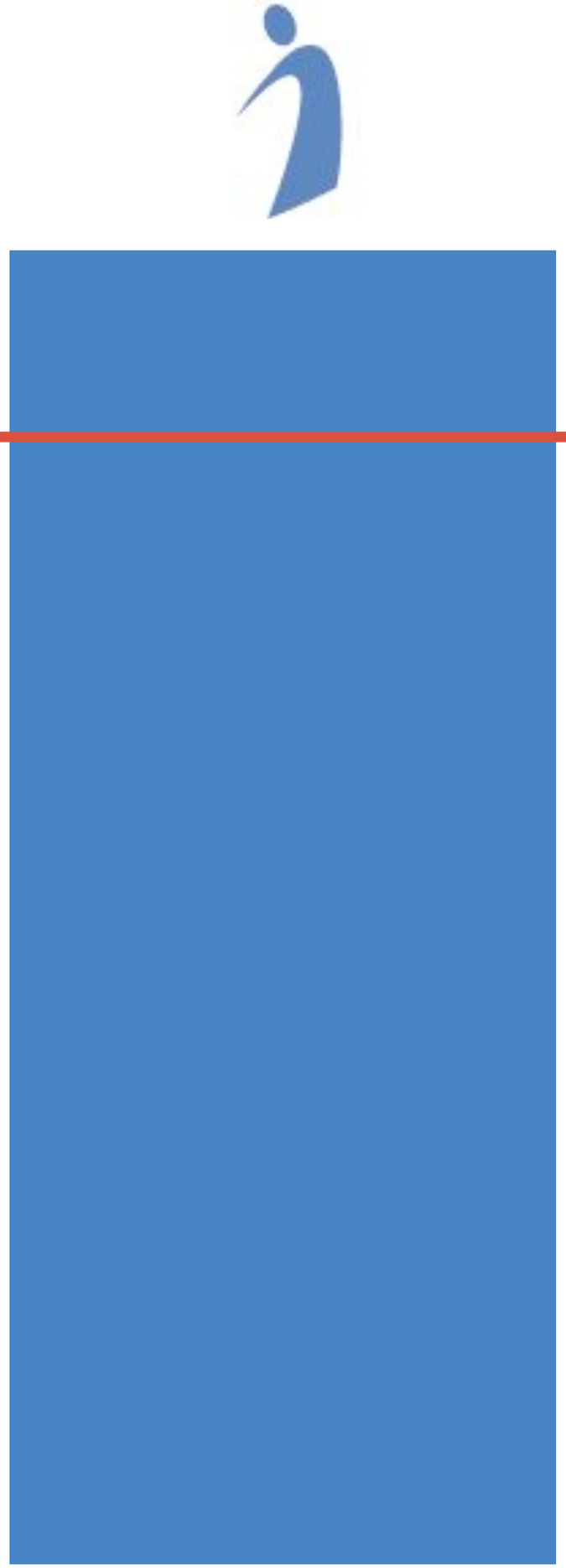
computer power

computer?



computer power

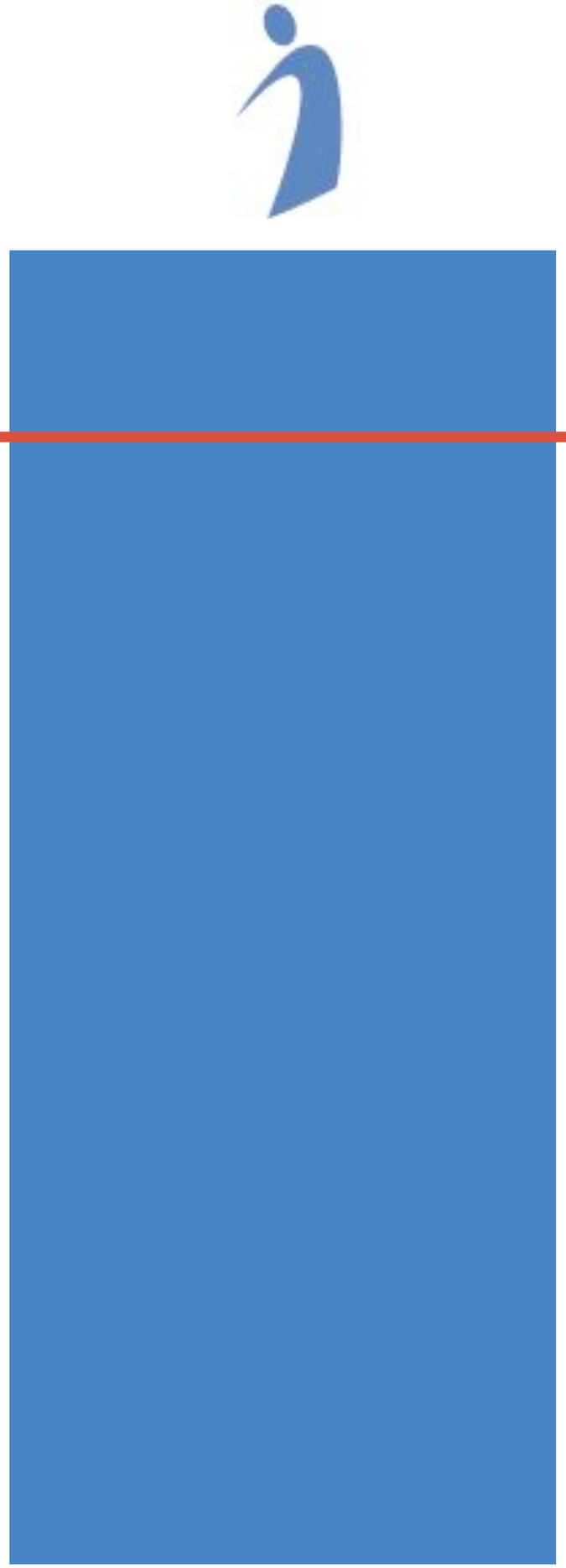
computer?



computer power

computer?

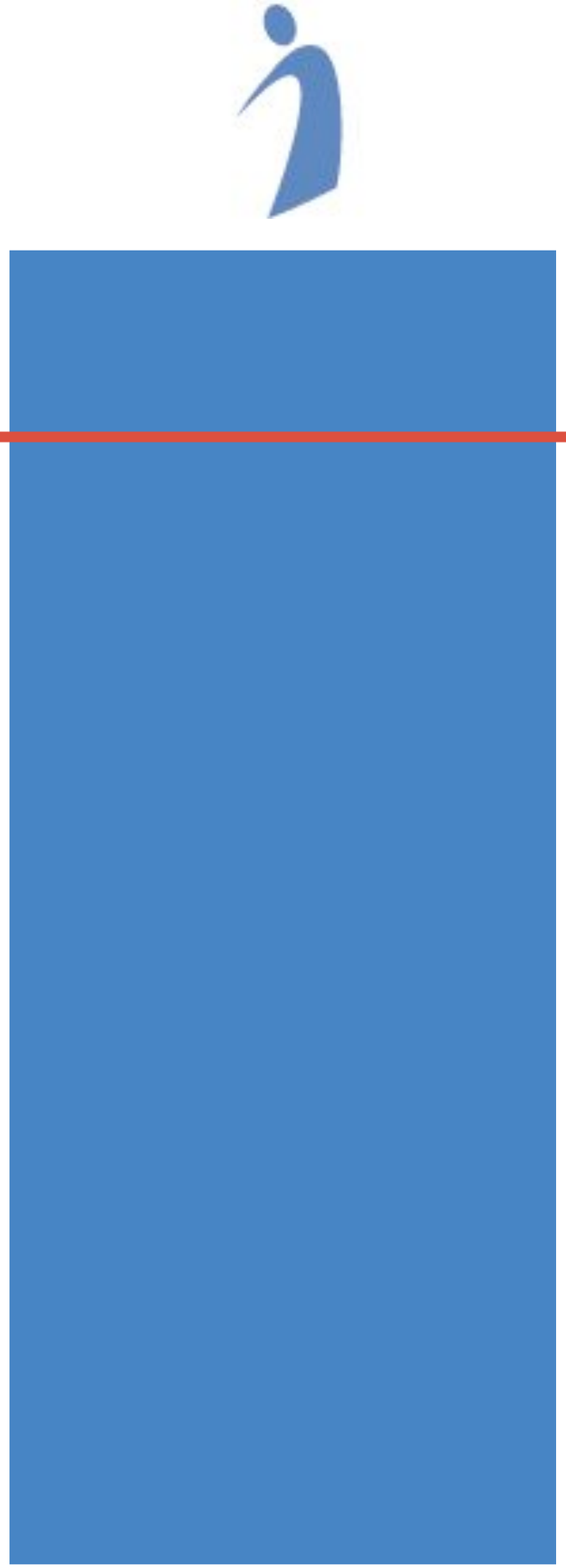
OS?



computer power

computer?

OS?

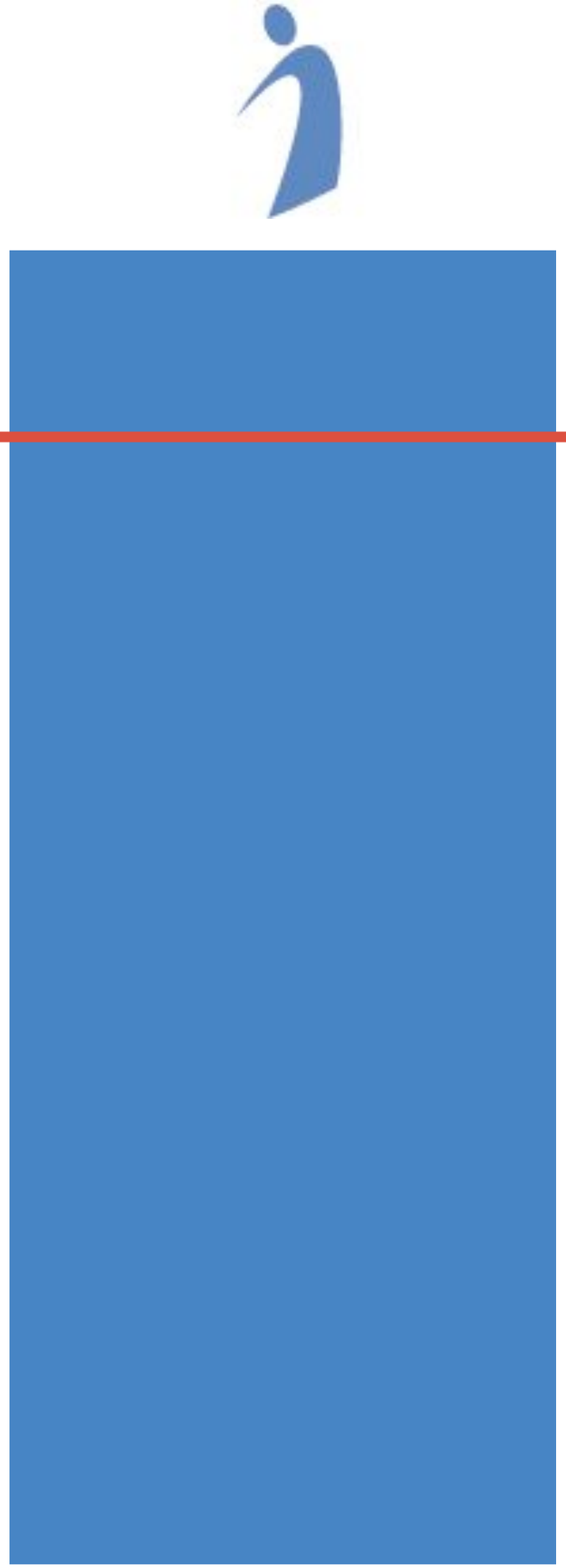


computer power

computer?

OS?

processor?

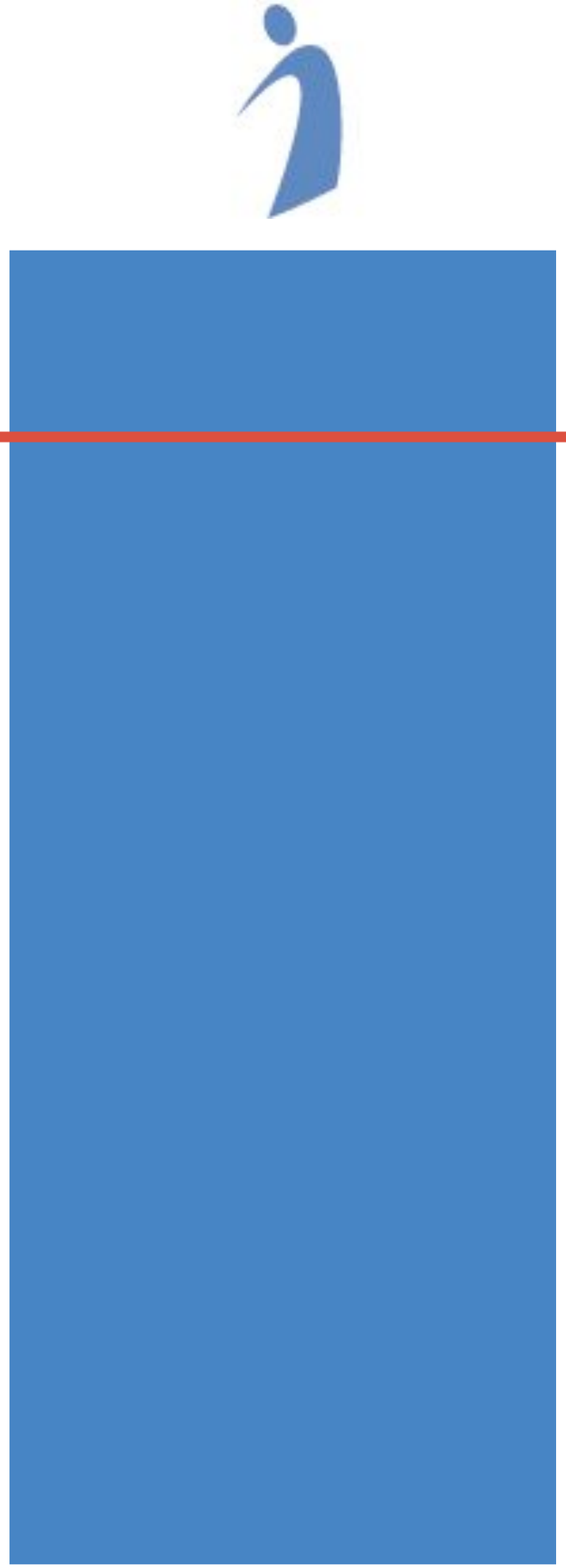


computer power

computer?

OS?

processor?



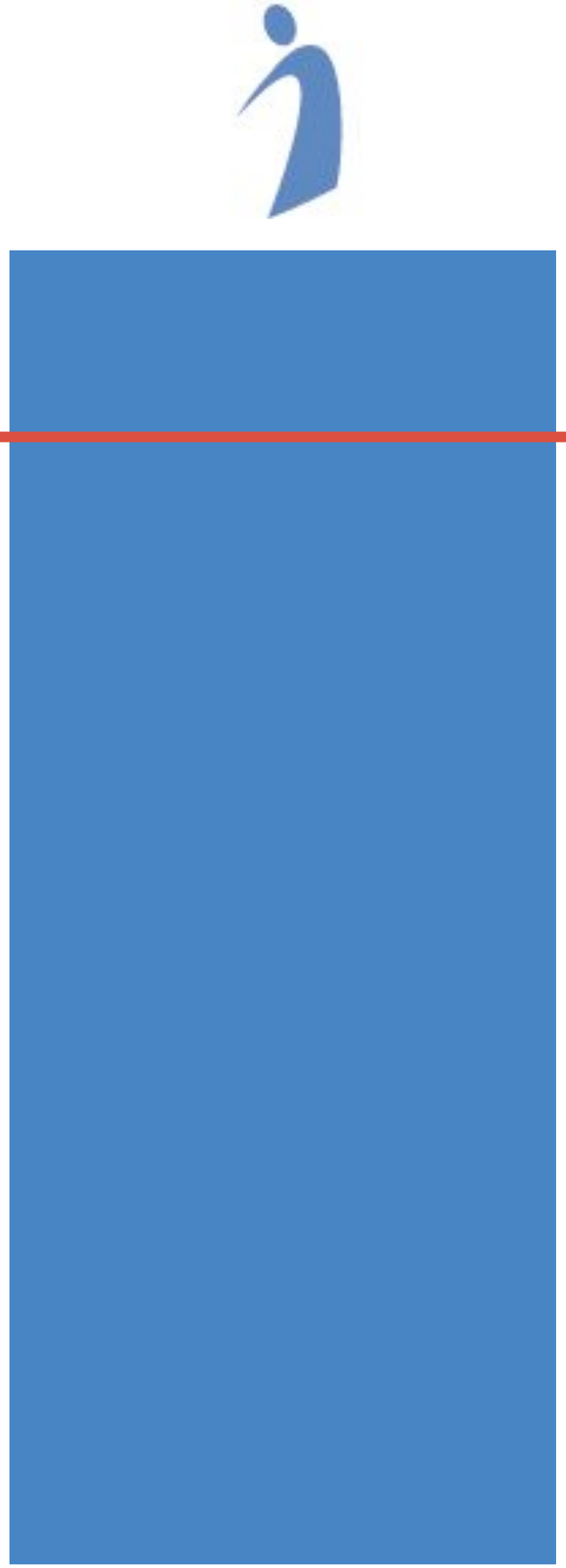
computer power

computer?

OS?

processor?

hard drive?



computer power

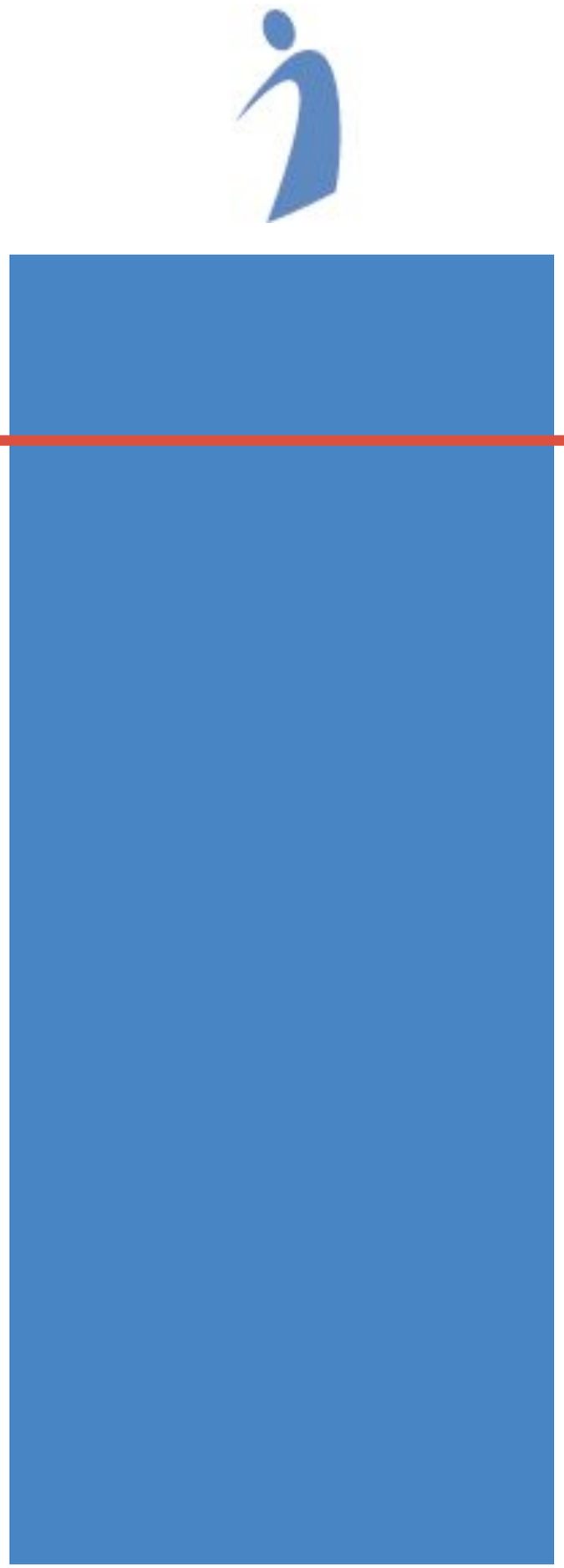
computer?

OS?

processor?

hard drive?

2000
6 hard drive companies



computer power

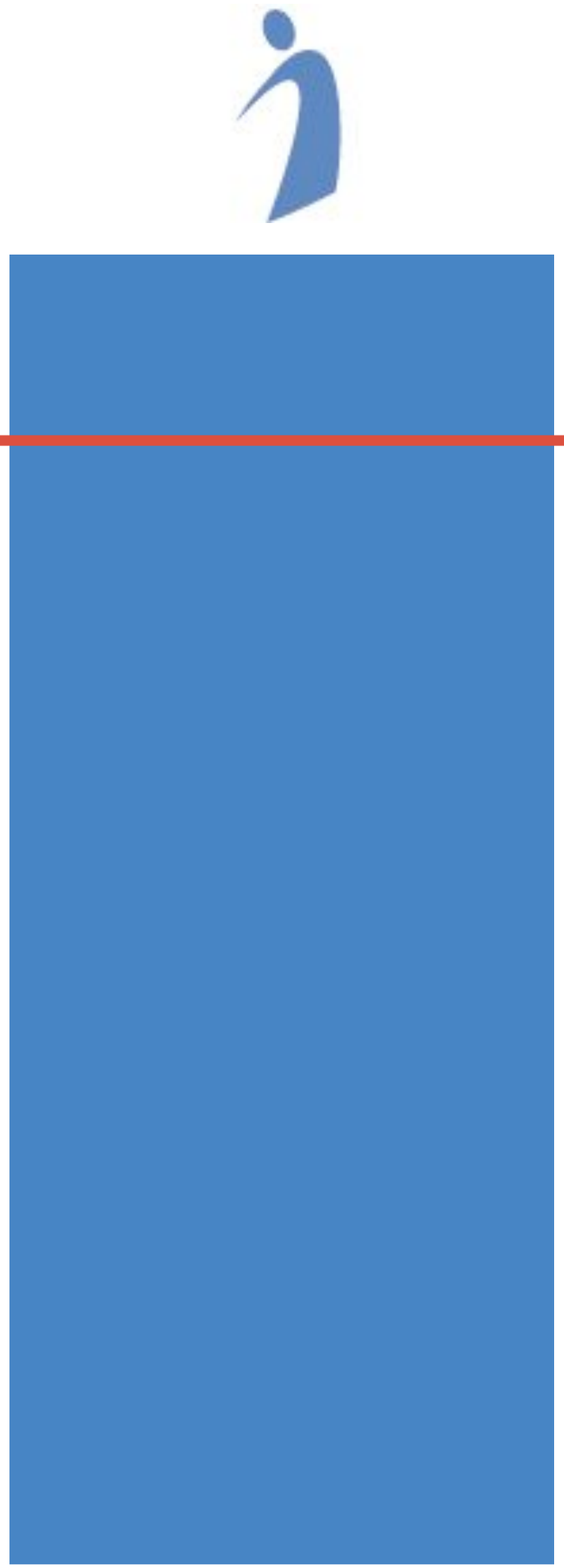
computer?

OS?

processor?

hard drive?

2000
6 hard drive companies
196 million disks



computer power

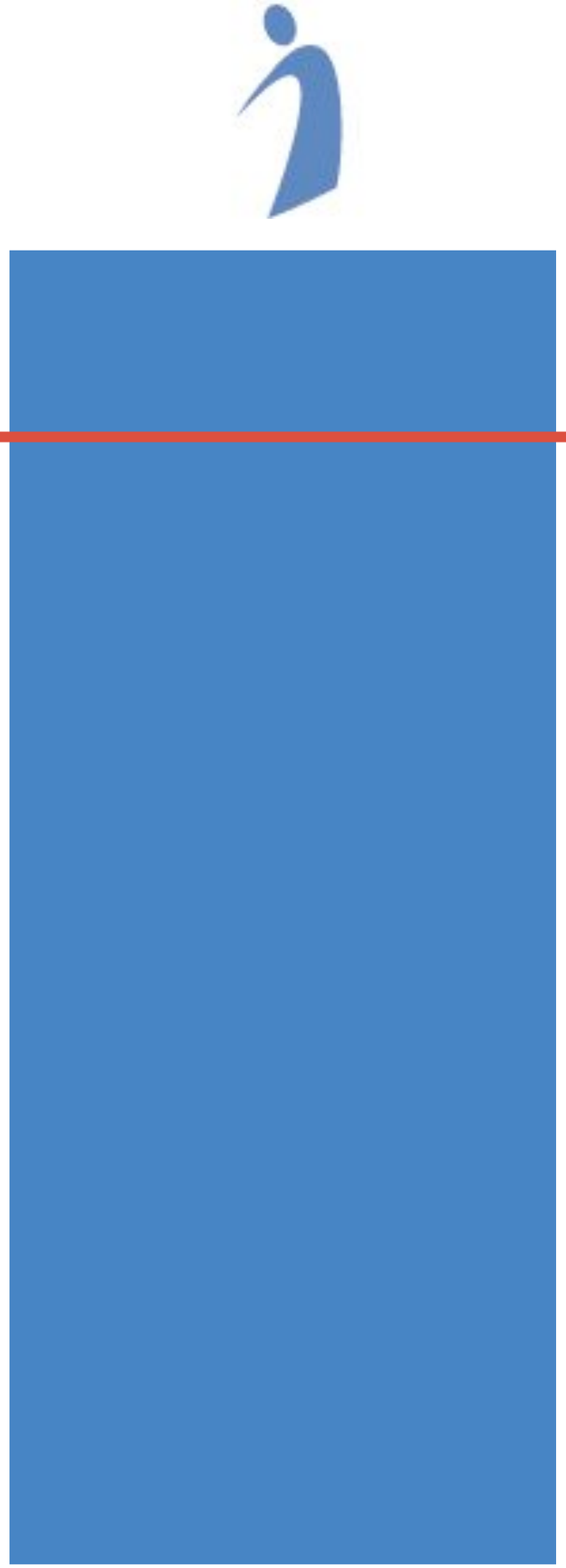
computer?

OS?

processor?

hard drive?

2000
6 hard drive companies
196 million disks
0 profit



computer power

computer?

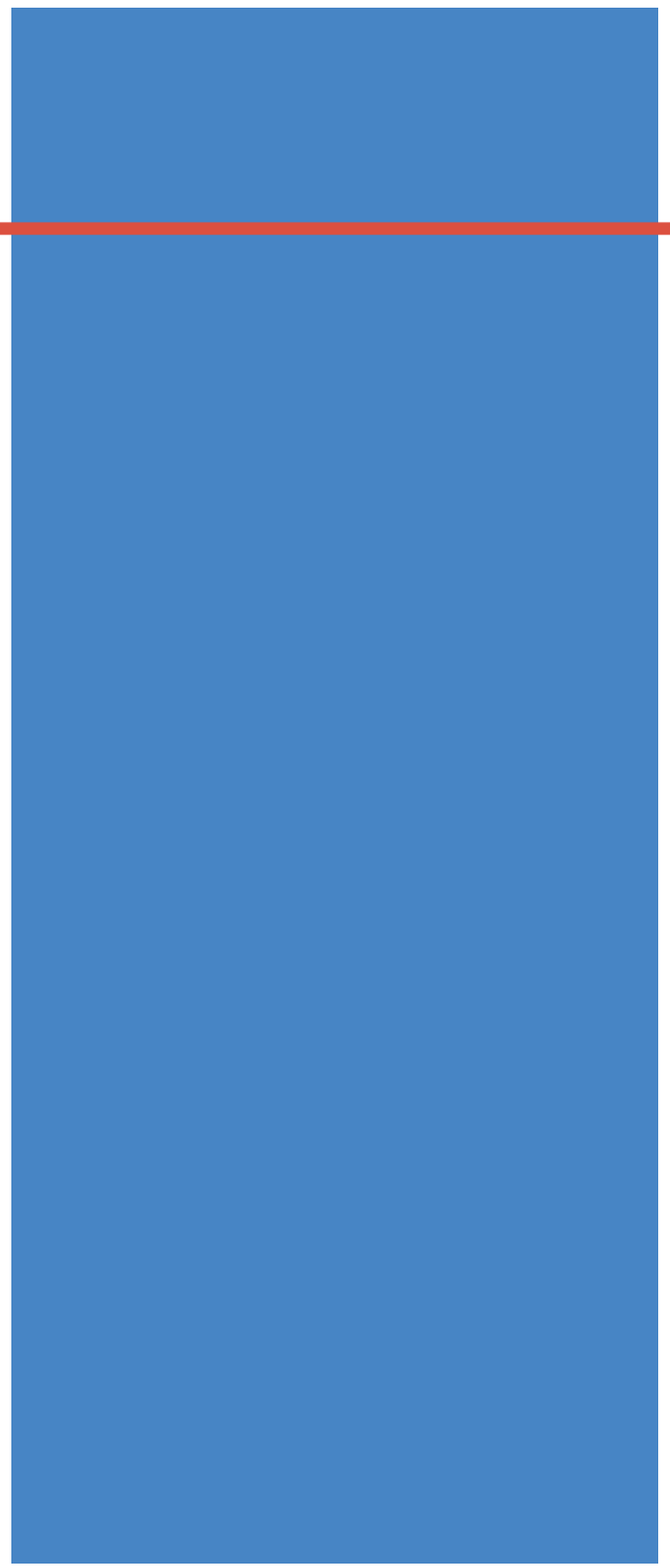
OS?

processor?

hard drive?

2000
6 hard drive companies
196 million disks
0 profit

Dell: 7%



computer power

computer?

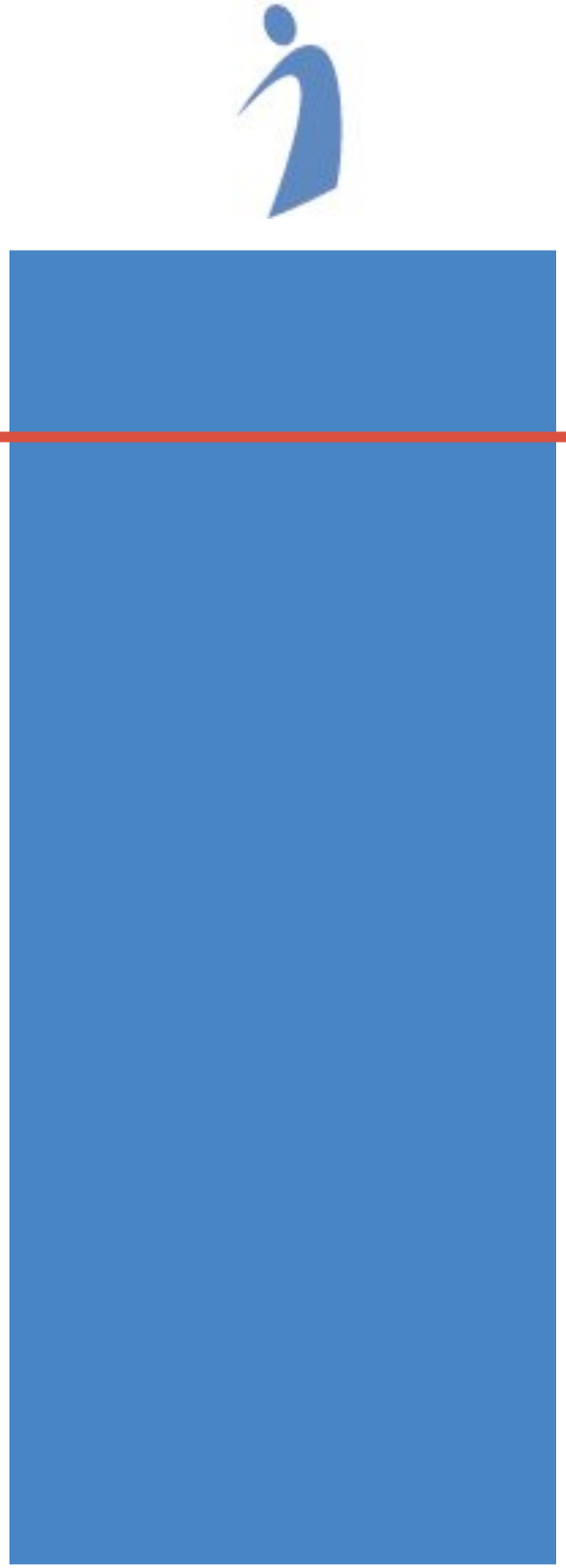
OS?

processor?

hard drive?

```
2000
6 hard drive companies
196 million disks
0 profit

Dell: 7%
Microsoft:  31%
```



computer power

computer?

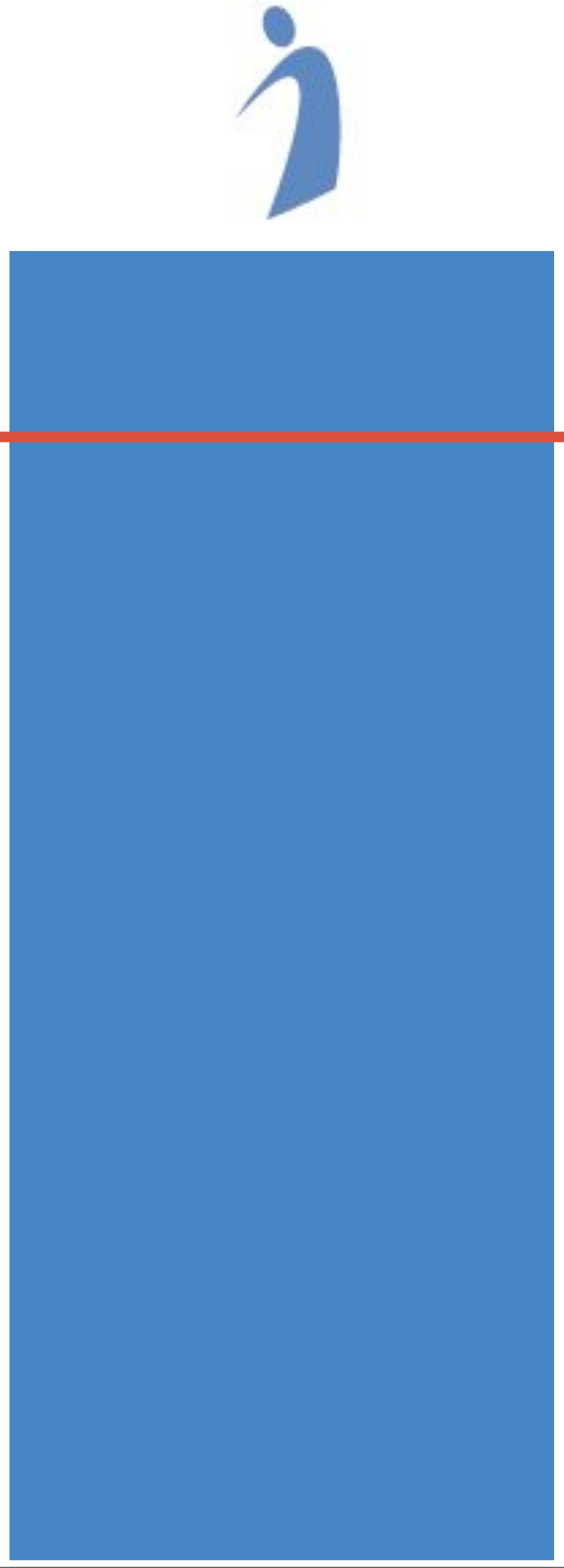
OS?

processor?

hard drive?

2000
6 hard drive companies
196 million disks
0 profit

Dell: 7%
Microsoft: 31%
Intel: 13%



the story so far

registering

predicting

calculating

controlling

***coming up*, communicating**

but first

8 Apr: Information and disasters (Megan Finn, guest lecture)

Required reading:

- Fradkin, Philip L. 2005. "The Culture of Disasters" pp 263-288 in *The Great Earthquake and Firestorms of 1906*. University of California Press: Berkeley.

Additional material:

- Klinenberg, Eric. 1997. Introduction and Chapter 1. pp 1-36 in *Fighting for Air*. Metropolitan Books: New York.