

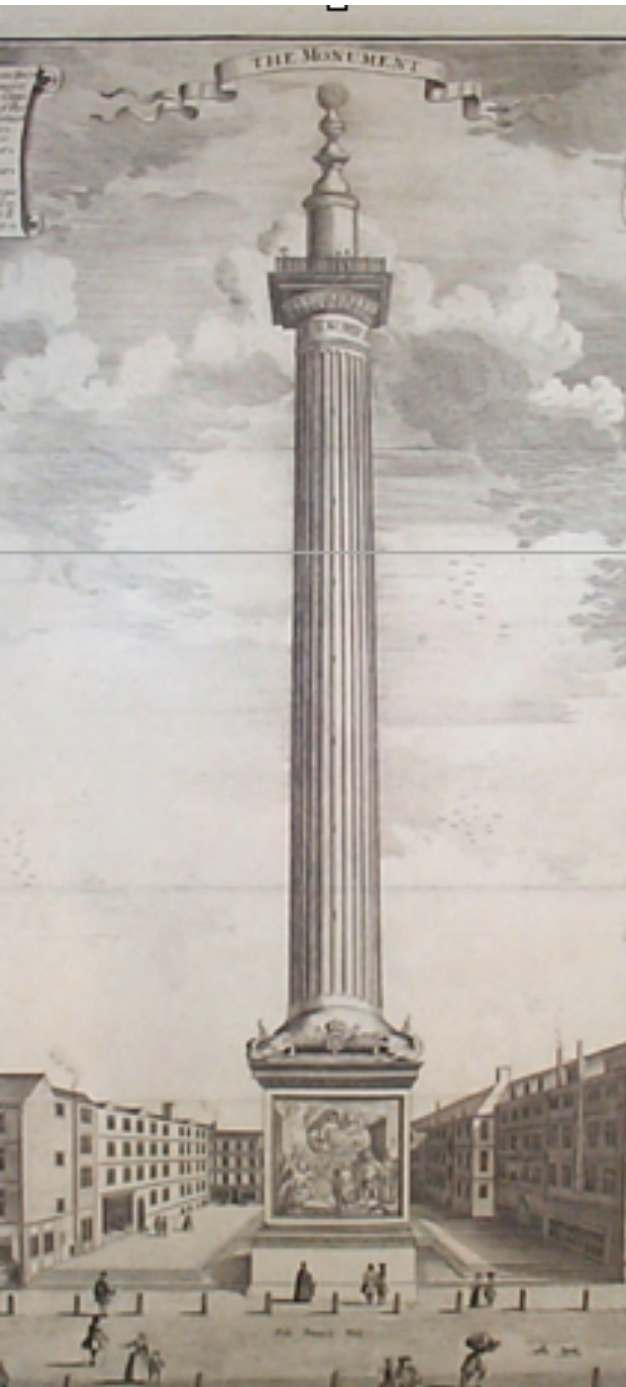
# History of Information

## scientific "revolution"

**authenticity & authority  
truth and trust**

History of Information

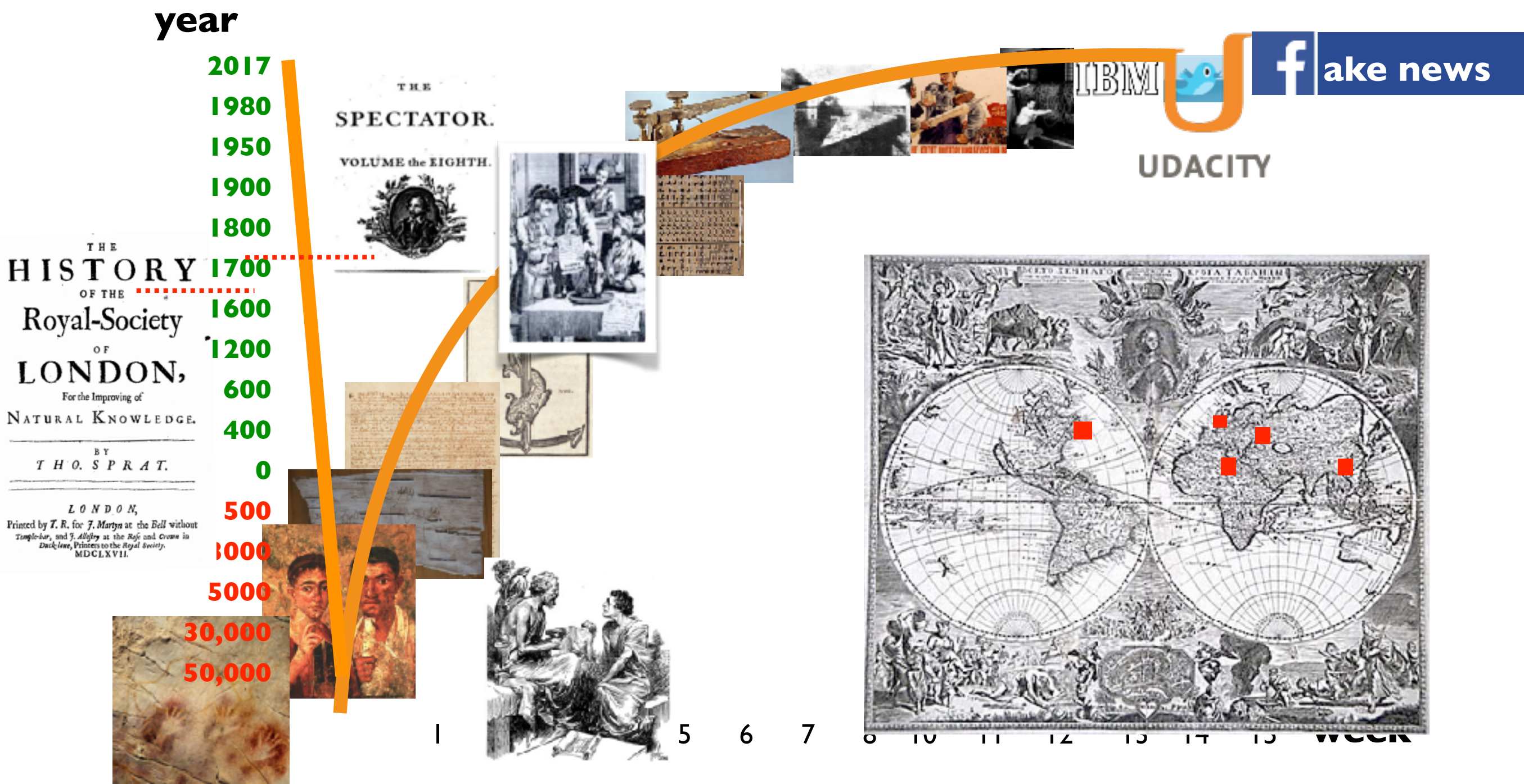
Feb 16, 2017





# Scientific "revolution"

# where are we?



**the three Rs** "The impact of printing, experienced first by literate groups in early modern Europe, changed the character of the Italian Renaissance and ought to be considered among the causes of both the Protestant Reformation and the **Rise of modern science.**"

— Eisenstein

## another revolution?

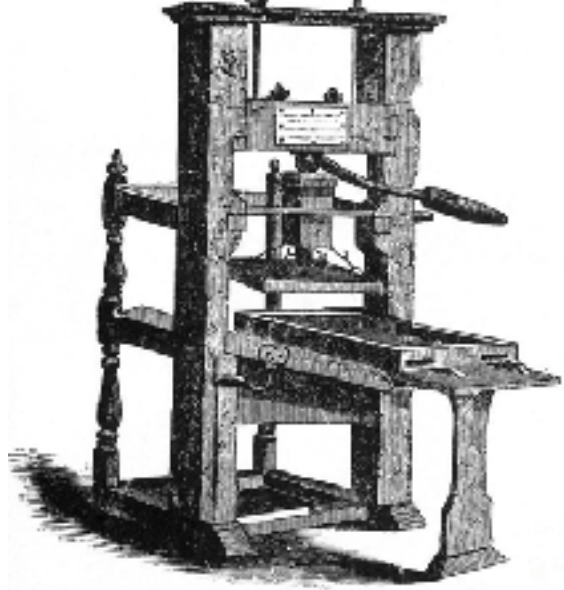
### putting the other "Rs" in their place

"The Scientific Revolution outshines everything since the rise of Christianity and reduces the Renaissance and Reformation to the rank of mere episodes, mere internal displacements within the system of medieval Christianity."

— Herbert Butterfield,

*The Origins of Modern Science, 1300-1800*, 1948





not just tech ...

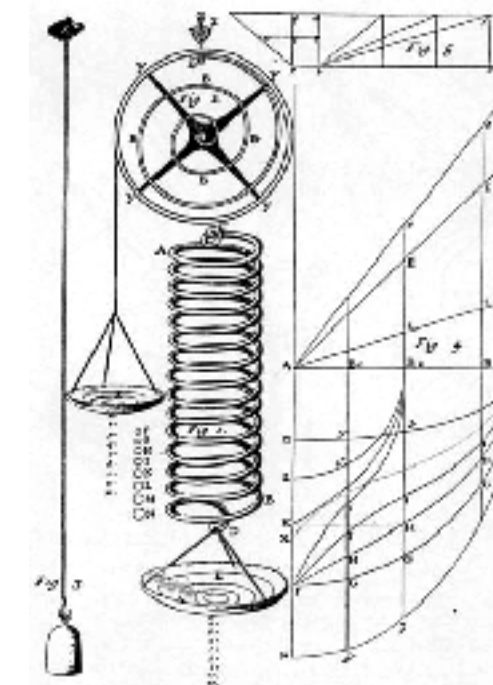
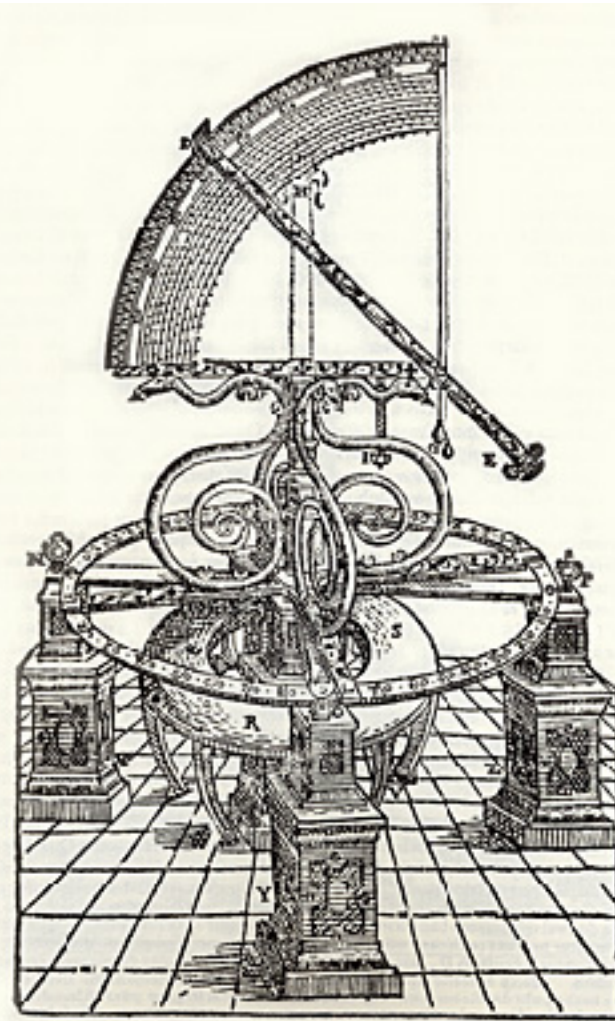


PLATE TO HOOVER'S LECTURE "De Brevitas" 1688.  
 FIG. 1. Wheel and spring stretched to points a, b, c, d, e, f, g, h, i, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, by weights.  
 FIG. 2. Wheel and spring stretched by weights put in pan.  
 FIG. 3. The spring of a string of brass wire 10 ft. long.  
 FIG. 4. Diagram of velocity of spring.  
 FIG. 5. Diagram of line of ascent and descent of heavy bodies.



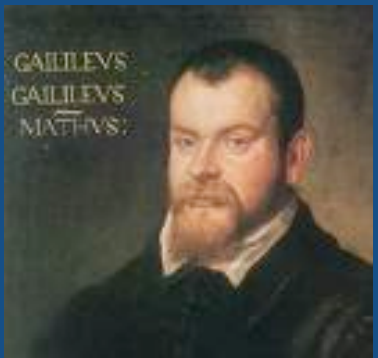


# nor just techies ...



Gutenberg, d. 1468

Copernicus, 1473-1543



Tycho Brahe, 1546-1601

Bacon, 1561-1626

Galileo, 1564-1642



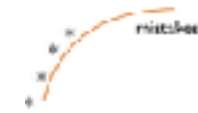
Descartes, 1596-1650

Newton, 1642-1727





# Scientific "revolution"



in conclusion

## how to think about determinism

- what happened?
- what was involved?
- what did (or did not) come before?
- what did (or did not) follow?
- what did (or did not) contribute?
- what happened elsewhere?
- what's likely to be underestimated?
- what was necessary, what sufficient?

whom to trust

case histories

what happened

who was involved

what came before





(They that conquer'd the father won't be slaves to the son.)

# precursor: political revolution

---

"Those dreadful revolutions, which cannot be beheld upon Paper, without horror; unless we remember, that they had this one happy effect, to open mens eyes to look out for the true Remedy."

--Sprat, *History*

**English Civil War, 1642-1649**

execution of Charles I

**Commonwealth & Protectorate, 1649-1659**

**Restoration, 1660**

return of Charles II ("since the King's return")

**Great Plague, 1665**

**Fire of London, 1666**







late dreadful conflagration, added to the plague and war, the most dismal judgments that could be inflicted ; but which indeed we highly deserved for our prodigious ingratitude, burning lusts, dissolute court, profane and abominable lives —John Evelyn

"La sange du juste à Londres fera faute  
Bruslez par foudre de vingt trois le six,  
La dame antique cherra de place haute  
De meme sute plusieurs seront occis"

# print's legacy: almanacks & prophecy

"Sir Thomas Crewe...hath heard at the Committee for examining the burning of the city, ... .that it was done by plots ... it was bragged by several Papists that upon such a day in such a time, we should find the hottest weather that ever was in England; and words of plainer sense ...

"We talked much of Nostradamus his prophecy of these times, and the burning of the City of London, some of whose verses are put into **Booker's Almanac** this year .... My Lady Carteret herself did tell us how abundance of pieces of burnt paper were cast by the wind .. .she took one up ... wheron there remained no more nor less than these words: "Time is, it is done"

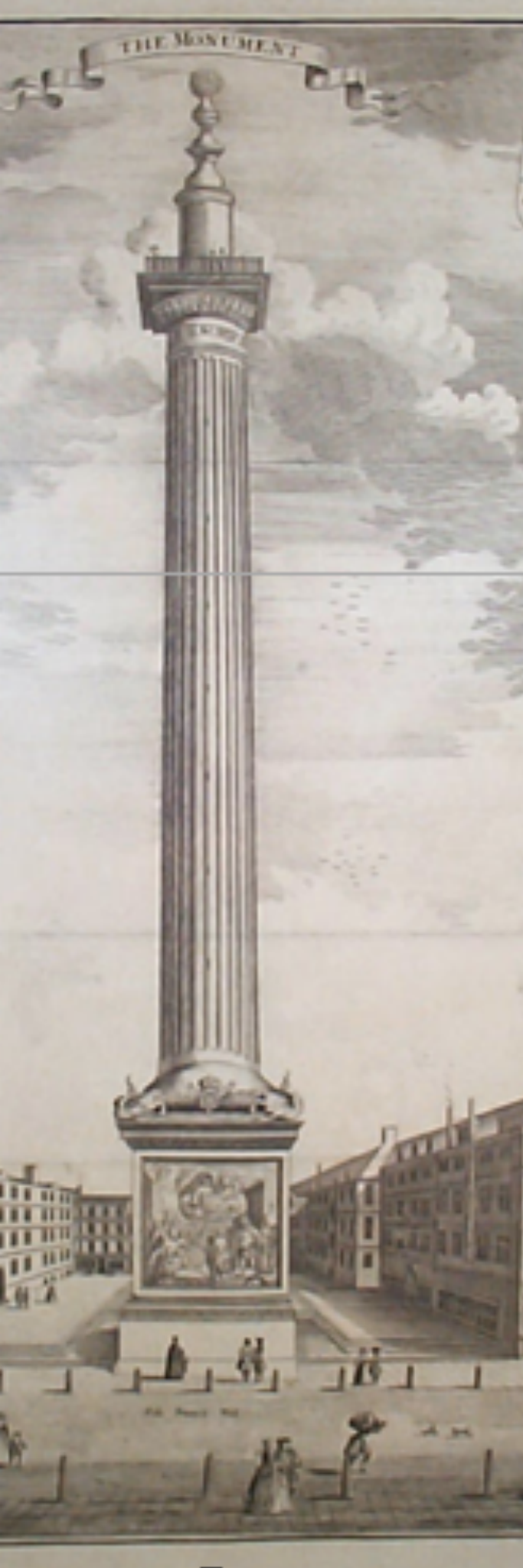
— Pepys, *Diary* November 2, 1666; February 3, 1666/7

An Almanack  
for the yere. M. D. lxxij.  
Composed by M. Michael  
Nostradamus Doctour  
in Physicke/ of Salon of  
Craux in Provence.

Whā the sonne fayleth & fieth/then shal  
the monster be seene in the playne day  
Men shall interprete it farre otherwise  
derth hath no respect/none shall provide  
for it.







late dreadful conflagration, added to the plague and war, the most dismal judgments that could be inflicted ; but which indeed we highly deserved for our prodigious ingratitude, burning lusts, dissolute court, profane and abominable lives —John Evelyn

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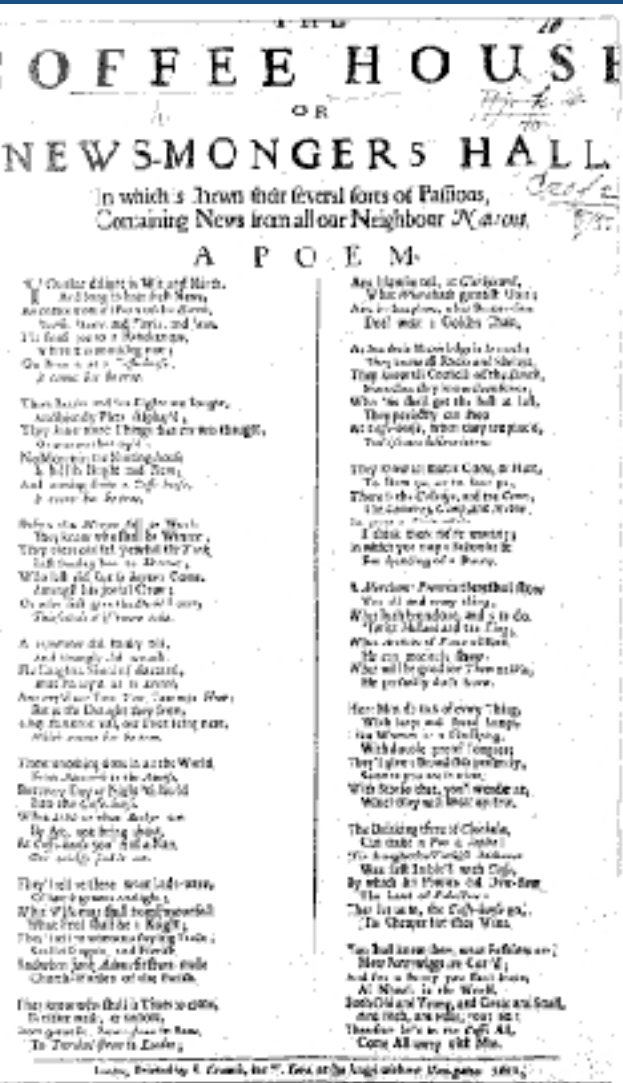


coming up:  
3/8 advertising

# the public sphere?

"I lately dropped into a Coffee-House at Westminster, where I found the Room hung around with ... Elixirs, Tincture, the Anodine Fetus, English Pills, Electuaries, and in short, more remedies than I believe there are diseases."

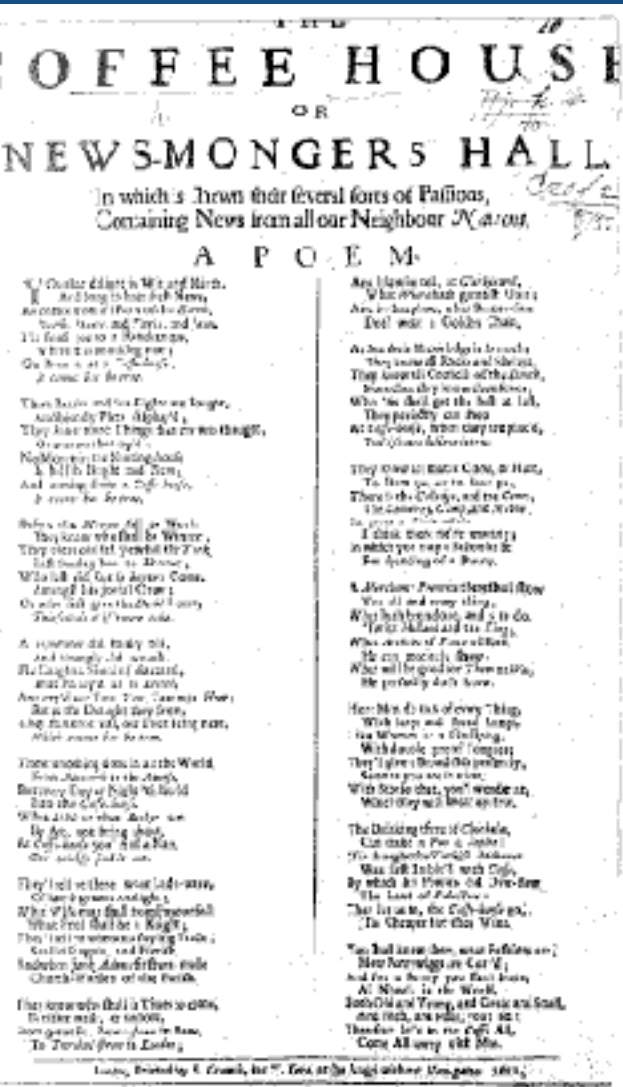
— Richard Steele, *Spectator* 1712



coming up:  
3/8 advertising

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Prevention

SUBSCRIBE

Can I believe there are

Food EVERYDAY EATING

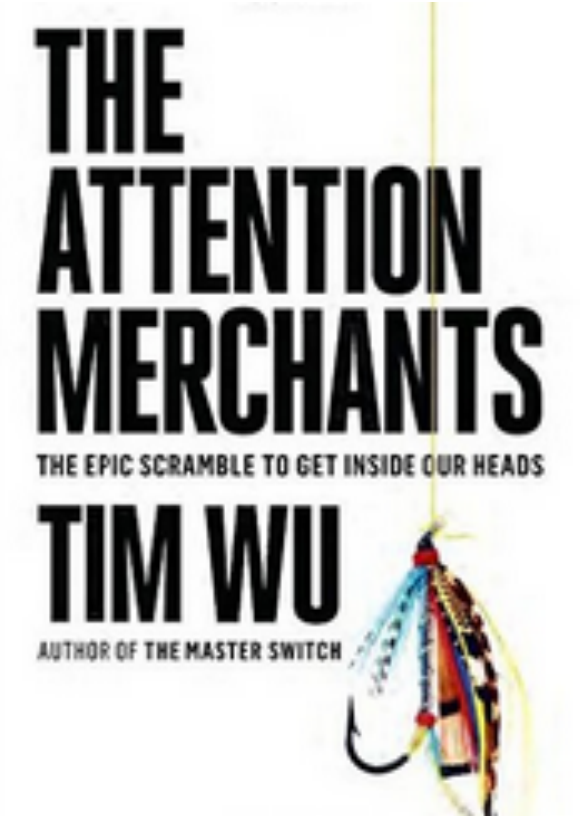
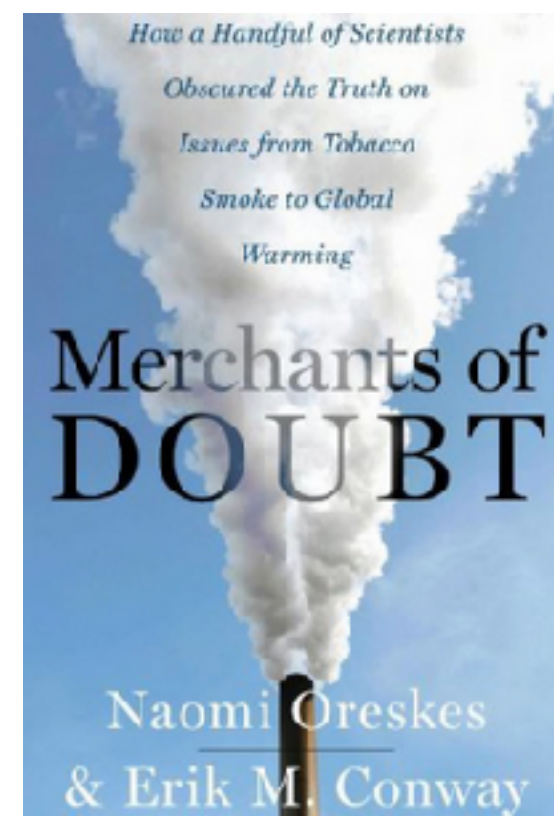
Eggs Are Worse Than Cigarettes?  
Unscrambling confusion about your breakfast staple

AUGUST 20, 2012 By MOLLY RAISCH



Pin it

Eggs are the Dr. Jekyll and Mr. Hyde of the breakfast world. One day they're a diet darling, chockful of healthy fats, vitamin B, and protein. The next thing you hear: Eggs are bad for you—as bad as cigarettes, in fact, according to a recent study in the journal *Atherosclerosis*.







London's Great Fire as seen from Newgate in a painting from around 1640, Museum of London

## EPA spending freeze could hurt Colo. drinking water safety

Jacy Marmaduke and James Bruggers

Published 5:12 p.m. MT Jan. 24, 2017 | Updated 10:09 a.m. MT Jan. 25, 2017

# facing choices

## public sphere/opinion/ ... public good

## Trump Taps RFK Jr., Promoter Of Bogus Vaccine-Autism Link, For Review Panel

f SHARE

TWEET

PIN-IT

Bookmark

95 Comm

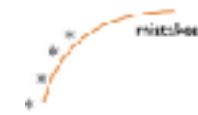


POLITICS

## Meeting with Trump emboldens anti-vaccine activists, who see an ally in the Oval Office



# Scientific "revolution"



in conclusion

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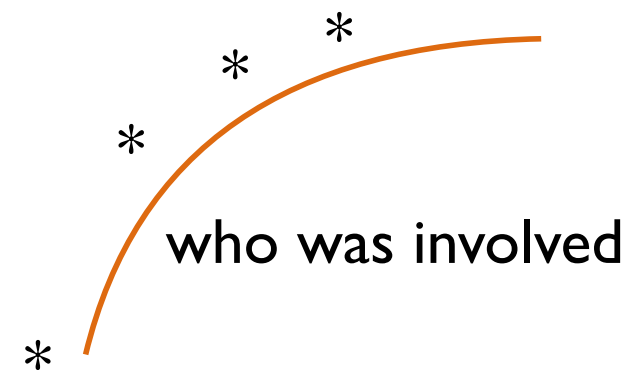
case histories

what happened

who was involved

what came before





# proto science



Roger Bacon  
1214–1292



Francis Bacon  
1561–1626

## scientific rumblings

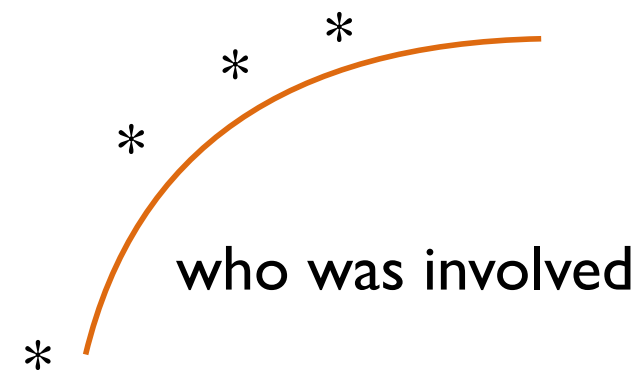
Roger Bacon *scientia experimentalis*

"disregarding the crowd's approach"

## Francis Bacon, *New Atlantis*

idols of the tribe	- <i>collective beliefs</i>
idols of the cave	- <i>individual beliefs</i>
idols of the market place	- <i>misleading words</i>
idols of the theatre	- <i>sophistry</i>

"[FB] sought and gather'd for our use the **Tru**"  
— Cowley "To the Royal Society"



# from looking back to looking around

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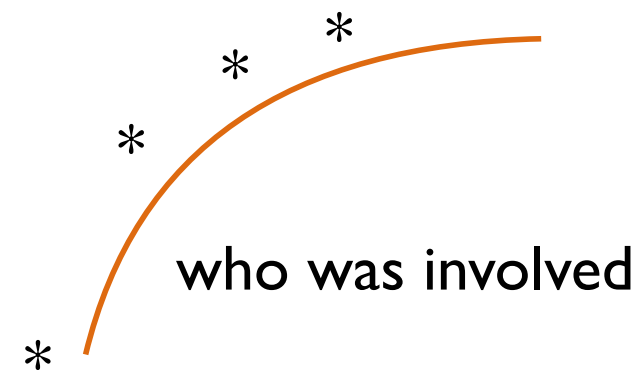
"though I do not deny that moderns can make some discoveries ... do not think one will arise who can give us a body of philosophy more complete than [Aristotle]"

—Erasmus

"Why do we not, I say, turn over the living book of the world instead of dead papers."

—John Comenius  
(1592-1670)





# from dead to living

from **Ptolemy** (c. 100-170)

to

**Copernicus, Galileo, Tycho, Kepler, Newton**

from **Hippocrates** (460-375 bce), **Galen** (c. 129-216)

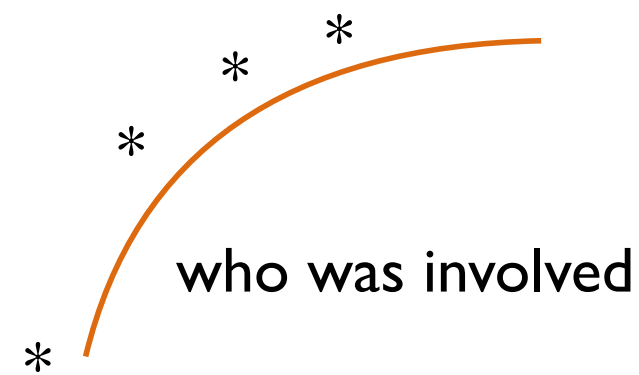
*Ayurveda; Yellow Emperor's Inner Canon*

to

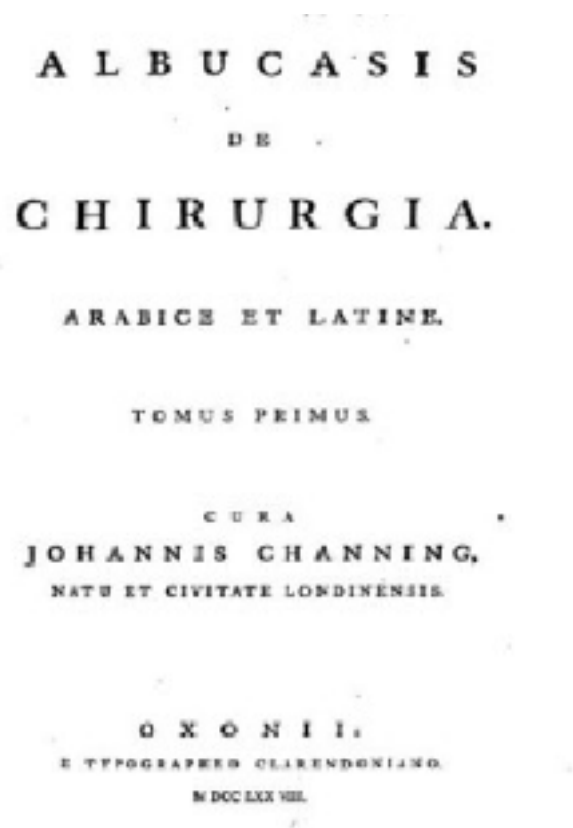
**Paracelsus** (1493-1541) (?taught by Trithemius)

**Harvey** (1578-1657)





# too easily overlooked



**al-Khwarizmi** (780-850) - *al-Jabar*

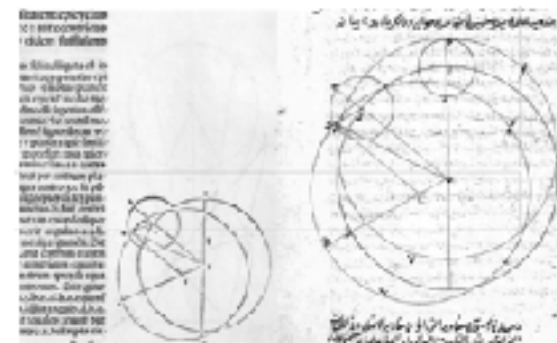
**al-Zahrawi** [Albucasis] (936-1013), *Al-Tasrif*

--surgery, orthopedics, ophthalmology, nutrition  
republished over 700 years  
(see *Albucasis de Chirurgia*, 1778)

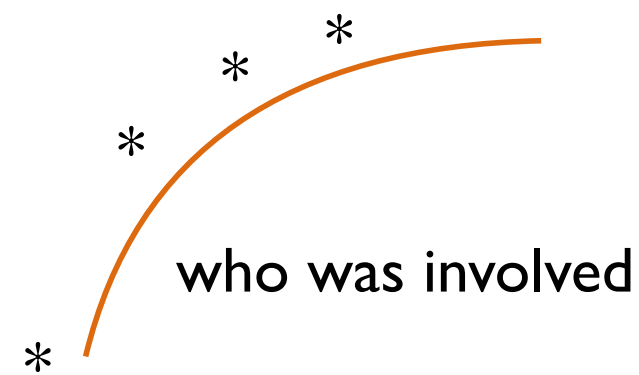
**Ibn al-Haytham** [Alhazen] (965-1040)

--optics; Euclid's Elements, doubts about Ptolemy  
*influencing* Roger Bacon, Kepler

**Ali Qushji** (1403-1474)







# future times & first promoters



Gresham College

28 Nov 1660

"that future times should hear the names of  
its first Promoters"

Wilkins (1614-1672)

Boyle (1627-1691)

Wren (1632-1723)

Locke (1632-1704)

Hooke (1635-1703)

Newton (1642-1727)

Halley (1656-1742)

Pepys (1633-1703)

Evelyn (1620-1701)

Moxon (1627-1691)

Graunt (1620-1674)

Petty (1623-1687) ...

Thomas Bayes (1701?-1761)

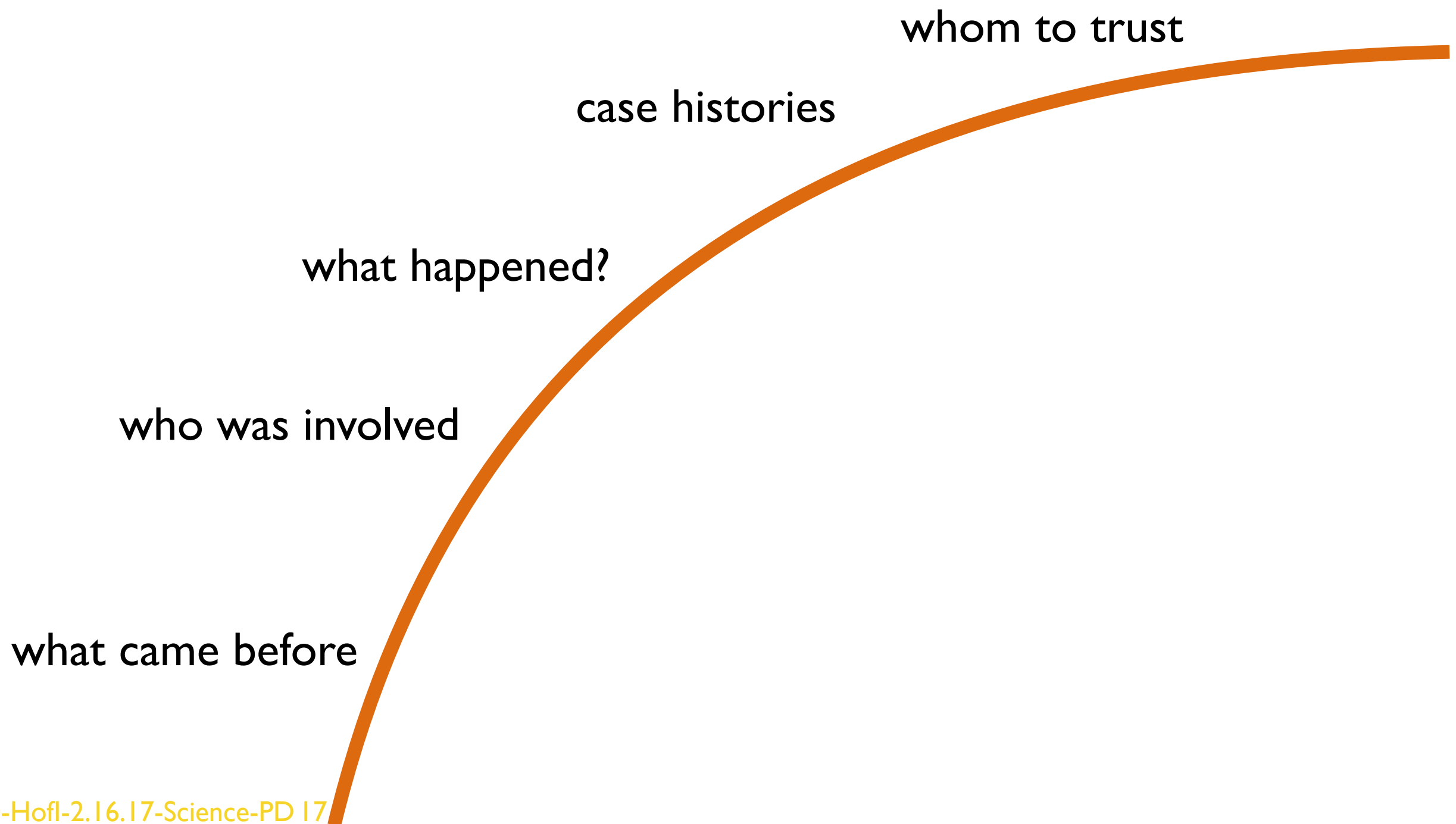
Benjamin Franklin (1706-1790)

Charles Babbage (1791-1871)

Alan Turing (1912-1954)

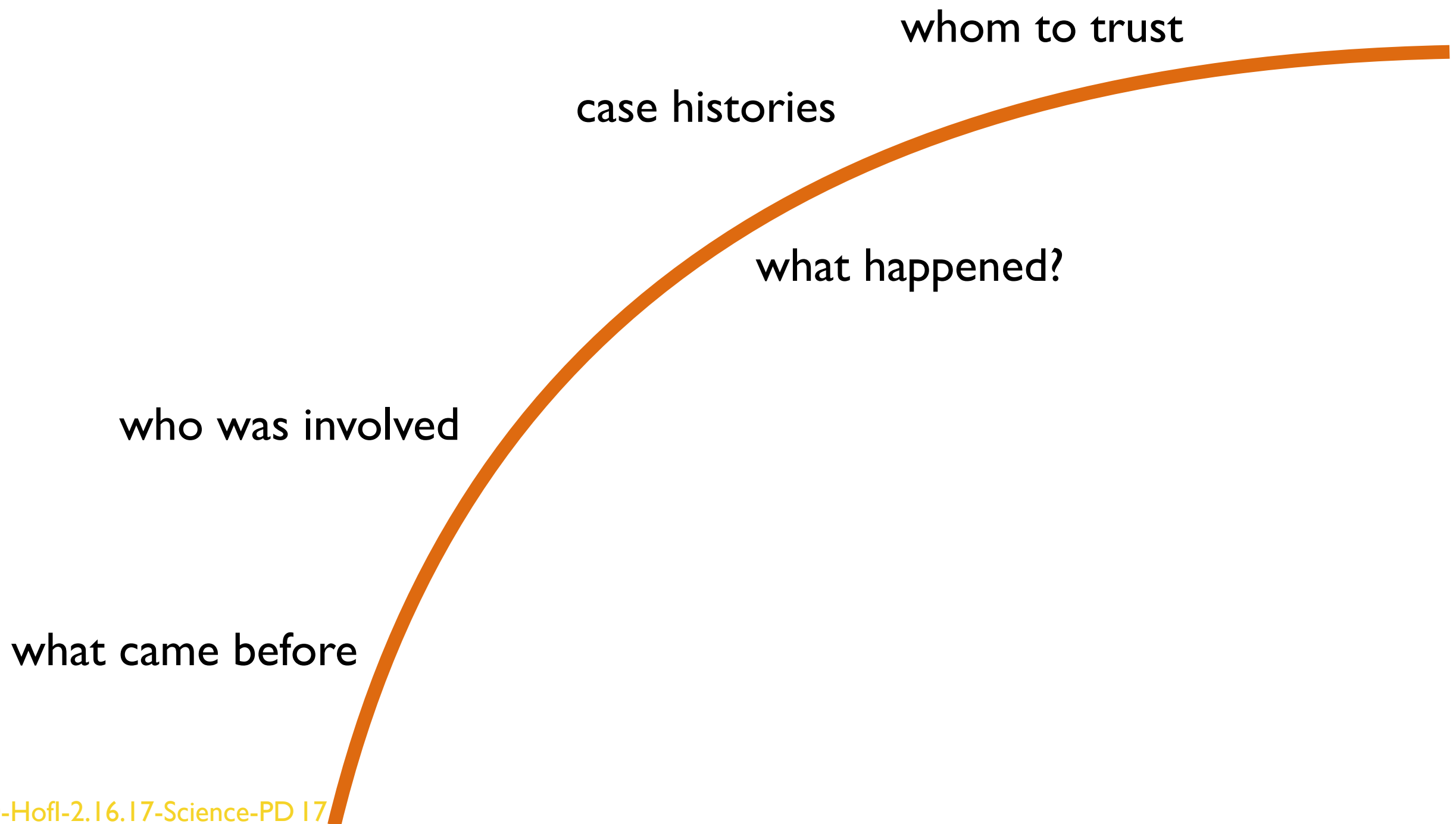
Steven Hawking (1942 -

# Scientific "revolution"





# Scientific "revolution"





# their purpose

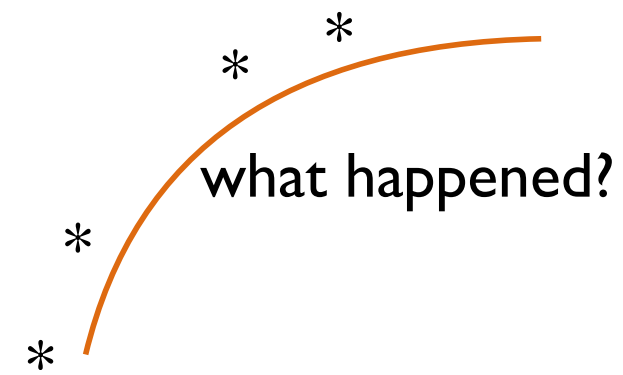


Thomas Sprat  
1635–1713

"... is, in short, to make faithful **Records**, of all the Works of Nature, or Art, which can come within their reach: that so the present Age, and posterity, may be able to put a mark on the **Errors**, which have been strengthened by long prescription: to restore the **Truths**, that have lain neglected: ... to separate the knowledge of **Nature**, from the colours of **Rhetorick**, the devices of Fancy, or the delightful deceit of Fables."

— Sprat





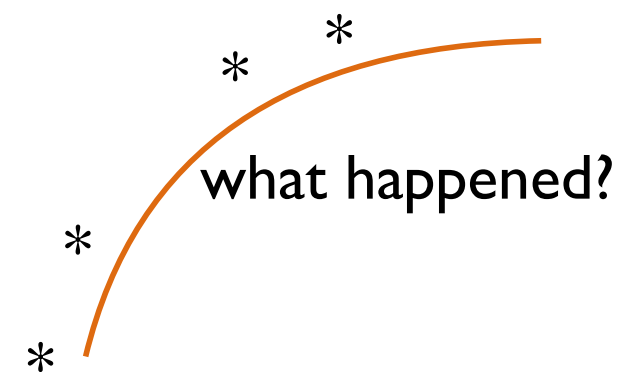
# revolutionary beliefs

## new scientists

"Men did generally think, that no man was fit to meddle in matters of this consequence, but he that had bred himself up in a long course of Discipline for that purpose; that had the habit, the gesture, the look of a Philosopher.

**Whereas experience on the contrary tells us, that greater things are produc'd, by the free way, than the formal."**

— Sprat



# Sprat's model



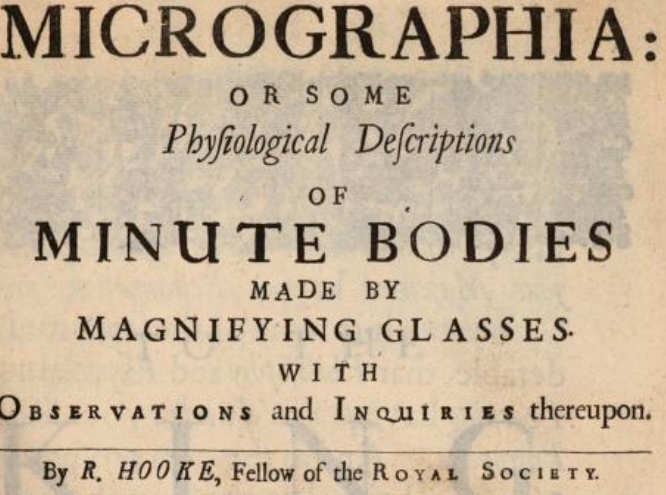
Nullius in Verba

## knowledge of Nature

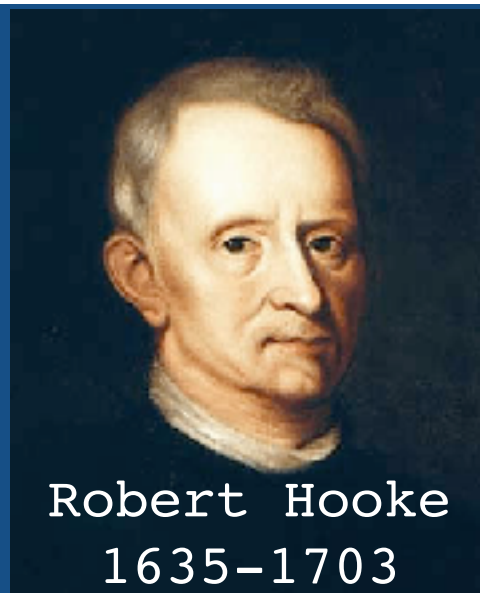
"They have labor'd to inlarge it, from being confin'd to the custody of a few; or from servitude to private interests.

"They have striven to preserve it from being over-press'd by a confus'd heap of vain, and useless particulars; or from being straitned and bounded too much up by General Doctrines."





# observation & experimentation



## Hooke & Boyle

"Trials in Chymistry, or Mechanics ...  
the right Art of Experimenting"

— Sprat

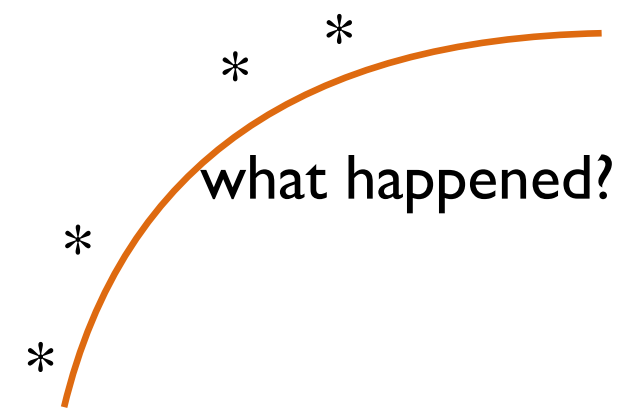
## justifying technology

"I judged that whatever men's eyes were in the  
younger age of the World, our eyes in this old  
age of it needed spectacles"

— Hooke



Robert Boyle  
1627–1691



# Sprat's model

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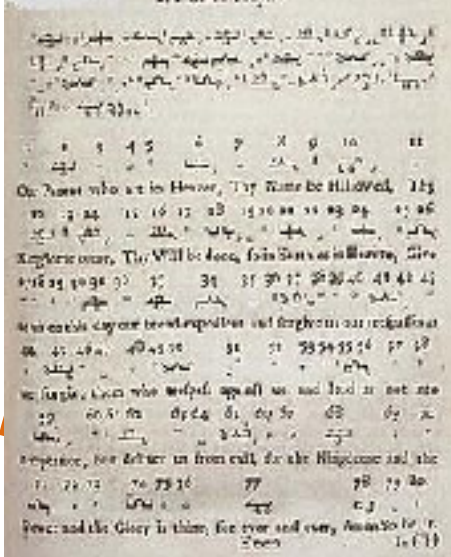
Not so much, by any solemnity of Laws, or ostentation of Ceremonies,  
as by **solid Practice**, and examples: not, by a glorious pomp of Words;  
but by the silent, effectual, and unanswerable Arguments of **real  
Productions**.

Members ... different Religions, Countries, and Professions ... not  
to lay the Foundation of an English, Scotch, Irish, Popish, or  
Protestant Philosophy; but a **Philosophy of Mankind**. ... the Church  
of England ought not to be apprehensive

the general Banck, and **Free-Port of the world**

... receive strangers from all countries, into its number





“sacred responsibility” — Erasmus

# communication



**John Wilkins**  
1614–1672



**Henry Oldenburg**  
1619–1677

## corresponding secretary

"their intention was more to communicate to each other their discoveries ... some resemblance, to the Academy lately begun at Paris ... to all the learned world they called for aid"

— Sprat

"Pardon ... an unknown person, write to one who is not unknown; for to what man who has heard of the Royal Society can you be unknown? And who has not heard of the Society, if he is in anyway drawn to an interest in learning"

—Leibniz to Oldenburg, 1670

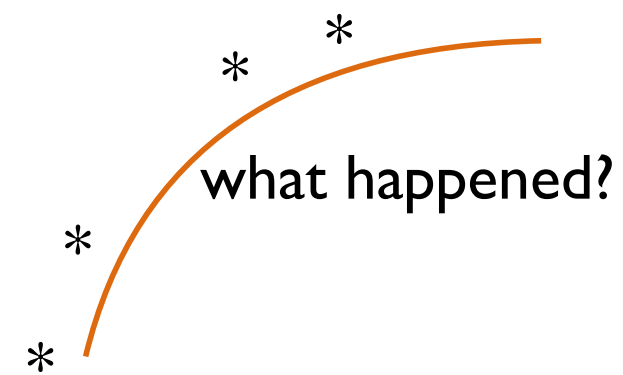
"the noble, positively royal ambitions of my friend  
Aldus ... labour indeed worthy of Hercules ...a library  
which **knows no walls** save those of the world itself"  
—Erasmus

## "publish'd to the world"

coming up 2/23:  
IP

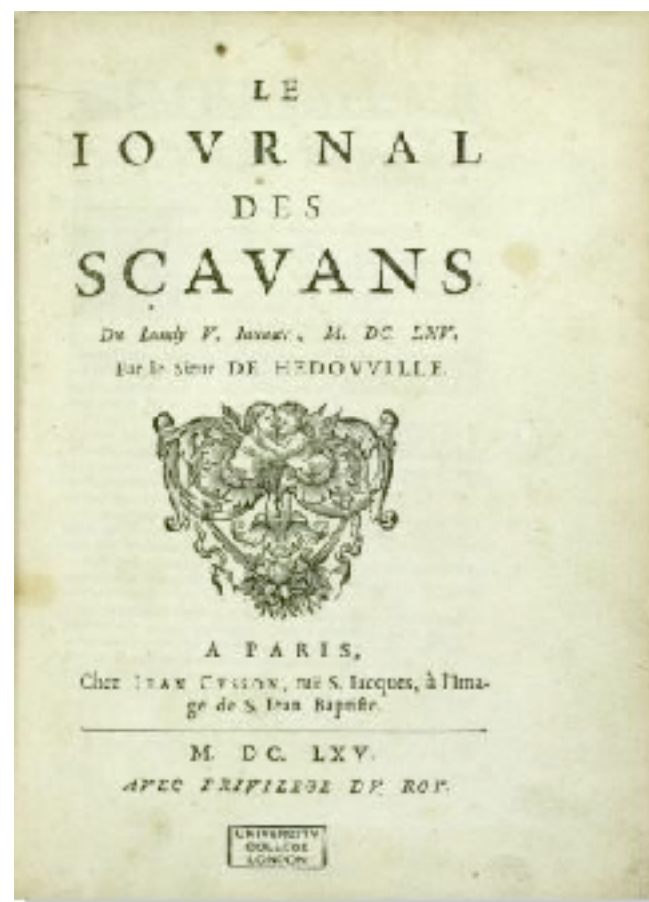
"[Publication] is a most heroick Invention: For by  
such concealments, there may come very much hurt  
to mankind. If any certain remedy should be found  
out against an Epidemical disease; if it were  
suffer'd to be ingross'd by one man, there would  
be great swarms swept away, which otherwise might  
be easily sav'd."

-- Sprat

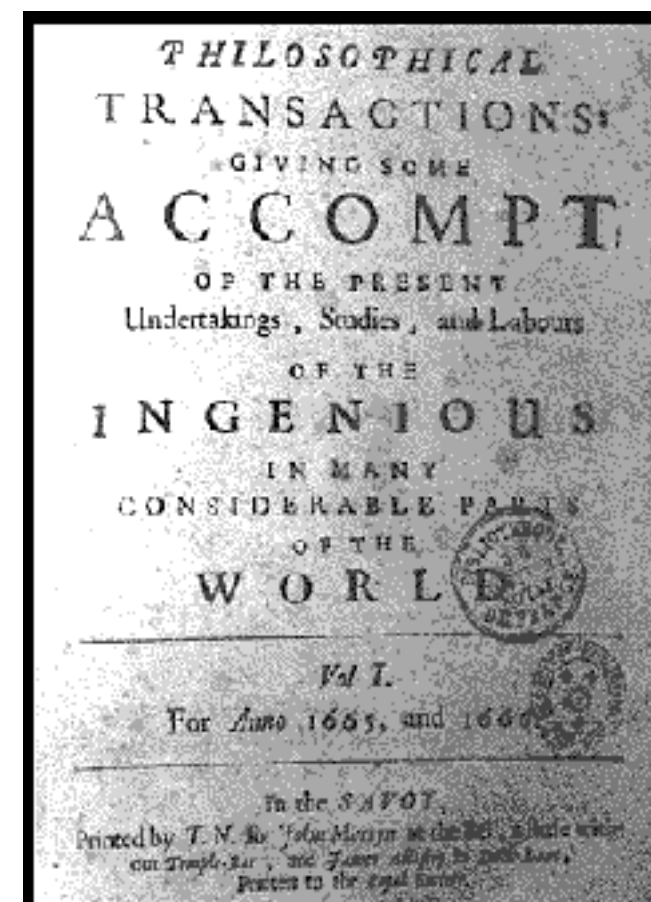


# publishing

*Journal des Scavans,*  
Jan 5th, 1665



*Philosophical Transactions,*  
March 6th, 1665





# L'IMPRIMEUR AU LECTEUR.



Le dessein de ce Journal estant de faire sçavoir ce qui se passe de nouveau dans la Republique des lettres, il sera composé,

Premierement d'un Catalogue exact des principaux livres qui s'imprimeront dans l'Europe. Et on ne se contentera pas de donner les simples titres, comme ont fait jusques à present la plupart des Bibliographes: mais de plus on dira de quoy ils traitent, & à quoy ils peuvent estre utiles.

Secondement, quand il viendra à mourir quelque personne celebre par sa doctrine & par ses ouvrages, on en fera l'Eloge, & on donnera un Catalogue de ce qu'il aura mis au jour, avec les principales circonstances de sa vie.

En troisieme lieu on fera sçavoir les experiences de Physique & de Chymie, qui peuvent servir à expliquer les effets de la Nature: les nouvelles decouvertes qui se font dans les Arts & dans les Sciences, comme les machines & les inventions utiles ou curieuses que peuvent fournir les Mathematiques: les observations du Ciel, celles des Meteores, & ce que l'Anatomie pourra trouver de nouveau dans les animaux.

En quatrieme lieu, les principales decisions des Tribunaux Seculiers & Ecclesiastiques, les censures de Sorbonne & des autres Universtitez, tant de ce Royaume que des Pays estrangers.

Enfin, on taschera de faire en sorte qu'il ne se passe rien dans l'Europe digne de la curiosité des Gens de lettres, qu'on ne puisse apprendre par ce Journal.

Le seul denombrement des choses qui le composeront pourroit suffire pour en faire connoistre l'utilité. Mais j'edifieray qu'il sera tres-advantageux à ceux qui entreprendront quelque ouvrage considerable, puis qu'ils pourront s'en servir pour publier leur dessein, & intiter tout le monde à leur communiquer les manuscrits, & les pieces fugitives qui pourront contribuer à la perfection des choses qu'ils auront en-

ing

is,

what happened?



(1) Numb. 1.

# PHILOSOPHICAL TRANSACTIONS.

Munday, March 6. 1664.

## The Contents.

*An Introduction to this Tract. An Account of the Improvement of Optick Glasses at Rome. Of the Observation made in England, of a Spot in one of the Belts of the Planet Jupiter. Of the motion of the late Comet predicted. The Heads of many New Observations and Experiments, in order to an Experimental History of Cold; together with some Thermometrical Discourses and Experiments. A Relation of a very odd Monstrous Calf. Of a peculiar Lead-Ore in Germany, very useful for Essays. Of an Hungarian Bolus, of the same effect with the Bolus Armenus. Of the New American Whale-fishing about the Bermudas. A Narrative concerning the success of the Pendulum-watches at Sea for the Longitudes; and the Grant of a Patent thereupon. A Catalogue of the Philosophical Books published by Monsieur de Fermat, Counsellour at Tholouse, lately dead.*

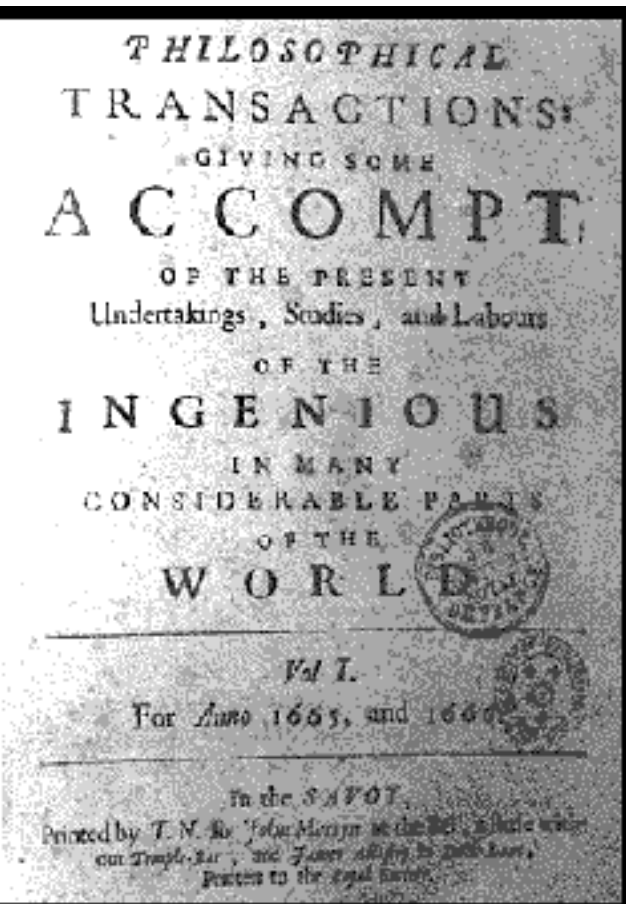
## The Introduction.



Hereas there is nothing more necessary for promoting the improvement of Philosophical Matters, than the communicating to such, as apply their Studies and Endeavours that way, such things as are discovered or put in practise by others; it is therefore thought fit to employ the *Press*, as the most proper way to gratifie those, whose engagement in such Studies, and delight in the advancement of Learning and profitable Discoveries, doth entitle them to the knowledge of what this Kingdom, or other parts of the World, do, from time to time, afford, as well

A

of





# PHILOSOPHICAL TRANSACTIONS.

(10)

## *An Account of a very odd Monstrous Calf.*

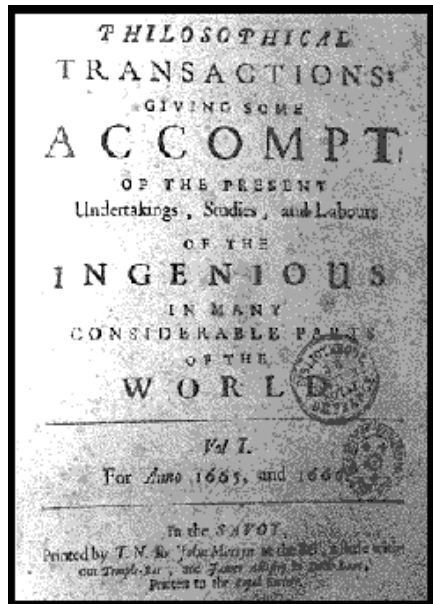
By the same Noble person was lately communicated to the *Royal Society* an Account of a very Odd Monstrous Birth, produced at *Limmington* in *Hampshire*, where a Butcher, having caused a Cow (which cast her Calf the year before) to be covered, that she might the sooner be fatted, killed her when fat, and opening the Womb, which he found heavy to admiration, saw in it a Calf, which had begun to have hair, whose hinder Leggs had no Joynts, and whose Tongue was, *Cerberus*-like, triple, to each side of his Mouth one, and one in the midst: Between the Fore-leggs and the Hinder-leggs was a great Stone, on which the Calf rid: The *Sternum*, or that part of the Breast, where the Ribs lye, was also perfect Stone; and the Stone, on which it rid, weighed twenty pounds and a half; the outside of the Stone was of Grenish colour, but some small parts being broken off, it appeared a perfect Free-stone. The Stone, according to the Letter of Mr. *David Thomas*, who sent this Account to Mr. *Boyle*, is with Doctor *Haughteyn* of *Salisbury*, to whom he also referreth for further Information.

PHILOSOPHICAL  
TRANSACTIONS:  
GIVING SOME  
ACCOMPT  
OF THE PRESENT  
Undertakings, Studies, and Labours  
OF THE  
INGENIOUS  
IN MANY  
CONSIDERABLE PARTS  
OF THE  
WORLD

Vol. I.  
For Anno 1665, and 1666.

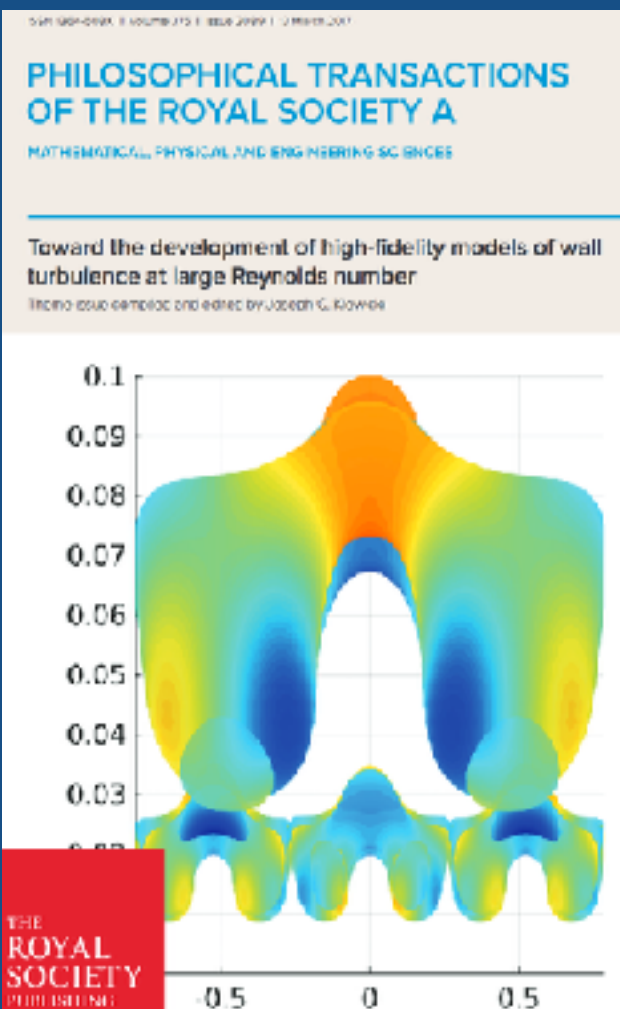
In the SAVOY.  
Printed by T. N. for John Maister at the Sign of the  
cut Temple-Bar, and James Chisley at the Sign of  
Printers to the Royal Society.





so passé?

350+ years on



## Chan Zuckerberg Initiative acquires and will free up science search engine Meta

Posted Jan 23, 2017 by Josh Constine (@joshconstine)

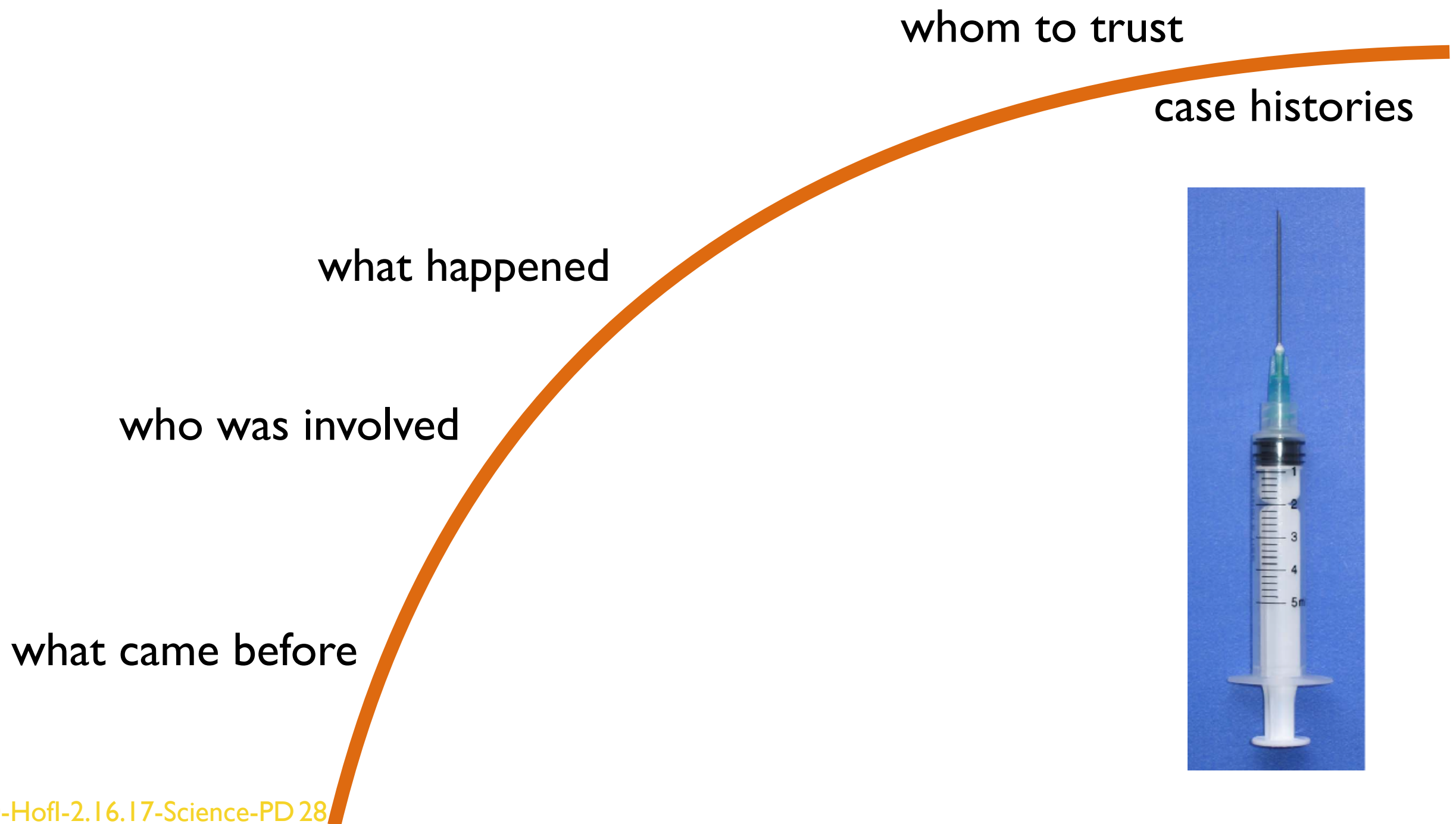


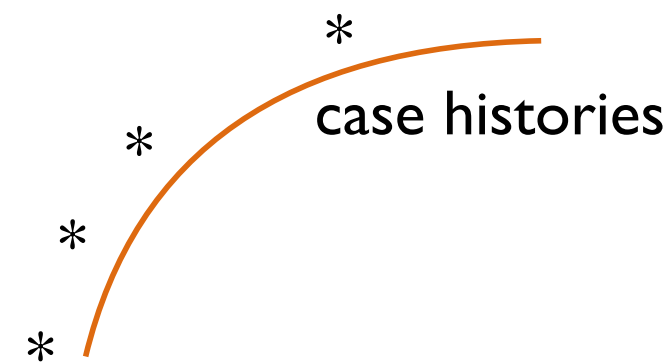
Next Story



Mark Zuckerberg and Priscilla Chan's \$45 billion philanthropy organization is making its **first acquisition** in order to make it easier for scientists to search, read and tie together more than 26 million science research papers. The **Chan Zuckerberg Initiative** is acquiring **Meta**, an AI-powered research search engine startup, and will make its tool free to all in a few months after enhancing the product.

# Scientific "revolution"





# great fears

**BUBONIC PLAGUE IN CALIFORNIA.**  
 The information given out by the Marine Hospital Service that since Feb. 22 there have been thirty-one deaths from bubonic plague in San Francisco and three others in California outside the city is sufficiently startling to impose upon the Governor of that State a duty of a very exigent character. For some time there has been a conflict of opinion, and possibly of authority, between the California State Board of Health and the Board of Health of San Francisco. The State Board insists that there is no bubonic plague on the Pacific Coast. The local board insists that it not only exists but is steadily increasing. Surgeon General WYMAN of the Marine Hospital Service appears to agree with President HUTCHINSON of the local board.

*New York Times*  
 November, 1902

## the plague

*bubonic plague*

“Black Death” & the Silk Road  
 Mongolia, 1330; Europe 1347



## the pox

*smallpox*

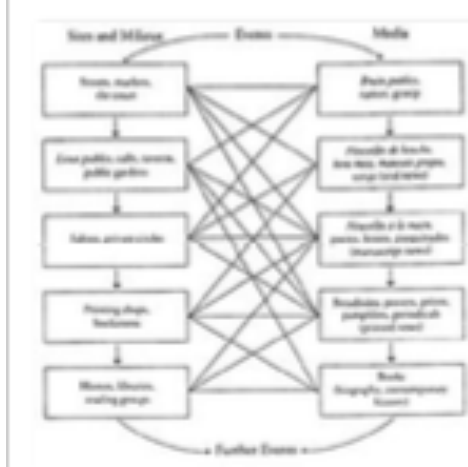
Egypt, 1350 bce

Europe 5th - 6th century





Samuel Pepys  
1633-1703



# slow progress

The plague is much in Amsterdam, and we in fears of it here.

Pepys, **Dec. 31, 1663**

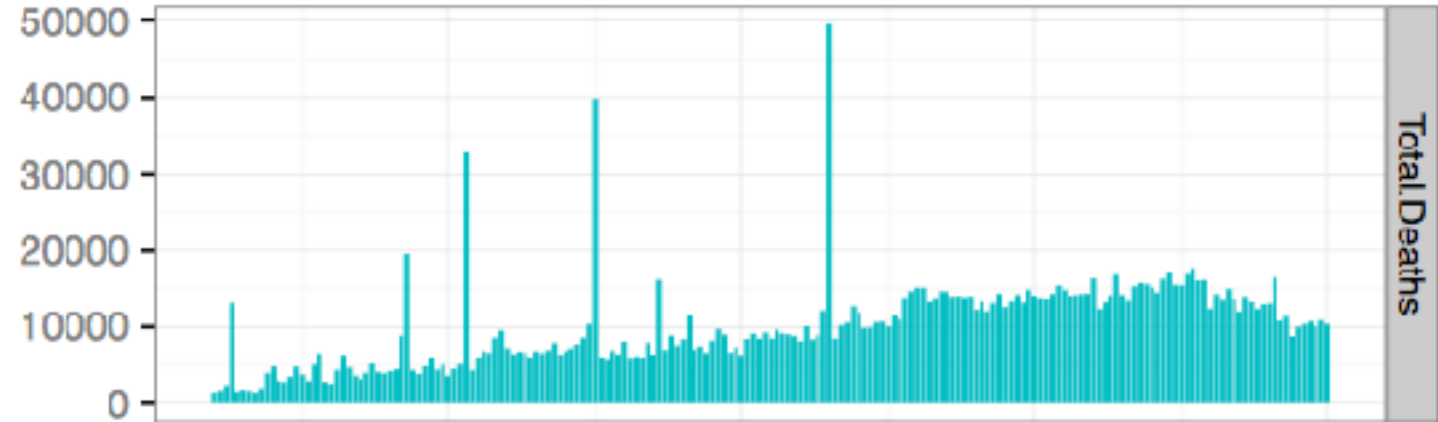
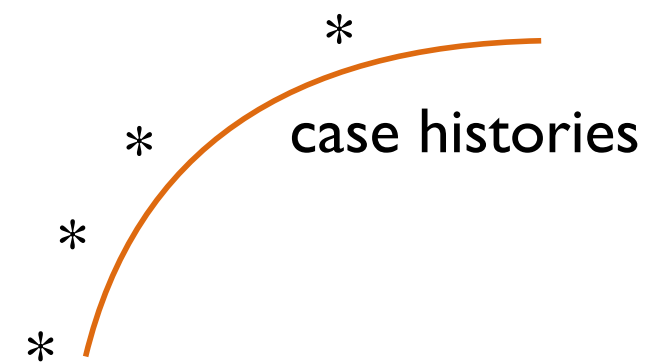
The talk upon the 'Change is, that De Ruyter is dead, with  
fifty men of his own ship, of the plague, at Cales **June 30, 1664**

We were told to-day of a Dutch ship ... where all the men were  
dead of the plague, and the ship cast ashore at Gottenburgh

**Sept. 24, 1664**

Thence to the Coffee-house ... where all the newes is of the  
Dutch ... and of the plague growing upon us in this towne

**May 24, 1665**



# plague — and big data



"The towne grows very sickly, and people to be  
afeard of it; there dying this last week of the  
plague 112, from 43 the week before. The  
Mortality Bill is come to 267"

— Pepys' Diary, June 29th, 1665

"Above 700 died of the plague this week."

— July 13, 1665

"The sickness is... almost every where, there  
dying 1089 of the plague this week."

— July 19, 1665



# advice of the physician

---

## PROCLAMATION

" 'That no hogs dogs, or cats, ... be kept within any part of the city' ...

"Wherefore were we ordered to kill all the dogs and cats, but because as they were domestic animals, and are apt to run from house to house ...so they are capable of carrying ...

infectious streams ... even in their furs and hair ... by the advice of the physician, that all dogs and cats should be immediately killed."

--Defoe, *Journal of the Plague Year*, 1722





Daniel Defoe  
1660?-1731

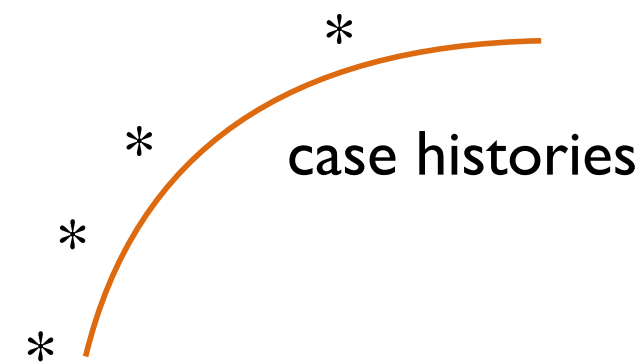
"Elixirs .. Pills and Lozenges ..  
infallible, and never fail of success."  
— Steele

## a plague of print?

### **print: solution or problem?**

"Some endeavours were used to suppress the printing of such books as terrified the people... these terrors ... led them into a thousand weak, foolish, and wicked things .. running about to fortune tellers ... streets were plastered over with doctors' bills and papers of ignorant fellows, quacking and tampering in physic, and inviting people to come to them for remedies . 'infallible preventive pills against the plague' ... 'Sovereign cordials against the corruption of the air'"

--Defoe, *Journal of the Plague Year*, 1722



pox



## smallpox

**Queen Anne** (1665-1714)

17 pregnancies, 3 still births, 10 miscarriages

3 died in infancy of **smallpox**

**William Duke of Gloucester** (1689-1700)

*Plains Indians:*

perhaps 90% of indigenous population

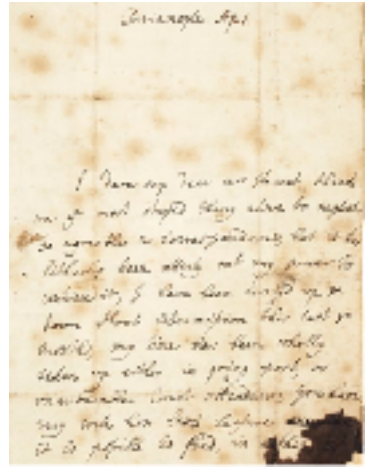


"P.S. You will Do well to try to **Innoculate** the Indians by means of Blanketts, as well as to try Every other method that can serve to Extirpate this Execrable Race."

— Lord Amherst, July 16, 1763



Lady Mary  
Wortley Montagu  
1689-1762



# fighting back: inoculation

## east to west

"Pylarni, a woman, affirmed that she had inoculated no less than six thousand persons in ... 1713 .. children of English and French Merchants. ... Lady Mary Wortley Montague ... 1717 ... her only son, then six years old ... in London experiment was made upon malefactors ... an incision an inch long .. in both arms ... a thread of the same length, impregnated with the matter of a ripe pustule ... removed after forty hours ... the wounds ... usually healed by the twentieth [day]"

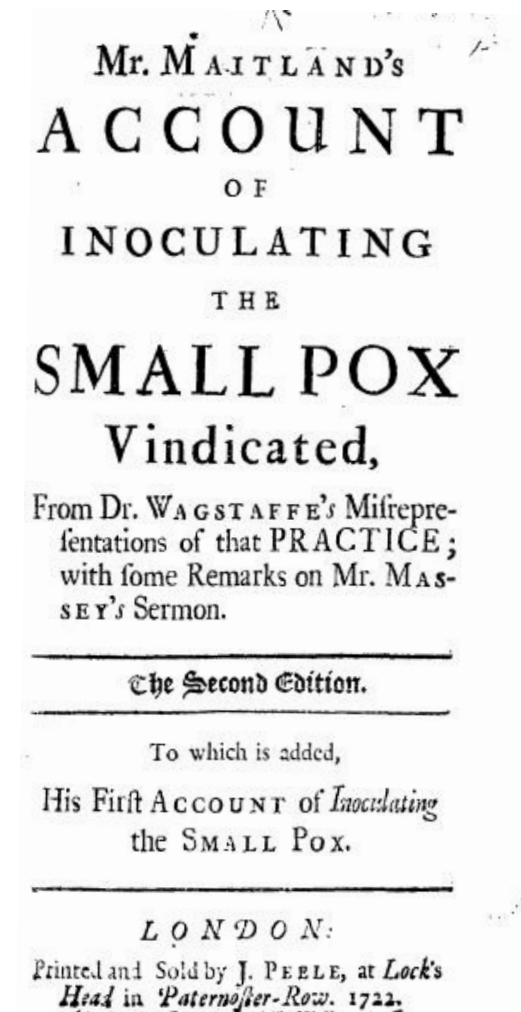
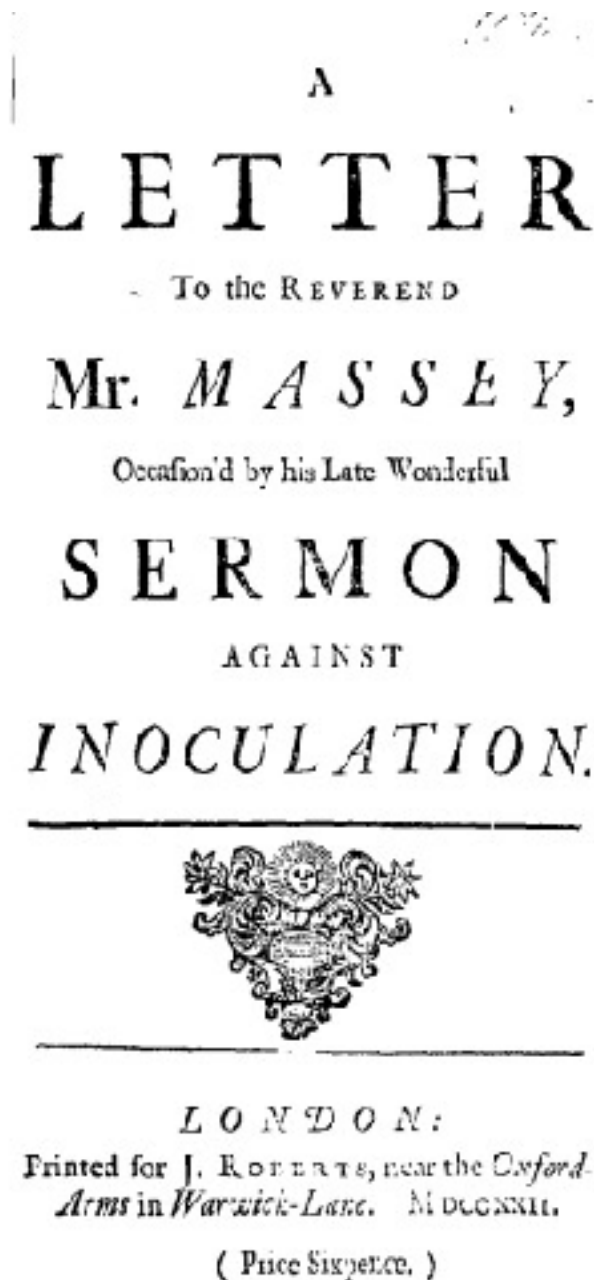
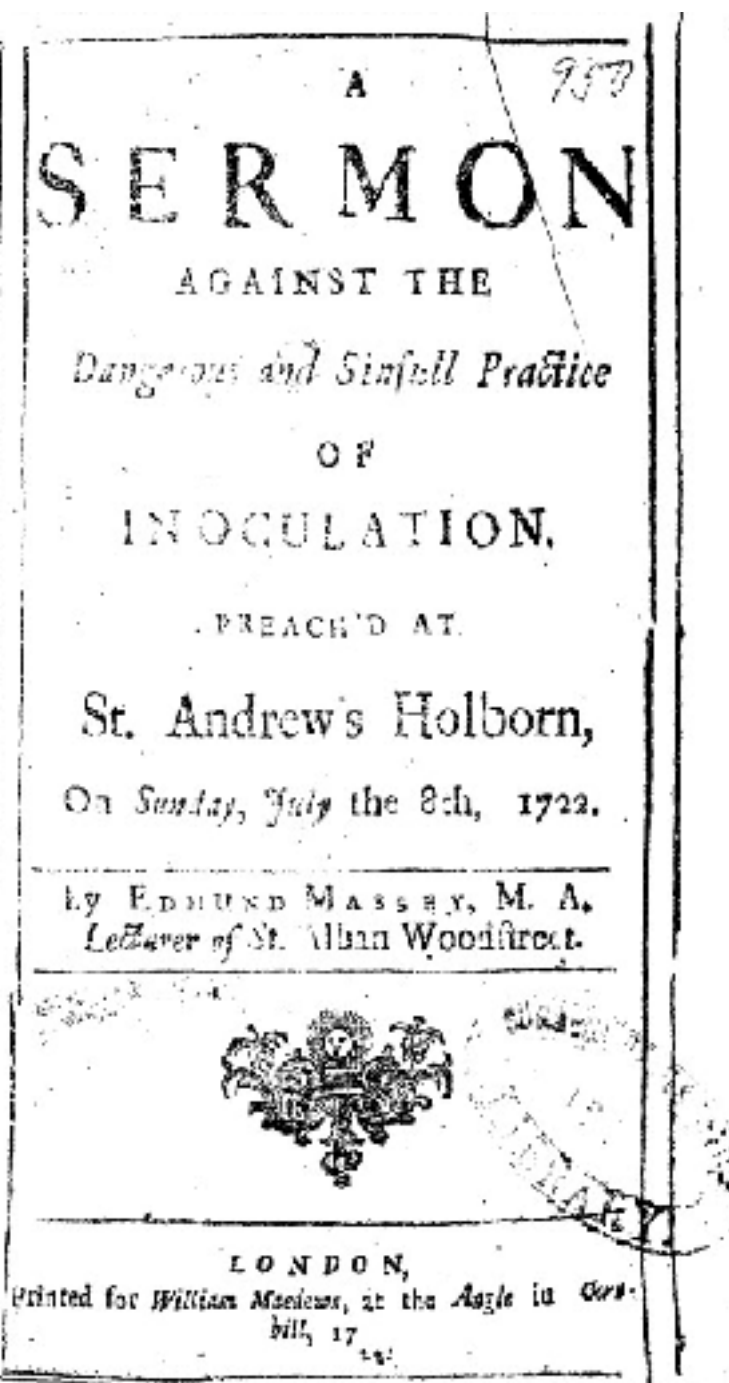
—La Condamine, *Discourse on Inoculation*, 1754







# a fight for authority



by  
John Arbuthnot  
1667-1735



Voltaire  
[François-Marie Arouet]  
1694-1778

## french resistance?

---

"It is whispered in Christian Europe that the English are mad and maniacs: mad because they give their children smallpox to prevent their getting it, and maniacs because they cheerfully communicate to their children a certain and terrible illness with the object of preventing an uncertain one. The English on their side say: 'The other Europeans are cowardly and unnatural: cowardly in that they are afraid of giving a little pain to their children, and unnatural because they expose them to death from smallpox some time in the future.' To judge who is right in this dispute, here is the history of this famous inoculation which is spoken of with such horror outside England."

--Voltaire, *Letters on England*



Cotton Mather  
1663–1728

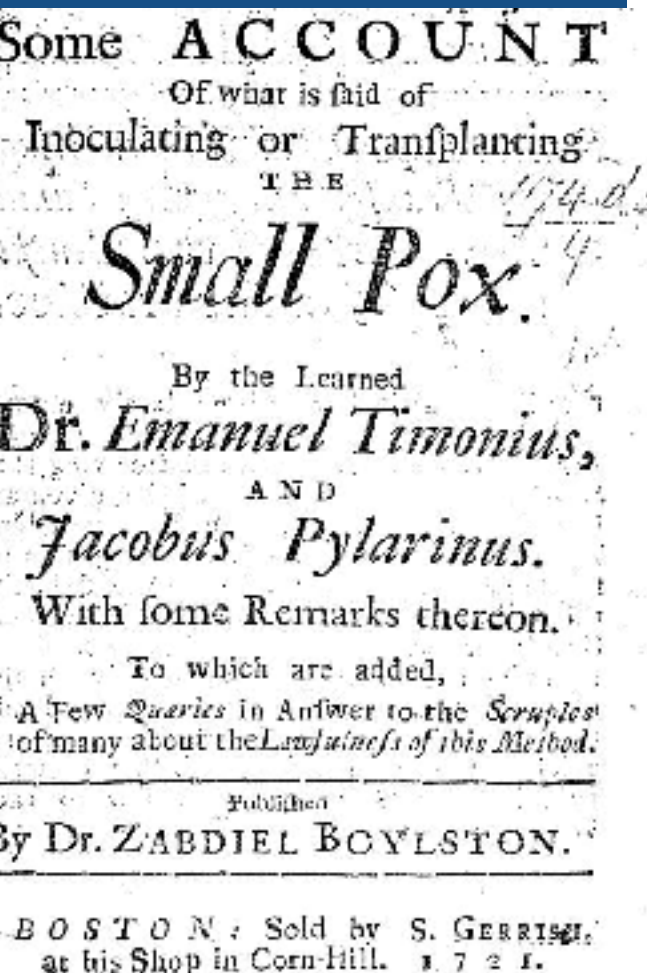
"Cotton Mather, you dog, dam you! I'll inoculate you with this; with a pox to you" [note attached to missile]

## crossing the Atlantic

### Boston outbreak 1721

"Inquiring of my Negro-man, Onesimus, who is a pretty intelligent fellow, whether he had ever had the smallpox, he answered both yes and no. He told me that he had undergone the operation which had given something of the smallpox and would forever preserve him from it, adding that was often used in West Africa."

--Cotton Mather, *Vindication*, 1722







Cotton Mather  
1663–1728

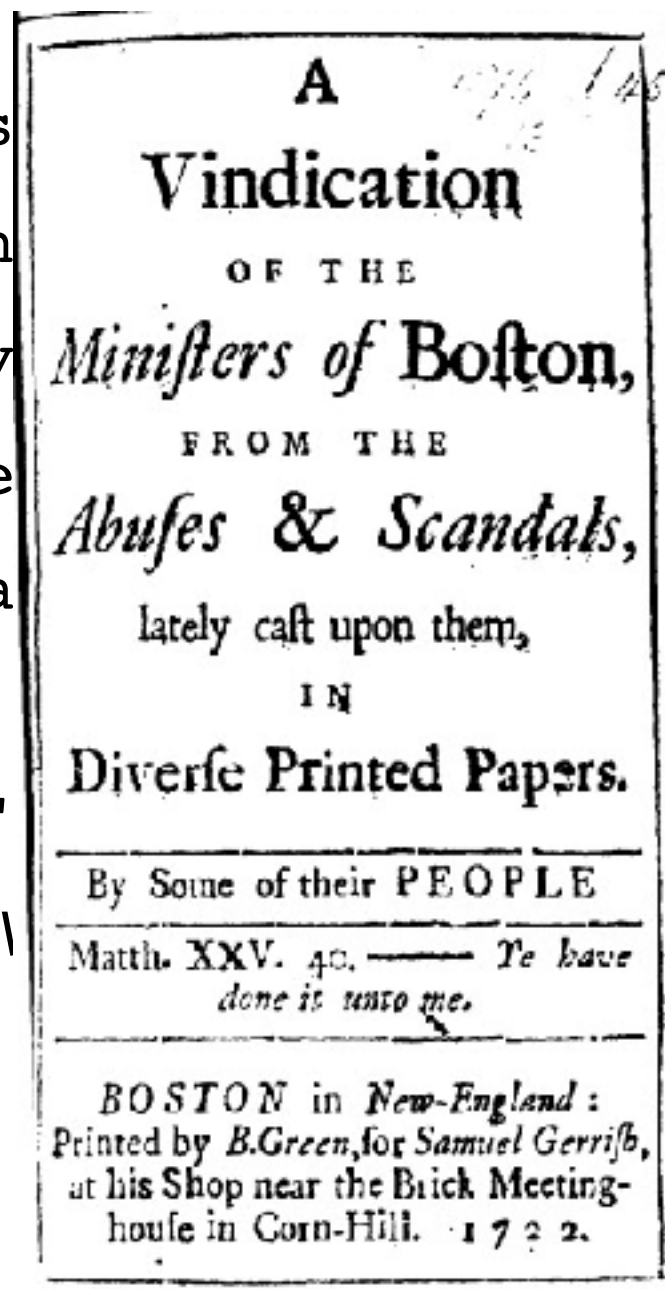
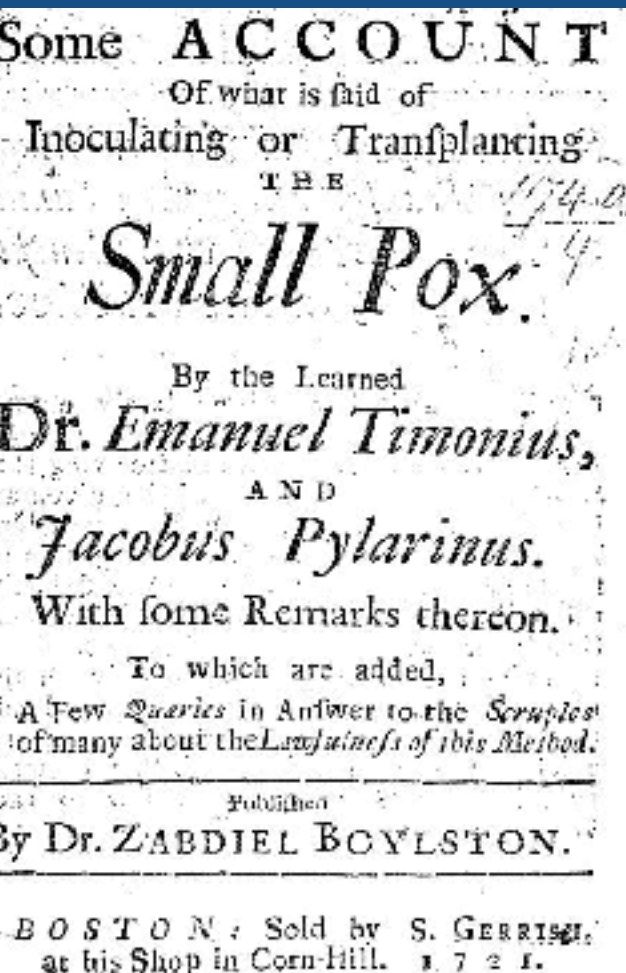
"Cotton Mather, you dog, dam you! I'll inoculate you with this; with a pox to you" [note attached to missile]

## crossing the Atlantic

### Boston outbreak 1721

"Inquiring of my Negro-man, Onesimus pretty intelligent fellow, whether he had the smallpox, he answered both y He told me that he had undergone the which had given something of the sma would forever preserve him from it, that was often used in West Africa."

--Cotton Mather, 1





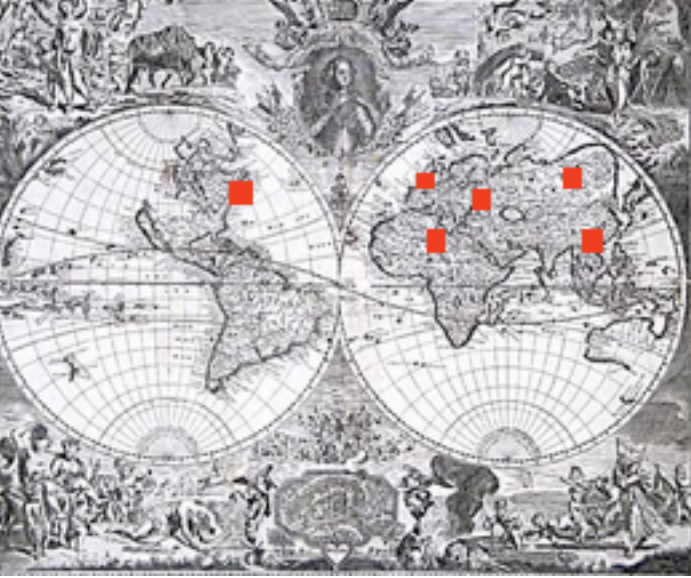
# not quite Voltaire

"at Boston ... the fatal lot having fallen upon some families of distinction, this gave weight to the clamour of prejudice. The civil magistrate interfered, it was made a party affair, and the operation was laid under restraints little less than a prohibition ... A dreadful epidemical small-pox raged in Carolina in 1738."

—La Condamine, *Discourse on Inoculation*, 1754

To the Author of the New-England Courant,  
S I R,  
Reading in your last a Story concerning Inoculation, on, with the News of the intended Expedition against the Eastern Indians; they casually lodged together in the same Apartment of my Brain, and by next morning formed themselves into the following Project for reducing the Eastern Indians by Inoculation.  
That there be forthwith enlisted a sufficient number of inoculators, to be commanded by a Major General Inoculator, who in Quality of a Field Officer, may do Duty on Horseback.  
That they be completely armed with Incision-Lancet, Adora's Box, Nut-Shell and Fillet; their Exercise and Discipline to be according the Practice of that able and experienced Officer among the Turks (our Inoculation-General's good Friend and intimate Acquaintance) Captain Timonius.  
That their Ammunition be of the best Proof, that is, a Composition of Negro Yaws, and constant Small Pox.  
That the Inoculators be all Volunteers, who besides their usual Feet, and travelling Charges, may be allowed Gratuity of 10 l. per Head, of each Indian who survives, conveys and spreads the Infection amongst his Neighbours; and of 5 l. per Head for those who blow up too soon (or die) before they reach the Places where Execution is intended.  
That in Consideration of the difference of Climate, and other more pressing Occasions, the Timonius direct his Expeditions to be made only in Winter and Spring, and shall be in Summer, as in all Probability like to do its Execution in that Season.  
The three greatest Evils incident to Mankind, are War, Sword, Famine and Pestilence. The first, or War, hath been allowed and practised by all Nations in all Ages. The second is also made use of to annoy an Enemy; as in the Instance of Blockading, or starving strong Towns: But the doing of Execution by Famine or Pestilence, seems reserved for the Honour of the Inoculator and his Directions. That it is





# where was the scientific revolution?

## **inoculation/variolation**

India: 8th century

China: 10th century

Tibet: 11th century

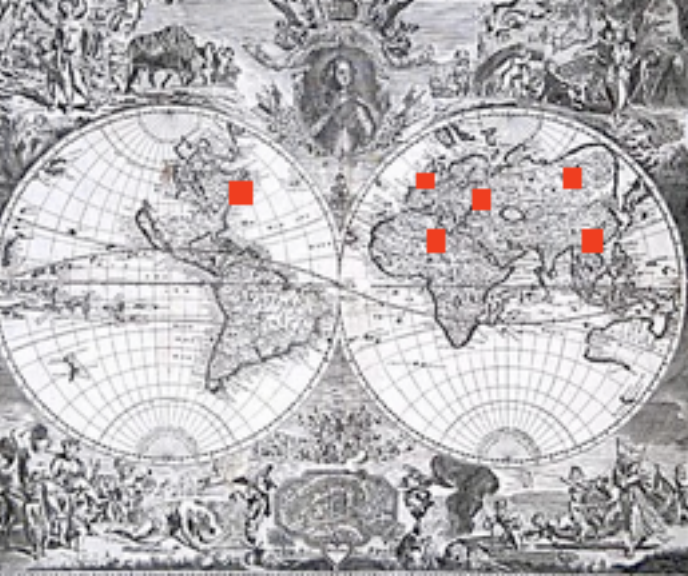
Africa: ?

Turkey: ? 16th century

England, France, US: 18th century

Jenner tests smallpox vaccine  
May 14, 1796





scie

## inoculation/vario

India:

China:

Tibet:

Africa:

Turkey:

England, France, US:

Jenner tests smallpox vaccine  
May 14, 1796

## recurring resistance

18th, 19th, 20th, 21st century



Protesters gathered in Sacramento last June to try to kill a bill that aimed to make it more difficult for parents to opt-out of vaccinations required for public schools.

AP Photo/Rich Pedroncelli

## Why fighting anti-vaxxers and climate change deniers often backfires

By Jon Cohen | Feb. 13, 2016, 6:00 PM

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\*  
\*  
\*  
case histories

in passing

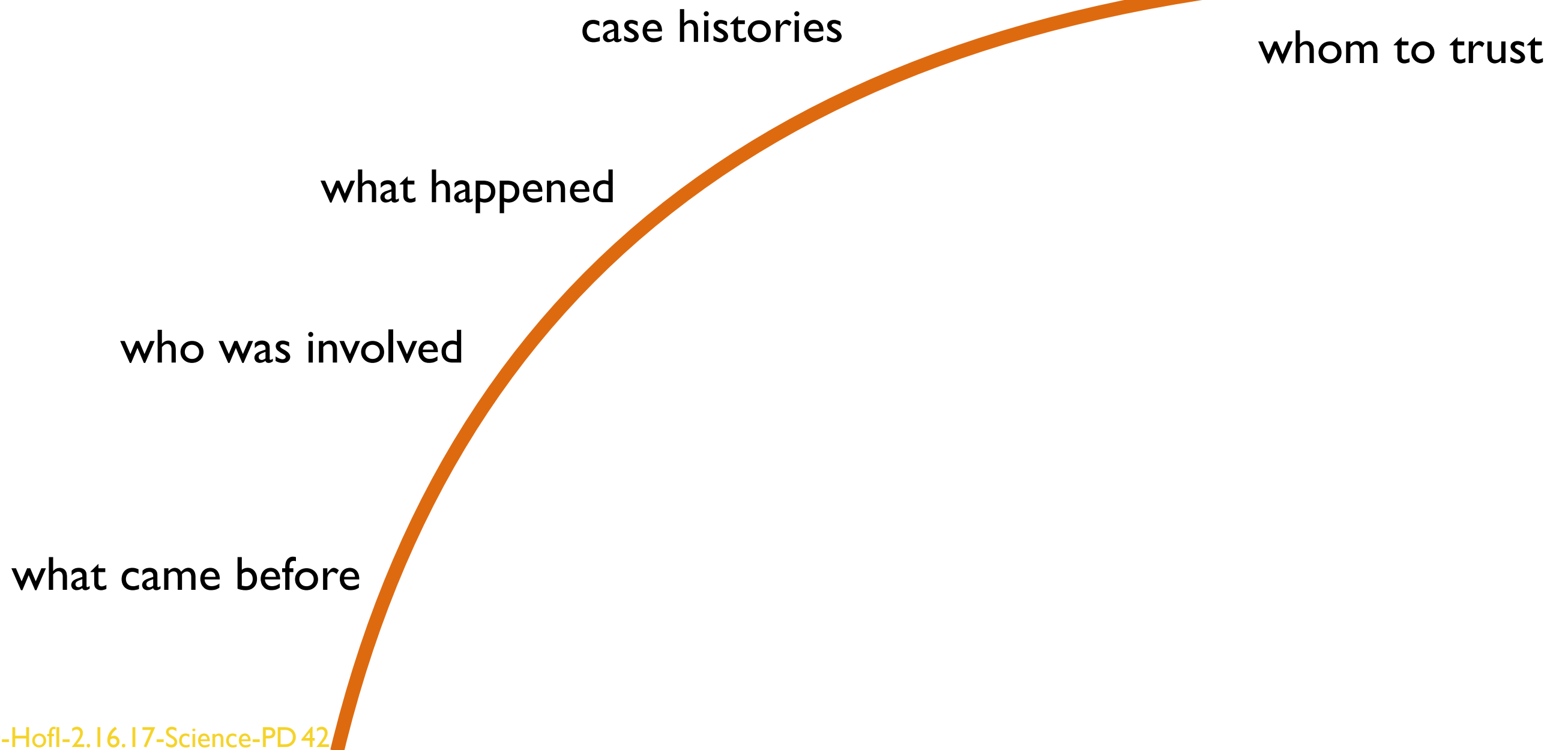
## ***D.A. Henderson, Doctor Who Helped End Smallpox Scourge, Dies at 87***

By DONALD G. McNEIL Jr. AUG. 21, 2016

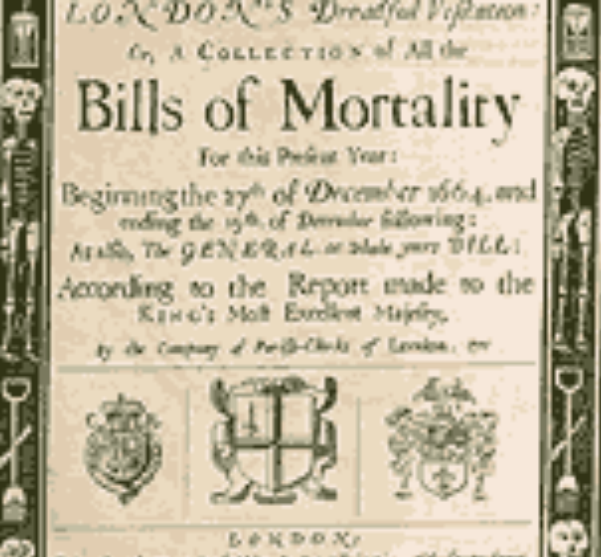


Dr. Donald A. Henderson, who led the World Health Organization's war on smallpox, administering a smallpox vaccination in Ethiopia, around 1972. The last known case was in 1977. World Health Organization

# Scientific "revolution"

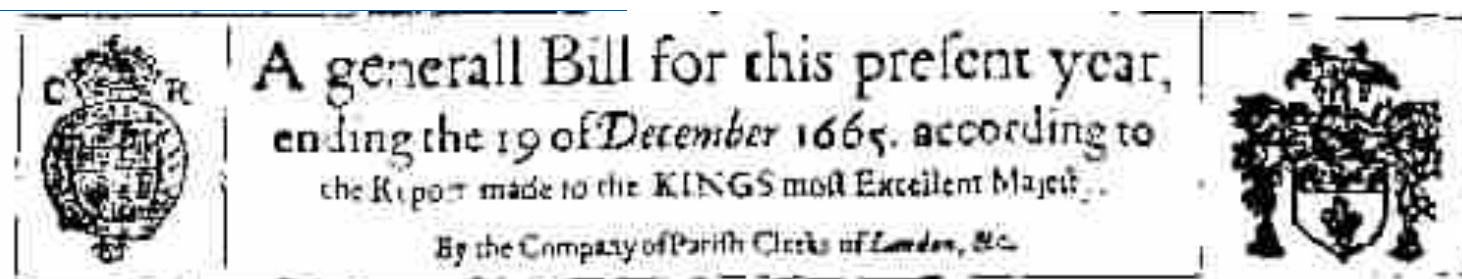






"The Mortality Bill is come to 267" —Pepys

big data



**1603:** regular bills of mortality

**1611:** incorporation of parish clerks counting by "searchers"

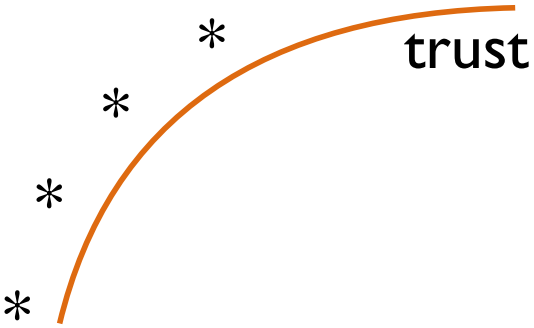
**1629:** other deaths

**1728:** age of deceased

**1837:** last bills

*The Diseases and Casualties this year.*

<b>A</b> Bortive and Stillborne—517	Executed—21	Pallie—30
Aged—1545	Flux and Small Pox—655	Plague—68538
Aque and Peaver—5237	Found dead in Streets, fields, &c.—2	Planner—6
Apoplex and Suddenly—116	French Pox—86	Plurisie—19
Bedric—12	Frighted—23	Poysoned—2
Blasind—5	Gout and Sciatica—27	Quinsie—35
Bleeding—16	Grief—46	Rickets—137
Bloody Flux, Scowering & Flux—185	Gripping in the Guts—1238	Killing of the Lights—137
Burnt and Scalded—8	Hanged & made away themselves—7	Rupture—14
Calenture—3	Headmole shot & Molefallen—14	Scurvy—17
Cancer, Gangrene and Fistula—56	Jaundies—120	Shingles and Swine pox—2
Canker, and Thrush—121	Imposume—227	Sores, Ulcers, broken and boiled—82
Childbed—625	Kill'd by severall accidents—46	Spleen—14
Christmas and Infants—1258	Kings Evil—88	Spotted Fever and Purples—1279
Cold and Cough—63	Leprosie—2	Scrooping at the Stomack—334
Collick and Winde—134	Lethargy—14	Stone and Strangury—8
Consumption and Tiflick—488	Livergown—21	Sustet—111
Convulsion and Morier—1056	Meargrom and Headach—12	Teeth and Worms—2614
Distracted—5	Mealles—7	Vomiting—54
Devote and Turpany—1476	Murthered and Shot—9	Vunn—7
Drowned—55	Overjaid & Starved—45	
Of Males—5114	Of Females—48538	Of the Plague—68538
Of Children—4853	Of the Plague—68538	
Of all—9967		
Increased in the Burials in the 130 Parishes and at the Pest-house this year—79029		
Increased of the Plague in the 130 Parishes and at the Pest-house this year—68538		



The principal, and most constant of them, were Doctor *Seth Ward*, the present Lord Bishop of *Exeter*, Mr. *Boyl*, Dr. *Wilkins*, **Sir William Petty**, Mr. *Mathew Wren*, Dr. *Wallis*, Dr. *Goddard*, Dr. *Willis*, Dr. *Bathurst*, Dr. *Christopher Wren*, Mr. *Rook*

trustworthy?



**William Petty, RS**

surveyor

*Political Anatomy of Ireland*

velocity of circulation

natural vs market price

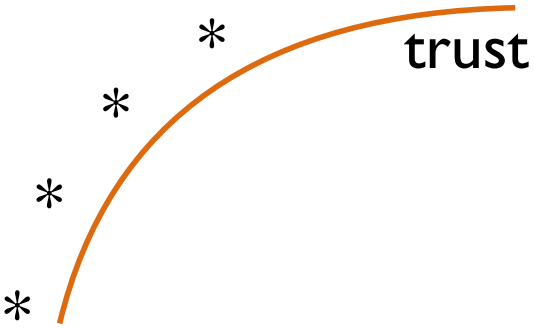
economic surplus

population change



William Petty  
1623–1687





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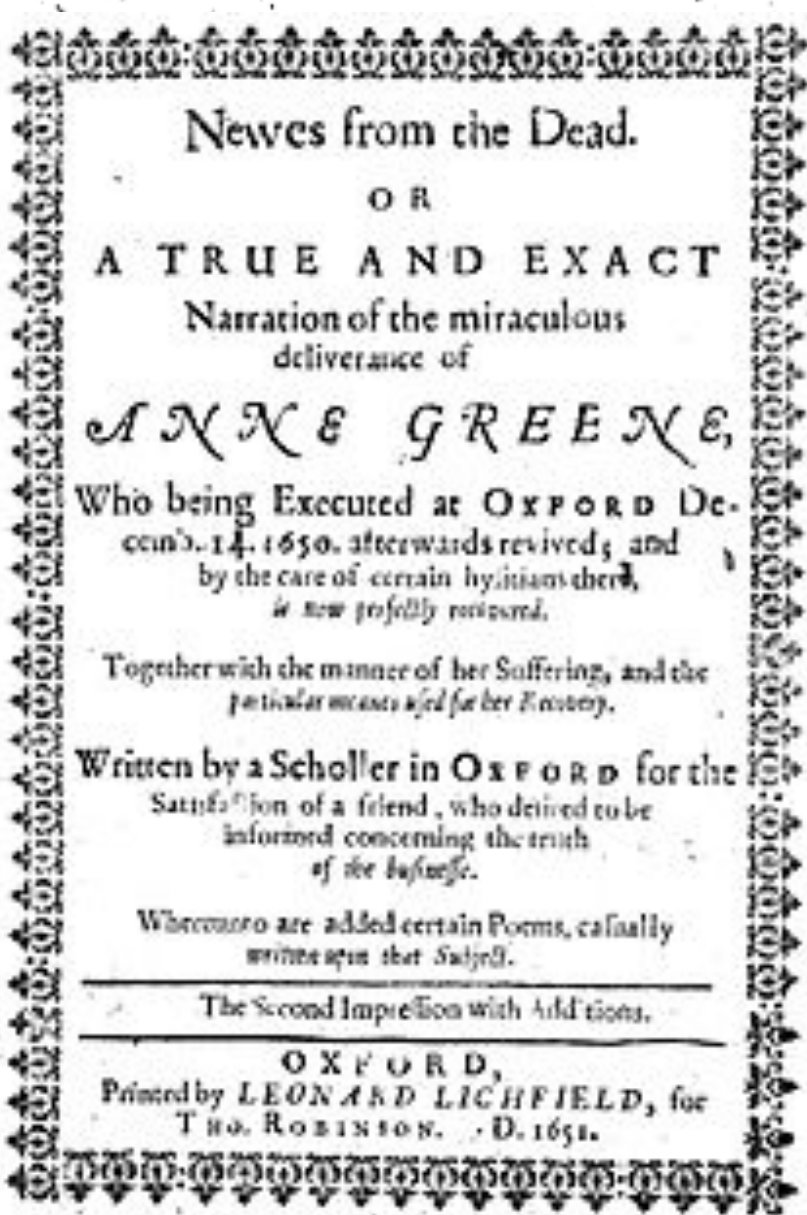
velocity of circulation

natural vs market price

economic surplus

population change

William Petty  
1623–1687







John Graunt  
1620–1674

## in a class of his own?

"His Majesty gave this particular charge to His Society, that if they found any more such Tradesmen, they should be sure to admit them all, without any more ado."

— Sprat

**John Graunt, FRS**  
*Natural and Political  
Observations ...  
upon the Bills of Mortality*  
1662

shopkeeper's math

*Natural and Political*  
**OBSERVATIONS**  
Mentioned in a following INDEX,  
and made upon the  
Bills of Mortality.

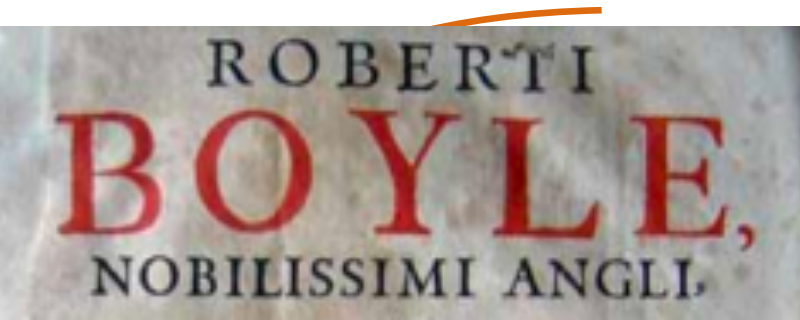
By *JOHN GRAUNT*,  
Citizen of  
**LONDON.**

With reference to the *Government, Religion, Trade,  
Growth, Age, Diseases, and the several Change*. of the  
said **CITY**.

— *Nas, me ut miratur Turbo, labere.  
Contentur paucis LeHoribus* —

**LONDON,**  
Printed by *Tho: Roycroft*, for *John Martin, James Allijoye,*  
and *Tho: Dine*, at the Sign of the Bell in *St. Paul's*  
Church-yard, **MDCLXII.**

Nullius in Verba?



# social revolution?

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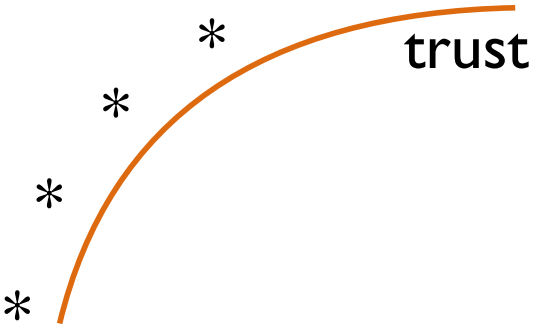
## significant developments?

scientific societies

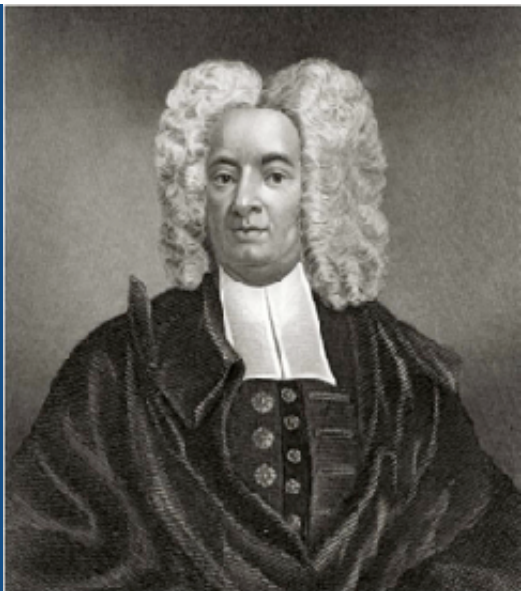
the English gentleman

"Though the Society entertains very many men of particular Professions; yet the farr greater Number are **Gentlemen**, free, and unconfin'd. ...

"to commit the Work to the care of such men, who, by the freedom of their education the plenty of their estates, and the usual generosity of Noble Bloud, may be well suppos'd to be most averse from such sordid considerations."



# whom to trust?

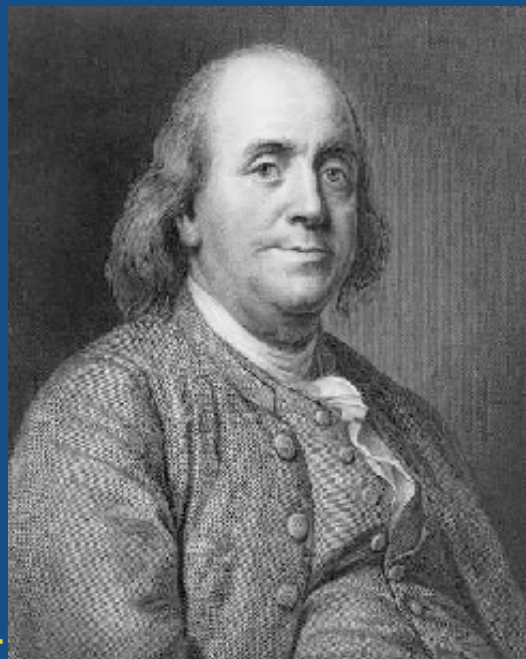


## Cotton Mather

*Wonders of the Invisible World*, 1693

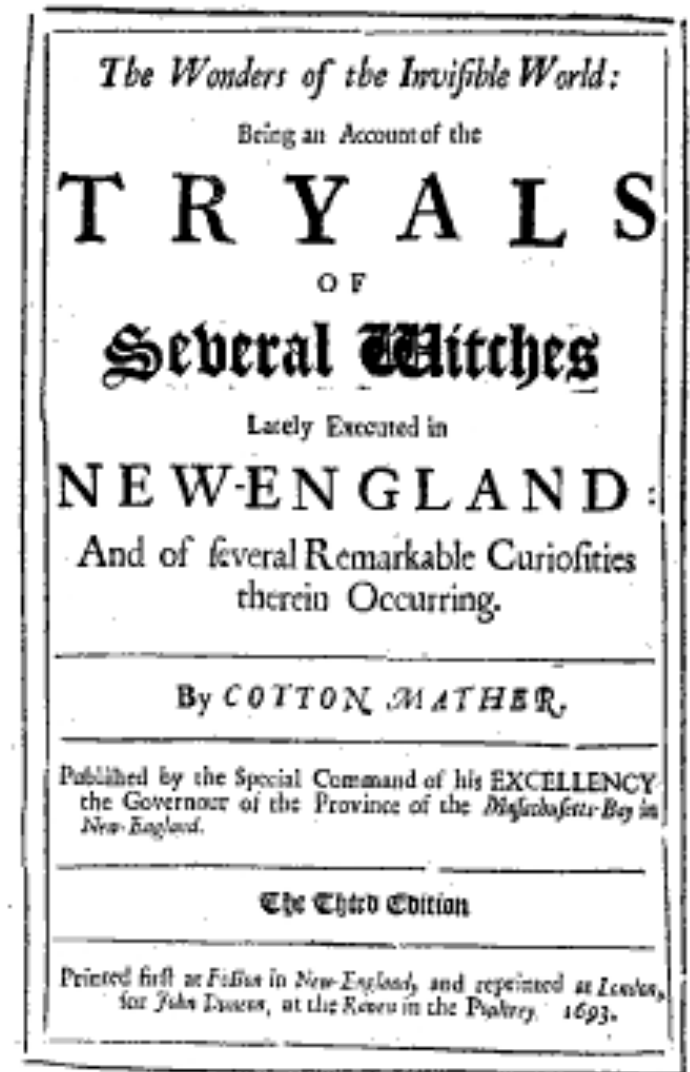
defense of witch trials:

"An army of devils is horribly broke in upon the place which is the center, and after a sort, the first-born of our English settlements"



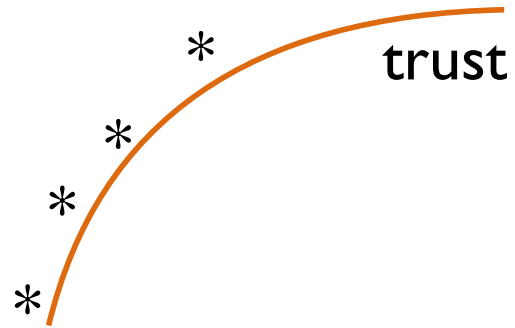
## Benjamin Franklin

Fellow of the Royal Society





Nullius in Verba?



## establishing authority

"we find many Noble Rarities to be every day given in, not onely by the hands of Learned and profess'd Philosophers; but from the Shops of Mechanicks; from the Voyages of Merchants; from the Ploughs of Husbandmen; from the Sports, the Fishponds, the Parks, the Gardens of Gentlemen" --Sprat

10-Hofl-2.16.17-Science-PD 48

(1) Numb. 1.

# PHILOSOPHICAL TRANSACTIONS.

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Munday, March 6. 1664.

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### The Contents.

*An Introduction to this Tract. An Accompt of the Improvement of Optick Glasses at Rome. Of the Observation made in England, of a Spot in one of the Belts of the Planet Jupiter. Of the motion of the late Comet prædicted. The Heads of many New Observations and Experiments, in order to an Experimental History of Cold; together with some Thermometrical Discourses and Experiments. A Relation of a very odd Monstrous Calf. Of a peculiar Lead-Ore in Germany, very useful for Essays. Of an Hungarian Bolus, of the same effect with the Bolus Armenus. Of the New American Whale-fishing about the Bermudas. A Narrative concerning the success of the Pendulum-watches at Sea for the Longitudes; and the Grant of a Patent thereupon. A Catalogue of the Philosophical Books published by Monsieur de Fermat, Counsellour at Tholouse, lately dead.*

Numb. 364.

Beginning the Thirty first Volume.

# PHILOSOPHICAL TRANSACTIONS.

sta

For the Months of January, Feb. March and April. 1720.

## The CONTENTS.

*An Introduction to this Treatise. An Account of the Improvement of Optick Glasses at Rome. Of the Observation made in England, of a Spot in one of the Belts of the Planet Jupiter. Of the motion of the late Comet predicted. The Heads of many New Observations and Experiments, in order to an Experimental History of Cold; together with some Thermometrical Discourses and Experiments. A Relation of a very odd Monstrous Calf. Of a peculiar Lead-Ore in Germany, very useful for Essays. Of an Hungarian Bolus, of the same effect with the Bolus Armenus. Of the New American Whale-fishing about the Bermudas. A Narrative concerning the success of the Pendulum-watches at Sea for the Longitudes; and the Grant of a Patent thereupon. A Catalogue of the Philosophical Books publisht by Monsieur de Fermat, Counsellour at Tholouse, lately dead.*

- I. *Some Remarks on a late Essay of Mr. Cassini, wherein he proposes to find, by Observation, the Parallax and Magnitude of Sirius. By Edmund Halley, L. L. D. Astron. Reg. Geom. Prof. Savil. & R. S. S.*
- II. *An Account of the External Maxillar, and other Salivary Glands: Also of the Insertions of all the Lymphatics (as well above as below the Subclavians) into the Veins; which Glands and Insertions have not hitherto been mentioned, or not truly described by any Authors. By Richard Hale, M. D. Reg. Soc. & Col. Med. Lond. Soc.*
- III. *De Peste Constantinopoli grassante. Auctore nupero V. Cl. Emanuele Timone, M. D. Hoc scriptum ab Auctore Clarissimo, qui Constantinopoli per multos annos Medicinam fecerat, Excellentissimo Ablegato Britannico, Roberto Sutton, Eq. Aurato, traditum, ejusdem Equitis permissu, cum Societate Regia communicavit idem R. Hale, M. D.*
- IV. *An Account of a Luminous Appearance in the Air, seen at Dublin on January the 12th, 1719. By Philip Percival, Esq; Brother to the Right Honourable the Lord Percival, F. R. S. and communicated by his Lordship to the Royal Society.*

- V. *Of the Infinity of the Sphere of Fix'd Stars. By Edmund Halley, L. L. D. R. S. S.*
- VI. *Of the Number, Order, and Light of the Fix'd Stars. By the same.*
- VII. *An Account of the Method of making Sugar from the Juice of the Maple Tree, in New England. By the Honourable Paul Dudley, Esq; F. R. S. Communicated by John Chamberlayne, Esq.*
- VIII. *A Copy of an Affidavit made in Scotland, concerning a Boy's living a considerable time without Food. Communicated by Patrick Blair, M. D. F. R. S.*
- IX. *A Discourse concerning a Method of discovering the Virtues of Plants by their External Structure. By the Same.*
- X. *An Account of a Book, Entitled, Geometria Organica, sive Descriptio Linearum Curvarum Universalis. Auctore Colino Mac Laurin, Matheseos in Collegio Novo Abredonensi Professore, & R. S. S.*



# EXPERIMENTS

IN

CONSORT  
OF THE  
LUCTATION  
ARISING

From the Affusion of several  
MENSTRUUM

Upon all sorts of Bodies.

To which is added

The Nature, Causes, and Power  
of Mixture.

Exhibited to the Royal Society

By *NEHEMIAH GREW*, M.  
and Fellow of the Royal Society.

LONDON,

Printed for John Marryn, Printer to  
Royal Society, at the Bell in S. Pauls  
Church-yard. 1678.

New EXPERIMENTS,  
And Useful  
OBSERVATIONS  
CONCERNING

*Sea-Weather*

MADE  
FRESH

According to the  
Patentees Invention

In a Discourse Humbly De-  
scribed to His Majesty the King  
of Great-Britain, &c.

By a Fellow of the Colledge of  
Physicians, and of the Royal-

Printed Anno Dom. 1681

"well constituted government  
have always made the  
profession of a physician  
both honourable and  
advantageous" —Steele

battling books

AN  
EXAMINATION

OF  
Mr. John Colbatch

HIS  
BOOKS, viz.

- I. *Novum Lumen Chirurgicum.*
- II. *Essay of Alkalies and Acids.*
- III. *An Appendix to that Essay.*
- IV. *A Treatise of the Gout.*
- V. *The Doctrine of Acids further Asserted,*  
&c.
- VI. *A Relation of a Person Bitten by a Viper,*  
&c.

To which is added,  
An Answer to Dr. Leigh's Remarks on a Treatise  
concerning the Heat of the Blood.

Together with  
Remarks on Dr. Leigh's Book intituled *Exercitationes quinq;* Printed at a private Press in Oxford  
without the License of the University.

AS ALSO  
A short View of Dr. Leigh's Reply to Mr. Colbatch, &c.

By *RICHARD BOULTON*, of  
Brazen-Nose College in OXFORD.

LONDON,  
Printed for Tho. Bennet, at the Half-Moon  
in St. Pauls Church-yard 1699.

A Compleat *Deliver*  
TREATISE  
OF  
URINES,

Shewing the right Method of  
Urinal Prognostication,

Far different  
From the Common Practice

OF  
*Quacks and Mountebanks.*

By *T. H. FICKS* *Pharmacop. Rustican.*

*Pro Capra Leporis habent sua fata libelli.*





# dialectics?

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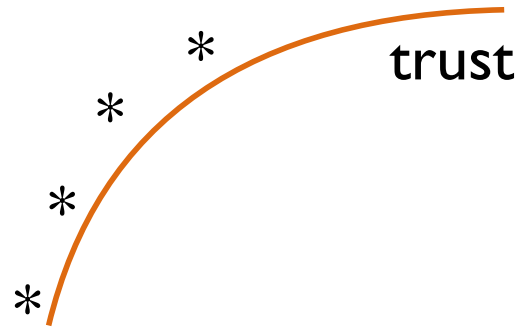
“Let us consider the matter in this way: If the wise man or any other man wants to distinguish the true physician from the false, how will he proceed?

.... He will consider whether what [the physician] says is true, and whether what he does is right, in relation to health and disease?

... But can any one attain the knowledge of either unless he have a knowledge of medicine?

... No one at all, it would seem, except the physician can have this knowledge; and therefore not the wise man; he would have to be a physician as well as a wise man.”

--Plato, *Charmides*

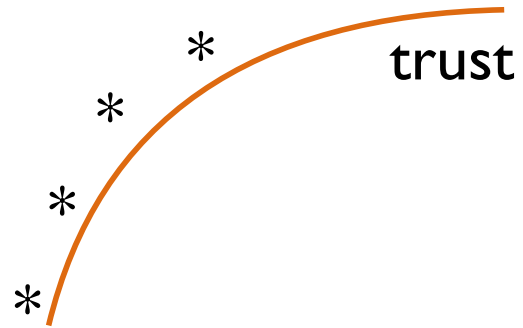


in sum

questions of information quickly turn into questions of validation, authority, institutions, and reputation



if so, then we need to understand not just the tech, nor just the techies, but also the mechanisms of authority and authenticity



in sum

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if so, then we need to understand not just the tech, nor just the techies, but also the mechanisms of authority and authenticity

*Coming up:*

Reference books, 2/21

IP, 2/23





# Readings for Feb. 21

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## 21 Feb: Reference Books and the Organization of Knowledge

Our notion of “knowledge” really dates from the eighteenth century, marked by the emergence of the encyclopedia, modern libraries and museums and academic disciplines—all of whose traces are still evident today in everything from Wikipedia to a college course catalogue.

### *Required Readings*

McArthur, Tom. 1986. "Reference and Revolution" & "Thematic Lexicography," chapters 13 & 14 in *Worlds of Reference*. Cambridge: Cambridge University Press.

Source: Course reader.

Diderot, Denis. "Detailed Explanation of the System of Human Knowledge." *The Encyclopedia of Diderot & d'Alembert Collaborative Translation Project*. Translated by Richard N. Schwab and Walter E. Rex. Ann Arbor: Michigan Publishing, University of Michigan Library, 2009 [\[link\]](#)

[Diderot, Denis] Map of the system of human knowledge. [\[link\]](#) (graphical representation of D's system)

"Encyclopedists." Article in the Internet Encyclopedia of Philosophy. [\[link\]](#)

### *Additional Reading*

Blom, Phillip. *Enlightening the World: Encyclopédie, The Book That Changed the Course of History*. Macmillan. Pp. 139-153.  
Google Books [\[link\]](#)



# Assignment for Feb. 21

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Pick one of the following definitions from the Encyclopédie and look at the definition of the equivalent term in Wikipedia. How would you explain the differences—what would you ascribe to the the difference in the way the two sources were compiled, the difference in the cultural background, or the different conceptions of “knowledge” (or “information”) that each work embodies?

[adultery](#)

[childhood](#)

[doubt](#) (Diderot)

[elegance](#) (Voltaire)

[man](#) (Diderot) – (see “human” in Wikipedia)

[paternal authority](#) (see “father” in Wikipedia)