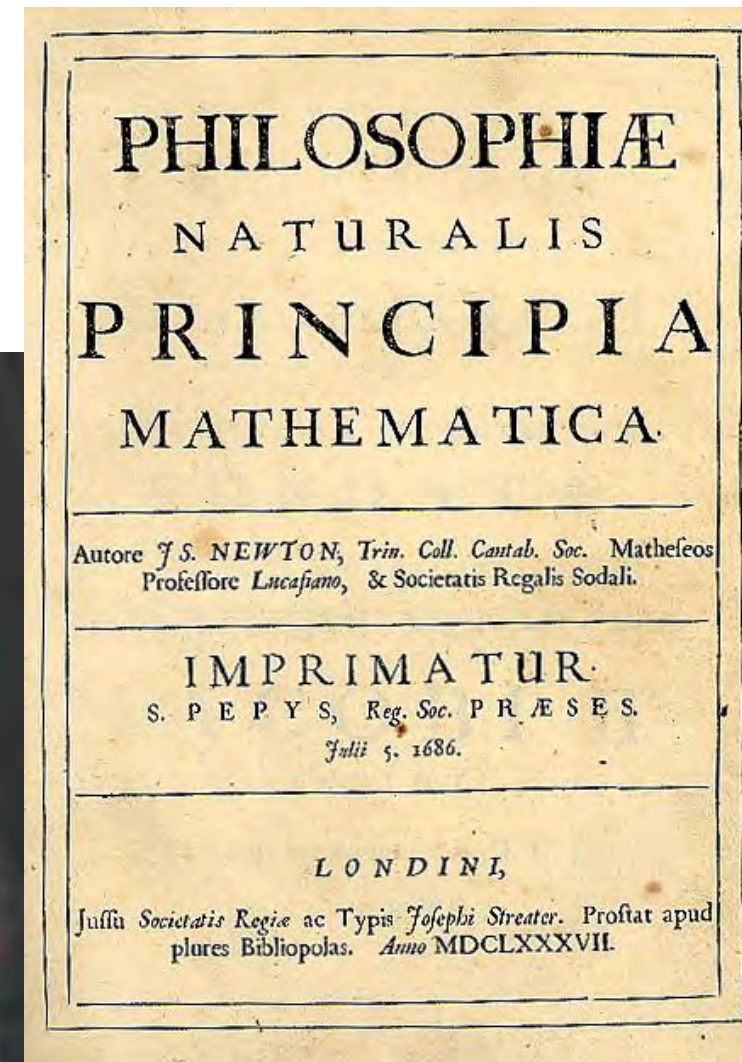
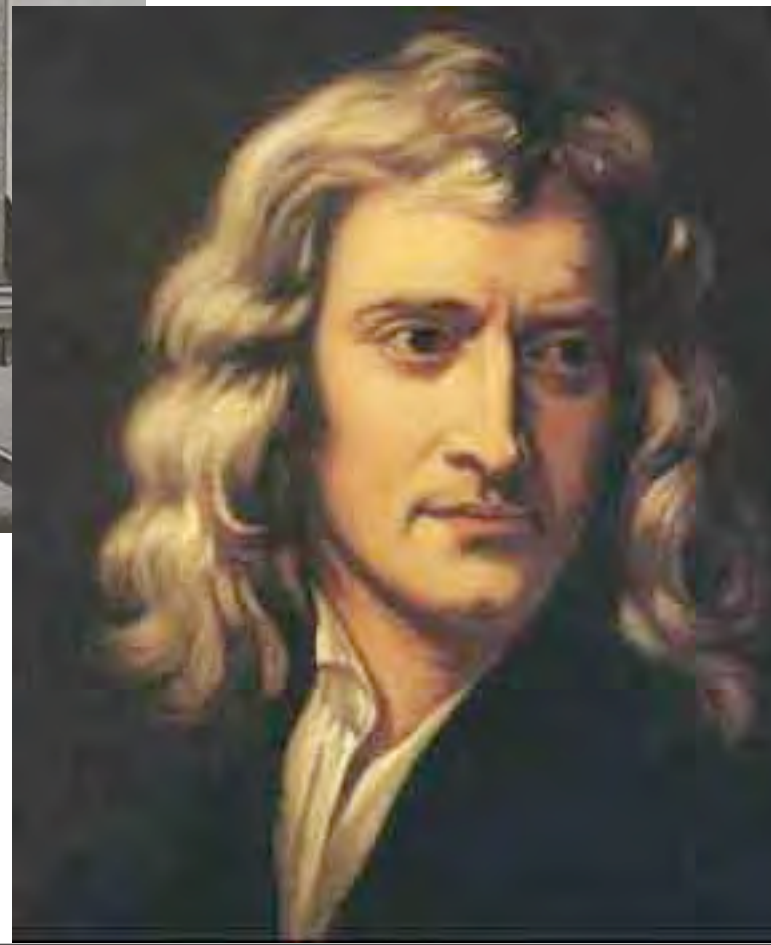
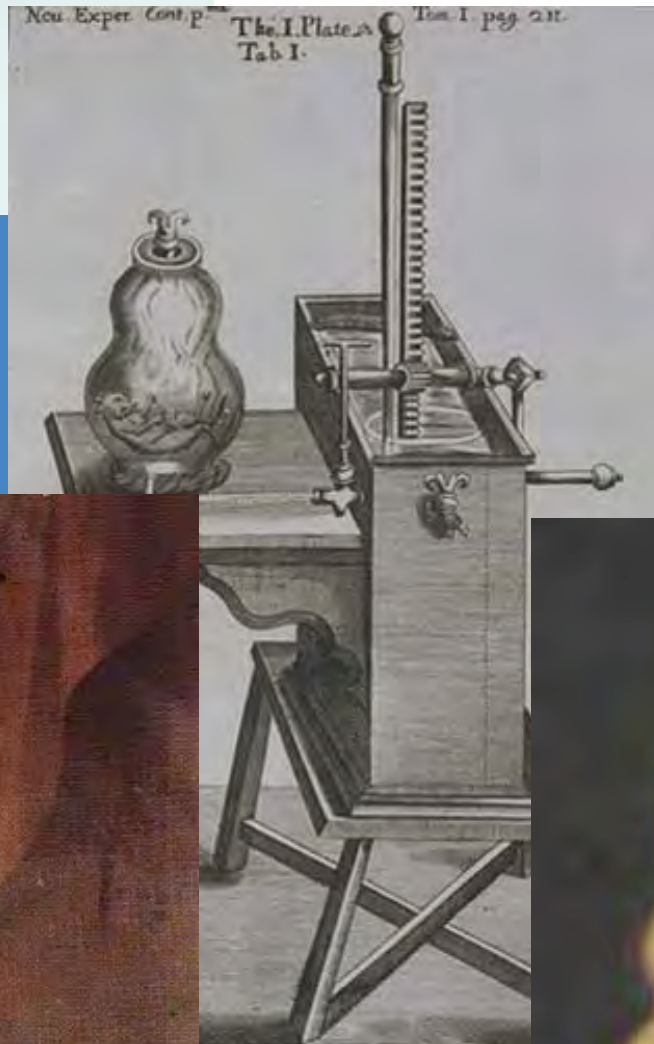


scientific information

History of Information Feb 17 200





overview

the scientific revolution
the English experience

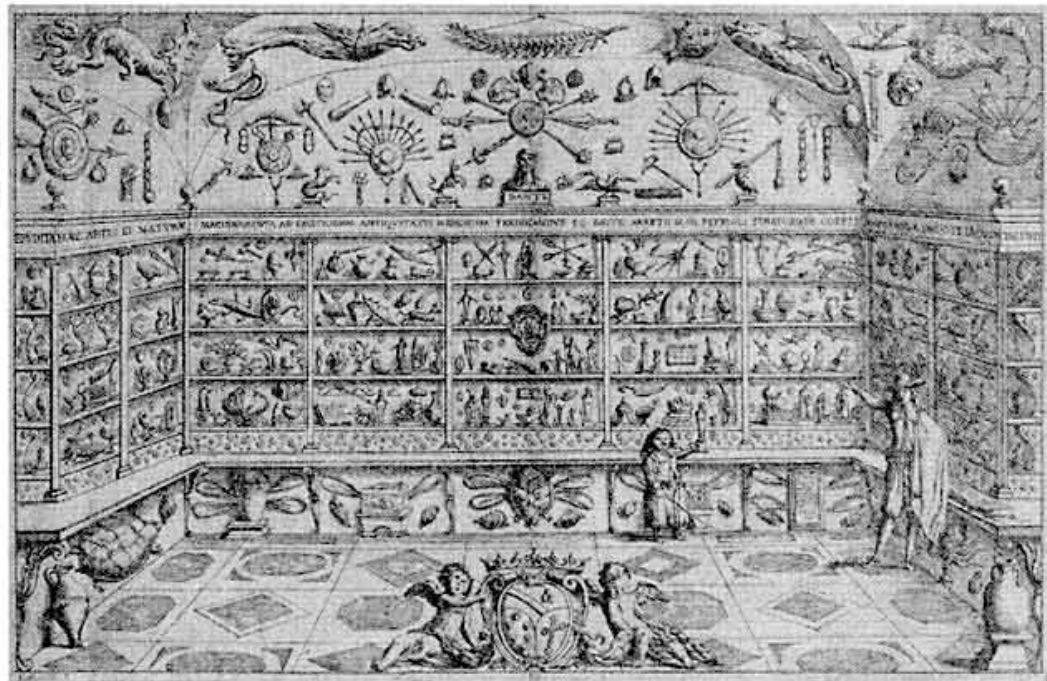
the background & the model

an example
kill or cure

problems with the model



where we left off



a shortage of technology?

clubs and coffee houses

the virtuosi

cabinets of curiosities

the public sphere

"conversing in quiet one with another,
without being ingag'd in the passions,
and madness of that dismal Age."

--Sprat, 1667



change nonetheless

NICOLAI
COPERNICITOTO-
RINENSIS DE REVOLVTIONI-
bus orbium coelestium,
Libri VI.

IN QVIBVS STELLARVM ET FI-
XARVM ET ERRATICARVM MOTVS, EX VETE-
ribus atq; recentibus obseruationibus, restituit hic autor.
(Præterea tabulas expeditas luculentasq; addidit, ex qui-
bus eisdem motus ad quoduis tempus Mathe-
maticum studiosus facillime calcu-
lare poterit.)

ITEM, DE LIBRIS REVOLVTIONVM NICOLAI
Copernici Narratio prima, per M. Georgium Ioachi-
mum Rheticum ad D. Ioan. Schone-
rum scripta.



Cum Gratia & Privilegio Cæs. Maiest.
BASILEÆ, EX OFFICINA
HENRICI PETRINI

"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



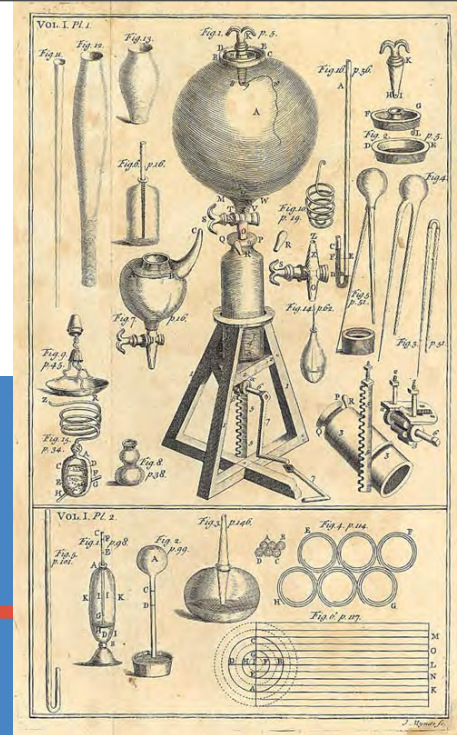
scientific revolution?

what happened

what came before

what came afterwards

who was involved



technological revolution?

"Printing ... the most useful invention ever found out ... make men Polite .. encrease the Knowledge of Letters ... all useful Arts and Sciences ... Perfection of Human Knowledge."

Defoe, *Regulation of the Press*, 1704

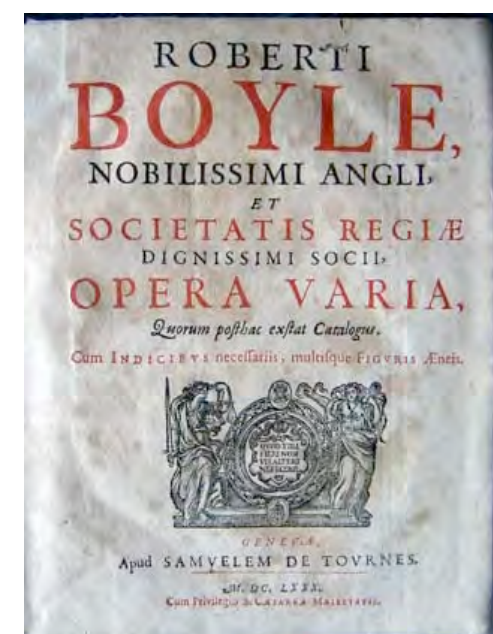


telescopes, microscopes

air pumps, pendulums

watches, springs

maps, books





political revolution

"Those dreadful
revolutions,
which cannot be
beheld upon
Paper, without
horror."

Sprat, History

English Civil War, 1642-1651

Commonwealth & Protectorate, 1649-1659

Restoration, 1660

Great Plague, 1665

Fire of London, 1666

Glorious Revolution, 1688



social revolution

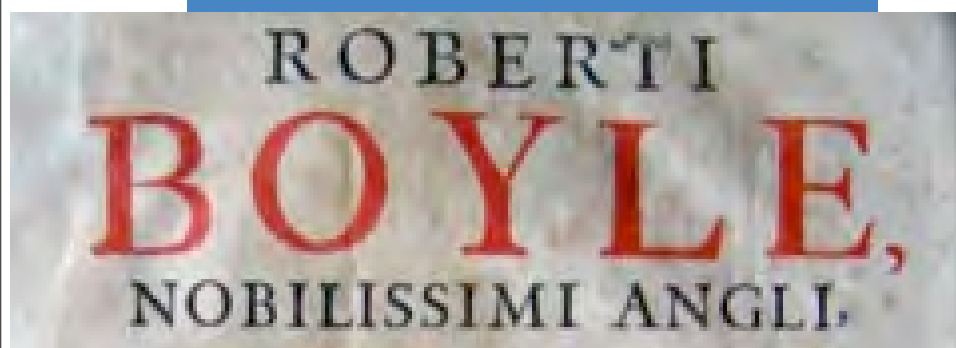
café society & the public sphere

This freedom therefore, which they use, in embracing all assistance, is most advantageous to them: which is the more remarkable, in that they diligently search out, and join to them, all extraordinary men, though but of ordinary

Trades.

--Spratt

the English gentleman





social revolution

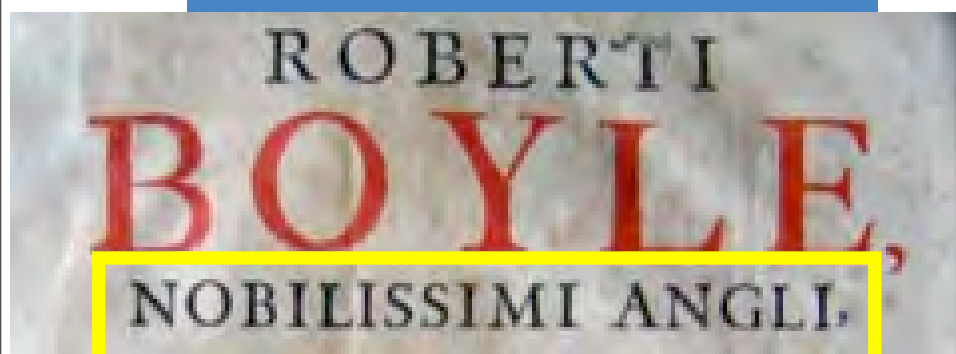
café society & the public sphere

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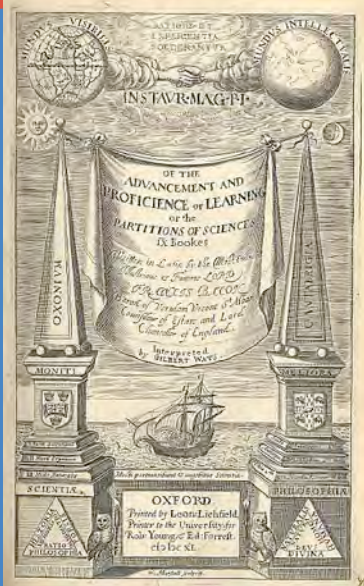
--Spratt

the English gentleman





Francis Bacon
1561–1626



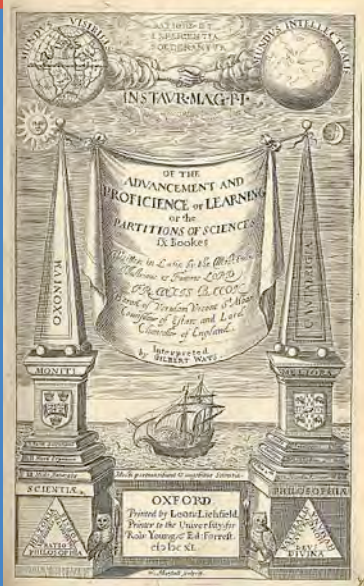
Thomas Sprat
1635–1713

what happened?

"the advancement of *Real Knowledge*"
--Sprat



Francis Bacon
1561–1626



Thomas Sprat
1635–1713

what happened?

"the advancement of *Real Knowledge*"
--Sprat

"reliable truth-generating
practices were put in place and
institutionalized"

Steven Shapin,
A Social History of Truth, 1994



a century of facts

"The Experiments
that be made at the
charge of the
Society. Two
Curators at least
shall be appointed
for the Inspection
of those which
cannot be perform'd
before the Society:
by them the bare
report of matter of
Fact shall be stated
and return'd."

Sprat, History

"Facts are stubborn
things"

Smollett, Gil Bas,
1749

the impulse to order things and facts
observation and description

experimentation

explanation

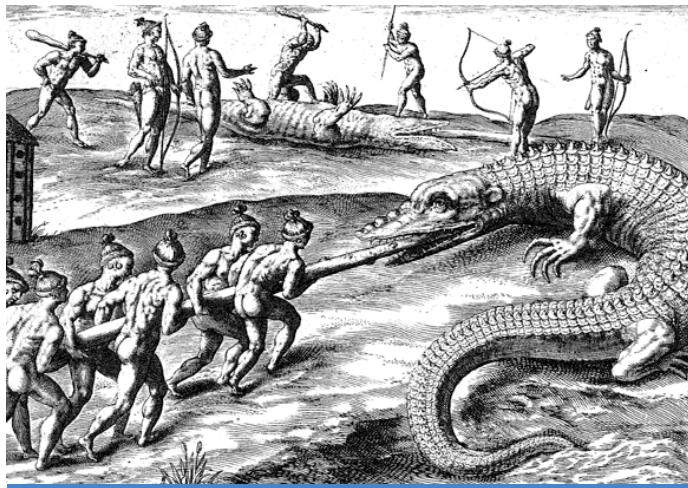
prediction

calculation

replication

not

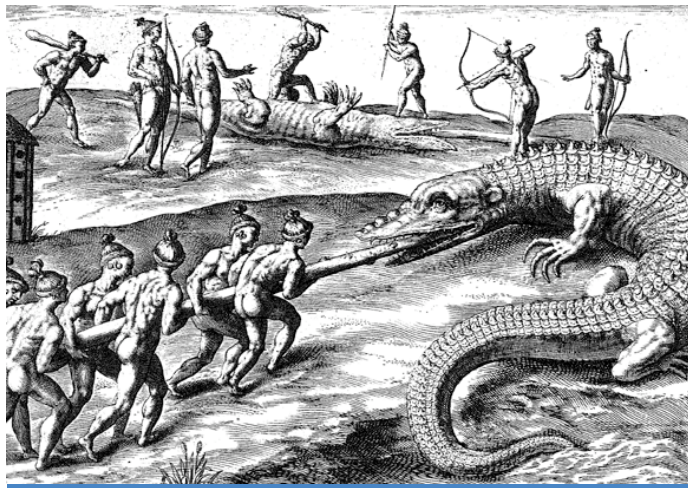
opinion, enthusiasm, fancy



before

tall tales

And of the Cannibals that each other eat,
The Anthropophagi, and men whose heads
Do grow beneath their shoulders.

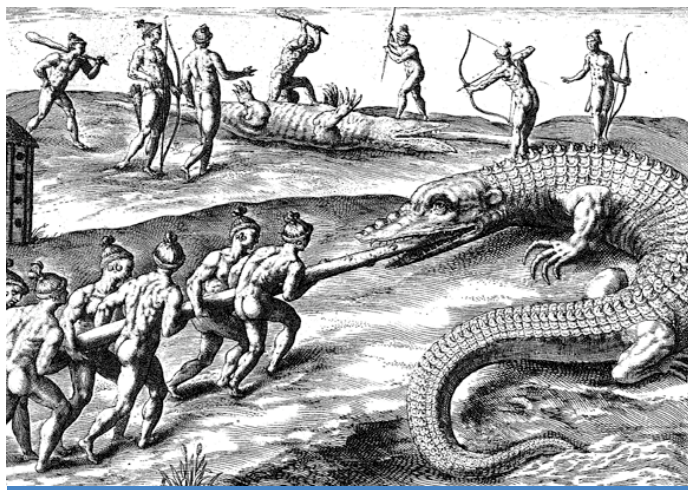


before

tall tales

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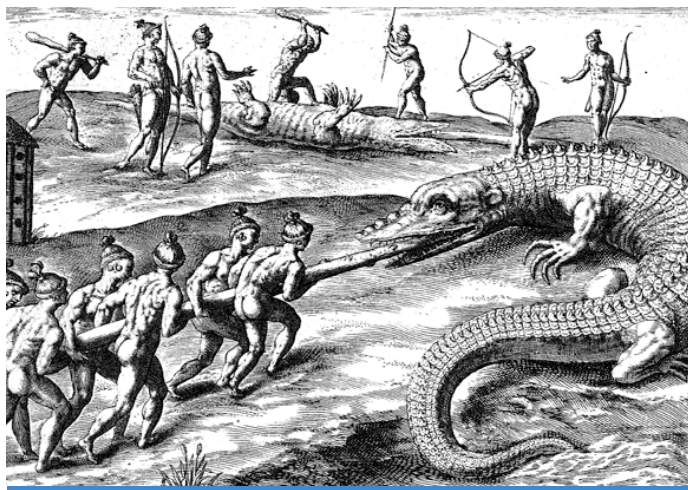
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Samuel Pepys
1663–1703



before

tall tales

And of the Cannibals that each other eat,
The Anthropophagi, and men whose heads
Do grow beneath their shoulders.

"Having in our company Captn. Minnes, with whom I was much pleased to hear him talk in fine language, but pretty well for all that. Among other things, he and the other Captains that were with us tell me that negros drowned look white and lose their blackness, which I never heard before"

Samuel Pepys, *Diary*, 11 April, 1662



Samuel Pepys
1663-1703



portents

A lioness hath whelped in the streets;
And graves have yawn'd, and yielded up their dead;
Fierce fiery warriors fought upon the clouds,
In ranks and squadrons and right form of war,
Which drizzled blood upon the Capitol;



"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 plusiers seront occis"

conspiracy theory



"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"

--Pepys, November 2, 1666


"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, February 3, 1666/7



"La sange du juste à Londres fera faute
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--Pepys, February 3, 1666/7

An Almanack
for the yere. M. D. lviij.
Composed by M. Michael
Ratradamus Doctour
in Physicke of Salbn of
Graue in Prouince.

Whā the Sonne sayleth & fieth then shall
the monster be seene in the playne day
then shall interprete it farre otherwise
deeth hath no respect, none shall pro-
uide for it.



disgrace to reason

"It is indeed a disgrace to the Reason, and honor of mankind, that every fantastical Humorist should presume to interpret all the secret Ordinances of Heven; and to expound the Times, and Seasons, and Fates of Empires, though he be never so ignorant of the very common Works of Nature, that lye under his Feet. There can be nothing more injurious than this, to mens public, or privat peace. This withdraws our obedience, from the true Image of God the rightfull Soveraign, and makes us depend on the vain Images of his pow'r, which are fram'd by our own imaginations. This weakens the constancy of human actions. This affects men with fears, doubts, irresolutions, and terrors. It is usually observ'd, that such presaging, and Prophetical Times, do commonly fore-run great destructions, and revolutions of human affairs. And that it should be so is natural enough, though the presages, and prodigies themselves did signify no such events. For this melancholy, this frightful, this Astrological humor disarms mens hearts, it breaks their courage; it confounds their Councils, it makes them help to bring such calamities on themselves"

--Sprat



distancing

For there is mention made, both of Salt-peter and Aqua fortis, in the Writings of Geber, a Spanish Monk, and an Alchymist; but at what time he lived is unknown, though it be certain, some hundreds of years before Raimund Lully; who about the year 1333. published some of his Books, wherein he treats of Salt-peter and Aqua fortis. It is no ill conjecture of Maierus, that the foresaid Monk, being a skilful Alchymist, had a design to draw a higher Spirit from Peter than the common Aqua fortis, and that he might better open the body of Peter, he ground it with Sulphur and Charcoal, by which Composure he soon became the Inventour of Gun-powder.



building a movement

It was therefore, some space after the end of the Civil Wars at Oxford, in Dr. Wilkins his Lodgings, in Wadham College, which was then the place of Resort for Vertuous, and Learned Men, that the first meetings were made, which laid the foundation of all this that follow'd. The Vniversity had, at that time, many Members of its own, who had begun a free way of reasoning; and was also frequented by some Gentlemen, of Philosophical Minds, whom the misfortunes of the Kingdom, and the security and ease of a retirement amongst Gown-men, had drawn thither.

--Spratt
Hofl Science - 16



who?

"take the measure
of the *Royal
Society*, ... from
the honor, and
reputation, of
many of those Men,
of whom it is
compos'd

--Spratt

scientific revolutionaries

Boyle (1627-1691)

Wren (1632-1723)

Locke (1632-1704)

Hooke (1635-1703)

Newton (1642-1727)

Halley (1656-1742)

Huygens (1629-1695)

Mercator (1620-1687)

Moxon (1627-1691)

Graunt (1620-1674)

Petty (1623-1687)



"I have sent one to weigh Air at the Picque of Teneriff that's the lightest Air. I shall have a considerable Cargo of that Air. Sheerness and the Isle of Dogs Air is the heaviest. Now if I have a mind to take Countrey Air, I send for, may be, forty Gallons of Bury Air, shut all my windows and doors close and let it fly in my Chamber.."

Shadwell, *Virtuoso*

serious problems

"the King came and stayed an hour or two laughing at Sir W. Petty, who was there about his boat; and at Gresham College in general; at which poor Petty was, I perceive, at some loss; but did argue discreetly, and bear the unreasonable follies of the King's objections and other bystanders with great discretion; .. but the King ... cried him down with words only. Gresham College he mightily laughed at, for spending time only in weighing of ayre, and doing nothing else since they sat."

--Pepys, February 1, 1663/4



Sprat in 3 parts

I shall divide into three Periods of Time, according to the several Degrees of the preparation, growth, and compleat Constitution of the
Royal Society.

The **First** shall consist of the first occasions of this Model, and the Men, who first devis'd to put it in execution: and shall end, where they began to make it a form'd, and Regular Assembly.

The **Second** shall trace out their first attempts, till they receiv'd the publick assistance of Royal Authority.

The **Third** shall deliver, what they have done, since they were made a Royal Corporation



Sprat's wonderful model

Nature alone, which could pleasantly entertain them ... Trials in Chymistry, or Mechanicks ... their intention was more to communicate to each other their discoveries ... [as now in Paris], where they have at last turn'd their thoughts, from Words to experimental Philosophy

Their purpose 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's model

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**

They have studi'd, to make it, not onely an Enterprise of one season, or of some lucky opportunity; but a business of time; a stedly, a lasting, a popular, an **uninterrupted Work**.



Sprat's *model*

They have attempted, to free it from the Artifice, and Humors, and Passions of Sects; to render it an Instrument, whereby Mankind may obtain a Dominion over Things, and not onely over one anothers Iudgements.

And lastly, they have begun to establish these Reformatations in Philosophy, 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.

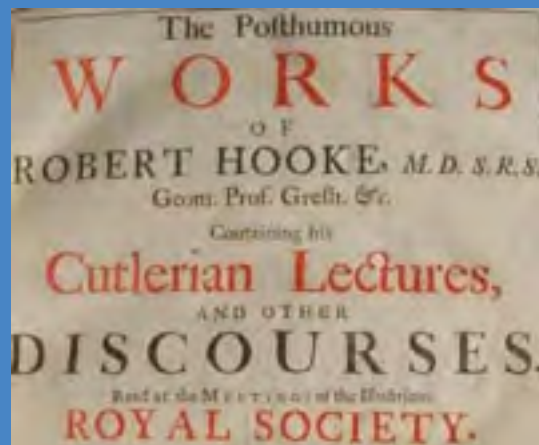
Members ... different Religions, Countries, and Professions ... not to lay the Foundation of an English, Scotch, Irish, Popish, or Protestant Philosophy; but a Philosophy of Mankind. ... the Church of England ought not to be apprehensive to settle a constant Intelligence ... the general Banck, and Free-Port of the world ... receive strangers from all countries, into its number



"publish'd to the world"



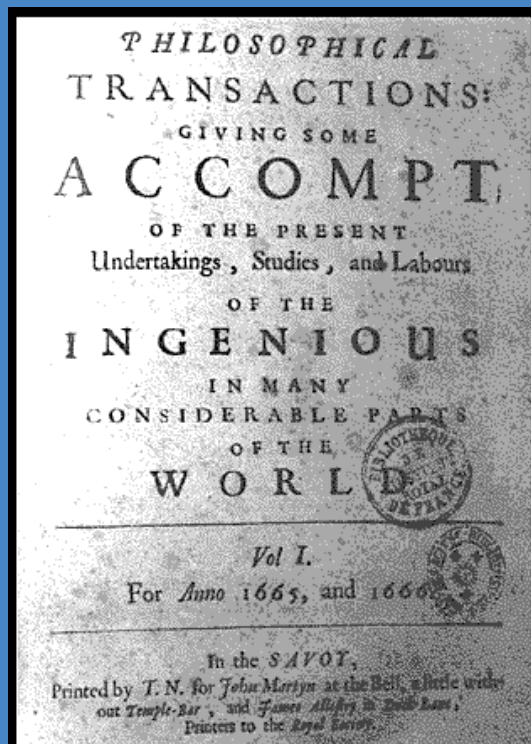
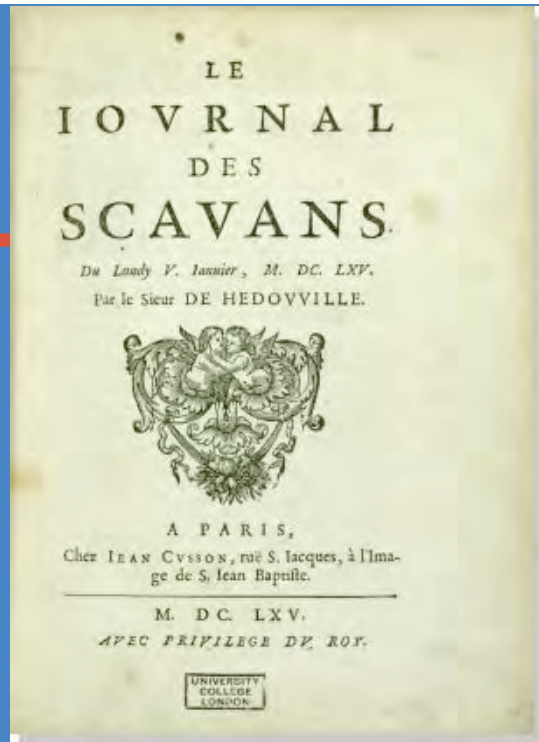
Robert Hooke
1663–1703



"to be counted *Authors*; prevails on all, even on ... reserv'd *Chymists*
--Sprat

"to print a Paper of advertisements... wherein will be contained heads or substance of the inquiries they are most solicitous about, together with the progress they have made and the information they have received from other hands ... a short account of such other philosophical matters as accidentally occur."

--Robert Hooke



society of letters

corresponding secretary

Henry Oldenberg, 1662

Journal des Scavans, 1665

Philosophical Transactions, 1665

advertisements, articles, abstracts

Boyle, random publication v **Hooke**, ordered

publicity, priority, profit



(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.



(1)

Numb. 1.

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. *Bowle*

A Discourse of the Rule of the Decrease of the Height of the Mercury in the Barometer, according as Places are elevated above the Surface of the Earth, with an Attempt to discover the true Reason of the Rising and Falling of the Mercury, upon change of Weather.

By EDM. HALLEY.

THE Elastick Property of the *Air* has been long since made out, by Experiments before the *R. Society* and elsewhere; and the Resistance of its Spring is found to be nearly equal to the Weight or Force that compresses it; as also, that the Spaces the same *Air* occupies, under dif-

proceeding

A Table shewing the Altitude to given Heights of the Mercury.

Inch.	Feet.
30	0
29	915
28	1862
27	2844
26	3863
25	4922
20	10947
15	18715
10	29662
5	48378
1	91831
0,5	110547
0,25	129262
0,1	29 mil. or 154000
0,01	41 mil. 216169
0,001	53 mil. 278338

A Table shewing the Heights of the Mercury at given Altitudes.

Feet.	Inch.
0	30, 00
1000	28, 91
2000	27, 86
3000	26, 85
4000	25, 87
5000 feet	24, 93
1 mile	24, 67
2	20, 29
3	16, 68
4	13, 72
5	11, 28
10	4, 24
15	1, 60
20	0, 95
25	0, 23
30	0, 08

"A Discourse on the Rule of the Decrease of the Height of Mercury in the Barometer, According as Places are Elevated Above the Surface of the Earth, with an Attempt to Discover the True Reason of the Rising and Falling of the Mercury, upon Change of Weather"

Edmond Halley

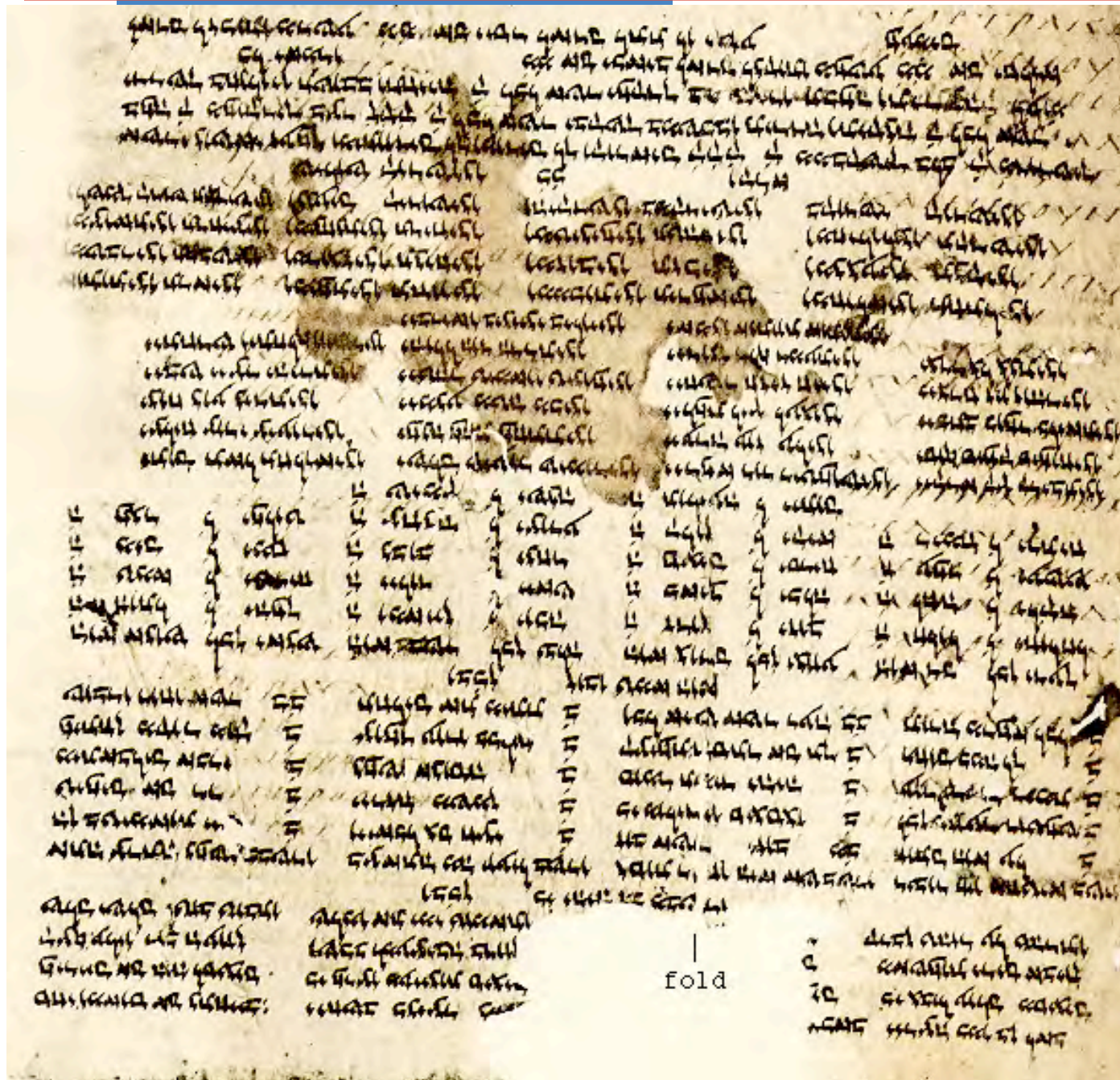
Philosophical Transactions, 1686

A Discourse of the Rule of the Decrease of the Height of the Mercury in the Barometer, according as Places are elevated above the Surface of the Earth, with an Attempt to discover the true Reason of the Rising and Falling of the Mercury, upon change of Weather.

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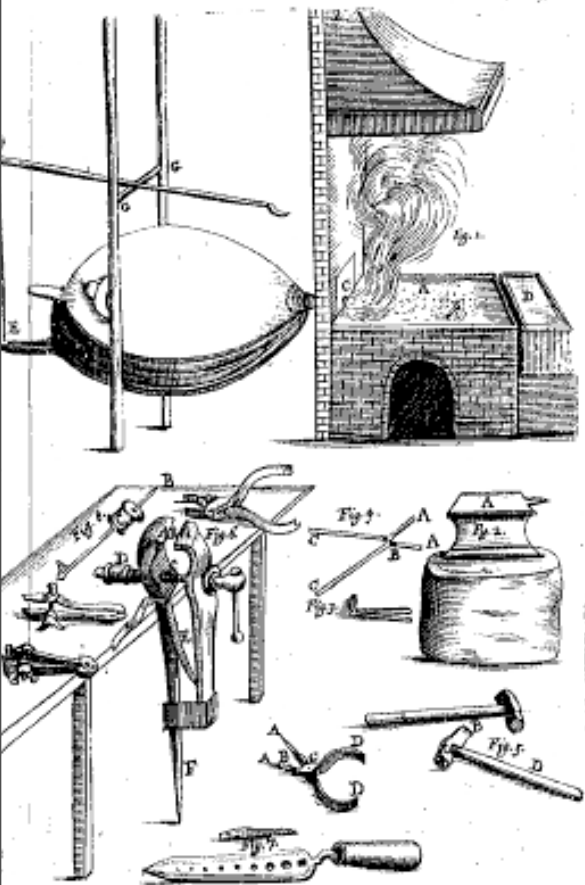
proceeding



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Edmond Halley

Philosophical Transactions, 1686



MECHANICK
EXERCISES,
 OR,
 The Doctrine of
Handy-works.

Began Jan. 1. 1677. And intended to be
 Monthly continued.

By Joseph Moxon Hydrographer to the
 Kings most Excellent Majesty.



LONDON,

Printed for Joseph Moxon at the sign of the
 Launceston, 1677.

not so philosophical

philosophers, physicians, and mechanics

this freedom ... which they use in embracing
 all assistance ... is most advantageous to
 them

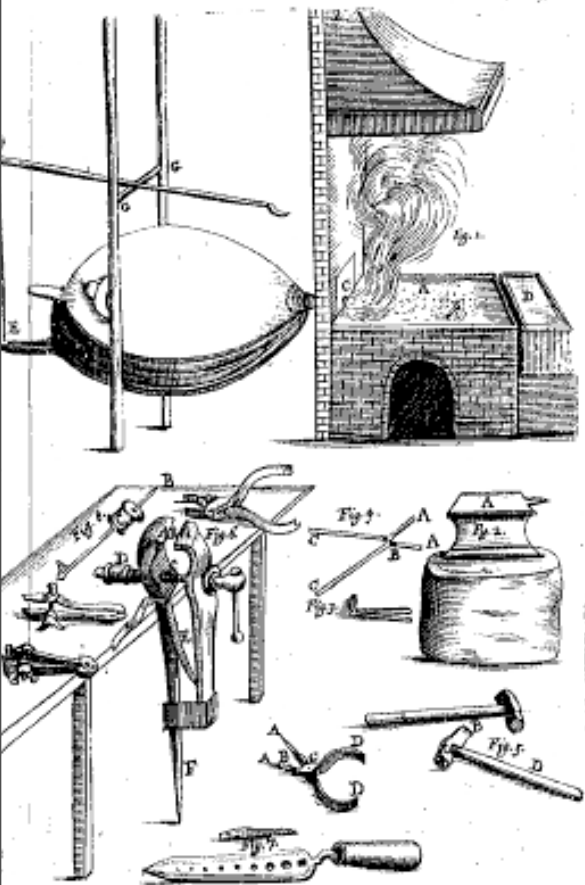
Edward Moxon, *Mechanic Exercises* 1677-

"hunger during the war, taken together with
 the liberation of the press, resulted in an
 out-pouring of cookbooks, after the war, that
 themselves carried ideological weight,
 signifying a movement from a society where
 secret know-how was passed on orally, to a
 society in which knowledge was available
 publicly."

Diane Purkiss, *The English Civil War*, 2006

"Cunning or Sleight,
 or Craft of the
 Hand ... cannot be
 taught by Words, but is
 only gain'd by
 Practice and Exercise"

Moxon, *Mechanic
 Exercises*



MECHANICK
EXERCISES,

OR,
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Handy-works.

Began Jan. 1. 1677. And intended to be
Monthly continued.

By Joseph Moxon Hydrographer to the
Kings most Excellent Majesty.



LONDON, **philosoph**

Printed for Joseph Moxon at the sign of the
Lion in the Strand, 1677. **this freedom**
all assistar

"Cunning or Sleight,
or Craft of the
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taught by Words, but is
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Practice and Exercise"

Moxon, *Mechanick
Exercises*

"hunger durin
the liberatic
out-pouring of
themselv
signifying a
secret know-
society in

Diane Purk

Numb. I.

1

MECHANICK EXERCISES:

Or, the Doctrine of

Handy-works.

Applied to the Art of

Printing.

P R E F A C E.

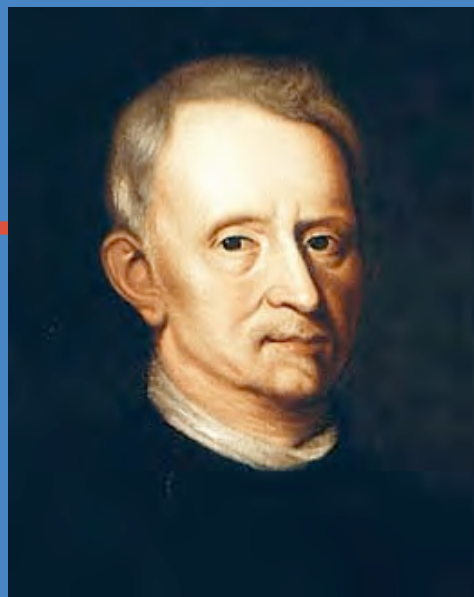
Before I begin with Typographie, I shall say
some-what of its Original Invention; I mean
here in Europe, not of theirs in China and
other Eastern Countries, who (by general
assent) have had it for many hundreds of years,
though their Invention is very different from ours; they
Cutting their Letters upon Blocks in whole Pages or
Forms, as among us our Wooden Pictures are Cut; But
Printing with single Letters Cast in Mettal, as with us
here in Europe, is an Invention scarce above Two hundred
and fifteen years old; and yet an undecidable Controversie
about the original Contriver or Contrivers remains on foot,
between



"Hooke concealed his invention about Watches too long; pray tell him not to do so with what other things hee hath of that kind."

--Moray to Oldenberg

too open?



Christiaan Huygens
1629-1695

Hooke v Huygens

"I my self had an other way of continuing and equalling the vibrations of a pendulum by clock work long before I heard of Monsieur Zulichems way, nay though equated with a Cycloeid yet I have not either cryd eureka or publisht it and yet I think I can produce a sufficient number of Credible witnesses that can testify for it about these 12 years. Soe that the argument that he soe much Relys upon to secure to him the Invention is not of soe great force as to perswaid all the World that he was the first & Sole inventor of that first particular of applying a pendulum to a clock."

--Hooke



Stubbe's animadversions

Mistakes about the SWEATING-SICKNES, and its Cure.

TO shew the great Utility of the Royal Society, he sayes

They will be able by degrees to purchase such Extraordinary Inventions, which are now close lock'd up in Cabinets; and then to bring them unto one Common Stock, which shall be upon all occasions exposed to all mens use. This 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 Epidemicall disease, if it were suffer'd to be engross'd by one man, there would be great Swarms swept away, which otherwise might be easily sav'd. I shall instance in the Sweating-Sickness. The Medicine for it was almost Infallible. But, before that could be generally published, it had almost dispeopled whole Towns. If the same disease should have returned, it might again have been as destructive, had not the Lord Bacon ta-ken care to set down the particular course of Physick for it in his History of Henry the Seventh, and so put it beyond the possibility of any private man's invading it. This out to be imitated in all other Sovereign Cures of the like nature to avoid such dreadful casualties.

One would think by the words of our Historian, That the Cure of the Sweating-Sickness, were recorded by no Body but the Lord Bacon that it was almost Infallible; that the Sweating-Sickness did not return again; And that the Cure was rather concealed (and needed to be generally published) at first, then to be discovered by Observation and Experiments of those that first fell sick. But there is no such thing: for the same cure is related by Polydore Virgil, and Holinshed in their Histories of Henry the Seventh. And the same sickness did rage in the twenty second year of the said King his Reign, as well as the first. And the Cure related was so far from being almost Infallible, that my Lord Bacon only saies it commonly recovered the sick: and after it was so generally known, yet the twenty second year of that Kings Reign, many dyed of it (as Holinshed saith) howbeit not in the same number, by reason of the remedy found out at the beginning of it. To convince the Reader of the truth of what I say, and to shew how unacquainted



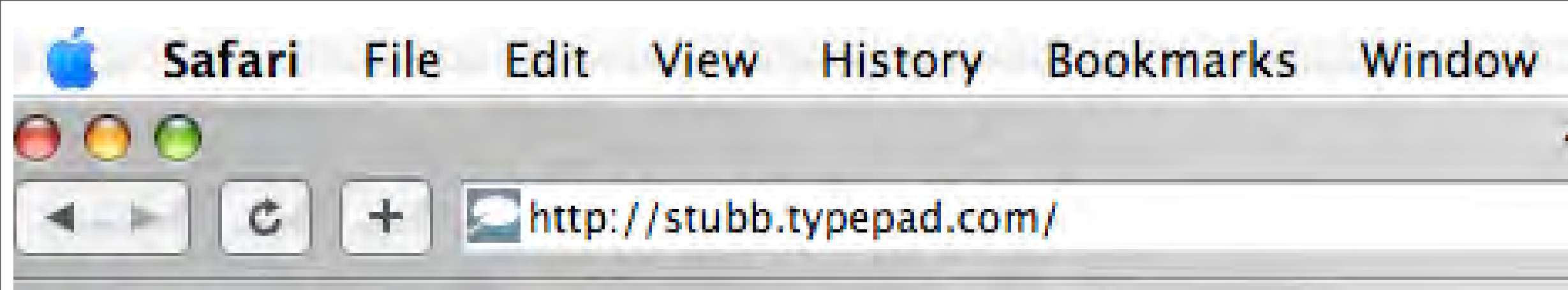
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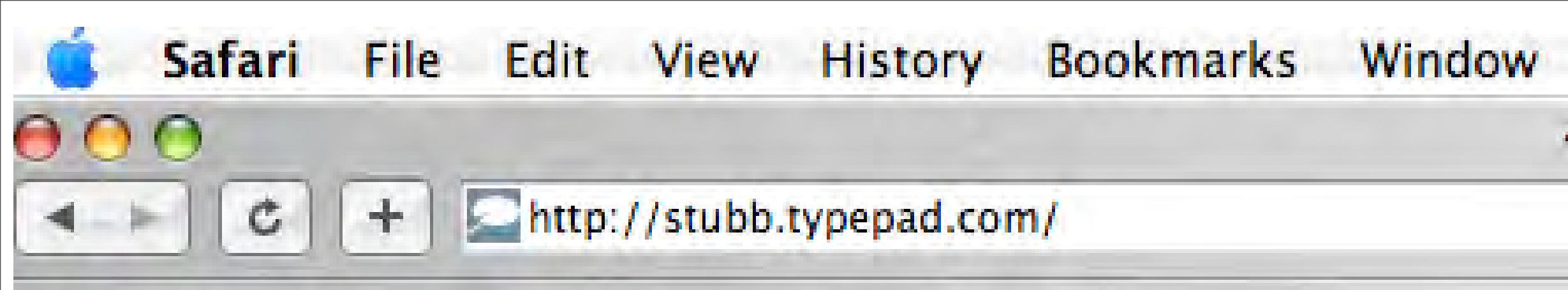
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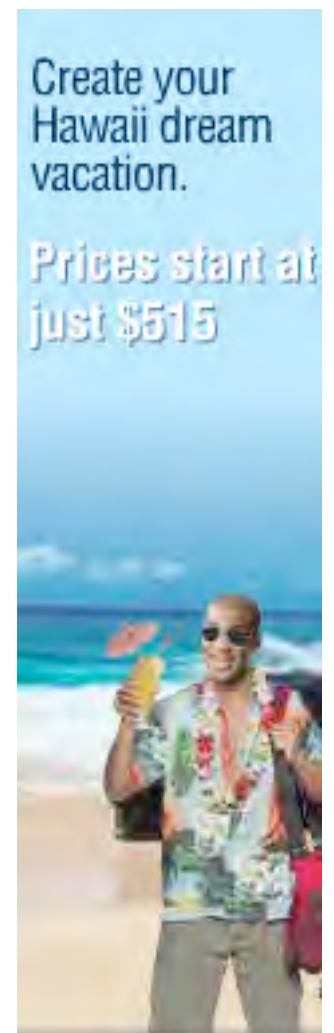
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[BOOK NOW](#)





too philosophical?

seeking truth?

"Women do not bring into the world at one time real children, and at another time counterfeits which are with difficulty distinguished from them"

Socrates, *Theaetatus*

"If falsehood, like truth, had only one face, we would be in better shape, For we would take as certain the opposite of what the liar said. But the reverse of truth has a hundred thousand shapes and a limitless field."

Montaigne, "Of Lyars"

"Our thoughts and beliefs 'pass,' so long as nothing challenges them, just as bank-notes pass so long as nobody refuses them."

William James, *Pragmatism*



truth & trust

Cramp be thou faintless
As our Lady was sinless
When she bare Jesus
Pepys

sickness: plague and pox
a test for trustworthiness

"so great a Number of
Contemporaries ... that lov'd truth so
zealously; sought it so constantly;
and upon whose labours, mankind might
so freely rely"
--Sprat

"Mistakes about the Sweating-Sicknes"
--Stubbe



plague

This 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

black death: 1347

plague again: 1665

in London, of about 1/2 million, 100,00 died

"[W]ar, plague, famine -- reduced the
population of France by the end of the
reign to its lowest point for three
centuries." Blanning



Queen Anne (1665-1714)

17 pregnancies

3 still births

10 miscarriages

3 died in infancy of smallpox

William Duke of Gloucester (1689-1700)



Beef Recall Amid E. coli Worries

U.S. Food and Drug Administration

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Peanut Product Recalls: *Salmonella* Typhimurium

Updated: February 13, 2009

An elderly North Carolina man died in November from the same strain of salmonella that's causing the outbreak, officials in that state said Friday.

identifying causes

fatal mistakes





slow progress

The plague is much in Amsterdam, and we in fears of it here, which God defend. Pepys, December 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 of 3 or 400 tons, where all the men were dead of the plague, and the ship cast ashore at Gottenburgh. September 24, 1664

Thence to the Coffee-house with Creed, where I have not been a great while, where all the newes is of the Dutch being gone out, and of the plague growing upon us in this towne, May 24, 1665

In the evening home to supper; and there, to my great trouble, hear that the plague is come into the City (though it hath these three or four weeks since its beginning been wholly out of the City); but where should it begin but in my good friend and neighbour's, Dr. Burnett, in Fanchurch Street: which in both points troubles me mightily. June 10, 1665

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; June 29th, 1665 Above 700 died of the plague this week. July 13, 1665

I hear the sickness is... almost every where, there dying 1089 of the plague this week. July 19,

MICROGRAPHIA:

OR SOME

Physiological Descriptions of the
1775

MINUTE BODIES

MADE BY
MAGNIFYING GLASSES.

WITH

OBSERVATIONS and INQUIRIES thereupon.

By R. HOOKE, Fellow of the ROYAL SOCIETY.

*Nonnulli acule quondam contulerunt Linceus,
Nonnulli idcirco contemnat Lippus suavis. Hecat. Ep. lib. 1.*



Fig. 1.

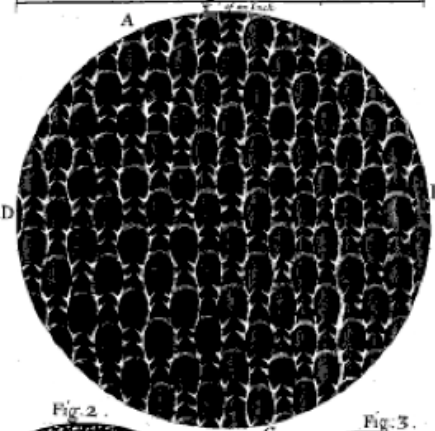
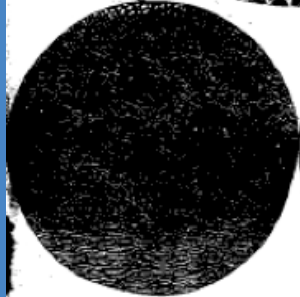


Fig. 2.

Fig. 3.



Schem. XV.

early thoughts

"the ingenious Invention of that Excellent person, Doctor Wren, of injecting liquors into the veins of an Animal, seems to be reducible to this head: I cannot stay, nor is this a fit place, to mention the several Experiments made of this kind by the most incomparable Mr. Boyle, the multitudes made by the lately mention'd Physician Doctor Clark, the History whereof, as he has been pleas'd to communicate to the Royal Society, so he may perhaps be prevail'd with to make publique himself: But I shall rather hint, that certainly, if this Principle were well consider'd, there might, besides the further improving of Bathing and Syringing into the veins, be thought on several ways, whereby several obstinate distempers of a humane body, such as the [H] Gout, Dropsie, Stone, &c. might be master'd, and expell'd; and good men might make as good a use of it, as evil men have made a perverse and Diabolical. And that the filling of the pores of the skin with some fluid vehicle, is of no small efficacy towards the preparing a passage for several kinds of penetrant juices, and other dissoluble bodies, to insinuate themselves within the

skin." --Hooke
Hof Science - 36



Lady Mary Wortley
Montague
1689–1762

earlier thoughts

inoculation

Tibet, 11th century

Turkey, ? 16th century

England, France 18th century

"gradual eradication of small pox was responsible for much of the population growth that occurred in England in the eighteenth century."

--Peter Razzell
Hoff Science - 37

Mr. MAITLAND'S
ACCOUNT
OF
INOCULATING
THE
SMALL POX
Vindicated,

From Dr. WAGSTAFFE'S Misrepresentations of that PRACTICE; with some Remarks on Mr. MASEY'S Sermon.

The Second Edition.

To which is added,
His First ACCOUNT of *Inoculating*
the SMALL POX.

L O N D O N:

Printed and Sold by J. PEELE, at *Lock's*
Head in *Paternoster-Row*. 1722.

inoculation

"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*



short of numbers

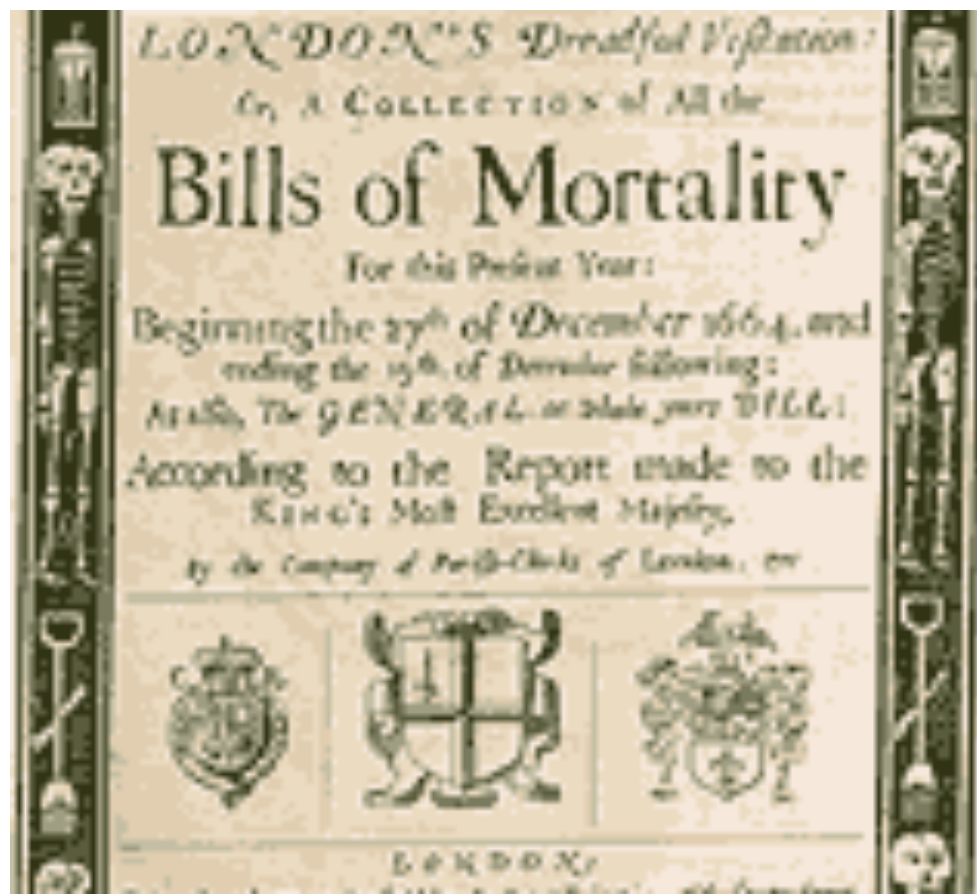


rebuilding London

Hooke, Wren

tracking disease

Graunt, Petty



death rate

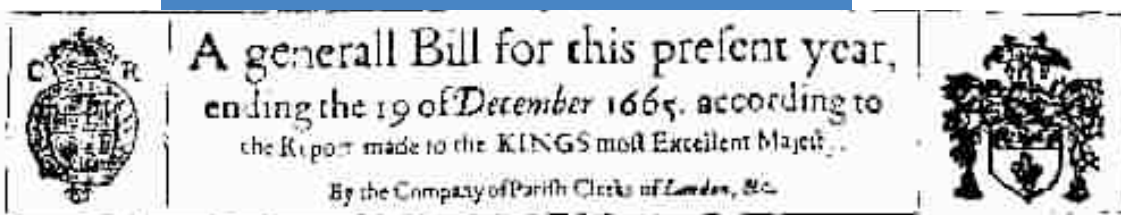
1603: regular bills of mortality

1611: incorporation of parish clerks counting by "searchers"

1629: other deaths

1728: age of deceased

1837: last bills



The Diseases and Casualties this year.

A Borstive and Stillborne	517	Executed	21	Pallie	30
Aged	1545	Floz and Small Pox	655	Plague	68598
Aque and Peaver	5237	Found dead in Streets, fields, &c.	2	Plasme	6
Appoplex and Suddenly	116	French Pox	86	Plurisie	19
Bedric	10	Frighted	23	Posionous	1
Blasind	9	Gout and Sciatica	27	Quinsie	35
Bleeding	16	Grief	26	Rickets	157
Bloody Flux, Scouring & Flux	187	Gripping in the Guts	128	Killing of the lights	157
Burns and Scalded	8	Hungel & made away themselves	7	Leprosie	14
Calenture	3	Headmoultshot & Mouldfallen	14	Scurvy	107
Cancer, Gangrene and Fistula	56	jaundies	100	Shingles and Swine pox	2
Canker, and Thrush	10	Impostume	107	Sores, Ulcers, broken and heilled	82
Childhood	625	Kild by severall accidents	46	Spleen	14
Cholikes and Infants	1258	Kings Evill	28	Spotted Fever and Purples	1029
Cold and Cough	68	Leprosie	2	Stoppung of the stomack	334
Collick and Winde	124	Lethargy	14	Strep and Stranguy	38
Consumption and Tiblick	4808	Livergreen	2	Sucket	100
Convulsion and Morice	1056	Meygram and Headach	1	Teeth and Worms	1014
Distracted	1	Mealles	7	Vomiting	51
Double and Turpany	1476	Murthered and Shot	9	Vunn	7
Drowned	30	Overiaid & Starved	45		
Col Males	5114				
Col Females	4853				
Col In all	9967				
Col Males	48569				
Col Females	48137				
Col In all	96706				
Col of the Plague	68598				
Increased in the Burials in the 130 Parishes and at the Pest-houses this year	79009				
Increased of the Plague in the 130 Parishes and at the Pest-houses this year	68598				



political arithmetic



William Petty
1623-1787

politics and population

William Petty, RS (1623-1687)

surveyor

Political arithmetic of Ireland

velocity of circulation
natural vs market price
economic surplus
population change

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: The first by comparing the Bills of Mortality, whereby he finds that the People of *London* are as many as those of *Paris* and *Rouen* put together. The second by comparing the number of Houses, which by the Chimny-Books are found above 80000 in *London*, whereas a great Author among the *French*, (who seldome faile to magnifie their own things,) reckons but 50000 Houses in *Paris*. As to the third, to wit the Wealth, he conceives that there is yet a much greater disproportion, there being no comparison between them for Trade, and besides a good argument drawn from the Law-Suites of both places, he concludes from the *Paris* bills of Mortality, that two 5ths of the People of *Paris* are so poor

competitive counts

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2. I begin with the Ingenious Author of the *Novelles 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 *Moschees* or *Mahometan Temples*. To which I reply, that I hope this Objector is but in jest, for that *Mahomet* was not borne till about the Year 570, and had no *Moschees* till about 50 Years after

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battle with 'declinists'



headcounters

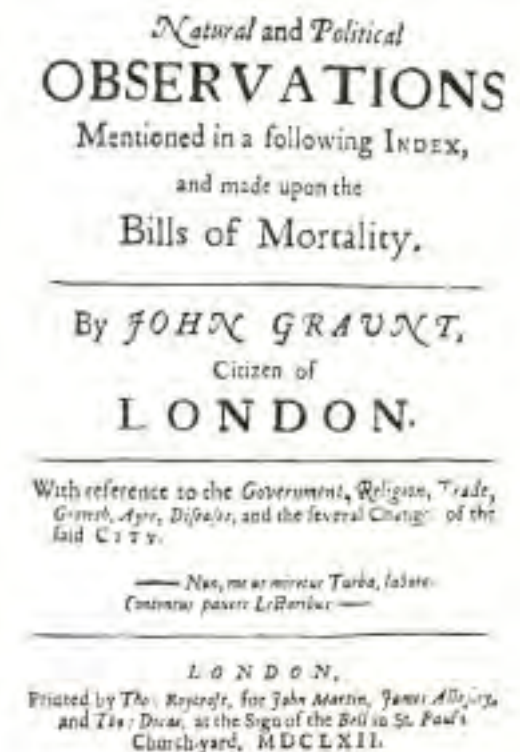


John Graunt
1620–1674

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

--Pratt

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





counting difficulties

AN INDEX of the Positions, Observations, and Questions contained in this Discourse.

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5. The ignorance of the Searchers no impediment to the keeping of sufficient, and usefull Accounts, p. 13
6. That about one third of all that were ever quick die under five years old, and about thirty six per Centum under six, p. 14
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8. A Table of the Proportions dying of the most notorious, and formidable Diseases, or Casualties, p. 16
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12. That

shame

"The Old-Women Searchers, after the mist of a Cup of Ale, and the bribe of a two-grout fee ... cannot tell whether this emaciation or leanness were from a phthisis, or from an Hectick Fever, Atrophy, &c. or from an Infection of the Spermatick parts ... onely hated persons, and such, whose very Noses were eaten off were reported by the searchers to have died of this too frequent Malady."

principle

fear



history of trust

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 he 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.



scientific knowledge

matters of fact, matters of trust

in machines

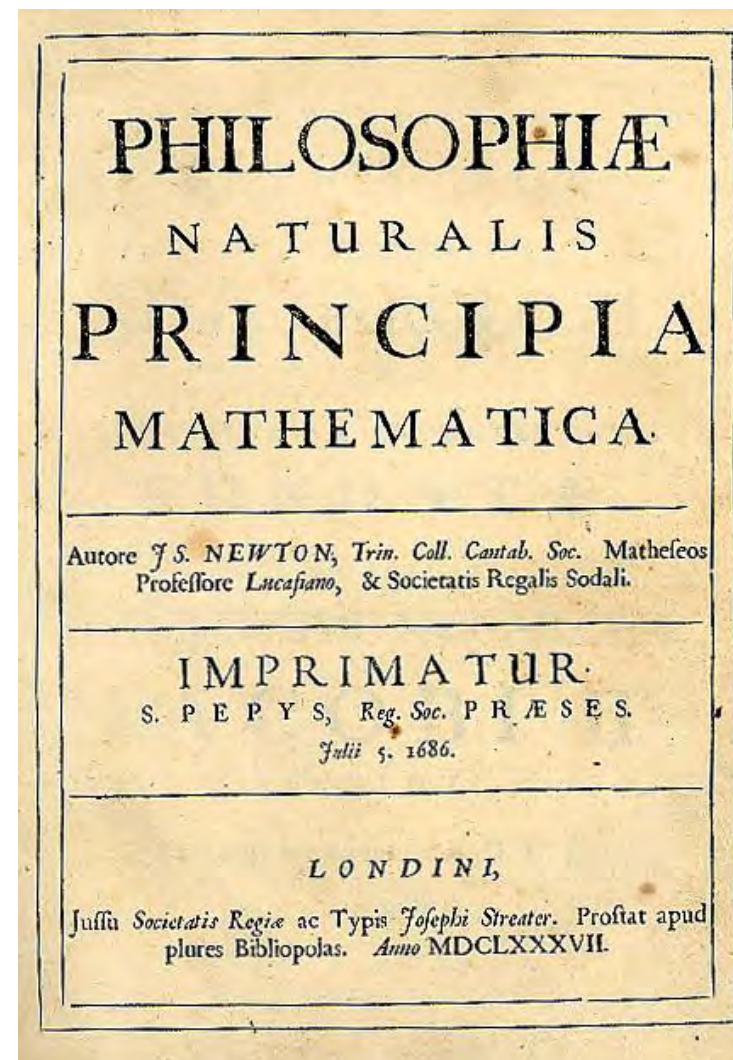
in books

in calculation

in people



Robert Boyle
1627–1691





machines

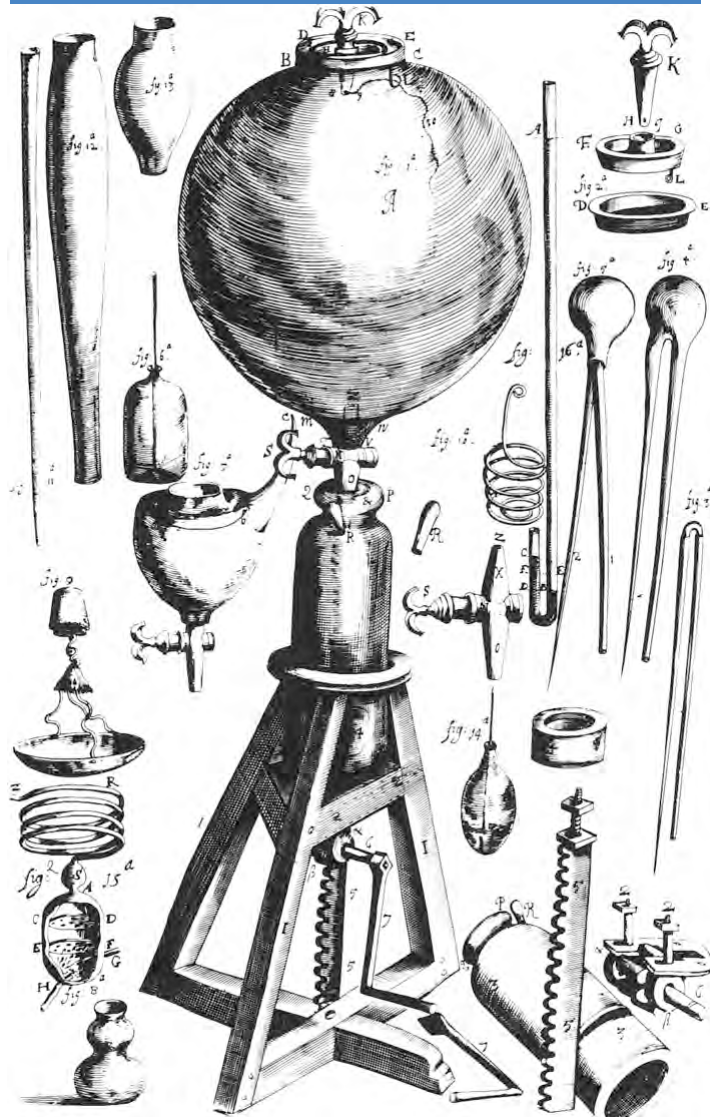
Boyle v Hobbes

the gap
between instruments & world

"the right *Art of Experimenting*"

--Sprat

"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, in defense of scientific devices





failed demos

"And thither anon come all the Gresham College, and a great deal of noble company: and the new instrument was brought called the Arched Viall, where, being tuned with lute-strings, and played on with keys like an organ, a piece of parchment is always kept moving; and the strings, which by he keys are pressed down upon it, are grated in imitation of a bow, by the parchment; and so it is intended to resemble several vialls played on with one bo, but so basely and harshley, that it will never do. But, after three hours' stay, it could not be fixed in tune"
--Pepys, October 5, 1664



books

"we are now
arriv'd at that
excessive
censuring humor,
that he who
takes upon him
to commend any
thing ... will
raise to himself
farr more
Enemies than
Friends .. this
sowness of
Criticism"

--Sprat

battle of the books

Adrian Johns, *The Nature of the Book*, 1998

error

"piracy"

plagiarism

fraud

"Swiftboating"

"The wits .. had powerful strategies at their disposal for challenging the worth of any printed book ... and the truth of any printed statement".

--Johns



forward to the past

"I will write my Name in each Book with my own Hand"

J. Desaguliers,

Course of Experimental Philosophy, 1734

"These men had discovered the central, overwhelming paradox rending early modern print culture. The only really effective way to guarantee the authenticity of their printed sheets was to abandon the defining element of print itself. ... they returned to inscribing their authorship by hand"

--Johns



people

"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 sordid considerations"

--Sprat

"from the honor, and reputation, of these Men
... *Gentlemen*, free and unconfind'd ... an
Assembly, ... whose privileges shall be the
same .. gain shall be in common"

--Sprat

Hooke's trials

Graunt's

"shop arithmetic"

Petty &

Anne Greene





animadversions

"Some men ...
have ... made use of
such experiments of
mine, as I have
strong motives to
think they never
made nor saw, only
because they had
been related by one,
after whom they
thought they might
without a hazard of
their credit deliver
any matter of fact"

Boyle *New
Experiments Touching
Cold*, 1665

"there is less credit to be placed in the
Narrations of some of our *Virtuosi*, who
have been so mistaken in their Accounts ...
with what *negligence* and *imperfectness* will
they register things? how *un-philosophical*
will their memories be?"

--Stubbe



from open ...

"Put an advertisement
in the *Courant* "by
that Means, you'll
have the Assistance of
the most able Men in
the Kingdom."

-Susanne
Centilivre, *Love's
Contrivance*, 1703

"it suffices, if many of them be
plain, diligent, and laborious
observers: such, who though they
bring not much knowledge, yet
bring their hands, and their eyes
uncorrupted"

-Sprat





... to closed

membership

peer review

**natural history to natural
philosophy**

back to the university



(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.

Beginning the Thirty first Volume.

PHILOSOPHICAL TRANSACTIONS.

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

The CONTENTS.

- 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 A legato Britanico, Roberto Sutton, Eq. Aurato, traditum, ejusdem Equitis permisso, 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, 17th.* By Philip Percival, Esq; Brother to the Right Honourable the Lord Percival, F. R. S. and communicated by his Lordship to the Royal Society.

change to believe in

- 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, Entituled, Geometria Organica, sive Descriptio Linearum Curvarum Universalis.* Auctore Colino Mac Laurin, Matheseos in Collegio Novo Abredonensi Professore, & R. S. S.



summary

beginnings of science

scientific method


from certainty to trust

**from facts to people and
institutions**



ahead

19 Feb: Reference Books and the Organization of Knowledge

 McArthur, Tom. 1986. Ch 12-15, pp. 91-133 in *Worlds of Reference*. Cambridge: Cambridge University Press.



when were tables?

Origen's Hexapla, c . 234

