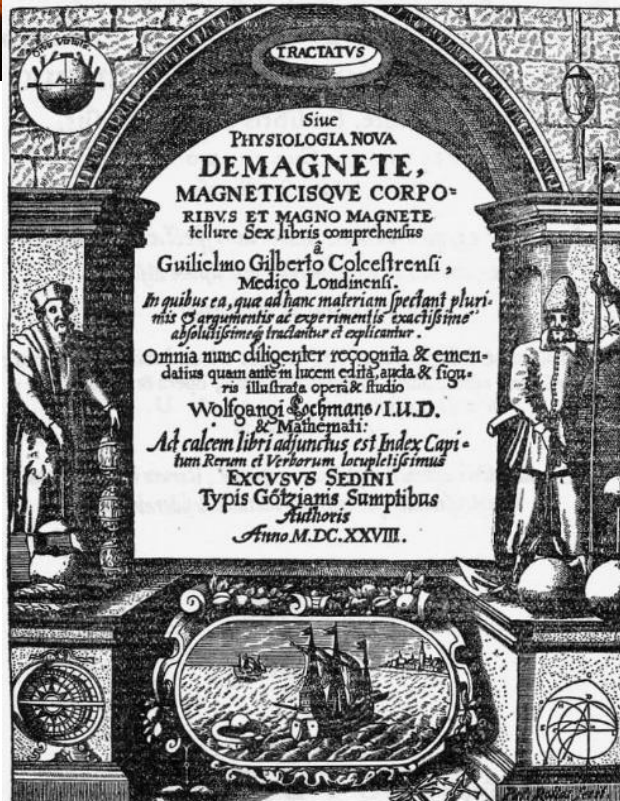
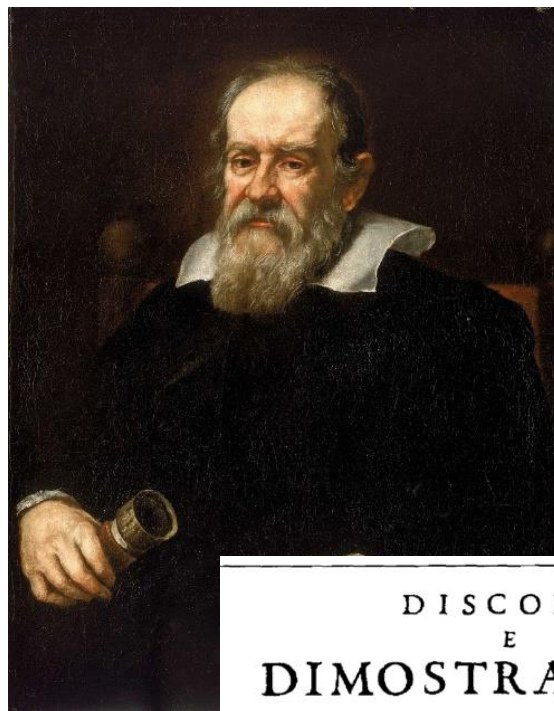


4.

od alkemije do
flogistona



DISCORSI
E
DIMOSTRAZIONI
MATEMATICHE,
intorno à due nuoue scienze

Attenenti alla
MECANICA & I MOVIMENTI LOCALI,
del Signor
GALILEO GALILEI LINCEO,
Filosofo e Matematico primario del Serenissimo
Grand Duca di Toscana.

Con vna Appendice del centro di gravità d'alcuni Solidi.

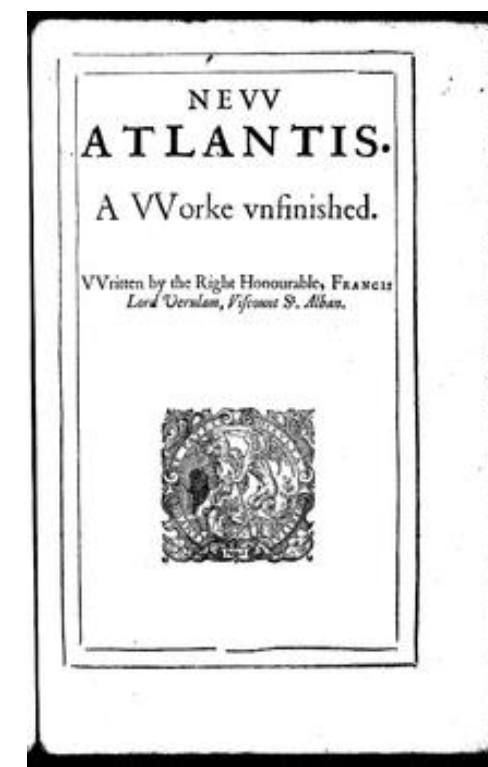


IN LEIDA,
Appresso gli Elsevirii. M. D. C. XXXVIII.

DISCOURS
DE LA METHODE
Pour bien conduire sa raison, & chercher
la verité dans les sciences.
PLUS
LA DIOPTRIQUE.
LES METEORES.
ET
LA GEOMETRIE.
Qui sont des essais de cete METHODE.



A LEYDE
De l'imprimerie de IAN MAIRE.
C13 13 C XXXVII.
Avec Privilège.





Robert Boyle (1627.–1691.)



**Katherine Jones, Viscountess Ranelagh
(1615.–1691.)**



Lismore Castle



Burlington House, Mayfair, London

THE
SCEPTICAL CHYMIST:
OR
CHYMICO-PHYSICAL
Doubts & Paradoxes,
Touching the
SPAGYRIST'S PRINCIPLES
Commonly call'd
HYPOSTATICAL;
As they are wont to be Propos'd and
Defended by the Generality of
ALCHYMISTS

Whereunto is præmis'd Part of another Discourse
relating to the same Subject.

BY

The Honourable ROBERT BOYLE, Esq;

LONDON,

Printed by J. Cadwell for J. Crooke, and are to be
Sold at the Ship in St. Paul's Church-Yard.

M D C L X I.

I now mean by Elements, as those Chymists that speak plainest do by their Principles, certain Primitive and Simple, or perfectly unmingled bodies; which not being made of any other bodies, or of one another, are the Ingredients of all those call'd perfectly mixt Bodies are immediately compounded, and into which they are ultimately resolved.

And indeed, when in the writings of *Paracelsus* I meet with such Phantastick and Unintelligible Discourses as that Writer often puzzles and tyres his Reader with, father'd upon such excellent Experiments, as though he seldom clearly teaches, I often find he knew; me thinks the Chymists, in their searches after truth, are not unlike the Navigators of *Solomons Tarshish Fleet*, who brought home from their long and tedious Voyages, not only Gold, and Silver, and Ivory, but Apes and Peacocks too; For so the Writings of several (for I say not, all) of your Hermetick Philosophers present us, together with divers Substantial and noble Experiments, Theories, **which either like Peacocks feathers make a great shew, but are neither solid nor useful; or else like Apes, if they have some appearance of being rational, are blemish'd with some absurdity or other, that when they are *Attentively* consider'd, makes them appear Ridiculous.**

208
The Prolongation of Life.

The Recovery of Youth, or at least some of the Marks of it, as new Teeth, new Hair colour'd as in youth.

The Art of Flying.

The Art of Continuing long under water, and exercising functions freely there.

The Cure of Wounds at a Distance.

The Cure of Diseases at a distance or at least by Transplantation.

The Attaining Gigantick Dimensions.

The Emulating of Fish without Engines by Custome and Education only.

The Acceleration of the Production of things out of Seed.

The Transmutation of Metalls.

The makeing of Glass Malleable.

The Transmutation of Species in Mineralls, Animals, and Vegetables.

The Liquid Alkaest and Other dissolving Menstruums.

The making of Parabolicall and Hyperbolicall Glasses.

The making Armor light and extremely hard.

The practicable and certain way of finding Longitudes.

The use of Pendulums at Sea and in Journeys, and the Application of it to watches.

Potent Druggs to alter or Exalt Imagination, Waking, Memory, and other functions, and appease pain, procure innocent sleep, harmless dreams, etc.

A Ship to saile with All Winds, and A Ship not to be Sunk.

Freedom from Necessity of much Sleeping exemplify'd by the Operations of Tea and what happens in Mad-Men.

Pleasing Dreams and physical Exercises exemplify'd by the Egyptian Electuary and by the Fungus mentioned by the French Author.

Great Strength and Agility of Body exemplify'd by that of Frantick Epileptick and Hysterical persons.

A perpetuall Light.

Varnishes perfumable by Rubbing.

209
A Ship to saile wth All winds, and A Ship not to be Sunk.

Freedom from Necessity of much Sleeping exemplify'd by the Operations of Tea and wth happens in mad-men.

Pleasing Dreams & physical Exercises exemplify'd by the Egyptian Electuary and by the Fungus mentioned by the French Author.

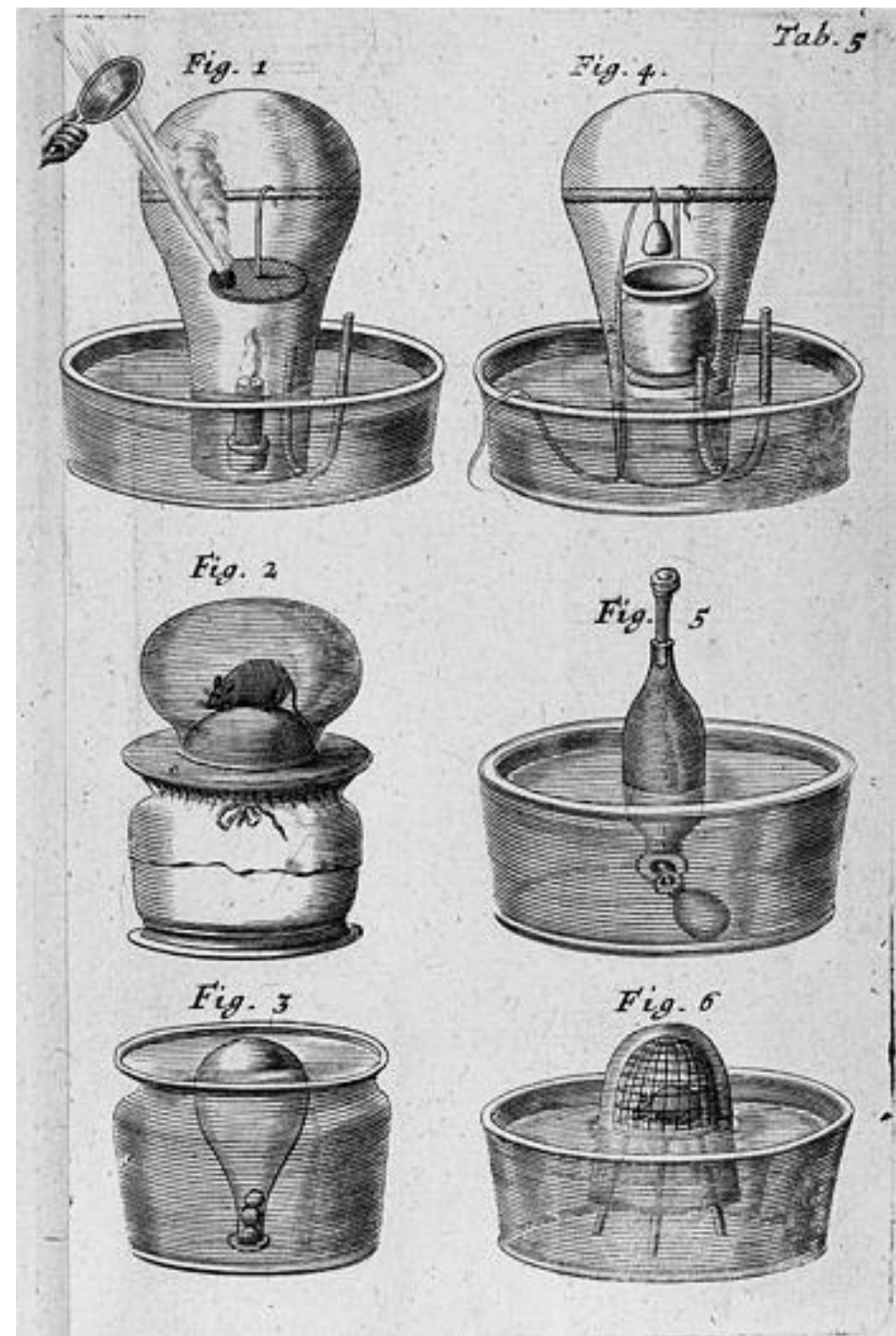
Great Strength and Agility of Body exemplify'd by that of Frantick, Epileptick and Hysterical persons.

A perpetuall Light.

Varnishes perfumable by Rubbing.

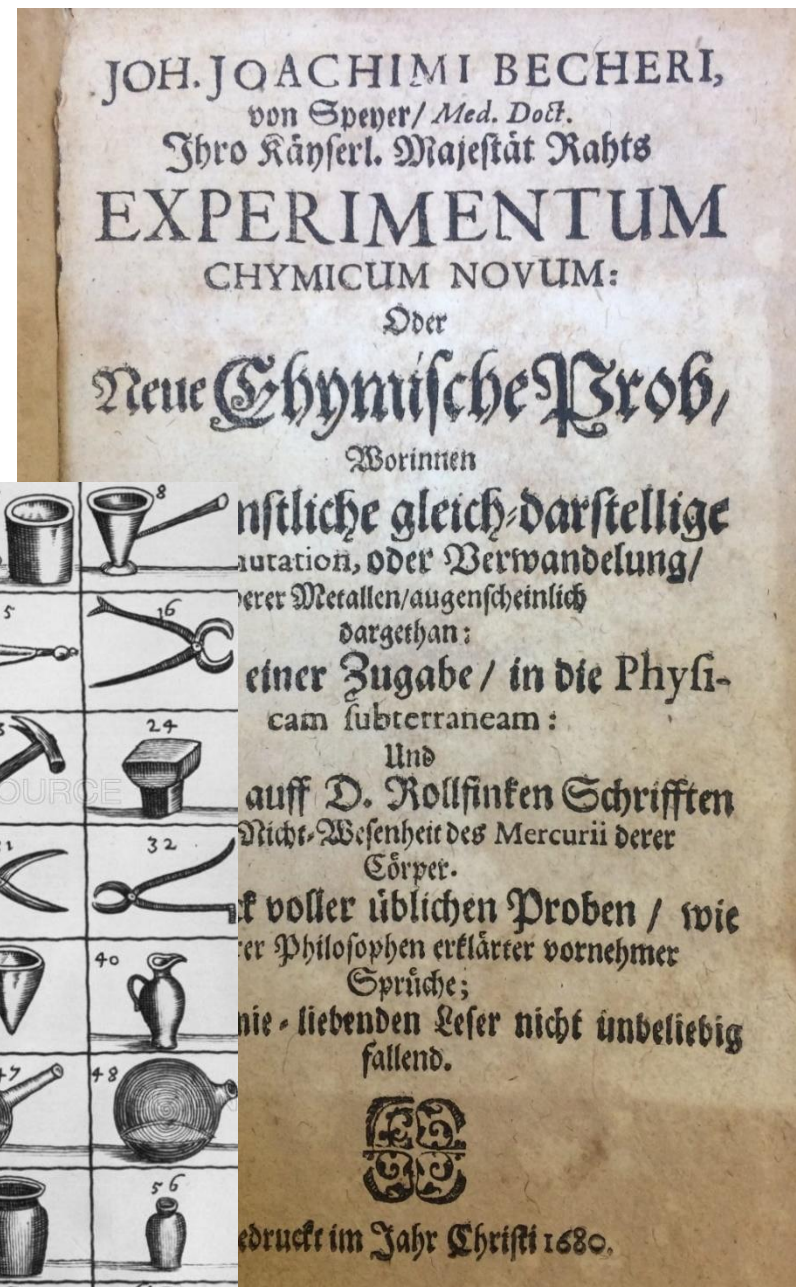
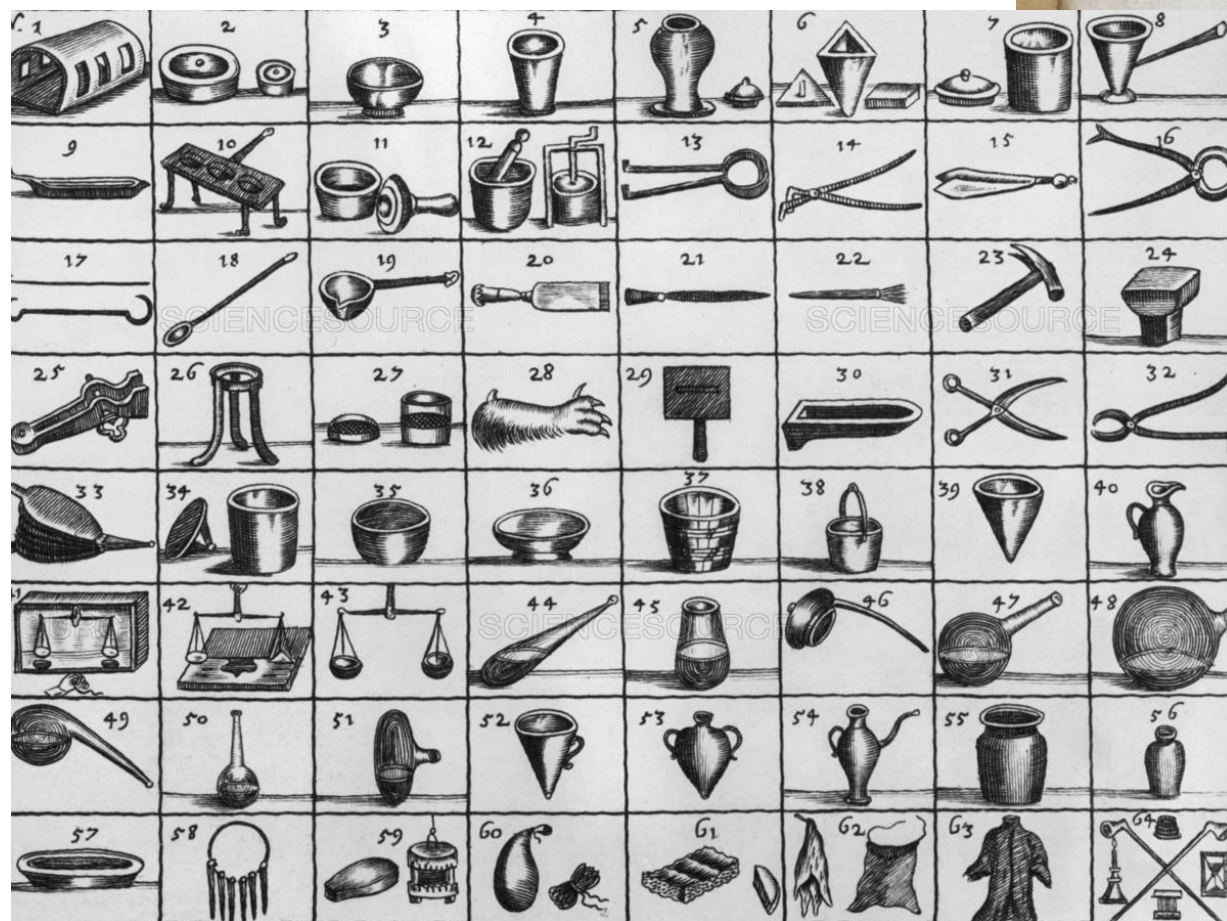


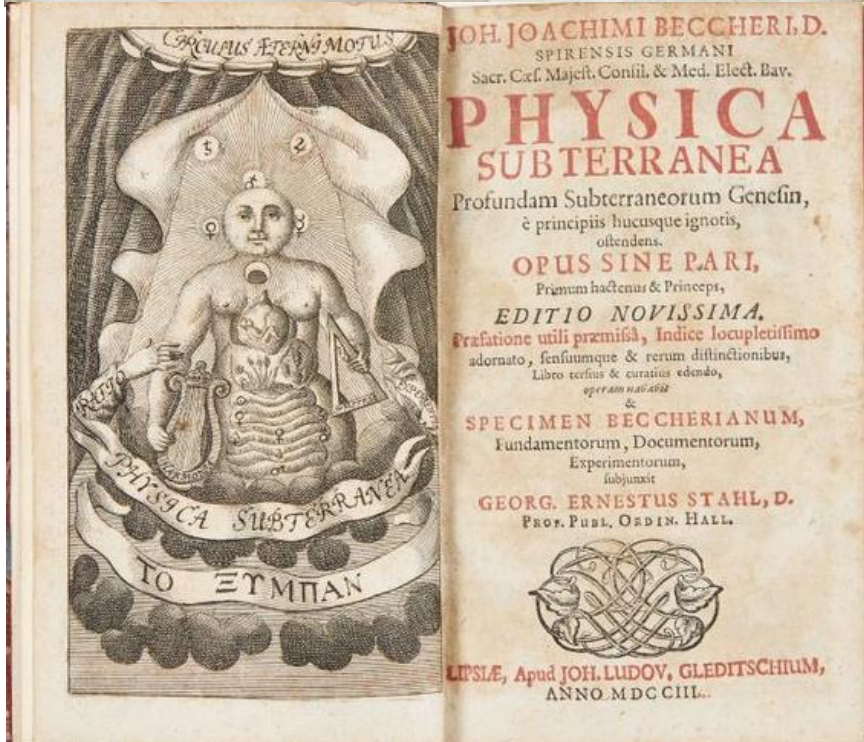
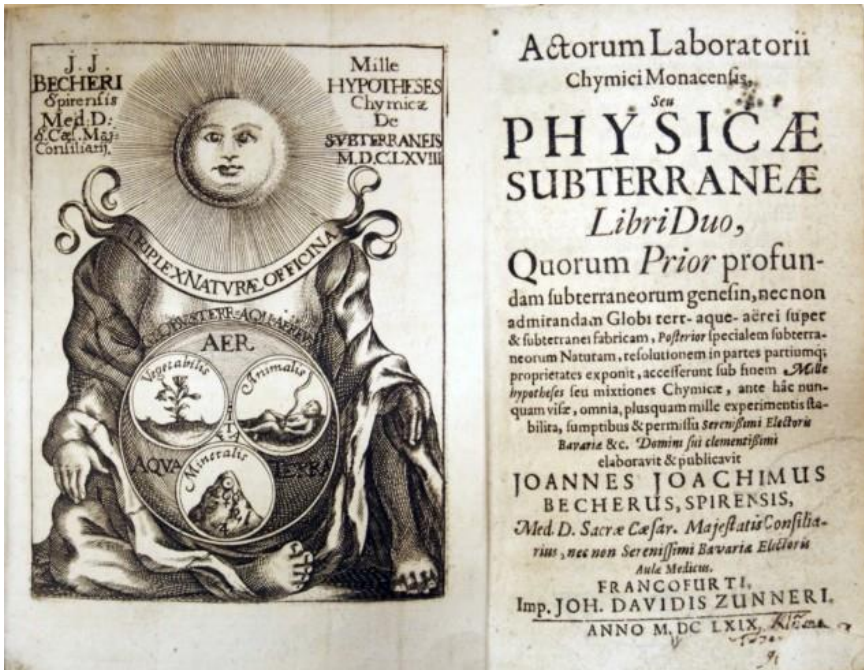
John Mayow (1641–1679)





Johann Joachim Becher (1635.–1682.)





~~Vatra~~
Voda
Zrak
Zemlja

terra lapidea



terra fluida seu
mercurialis

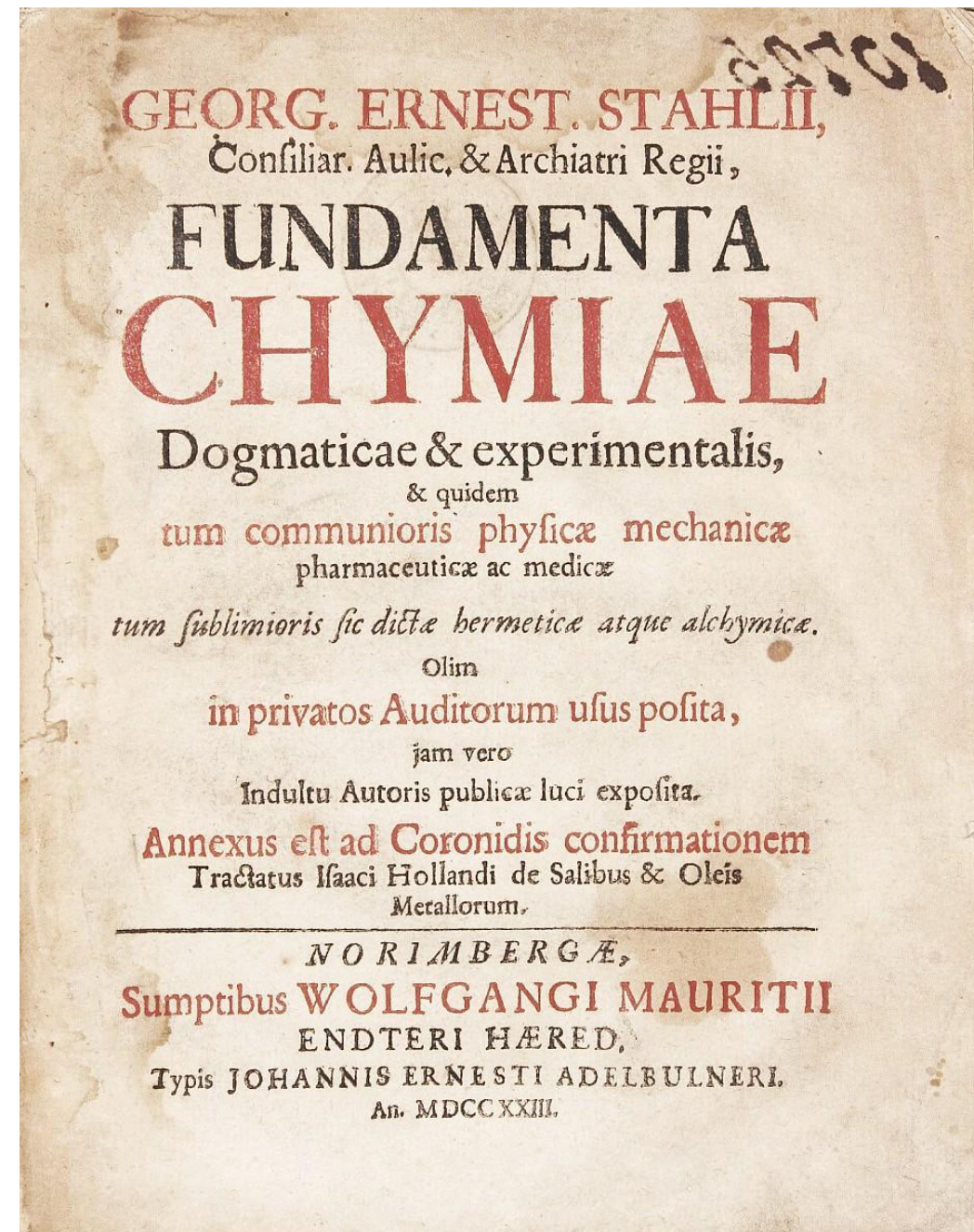
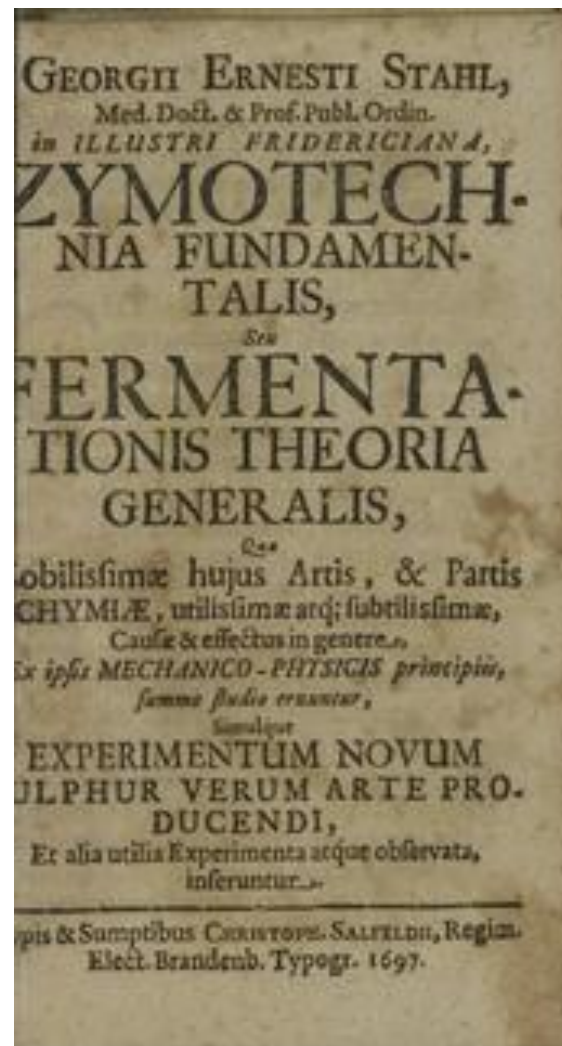


terra pinguis

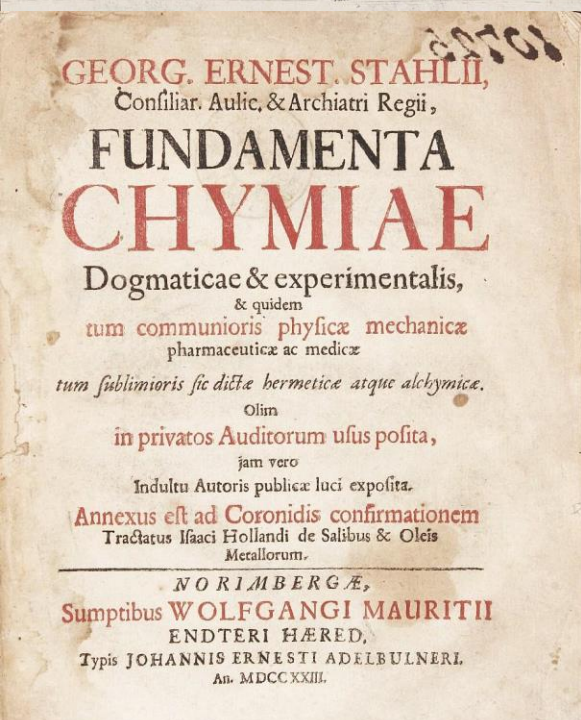




Georg Ernst Stahl (1659.–1734.)



φλογιστόν = *materia & principium ignis, non ipse ignis*



1697: *terra pinguis* → *φλογιστόν* = 'tvar i počelo vatre, ali ne sâma vatra'

Flogistonska teorija:

Sve zapaljive tvari sadrže **flogiston**, koji se prilikom gorenja oslobađa

On je osnova boje (npr. sumpora ili ugljena), sjaja (npr. pirita i galenita) i kovkosti (u metala) – kada tvari izgube svoj **flogiston**, izgube i ta svojstva

Tvari bogate **flogistonom** mogu ga predati drugim tvarima, tvari siromašne **flogistonom** mogu **flogiston** izvlačiti iz drugih tvari

D. JOHANNIS HENRICI POTT

Prof. Chym. und Mitglied der Königl. Academie der Wissenschaften

Chymische Untersuchungen

Welche fürnehmlich

von der

LITHOGEOSIA

oder

Erkenntniß und Bearbeitung der gemeinen einfachen Steine und Erden

Ingleichen

Von Feuer und Licht

handeln.



Potsdam,

By Christian Friedrich Voss.

1746.

Johann Heinrich Pott
(1692.-1777.)

1. Flogiston je sadržan u gorivim tvarima, ali se ne može izolirati.
2. Gorenjem izlazi iz tijela
3. Razlog zašto dovodi do širenja tijela je nepoznat, ali nije slučajan: proporcionalno je kompaktnosti teksture tijela ili čvrstoći njihove konstitucije.
4. Porast težine prilikom kalcinacije pokazuje se tek nakon duljeg vremena i to ili zbog toga što čestice tijela postaju kompaktnije čime se smanjuje volumen i raste gustoća (kao što je slučaj kod olova) ili se teške čestice iz zraka uvuku u tvar (kao što je slučaj kod cinkovog oksida)
5. Zrak privlači flogiston iz tijela
6. Jednom pokrenut, flogiston je glavni aktivni princip u prirodi svih neživih tijela
7. Uzrok je boje i svih svojstava metala
8. Glavni je pokretač fermentacije

U potrazi za flogistonom (φ)

Stahl:

Flogiston = 'suha tvar zemljaste naravi koja se nikad ne nalazi u čistom stanju'

sumpor $\rightarrow$ sumporna kiselina + φ

sumporna kiselina + potaša $\rightarrow$ fiksirana sumporna kiselina

fiksirana sumporna kiselina + φ (ugljen) $\rightarrow$ sumpor

sumpor = (sumporna kiselina + φ)

metal $\rightarrow$ vapno + φ

vapno + φ (ugljen) $\rightarrow$ metal

metal = (vapno + φ)

Rouelle:

Flogiston = tvar bez težine, kada napušta tvari uzrokuje 'zgušnjavanje'

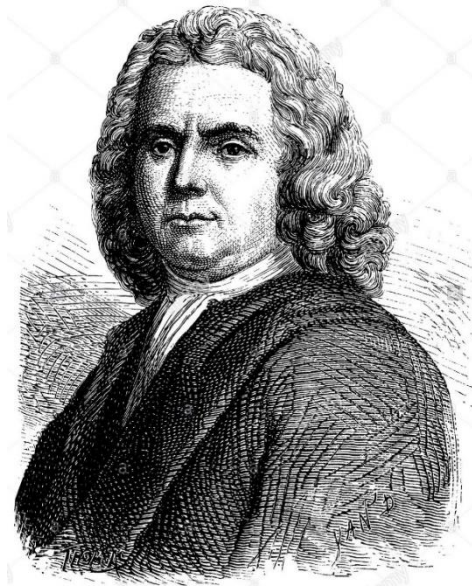
Bošković:

Težina (masa) se povećava gubitkom flogistona $\rightarrow$ flogiston mora imati negativni težinu (masu)!

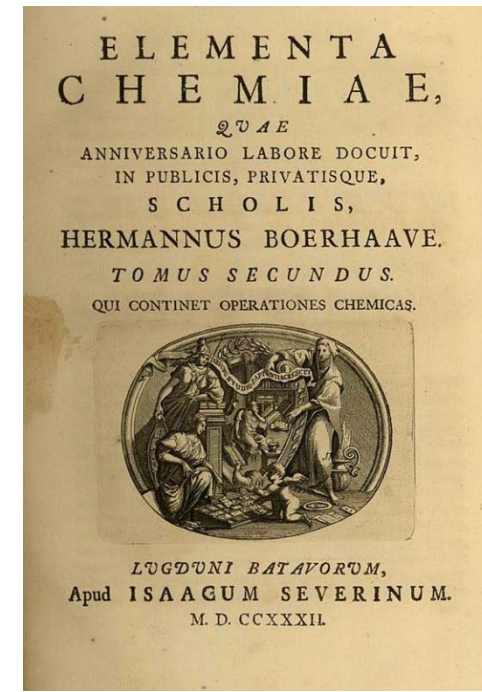


sal acidum

Friedrich Hoffmann (1660.–1742.)



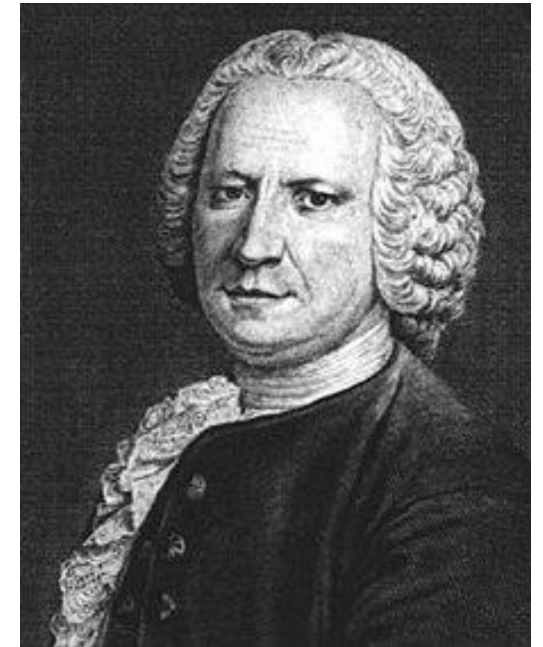
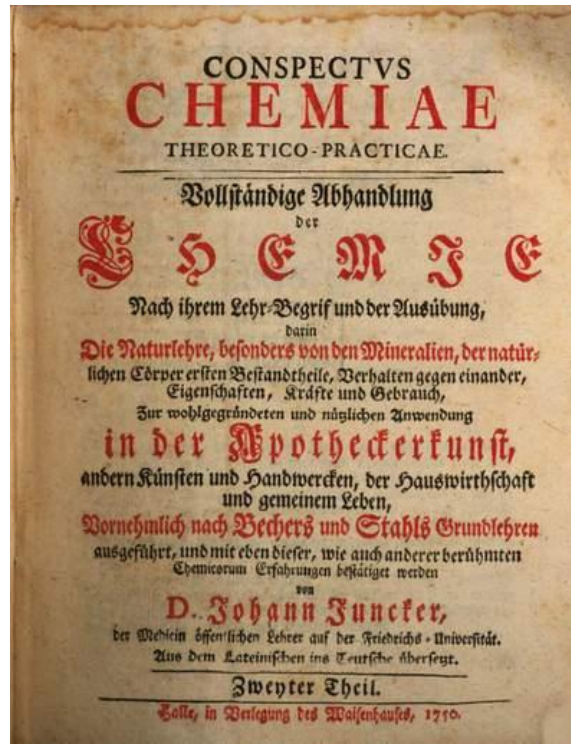
Herman Boerhaave (1668. –1738.)



pabulum ignis



Johann Juncker (1679.–1759.)



Guillaume François Rouelle (1703.–1770.)

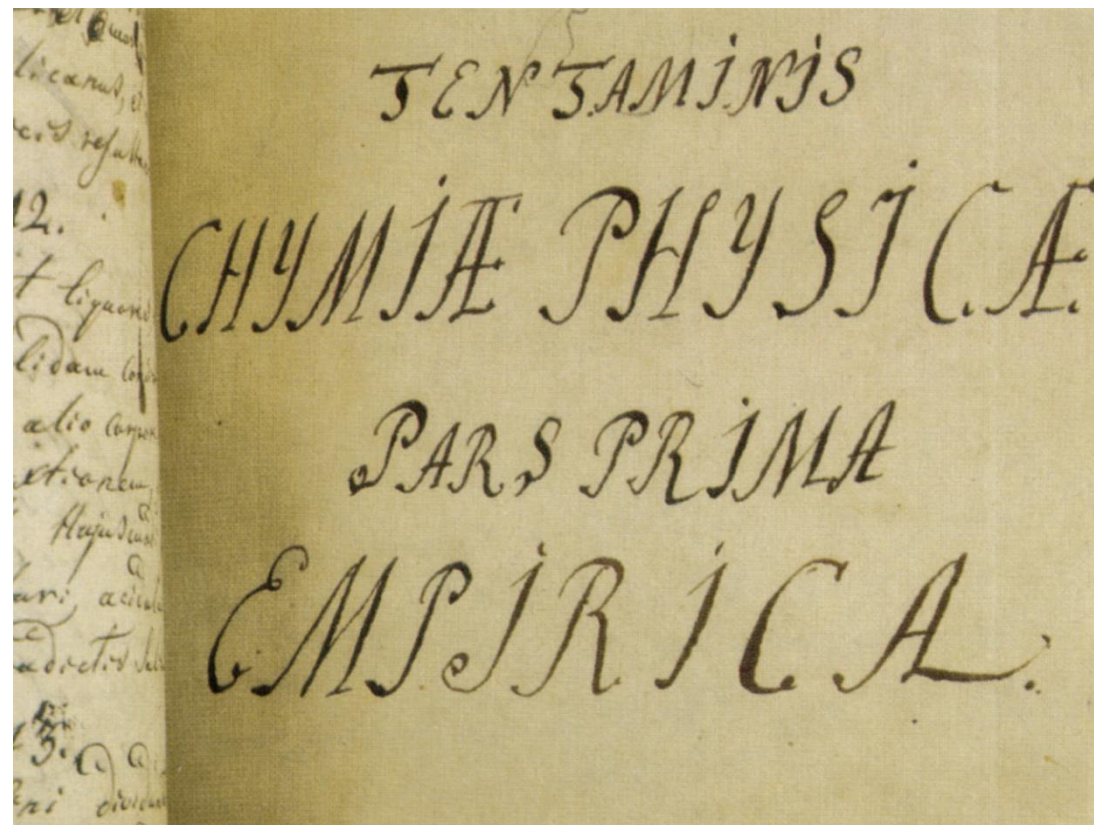


Миха́йл Васи́льевич Ломоно́сов,
(1711. –1765.)

ПЕРВЫЯ ОСНОВАНІЯ
МЕТАЛЛУРГІИ,
ИЛИ
РУДНЫХЪ ДѢЛЪ.



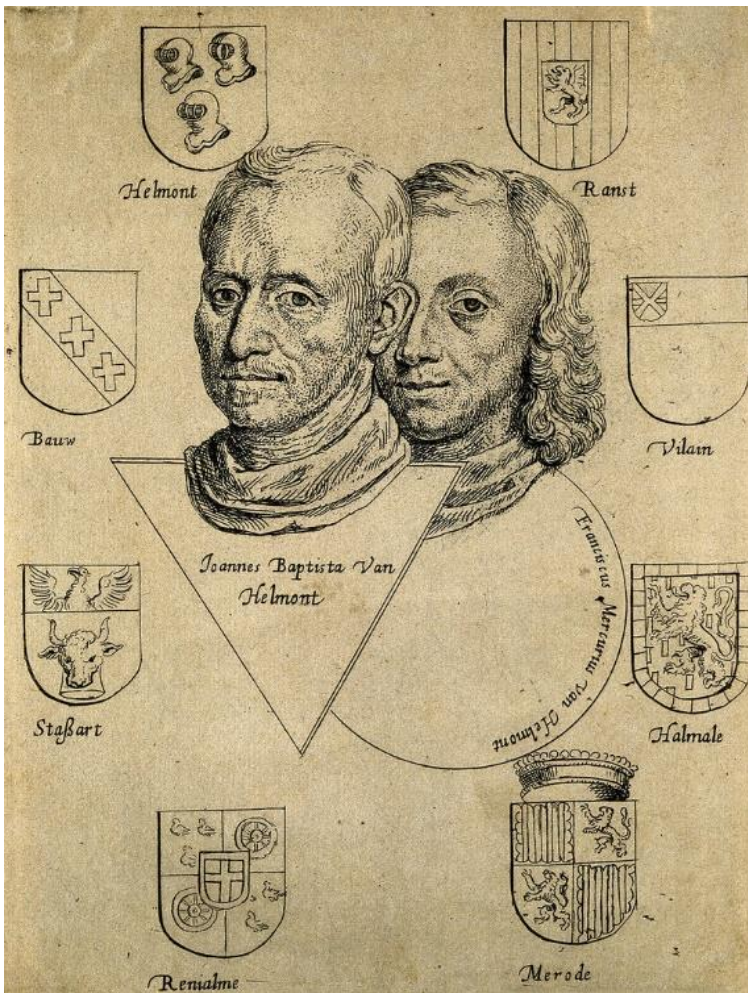
ВЪ САНКТПЕТЕРБУРГѢ
печатаемы при Императорской Академіи
Наукъ 1763 года.



Prodromus ad veram Chimiā Physicā, 1752.

5.

pneumatska kemija



van Helmont, *Gas sylvestre*

gas od χάος [ili *gahst* / *geist* = duh; ili *Gäsch* = pjena (uslijed vrenja)]

I call this Spirit, unknown hitherto, by the new name of Gas, which can neither be constrained by Vessels, nor reduced into a visible body, unless the feed being first extinguished. But Bodies do contain this Spirit, and do sometimes wholly depart into such a Spirit, not indeed, because it is actually in those very bodies (for truly it could not be detained, yea the whole composed body should I lie away at once) but it is a Spirit grown together, coagulated after the manner of a body, and is stirred up by an attained ferment, as in Wine, the juyce of unripe Grapes, bread, hydromel or water and Honey.

Oriatrike: Or, Physick Refined, prev. J. Chandler (1662.)

NEW
EXPERIMENTS
PHYSICO-MECHANICAL,

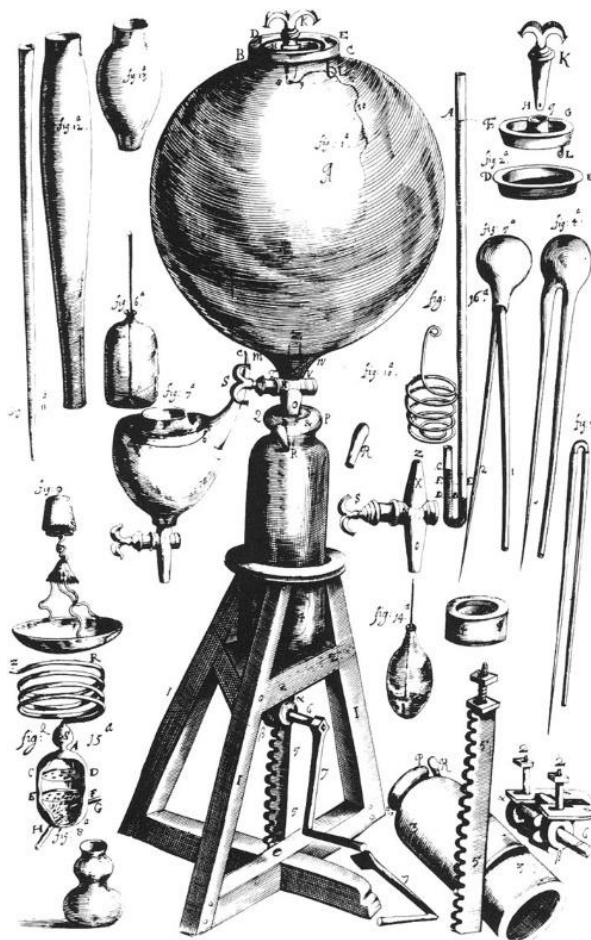
Touching
The SPRING of the AIR, and its EFFECTS,
(Made, for the most part, in a New
Pneumatical Engine)

Written by way of LETTER
To the Right Honorable CHARLES Lord
Vicount of DUNGARVAN,
Eldest Son to the EARL of CORKE.

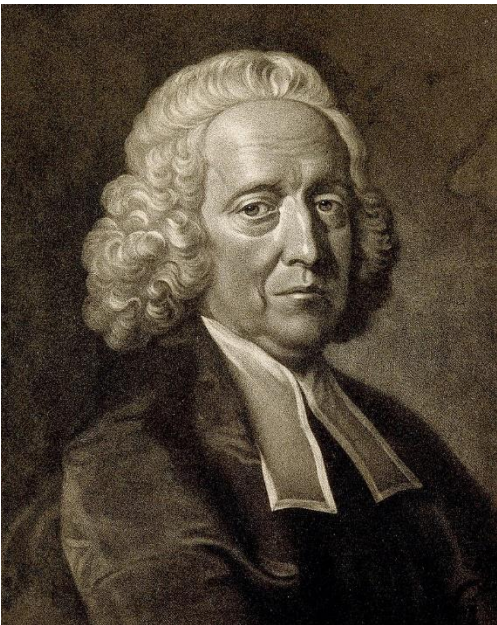
By the Honorable Robert Boyle Esq;



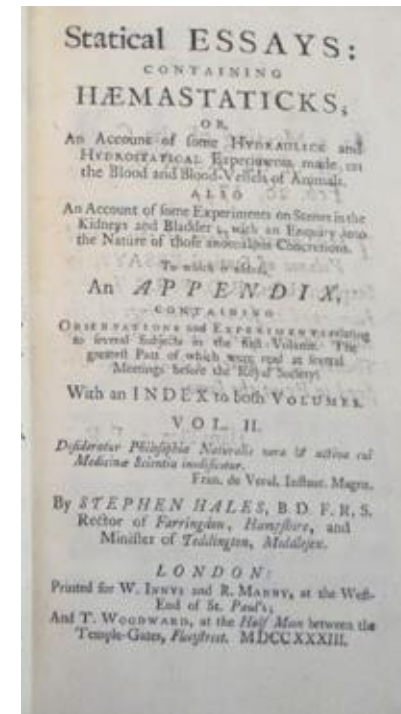
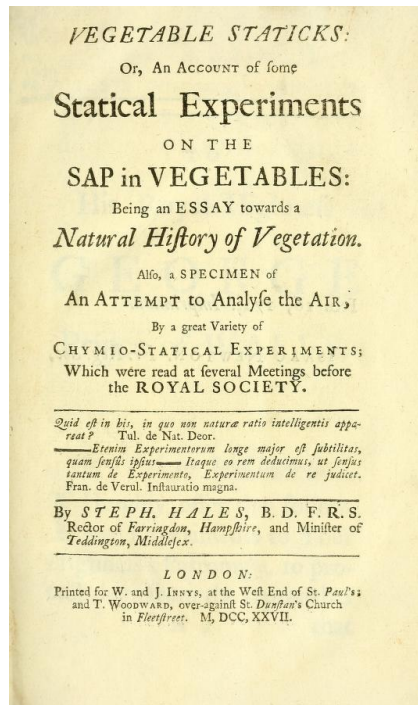
OXFORD: Printed by H. Hall, Printer to the University,
for Tho: Robinson. 1662.



Robert Hooke (1635.–1703.)



Stephen Hales (1677.–1761.)

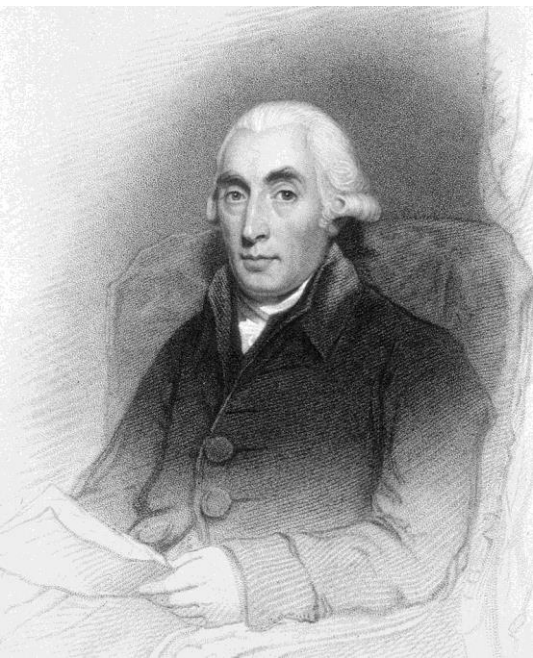


„...plants very probably draw through their leaves some part of their nourishment from the air..”

„... air freely enters plants, not only with the principal fund of nourishment by the roots, but also thro' the surface of their trunks and leaves...”

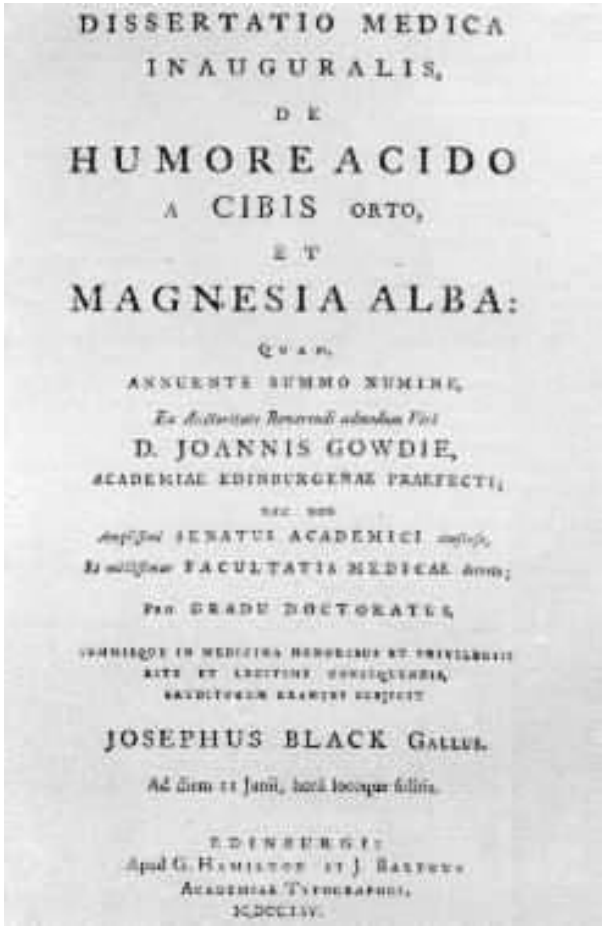
*Green Teddington's serene retreat
For Philosophic studies meet,
Where the good Pastor Stephen Hales
Weighed moisture in a pair of scales,
To lingering death put Mares and Dogs,
And stripped the Skins from living Frogs,
Nature, he loved, her Works intent
To search or sometimes to torment.*

Thomas Twining (1735.–1804.)



Joseph Black (1728.–1799.)

'fixed air'



DIRECTIONS FOR IMPREGNATING WATER

WITH
FIXED AIR;

In order to communicate to it the peculiar Spirit
and Virtues of

Pymont Water,

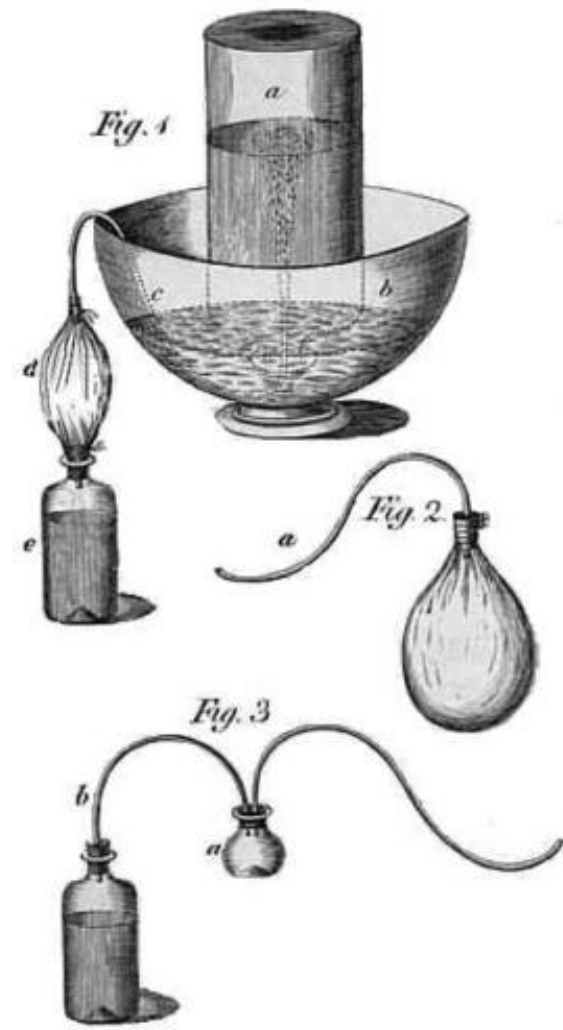
And other Mineral Waters of a similar
Nature.

By JOSEPH PRIESTLEY, LL.D. F. R. S.

L O N D O N :

Printed for J. JOHNSON, No. 72, in St. Paul's
Church-Yard. 1772.

[Price ONE SHILLING.]





H. Cavendish

Henry Cavendish (1731.–1810.)

Received May 12, 1766

XIX. *Three Papers, containing Experiments on factitious Air, by the Hon. Henry Cavendish, F.R.S.*

Read May 29, Nov. 6 and Nov. 13, 1766

By factitious air, I mean in general any kind of air which is contained in other bodies in an unelastic state, and is produced from thence by art.

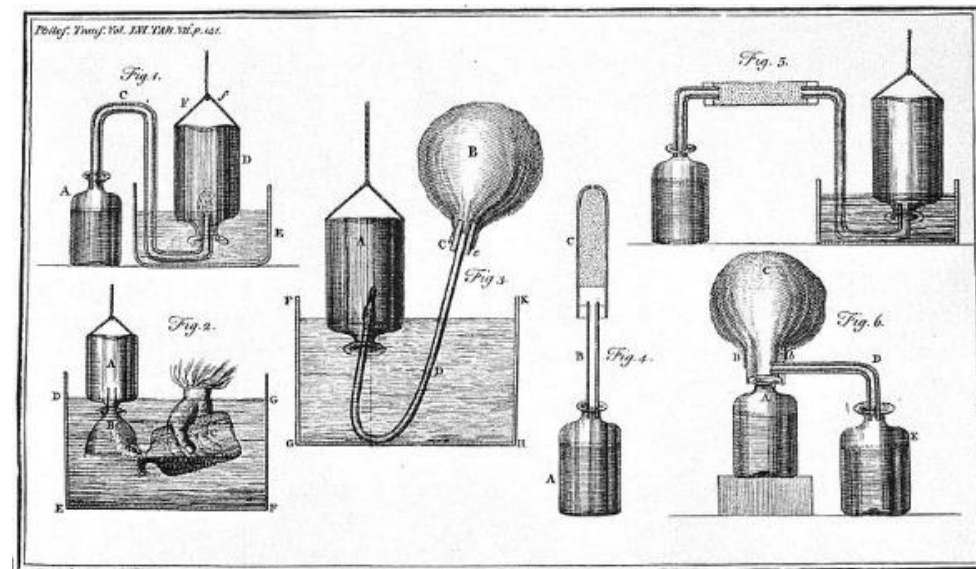
By fixed air, I mean that particular species of factitious air, which is separated from alkaline substances by solution in acids or by calcination; and to which Dr. Black has given that name in his treatise on quicklime.

As fixed air makes a considerable part of the subject of the following papers; and as the name might incline one to think, that it signified any sort of air which is contained in other bodies in an unelastic form; I thought it best to give this explanation before I went any farther.

Before I proceed to the experiments themselves, it will be proper to mention the principal methods used in making them.

In order to fill a bottle with the air discharged from metals or alkaline substances by solution in acids, or from animal or vegetable substances by fermentation, I make use of the contrivance represented in TAB. VII. Fig. 1. where A represents the bottle, in which the materials for producing air are placed; having a bent glass tube C ground into it, in the manner of a stopper. E represents a vessel of water. D the bottle to receive the air, which is first filled with water, and then inverted into the vessel of water, over the end of the bent tube. Ff represents the string, by which the bottle is suspended. When I would measure the quantity of air, which is produced by any of these substances, I commonly do it by receiving the air in a bottle, which has divisions marked on its sides with a diamond, shewing the weight of water, which it requires to fill the bottle up to those divisions: but sometimes I do it by making a mark on the side of the bottle in which I have received the air, answering to the surface of the water therein; and then, setting the [bottle] upright, find how much water it requires to fill it up to that mark.

In order to transfer the air out of one bottle into another, the simplest way, and that which I have oftenest made use of, is that represented in



Flogiston pronadjen?

1766: Cavendish

Reakcija razrijeđenih kiselina s metalima (željezo, kositar, cink) proizvodi vrlo lagan i jako zapaljiv 'zrak' – ***Zapaljivi zrak iz kovinâ***

metal + kiselina $\rightarrow$ sol + *zapaljivi zrak*

metal $\rightarrow$ vapno + φ

(vapno + φ) + kiselina $\rightarrow$ (vapno + kiselina) + φ

vapno + kiselina $\rightarrow$ sol

Zapaljivi zrak = φ

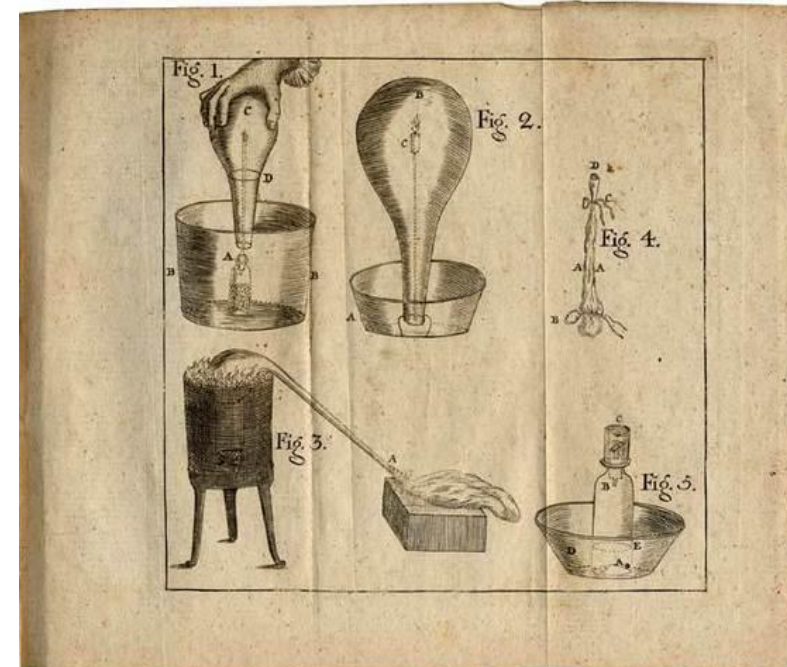
metal = (vapno + φ)

sol = (vapno + kiselina)

„...phlogiston [from metals] flies off, without having its nature changes by the acid, and forms inflammable air.”



Carl Wilhelm Scheele (1742.–1786.)





oko 1765.–1773: pokusi sa izgaranjem

*‘Zrak se sastoji od dva fluida različita jedan od drugoga, jedan u opće ne pokazuje sklonost privlačenja flogistona (**Pokvareni zrak**), dok je drugi (**Vatreni zrak**), koji čini između 1/3 i 1/4 ukupne količine zraka, izrazito sklon takovom privlačenju.’*

metal + *Vatreni zrak* → vapno + toplina

(vapno + φ) + *Vatreni zrak* → vapno + toplina

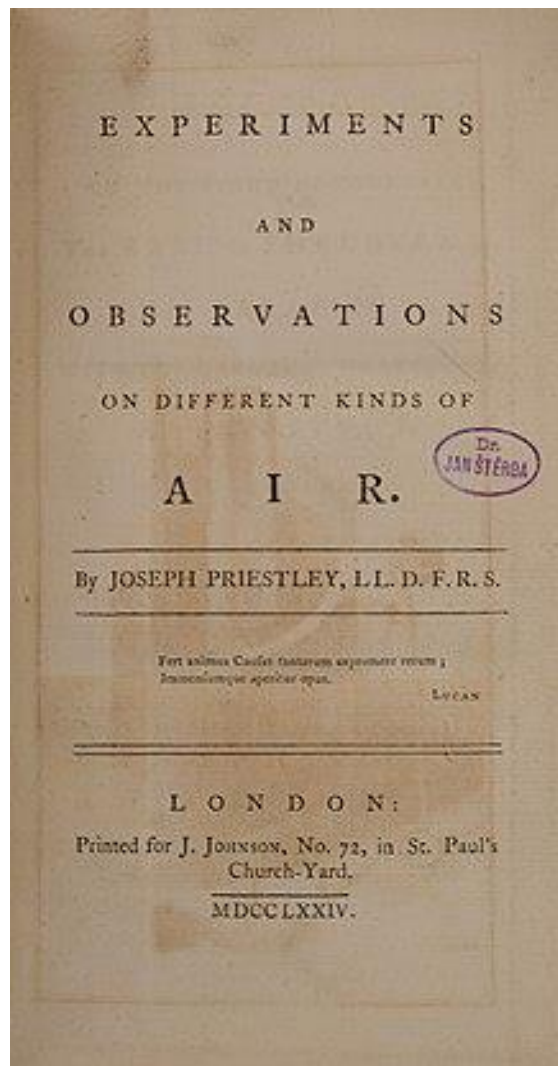
Vatreni zrak + φ = toplina

Dokaz – ‘sinteza’ Vatrenog zraka:

toplina + salitra → ***Vatreni zrak*** + (salitra + φ)



Joseph Priestley (1733.–1804.)



J. Priestly, *Experiments and Observations on Different Kinds of Air* (6 svezaka, 1774.–86.)

**DIRECTIONS
FOR
IMPREGNATING WATER
WITH
FIXED AIR;**

In order to communicate to it the peculiar Spirit
and Virtues of

Pymont Water,

And other Mineral Waters of a similar
Nature.

By JOSEPH PRIESTLEY, LL. D. F. R. S.

L O N D O N :

Printed for J. JOHNSON, No. 72, in St. Paul's
Church-Yard. 1772.

[Price ONE SHILLING.]

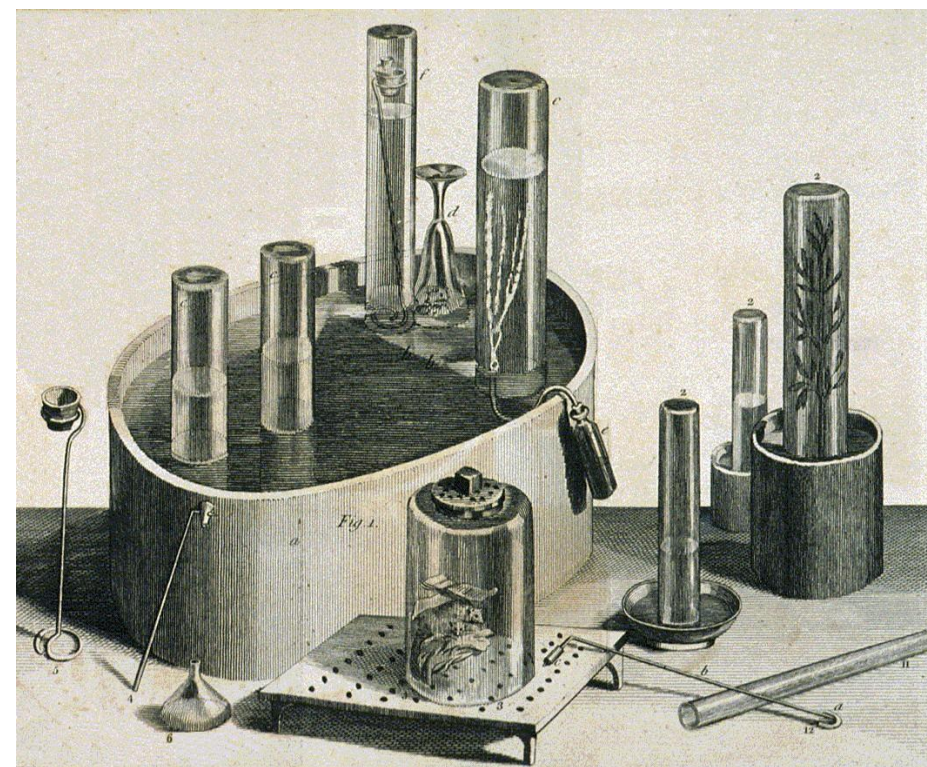


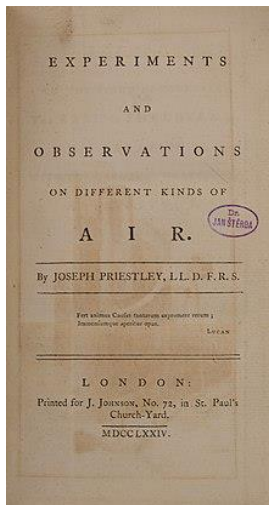
1774: '[...] on the 1st August, 1774, I endeavoured to extract air from mercurius calcinatus per se; and I presently found that, [...] air was expelled very readily. [...] what surprized me more than I can express was, that a candle burned in this air with a remarkably vigorous flame... I was utterly at a loss how to account for it.'

živa (+ zrak) – φ → *mercurius calcinatus per se*

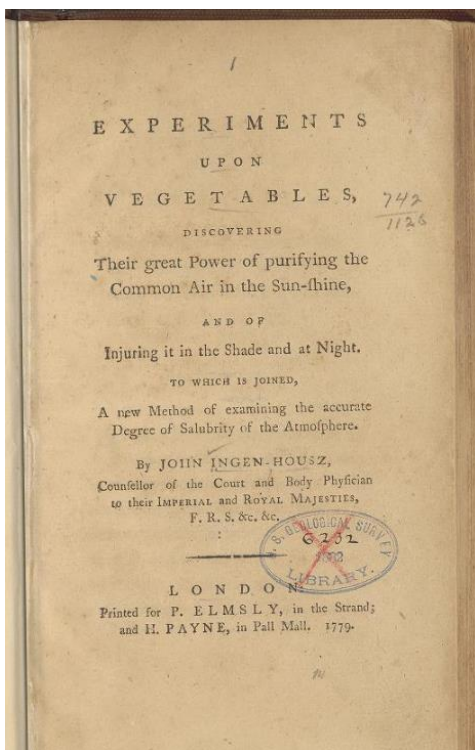
mercurius calcinatus per se → živa + **deflogistonirani zrak**

Deflogistonirani zrak = zrak – φ

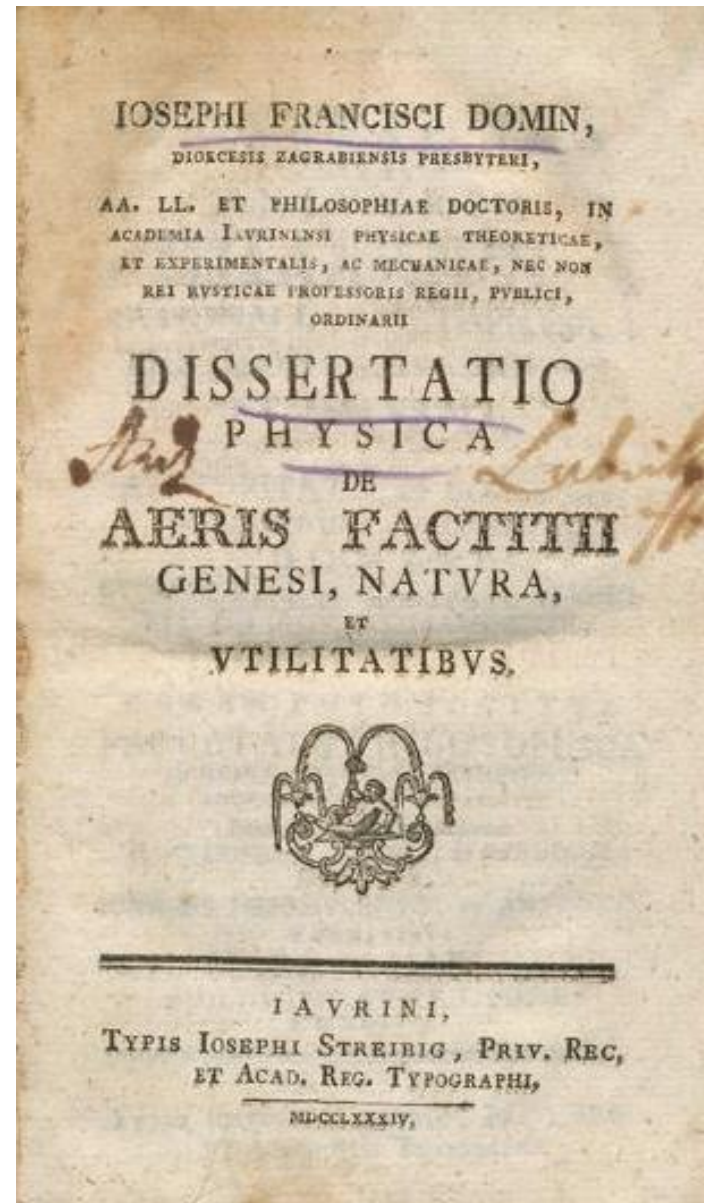




Jan (John) Ingenhousz (Ingen-Housz)
(1730.–1799.)



Biljke proizvode *deflogistonirani* zrak
ne pod utjecajem topline nego
svjetla.



Josip Franjo Domin (1754. – 1819.), *Fizikalna rasprava o postanku, naravi i koristi umjetnog zraka*, Győr, 1784.

THE
R U D I M E N T S
OF
ENGLISH GRAMMAR;

ADAPTED TO THE
USE of SCHOOLS.
WITH
OBSERVATIONS on STYLE.

By JOSEPH PRIESTLEY.

L O N D O N :
Printed for R. GRIFFITHS, in the Strand.
M.DCC.LXI.

I N S T I T U T E S
OF
NATURAL AND REVEALED
R E L I G I O N.
IN TWO VOLUMES.

TO WHICH IS PREFIXED,
An ESSAY on the best Method of communicating religious
Knowledge to the Members of Christian Societies.

By JOSEPH PRIESTLEY, LL.D. F.R.S.

THE SECOND EDITION:

V O L. I.

Wisdom is the principal Thing. SOLOMON.

B I R M I N G H A M,
PRINTED BY PEARSON AND ROLLASON, FOR J. JOHNSON,
NO. 72, ST. PAUL'S CHURCH-YARD, LONDON.
M DCC LXXXII.

A N
E S S A Y
ON THE
FIRST PRINCIPLES
OF
GOVERNMENT,
AND ON THE NATURE OF
Political, Civil, and Religious
L I B E R T Y,

INCLUDING
Remarks on Dr. BROWN's *Code of Education*,
AND ON
Dr. BALGUY's Sermon on CHURCH AUTHORITY.

The SECOND EDITION, corrected and enlarged,
By JOSEPH PRIESTLEY, LL.D. F.R.S.

L O N D O N :
Printed for J. DODSLEY, in Pall-Mall ; T. CADELL, (suc-
cessor to Mr. Millar) in the Strand ; and J. JOHNSON,
No. 72, in St. Paul's Church-Yard.
M D C C L X X I.



DOCTOR PHILOGISTON,
The PRIESTLEY politician or the
Political Priest.

