

AL-CHEMIA:
THE GREAT SECRET

*A History of Alchemy and
its Influence on Chemistry*

by David V. Black

and the

Chemistry Students at Walden School of Liberal Arts

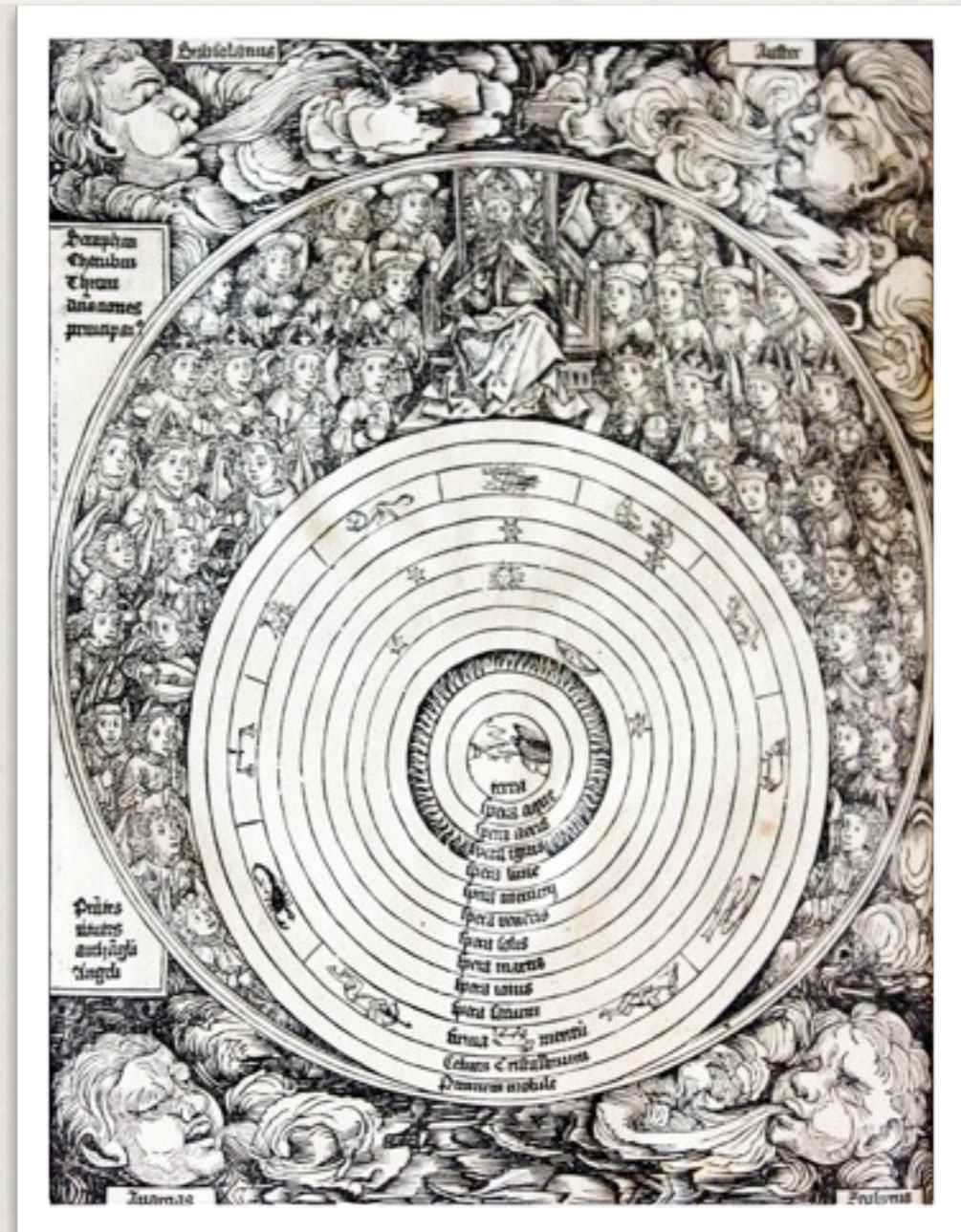
SOURCES



- ✦ *Many of the images in this presentation are photos taken by David V. Black as part of a Research Fellowship sponsored by the Société de Chimie Industrielle (American Section) at the Chemical Heritage Foundation in Philadelphia; Summer, 2009*
- ✦ *CHF has an extensive collection of books on alchemy and the history of chemistry; visit them at:
<http://www.chemheritage.org/>*

⊕ ORIGINS ⊕ F ALCHEMY

- ✦ *Aristotle's conception of the four terrestrial elements (Earth, Water, Air, and Fire):*
- ✦ *Metals can mature and transmute into each other*
- ✦ *Base metals such as lead will convert into gold*
- ✦ *Some substance (stone, tincture, or material) could be found to speed up the process: the Philosopher's Stone*



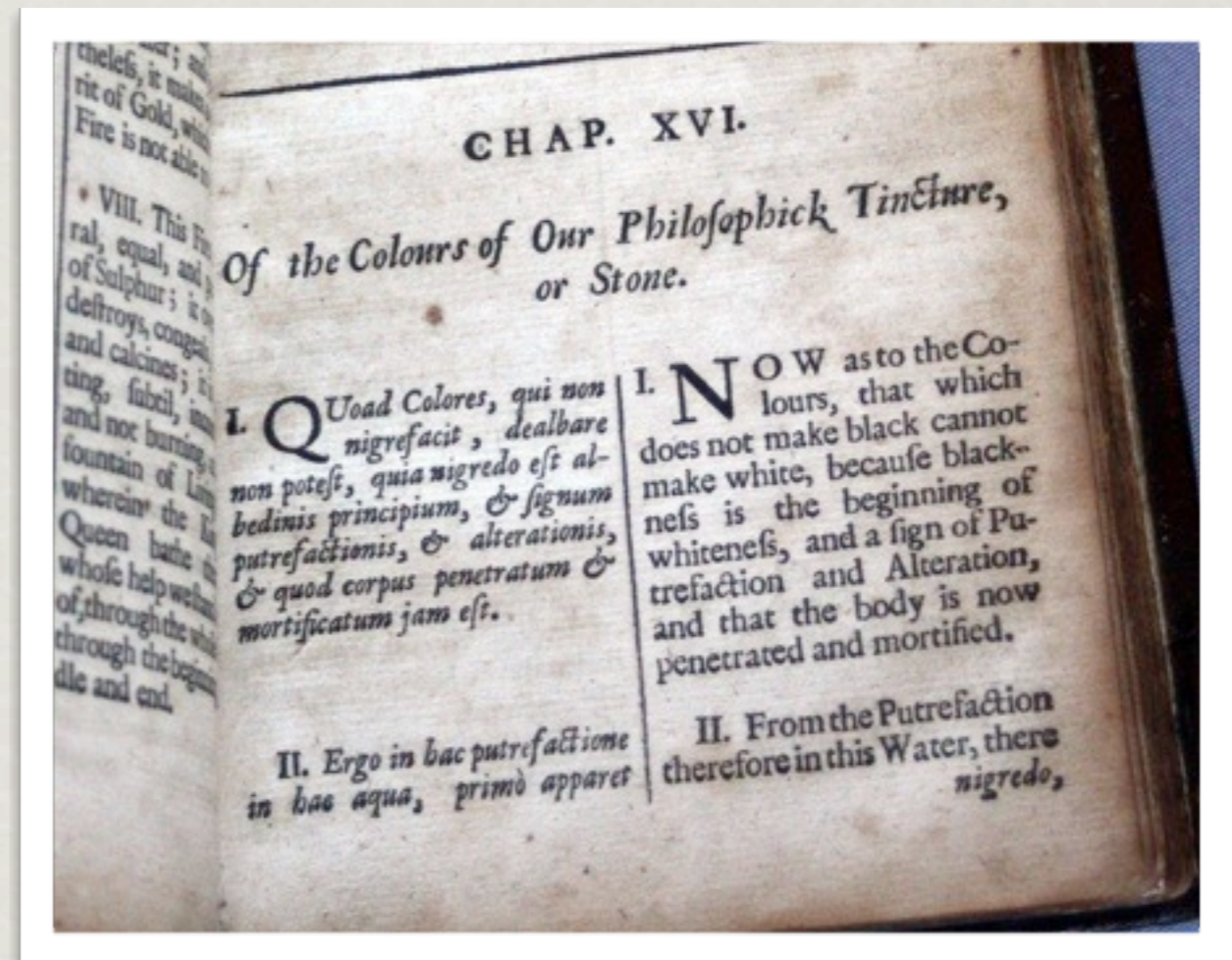
THE ELIXIR ⊕ LIFE



- ✦ *El-ixir: El = “The”; Xires = “Stone”; Elixir = “The Stone”*
- ✦ *Could produce a tincture, powder, ointment, or liquid that would provide immortality*
- ✦ *The Red Elixir produces gold, the White Elixir produces silver*

ALCHEMISTS' GOAL: TO FIND THE STONE

- ✿ *Many claimed to have made the Stone (or were later attributed with doing so)*
- ✿ *Some gave recipes or instructions*
- ✿ *Often couched in metaphorical and symbolic language to confuse the uninitiated*
- ✿ *Many alchemists were wealthy or had wealthy patrons*



ALCHEMISTS AS CØN ARTISTS



- ✦ *Leyden and Stockholm Papyrii show recipes for fake emeralds*
- ✦ *Earliest alchemical works had recipes for gold that couldn't work*
- ✦ *Alchemy surrounded by tradition of secrecy and deliberate obscurity*
- ✦ *Appeasing the patron: putting on a show to gain continued support*

HERMES TRIMEGISTOS



- ✦ *The Thrice-Majestic: Hermes, Thoth, and Mercury*
- ✦ *Legendary figure: Sometimes linked with Moses or Pharaoh*
- ✦ *Hermetic Art (Hermeticism) named for him*
- ✦ *Wrote **Divine Pymander** and the **Emerald Tablet***
- ✦ *Alchemy and magic are identical branches of the same tree*

MARIA THE JEWESS



- ✦ *Another legendary figure, believed to have lived somewhere between 1st and 3rd Centuries*
- ✦ *Said to have discovered hydrochloric acid*
- ✦ *Invented the kerotakis (tribikos), a type of retort*
- ✦ *Believed in the union of opposites: “Join the male and the female and you will find what is sought.”*

ZOSIMOS OF PANOPOLIS

- ✦ *Historical figure: from Panopolis in Upper Egypt, lived in Alexandria around 350 A.D.*
- ✦ *Influenced by Gnostic Christianity, Greek philosophy, Egyptian traditions*
- ✦ *Work translated into Arabic as the **Mushaf as-Suwar** or **Book of Pictures***



VISIONS OF ZOSIMOS

- ✦ *He related two alchemical dreams to his student and wife, Theosebeia*
- ✦ *The Priest of the Altar (Ion) chops Zosimos into four pieces (the elements) and grinds him to a powder (the tincture)*
- ✦ *In the second dream, the Homunculus (Brazen Man or Agathodaimon) dissolves Zosimos in a vat of liquid (the elixir); these indicate the inward transformation*
- ✦ *The Stone is represented by a blue (now green) and yellow symbol with the Water of Life pouring out*

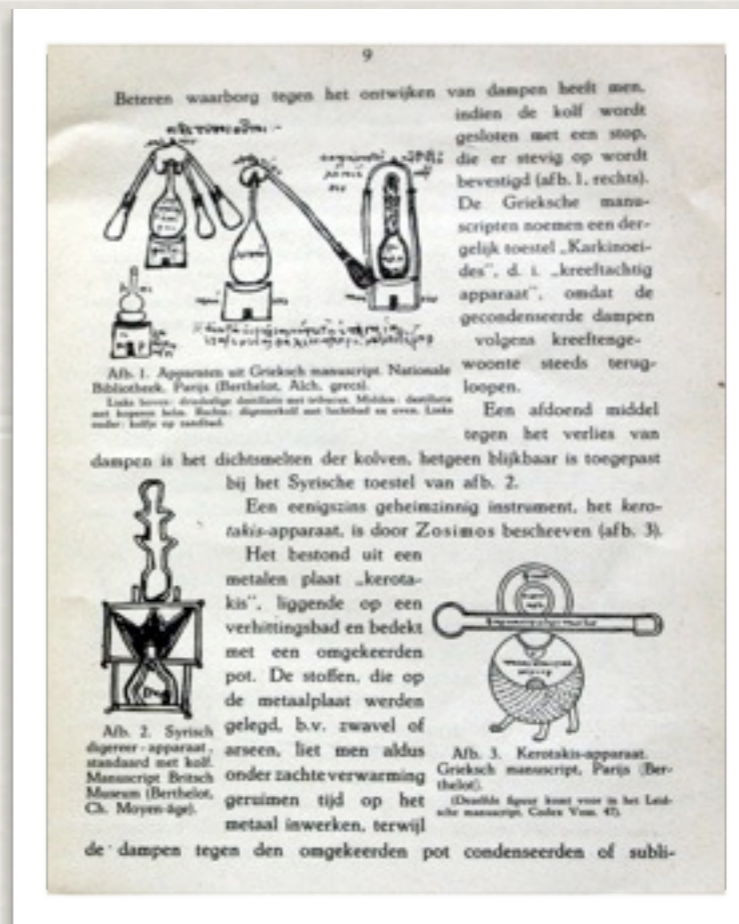


Figure 3: The dead man, with the sun on his head (no longer with a face), is Zosimos. The woman, with the moon on her head (and a face), who holds the dead body is the great or divine Theosebeia. She holds the spirit that separated from the dead body of Zosimos on a chain. Above the two there is a symbol of the stone of the sages, described in the text as consisting of two parts. The lower is described as sky blue, and the upper as yellow, and out of it pours the divine water (which also should be blue). This is the divine water that revives the dead body (see complete picture on fol. 171b and 172a).

☀ Symbols with faces above heads represent the **Other One**, or the perfected Zosimos and Theosebeia (sun and moon) as the red and white elixirs

☀ Illustrations show alchemical furnaces, retorts, and other apparatus already in use by the 4th Century

☀ Many of the common themes of alchemy (such as the inward and outward transmutations, the King and Queen [sun and moon] as elixirs, the Stone, and the uroboros) are all shown

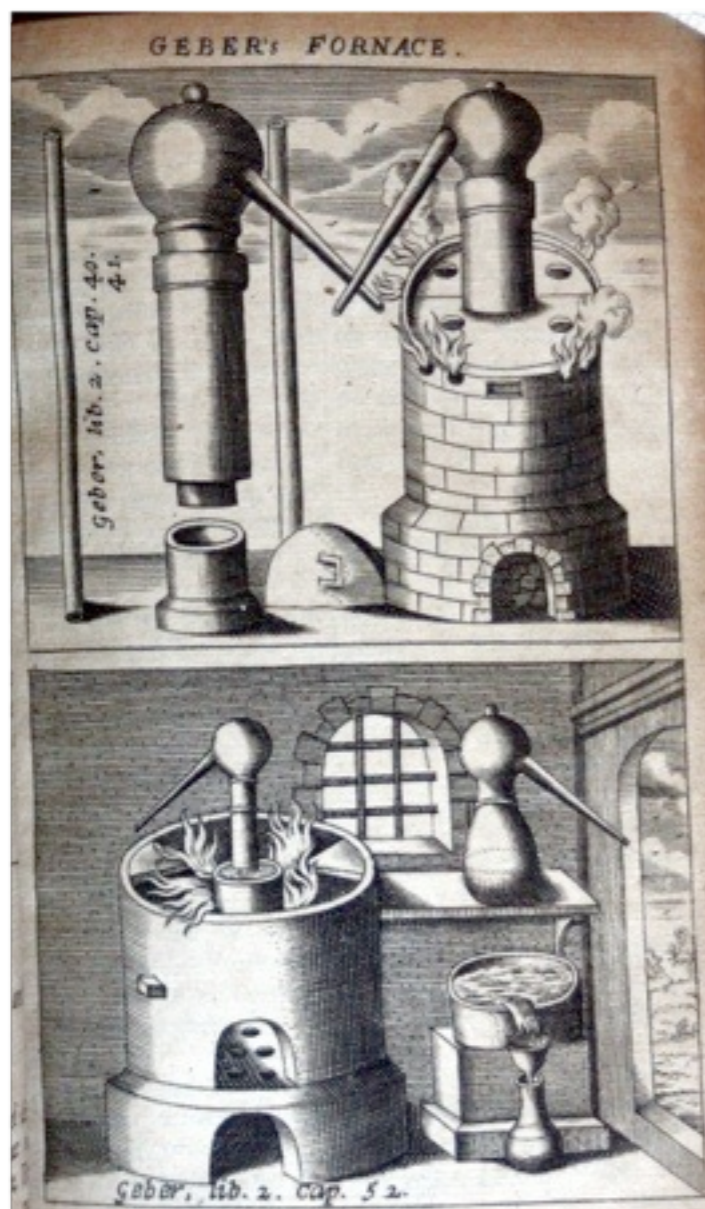


GEBER (JABIR IBN-HAYYAN)



- ✦ *Born in 721, was either Arab or Persian*
- ✦ *Known as first experimental chemist*
- ✦ *Invented distillation and discovered various acids and chemicals*
- ✦ *A prominent polymath: chemist, astronomer, engineer, philosopher, pharmacist, and physician*
- ✦ *Widely read in 10th Century Islamic world*

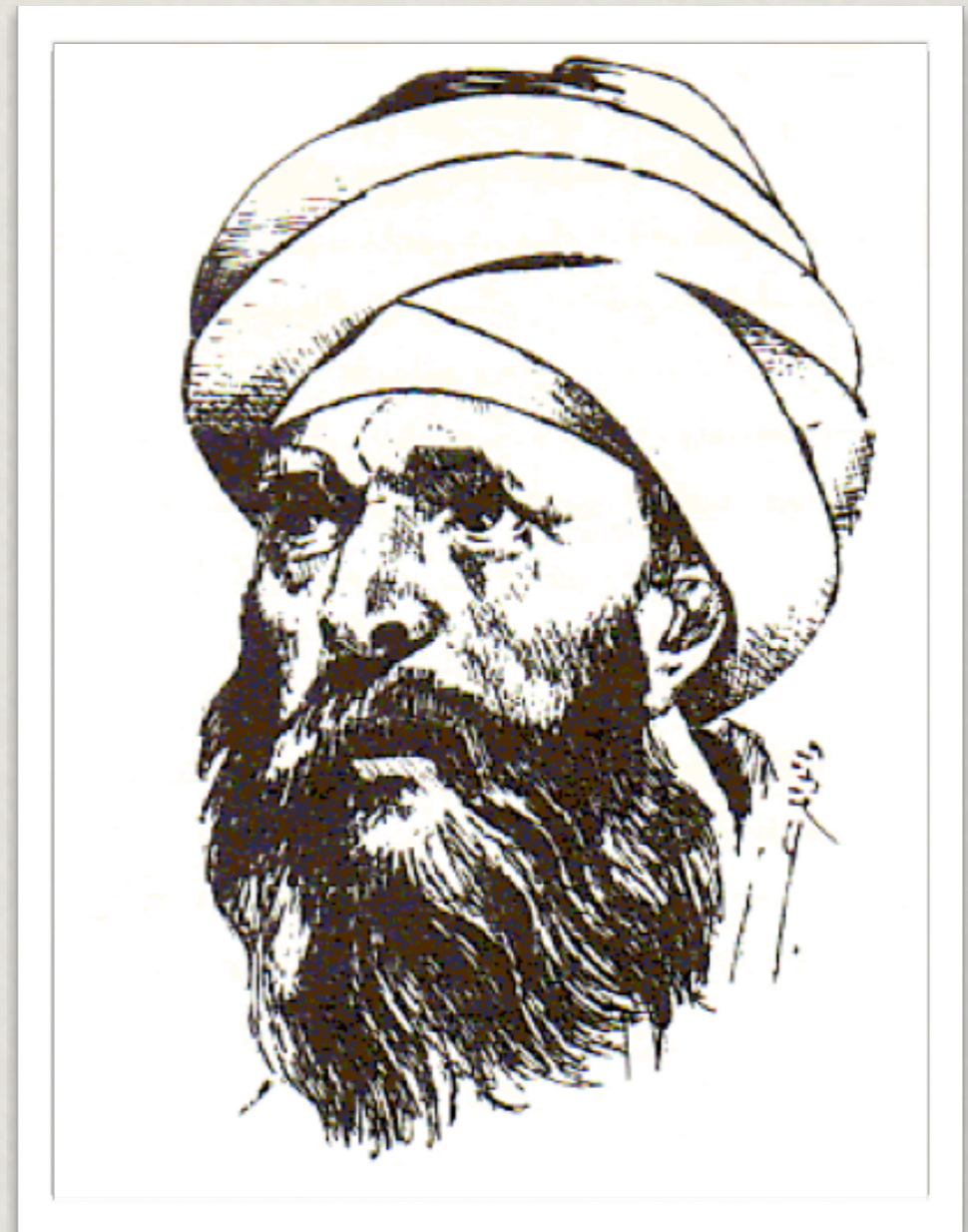
GEBER'S WORKS



- ✦ *Kitab al-Zuhra (Book of Venus) discusses alchemy*
- ✦ *“By rearranging the qualities of one metal, a different metal would result”*
- ✦ *Over 3000 works attributed to him*
- ✦ *Works are highly symbolic and numerologic; possible origin of word “gibberish”*
- ✦ *Historians claim many of his works were actually written by a later Pseudo-Geber*

AL GHAZALI

- ✦ *Lived 1058 to 1119*
- ✦ *Islamic theologian, philosopher, and cosmologist*
- ✦ *Revised Occasionalism: A theory of cause and effect and methodic doubt which is similar to modern scientific skepticism*



MORIENUS



- ✦ *Born in Rome in 12th Century*
- ✦ *Lived in Alexandria and learned how to create the Stone*
- ✦ *Lived as a hermit near Jerusalem*
- ✦ *Summoned to the Sultan Khalid to show him how to create the Stone; **Liber de Compositione Alchemiae** records their conversation*

ALBERTUS MAGNUS

- ✦ *Born somewhere between 1190 and 1210*
- ✦ *Educated at University of Padua, accepted into Dominican Order*
- ✦ *Wrote on theology, metaphysics, and logic; a number of alchemical works attributed to him but uncertain*
- ✦ *Teacher of St. Thomas Aquinas*
- ✦ *Wrote **De Mineralibus** (On Minerals) in which he commented on Aristotle and talked about the power of stones*
- ✦ *Credited with discovering arsenic*



ARNOLD OF VILLANOVA



- ✦ *Lived about 1240 to 1310*
- ✦ *Studied at Sorbonne in Paris*
- ✦ *Physician to Pope Clement V*
- ✦ *Created an anesthesia*
- ✦ *Claimed to have made the Stone*
- ✦ *Wrote **Rosarium**, **Philosophorum**, **Speculam**, **Alchemiae**, **Scientia Scientiae**, **The Alchemy**, and others*

ROGER BACON

- ✦ *13th Century English friar*
- ✦ *Attended Oxford and concentrated on mathematics and science*
- ✦ *Developed the ideal formula for gunpowder based on Chinese descriptions*
- ✦ *Knew his discovery was dangerous, so he wrote the recipe as a cipher (anagram)*
- ✦ *Arrested several times*
- ✦ *Supposedly created a talking brass head and other marvels*

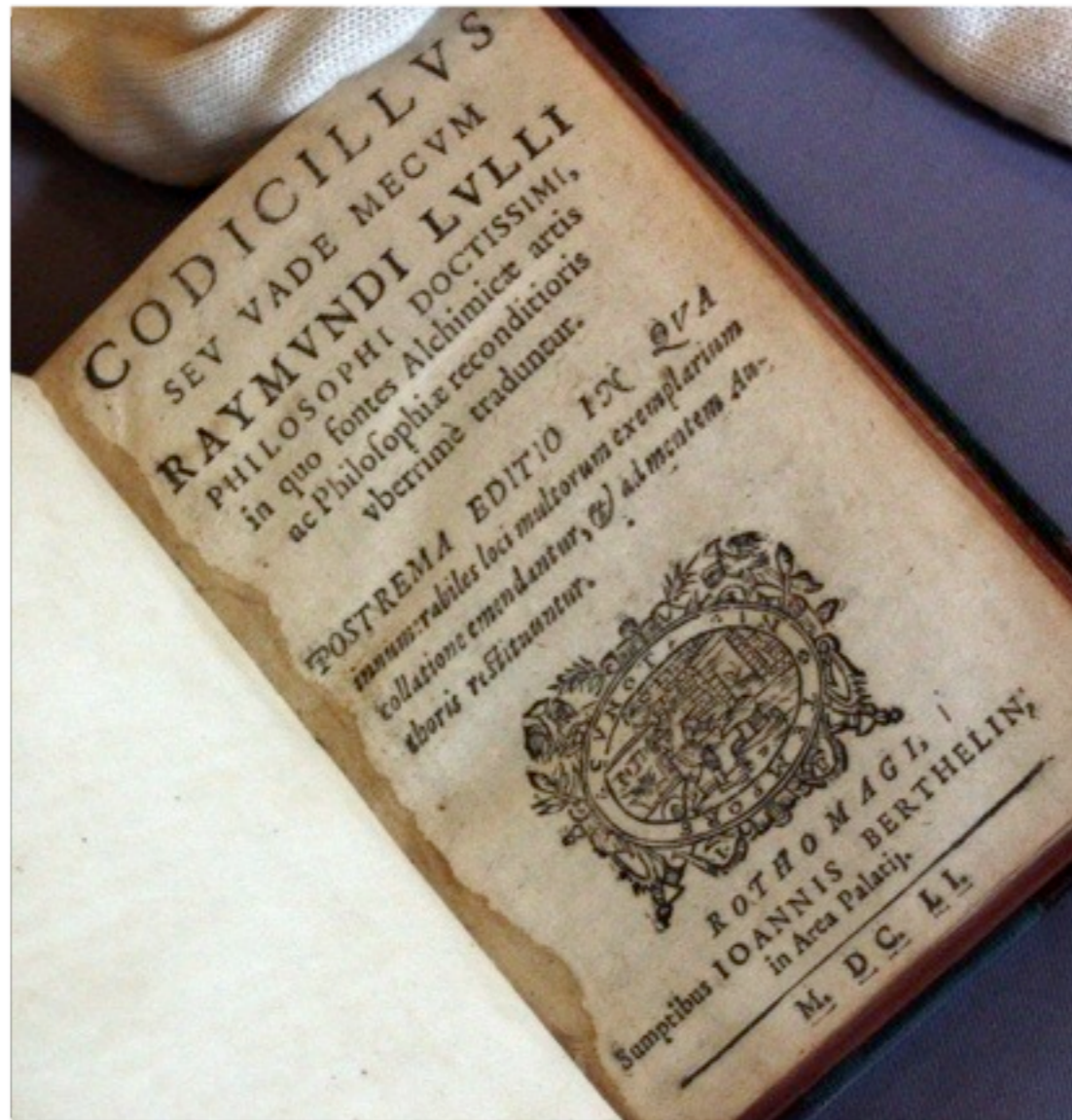


RAMON LLULL



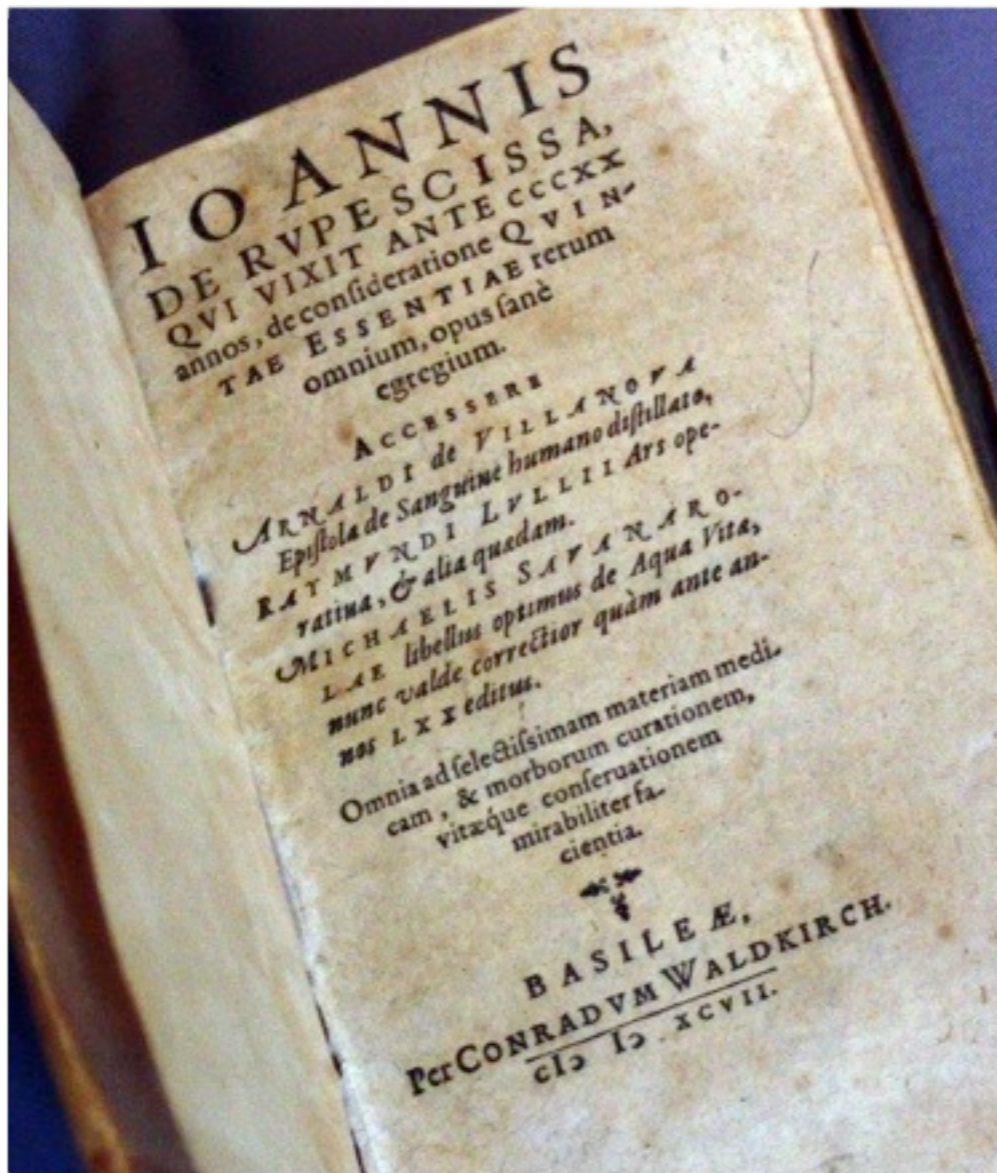
- ✦ *Born 1232 in Palma, a city on the island of Majorca (Spanish)*
- ✦ *Courtier and womanizer as a young man in the court of King James of Aragon*
- ✦ *Sudden conversion to religion; dedicated his life to preaching Christianity to Muslims, went on a hermitage for nine years and wrote books in Catalan*
- ✦ *Fluent in Arabic, Latin, and Occitan*
- ✦ *Died after being stoned in Tunis*

RAMON LLULL'S ALCHEMY



- ✦ *Most of his alchemical works are probably wrongly attributed to him*
- ✦ *Credited with writing **Ars Magna** (the Great Art)*
- ✦ *Developed a type of computational system (Borda System) for religious logic; used wheels within wheels to generate arguments*

JOHN OF RUPESCISSA



- ✦ *Spanish monk who lived around 1366*
- ✦ *Known for experiments in distillation and using chemicals to cure diseases (the Panacea)*
- ✦ *Supposedly created the Philosopher's Stone*
- ✦ *Was denounced and imprisoned*
- ✦ *Possible source of Pseudo-Geber texts*

NICHOLAS FLAMMEL

- ✦ *Born mid-1300s*
- ✦ *French scribe, manuscript seller, and alchemist*
- ✦ *Met an angel while traveling to Spain who told him the secret of the Stone*
- ✦ *Used the Stone to produce the Elixir of Life; he and his wife Perenelle are supposed to be immortal*
- ✦ *Tombstone dates his death as 1418 but his grave is supposedly empty; has hieroglyphs that tell the secret*
- ✦ *His house still exists in Paris and is now a restaurant*



BASIL VALENTINE



- ✦ *Born 1394; a Benedictine Monk and Canon of the Priory of St. Peter in Erfurt, Germany*
- ✦ *Discovered that ammonia could be produced from sal ammoniac; hydrochloric acid from acidified brine; copper and sulfur from chalcopyrite*
- ✦ *Works: **Curus Triumphalis Antimonii** (Triumphal Chariot of Antimony); **The Twelve Keys; Of the First Tincture, Root, and Spirit of Metals;** and **Last Will and Testament.***

THE TWELVE KEYS

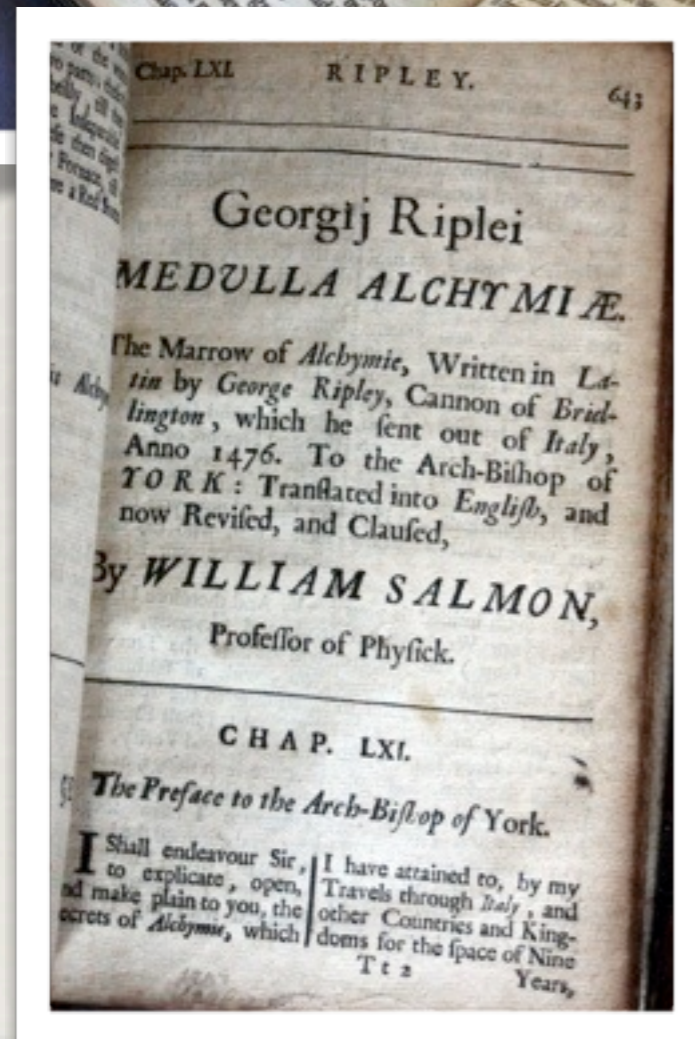


- ✿ *Mystical symbols that will lead to the Philosopher's Stone and fountain of health*
- ✿ *Translated and retranslated throughout Europe*



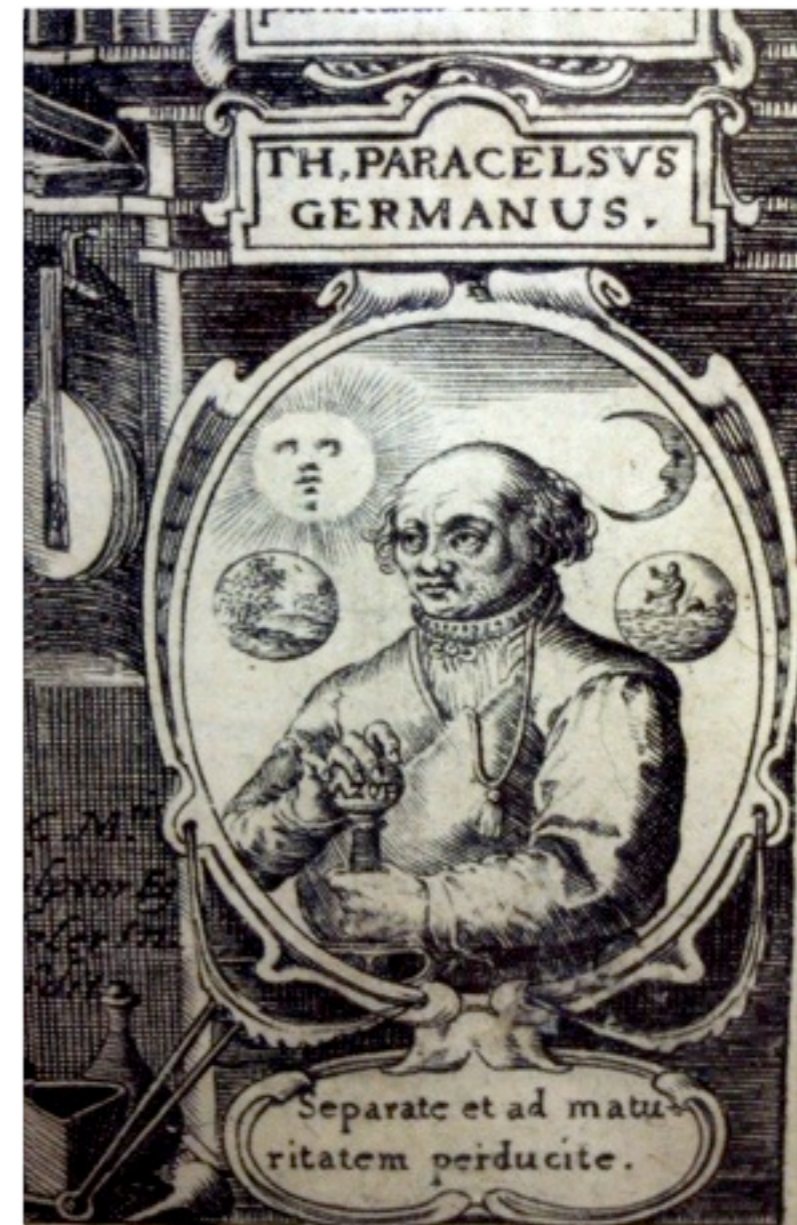
GEORGE RIPLEY

- ✦ 15th Century English alchemist: Canon of Birdlington; a wealthy country squire
- ✦ Favored by Pope Innocent VIII
- ✦ Supposed to have been able to transmute metals
- ✦ Allegorical writings are hard to understand; include **Liber Duodecem Portarum**, **Marrow of Alchemy**, and the “Ripley Scrowle”
- ✦ Wrote about the **Twelve Gates of Alchemy**



PARACELSUS (AUREOLUS PHILIPPUS THEOPHRASTUS BOMBASTUS VON HOHENHEIM)

- ✦ *Born in Switzerland in 1493*
- ✦ *Is known as the “Luther of Medicine”; attempted to reform medical practice to be based on correct anatomy, observation, and medicines instead of blindly following Galen or Celsus*
- ✦ *Paracelsus means “better than Celsus”*
- ✦ *Considered one of the greatest iatrochemists (pharmacists)*



PARACELSUS (AUREOLUS PHILIPPUS THEOPHRASTUS BOMBASTUS VON HOHENHEIM)

- ✦ *Never gained a medical degree but worked as a surgeon in mercenary armies; kicked out of several universities*
- ✦ *Believed more knowledge could be gained from consulting old women than from all the medical texts of the day*
- ✦ *Published many almanacs and medical books; credited with several alchemical texts*
- ✦ *Developed successful treatments for several diseases*

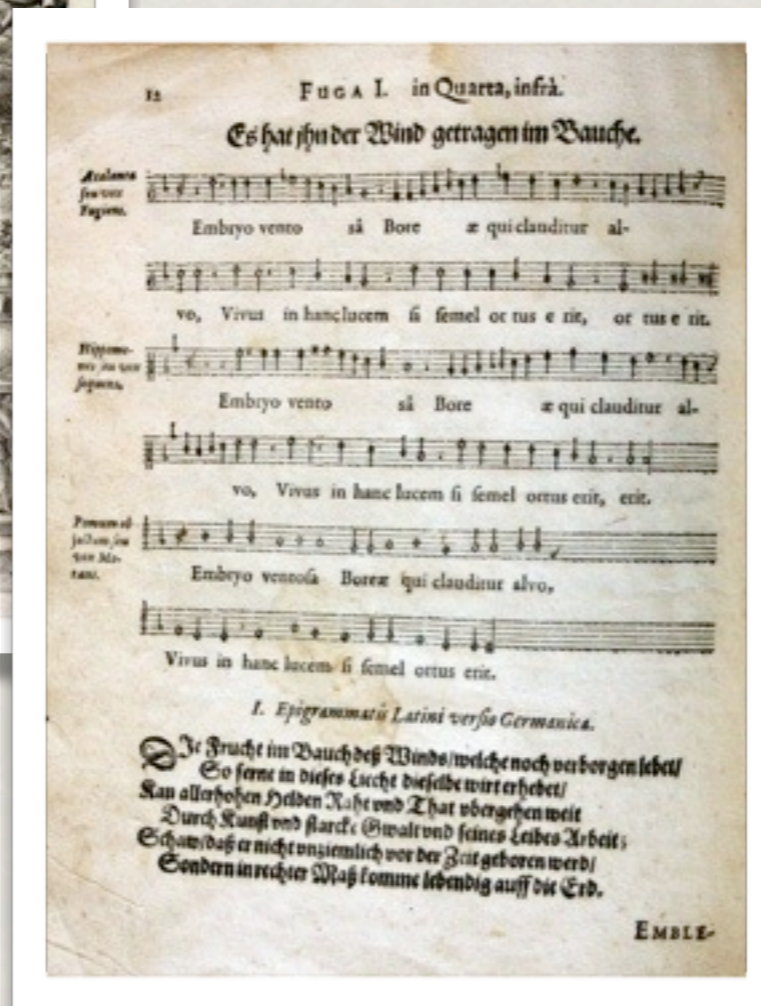


MICHAEL MAIER



- ✦ *Born 1568 in Holstein, Germany*
- ✦ *Doctorate of Medicine in 1596 at Basel*
- ✦ *Physician and counselor to Rudolph II of Prague and James I, Prince of Nassau*
- ✦ *Wrote **Atalanta Fugiens** (*Atlanta Fleeing*) in 1617*

ATALANTA FUGIENS



- ✦ Fifty allegorical drawings showing “the secrets of nature and chemistry”
- ✦ Epigrams in Latin and German which, if understood, would lead to the Philosopher’s Stone
- ✦ Each drawing also came with a musical number in the form of a three-voice fugue (fugiens)

SYMBOLS IN ATALANTA FUGIENS

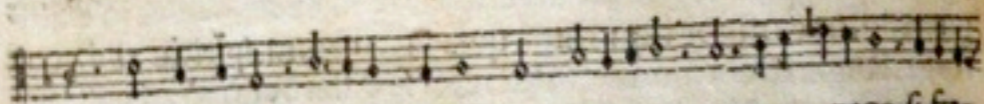
- ✿ *Many of his symbols share elements that go back to Zosimos*
- ✿ *Kronos disgorging the Stone (Fuga 1)*
- ✿ *The uroboros: the dragon devouring her husband (Fuga 50)*



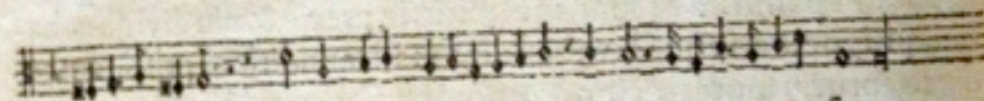
FUGA IV. in Quarta, supra.

Süße den Bruder der Schwester zu/ vnd gib ihnen den Becher der Liebe.

Atalanta fugiens.

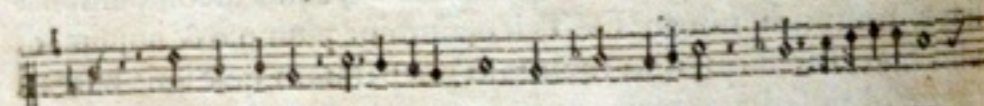


Non hominum foret in mundo nunc tanta pro pago, si fra-

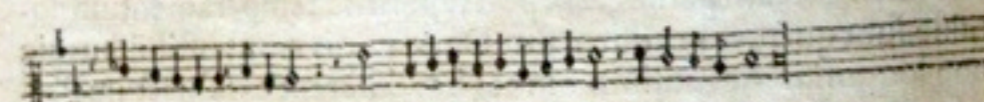


tri Conjux non data prima soror.

Hippom. sequens.

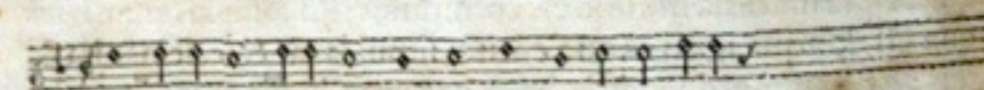


Non hominum foret in mundo nunc tanta pro pago

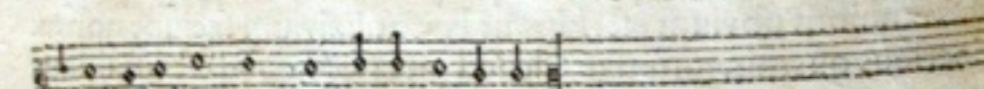


si fra tri non data prima soror.

Pomum morans.



Non hominum foret in mundo nunc tanta propago,



si fratri conjux non data prima soror.

IV. Epigrammatis Latini versio Germanica.

Der Menschen Geschlecht in dieser Welt wär nicht so wol vermehret!
Wann nicht zum Bruder die Schwester sich gekehret.
Darumb zusammen süß zwey Geschwister eines Geblütes!
Daß sie ehlig leben/ Mann vnd Weib eins Gemüthes.
Schenk ihnen ein der Lieb Becher mit süßem Reben Safft!
Solchs gib ihm zur Hoffnung der Frucht ein groß vnd starke Krafft.
EMBLE.

EMBLEMA L. De secretis Naturæ.

Draco mulierem, & hæc illum interimmit, simulque sanguine perfunduntur.



EPIGRAMMA L.

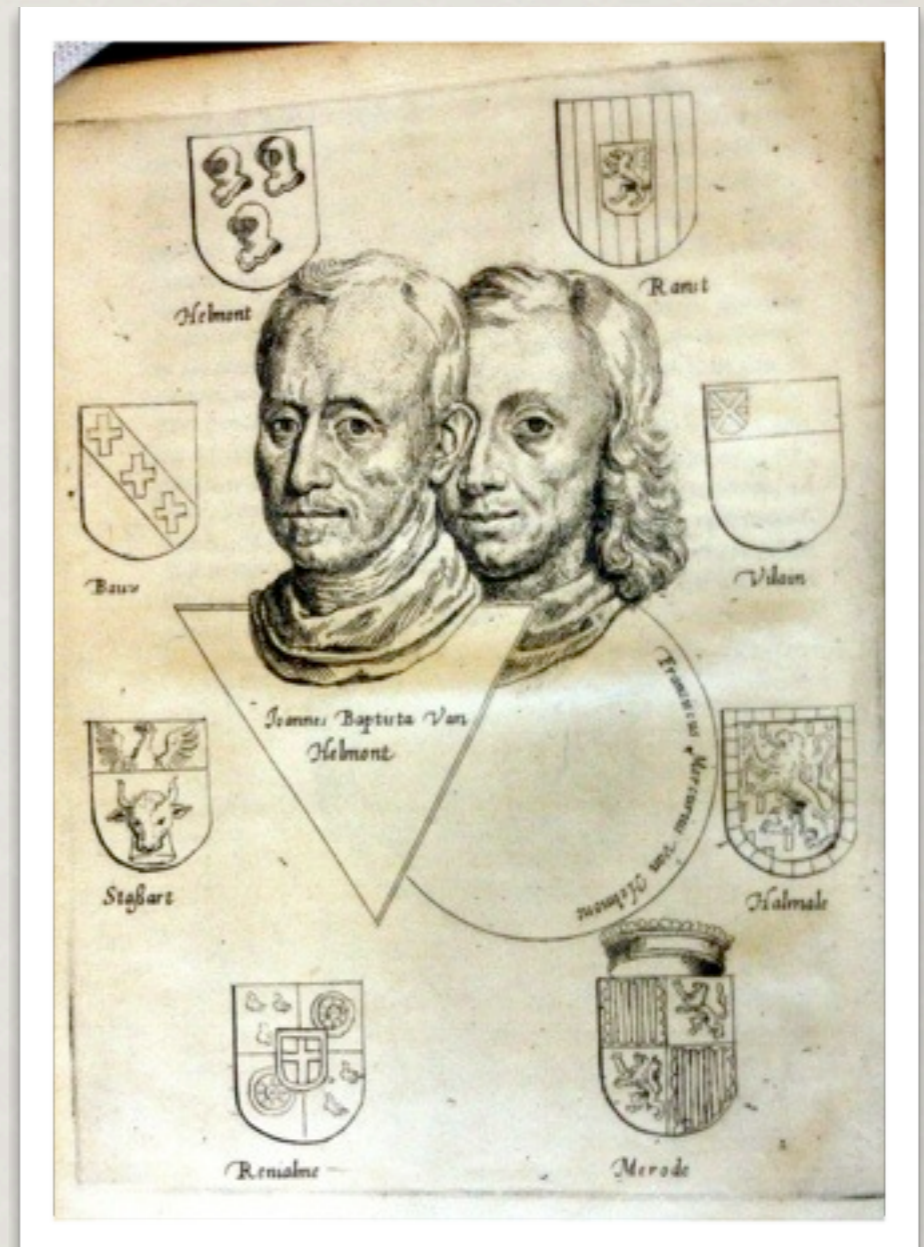
Alta venenoso fodiat ur tumba Draconi,
Cui mulier nexu sit bene vineta suo:
Ille maritalis dum carpit gaudia lecti,
Hæc moritur, cum qua sit Draco tectus humo.
Illius hinc corpus morti datur, atque cruore
Tingitur: Hac operis semita vera tui est.

Dd

DRACO-

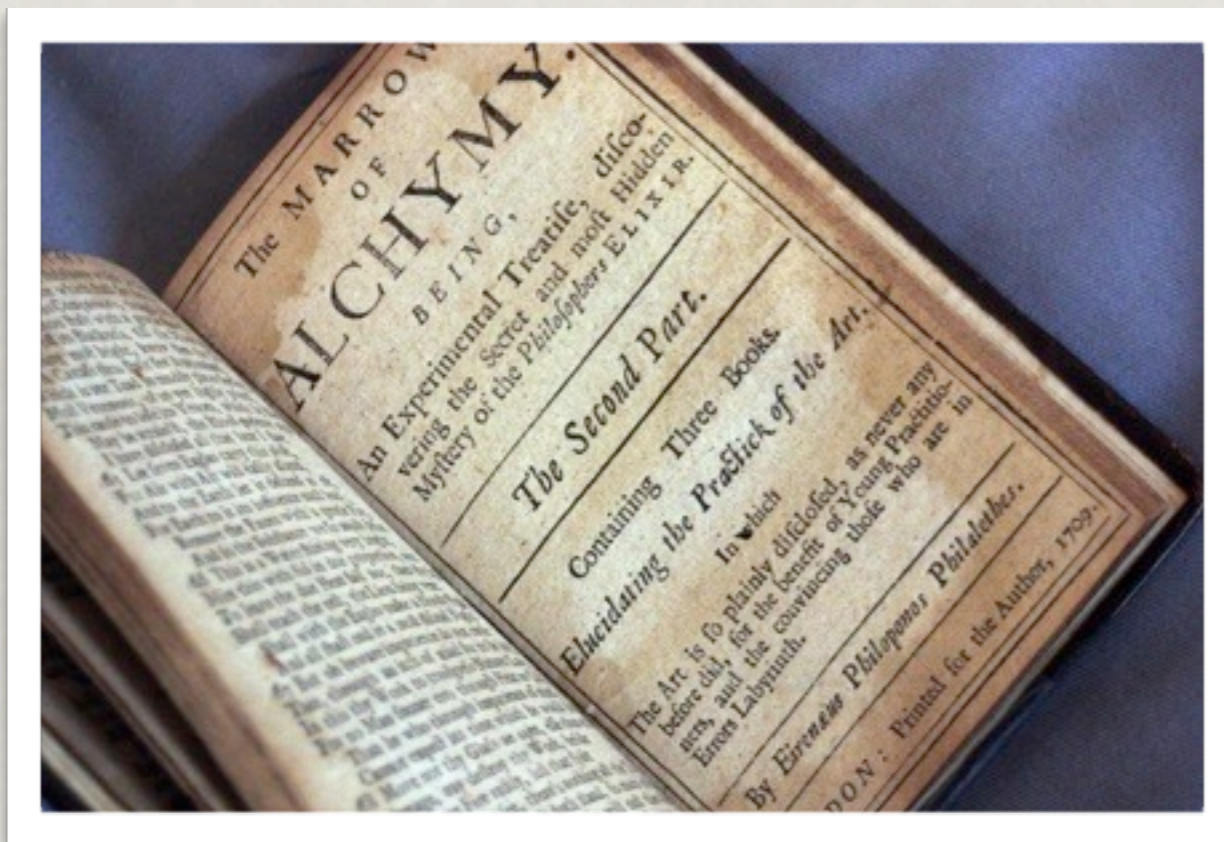
JOHANN BAPTISTA VAN HELMONT

- ✿ *Born 1579 in Brussels*
- ✿ *Flemish physician and chemist; studied Hippocrates, Galen, Avicenna, and other medical texts*
- ✿ *Coined the term “gas” (from chaos) and discovered carbon dioxide*
- ✿ *Tree experiment: weight gain was all due to water (failed to realize also comes from air)*
- ✿ *Died from accidental carbon monoxide poisoning*



GEORGE STARKEY (EIRENÆUS PHILALETHES)

- ✦ *Born in Bermuda, 1628; studied at Harvard*
- ✦ *First American scientist; wrote under pseudonyms (Philaethes and No Adept)*
- ✦ *Defended Helmontian chemistry and medicine*
- ✦ *Influential alchemical author; friend of Robert Boyle*
- ✦ *Died of the Plague in 1665*



AVEDIS ZILDJIAN

- ✦ *Original head of family was an alchemist trying to turn metal sheets into gold*
- ✦ *Didn't make gold, but the metal sheets did produce a clear musical tone*
- ✦ *Sultan Osman III rewarded him for his discovery and changed his name to Zil ("Cymbal") and Dij ("Seller")*
- ✦ *Began selling cymbals in 1623; recipe is a closely guarded family secret*
- ✦ *Family moved to U. S. in 1938; it is the oldest family-run business in the United States*



RESULTS OF ALCHEMY



- ✦ *Never succeeded in proving the Philosopher's Stone or Elixir of Life*
- ✦ *Discovered many new substances and elements*
- ✦ *Developed new processes for purifying chemicals, such as distillation, condensation, sublimation, and crystallization.*
- ✦ *One of three threads which led to modern chemistry, along with Greek matter theories and Medieval craftsmanship*

RESULTS ⊕ OF ALCHEMY

- ✦ *They tried to prove Aristotle's transmutation, but instead led to his overthrow*
- ✦ *Lasted from 300 B.C. to about 1750 A.D.; transition period where scientific observation was used but transmutation was still believed is called Chymistry (1600 to 1750)*

