Early Chemical History

Some cool old stories about how chemistry came to be!

Rhonda Reist

400 BC - Greeks

- The first to try to explain why chemical changes occur.

Democritus

Greek philosopher named Democritus was the first to discuss an indivisible particle he called an ATOM.

Eventually there became the idea that there were 4 types of “atomos”

EARTH

Air

Fire

Water

Next 2000 years . . .

“Chemical” history was dominated by ALCHEMY - the belief that you could turn less valuable metals into gold!

Sort of brings up the image of a Medieval Wizard!

But alchemy didn’t originate in Europe.

It came from the Middle East

One of the earliest “alchemists” was a Muslim “philosopher named Jabir.

The techniques came to Western Europe following the first Crusades.

The Egyptian and Arabs knew of many ways to change substances by mixing and heating various combinations of materials.

Famous painting of an alchemist in his lab by Joseph Wright of Derby.
Searching for the “philosophers stone”. . .
He probably had made some elemental phosphorus.

An Alchemist's lab in France.


Another Alchemist's Lab

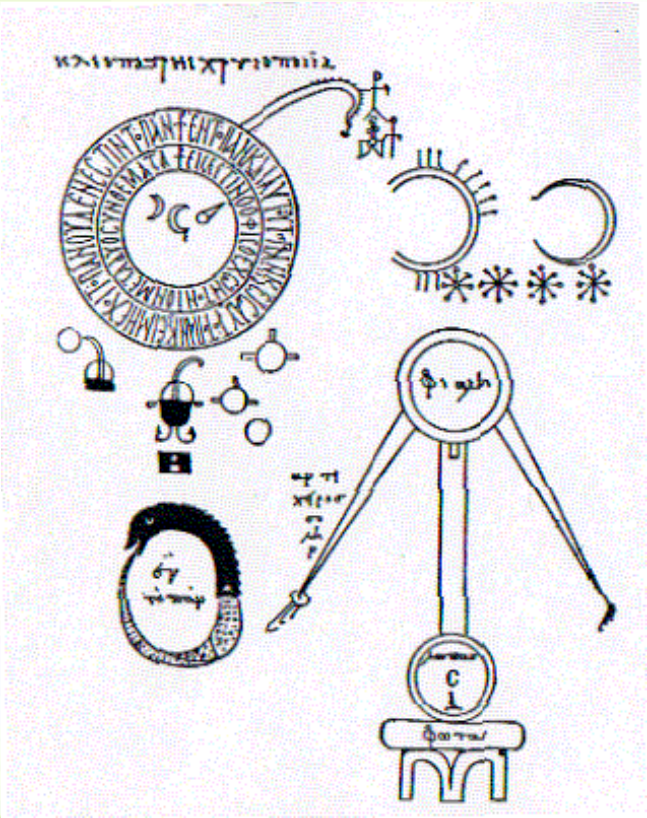

Welcome to
Potions
Class!

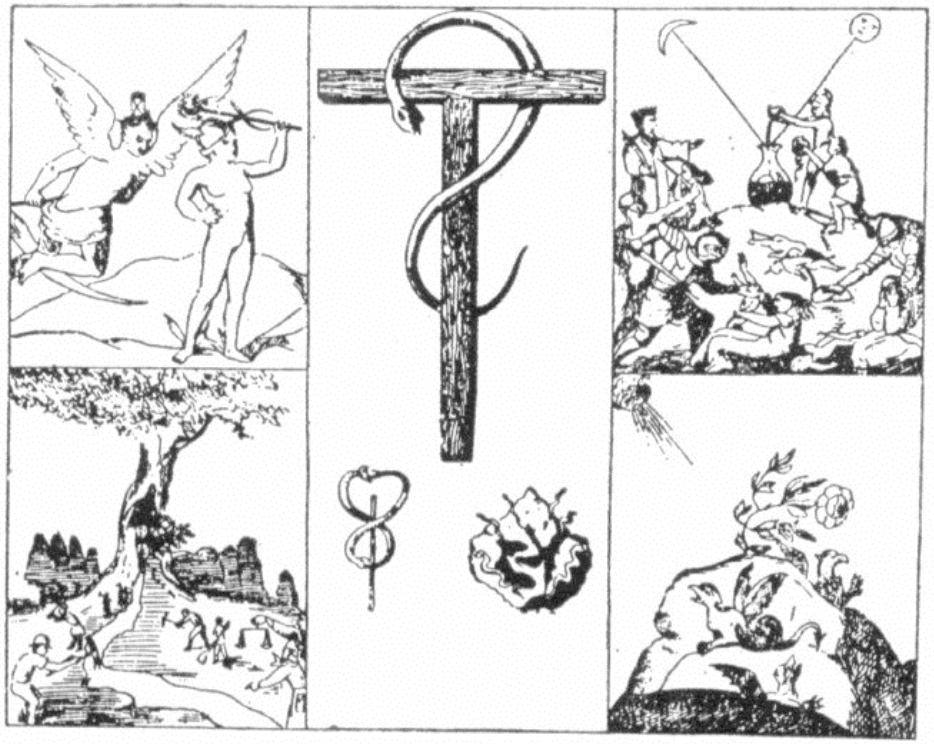
Alchemy was somewhat good.

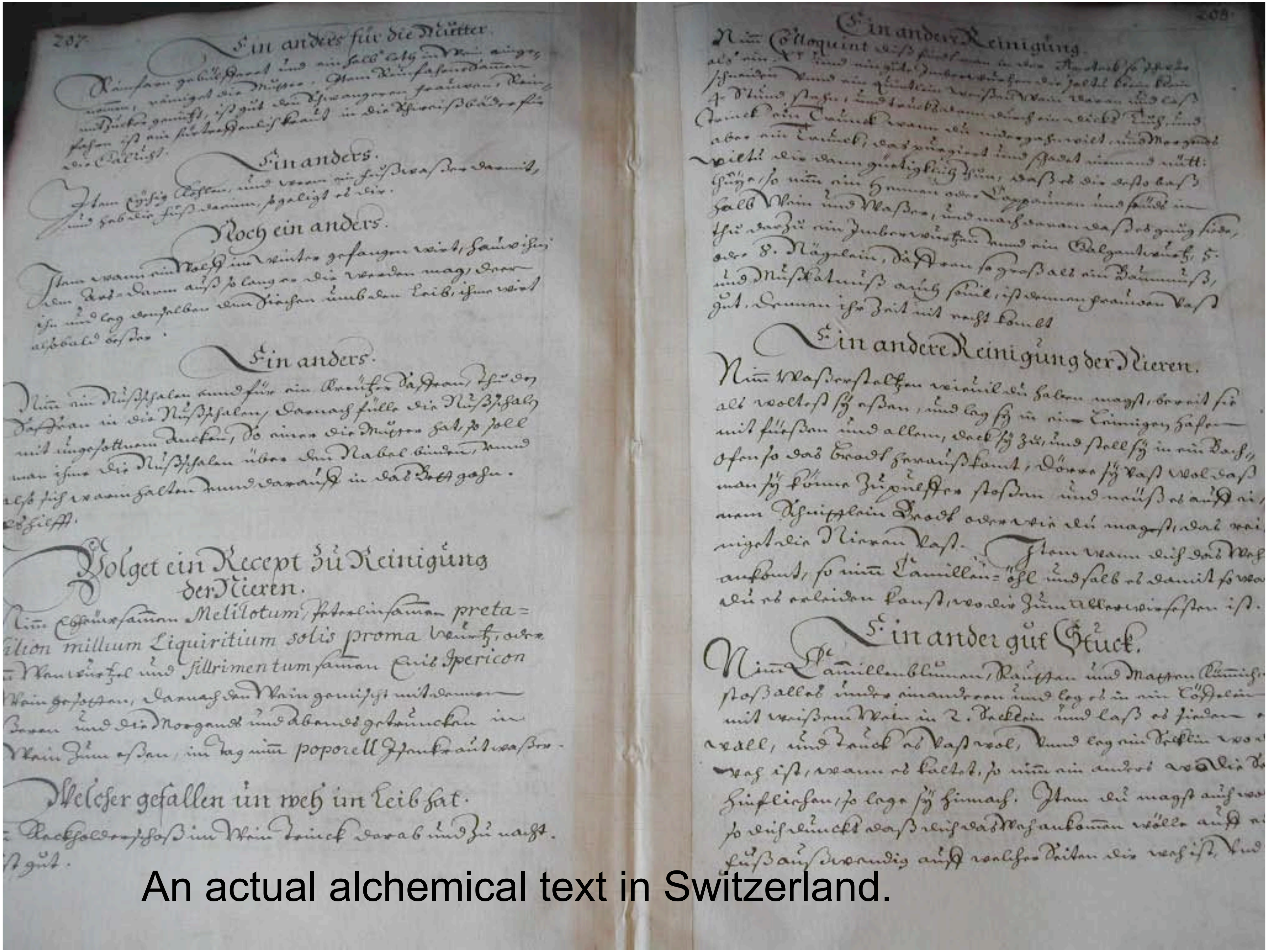
It resulted in the discovery of many new ELEMENTS and COMPOUNDS.

However, the alchemists were very secretive & much of their work was written in strange code!

Often the alchemists “language” was in strange code!







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Ein anders für die Mütter.

Ein anders.

Noch ein anders.

Ein anders.

Volget ein Recept zu Reinigung der Nieren.

Welcher gefallen un weh im Leib hat.

208

Ein ander Reinigung.

Ein andere Reinigung der Nieren.

Ein ander gut Stuck.

An actual alchemical text in Switzerland.

Plus, it was just plain

WRONG!

Some advancements that helped move along the nature of chemistry - things that really helped the cause . . . .

1500's

- Georg Bauer
- Developed METALLURGY

How to get metals out of their ores.

1500's

- Paracelsus
  - Swiss alchemist & doctor. Actually cured some people!
  - Worked with MEDICINAL minerals.


Medieval Hospital
1500's
In Beaune, France

A medieval pharmacy in France.

Sample medications in a medieval hospital pharmacy.

1600's

Some contemporaries:

- Shakespeare
- Galileo
- Newton
- Elizabeth the 1st just ended her reign.

Robert Boyle - English or was he Irish?

First “Chemist” to perform QUANTITATIVE Chemistry while studying the relationship between pressure & volume of gas or was it Hooke that really did the work?

A founding member of the Royal Society & VERY VERY Wealthy!

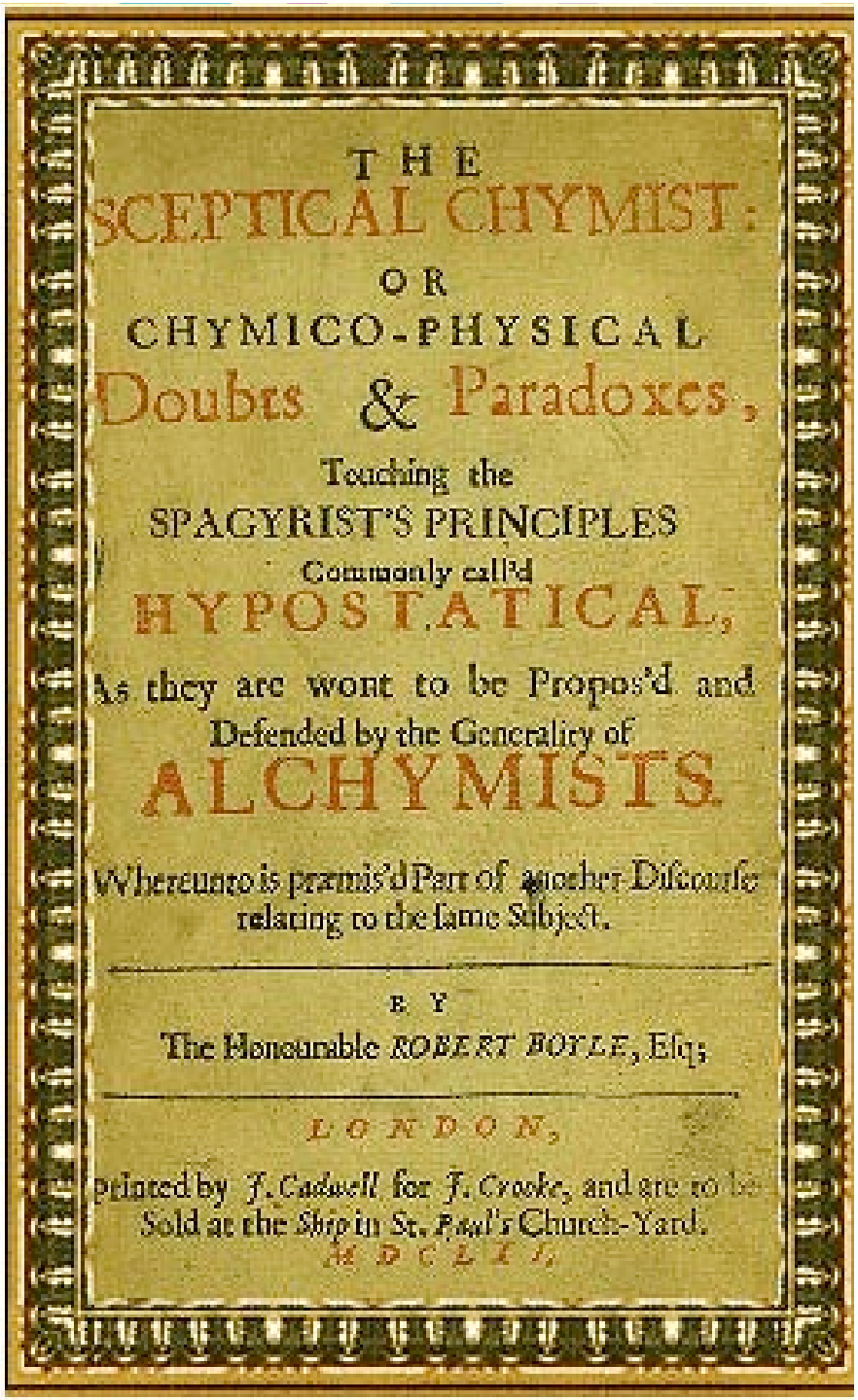
At this time the only the rich could afford to do scientific research- the was no Fermilab! They were known as "Natural Philosophers".

Robert Boyle - English

Was one of the first people to suggest the idea of an ELEMENT; or basic “building piece”.

Robert Boyle's book "The Sceptical Chymist"

One of the first "chemistry books"



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 prænis'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.
MDCLXI.

Robert Boyle - English

Still thought that metals weren’t ELEMENTS & therefore could be changed into other metals . . . An ALCHEMICAL belief.

1700's

George Stahl

German

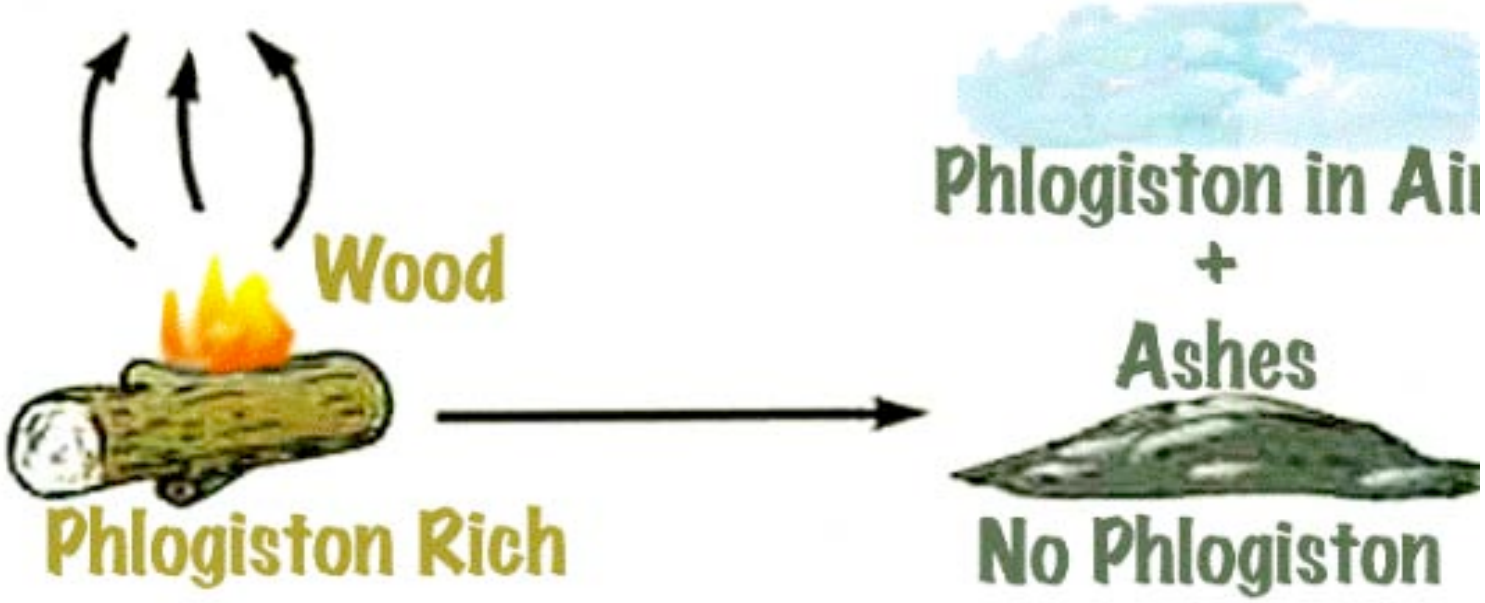
(1660-1734)

Was studying COMBUSTION

1700's

Suggested that when something burned it released a substance called PHLOGISTON.

PHLOGISTON was a VERY persistent idea!



He thought that when you burned something in a closed container it eventually went out because the air in the container became saturated with

PHLOGISTON.

But there was a problem . . .

When some metals would burn they would get heavier!

This contradicted the phlogiston theory!

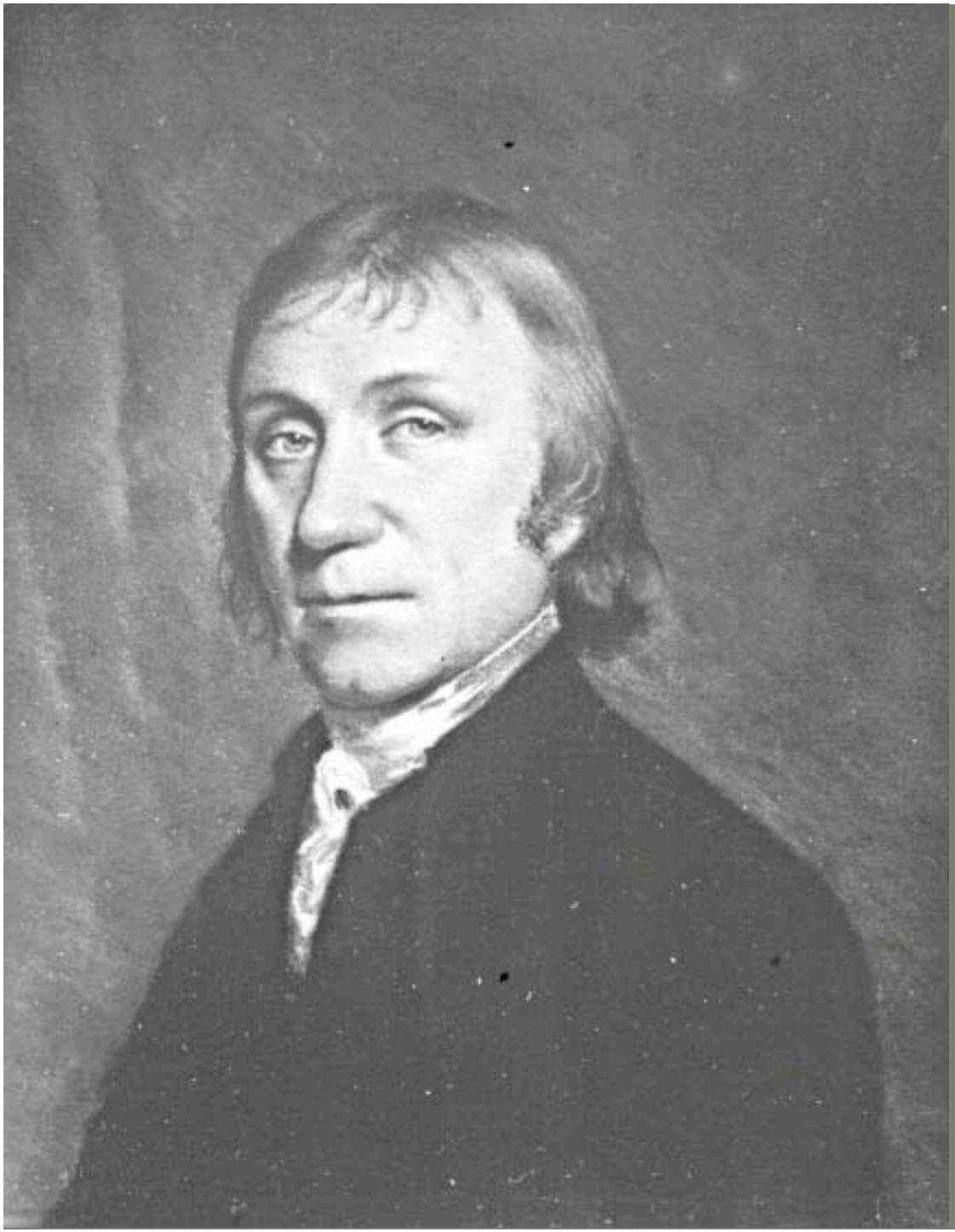
The belief in the substance phlogiston

caused a big slow down in chemical discoveries!

A BIG slow down!

Joseph Priestley

- 1733-1804
- British
- Truly was a minister! A “dissenter”.
- Friend of Ben Franklin
- Lived above a brewery!
- NOT a wealthy man



Great experimentalist!

In the late 1760's he found that you could dissolve "fixed air" aka carbon dioxide into water making…

Soda water or carbonated water! POP!

Is credited with discovering

OXYGEN

He had heated various metal “calxes” & noticed that the gases produced caused a flame to burn very brightly!

Also noted that mice breathing this “air” could stay alive much longer than in regular air.

Since substances could burn very well in oxygen

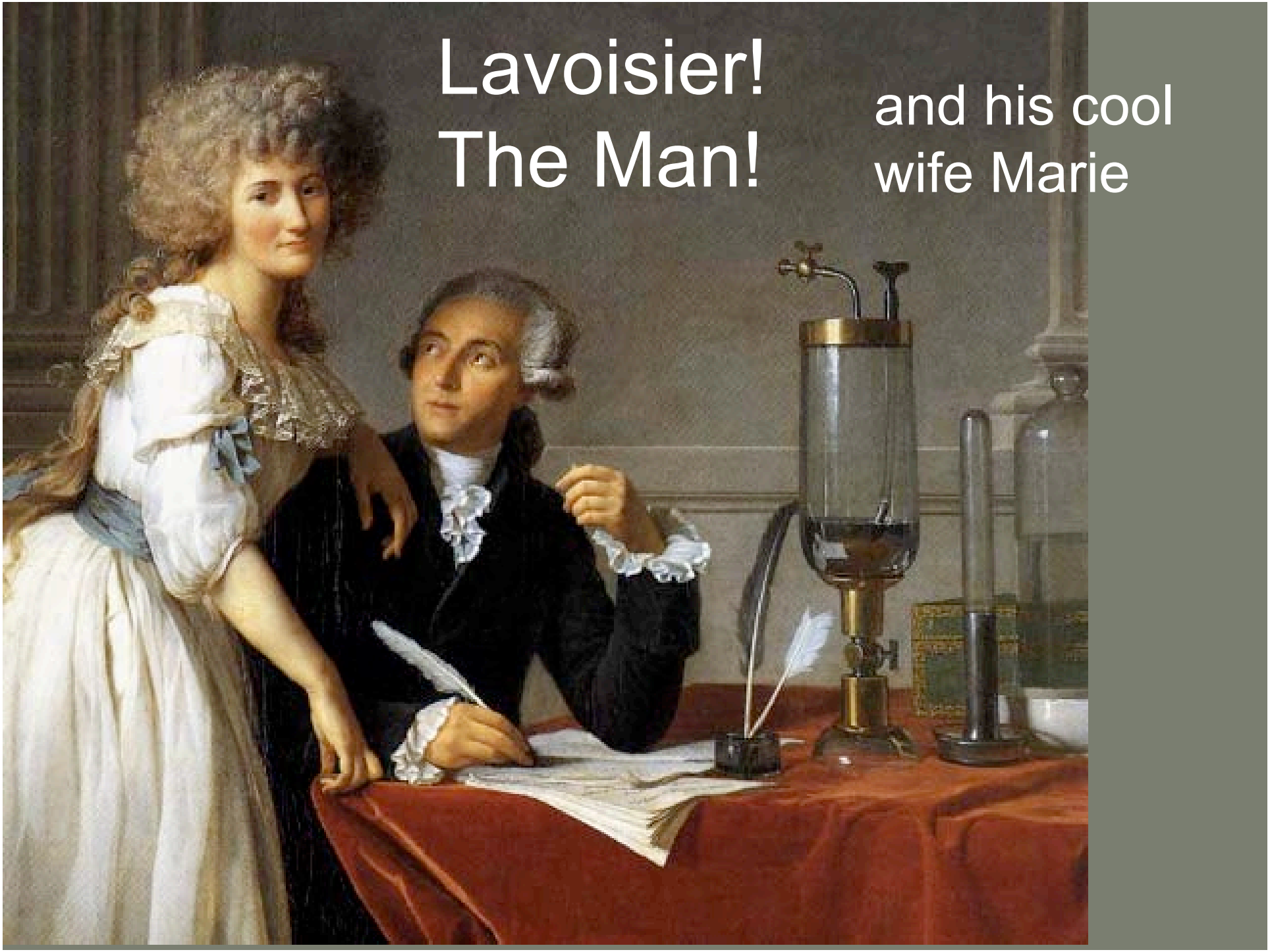
Oxygen was originally called

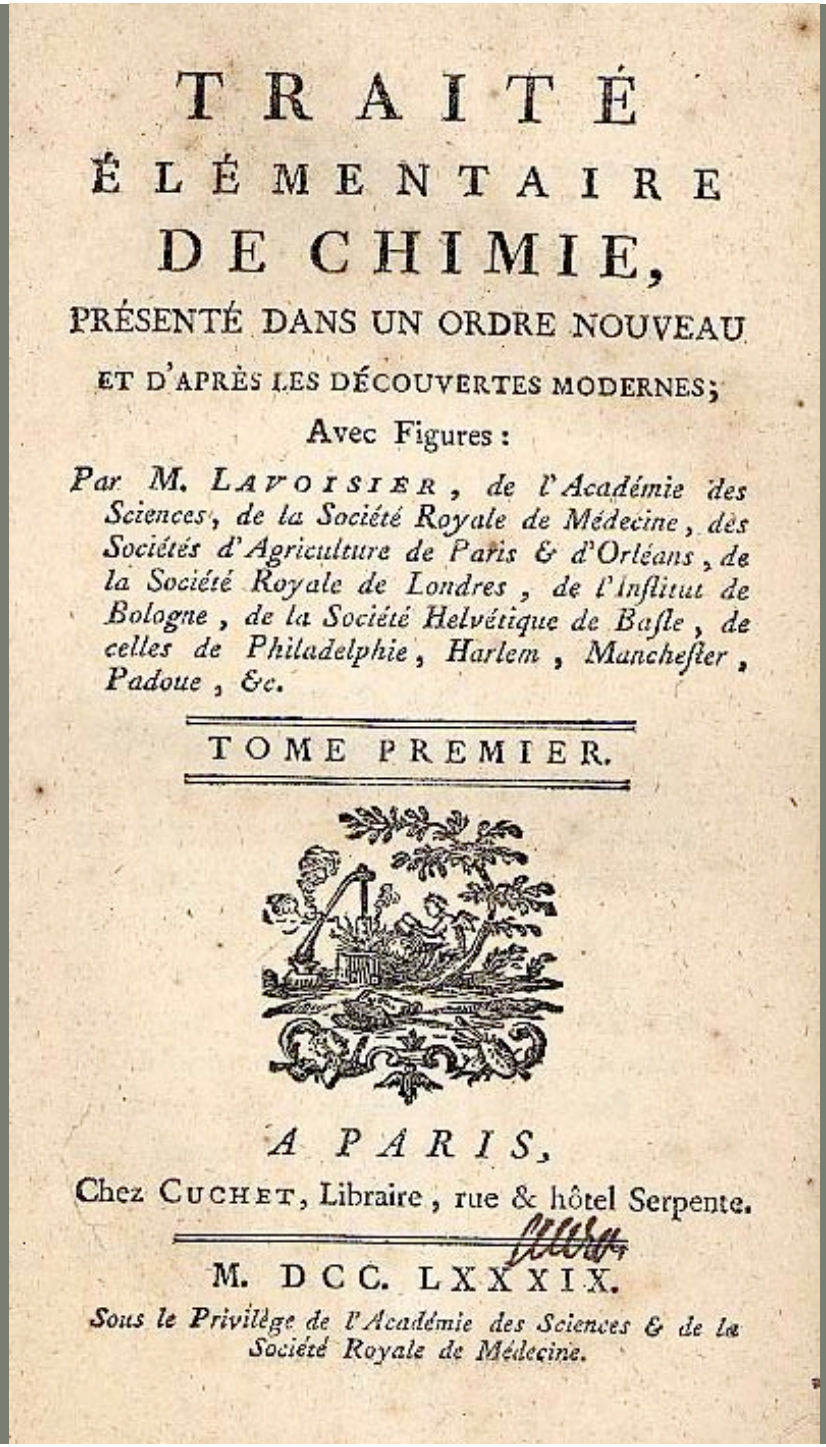
“DEPHLOGISTICATED air”

Then the big revolution happened!

France 1734-1794

Antoine Lavoisier


Lavoisier!
The Man!
and his cool
wife Marie



TRAITÉ
ÉLÉMENTAIRE
DE CHIMIE,
PRÉSENTÉ DANS UN ORDRE NOUVEAU
ET D'APRÈS LES DÉCOUVERTES MODERNES;
Avec Figures :

Par M. LAVOISIER, de l'Académie des Sciences, de la Société Royale de Médecine, des Sociétés d'Agriculture de Paris & d'Orléans, de la Société Royale de Londres, de l'Institut de Bologne, de la Société Helvétique de Basle, de celles de Philadelphie, Harlem, Manchester, Padoue, &c.

TOME PREMIER.

A PARIS,
Chez CUCHET, Libraire, rue & hôtel Serpente.

M. DCC. LXXXIX.

Sous le Privilège de l'Académie des Sciences & de la Société Royale de Médecine.

Copy of Lavoisier's most important publication.

Finally explained the true nature of

COMBUSTION

and killed of the

PHLOGISTON theory!

He did this with the help of VERY accurate

MEASURING devices.

He had the best balances in the world for a number of years!

Lavoisier carefully weighed the starting substances: REACTANTS

& ending substances: PRODUCTS

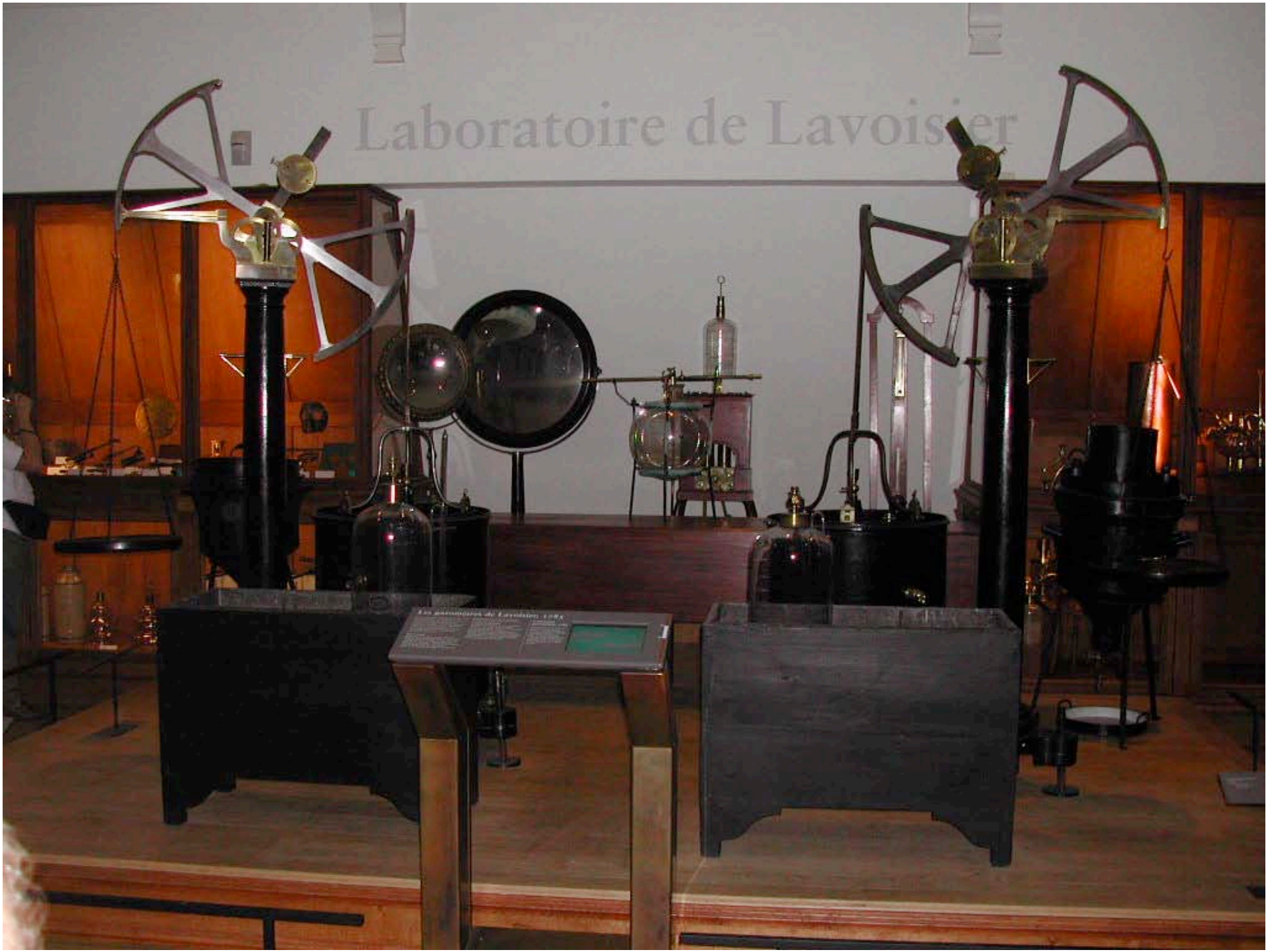
of reactions & noticed that they were always the

SAME!

Showing that “matter was neither created or destroyed” in a chemical reaction . . . this is called the

LAW OF CONSERVATION OF MASS

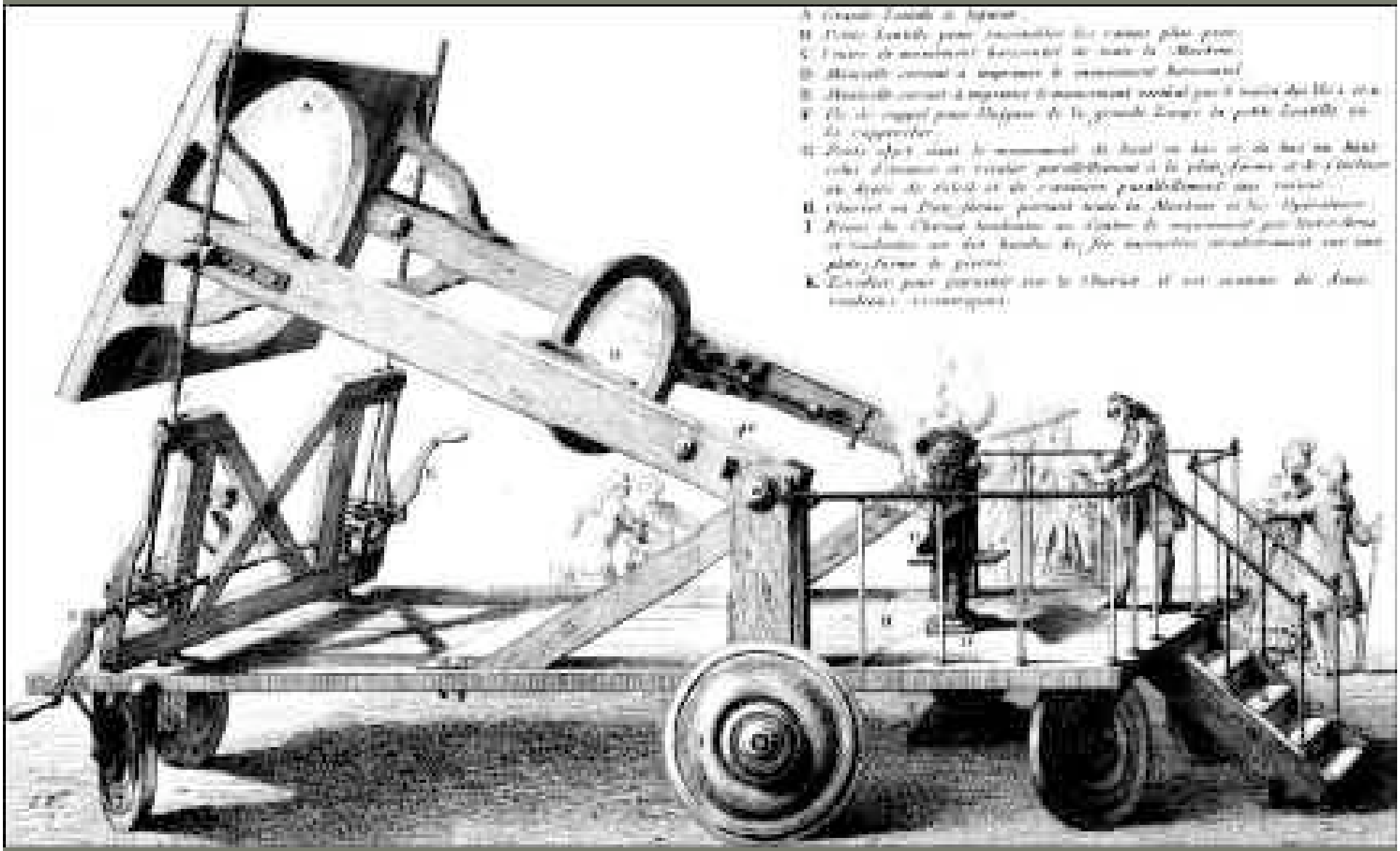
Gazomètre de Lavoisier et Meusnier, planche extraite du *Traité élémentaire de chimie*, pl. VIII.


Laboratoire de Lavoisier


Laboratoire de Lavoisier


Leather “gas bottles”
Microscope composé par Dellebarre
Compound microscope by Dellebarre
Trois flacons en cuir pour conserver les gaz
Three leather bottles for storing gases


Pneumonic trough to collect gases.
(It's as big as your table!)



Lavoisier’s great burning lens!

What a dork!
I had to prove I was there!


Lavoisier's Face Shield!

Yeah! People keep using balances!

Joseph PROUST
(1754-1826)

French

Did tons of work with iron and copper compounds

Did tons of work with iron and copper compounds

Noticed that in “a given compound always contains the same

RELATIVE MASSES

of elements . . . It didn’t matter where the compound came from.

For example: copper carbonate

- 5.3 parts copper
- 4 parts oxygen
- 1 part carbon by mass

This is now called the

LAW OF DEFINITE PROPORTIONS

JOHN DALTON

BRITISH

(1766-1844)

Super bright & intelligent but he was really a huge geek!

Started wondering what could cause the Law of Definite Proportions to be true.

Dalton noticed that other compounds combined in predictable ways . . .

For example, the mass of oxygen that combined with 1.0 g carbon

Compound 1	1.33g oxygen
Compound 2	2.66 g oxygen

Suggested that you could have CO and CO_2

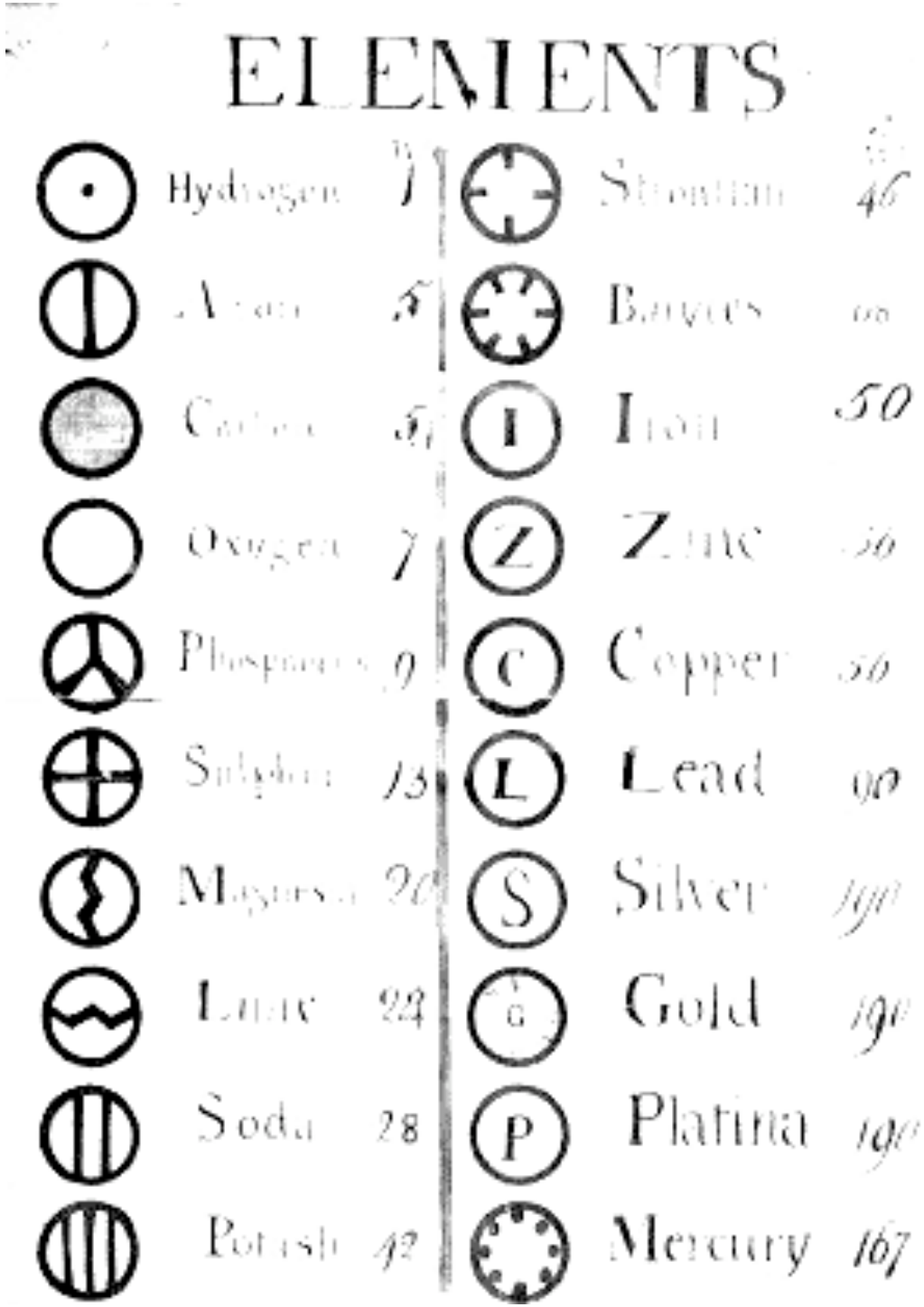
Dalton developed the

LAW OF MULTIPLE PROPORTIONS

from this.

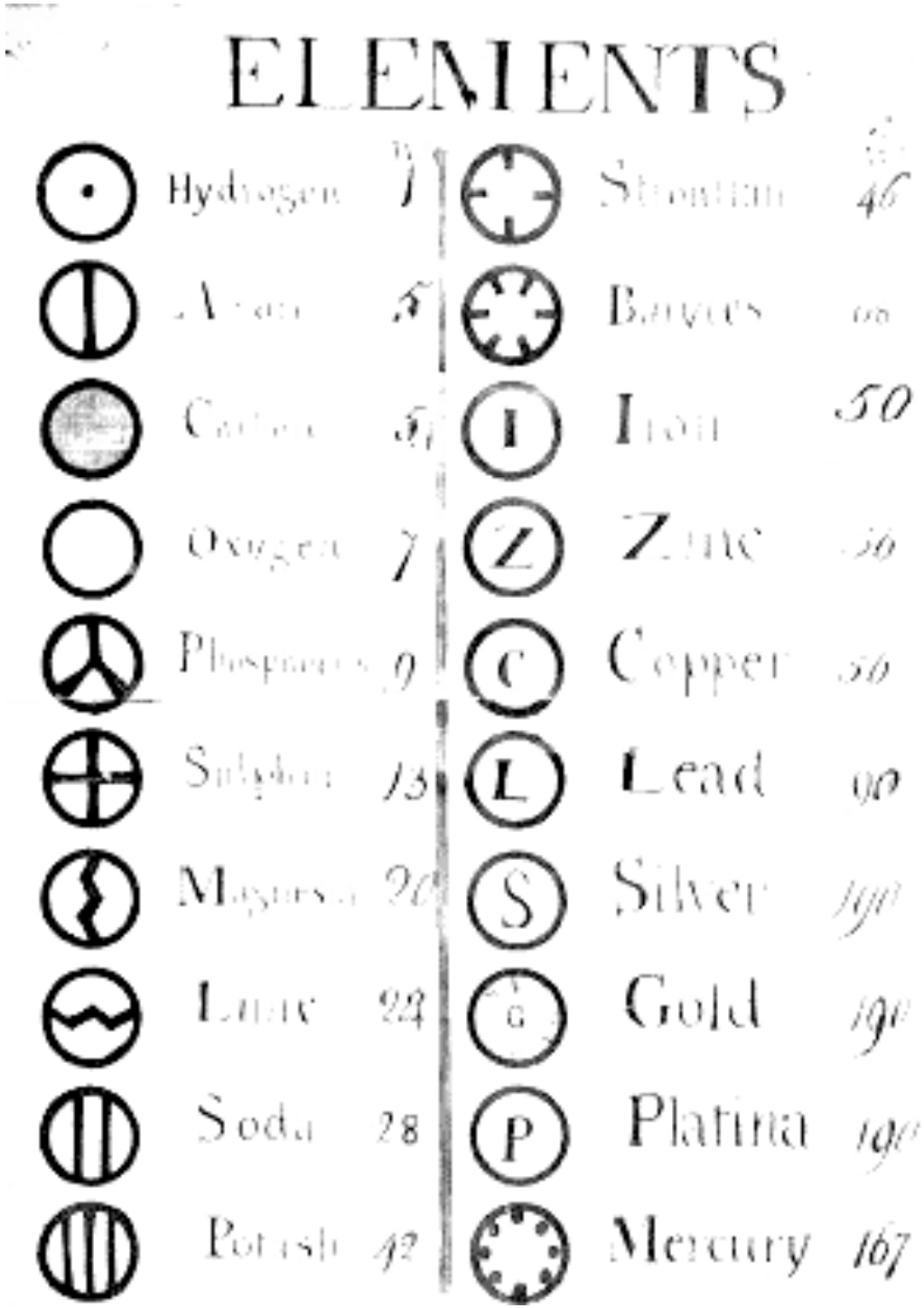
When 2 or more COMPOUNDS are made from the same ELEMENTS

They will always combine in ratios of WHOLE NUMBERS.



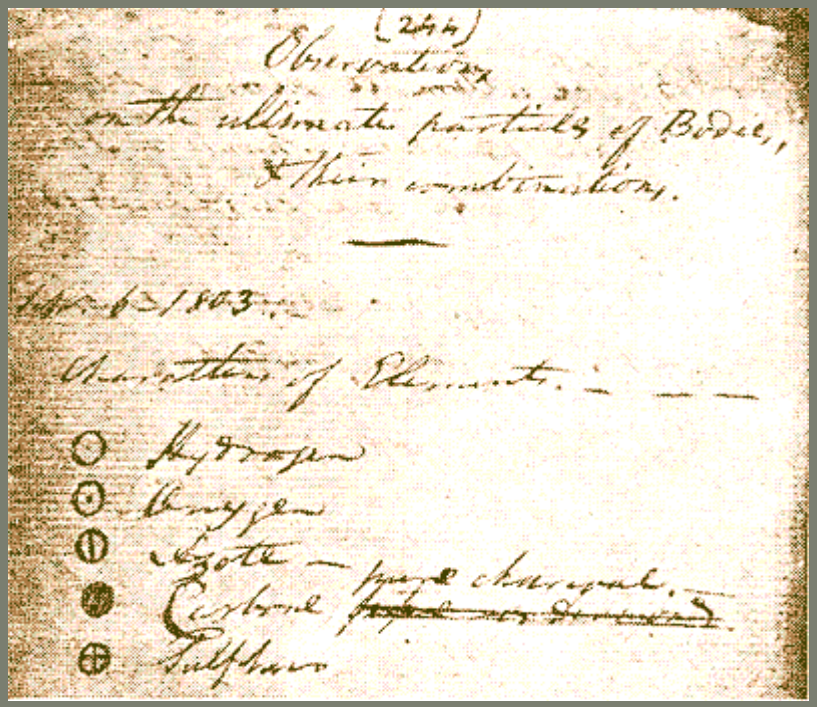
Suggested that the compounds were made of tiny building pieces called

ATOMS



Symbols for different Elements used by Dalton

This idea was not widely accepted for MANY years!



- Major paper on atoms was published in 1804
- People were still arguing it 100 years later!

Dalton's Atomic Theory

(the first actual explanation of how "chemistry" worked)

1. Each ELEMENT is made up of tiny indivisible particles called ATOMS.

Dalton's Atomic Theory

(the first actual explanation of how "chemistry" worked)

2. The atoms of a given element are IDENTICAL; the atoms of different elements are DIFFERENT in some FUNDAMENTAL way.

Dalton's Atomic Theory

(the first actual explanation of how "chemistry" worked)

3. Chemical COMPOUNDS are formed when atoms COMBINE with each other.

Dalton's Atomic Theory

(the first actual explanation of how "chemistry" worked)

3 cont.

A given compound always has the same RELATIVE NUMBERS and types of ATOMS.

Dalton's Atomic Theory

(the first actual explanation of how "chemistry" worked)

4. Chemical reactions involve RECOMBINATIONS of atoms.

Dalton's Atomic Theory

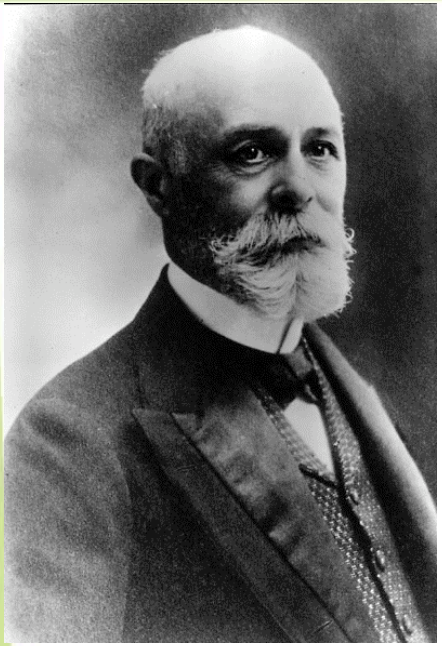
(the first actual explanation of how "chemistry" worked)

4. cont.
   The atoms themselves are NOT CHANGED in a chemical reaction.

Amazingly,

most of this theory (explanation) remained unchanged until about 1900 when radioactivity was discovered.

ASSIGNMENT!



Becquerel

Curie

- Read more Curie and Beccquerel and the “radioactive walk” in Paris.
- Send Lee Marek $5