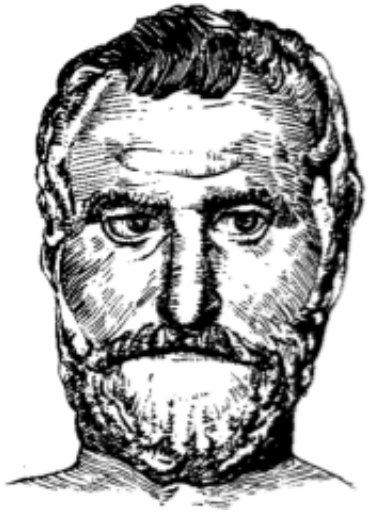
Thales of Miletus (600 BC)--



First Natural Philosopher we know of who hypothesized on the makeup of matter.

I. Water is the universal element.

Evidences: Heating substances ---> water
ie. leaf, wood, paper, chalk, minerals (the water of hydration).

When the Heat's On-- You Sweat!

II. The Water Cycle-- shows how water interacts everywhere.

III. Concluded: “Nature follows a pattern of laws.”

DEMOCRITUS (400 BC)-- First Atomic Hypothesis.

Atomos: Greek for “uncuttable”. Chop up a piece of matter until you reach the atomos.

Properties of atoms:

- Indestructible.
- Changeable, however, into different forms.
- An infinite number of kinds so there are an infinite number of elements.
- Hard substances have rough, prickly atoms that stick together.
- Liquids have round, smooth atoms that slide over one other.

Smell is caused by atoms interacting with the nose-- rough atoms hurt .

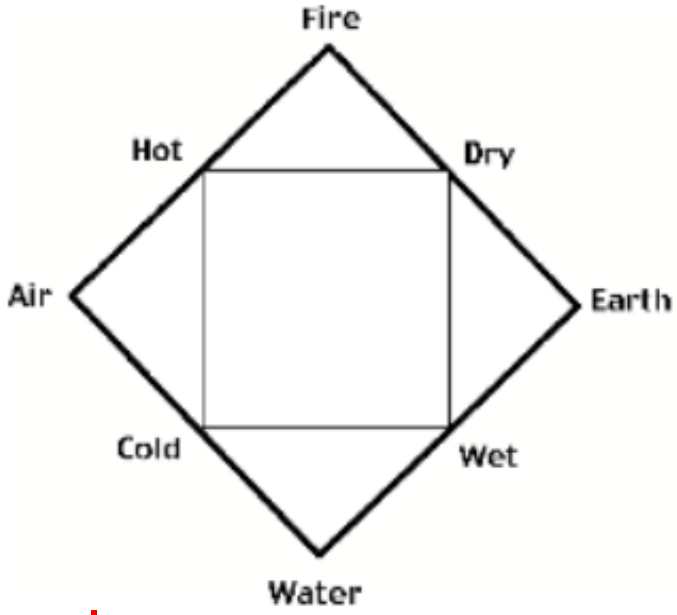
Sleep is caused by atoms escaping the brain.

- Death-- too many escaped or didn't return.
- The heart is the center of anger.
- The brain is the center of thought.
- The liver is the seat of desire.
- “Nothing exists but atoms and space, all else is opinion”.

EMPEDOCLESE (400 BC)

-- The Four Element Hypothesis:

Primary Matter-- Fire, Water, Earth, Air.
The Four Qualities-- Wet, Dry, Warm, Cold.



The Four Elements are brought together by *Love* and separated by *Hate*

The Modern Terms are *Endothermic Energy* and *Exothermic Energy*

Sample Formulae:
Human flesh-- equal quantities of the Four Elements.
Bones-- 1/2 Fire, 1/4 Earth, 1/4 Water.

ARISTOTLE (300 BC)

-- (student of Plato, teacher of Alexander The Great and many others).

Known as “THE MASTER OF THOSE WHO KNOW”, his influence was so great that it is said that he held back science for 2000 years.

In future generations one could prove an argument with the Latin statement-- “IPSE DIXIT ” (“He himself said it”).

ARISTOTLE’S BIG ACTIONS--

- Established the world's greatest library (university) at Alexandria. It lasted 700 years!
- Used diagrams to illustrate points of explanation.
- Reviewed and criticized the works of others.
- Preserved much knowledge of the ancient world.

Aristotle continued

Established the Science of Biology.

Supported the Four Element Hypothesis.

Invented a diving bell and took Alex the Great on a tour off the harbor bottom.

Added to the Four Element Hypothesis-- Proposed a fifth element-- The Ether or Heavenly Glow. (The Ether was still being sought in the 19th century as a medium for the transmission of light.

The heavens are a series of concentric crystalline spheres (we still use his terms)--

The Geosphere (earth at center of the universe).

The Hydrosphere (the waters of the earth).

The Atmosphere (the air above the earth).

The Pyrosphere (lightning).

The Stellarsphere (all stars are on the same sphere).

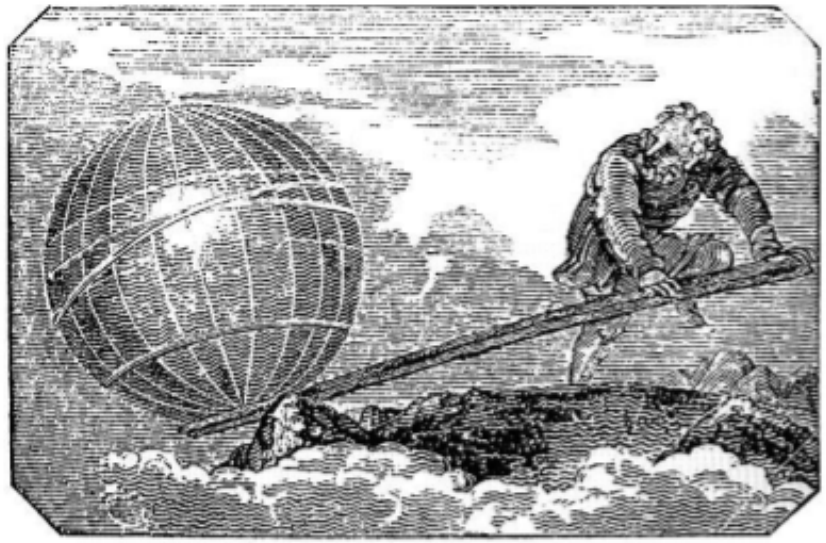
The Prime Mover or First Cause (to keep all in motion).

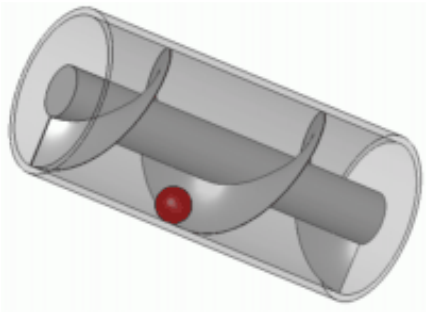
Aristotle's "FUNDAMENTAL OBSERVATIONS " :

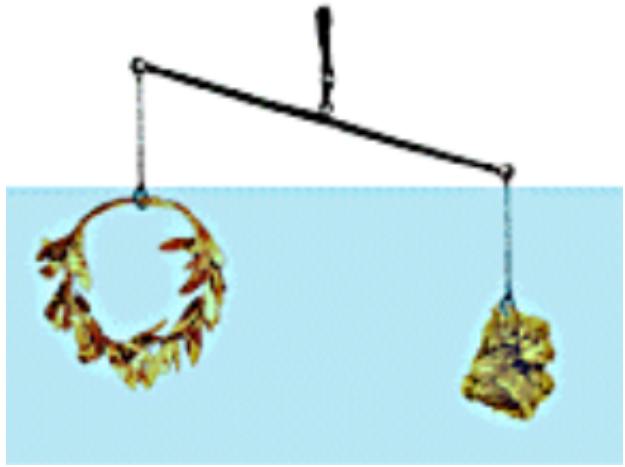
-The Heart is the center of thought (we memorize by heart).
-The Brain is a radiator to cool the blood (hot-headed).
-A continuous force (like the prime mover) must be exerted to keep things in motion.
-A thrown object continues to move because air from in front moves behind and pushes.
-Earthquakes are caused by winds blowing within the earth.
-Objects fall at accelerations proportional to their weights.
-Air is levity (it rises).
-The moon shines by its own light.
-Nature abhors a vacuum.
-Spontaneous Generation of Life (dead meat changes into living flies. This was still being disputed in the 19th century).
-It is the nature of things to be the way they are. ("it is the nature of the sun to be hot").
-Animals on the earth will be the same species

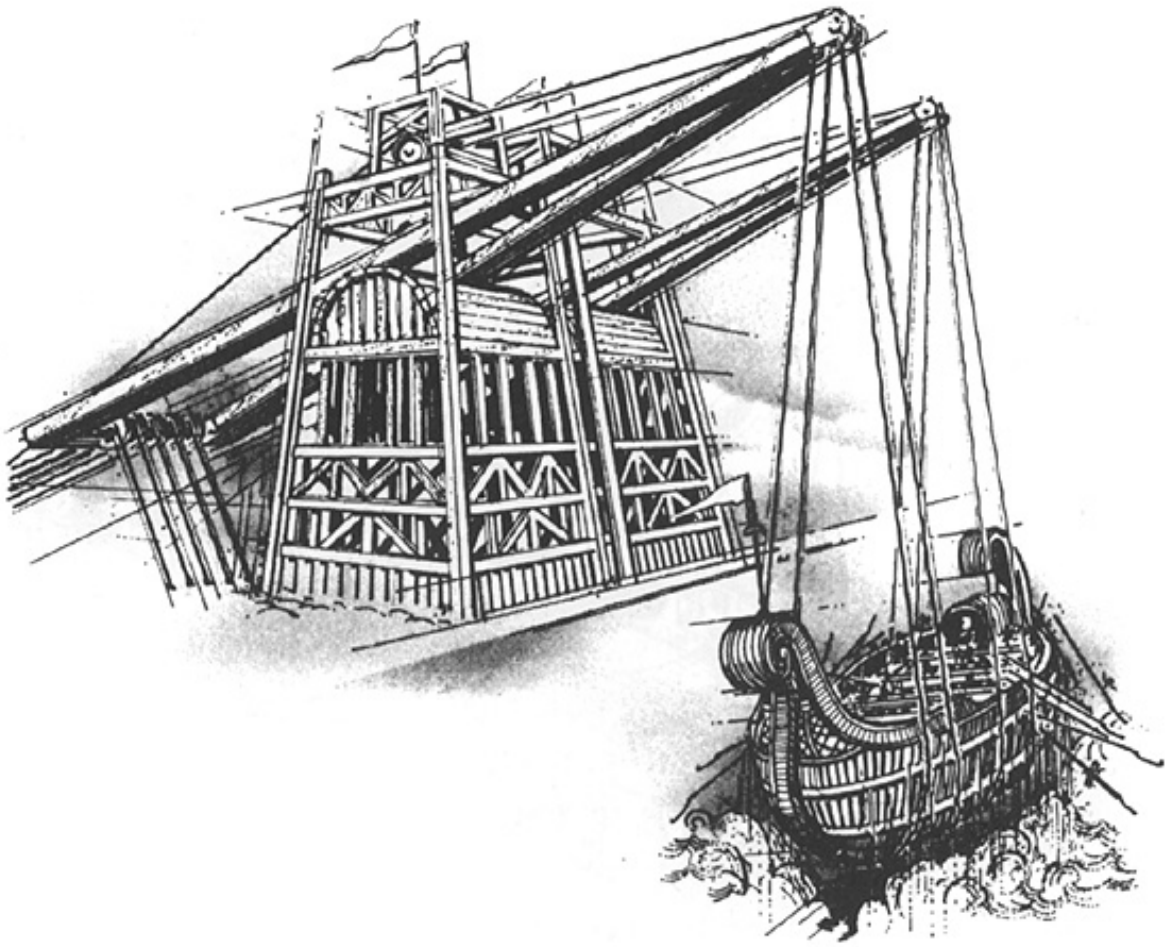
ARCHIMEDES (200) BC--

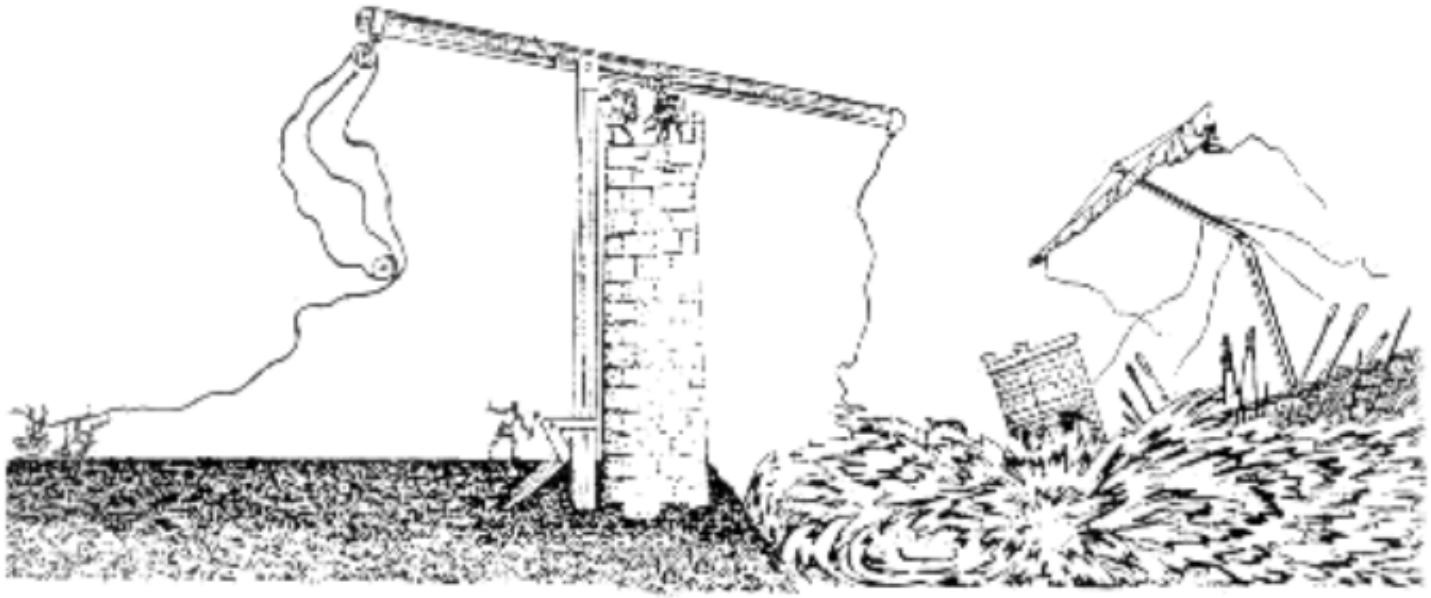
-Calculated the value of pi (between 3 10/71 and 3 1/7).
-Derived laws of the levers and pulleys for catapults and he single-handedly moved a ship onto the beach with pulleys.
-Used levers on the walls of Syracuse to dump Roman ships attacking the walls with battering rams.
-Had soldiers use their shields to reflect sunlight on Roman ships to start fires. (This was recently repeated by the Greek navy and it worked.)
-Discovered “Archimedes' Principle” to solve the problem of the king's gold crown being an alloy.
-The Cartesian diver illustrates the principles of buoyancy, transmission of pressure, and compression of air.
-The Archimedian Screw (for pumping ships).
-Invented an odometer for measuring the distances of Roman roads.
-King Hiero's Steam Ball-- first steam and jet engine.
-King Hiero's Fountain-- neat siphon action.
-Slain by a Roman soldier while doing geometry in the sand, “Disturb not my circle”.











FRIAR ROGER BACON (1200)--

The “Crazy Monk” of Oxford University.

Said, “Experimentation in Science is Necessary”

Developed a formula for gunpowder and used it to stop a student demonstration.

Predicted: Horseless carriages.
Sailless ships.
Flying machines.
Machines for lifting great weights.

Wrote the Novum Organum in which he presents --

The Scientific Method
Collect reliable data
Classify the Data
Generalize, experiment
Make Hypothesis or Theory
Try to prove it by further experiments

LEONARDO DA VINCI (1400)--

(Designed and built many of Friar Bacon's predictions).

GALILEO (1600)

-- Popular Professor of Physics.

Attacked the errors of Aristotle.

Improved the telescope.

Discovered the satellites of Jupiter and Galaxies.

Invented a thermometer.

Derived the Laws of Acceleration and of the Pendulum.

Showed that the Earth moves and is not the center of the Universe.

SIR ISAAC NEWTON (1600)--

Wrote the PHILOSOPHIAE NATURALIS PRINCIPIA an ultimate Physics book (Boom has a copy).

Co-invented the Calculus.

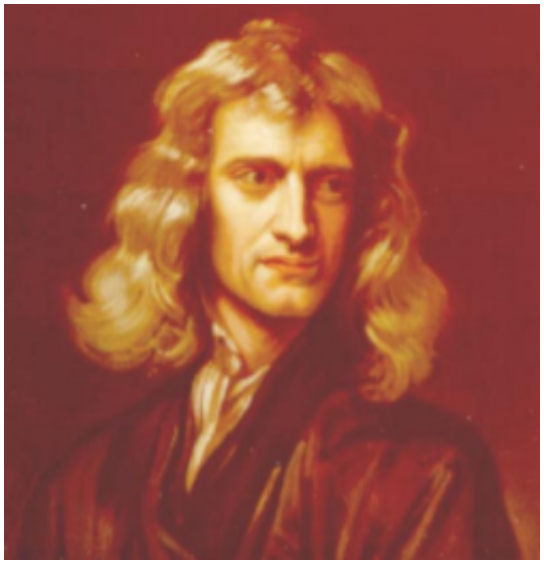
The Laws of Motion.

The Law of Universal Gravitation.

Laws of Heat.

Laws of Opticks.

Many others, too!



JOHN DALTON (1800)--

"Father of Modern Chemistry".

The MODERN ATOMIC THEORY
(compare to Democritus').

Elements are composed of atoms.

Atoms are indestructible (chemically correct).

All atoms of an element are identical (chemically correct).

In orderly fashion, the atoms combine to form molecules
(Dalton's Law).

The atoms are not changed in the process of forming molecules.