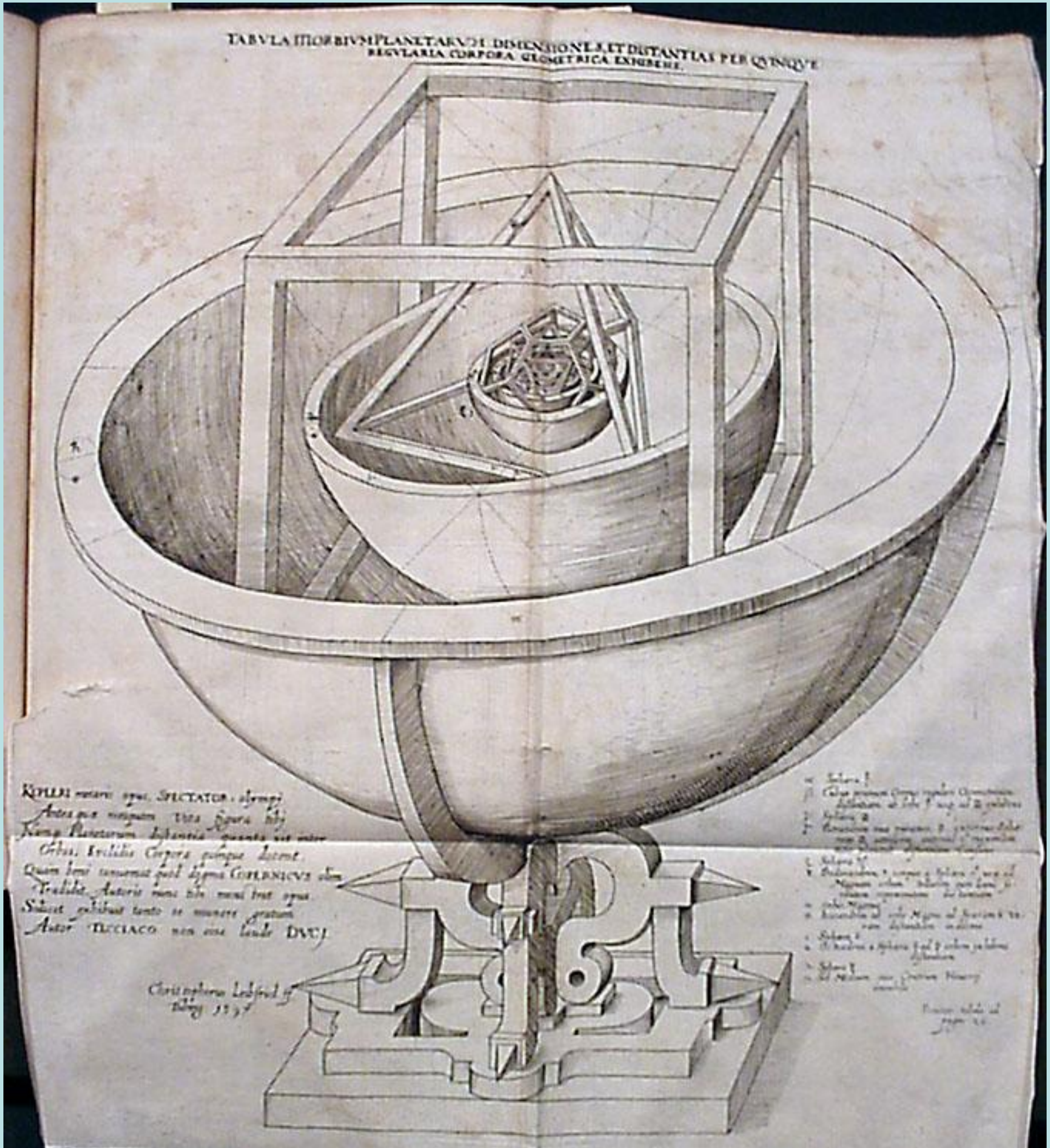

TETRAHEDRON
Fire
CUBE
Earth
OCTAHEDRON
Air
ICOSAHEDRON
Water
DODECAHEDRON
the Universe
The Platonic Solids

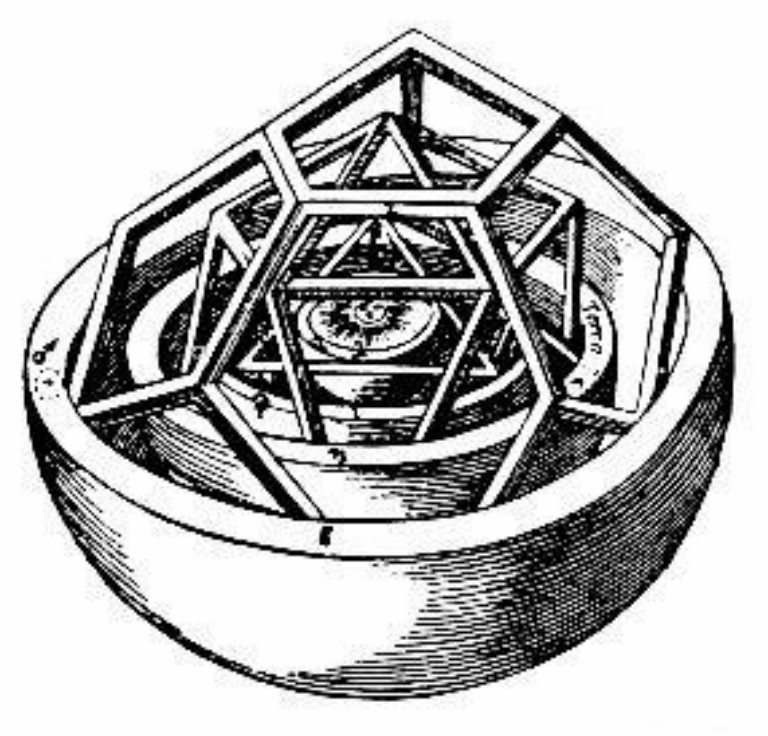
Platonic Solids

Cosmic figures are regular polyhedrons. A polyhedron is said to be regular if its faces are congruent regular polygons and if its polyhedral angles are all congruent. Plato proved that there are only 5 regular polyhedrons and for many years they were considered to be most magical and beautiful in the world and in geometry.

Kepler's **Platonic Solids**

Kepler proposed that the distance relationships between the six planets known at that time could be understood in terms of the five **Platonic solids**. His 1596 book, *Mysterium Cosmographicum,* proposed the model illustrated in the last slide, in which one **Platonic** solid fits between each pair of planetary spheres.


TABVLA III ORBIVM PLANETARVM DIMENSIONES, ET DISTANTIAS PER QVINQVE
REGVLARIA CORPORA GEOMETRICA EXHIBENS.



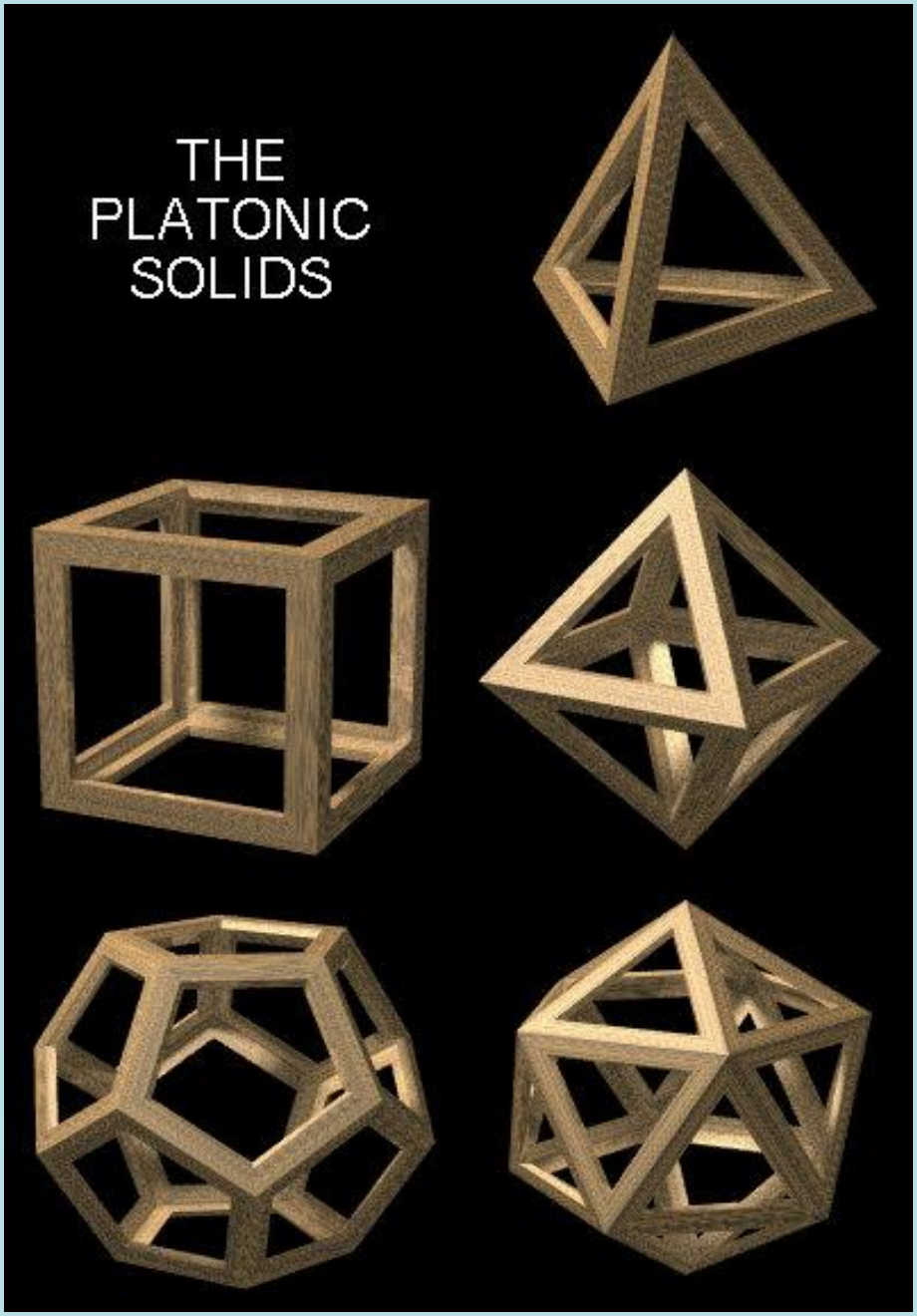
•The image is a close up of the spheres of inner planets, Mercury, Venus, Earth, and Mars.
•It explains why there are only six planets: How could there be a seventh planet, when Euclid proved that there are only five Platonic solids!
•Of course, the model is completely false, the interplanetary distances it predicts are not sufficiently accurate, and Kepler was scientist enough to accept this eventually.
•But it an excellent example of how truth and beauty are not always equivalent.

- The Platonic solids were known to the ancient Greeks, and were described by Plato in his Timaeus ca. 350 BC.
- tetrahedron with the "element" fire
- the cube with earth
- the icosahedron with water
- the octahedron with air
- the dodecahedron with the stuff of which the constellations and heavens were made

Cosmic Figures

- Plato tried to assure his readers that they form the foundation of the world being the 4 elements and the universe.
- Euclid wanted to show how geometry can be developed in from the very simple ideas to and the beauty of mathematics.
- In book 13 of Euclid's Element's he proved that there were only 5 regular polyhedrons.

	Faces	Edges	Vertices	Face is
Tetrahedron				
Cube				
Octahedron				
Dodecahedron				
Icosahedron				



# of faces + # of vertices = # of edges + 2

$$f + v = e + 2$$

	Faces	Edges	Vertices	Face is
Tetrahedron	4	6	4	Triangle
Cube	6	12	8	Square
Octahedron	8	12	6	Triangle
Dodecahedron	12	30	20	Pentagon
Icosahedron	20	30	12	Triangles

Euler's polyhedron theorem

The Soccer Ball

- How many faces, vertices, edges?