Plato

The Reality of Ideas

Plato

- o 427(?) - 348 BCE
- o Lived about 200 years after Pythagoras.
- o "Plato" means "the broad" – possibly his nickname.
- o Son of a wealthy Athens family.
- o Served in the Athens army during the Peloponnesian War.

Plato and Socrates

- o Plato was Socrates' student.
- o Almost all we know about Socrates is from Plato's writings.
- o After Socrates' execution for corrupting the young and neglecting the gods, Plato left Athens in disgust and travelled widely.
  - In Italy, Plato met the Pythagoreans.

The Academy

- In (ca.) 387 BCE, Plato returned to Athens and established a school for philosophy, built in a grove dedicated to the famous hero Academos.
- The Academy continued until it was closed in 529 CE, over 900 years.

Pre-eminence of Mathematics

- Though planned as a school for future statesmen, Plato had become convinced that the road to knowledge lay in exact reasoning, as in mathematics.
- The famous inscription over the entrance read:
  - Let no one who does not know geometry enter here.
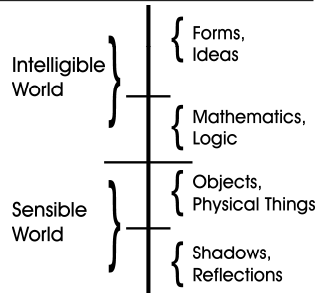
Plato's Dialogues

- Plato's works span approximately 30 "dialogues" – dramatic conversations with statesmen, citizens, and other recognizable names from Plato's time and earlier.
- Socrates is the main interlocutor.
  - It is hard to tell what are just Socrates' own views and what is just Plato's voice.

Plato on Reality

o Most of Plato's writings are not about nature, but his concepts of reality and knowledge have had a profound impact.

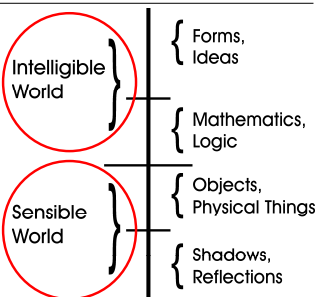o These are characterized by two well-known passages from his dialogue, *The Republic.*

The Divided Line

o Think of everything that is, placed on single line, extending from the lowest to the highest sense of reality.

Intelligible World
{ Forms, Ideas
{ Mathematics, Logic

Sensible World
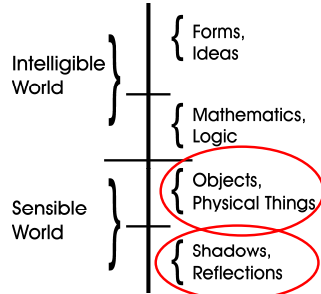{ Objects, Physical Things
{ Shadows, Reflections

The Divided Line, 2

o There are two main sections of the line, representing those things apprehended by the senses and those things only apprehended by the mind.
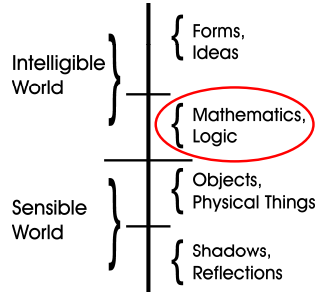
Intelligible World
{ Forms, Ideas
{ Mathematics, Logic

Sensible World
{ Objects, Physical Things
{ Shadows, Reflections

The Divided Line, 3

- Each section can also be divided into two subsections.
- At the bottom the division is between objects and mere appearances.

Intelligible World
- Forms, Ideas
- Mathematics, Logic

Sensible World
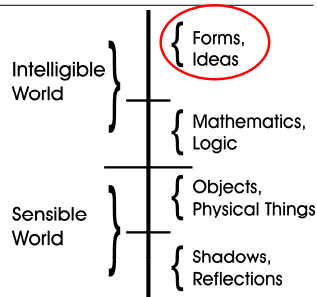- Objects, Physical Things
- Shadows, Reflections

The Divided Line, 4

- In the upper section, the lower part represents matters understood by deductive reasoning
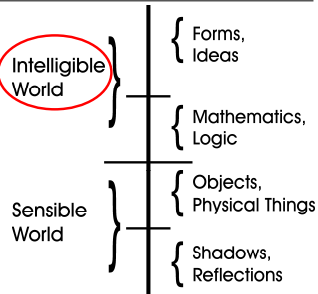- Deduction implies valid arguments from an assumed starting place.

Intelligible World
- Forms, Ideas
- Mathematics, Logic

Sensible World
- Objects, Physical Things
- Shadows, Reflections

The Divided Line, 5

- At the very top is the purest form of reality, the forms.
- Understanding the forms is the highest goal of philosophy.

Intelligible World
- Forms, Ideas
- Mathematics, Logic

Sensible World
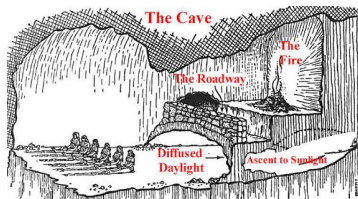- Objects, Physical Things
- Shadows, Reflections

The Divided Line, 6

○ Knowledge is possible only of what lies in the Intelligible World.

○ Opinion is all that is possible for the Sensible World.

○ Therefore true knowledge depends entirely on the mind.

Intelligible World — { Forms, Ideas

{ Mathematics, Logic

Sensible World — { Objects, Physical Things

{ Shadows, Reflections

The Allegory of the Cave

The Cave
The Fire
The Roadway
Diffused Daylight
Ascent to Sunlight

○ Also in *The Republic*, Plato explains the route to knowledge and the responsibilities of philosophers through an allegory about prisoners in a cave.

The Allegory of the Cave, 2

The Cave
The Fire
The Roadway
Diffused Daylight
Ascent to Sunlight
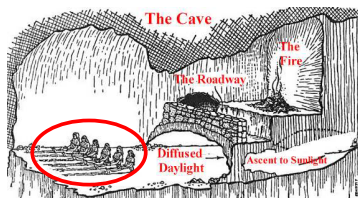
○ Imagine a cave in which prisoners are chained and seated so that they all face one way, toward a wall.

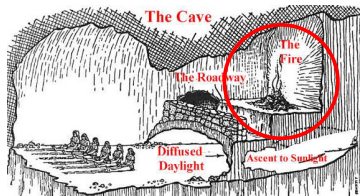## The Allegory of the Cave, 3

- The prisoners have been there all their lives and know nothing of the outside world.
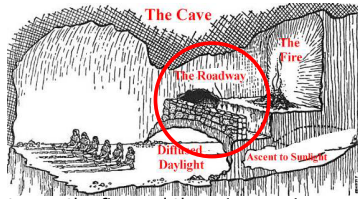
The Allegory of the Cave, 4

- All that the prisoners see are the shadows cast on the wall before them.
  - This is the lowest segment of the Divided Line.
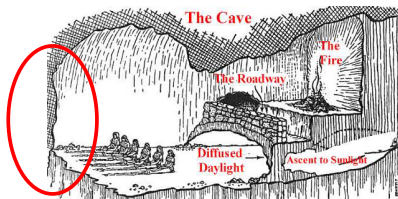
The Allegory of the Cave, 5

- Behind the prisoners is a fire, which they cannot see, that casts the shadows on the wall before them.

The Allegory of the Cave, 6

o Between the fire and the prisoners is a parapet, or walkway, where people are crossing back and forth with strange objects held above their heads.
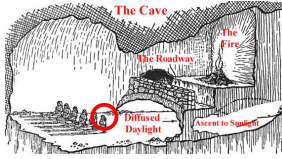
The Allegory of the Cave, 7

o Everything the prisoners see or hear is bounced off the wall. They therefore think of that as the true reality.

The Allegory of the Cave, 8

o Now, suppose one of the prisoners is unshackled and led away, up out of the cave and into the world outside.
o The prisoner will probably object and when outside, will be blinded by the light.
o But in time the released prisoner will realize that it is the world outside that is real and the world in the cave only one of illusion.

The Allegory of the Cave, 9

- If then the prisoner is led back down into the cave and placed in his original position, the other prisoners would mock him if he told them of the world outside and think him a fool. And they would object to anyone else being led away.

The Allegory of the Cave, 10

- From *The Republic*:
  - "…the prison-house is the world of sight, the light of the fire is the sun, and … the journey upwards [is] the ascent of the soul into the intellectual world…."
    - Complete text in *Glimpses of Reality,* chapter 5.

The Allegory of the Cave, 11

- The prisoner who is released and attains a full understanding of what is real (the philosopher), has a responsibility to return to the cave and instruct others in what is real, so that they too may escape into the world of truth.

The Duty of the Philosopher

○ For Plato, the philosopher has a duty to enlighten the uneducated.
○ Compare this to the Pythagoreans, who sought to prevent any special knowledge they had from escaping from their cult.

Saving the Phenomena

○ The key is to show the real causes of the phenomena that are sensed by the unenlightened.
  • To show how a lower part of the divided line is accounted for by a higher part.
○ This is called Saving the Phenomena. (Or, Saving the Appearances.)

Saving the Phenomena, 2

○ Examples would be:
  • Explaining to the prisoners that the shadows they see are caused by the fire behind them and the people walking on the parapet.
  • Explaining that night comes when the sun is no longer visible in the sky.

The Mysteries of the Cosmos

o Accounting for the strange behaviour of the heavens provided an excellent proving ground for the philosopher's task.
o Everyone sees the same phenomena.
o Some aspects of the heavenly bodies seemed to defy explanation.
 • Note the role of science as uncovering the secrets of nature.

Empedocles, 492-434 BCE

o One more minor philosopher to mention.
  • Not a Pre-Socratic, but a contemporary of Socrates.
o Came up with the most popular and accepted world view of ancient times.
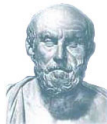
The Four Elements

o The basic stuff of the world:
  • Four elements: Earth, Air, Fire, Water
  • Embodying pairs of qualities from two sets of opposites:
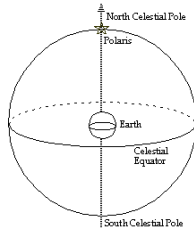   o Hot-Cold, Wet-Dry

Fire

Hot   Dry

Air   Earth

Wet   Cold

Water
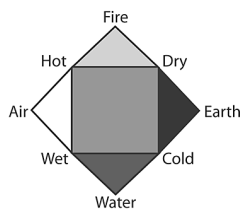
Two Forces

○ Causes of change:
  • Two forces: **Love** and **Hate**
  • The universe cycles through stages as Love and Hate counter each other.
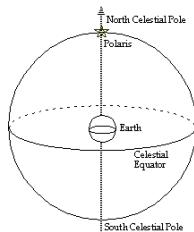
The Two Sphere Universe

○ Empedocles described the cosmos as a large spherical ball, with the stars all at the edge.
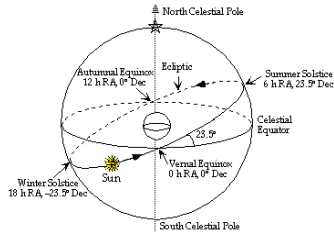
○ Earth was a sphere in the middle.

The Two Sphere Universe, 2

○ The Earth remained stationary in the centre, and the entire celestial sphere revolved around every day, carrying the sun and the moon with it.

The Two Sphere Universe, 3

○ The sun was thought to creep slowly around the celestial sphere on a circular path angled at 23½° to the equator, giving the seasons.

○ The moon was similar.

North Celestial Pole
Ecliptic
Autumnal Equinox
12 h RA, 0° Dec
Summer Solstice
6 h RA, 23.5° Dec
Celestial Equator
23.5°
Sun
Winter Solstice
18 h RA, –23.5° Dec
Vernal Equinox
0 h RA, 0° Dec
South Celestial Pole

The Problem of the Planets

○ The stars all appeared to turn around the Earth as one, going from east to west, as though imbedded in the celestial sphere.

● Note: Going the wrong way in the illustration.
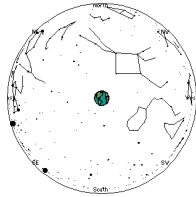
The Problem of the Planets, 2

○ Exceptions:

● A few of the "stars" – meaning heavenly bodies – did not stay in the same place relative to the others.

● They moved against the backdrop of the celestial sphere.

The Problem of the Planets, 3

- Most obvious was the sun, which travelled along a circular path against the celestial sphere taking a year for a complete cycle.
- The moon similarly had a 29½ day cycle.
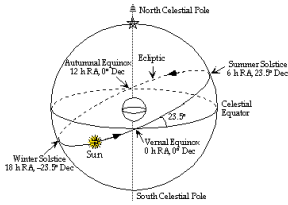
The Problem of the Planets, 4

- The sun and the moon were obviously different sorts of heavenly bodies.
- But there were five other bodies that looked like stars, yet they also changed position relative to the celestial sphere.

The Problem of the Planets, 5

- These misbehaving stars were given names:
  - Mercury, Venus, Mars, Jupiter, and Saturn.
- These, along with the sun and the moon, were called "**wandering stars**," as opposed to the "fixed stars" that appeared to remain in the same place on the celestial sphere.
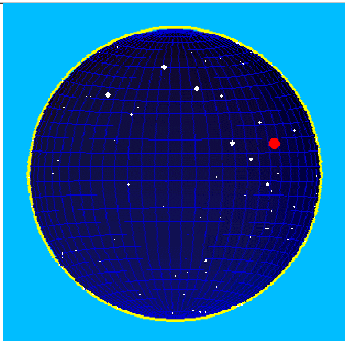
The Problem of the Planets, 6

○ Almost all of ancient astronomy is concerned with explaining the motions of these 7 wandering stars.

○ The word for "wanderer" in ancient Greek is πλανητης, *planetes*, from which we get **planet**.

○ All 7 wanderers were called *planets*, but only the sun and the moon had nice, easily understood paths.
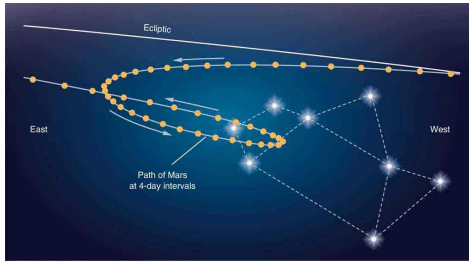
The Problem of the Planets, 7

○ The strange motions of the planets obsessed many ancient philosophers.

○ The heavenly bodies were free of human intervention. They repeated their motions over and over again.

○ If the world was rational there must be some way of accounting for their motions precisely.

Retrograde motion

The planets not only move relative to the fixed stars, they change direction.

Retrograde motion

Ecliptic

East   West

Path of Mars
at 4-day intervals

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Saving the Astronomical Phenomena

○ Plato's admonition to philosophers to "save the phenomena" was a challenge to show how the phenomena of the world can be rationally understood.
○ A major triumph would be to account for the Problem of the Planets.

Eudoxos of Cnidus

○ 408-355 BCE
○ Famous mathematician and astronomer.
○ At one point a student of Plato's.
○ Eudoxus accepted Plato's challenge to "save" the planets by accounting for their weird motions with simple geometric manipulations.
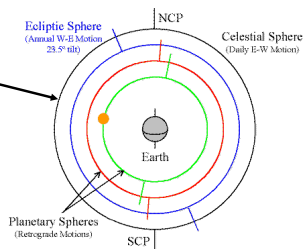
The Spheres of Eudoxus

- Eudoxus came up with a scheme to account for the strange forward and backward motions of the planets.
- He imagined a series of concentric spherical shells for each planet, turning on different axes nested inside each other.
- On the innermost spherical shell would be the only part visible: the planet.

The Spheres of Eudoxus, 2

- The outer sphere is aligned north and south and turns simultaneously with the celestial sphere.
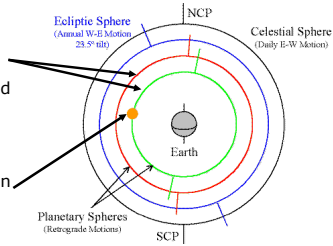- This swings the planet around daily.

The Spheres of Eudoxus, 3

- Next is the Ecliptic Sphere, which is aligned with the motion of the sun, i.e. a 23.5° tilt to the axis of the celestial sphere.
- This causes the slow west to east migration of the planet
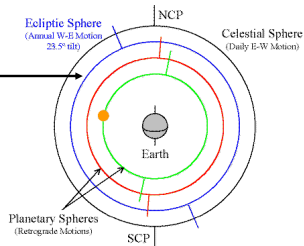
The Spheres of Eudoxus, 4

○ The third and fourth spheres are aligned differently for each planet and produce the looping retrograde motions.

○ The planet is on the innermost sphere.

NCP

Ecliptic Sphere
(Annual W-E Motion
23.5° tilt)

Celestial Sphere
(Daily E-W Motion)

Earth

Planetary Spheres
(Retrograde Motions)

SCP

The Problem of the Planets Solved

○ The phenomena, i.e. the crazy motion of the planets, are saved.

• This means that they are shown to be nothing more than the combination of regular motions of regular geometric shapes.

• The sphere is a "philosophical" shape. Therefore the planetary motions are philosophical.

A complex (invisible) system in the sky

○ Eudoxus required 27 different concentric spheres.

• 3 for each of the sun and moon,

• 4 for each of the other 5 planets,

• and the celestial sphere for the fixed stars.

Yes, but…

○ The main problem with Eudoxus' brilliant solution is that it did not work.

○ Despite all the possibilities, Eudoxus could never figure out the relative sizes, angles, and rates of revolution to put the planet in the right place in the sky.

On the positive side…

○ Eudoxus' goal was to capture the unexplained movements of the planets by mathematics.

○ This became a model of what a proper explanation of nature should look like.

○ *Note:* The "sensible world" (the visible planets) are explained by reference to the "intelligible world" (mathematics).