

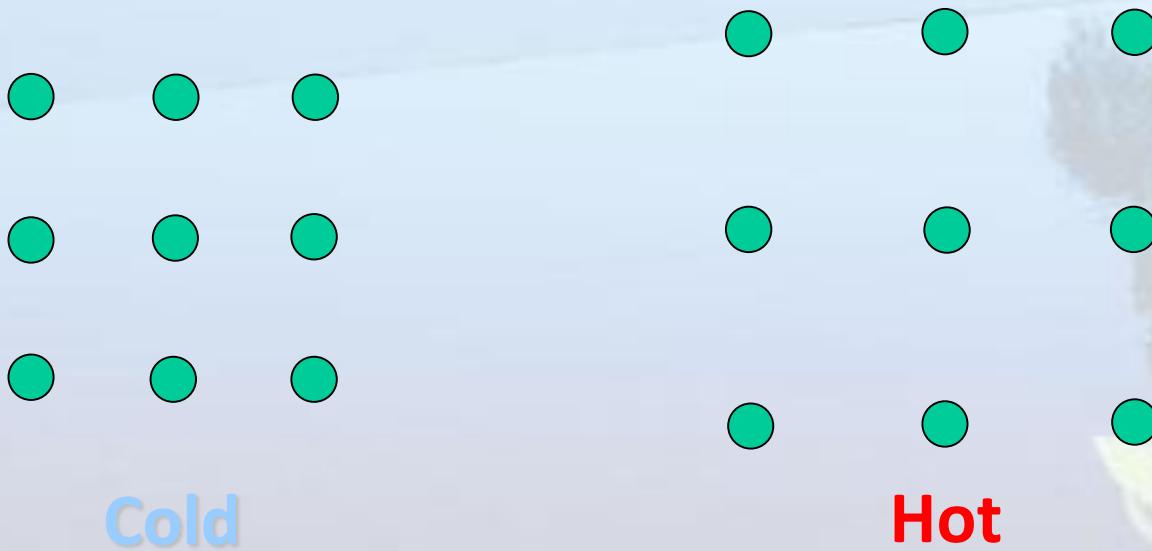
Science in Classics

经典中的科学

Plato, *The Republic of Plato*
(柏拉图：《理想国》)

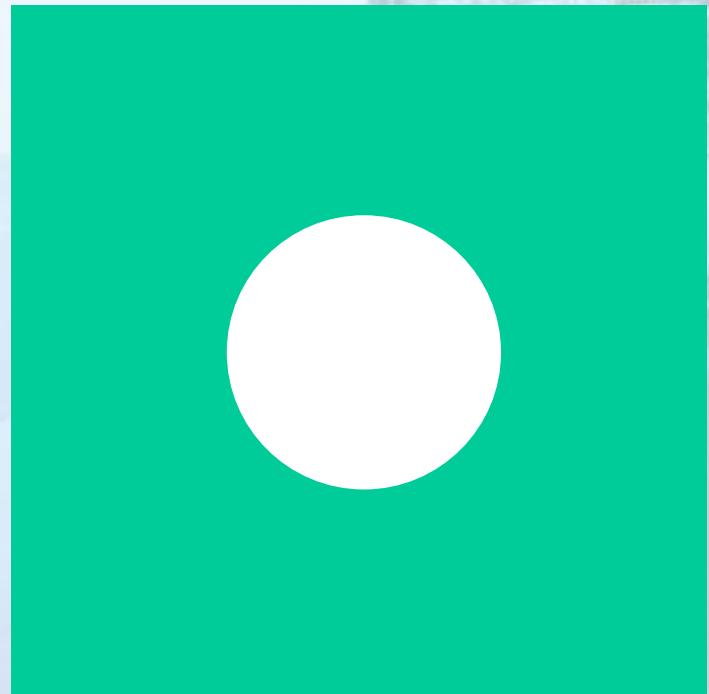
Atomic theory

- Everything is made of atoms.
- Heating \Rightarrow energy $\uparrow \Rightarrow$ separation \uparrow
- Cooling \Rightarrow energy $\downarrow \Rightarrow$ separation \downarrow



Prediction

- The metal is heated.
The hole
 - A. becomes larger.
 - B. becomes smaller.
 - C. remains unchanged.
- Which is true?

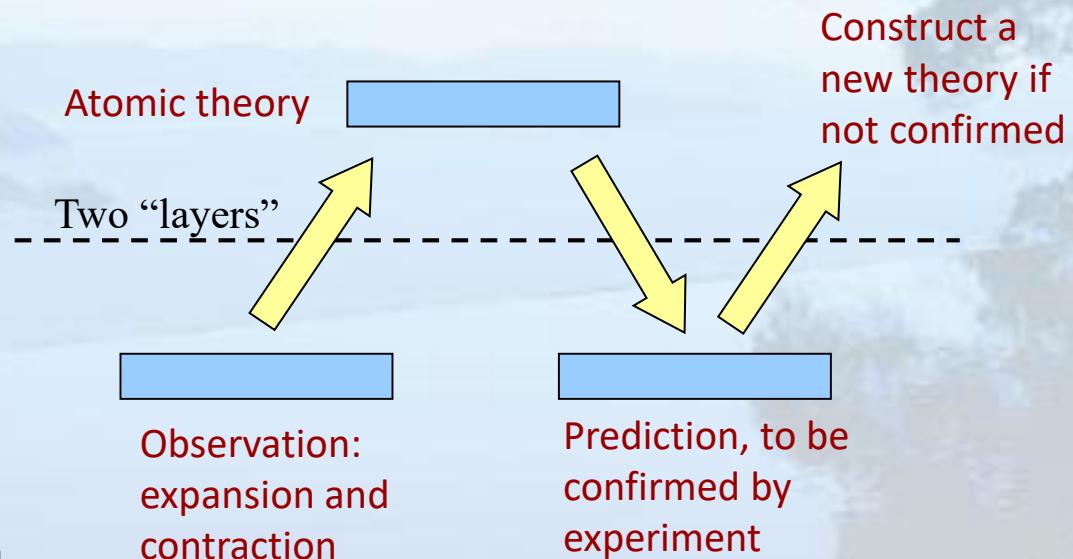


Tell you later!



What physicists are doing ...

- Bottom-up
- Top-down
- Aim: The theory
 - Something general
(also truer?)



Text

- Plato, *The Republic of Plato* / translated by Benjamin Jowett.
 - 506d-518d (from Book VI and Book VII)
 - originally in classical Greek

Core Question

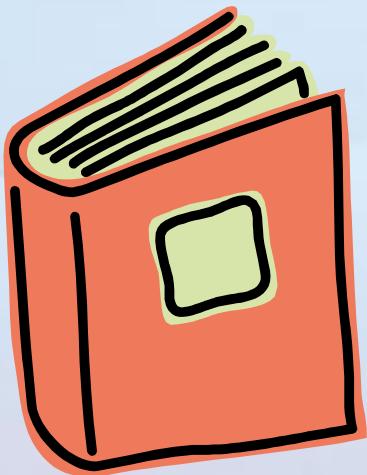
Is the real world really real?

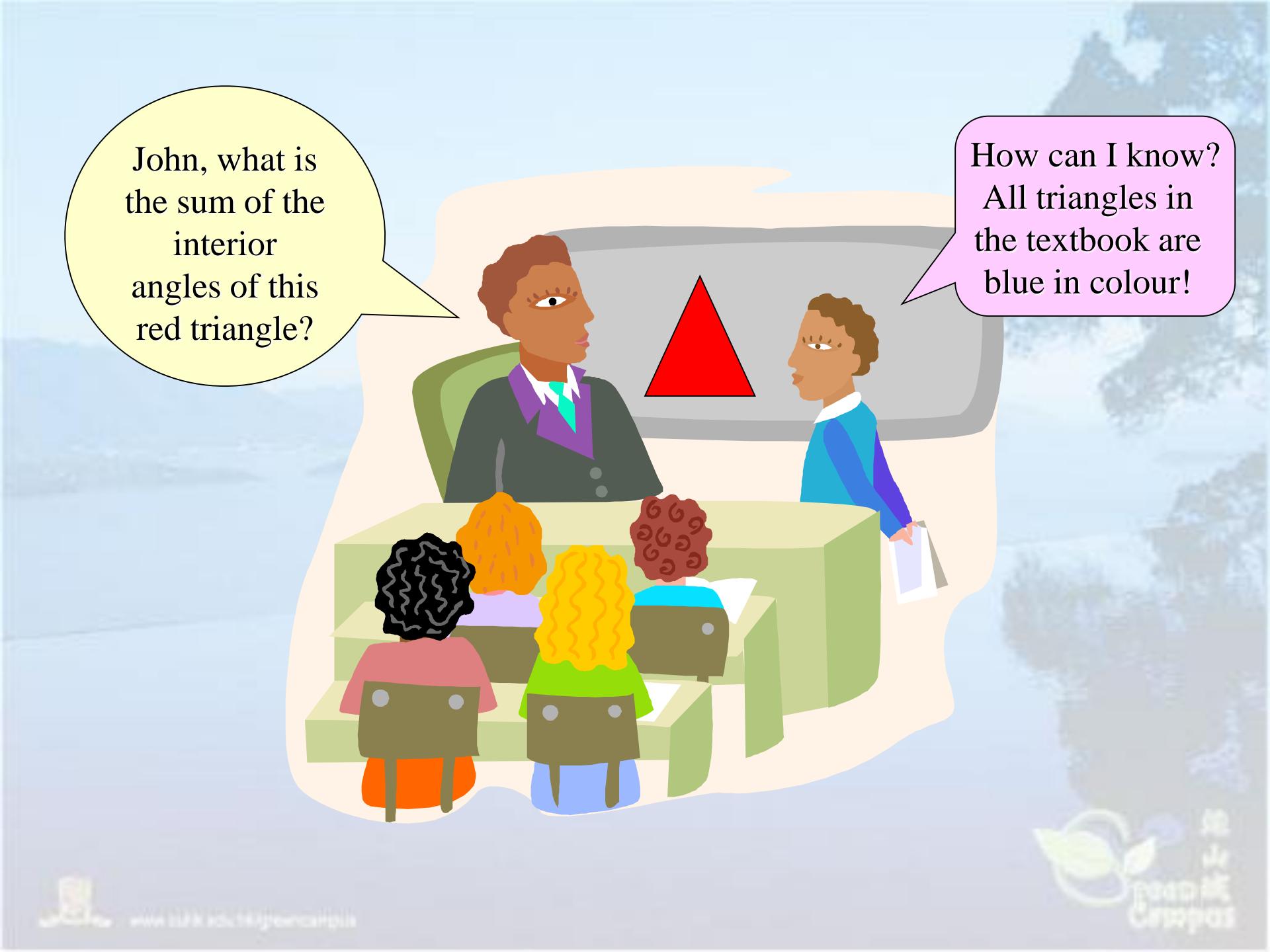
Outline of lecture

1. What is NOT science?
2. Plato's worldview
3. Plato's epistemology
4. What is science?



Mrs. Smith um the problem is I may not be able to help because I haven't seen your son's body in any biology textbook.





John, what is
the sum of the
interior
angles of this
red triangle?

How can I know?
All triangles in
the textbook are
blue in colour!

Science is not ...

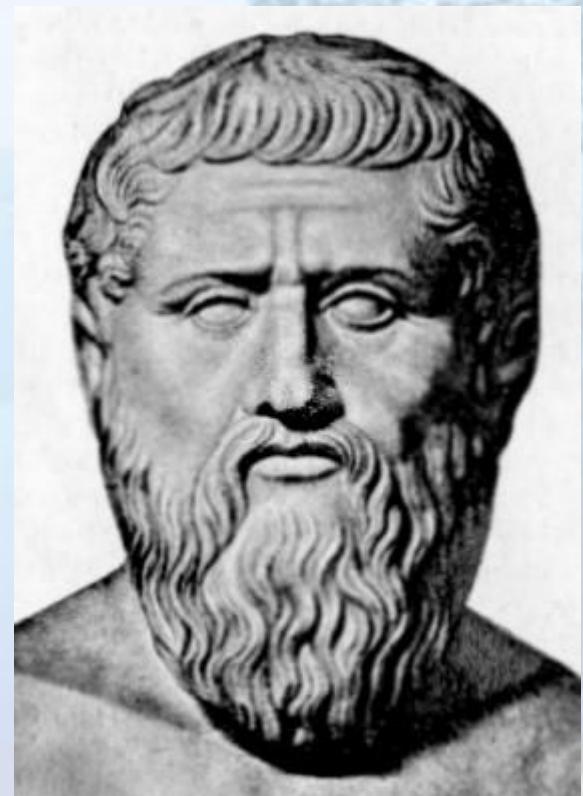
- Science is not only about experience.
- Something beyond experience is “truer” (e.g. universal principles).

Outline of lecture

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4. What is science?

Plato

- c.428 BC – c. 348 BC
- Classical Greek philosopher.
- Mentor: Socrates
- Student: Aristotle
- Socrates + Plato + Aristotle:
laid the foundations of
Western philosophy.



Wikipedia



Wikipedia

Plato and Socrates in a medieval picture

- Father: Ariston
- Mother: Perictione
- Elder brothers: Adeimantus and Glaucon.
- Sister: Potone.
- Note: There is a character called Glaucon in *The Republic*.

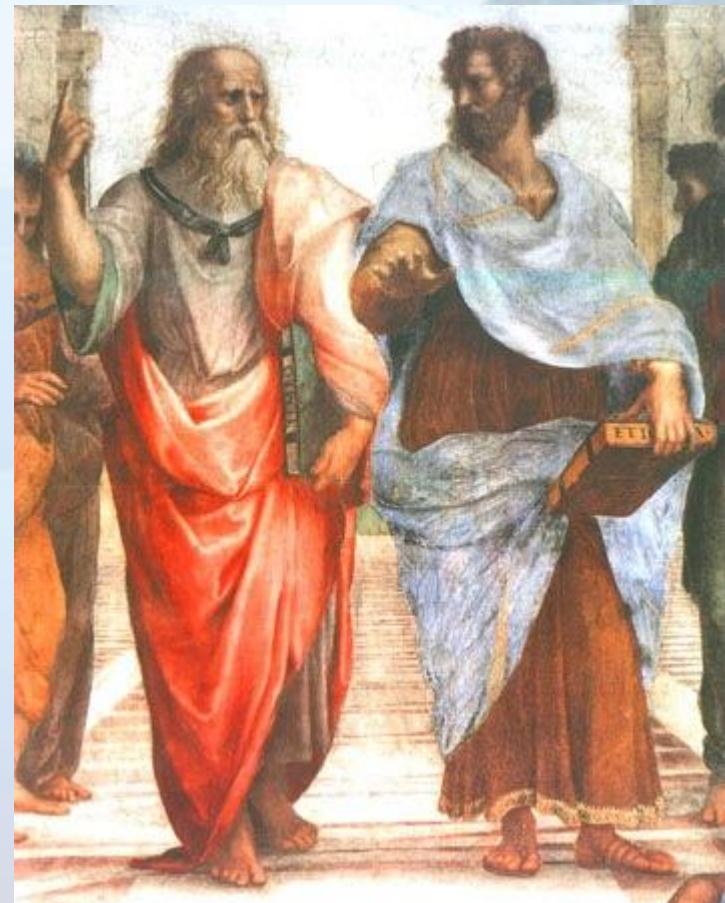
The School of Athens - Raffaello Sanzio (Wikipedia)

They are Plato
and Aristotle.
Which is which?



Hints

- Their arms.
- The orientation of their books.



More hints

- Plato talked about the ideal world. Aristotle talked about the real world.
- Answer:
 - Left: Plato
 - Right: Aristotle



What is this?



Theory of reminiscence (回忆)

- We lived in the world of forms (理型). There was the perfect desk.
- We now live in the material world. There are material desks. A material desk can remind us of the perfect desk.
- We therefore know it is a desk.

Education ≠ imparting (灌输) knowledge

66

The conversion of
the soul is the
turning round the
eye from
darkness to light.

But then, if I am right, certain professors of education must be wrong when they say that they can put a knowledge into the soul which was not there before, like sight into blind eyes.

They undoubtedly say this, he replied.

67

Whereas, our argument shows that the power and capacity of learning exists in the soul already; and that just as the eye was unable to turn from darkness to light without the whole body, so too the instrument of knowledge can only by the movement of the whole soul be turned from the world of becoming into that of being, and learn by degrees to endure the sight of being, and of the brightest and best of being, or in other words, of the good.

Very true.

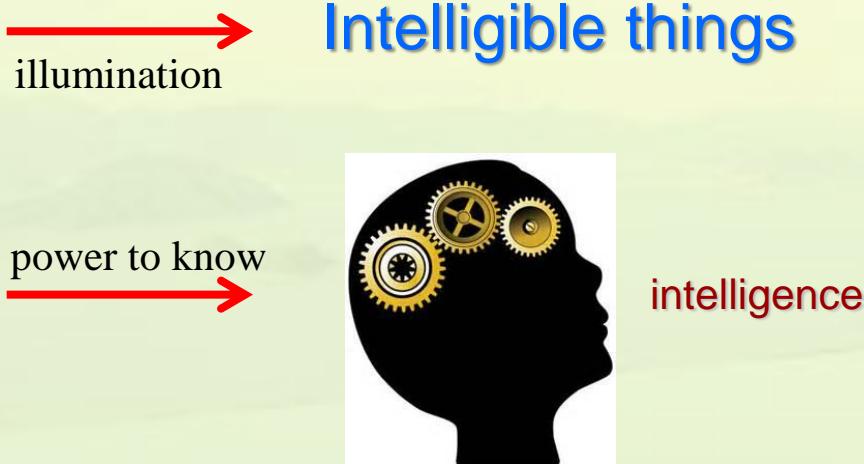
[...]

柏拉图认为人天生就有学习的能力。教育不是教新知识，而是帮助学生看到他们本来就能看到的。对这一点有兴趣的同学可阅读柏拉图的 *Meno*。

(Book VII)

Plato's two-world system

The idea of good
(至善的理型)

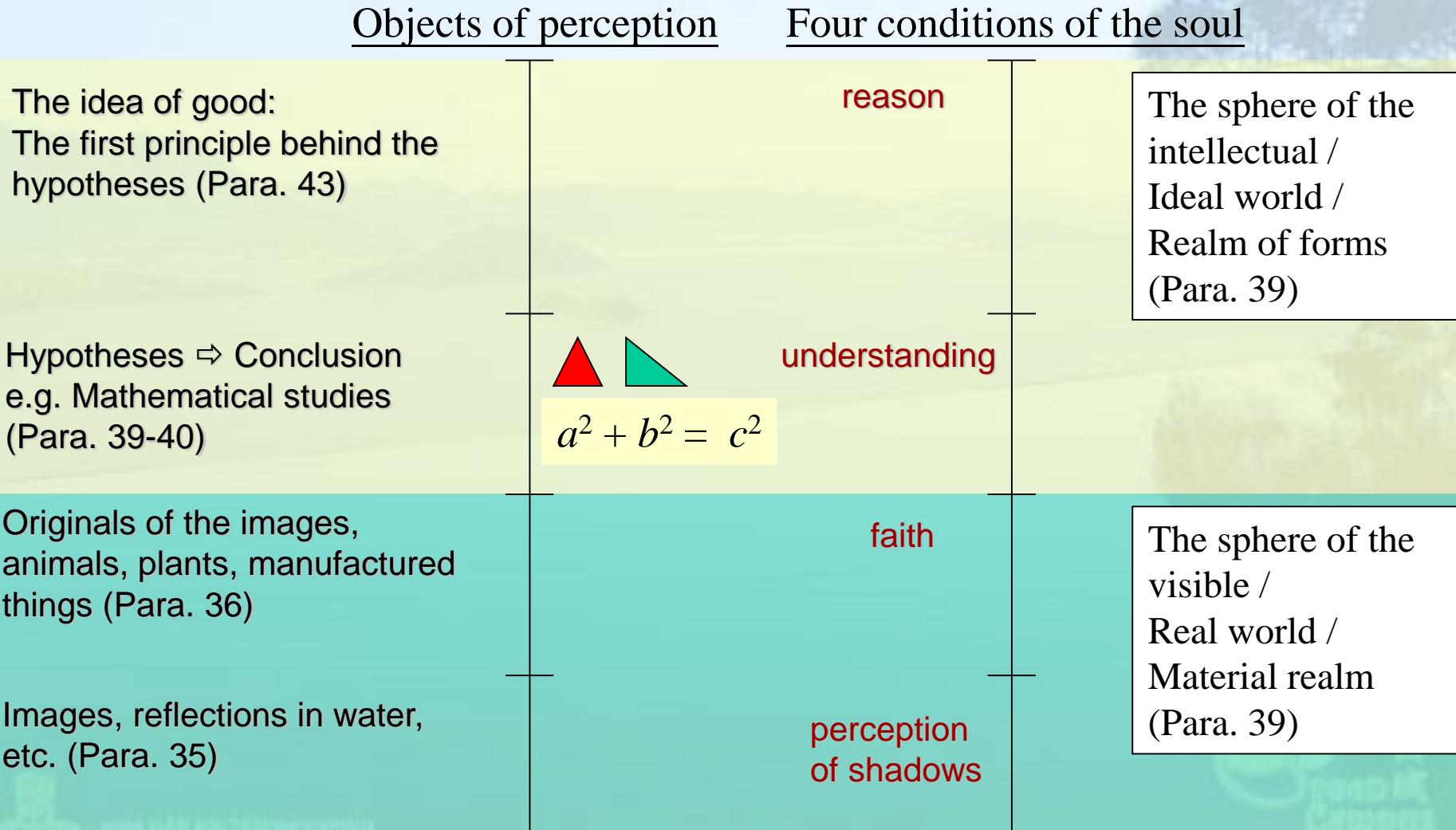


The sphere of the
intellectual /
Ideal world /
Realm of forms
(Para. 39)



The sphere of the
visible /
Real world /
Material realm
(Para. 39)

Plato's two-world system



Different degrees of truth

(About the real world)

37

Would you not admit that both the sections of this division have different degrees of truth, and that the copy is to the original as the sphere of opinion is to the sphere of knowledge?
Most undoubtedly.

(Book VI)

- Not either true or false.
- Do not say that the images are false.

What is education?

Objects of perception

The idea of good:
The first principle behind the
hypotheses (Para. 43)

Hypotheses \Rightarrow Conclusion
e.g. Mathematical studies
(Para. 39-40)

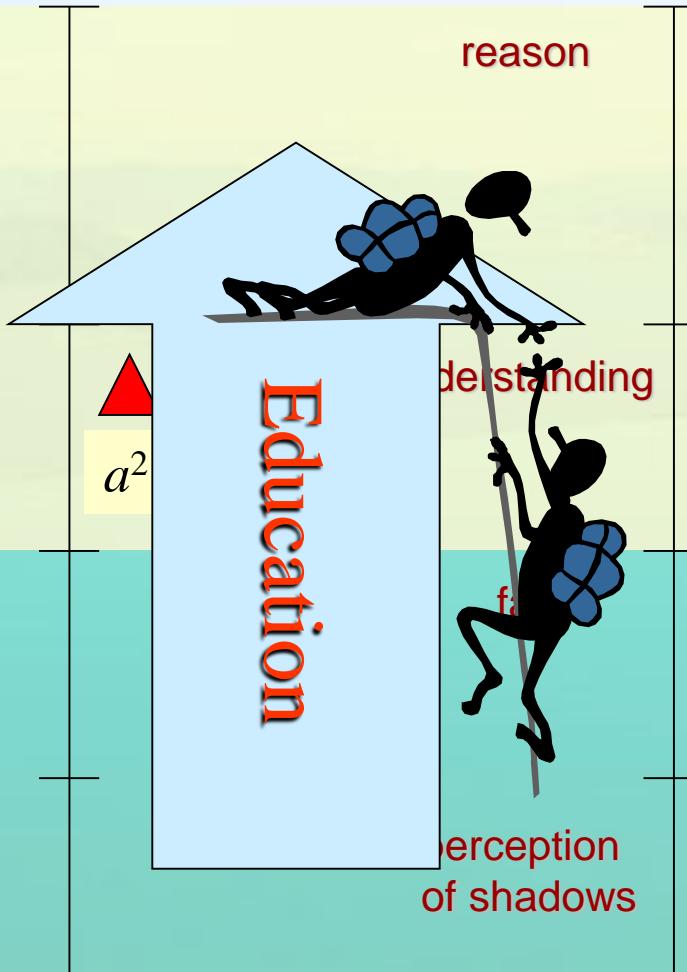
Originals of the images,
animals, plants, manufactured
things (Para. 36)

Images, reflections in water,
etc. (Para. 35)

Four conditions of the soul

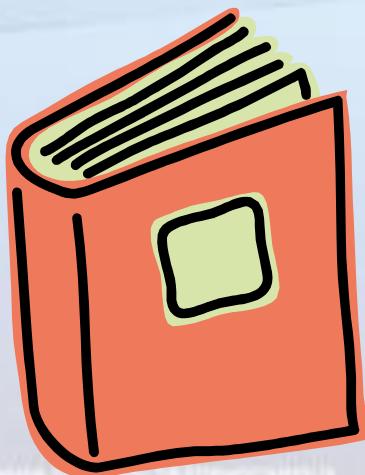
The sphere of the
intellectual /
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(Para. 39)

The sphere of the
visible /
Real world /
Material realm
(Para. 39)



Is the doctor educated?

Mrs. Smith um the problem is I may not be able to help because I haven't seen your son's body in any biology textbook.



What about John?

John, what is the sum of the interior angles of this red triangle?

How can I know?
All triangles in the textbook are blue in colour!

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1. What is NOT science?
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3. **Plato's epistemology**
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Sense is inevitable

2

We can only
attain to the
things of mind
through the
things of sense.
The 'child' of the
good.

Yes, my friend, and I shall be at least equally satisfied, but I cannot help fearing that I shall fall, and that my indiscreet zeal will bring ridicule upon me. No, sweet sirs, let us not at present ask what is the actual nature of the good, for to reach what is now in my thoughts would be an effort too great for me. But of the child of the good who is likest him, I would fain speak, if I could be sure that you wished to hear—otherwise, not.

By all means, he said, tell us about the child, and you shall remain in our debt for the account of the parent.

(Book VI)

- The good is too abstract.
- Talk about his child (i.e. the sun)
- Sense is a starting point.

Sense provides the content

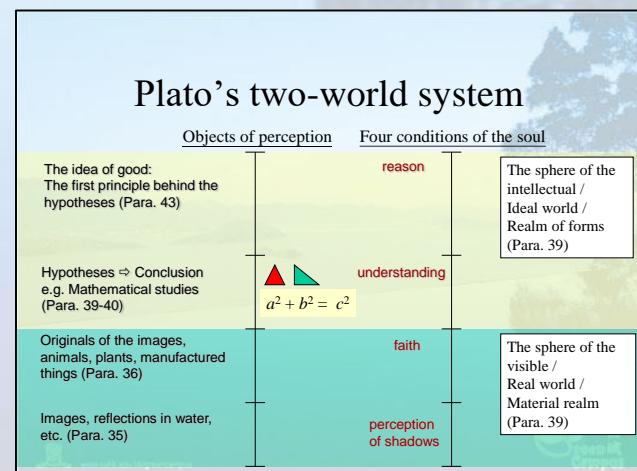
39

Images and hypotheses.

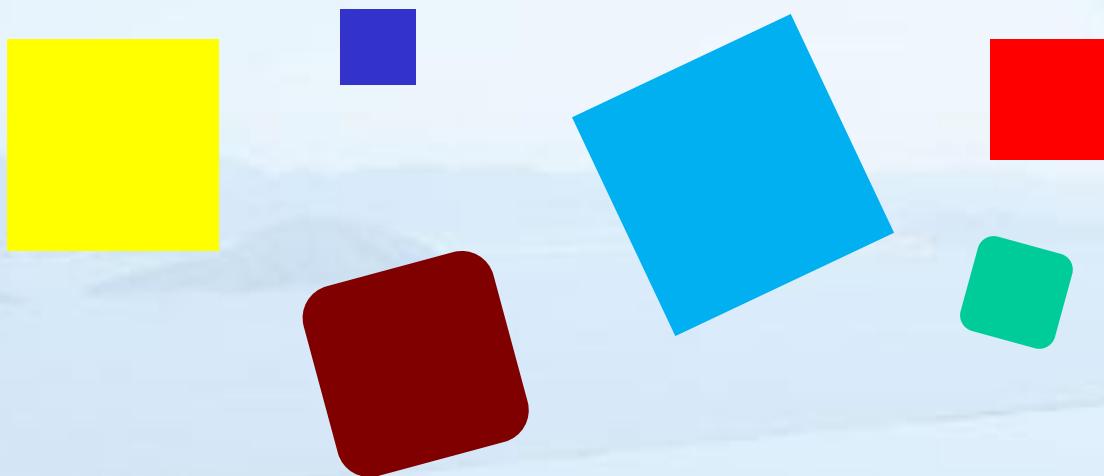
Thus:—There are two subdivisions, in the lower or which the soul uses the figures given by the former division as images; the enquiry can only be hypothetical, and instead of going upwards to a principle descends to the other end; in the higher of the two, the soul passes out of hypotheses, and goes up to a principle which is above hypotheses, making no use of images⁷ as in the former case, but proceeding only in and through the ideas themselves.

I do not quite understand your meaning, he said.

- Before you can study the figures, you saw them in the lower division.



What are they?



- What are common among them?
- What will you call them?

The absolute

(Book VI)

5

The old story, that there is a many beautiful and a many good, and so of other things which we describe and define; to all of them 'many' is applied.

True, he said.

6

And there is an absolute beauty and an absolute good, and of other things to which the term 'many' is applied there is an absolute; for they may be brought under a single idea, which is called the essence of each.

7

Very true.

The many, as we say, are seen but not known, and the ideas are known but not seen.

- Many squares: red, green, big, small, round-cornered...
- Have you seen any perfect square?

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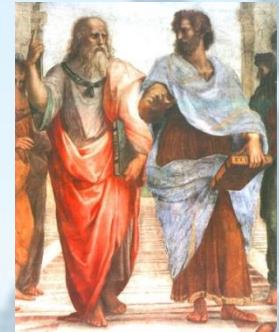
The Allegory of the cave



Plato's Allegory of the cave, Engraving of Jan Saenredam (1565-1607) after a painting of Cornelis Corneliszoon van Haarlem (1562-1638) (Wikimedia Commons)

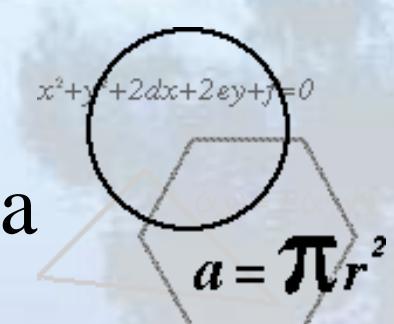
Republic

- What is justice?
- Personal justice \Leftrightarrow justice in a city
- The ruler should be a philosopher.
- He should know the idea of good.
- One way to know it is to study
 - Arithmetic, geometry, solid geometry, astronomy. (Book VII)



Science

- The idea of good: intelligible (which Plato's finger is pointing at?) but not visible.
- Geometry: the theorems are intelligible but not visible.
- One must study geometry (and other science subjects) in order to become a philosopher.



Plato's influence on science

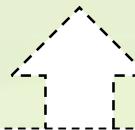
does not mean that the modern scientific worldview is entirely Platonic.

“Intelligible sphere”

Natural laws

Mathematical laws

$$a^2 + b^2 = c^2$$



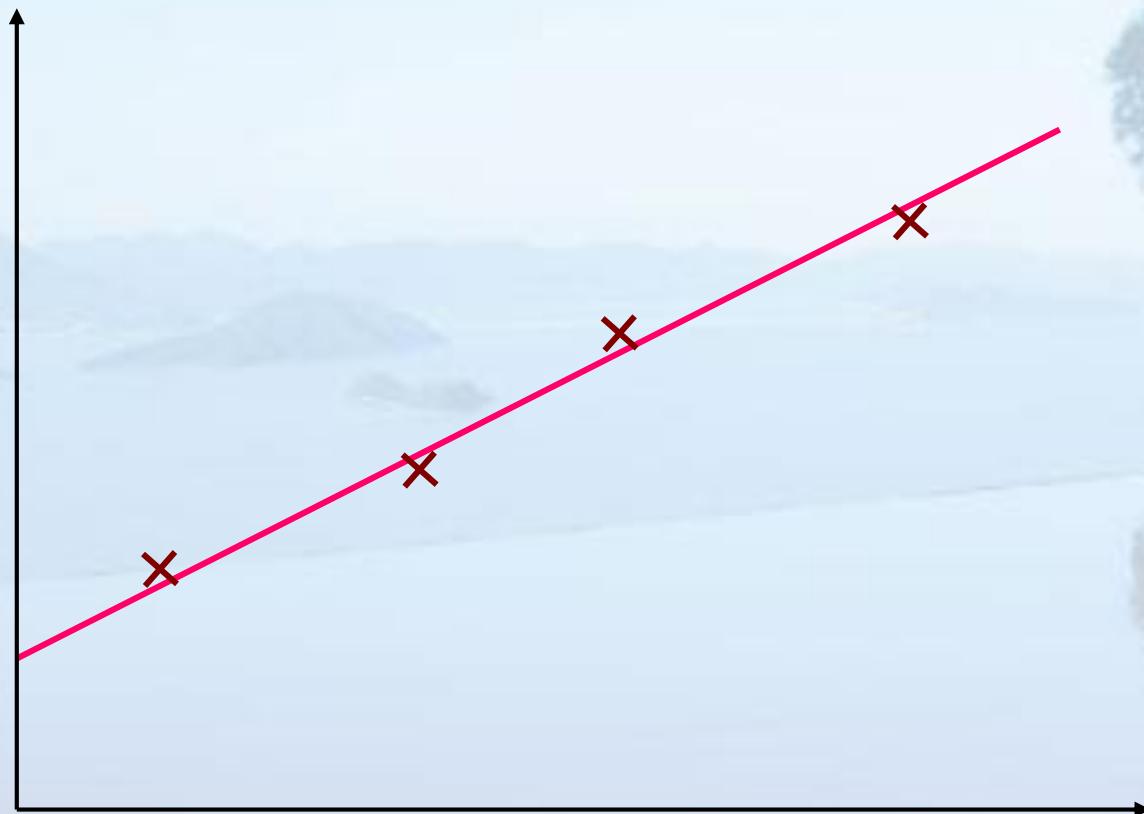
What method is this?

Visible sphere

Experimental data

Observations

Experimental data



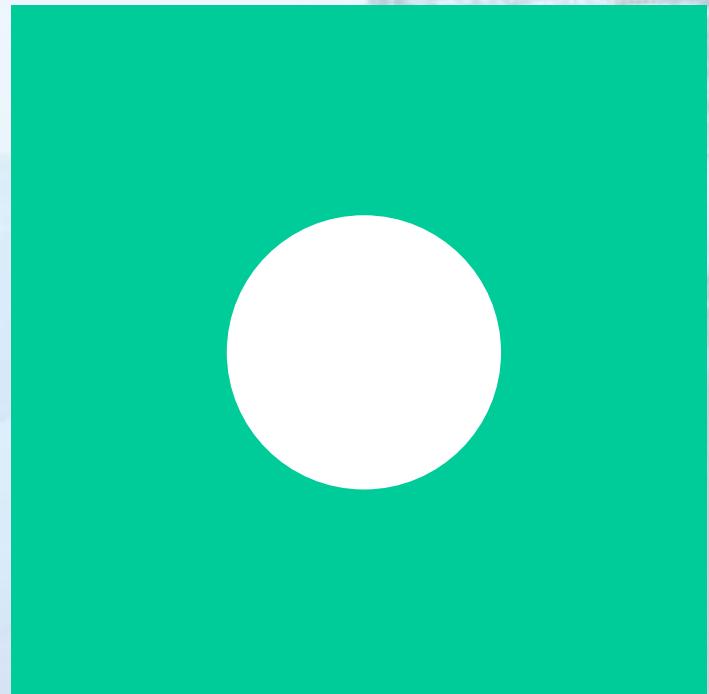
- There are discrepancies between the points and the line. Can you see any “form” here?

Many questions to ask

- Is there any “form” in my major?
- What does “real” mean?
- What is more/less real?
- Is the real world really real?

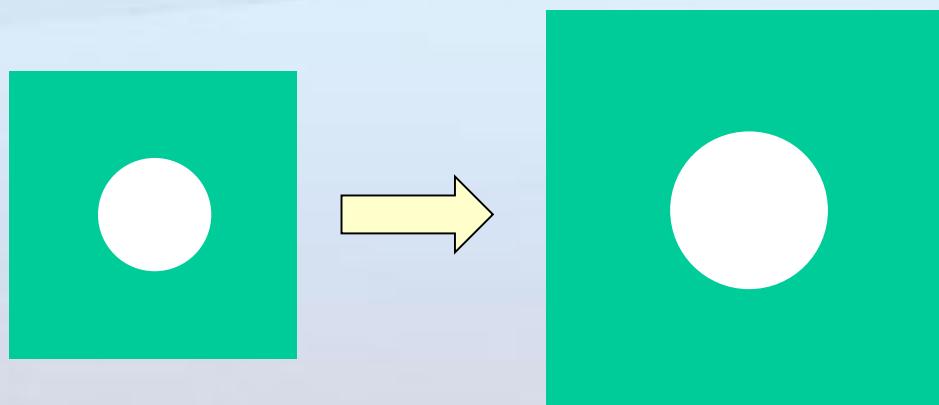
Prediction

- The metal is heated.
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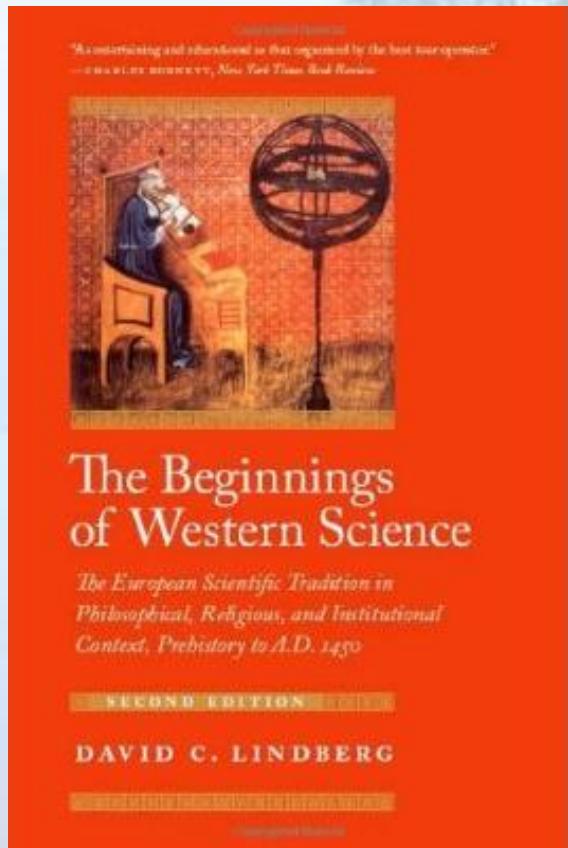
Answer

- The hole becomes larger.
- The atoms separate from one another. ⇔
The whole piece becomes larger.



The Beginnings of Western Science

- An excellent textbook on the history of science
- Chapter 2: Introducing Plato's world of forms
 - How Plato's view shaped the way of thinking of natural philosophers



林德伯格：《西方科学的起源》(译者：张卜天)

End