According to the square of oppositions, exactly one of “it is the case that $p$” and “it is not the case that $p$” is true.

*Either* “it is the case that there will be a sea battle tomorrow” *or* “it is not the case that there will be a sea battle tomorrow”.

Problematic for existence of free will, and for Aristotelian metaphysics.
The Master argument.

Diodorus Cronus (IVth century BC).

- Assume that \( p \) is not the case.
- In the past, “It will be the case that \( p \) is not the case” was true.
- In the past, “It will be the case that \( p \) is not the case” was necessarily true.
- Therefore, in the past, “It will be the case that \( p \)” was impossible.
- Therefore, \( p \) is not possible.

*Ergo*: Everything that is possible is true.
Megarians and Stoics.

- **Socrates** (469-399 BC)
  - **Euclides** (c.430-c.360 BC)
    - **Eubulides** (IVth century)
      - **Apollonius Cronus**
        - **Diodorus Cronus** (IVth century)
          - **Stilpo** (c.380-c.300 BC)
            - **Zeno of Citium** (c.335-263 BC)
              - **Cleanthes of Assos** (301-232 BC)
                - **Chrysippus of Soli** (c.280-207 BC)
  - **Plato** (c.427-347 BC)
    - **Euclides** (c.430-c.360 BC)

Eubulides.

- Strongly opposed to Aristotle.
- Source of the “seven Megarian paradoxes”, among them the Liar.

- *The Liar* is attributed to Epimenides the Cretan (VIIth century BC); (Titus 1:12).

- **Aulus Gellius, Noctes Atticae.**

The seven Megarian paradoxes.

- **The Liar.** “Is the man a liar who says that he tells lies?”

- **The concealed man.** “Do you know this man who is concealed? If you do not, you do not know your own father; for he it is who is concealed.”

- **The hooded man.** “You say that you know your brother. Yet that man who just came in with his head covered is your brother and you did not know him.”

- **Electra.** “Electra sees Orestes: she knows that Orestes is her brother, but does not know that the man she sees is Orestes; therefore she does know, and does not know, her brother at the same time.”

- **The Sorites / the heap.** “One grain of wheat does not make a heap. Adding one grain of wheat doesn’t make a heap.”

- **The bald one.** “Pulling one hair out of a man’s head will not make him bald, nor two, nor three, and so on till every hair in his head is pulled out.”

- **The horned one.** You have what you have not lost. You have not lost horns, therefore you have horns.
I know my brother.

I do not know the hooded man.

The hooded man is my brother.

I do not know my brother.

know:

“I know a lot about \( X \).”

“\( X \) at sight

(regardless of whether \( X \) is hooded or not).”

Every metal is a chemical element.

Brass is a metal.

Brass is a chemical element.
Syllogistics is finitary and cannot deal with very simple propositional connectives:

Every human being is a man or a woman.
Every man is mortal.
Every woman is mortal.

Ergo... every human being is mortal.
Stoic Logic (1).

Chrysippus of Soli (c.280-207 BC)

- 118 works on logic,
- seven books on *the Liar*,
- inventor of propositional logic,
- nonstandard view of modal logic (“the impossible can follow from the possible”).

Stoic Logic (2).

Chrysippus’ Principles of Propositional Logic.

- If $p$, then $q$. But $p$, therefore $q$.
- If $p$, then $q$. But not $q$, therefore not $p$.
- Not both $p$ and $q$. But $p$, therefore not $q$.
- Exactly one of $p$ and $q$. But $p$, therefore not $q$.
- Either $p$ or $q$. But not $q$, therefore $p$.
Categorial propositions (“Every $B$ is an $A$”) are very special propositions.

“Socrates is bald”

**Attempt 1.** “Every socratizing animal is bald.”

“If Socrates is bald, then Plato is bald.”

**Attempt 2.** Define predicates “a Socrates-is-bald-situation” and “a Plato-is-bald-situation.”

Every Socrates-is-bold-situation is a Plato-is-bald-situation.
Hypothetical Syllogisms (2).

**Barbara** becomes:

\[
\begin{align*}
&AaB \\
&BaC \\
\hline
&AaC
\end{align*}
\]

Every Socrates-is-bald-situation is a Plato-is-bald-situation
Every Plato-is-bald-situation is a Aristotle-is-bald-situation
Every Socrates-is-bald-situation is a Aristotle-is-bald-situation

If Socrates is bald, then so is Plato.
If Plato is bald, then so is Aristotle.
If Socrates is bald, then so is Aristotle.

Tempting: \((p \rightarrow q \& q \rightarrow r) \rightarrow (p \rightarrow r)\).
Hypothetical Syllogisms (3).

A disjunction can be expressed by
Every not-\(p\)-situation is a \(q\)-situation.

Socrates is either a woman or a man.

Every Socrates-is-not-a-woman-situation is a Socrates-is-a-man-situation.

A negation can be expressed by
Some not-\(p\)-situation is a not-\(p\)-situation.

Socrates is not a woman.

Some Socrates-is-not-a-woman-situation is a Socrates-is-not-a-woman-situation.
Hypothetical Syllogisms (4).

Socrates is either a woman or a man.
Socrates is not a woman.
Socrates is a man.

Every Socrates-is-not-a-woman-situation is a Socrates-is-a-man-situation.

Some Socrates-is-not-a-woman-situation is a Socrates-is-not-a-woman-situation.

Some Socrates-is-not-a-woman-situation is a Socrates-is-a-man-situation.

AaB
BiC
AiC.

Tempting: \( p \lor q \land \neg p \rightarrow q \).
We have to be careful, as Boethius claims:

\[
\begin{align*}
\text{If } p, \text{ then } \text{'if } q, \text{ then } r' \\
\text{If } q, \text{ then not } r. \\
\hline
\text{Not } p.
\end{align*}
\]
Neoplatonism.

(Really old-fashioned) received opinion. The middle ages were Aristotelian, the rediscovery of Plato’s works marked the beginnings of the Renaissance.

But: until the XIIth century, Aristotle was only known via neoplatonistic scholars.

Sources of neoplatonism.

- Proclus (410-485)
- (ps) Dionysius Areopagita (c.500)
- Plotinus (204-270)
- Origen (185-254)
- S. Ambrose (c.340-397)
- S. Augustine (354-430)
- Porphyrius (232-c301)
- Boëthius (c.475-524)
Late antiquity.

- Galen (129-216)

Galen of Pergamum
(129-216)
Court Physician to Marc Aurel
Introduction to Dialectics
(rediscovered in XIXth century)
Late antiquity.

- Galen (129-216)
- Augustine (354-430)

(Sanctus) Aurelius Augustinus
(354-430)
doctor ecclesiae
Late antiquity.

- Galen (129-216)
- Augustine (354-430)
- Boëthius (c.475-524)
- Cassiodorus (c.490-c.585)

*Flavius Magnus Aurelius Cassiodorus Senator* (c.490-c.585)

**Main work:** *Institutiones*
Late antiquity.

- Galen (129-216)
- Augustine (354-430)
- Boëthius (c.475-524)
- Cassiodorus (c.490-c.585)
- Isidore of Seville (c.560-636)

(Sanctus) Isidorus Hispalensis
(c.560-636)

**Main work:** *Etymologiae*

Patron Saint of the Internet
“The last of the Roman philosophers, and the first of the scholastic theologians" (Martin Grabmann)
Logic in the Middle Ages.

- *Peripatetic position:* Logic is a preliminary to scientific inquiry.
- *Stoic position:* Logic is part of philosophy.

In the Middle Ages:

- Logic as *ars sermocinalis.* (Part of the preliminary studies of the *trivium.*)
- Logic (in a broader sense) as central to important questions of philosophy, metaphysics and theology.
Kurt Flasch, Das philosophische Denken im Mittelalter, Von Augustin zu Machiavelli, Reclam, Ditzingen 1986 [Universal-Bibliothek 8342]

Theological Questions.

Theological questions connected with the set-up of logic.
- The Immortality of the Soul.
- The Eucharist.
- The Trinity and the ontological status of Father, Son and Holy Spirit.
- Free will and responsibility for one’s actions.