

Aristotle's Logic

The place of logic in Aristotle's thought

In *Metaph. E.1*, Aristotle divides the sciences (=branches of knowledge) into three divisions: Theoretical (mathematics, natural science, theology), Practical (ethics, politics), and Productive (art, rhetoric). They are distinguished by their aims—truth, action, and production, respectively. Where is logic on this list? Aristotle does not seem to include it anywhere.

This has been a subject of debate among subsequent interpreters. The question is whether logic is a **subject matter** to be studied (a science), or merely a **method** to be used by the various sciences. (This became a topic of dispute between the Stoics and Peripatetics.)

The usual answer is that for Aristotle logic is not a subject matter, but a **tool** to be used by any science. That's why his collection of logical works is called the *Organon*—Greek for tool. (The title is due to Alexander of Aphrodisias, ca. 200 CE.) These are the works included in the *Organon*, and their topics:

| | |
|----------------------------|--------------------------------------|
| <i>Categories</i> | terms |
| <i>De Interpretatione</i> | statements |
| <i>Prior Analytics</i> | theory of inference |
| <i>Posterior Analytics</i> | the axiomatic structure of a science |
| <i>Topics</i> | a manual of argumentation |
| <i>De Soph. Elench.</i> | a manual on fallacies |

The invention of logic

It's fair to say that Aristotle invented deductive logic. (That's not to say that no one had drawn inferences before Aristotle told them how to do so. Rather, he was the first to **codify** inferences into a **system**, and to create rules for distinguishing correct from incorrect inferences.)

Aristotle was justifiably proud of his creation. He even gives himself a pat on the back (*SE*, 183b34-184b7, Ackrill translation):

Of our present subject, ... it is not true to say that part had already been worked out and part had not: it did not exist at all. ... On the subject of rhetoric much had been said long before, whereas regarding reasoning (*sullogizesthai*), we had nothing earlier to refer to, but we had to work things out over a long time by trial and error. If, therefore, when you look at it, this discipline seems to you in pretty good shape (considering the original conditions), when compared with other subjects which have grown up over the generations, then the only thing left for all of you who have followed the lectures is to pardon any omissions—and be heartily grateful for what has been discovered.

Aristotle's logic compared to contemporary logic

To one trained in post-Fregean first-order logic (quantification theory), Aristotle's syllogistic may seem a narrow, barren, and stultifying theory. But this is not so. To think this would be to wrongly blame Aristotle for the authority his teachings subsequently had bestowed upon them.

Still, I had always thought that Aristotle's logic was the least interesting and least valuable part of his philosophy. But compare Lynn Rose, in his book *Aristotle's Syllogistic*:

“For the most part ... the works of Aristotle have always struck me as uninteresting, unoriginal, and untrue. The *Prior Analytics* is the only exception; it is so rich, so important, so original—so uncharacteristic of Aristotle—that I often wonder if it could have been written by someone else ...”

Similarities

- Formal
- Definition of validity (24b19)
- Relation between truth and validity (53b4ff)
- Proofs of validity
- Disproofs by counterexample
- Use of variables (predicate letters)
- Systematic presentation

Differences

- Term logic, not propositional (no connectives)
- Restricted to 2 premises, 3 terms
- No special symbols (other than predicate letters)

“Existential import” (Square of Opposition)

A implies **I** **E** implies **O**

No “singular” propositions

No relational predicates

No individual variables or quantifiers

What is a syllogism (*sullogismos*)?

See 24b18-20. Compare the very free Fine/Irwin translation with Smith’s much more literal one (*Companion*, p. 29).

Broad sense

Any piece of valid deductive reasoning—a syllogism is just a valid inference.

Narrow sense

A piece of deductive reasoning that fits a certain form: 3 statements of subject-predicate form (2 premises and a conclusion), 3 terms (the “extremes” in the conclusion, the “middle” in each of the 2 premises).

In innumerable logic books, you will see something like this as an example of an Aristotelian syllogism:

All men are mortal
Socrates is a man
Therefore, Socrates is mortal.

This certainly counts as syllogism in the broad sense. But as an example of a syllogism in the narrow sense, it is wrong or at least misleading for several reasons.

- It contains a singular term (‘Socrates’)
- It consists of sentences (rather than sentence forms)
- It is couched as an argument, rather than a conditional statement (or, better, as an inference rule).

An example from Aristotle shows the difference (25b37-26a1):

“... if A is predicated of every B, and B of every C, then necessarily A is predicated of every C In the same way, if A is predicated of no B, and B of every C, then A will belong to no C.”

In short, an Aristotelian syllogism is a rule that tells you when, given premises of a certain form, it is correct to draw a conclusion of a certain form. (Not everyone takes this view: some think a syllogism is just a certain kind of valid argument form; some think a syllogism is a necessarily true conditional statement form.)

The Anatomy of a Syllogism

- A **deduction** of a subject/predicate proposition from two premises.
- The **conclusion** takes the form ***P* is predicated of * *S*** where * is one of the term-operators ‘every’, ‘no’, ‘some’, or ‘not every’.
- The **premises** are also subject/predicate propositions, each containing the same middle term ***M***.
 - **Major** premise: contains the terms ***P*** and ***M***.
 - **Minor** premise: contains the terms ***S*** and ***M***.
- There are three **figures** (*schēmata*) of syllogisms, depending on which of the terms (***S***, ***P***, ***M***) are predicates and which are subjects in the premises.