A History of Logic

Various Authors

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Aristotle 亚里士多德 (384 ~ 322 B.C.)

The rise of modern formal logic following the work of Frege and Russell brought with it a recognition of the many serious limitations of Aristotle's logic.

However, Aristotle shares with modern logicians a fundamental interest in metatheory:

- His primary goal is not to offer a practical guide to argumentation but to study the properties of inferential systems themselves.

The Organon

Aristotle's logical works, called the **Organon** are the earliest formal study of logic that have come down to modern times:

- **The Categories** ~ 范畴篇, a study of the ten kinds of primitive terms.
- **On Interpretation** ~ 解释篇, an analysis of simple **categorical propositions** into simple terms, negation, and signs of quantity.
- **The Prior Analytics** ~ 前分析篇, a formal analysis of what makes a **syllogism**.
- **The Posterior Analytics** ~ 后分析篇, a study of **scientific demonstration**, containing Aristotle's mature views on logic.
- **The Topics** ~ 论辩篇, a discussion of **dialectics**.
- **On Sphistical Refutations** ~ 辩谬篇

Deduction

All Aristotle's logic revolves around **deduction** (συλλογισμός/sullogismos).

Definition: Deduction

A deduction is **speech** (λόγος/logos) in which, certain things having been supposed, something different from those supposed results of necessity because of their being so. (*Prior Analytics* I.2, 24b19-20)

Each of the "things supposed" is a **premise** (πρότασις/prótasis) of the argument, and what "result of necessity" is the **conclusion** (συμπέρασμα/sumperasma).

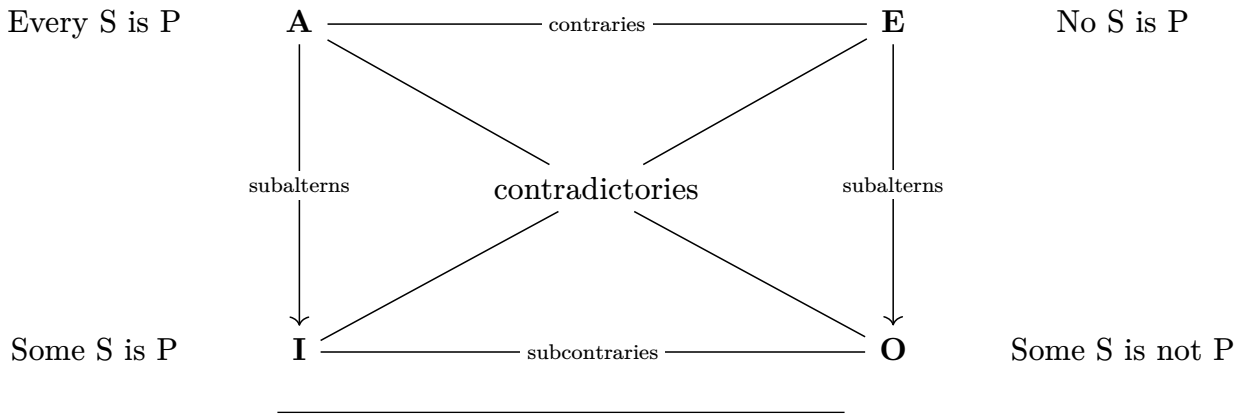
The Syllogism

Syllogisms are structures of sentences each of which can meaningfully be called true or false: **assertions** (ἀποφανσεις/apophanseis), in Aristotle's terminology. According to Aristotle, every such sentence must have the same structure: it must contain a **subject** (ὑποκειμενον/hupokeimenon) and a **predicate** and must either affirm or deny the predicate of the subject. Thus, every assertion is either the **affirmation** (καταφασις/kataphasis) or the **denial** (ἀποφασις/apophasis) of a single predicate of a single subject.

The Square of Opposition

The square of opposition is a group of theses embodied in a diagram. The theses concern logical relations among four logical forms:

Name	Form	Title
A	Every S is P	Universal Affirmative
E	No S is P	Universal Negative
I	Some S is P	Particular Affirmative
O	Some S is not P	Particular Negative



Chrysippus (279 ~ 206 B.C.)

Aristotelian logic was what was transmitted to the Arabic and the Latin medieval traditions, while the works of Chrysippus have not survived.

Connective Logic

- $\cap, \quad \wedge, \quad \rightarrow$