

Writing and Drawing in Logic – The Case of Aristotelian Diagrams

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When communicating their research, logicians not only *write* words and formulas, but they also *draw* various kinds of diagrams. The use of diagrams has a very long history in logic, including diagrams such as the Porphyrian tree and the pons asinorum in medieval logic, and Euler diagrams, Venn diagrams and Peirce graphs in more recent times (Moktefi and Shin 2012). In this contribution, however, I will focus on yet another broad category of diagrams used in logic, viz. *Aristotelian diagrams*. These diagrams visually represent the elements of some logical, lexical or conceptual field, and the logical relations holding between them (in particular, the relations of contradiction, contrariety, subcontrariety and subalternation). Without a doubt, the oldest and most well-known example is the ‘square of opposition’ for the categorical statements from syllogistics; however, throughout history, several larger, more complex Aristotelian diagrams have also been devised, such as hexagons, octagons, cubes and rhombic dodecahedra.

The central question of this contribution is: what exactly is the role of Aristotelian diagrams in the practice of logicians? Given their widespread use, it seems obvious that these diagrams indeed do have an important methodological role to play, but it is unclear what that role consists in precisely. Previous work has tried to address this issue from a highly *theoretical* perspective. For example, Smessaert and Demey (2014) develop a sophisticated mathematical account of the information contents of Aristotelian diagrams; based on this account, they then argue that the widespread use of Aristotelian diagrams is due to their informational optimality. In this contribution, these theoretical approaches will be complemented with a more *practice-based* perspective (Dutilh Novaes 2012). In particular, I will present a detailed examination of the writings of logicians regarding Aristotelian diagrams. In other words: which reasons do logicians themselves offer for their use of Aristotelian diagrams? I will distinguish four broad views on the use of Aristotelian diagrams.

First of all, the received view holds that Aristotelian diagrams primarily serve as *mnemonic* devices, used mainly when introducing novice students to the abstract discipline of logic. However, this view has become untenable, because today, most Aristotelian diagrams are no longer found in logic textbooks, but rather in research-level papers/monographs from a wide variety of reasoning-related disciplines (logic itself, but also linguistics, psychology, computer science, etc.).

A second view focuses on the cognitive advantages that Aristotelian diagrams have in virtue of their *multimodal* nature (symbolic/textual + visual). This second view is related to the first one, but it is still fundamentally different: whereas the first view focuses exclusively on the use of Aristotelian diagrams in pedagogical contexts, the second one accommodates both teaching and research-level contexts. However, this account has difficulties to explain the use of larger, more visually complex diagrams, such as octagons and, especially, three-dimensional diagrams.

Thirdly, certain authors motivate their use of Aristotelian diagrams by emphasizing their rich and respectable *tradition* within the broader history of logic. In this way, the tradition of using Aristotelian diagrams gets endowed with a certain degree of (implicit) normativity. This view is, at best, incomplete, because it cannot offer an explanation as to why the tradition of using Aristotelian diagrams came about in the first place.

The fourth, and in my opinion most plausible view, holds that Aristotelian diagrams have a powerful *heuristic* potential. They function as a new layer of abstraction that enables researchers to draw high-level analogies between seemingly unrelated frameworks, and to introduce new concepts (by transferring them across frameworks). On this view, Aristotelian diagrams primarily function as a unifying *language* for a broad interdisciplinary research community working on logical reasoning.

Bibliography

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