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Ebert, Theodor / Nortmann, Ulrich. 2007. *Aristoteles: Analytica priora, Buch 1.* Berlin: Akademie (924 pages, EUR 98.00. ISBN 978-3-05-004427-9).

This book is an important and much-needed contribution to the history of logic. It offers an up-to-date German translation of *Prior Analytics* Book 1, an introduction to Aristotle's system of syllogistic which is easily approachable, a detailed bibliography, and a full and lengthy commentary which takes up the bulk of the book (pp. 209–906). The translation is accessible, and the commentary is thorough – it covers all parts of *An Pr* Book 1, which includes the non-modal syllogistic and the modal syllogistic. Ebert is mostly responsible for the commentary on the non-modal syllogistic, Nortmann for the commentary on the modal syllogistic. The discussion of the modal syllogistic covers both the apodeictic (i. e., the syllogisms about necessity) and the problematic (i. e., the syllogisms involving possibilities). There are a number of features of this book which contribute to its value. First, the up-to-date German translation of *AnPr* Book 1 would even on its own make the book an important advance. Second, the extensive commentary contains impressive detail. The authors have included in their commentary very helpful discussions in which they review different ways scholars have sought to explain the interpretive puzzles that arise from Aristotle's text. This places the interpretive discussion right in among the exegetical material, and provides a useful link, as well, to recent secondary literature. All of these features combine to make the book essential reading for anyone working in this area. In fact, the commentary is so rich and thorough that we might hope to someday see an English translation.

The commentary provides line-by-line discussions of famous interpretive puzzles about Aristotle's logical system, and it is Ebert and Nortmann's approach to these which we make the focus of this review. For whenever the project is interpreting Aristotle's logic there are certain questions which arise immediately. The first of these must be about when and whether the crucial interpretive problems are due to the minutiae of Aristotle's Greek, and when they are due to the logic. When it is the latter then a further question arises about whether it is appropriate to give a *formal* representation of Aristotle's logic – a representation using some logical system which modern readers know how to understand. Ebert and Nortmann clearly think this is appropriate in the analysis of Aristotle. They aim their commentary and interpretation at philosophers and set out a formal representation of Aristotle's logic using standard modern tools. This places Ebert and Nortmann's study in a special class. In recent years some interpreters have sought to explain Aristotle's syllogistic without getting involved in any formal representations. In fact such approaches have proved rather popular – but any reader who demands rigour and precision will want more. Ebert and Nortmann provide more. And it is certainly one of the book's great strengths that their commentary is guided at all stages by the spirit of capable logicians.

Ebert and Nortmann use standard lower predicate calculus to represent Aristotle's non-modal syllogistic premises, and modal predicate logic to represent Aristotle's modals. The use of predicate logic is sometimes supposed to be a controversial matter. But once an interpreter has made the decision to give a formal representation, then using predicate logic is not usually any real problem since most other formal representations of Aristotle's logic can be translated into predicate logic with no loss of clarity. One immediate effect of Ebert and Nortmann's use of predicate logic is that on the whole they make it relatively easy for a philosophical reader to begin to be able to appreciate the real logical structure of Aristotle's approach in *AnPr*.

Ebert and Nortmann's predicate logic representations of non-modal syllogistic (*a*, *e*, *i*, and *o*) premises are as follows (p. 333):

| | | | |
|---|---|---|---|
| (*a*) | Every *S* is *P* | :: | $\forall x(Sx \supset Px) \wedge \exists x Sx$ |
| (*e*) | No *S* is *P* | :: | $\forall x(Sx \supset \neg Px)$ |
| (*i*) | Some *S* is *P* | :: | $\exists x(Sx \wedge Px)$ |
| (*o*) | Some *S* is not *P* | :: | $\exists x(Sx \wedge \neg Px) \vee \neg \exists x Sx$ |

Even among scholars who use predicate logic to represent Aristotle's categorical propositions there is not unanimity, and so some will find Ebert and Nortmann's representations controversial. In particular the conjunctive *a* proposition and the disjunctive *o* proposition might seem a little odd, and both need to be explained. For it would seem that when Aristotle says 'every *S* is *P'* the most obvious predicate logic representation would be

(1) $\forall x(Sx \supset Px)$

Similarly, the most obvious way to represent 'some *S* is not *P*' would be $\exists x(Sx \wedge \neg Px)$. But of course in predicate logic (1) is true if there are no *S*s – i. e., if *S* is an empty term. Empty terms present a puzzle for interpreters because Aristotle tells us that *a* propositions *convert*: that is, according to Aristotle from 'every *S* is *P*' we can validly transpose the subject and predicate terms to get 'some *P* is *S*.' In predicate logic, this conversion fails if the *S* term is empty. Conversions are a crucial part of Aristotle's proof method in the syllogistic, and anyone working in the field knows they have to have some trick to explain the conversions. The most standard approach to this particular problem about *a* conversion is simply to stipulate that *S* is not empty. The validity of the conversion is preserved. Ebert and Nortmann, however, make the existence of some *S* a part of the translation itself and so offer a conjunctive interpretation of an *a* proposition. This affects the interpretation of the *o* proposition because, as Aristotle recognizes, the contradictory of an *a* proposition is an *o* proposition. He relies on this in his square of opposition in *De Interpretatione* and in reductio-style proofs throughout the *Prior Analytics*. It is in order to capture the contradictoriness of *a* and *o* propositions that Ebert and Nortmann give *o* propositions a disjunctive structure: $\exists x(Sx \wedge \neg Px) \vee \neg\, \exists x Sx$. The authors represent an *e* proposition as $\forall x(Sx \supset \neg Px)$, rather than as $\forall x(Sx \supset \neg Px) \wedge \exists x Sx$, and this is in order to capture the contradictoriness of *e* and *i* propositions, where an *i* is simply $\exists x(Sx \wedge Px)$ (see pp. 332–333). These slightly idiosyncratic interpretive matters are issues about which scholars might disagree, but disagreements of this sort in no way detract from the value of what Ebert and Nortmann have accomplished, which certainly must be received as a welcome contribution to the discussion.

The modal syllogistic presents especially complicated interpretive problems. In the modal syllogistic, Aristotle has *a*, *e*, *i*, and *o* propositions qualified by each of three distinct modal operators: necessity and two kinds of possibility. There is much controversy about how to represent Aristotle's propositions about necessity (i. e., his *apodeictic* premises). Less logically sensitive interpreters (and some logicians) often prefer to conduct the study of premises about necessity using only the simple-seeming representations $Aa_{\mathrm{N}}B$, $Ae_{\mathrm{N}}B$, $Ai_{\mathrm{N}}B$, and $Ao_{\mathrm{N}}B$, where the lower case *a*, *e*, *i*, and *o* indicate the different combinations of quantifiers with affirmation or denial, where N indicates that necessity is (somehow) involved, and where the upper case *A* and *B* represent the predicate and subject terms. These are sometimes useful abbreviations and work fine in the easy cases, but they are not always sufficient for the simple reason that they leave the deeper structure of Aristotle's propositions unexplained. By including lengthy discussions about recent interpretative approaches (including some labeled 'digressions' which are as long as 19 pages), the authors are able to incorporate both exegesis and interpretation in the commentary and so meet the need for formal detail in the account of modals. Much of the interpretive discussion refers to Schmidt's work and to Nortmann's own earlier work. Other recent work is on the whole also well represented. The pros and cons of various approaches and their background assumptions are discussed, but some of the most helpful and interesting interpretive discussions and digressions do make use of Nortmann's earlier work, according to which the deeper modal structure of the apodeictic propositions get cashed out as follows:

($a_N$) Every $S$ is $P$ of necessity :: $\forall x N(Sx \supset NPx)$

($e_N$) No $S$ is $P$ of necessity :: $\forall x N(Sx \supset N\neg Px)$

($i_N$) Some $S$ is $P$ of necessity :: $\exists x N(Sx \wedge NPx)$

($o_N$) Some $S$ is not $P$ of necessity :: $\exists x N(Sx \wedge N\neg Px)$

These modal predicate logic representations have the advantage of a clear and well-understood semantics, and they prove useful when dealing with Aristotle's modal conversions. Aristotle requires that $e_N$, $i_N$, and $a_N$ propositions convert, but just how to explain these conversions is a famous interpretive problem. Ebert and Nortmann explain that many scholars recognize a tension or ambiguity in predicate logic representations of Aristotle's modals. The reason there has seemed to be a tension is this. On the one hand, Aristotle's modal conversion principles appear to require that the necessity of an apodeictic premise must be understood as a *de dicto* modal operator – so, for example, an $a_N$ proposition 'every $S$ is $P$ of necessity' would seem to be $N\forall x(Sx \supset Px)$. Assuming it is necessary that there are some $S$s, then the $a_N$ proposition converts easily: that is, from $N\forall x(Sx \supset Px)$ we can obtain $N\exists x(Px \wedge Sx)$. But, on the other hand, while *de dicto* necessity seems to fit Aristotle's modal conversions, his syllogistic proofs turn out invalid if we take necessity as simply *de dicto*. When interpreted in modal predicate logic Aristotle's own syllogistic proofs clearly require some sort of *de re* necessity. An obvious *de re* interpretation of an $a_N$ proposition would seem to be $\forall x(Sx \supset NPx)$. But this, alone, is not enough since $\forall x(Sx \supset NPx)$ does *not* convert to 'some $P$ is $S$ of necessity', $\exists x(Px \wedge NSx)$. Striker's recent commentary preserves the ambiguity – and indeed some scholars do believe that the ambiguity is central to Aristotle's understanding and that it is evidence that he is confused about modals. Nortmann's representations help to resolve the tension between these *de dicto* and *de re* interpretations by incorporating the advantages of each. One of the more important digressions (pp. 252–259) includes a summary of Nortmann's earlier view of modal conversion and it is worth including reference to this in our review. If we represent an $e_N$ proposition as $\forall x N(Sx \supset N\neg Px)$, then by standard principles of the modal system S5 this is equivalent to $\forall x N(Px \supset N\neg Sx)$. (Notice also that $\forall x N(Sx \supset N\neg Px)$ is equivalent by the Barcan Formula to $N\forall x(Sx \supset N\neg Px)$, which might please those who believe there is a *de dicto* element to Aristotle's $e_N$ propositions.) In S5, $i_N$ conversion $\exists x N(Px \wedge NSx) \supset \exists x N(Sx \wedge NPx)$ is valid and $a_N$ conversion $\forall x N(Sx \supset NPx) \supset \exists x N(Px \wedge NSx)$ is also valid provided that there are some necessary $S$s. In their commentary, Ebert and Nortmann take some care to distinguish between the exposition of the text and the interpretation of it. By including both they illustrate how the tools of modern predicate logic can be used to introduce some interesting precision in the modern evaluation of Aristotle's proofs. And the inclusion of so much of the interpretive debate from the secondary literature makes the book a particularly useful resource.

In describing the problematic syllogistic Ebert and Nortmann use a modal M operator. M represents what is often called 'one-way possibility' – that is, possible in the sense of what is not-necessarily-not. They include a K operator to represent 'two-way possibility' – that is, possible in the sense of neither necessary nor impossible. Aristotle clearly distinguishes these two and requires them both. Aristotle tells us that syllogisms about possibility sometimes require *ampliation* – in an ampliated premise the subject and predicate terms are each qualified by separate possibility operators. Aristotle's own explanations of ampliation are characteristically brief and cryptic, and they appear to admit various readings. For example, an ampliated $a_K$ premise might be $\forall x(\mathrm{K}Bx \supset \mathrm{K}Ax)$, where both terms are qualified with a two-way possibility operator; or an ampliated $a_K$ premise might be $\forall x(\mathrm{M}Bx \supset \mathrm{K}Ax)$, where the subject term is qualified by a one-way possibility operator. Ebert and Nortmannn explain how $\forall x(\mathrm{M}Bx \supset \mathrm{K}Ax)$ is equivalent to $\forall x\mathrm{N}(\mathrm{M}Bx \supset \mathrm{K}Ax)$ and to $\forall x\mathrm{N}(Bx \supset \mathrm{K}Ax)$ in the modal system S5. (This approach is based on Nortmann's earlier work.) And these representations of ampliated K propositions sit well with Nortmann's doubly modal interpretations of the apodeictic N propositions.

There are two extremes into which much work in this field can easily tend to fall. Some scholars prefer to avoid any formal detail. They tend to offer what are only uninterpreted representations of Aristotle's syllogistic logic, and so their studies have only limited value to philosophers and historians of logic whose primary interest centres on developing a viable interpretation of the syllogistic. The other extreme is exemplified by logicians who can sometimes get carried away with their formalizations. These logicians often seek a set-theoretic or other such modeling of Aristotle's syllogistic, but this usually comes at a cost to utility since the connection to Aristotle's text can become less than obvious. Ebert and Nortmann steer clear of both of these extremes. Their interpretation is linked to the text and grounded at all times in the line-by-line scholarly commentary, and it has the advantage of a logician's precision. Ebert and Nortmann's predicate logic representations reflect some of the basic structure of Aristotle's own language. The authors make that structure apparent, highlighting it as part of the foundation of syllogistic. Of course the use of modern modal systems is in a sense itself an anachronistic leap and, so, will strike some readers as evidence of logicians carried away with modern techniques. But the effectiveness of Ebert and Nortmann's use of these modern techniques can be illustrated by an example. Much of our current understanding of matters like modality and negation and their interplay is analyzed by means of the logical scope of sentential operators. By contrast, Aristotle did not have a clear notion of scope. Ebert and Nortmann's detailed study demonstrates how modern tools can work to isolate particular passages in the logic where Aristotle, a logician himself – and one who is dealing with quantifiers, negation, and modal operators – perhaps can be seen to be struggling for lack of a defined notion of logical scope.

German readers will find in Ebert and Nortmann an accessible and useful translation of Aristotle. Philosophers and historians of logic will find the commentary a valuable contribution to the age-old discussion about how to understand and interpret Aristotle's system of logic. Both the authors and the Berlin Academy are to be congratulated for the provision of such a valuable resource for all scholars working in the history of logic.

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