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# Aristotle's Squares of Opposition

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**Abstract**

The article argues that Aristotle's Square of Opposition is introduced within a context in which there are other squares of opposition. My claim is that all of them are interesting and related to the traditional Square of Opposition. The paper focuses on explaining this textual situation and its philosophical meaning. Apart from the traditional Square of Opposition, there are three squares of opposition that are interesting to follow: the square of opposition with privative terms (19b19-24), the one with indefinite-term oppositions (20a20-23), and the modal square (22a24-31), which are all contained in Aristotle's *De Interpretatione* 10 and 13. The paper explains that all these squares follow a common plan, which is to demonstrate that every affirmation has its own negation, whatever is the proposition either categorical or conditional, or modal or non-modal, which is a reference to the universal importance of contradiction in logic.

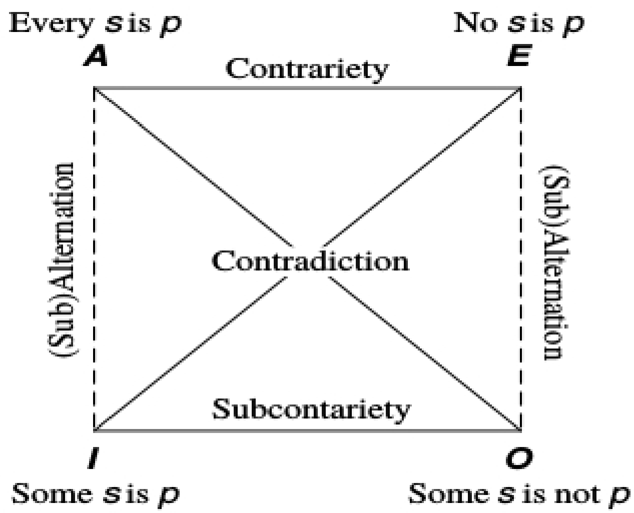
**Keywords:** opposition, negation, squares of opposition, modality, semantic.

## 1 The traditional Square of Opposition

The Square of Opposition is a traditional title referring to a didactic diagram designed to distinguish logical relations of opposition between affirmations and negations. No doubt, Aristotle is its author, being not unlikely that he adopted the practice of drawing squares for his own logical purposes. Aristotle developed this Square in his treatise *Peri Hermeneias* or *De Interpretatione*, chapter 7 (17a38-18a7), and completed it almost in its total actual shape. Its importance to logic is to have distinguished kinds of opposition between categorical affirmations and negations, which are by definition the simplest propositions. He distinguishes three types of opposition, namely, contradictoriness, contrariness and sub-contrariness.[1]

[1] Soon after, the relation of subalternation should have been added, for already the first western commentators, as Apuleius in the II AD and Boethius in the VI AD –who tells us to be borrowing from earlier authors–, comment on this last relation, which is not strictly speaking a relation of opposition, but it completes the geometric figure.

Aristotle's intention of drawing a square can be relativized, since he just mentions the horizontal and oblique lines and ignores the vertical lines, since he does not take into account subaltern propositions (namely A-I and E-O relations).




Aristotle's diagram is completed in its actual shape by the ancient commentators of Aristotle's logic, in particular those who follow the treatise *Peri Hermeneias* (later Latinized by *De Interpretatione*). The oldest textual square in its actual shape is the one attributed to Apuleius, about five hundred years later, even if he does not mention the term "square" either.[2]

But even if it is more accurate and literally more attested to referring to a diagram and not a square,[3] the doctrinal evidence is too strong to doubt that Aristotle ignored the Square that tradition brought to study. The aim of this paper is to show that the traditional Square of Opposition developed in chapter 7 falls within a general plan to draw squares of opposition in order to define different kinds of opposition. It will be shown that there are other three square-shaped diagrams in his *De Interpretatione* (*De Int*) confirming that Aristotle is fond to explain logical opposition in this way.

[2]Apuleius or the author of the treatise called *Peri Hermeneias* (Moreschini (ed.) 1991, pp. 189-215) uses the terms *scriptum* when referring to the propositions forming a square in the text, a term that could be translated by 'table'. For instance, when commenting on the traditional Square, the author of the treatise says that "it is easily understood ⟨the logical relations of opposition⟩ with the help of the propositions written below (*facile ostenditur ex ipsis propositionibus infra scriptis*).

[3]The square has been reproduced from Álvarez & Correia (2017), p. 91. Here the vertical lines (between A and I, and E and O), have been written by discontinuous lines with the purpose I have suggested here, namely, that Aristotle does not mention subaltern relations.

The throughout reading of the 14 modern chapters of *De Int* should convince anyone that to use diagrams to express conceptual distinctions is an accuracy of this treatise. As a matter of fact, Aristotle introduces the Square of Opposition in *De Int* 7 (17a38-17b15), but before and after his intention of using diagrams is evident. In fact, *De Int* 5 (17a8) distinguishes the affirmation and negation and *De Int* 6 (17a26-17a37) relates them in opposite sense through contradiction. Then, *De Int* 7 introduces quantifiers (either universal or particular) in categorical propositions having a universal subject term (for quantifying a singular term –like 'Every Socrates is just'– would be a non-sense). This is why the formulae 'stating universally of a universal' of 17b5, and 'stating of a universal not universally' of 17b8, become important to define the elements of the square: the universal affirmation and negation (which make contrariness) and particular affirmation and negation (which makes sub-contrariness). As a result, there are four propositions making two oppositions: universal affirmatives are opposed to universal negatives and (below, in the same order) particular affirmatives to particular negatives, as was described above.

Later, *De Int* 10 introduces many squares intending to find the simple negation of a given simple affirmation. During all these squares, Aristotle aims at demonstrating that every affirmation has its own negation, which is essential to his intention of showing the importance of having a definition of contradiction in categorical logic. In this treatise Aristotle says four times[4] that every affirmation has its own negation, which should be taken as his primary motivation to draw the Square of Opposition of *De Int* 7, and the other squares he builds in *De Int*. In particular, the Square of Opposition of *De Int* 7 aims at defining the negation or contradictory opposition for quantified propositions, because any quantified proposition can be wrongly said to have more than one negation. For instance, the universal affirmative proposition (A: 'Every S is P') might have two negations: the universal negative (E: 'No S is P') and the particular negative proposition (O: 'Some S is not P'), but in the right sense it has only one, which is its contradictory (O: 'Some S is not P'), for the other opposition (E: 'No S is P') is the corresponding contrary proposition.

To define the specific negation or contradiction of a given affirmation, that is, the negation that denies completely what the affirmation asserts, is Aristotle's target in *De Int*. And in a syntactic sense, this persistence corresponds to finding the place where the negative particle must be located within the categorical proposition that has been denied. In theory, the negative particle should be located in one and only one defined place. This is true, but the place is different from one another when the propositions are of different nature.

In commenting this doctrine, the ancient interpreters say that Aristotle places the negative particle before the more important part of the affirmation:[5] if the proposition

[4]Cf. *De Int* 17 a 33-34; 17b37; 18 a 18; 20b 3-4. Cf. *An Pr* I, 46, 51b33-36.

[5]For instance, Ammonius Hermiae (VI AD) in his commentary of Aristotle's *De Interpretatione*

is a two-term proposition, the negative particle must be placed before the verb. And if the affirmation is a three-term proposition, the negative particle must be placed before the verb 'to be'. And if it is a modal proposition, the negative particle must be placed before the modality. For instance:

*Two-term propositions:*
'S eats' is denied by 'S does not eat'[6]

*Three-term propositions:*
'S is P' is denied by 'S is not P'

*Two-term modal proposition:*
'S necessarily eats' is denied by 'S does not necessarily eat'

*Three-term modal proposition:*
'S is necessarily P' is denied by 'S is not necessarily P'

To this ancient doctrine we should add the case of the quantified propositions, which are denied when the negative particle is placed before the quantifier. This is the reason why Aristotle draw the Square of Opposition in Chapter 7, and the reason why he claims (*De Int* 20a23-30) that sometimes we can deny a proposition with an affirmation. For instance, if someone asks whether Socrates is wise, then other answers that he is not. You can say, Aristotle says (20a30), 'Socrates is not-wise'. But this is an exception, for in quantified propositions, if someone who has asked us whether is true that every man is wise, we are not to deny by saying 'No, every man is not wise' (because this is the contrary) but 'no, not every man is wise' (because this is the contradictory).

Now, as said, in *De Interpretatione* there are three squares of opposition, besides the Square of Opposition of chapter 7, deserving to be highlighted, because of their significance and level of complexity.

The first square is the one relating simple propositions with indefinite predicate ('S is not-P') propositions (which will be called the indefinite predicate square: 10, 20a20-23).

The second square is that relating modal propositions (which will be called the modal square: 13, 22a 24-31).

The third square is that relating privative, indefinite and simple propositions (which here will be called the privative square: 10, 19b19-24).

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refers to this doctrine and states that: for two-term propositions the more important part is the predicate, which is the verb (cf. *in Int* p. 87, 8 ff.). For three-term propositions the more important part is the verb 'to be', i.e. 'is' (cf. *in Int* p. 160, 14-15). For modal propositions, the mode (cf. ibid., p. 218, 8-9). Also Boethius (VI AD) refers to this doctrine in his second commentary on the same Aristotelian treatise: *in Int* 2, 18-2, pp. 377–8; and 23-27, p. 378.

[6]Here, the verb 'to eat' represents any verb which is not the verb 'to be'.

Some time ago, the first and the second square also called attention to the British logician A.N. Prior. Indeed, Z. Rybaříková (2016), pp. 3473, reminds us that Prior in one of his unpublished papers, titled "Aristotle on logical squares", in plural, "in his attempt to define Greniewski's $\Box$ operator, also considers squares which are introduced in the 10th and 12th chapters of *De Interpretatione*, i.e., the square that comprises indefinite names and the modal square." (p. 3473).[7] The reason why Prior remarks these two other Aristotelian squares in discussing with H. Greniewski on the Square of Opposition is that these squares are outstanding in the reading of *De Int*.

# 2 The indefinite-predicate square

As to the first square, its discussion has been done elsewhere in more detail,[8] and I will only point out its main characteristics. Aristotle deals with denying the universal affirmation having an indefinite predicate ('Every S is not-P'). And he maintains the ancient thesis that the negative particle takes the main part of the proposition, which in quantified propositions is the quantifier. Accordingly, the corresponding contradictory is 'Not every S is not-P'. So the square is the following:

$$\begin{tikzcd} \text{Every S is not-P} \arrow[d] \arrow[r, phantom, "\neq"] & \text{Not every S is not-P} \\ \text{No S is P} \arrow[r, phantom, "\neq"] & \text{Some S is P} \arrow[u] \end{tikzcd}$$

The diagonals are also contradictory, and their truth values are always different from one another. This square presents some difficulties relating the vertical relations, for Aristotle says that 'No man is Just' follows from (*akolouthousi de hautai*: 20a16) 'Every man is not-just', but not that they follow each other (*akolouthousi allellais*: Ammonius, *in Int* p. 181, 27-28) as the ancient Neoplatonic commentators took it.[9] Behind this Neoplatonic interpretation is the Canon of Proclus and the theory of formal equipollences later called obversion (Bain 1870).[10] Current logic follows Neoplatonic interpretation, as it accepts that $\forall x(Mx \to \neg Jx) \leftrightarrow \neg\exists x(Mx \land Jx)$ and $(p \to \neg q) \leftrightarrow \neg(p \land q)$.

[7] Rybaříková (2016), pp. 3473, mentions the modal square in chapter 12 but actually it is in chapter 13.

[8] Correia (2002), pp. 71-84.

[9] Boethius *in Int* 2, 25-29, p. 330 translates Aristotle *sequuntur vero hae* but he comments on to it that the propositions *sequuntur sese sibique*.

[10] Correia (1999), pp. 53-63.

According to Martha Kneale (1978), p. 57, Aristotle "rejects the converse entailment, which is required for obversion, on the ground that 'is not-white' might be taken in a narrower sense than 'is not white' (*An Pr* I, 46 51b8)". Her remark makes a strong difference between Aristotle's logic and Aristotelian logic developed by his commentators and it opens the problem of whether Aristotle accepted formal equivalences in its logic.[11]

## 3 The privative-predicative square

The second squared-shaped diagram I would like to discuss is mentioned by Aristotle in *De Int* 10, 19b22-24, in which he also introduces privative propositions through a passage that is almost impossible to interpret.[12] He says:[13]

19b22-24: *ὥστε διὰ τοῦτο τέτταρα ἔσται ταῦτα, ὧν τὰ μὲν δύο πρὸς τὴν κατάφασιν καὶ ἀπόφασιν ἕξει κατὰ τὸ στοιχοῦν ὡς αἱ στερήσεις, τὰ δὲ δύο οὔ·*

Boethius *in Int* 2, 23-27, p. 263, translates:

> 19b22-24: "Quare idcirco quattuor istae erunt, quarum duae quidem ad adfirmationem et negationem sese habebunt secundum consequentiam ut privationes, duae vero minime."

The English translation by J.L. Ackrill (1963) is equivalent, which confirms that the problem is not the translation from the Greek language,[14] but the sense of Aristotle's words:

> 19b22-24: "Because of this there will here be four cases (two of which will be related, as to order of sequence, to the affirmation and negation in the way the privations are, while two will not)."

And, as helping us, Aristotle adds:

> 19b30-31: "This then is how these are arranged (as I said in the *Analytics*)."

The square he refers to is in *Prior Analytics* I, 46 (51b37 ff.):

[11] Cf. Correia (1999), pp. 53–63.

[12] Cf. Boethius in his commentaries on Aristotle's *De Int* refers to this passage as one in which there exists a *difficillimum sensum* (*in Int* 23, p. 131), and (*in Int* 23-8, pp. 131–2. Later in his second edition commentary he adds that the passage is 'a challenge to human mind' (*in Int* 2, 1-4, pp. 274–5).

[13] This has also treated in Correia (2006), pp. 41-56.

[14] The French translation by Tricot (1977) is thus: 19b22-24: "Aussi, pour cette raison, aurons-nous ici quatre propositions: deux d'entre elles se comporteront à l'égard de l'affirmation et de la négation suivant leur ordre de consécution, comme des privations; mais pour les deux autres, il n'en sera pas de même."

| | |
|---|---|
| To be good | Not to be good |
| ↓ | ↑ |
| Not to be not good | To be not-good |

The problem now is how to arrange privative, indefinite and simple propositions in a square. Boethius' commentaries on Aristotle's *De Int* contain a complete historical report of the ancient solutions to this obscure passage,[15] which is only testimony of the opinions by Herminus, Alexander of Aphrodisias and Porphyry. According to Herminus (almost unknown commentator but probably Alexander of Aphrodisias' master), the logical relation between simple, privative and indefinite propositions, is the following:

| | |
|---|---|
| *Privative Aff* | *Privative Neg* |
| (i) a man is just | (i') a man is not unjust |
| ↕ | ↕ |
| *Indefinite Aff* | *Indefinite Neg* |
| (ii) a man is not-just | (ii') a man is not not-just |
| ≠ | ≠ |
| *Indefinite subject Aff* | *Indefinite subject and predicate Aff* |
| (iii) a not-man is just | (iii') a not-man is not-just |

Herminus' interpretation of Aristotle's *De Int* 10 is a square. But, according to Boethius it is a wrong and incomplete exegesis of Aristotle's words: it is wrong, for indefinite subject propositions has nothing to do here,[16] and it is also incomplete, for Herminus does not explain what the meaning of *secundum consequentiam* is.[17] However, his square was influential in Alexander of Aphrodisias' opinion, for Alexander arranges the same propositions and maintains the columns. Alexander's idea is to take privative and indefinite propositions as logically equivalent, so that both indefinite and privative affirmations are opposed to the simple affirmation. In the other column, the negative propositions behave in the same way. Thus, he draws another square.

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[15]cf. in *Int* 3-5, p. 132. huius sententiae multiplex expositio ab *Alexandro* et *Porphyrio*, *Aspasio* quoque et *Hermino* proditur.

[16]Boethius *in Int* 2, 31-3, pp. 275–6: "These things, however, Herminus [says]. He, misunderstanding badly the complete sense of the phrase [19b. 22-24], introduced these propositions, namely, that with both [terms] indefinite and that with an indefinite subject."

[17]According to Boethius, Herminus does not explain Aristotle's expression *secundum consequentiam* (which is the translation of Boethius for *kata to stoikhoun*) and therefore it is not clear which are the two propositions that must be disposed *secundum consequentiam* in accordance with the privative propositions (*in Int* 2, 3-8, p 276).

| | |
|---|---|
| *Simple Aff* | *SimpleNeg* |
| (i) a man is just | (i') a man is not just |
| ≠ | ≠ |
| *Privative Aff* | *Privative neg* |
| (ii) a man is unjust | (ii') a man is not unjust |
| ↕ | ↕ |
| *Indefinite Aff* | *Indefinite Neg* |
| (iii) a man is not-just | (iii') a man is not not-just |

According to Boethius, Porphyry criticizes Alexander by saying that Alexander takes the propositions only in a syntactic way.[18] By contrast, Porphyry proposes to read Aristotle's phrase *secundum consequentiam* (*kata to stoikhoun*) in a semantic way:

| | |
|---|---|
| *Simple Aff* | *Simple Neg* |
| (i) a man is just | (i') a man is not just |
| ↓ | ↑ |
| *Privative Neg* | *Privative Aff* |
| (ii) a man is not unjust | (ii) a man is unjust |
| ↕ | ↕ |
| *Indefinite Neg* | *Indefinite Aff* |
| (iii) a man is not not-just | (iii') a man is not-just |

Porphyry changes the columns. His reading is partially correct in taking the simple affirmation entailing the indefinite negation and the indefinite affirmation entailing the simple negation, for it is what Aristotle says in *An Pr* I, 46. However, he is wrong in making the indefinite propositions logically equivalent to the privative ones, for Aristotle explains in *Categories* 11b38-12a25 that the privative proposition is equivalent to the indefinite proposition only when the predicate is necessary and not incidental to the subject.

Indeed, this is an essential passage in many respects:

> "If contraries are such that it is necessary for one or the other of them to belong to the things they naturally occur in or are predicated of, there is nothing intermediate between them. For example, sickness and health naturally occur in animals' bodies and it is indeed necessary for one or the other to belong to an animal's body, either sickness or health; (...) But if it is not necessary for one or the other to belong, there is something intermediate between them. For example, black and white naturally occur in bodies, but it is not necessary for one or the other of them to belong to a

[18] Boethius *in Int* 16-20, p. 134. Quod autem ait ad consequentiam, tamquam si dixisset ad similitudinem, ita debet intelligi.

> body (for not every body is either white or black); (...) And between these there is certainly something intermediate–between white and black are grey yellow and all other colours, and between the bad and the good the neither bad nor good.(...)". Ackrill 1963, transl.

In the following figure, the relation stated by Aristotle can be seen clearer:

| **Necessary predicate** | **Subject** | **Intermediate state** | **Privative/Indefinite** |
|---|---|---|---|
| Health-Illness | Animal body | It does not exist | Equivalence: illness = non-health |

| **Accidental predicate** | **Subject** | **Intermediate state** | **Privative/Indefinite** |
|---|---|---|---|
| Bad-Good | Man | It does exist | No equivalence: bad $\neq$ non-good |

Thus, Porphyry approaches to the correct interpretation of the square but not completely, because the equivalence between indefinite and privative propositions is not always true. It was Ammonius Hermeias in the school of Alexandria, by following the oral teaching of his master Proclus, who in his commentary to Aristotle's *De Int* gave the most correct interpretation of *De Int* 19b 22-24. Ammonius cites correctly the passages: *Physics* A, 7, 189b30 and *Categories* 11b38-12a25 (to which I modestly would add *Metaphysics* X, 7) to confirm his exegesis. Ammonius (*in Int* p. 163 ff.), says:

| | |
|---|---|
| *Simple Aff* | *Simple Neg* |
| (i) a man is just | (i) a man is not just |
| ↓ | ↑ |
| *Privative Neg* | *Privative Aff* |
| (ii) a man is not unjust | (ii) a man is unjust |
| ↑ | ↓ |
| *Indefinite Neg* | *Indefinite Aff* |
| (iii) a man is not not-just | (iii) a man is not-just |

The difference between Ammonius and Porphyry is the one Aristotle mentions in *Categories* 11b38 -12a 25, namely, indefinite propositions and privative propositions are equivalent to one another only when the predicate is necessary to the subject.

# 4 The modal square

The third square (*De Int* 13, 22a24-32) refers to modal propositions. The square is as following:[19]

[19] My translation. Ackrill (1963) translates *endekhómenon* as admissible. I take the philosophical concept that something is contingent when either it or its contrary happens or have happened. In fact, not everything is contingent, for none of the contraries has happened. I take it, then, as a quality, but possibility is not a quality of something, but of human mind.

| | |
|---|---|
| It is possible to be | It is not possible to be |
| It is contingent to be | It is not contingent to be |
| It is not impossible to be | It is impossible to be |
| It is not necessary to be | It is necessary to be |
| | |
| It is possible not to be | It is not possible not to be |
| It is contingent not to be | It is not contingent not to be |
| It is not impossible not to be | It is impossible not to be |
| It is not necessary not to be | It is necessary not to be |

Aristotle in the previous chapter teaches how to make a negation by following the rule that the negative particle must be placed before the more important part of the proposition. Since in modal propositions the more important part is modality, in any modal proposition either a two- or three-term proposition, the negative particle will be placed before modality. This way to deny shows what later is called the *dictum* or the modalized part of the proposition. In fact, in any modal proposition M(P),[20] both M and P can be affirmed or denied. For instance: M(P), M(¬P), ¬M(P), ¬M(¬P).[21] Accordingly, he draws this new square in *De Int* 13 to declare his statement about negation.

One of the characteristics of this square is the re-definition of possibility. It is first defined by the negation of necessity, i.e., ¬N(P). But, since he also accepts that if something is necessary, then it is possible, i.e., $N(P) \rightarrow P(P)$, then the conclusion will be that $N(P) \rightarrow \neg N(P)$, which is a contradiction. So he realizes (22a15 ff) that P(P) is defined by the negation of the necessity of non-P, i.e., ¬N(¬P). As I take it, if *non-x* is necessary, then $x$ will not be able to exist. Then he rearranges the square by interchanging the fourth of the first group and its corresponding negation by the fourth of the third group and its corresponding negation. As a result, the new square is modified by this new definition of possibility:

[20]The categorical proposition which is modalized or the *dictum* is always in parenthesis: (P). The modality, M, comes always from outside.

[21]M stands for any modality (necessary, contingent, possible, impossible). N stands for the modality of necessity, and P for possible, I for impossible. Later, Aristotle introduces A, assertoricity o non-modality to recall the two- and three-terms categorical non-modal proposition (i.e., S is P).

| | |
|---|---|
| It is possible to be | It is not possible to be |
| It is contingent to be | It is not contingent to be |
| It is not impossible to be | It is impossible to be |
| **It is not necessary not to be** | **It is necessary not to be** |
| It is possible not to be | It is not possible not to be |
| It is contingent not to be | It is not contingent not to be |
| It is not impossible not to be | It is impossible not to be |
| **It is not necessary to be** | **It is necessary to be** |

This square contains logical equivalences and oppositions. One can find equivalences in each corner group and oppositions in front, but its oppositions can also be simplified and arranged in correspondence with the traditional Square in order to find the contradictory oppositions (A-O) and (E-I), thus:

| | |
|---|---|
| A | E |
| It is not possible not to be<br>(=It is necessary to be) | It is not possible to be<br>(=It is necessary not to be) |
| I | O |
| It is possible to be<br>(=It is not necessary not to be) | It is possible not to be<br>(=It is not necessary to be) |

It is evident that the modal square intends to show that there is only one modal negation for one modal affirmation, and in general the use of squares of opposition gains importance in Aristotle's logic not only because it confirms that every affirmation has only one negation, but also because it defines the types of opposition in modal categorical propositions and their corresponding truth logical values. Lukasiewicz (1951), p. 137, identified this Aristotle's modal square and its implicit formulae with "a basic modal system" and takes it as "the foundation of any system of modal logic". These Aristotle's intuitions "(...) are the roots of our concepts of necessity and possibility".[22]

Aristotle's implicit modal formulae are of two kinds: what he assumes and what he defines. He assumes that $A(P) \rightarrow P(P)$, but not vice versa, i.e., if something is true, then something is possible, or if something exists, then something is possible to exist.[23] He does not accept the converse, for something possible could not come to exist. He

[22]However, Aristotle's intuitions in modal logic "do not exhaust the whole stock of accepted modal laws" (Lukasiewicz, 1951, p. 137).

[23]Where A stands for assertoricity or the *inesse* quality of categorical propositions, that is, the quality of being not modalized, but true in the existence).

also assumes that $N(P) \to A(P)$, but denies its converse. Indeed, something that exists could not be necessary, but if it is necessary, that will exist. Indeed, necessity entails existence.

In his *Analytics* I, 13, 32a 5, he defines $P(P)$, i.e., the possibility of being as $\neg N(\neg P)$, i.e., the non-necessity of being of non-P, in a lucid recall of what he discussed in *De Int* 13, 22a15 ff., when he arranged the square, by redefining possibility. Hence, $N(P) \leftrightarrow \neg P(\neg P)$. And hence it also follows the distribution of the negative particle: $\neg N(P) \leftrightarrow P(\neg P)$, i.e., the non-necessity of being P is equivalent to the possibility of being non-P. And also, $\neg P(P) \leftrightarrow N(\neg P)$, i.e., the non-possibility of being P is equivalent to the necessity of being non-P. Besides, if impossibility is added, we have: $P(P) \leftrightarrow \neg I(P)$ and $\neg P(P) \leftrightarrow I(P)$. But it was accepted that $\neg P(P) \leftrightarrow N(\neg P)$, therefore: $N(\neg P) \leftrightarrow I(P)$. Hence it also follows that: $[I(\neg P) \leftrightarrow \neg P(\neg P)] \leftrightarrow N(P)$.

## 5 Conclusion

Aristotle's traditional Square of Opposition of *De Int* 7 is not isolated in his logical writings, but it is interrelated to the other squares he presents. In fact, there are three other important squares in the text. The first we have analyzed is the square of obversion; the second square is that of the privative and indefinite predicates, and the third square is that of modality. In the first, the question is whether Aristotle would accept equivalences between propositions and how to conciliate equivalences with the thesis that there is only one single negation for an affirmation. The second square raises the problem of how privative and indefinite predicates behave: whether they are formally equivalent or their equivalence will depend on their matter and meaning (for non-even is equivalent to odd, but non-white is not necessarily black). The third and last square we have analyzed is the modal one, and here the question is how to identify the correct modal negation for any modal affirmation. It is then clear that all the squares he introduces develop the aim of finding distinctions between opposite categorical propositions, either modal or non-modal, either with indefinite predicate or not, either related with privative propositions or not. It is clear that contradiction is the only opposition identified with negation, for it is the strongest separation between truth and falsity. When denying an affirmation, the negative particle affects to the more important part of the proposition: the verb, the verb to be, the quantifier, the modality. In particular, the use of squares aims at confirming that for every affirmation there will be always only one negation (even if that negation is equivalent to other, as the case of obversion), which entails the challenge of distinguishing contradiction within the ample number of species of proposition Aristotle defined in his logical writings.[24]

[24]This article was possible thanks to Fondecyt N° 1170522.

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