William of Sherwood, Singular Propositions and the Hexagon of Opposition

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February 15, 2011

Abstract

In Aristotelian logic, the predominant view has always been that there are only two kinds of quantities: universal and particular. For this reason, philosophers have struggled with singular propositions (e.g., "Socrates is running"). One modern approach to this problem, as first proposed in 1955 by Tadeusz Czeżowski, is to extend the traditional Square of Opposition to a Hexagon of Opposition.

We note that the medieval author William of Sherwood developed a similar theory of singular propositions, much earlier than Czeżowski, and that it is not impossible that the Hexagon itself could have been present in Sherwood's writings.

1 Introduction

In traditional Aristotelian logic, the predominant view has always been that there are only two kinds of quantities: *universal* and *particular*. In accordance, the four proposition types which figure in the classical theory of syllogisms are the *universal affirmative* ("Every man is running"), *universal negative* ("No man is running"), *particular affirmative* ("Some man is running") and *particular negative* ("Some man is not running"). We will abbreviate these by UA, UN, PA and PN, respectively. When two propositions share both the subject term and the predicate, they are related to one another in one of the following ways: *contradictory*, *contrary*, *subcontrary* or *subalternate*. This doctrine has frequently been represented by the Square of Opposition, as in Figure 1 below.

*The author is supported by a Mosaic grant (no: 017.004.066) by the Netherlands Organisation for Scientific Research (NWO).

Figure 1: The Square of Opposition

What about *singular* propositions, i.e., propositions of the kind "This man is running" or "Socrates is running"? Handling singular propositions is always difficult in a language based on universal and existential quantification, as witnessed (even in the case of first-order logic) by the intensive discussion on Russell's "The present king of France is bald" example [Russell 1905]. Nevertheless, many authors tried to show that singular proposition were either special kinds of particular, or, more frequently, special kinds of universal propositions (see the appendix for some examples).

In 1955 Tadeusz Czeżowski [Czeżowski 1955] presented an alternative view and showed how singular propositions ought to be analyzed in the Aristotelian context. This, among other things, led him to extend the Square of Opposition to a Hexagon of Opposition, where universal, particular, and singular propositions all play an independent role.

In this paper we note that, before Czeżowski, the medieval logician William of Sherwood developed a similar theory of singular propositions. In particular, the crucial aspect of Czeżowski's "discovery", namely the opposition relations which singular propositions form relative to other cateogrical propositions, is present in Sherwood's writing. Moreover, we argue that, perhaps, even the Hexagon of Opposition *as a diagram* could have been present in Sherwood's original writings (although it has not been preserved in the surviving manuscript). The paper ends with an appendix with some related historical background.

2 Czeżowski

Towards the end of the 19th century and beginning of the 20th century, a standard view in the theory of Aristotelian logic was that singular propositions are a special kind of universal propositions. The argument was that in a singular proposition, predication is of the *whole* of the subject, just like in a universal one, whereas in a particular proposition it is only of a part of the subject (see, e.g., [Keynes 1906, p 102]). This argument can be traced back to John Wallis in 1631, and we refer the reader to the appendix for a brief overview of this and subsequent historical developments.

Interestingly, it was known since Aristotle that a singular affirmative and a singular negative proposition are neither mutually contrary, as universal ones, nor subcontrary, as particular ones, but contradictory.[1] Moreover, it was typically believed that singular propositions *cannot* even have contraries:

> "Taking the proposition 'Socrates is wise', its contradictory is 'Socrates is not wise'; and so long as we keep to the same terms, we cannot go beyond this simple denial. The proposition has, therefore, no formal contrary."
> [Keynes 1906, section 82, p 115.]

[1]See, e.g., [*De Int.*, VII, 17b].

This, however, was not reason enough to abandon the traditional view that singulars are a special kind of universals.

In 1955, Tadeusz Czeżowski [Czeżowski 1955] advocated the separation of categorical propositions into *three* classes: universal, particular, and singular. He analyzed the function of singular propositions in syllogisms and the opposition relations they form with other categorical propositions. This led him to extend the traditional Square of Opposition to a Hexagon of Opposition, as illustrated in Figure 2 below (where SA abbreviates *singular affirmative* and SN *singular negative*).

Figure 2: Czeżowski's Hexagon of Opposition

The Hexagon of Opposition will be of special interest to us. In particular, we see in it two features of singular propositions worth of notice. Firstly, as we already mentioned, the singular affirmative and singular negative propositions are contradictory. More interestingly, both singular propositions have, besides their contradictories, also their contraries and their subcontraries.

Czeżowski, therefore, explicitly refutes the thesis that singulars do not have contraries,[2] and his overall aim is to correct the misconceptions about singular propositions:

> "Classical logic textbooks all concur in the view that singular propositions ought to be regarded as universal ... The relation between an affirmative singular proposition and a negative singular proposition is the relation of contradiction—and not of contrariety, as between an affirmative and a negative universal proposition. Hence it has been inferred that there is no proposition that might properly be the contrary of a singular proposition. This inference is wrong. In reality, the above-mentioned difference is merely an indication that a distinction ought to be made between singular and universal propositions and that trichotomy into universal (All S is P), singular (This S is P), and particular (Some S is P) propositions

[2] Of course, there is one subtlety going on here, namely the issue whether we consider "this man is wise" or "Socrates is wise" to be the generic form of a singular proposition—and in the latter case, whether "Socrates" has a term in common with "every man" or "some man". In fact, it seems to be this very issue that lies at the core of the debate between View 1 and View 2. But here we adhere to Czeżowski's view, who consciously does away with this problem: "I make the subject of the singular proposition take the form of 'This S', in order to enable the singular proposition to enter the opposition square, i.e., relations between propositions having the same terms in the subject and predicate respectively. That, however, alters that particular property of singular propositions which had served in classical logic as an argument for placing singular propositions together with universals—namely, that in a singular proposition the subject is predicated in all its extension. If it be 'S' that is to be regarded as subject—and that is how it must be, when a singular proposition is to be opposed to universal and particular propositions—then it must be admitted that is is only one of the 'S's that is predicated on, and not the whole of their extension." [Czeżowski 1955, p 392]. There has been at least one criticism of Czeżowski on this account [Mackie 1958] and at least one defence against that criticism [Gumanski 1960].

should be introduced in place of the customary dichotomy according to quantity, into universal and particular propositions."

"Opposition relations among the six propositions thus distinguished will be represented on a hexagon, analogously to the logical square."

"Contrary to the belief quoted above, both singular propositions do have their contraries—namely, universal propositions. But at the same time they are placed in a relation of subcontrariety to particular propositions, just as the latter are among themselves." [Czeżowski 1955, pp 392–394]

It is obvious from this quotation that Czeżowski considered his hexagon and the new perspective on singular propositions a novel discovery. However, going back some eight-hundred years, we find a medieval logician who, remarkably, came very close to Czeżowski's theory.

3 William of Sherwood

William of Sherwood was an English philosopher and logician, born some time between 1200 and 1210 and died between 1266–1271.[3] Not much is known of his life, and only two works can be definitely ascribed to him: *Introductiones in Logicam*, a logic textbook dealing with Aristotelian logic, and *Syncategoremata*, dealing with the theory of syncategorematic terms. The *Introductiones* have survived in just one manuscript, not written by Sherwood himself, presumably dating from the late thirteenth or early fourteenth century.[4]

There is a wide variety of topics treated in the *Introductiones*, but all we need is in Chapter 1, which is an exposition of Aristotelian syllogistic. There Sherwood discusses the four standard categorical propositions, and, following Aristotle, correctly analyzes the opposition relations—contradictory, contrary, subcontrary and subaltern—that appear between them. Then he mentions *singular propositions*, at first implying that these are really equivalent to particular propositions. Then, however, we read the following:

"[Singular statements] differ [from particular statements] in this respect: if two statements are singular and of different quality they are not subcontraries but, in accordance with the theory, contradictories—e.g., 'Socrates is running', 'Socrates is not running.'

Note, moreover, that a universal affirmative and a singular negative, as well as a universal negative and a singular affirmative, are mutually contrary (at least as far as the law goes) because they can be false at the same time and cannot be true at the same time. Suppose that Socrates is running and no one else; in that case these statements are false: 'every man is running', 'Socrates is not running.' Again, suppose that Socrates is not running but everyone except him [is running]; then

[3] For a detailed discussion of Sherwood's life, see, e.g., the introduction in [Kretzmann 1966, pp 3–20].

[4] Bibliothèque nationale MS. Lat. 16, 617 (formerly Sorbonne 1797).

these statements are false: 'no man is running', 'Socrates is running.' "
[*Int. Log.*, 2^{v}, 210 ff][5]

Sherwood clearly notes the two essential properties of singular propositions, present in Czeżowski's writings as well: the contradiction of the singular affirmative and negative, and the contrary relation they form with the universal ones. According to Kretzmann [Kretzmann 1966, footnote 38 on p 31] Sherwood is the first known medieval logician to make this particular observation. Of course, this should be seen in the wider context of medieval theories of singular propositions (see, e.g., [Ashworth 2008]). Many medieval authors were concerned with the nature of singular terms, in particular with ontological, epistemological and theological issues, but also with logical ones. It is beyond the scope of this paper to discuss all of these, since we want to focus on Sherwood's writing and the relation to Czeżowski's [Czeżowski 1955]. It should however be noted that the obsevations of Sherwood quoted above were not a standard part of medieval theories of singular propositions. For example, it is not present in Peter of Spain's influential *Summulae Logicales* [*Summulae*] (*cf.* [Kretzmann 1966, footnote 38 on p 31]).

The quoted passage makes it clear that Sherwood's theory comes very close to that of Czeżowski. Although the subcontrary relations between singular and particular propositions are not mentioned, they can easily be inferred from the contrary and the contradictory relations which *are* expliticly mentioned. Thus, Czeżowski's Hexagon of Opposition, or at least the logical essence thereof, was already there in the writings of Sherwood.

In the next sections, we will investigate the possibility of the Hexagon being present in Sherwood's writings not just as a theory, but as an actual diagram as well.

4 Sherwood's Hexagon

Norman Kretzmann, in his annotated translation of the *Introductiones*, shows a Hexagon of Opposition to represent Sherwood's treatment of singular propositions [Kretzmann 1966, p 33]. He does not mention any possibility of the Hexagon being due to Sherwood, but makes it clear that it is added, for the benefit of the reader, by himself.[6] We would like to take this one step further and ask the following question: could Sherwood himself have conceived of the Hexagon of Opposition *as a diagram*? Clearly, if that were even partly true, it

[5] *"... in tantum differunt, quod si utraque sit singularis et diversae qualitatis, non erunt subcontrariae, sed ratione contradictoriae, ut sunt hae: 'Socrates currit', 'Socrates non currit'. Item. Notandum, quod universalis affirmativa et singularis negativa et etiam universalis negativa et singularis affirmativa contrariantur ad minus quantum ad legem, quia possunt simul esse falsae et non simul verae. Posito, quod Socrates currat et nullus alius, hae sunt tunc falsae: 'Omnis homo currit', 'Socrates non currit'. Item. Posito, quod Socrates non currit, sed omnes alii ab ipso, tunc istae sunt falsae: 'nullus homo currit', 'Socrates currit'."*

[6] He even credits a certain Mr. Gerald W. Lilje for the suggestion (footnote 39 on p 32). Moreover, he does not note the connection to [Czeżowski 1955].

would be an interesting discovery for the history of the Square of Opposition and the history of logical diagrams in general.

In the only surviving manuscript of the *Introductiones*, we do not find any Hexagon of Opposition but only two Squares of Opposition—one for categorical propositions and one for modal ones. Nevertheless, in the following we shall speculate that in Sherwood's original text the categorical square might have been a Hexagon or at least something like it, which could have been altered, by the scribe responsible for the surviving manuscript, into a Square. To support this speculation, we shall give corroborating evidence showing why it is indeed likely that the scribe did make changes to the diagrams in the *Introductiones*.

Let us return to the paragraph quoted above, about the opposition relations between singular propositions and other categorical ones. Just after that, we read the following lines:

> "This, then, is the division of statements arising from the arrangement or relation of one statement with another—viz., some are contraries, some subcontraries, some subalterns, and some contradictories, *as in the figure below.*" [*Int. Log.*, 2^{v}, 225 ff][7]

In the manuscript, the figure we see is the categorical Square of Opposition. But this is surprising, since in the preceding two paragraphs Sherwood has just elaborately talked about singular propositions. And if we are to relate those paragraphs at least somewhat with the phrase "as in the figure below", we would expect that figure to be some kind of Hexagon of Opposition.

So, since Sherwood's text suggests the need of a Hexagon, could it be that Sherwood did in fact present a Hexagon but that the scribe responsible for our manuscript changed it? For one, the scribe might have misunderstood Sherwood and his Hexagon, or have been under the mistaken impression that the Hexagon was an error on Sherwood's part, which it was his duty to correct. It might also have been that the Hexagon, as presented in the document that the scribe was copying from, really did look confusing, bloated or otherwise unconvincing, and that the scribe felt justified in changing it to the standard version.

How realistic is such a scenario? We will now give another piece of evidence which, besides being very interesting in its own right, can serve as an argument for why our claim is not as far-fetched as it may seem.

5 The Modal Square of Opposition

We move ahead a few sections in the *Introductiones*. There, we come to the point where Sherwood discusses modality. Following Aristotle, he defines the four moods: *necessary*, *possible*, *non-necessary* and *impossible*, gives the standard duality principles such as "it is necessary" being equivalent to "it is impossible

[7] (My emphasis) *"Est igitur haec divisio enuntiationis, quae accidit ei in ordinatione ad alterum sive secundum comparationem, scilicet quod quaedam sunt contrariae, quaedam subcontrariae, quaedam subalternae, quaedam contradictoriae, ut in subiecta patet figura."*

that not" etc. and analyzes the opposition relations—contrary, subcontrary, contradictory and subaltern—between modal propositions. He then, just as before, refers the reader to a diagram, meant as a visual aid to undertanding and memorizing these relationships. The diagram we see in the manuscript is the standard modal Square of Opposition (Figure 5).

Figure 3: The Modal Square of Opposition

However, this is what Sherwood has to say about the diagram:

> "All these relations also appear in the accompanying figure. The figure could be arranged differently, however, so that the contrary series could be put in the first, or upper, line, and the subcontraries in the lower. But [the arrangement as given] coincides more closely with Aristotle's."
> [*Int. Log.*, 5^{v}, 588][8]

Surprisingly, then, there is a clear discrepancy between Sherwood's description of the diagram and the diagram we actually find in the manuscript. The one that Sherwood describes as an *alternative* and *better* version, is actually the one we find. What, then, was Sherwood's original diagram?

Going back to Aristotle's *On Interpretation*, we indeed find that, although Aristotle did not have a Square of Opposition as such, he listed the four modalities in a square table, arranged as follows: ([*De Int.*, XIII, 22a])[9]

Possible	Impossible
Non-necessary	Necessary

Presumably, then, Sherwood's original modal Square had the four modalities arranged precisely the same way, while adding all the logical relations. A reconstruction of such a square would look something like Figure 5 below, not a pretty sight indeed.

Figure 4: Reconstruction of Sherwood's modal Square

Sherwood's clever suggestion, of course, was to rearrange the modalities in order to bring the modal Square of Opposition in line with the standard,

[8] *"Et haec omnia patent in figura. Posset tamen figura aliter ordinari, ut ordines contrarii ponerentur in prima linea, quae est superior, et subcontrarii in inferiori. Sed iste magis competit modo Aristotelis."*

[9] The phrase "θεωρείσθω δὲ ἐκ τῆς ὑπογραφῆς ὡς λέγομεν" suggests that the tabular arrangement stems from Aristotle himself. On the other hand, in order to corroborate the argument given in this paper, it would be important to check the diagrammatic representation of the modal Square of Oppositions in manuscripts of *De Interpretatione* in Sherwood's time.

categorical Square of Opposition. So presumably, the scribe responsible for our manuscript decided to follow up on Sherwood's suggestion and actually replace the original modal Square with the alternative version. But the result, as we clearly see, is that Sherwood's original diagram has not been preserved.

Now we have a rather clear indication that the diagrams in our manuscript of the *Introductiones* are not necessarily those of Sherwood himself, and thus we can also look at the Hexagon of Opposition in a different light. And since we are talking about the same document and the same kind of diagram, it is really not impossible that the same thing that happened to the modal Square might have happened to the Hexagon.

6 Conclusions

It is not my convinced opinion that Sherwood was indeed the author of the Hexagon. There are still many arguments against it, the strongest one perhaps being Sherwood's own formulation a few paragraphs back, which creates the impression that singular propositions are not really that important. Consequently we could see the paragraph *"Est igitur haec divisio enuntiationis..."* not as relating to what immediately precedes it, but as summarizing the whole discussion of categorical propositions in general, in which singular propositions play no important role.

Be that as it may, the idea of the Hexagon occurring in Sherwood's writings is very intriguing, and worthwhile to entertain as a possibility. And our arguments do show why that is not an unrealistic possibility. What would, of course, shed more light on this issue, is if a new manuscript of the *Introductiones* were uncovered.

On the other hand, we definitely know that Sherwood's account does contain the *logical essence* of the Hexagon, even if not the *diagram*, in the description of the opposition relations between universal, particular, and singular propositions.

7 Appendix

In order to put both Czeżowski's and Sherwood's observations in a historical perspective, it is interesting to look at some other accounts of singular propositions, dating from the 17th century onwards.[10] As mentioned, it was customary to rank singular propositions either with particulars or with universals. To be precise, we find two predominant views:

- **View 1:** In a singular proposition, predication is of one individual, which is even less than in a particular. Therefore a singular proposition is certainly not a universal, but a very special kind of particular proposition.

[10] This account of the history of singular propositions is largely influenced by the research conducted by Jaap Maat (private communication).

- **View 2:** In a singular proposition, predication is of the whole of the subject, just like in a universal. Therefore a singular proposition is (a special kind of) universal.

The second view was first made explicit by John Wallis in 1631:[11] "A singular proposition, in a syllogistic disposition, always has universal force." [*Inst.*, Appendix].[12] Apparently, this view was quite popular and was, for example, taken up by Arnauld and Nicole into what became known as the Port Royal logic (1662):

> "Although a singular proposition differs from a universal in not having a common subject, it should nevertheless be classified with them rather than with particulars; because its subject, precisely by being singular, is necessarily taken through its entire extension, which is the essence of a universal proposition and which distinguishes it from the particular."
> [*Port Royal*, Part II, Ch. 3.][13]

On the other hand, View 1 seems to have been held by a number of authors, as illustrated by the following informative account by Euler:

> "Certain authors insist, that a singular proposition must be ranked in the class of particulars; it being considered, that a particular proposition speaks only of some beings comprehended in the notion, whereas a universal speaks of all. Now, say these authors, when we speak of only a singular being, this is still less than when we speak of some: and, consequently, a singular proposition must be considered as very particular.
>
> However well founded this reasoning may appear, it cannot be admitted. The essence of a particular proposition consists in this, that it does not speak of all the beings, comprehended in the notion of the subject, whereas an universal proposition speaks of all, without exception. Thus, when it is said: *Some citizens of Berlin are rich*, the subject of this proposition is the notion of *all the citizens* of Berlin; but this subject is not taken in all its extent, its signification is expressly restricted to *some*: and, by this, particular propositions are essentially distinguished from universal . . .
>
> It is clearly evident, from this remark, *that a singular proposition must be considered as universal*; as, in speaking of an individual, say Virgil, it, in no respect, restricts the notion of the subject which is Virgil himself, but rather admits it in all its extent." [*Lettres*, CVII][14]

[11] There have been previous attempts to implicitly reduce singular propositions to universal ones, for example in Lambert of Auxerre's Logica: *" 'Sortes currit, ergo homo currit', empthimema est quod sic potest reduci ad sillogismum: 'omne quod est Sortes currit, Sortes est homo, ergo homo currit.' "* [*Logica*, De Locis, p 140]

[12] *"Propositio Singularis, in dispositione Syllogistica, semper habet vim Universalis."*

[13] *"Mais quoique cette proposition singuliere soit différente de l'universelle en ce que son sujet n'est pas commun, elle s'y doit néanmoins plutôt rapporter qu'à la particuliere; parce que son sujet, par cela même qu'il est singulier, est nécessairement pris dans toute son étendue, ce qui fait l'essence d'une proposition universelle, et qui la distingue de la particuliere."*

[14] *"Quelques auteurs ont prétendu qu'une proposition singulière doit être rangée dans la classe des particulières; attendu qu'une proposition particulière ne parle que de quelques êtres compris dans la notion, pendant qu'une proposition universelle parle de tout. Or, disent ces*

Leibniz was another prominent figure who wrote at least twice on singular propositions. In this account he seems to adhere strictly to View 2, giving essentially the same argument as Euler and his predecessors:

> "It should be noted that (as far as the form is concerned) singular sentences are put with the universals. For, although it is true that there was only one Apostle Peter, one can nevertheless say that whoever has been the Apostle Peter has denied his master." [*Nouv. Ess.*, IV. XVII. 8.][15]

But later Leibniz had to changed his mind, and wrote the following contrasting passage:

> "How is it that opposition is valid in the case of singular propositions—e.g. 'The Apostle Peter is a soldier' and 'The Apostle Peter is not a soldier'—since elsewhere a universal affirmative and a particular negative are opposed? Should we say that a singular proposition is equivalent to a particular and to a universal proposition? Yes, we should." [*Diff.*][16]

The debate between View 1 and View 2 continued into the late nineteenth and early twentieth century, with little innovation. For example, in the following exchange we see R. F. Clarke (1889) saying:

> "*London is a large city* must necessarily be a more restricted proposition than *Some cities are large cities*; and if the latter should be reckoned under particulars, much more the former." [Clarke 1889, p 274]

To this, John N. Keynes (1906) replies:

> "This view fails to recognise that what is really characteristic of the particular proposition is not its *restricted* character—since the particular is not inconsistent with the universal—but its *indefinite* character."
> [Keynes 1906, footnote 1 on p 102]

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auteurs, quand on ne parle que d'un être singulier, c'est encore moins que si l'on parle de quelques-uns: et par conséquent une proposition singulière doit être regardée comme très-particulière.

Quelque fondée que puisse paraître cette raison, elle ne saurait être admise. L'essentiel d'une proposition particulière consiste en ce qu'elle ne parle pas de tous les êtres compris dans la notion du sujet; pendant qu'une proposition universelle parle de tous sans exception. Ainsi, quand on dit: Quelques habitants de Berlin sont riches*, le sujet de cette proposition est la notion de* touse les habitants *de Berlin; mais on ne prend pas ce sujet dans toute son étendue, sa signification est expressément restreinte à* quelques-uns: *et c'est par là que les propositions particulières sont essentiellement distinguée des universelles ...*

Il est très-évident, après cette remarque, qu'une proposition singulière doit être regardée comme universelle; *puisqu'en parlant d'un individu, comme de Virgile, elle ne restreint en aucune manieère la notion du sujet, qui est Virgile même, mais elle l'admet plutôt dans toute son étendue."*

[15] *"Il est bon pourtant de remarquer qu'on comprend (quant à la forme) les propositions singulières sous les universelles. Car quoiqu'il soit vrai qu'il n'y a qu'un seul saint Pierre Apôtre, on peut pourtant dire que quiconque a été saint Pierre l'Apôtre a renié son maître."*

[16] *"Qui fit quod in singularibus procedit oppositio: Petrus Apostolus est miles, et Petrus Apostolus non est miles, cum tamen opponatur alias universalis affirmativa et particularis negativa? An dicemus, singulare aequivalere particulari et universali? Recte."*

> "Singular propositions may be regarded as forming a sub-class of universals, since in every singular proposition the affirmation or denial is of the *whole* of the subject." [Keynes 1906, p 102]

8 Acknowledgements

The author would like to thank Jaap Maat for his contribution regarding the history of singular propositions, Benedikt Löwe, Sara Uckelman and Christoph Kann for comments on earlier versions of this paper and valuable input, and all the participants of the International Congress on the Square of Opposition, June 2007, Montreux, Switzerland for their fruitful discussions.

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