ANTECEDENTS OF CONTEMPORARY LOGICAL AND LINGUISTIC ANALYSES IN SCHOLASTIC LOGIC

This paper briefly points out the parallelism between Quine's analysis of opaque and transparent senses of some psychological predicates and Scholastic texts dealing with the distinction *sensu diviso* (or *de re*) and *sensu composito* (or *de dicto*) in extended modalities\(^1\). Given that this same distinction is playing a role in present linguistic discussions, a similar parallelism can be established between recent linguistic publications and logical tracts of the Middle Ages.

Following the tradition begun by Aristotle, philosophers of the so-called Scholastic period (extending from the second part of the 12th century to the 15th in some cases) divide a sentence into two fundamental parts: subject and predicate. All other elements in a sentence are considered modifications or determinations which have no signification when taken alone; they are syncategorematic words, that is, co-predicates. For example, the list of syncategoremata discussed by the logician William of Sherwood in the 13th century (1941) includes the Latin equivalents of *every*, *both*, *nothing*, *no*, *neither*, *not*, *and*, *or*, *if*, and modal adverbials such as *necessarily* and *possibly*.

It was a general consensus in the Scholastic period that syncategorematic words could be considered as modifications of either the subject or of the predicate, that is, of a term in isolation, or modifications of the sentence as a whole. In other words, all syncategorematic words were assigned two kinds of scope, narrow and wide; in some cases, narrow scope is equivalent to internal qualification or, in the Scholastic terminology, a syncategorematic word in *sensu diviso* 'divided sense'. However, the interpretation Schoolmen often assigned to a syncategorematic word in *sensu diviso* does not have a clear counterpart in contemporary logic. Wide scope is equivalent to external qualification or what Schoolmen called a syncategorematic term in *sensu composito* 'composite sense'. For instance, Schoolmen frequently discussed examples of the type *Socrates runs necessarily*, which they found to be ambiguous in Latin. One interpretation took the modal adverb *necessarily* as a modification of the rest of the string (*dictum*) as a unit, with the English paraphrase 'That Socrates runs is necessary' (*sensu composito*). In the second interpretation the adverbial assigned a quality to the term *Socrates* alone as in 'It is necessary for Socrates to run' (*sensu diviso*).

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These examples show how classical modalities such as *necessarily* and *possibly* could be analyzed as modifying either the sentence in which they appear or just one of its constituents. At the same time, there had been a tradition beginning with the Stoic Ammonius that the notion of modality could be extended to cover many more modes than the four classical ones specifically discussed by Aristotle: *possible, impossible, contingent, and necessary*. The notion of modality for Ammonius included what has at different times been called subjective modes, psychological modalities, or propositional attitudes (this last nomenclature is due to Russell)\(^2\). Examples of propositional attitudes in English are *believes that, wishes that, fears that*.

The tradition of extended modalities reappears in the Scholastic period and combines with the views on scope developing at that time to give us a very clear antecedent of what Quine (1960) has termed opaque and transparent senses of propositional attitudes. Perhaps the best known example of the use of extended modalities in the Middle Ages is the discussion attributed to Pseudo-Scot (Scotus 1891) in the *In librum primum (secundum) Priorum Analyticorum Aristotelis questiones* q. 36 where he cites *apparens* ‘apparent’, *dilectum* ‘preferred’, *dubium* ‘doubted’, and *scitum* ‘known’ among other modes. William of Ockham (1954: 218) lists the following besides the four classical ones: a proposition can be *vera* ‘true’, *falsa* ‘false’, *scita* ‘known’, *ignota* ‘unknown’, *prolata* ‘cited’, *scripta* ‘written’, *concepta* ‘thought’, *credita* ‘believed’, *opinata* ‘opined’, *dubitata* ‘doubted’. A late Schoolman, Paul of Pergula, includes *imaginor* ‘imagine’, *suspicor* ‘suspect’, and *apparet* ‘seem’ in his list of modalities. (Paul of Pergula 1961, p. 154).

For a Schoolman who accepted among modalities an extensive number of propositional attitudes, it was a natural conclusion to assign to those psychological predicates two kinds of scope: narrow and wide. An element such as *scio* ‘I know’ in Latin could modify the subordinate clause as a whole, that is, it could be construed opaquely as an external qualification, or, it could be construed transparently as an internal modification applying to only a part of the subordinate clause. Paul of Venice discusses this verb in his *Logica Magna*, a very exhaustive 15th century compilation of Scholastic logic. For Paul of Venice a sentence of the type *I know that A is true* can only be understood in the composite sense, that is, establishing a relationship between knowledge and the proposition *A is true*; in Scholastic terms, the mode qualifies the *dictum* as a whole. On the other hand, if the propositional attitude is placed in middle or in final position, as in *of A I know that it is true or that A is true is known by me*, the sense is divided. In this divided sense a relationship is established not between the propositional attitude and the

\(^2\) For the historical development of extended modalities see Dominczak (1923).
proposition $A$ is true but rather between I know that and the term $A$ or the predicate is true— or as a Schoolman would have said it, the mode does not qualify the whole dictum but just a term, the subject or the predicate. The parallelism between these Scholastic views on scope of subjective or psychological modes and what Quine has termed the relational and notional senses of propositional attitudes can be best seen in his article ‘Quantifiers and Propositional Attitudes’ (Quine, 1966). In discussing these two senses of propositional attitudes, Quine points out that Ralph believes that someone is a spy is ambiguous between the interpretation There is someone whom Ralph believes to be a spy and Ralph believes there are spies. In this second interpretation, the notional sense of believe, there is a relation between a believer and the proposition as an unanalysed linguistic unit. Quine formalizes this sense as:

(1) Ralph believes that ($\exists x$) ($x$ is a spy)

This is the Scholastic composite sense of believe where the subjective mode applies to the subordinate clause as a whole. In the first interpretation, the relational sense of believe, Quine establishes a triadic relation to avoid quantifying into a propositional-attitude idiom from outside, giving the following formulation for There is someone whom Ralph believes to be a spy:

(2) ($\exists x$) (Ralph believes $z$ ($z$ is a spy) of $x$).

If we translate this formulation into Scholastic terms we must say that the subjective mode believe no longer modifies the dictum as a whole, but just a part of it: believe is a modality in sensu diviso whose scope does not include someone. In other words, someone in Quine’s example can be treated referentially, that is, outside of the scope of believes that, and the construction acquires a transparent sense (Quine, 1960); this is the Scholastic modality in sensu diviso or de re. If, on the other hand, belief is taken opaquely, someone is non-referential and inside of believes that; this is the Scholastic modality in sensu composito or de dicto.

Another logician who discusses the transparent and opaque senses of propositional attitudes is Paul of Pergula, a disciple of Paul of Venice. In his Tractatus de sensu composito et diviso (1961) written in the 15th century he speaks of mental terms (terminus mentalis) such as verum ‘true’, scio ‘know’,

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3 Paul of Venice is concerned as well with the effect of the position of the modality on the interpretation of a modal sentence. I have discussed this aspect elsewhere (Rivero, 1971) and will not comment on it here.

4 A difference which is apparent at this point is that Schoolmen considered that partial modification could be effected either on the subject or on the predicate. Quine’s formulation indicates that he does not allow for partial modification of subjects, just of predicates, to keep the Scholastic terminology. However, see note 5 for a modern analysis where modifications de re or in sensu diviso apply to proper names.
dubito 'doubt', credo 'believe', imaginor 'imagine', suspicor 'suspect', and apparat 'seem'. Paul of Pergula is mainly concerned with the surface location of the propositional attitude, but he assigns two kinds of scope to his mental terms, narrow and wide. He finds that mental terms are construed opaquey when they precede or follow the subordinate clause. Taking an English example, Paul of Pergula believes that a sentence such as He thinks that Peter is here, or the sentence Peter is here, he thinks can only be interpreted in the opaque sense, with the mode applying to the subordinate clause as a whole. On the other hand, a sentence of the type Peter, he thinks, is here has only a transparent interpretation, with the modality applying to just a portion of the dictum.5

In summary, both the Schoolmen and Quine recognize that potentially opaque expressions are ambiguous in that they can receive a transparent interpretation, and that opacity and transparency are phenomena dealing with the scope of verbs of propositional attitude. Just like Quine, Scholastic logicians identified more cases of opacity than those dealing with psychological modalities. At the beginning of the paper I indicated how possibly and necessarily were assigned two kinds of scope in the Middle Ages. Quine (1953, p. 143ff) has also indicated that referential opacity afflicts classical modal contexts. In other words, both the Schoolmen and Quine recognize the ambiguity of possibly and necessarily and explain it in terms of narrow versus wide scope.

I will now turn to some recent studies in linguistics where certain aspects of syntax and semantics are treated in terms of scope, with distinctions quite similar to those made by Scholastic logicians. I will consider three separate analyses in the transformational literature to establish a connection between analyses in the Middle Ages and current treatments: Karttunen's analysis of indefinite NP's (1969); McCawley's proposal for NP's as definite descriptions and their relative clauses (1970, 1971); and Lakoff and Peters' treatment of phrasal versus sentence conjunction (1966). It is quite clear that other parallels could be drawn as in the analysis of modals, but I will not discuss them here.

I will first consider Karttunen's treatment of indefinite NP's (1969). He first distinguishes, following Baker (1966), between the specific and non-specific interpretation of indefinites NP's as in the following example:

(3)(a)  I am looking for a book.
(b)  Here it is.
(c)  Here is one.

The indefinite NP in (3a) can be interpreted specifically as (3b) indicates, or

5 "fit autem sensus compositus cum terminus mentalis praecedit vel sequitur dictum propositionis; divisum vero cum mediat inter partes illius dicti" (Paul of Pergula, 1961, p. 154)
non-specifically as (3c) shows. Accepting proposals advanced by McCawley (1971) and Bach (1968) for the underlying origin of noun phrases, Karttunen assumes that an indefinite NP has an underlying variable that is bound by an existential quantifier attached to some S-node that dominates the NP. This hypothesis is combined with Ross’ proposal (1968) that in underlying structure every declarative sentence is embedded as a complement in an (abstract) performative sentence, to give the following formulation of indefinite NP’s. An indefinite NP in the specific sense has its underlying variable bound by a quantifier including the performative sentence in its scope:

\[(\exists x) \text{[DECLARE (I, you, be looking (I, x). book (x))]}\]

‘There is something which is a book and of which I DECLARE TO YOU that I am looking for it’

If we interpret the abstract performative as an extended modality, it constitutes what a Schoolman would have termed a modality in *sensu diviso* because the term *a book* is outside of its scope and we cannot say that the performative modifies the whole subordinate clause.

An indefinite NP in the non-specific sense, on the other hand, has in Karttunen’s analysis a variable bound to a quantifier under the scope of the performative:

\[\text{DECLARE (I, you, (}\exists x\text{) [be looking (I, x). book (x)]} \]

‘I DECLARE TO YOU that there is something which is a book and which I am looking for’

In this interpretation the modality DECLARE modifies the whole subordinate string, its sense is *de dicto* or composite. In brief, Karttunen combines the scope of an extended modality or abstract performative and of an existential quantifier to explain the specificity of indefinite NP’s, and recognizes a meaning *de dicto* and a meaning *de re* for sentences with indefinites NP’s. This kind of ambiguity had been recognized in the Middle Ages. Peter of Spain’s rules to predict it apply very well to Karttunen’s formulation:

“Whenever two syncategorematic words, each determining the other, are posited in the same statement, ..., the statement is ambiguous by reason of the fact that one can determine the other and vice versa” (Peter of Spain, 1964, p. 38)

According to the Scholastic analysis of propositions, the two syncategorematic words in Karttunen’s formulation are the existential quantifier *some* and the performative *declare*. *Some* can include *declare* in its scope and vice versa and this is the source of ambiguity for Karttunen as much as it would have been for Peter of Spain.\(^6\)

\(^6\) While I am dealing with indefinite NP’s, I would like to bring attention to Russell’s (1951) treatment of *a* phrases as opposed to *some* phrases because it is very Scholastic in its approach. Russell considers that the difference between an *a* phrase and a *some* phrase
Another formalization for the de re/de dicto distinction is provided by McCawley for noun phrases as definite descriptions (1971, p. 224). Since he himself establishes the parallel, I will simply quote the relevant paragraph:

The sentence
\[ <19> \]
Willy said that he has seen the woman who lives at 219 Main St.

is appropriate either to report Willy's having said something such as 'I saw the woman who lives at 219 Main St.' (the de dicto interpretation) or to report his having said something such as 'I saw Harriet Rabinowitz', where the speaker identifies Harriet Rabinowitz as 'the woman who lives at 219 Main St.' (the de re interpretation). This ambiguity is brought out by the fact that the sentence can be continued in two ways, each of which allows only one of the two interpretations:

\[ <20a> \]
... but the woman he had in mind really lives in Pine St. de dicto
\[ <20b> \]
... but he doesn't know that she lives there. de re

McCawley then proceeds to incorporate these two interpretations into deep syntax. PM 1 represents the interpretation de dicto, PM 2 the reading de re.

(PM 1)

\[
\text{S} \quad \text{S} \\
\text{S} \quad \text{NP: } X_1 \\
X_1 \text{ said} \quad \text{Willy} \\
\text{S} \quad \text{NP: } X_2 \\
X_1 \text{ saw } X_2 \quad \text{the woman who lives at 219 Main St.}
\]

can be treated as a disjunction of proper names versus a disjunction of propositions. Suppose a Miss Smith has two suitors, Brown and Jones. According to Russell, the example You must have met a suitor corresponds to a disjunction of proper names, namely, You must have met Brown or Jones. On the other hand Some suitor has won Miss Smith's hand corresponds to a disjunction of propositions: Brown has won Miss Smith's hand or Jones has won Miss Smith's hand. If we interpret these two analyses in Scholastic terms, we see that Russell is dealing with the two scopes (sensu diviso and sensu composito) of the syn-categorematic word or. In the analysis for the a phrase we have an or in sensu diviso, that is, applying to terms alone, a departure from contemporary views on scope; however, in the second analysis the or is taken in sensu composito, that is, as a modification of two propositions. Peter Geach (1968) has pointed out that in a similar vein Ockham feels that in I owe a horse, a horse may be replaced by a disjunctive list of horses.
These two phrase-markers can be readily translated into the quasi-grammatical terminology of Scholastic logicians. PM 1 reflects in tree form the Scholastic opinion that a modality *de dicto* modifies all the material in the subordinate clause or *dictum*. The modality is *said*. PM 2 shows graphically how a modality *de re* dominates only a part of the *dictum* because the material relating to the NP X_2 is not a part of it. In ‘Syntactic and Logical Arguments for Semantic Structures’ (1970) McCawley discusses the referential and non-referential senses of NP’s in connection with mood in relative clauses in languages which have an indicative/subjunctive distinction (e.g. French). If a non-referential NP in French contains a relative clause, the verb of the clause must be in the subjunctive; the referential NP, on the other hand, must be modified by a relative clause in the indicative:

\[
\begin{align*}
(a) & \quad \text{Jean cherche un éléphant qui a deux têtes. (referential)} & \quad \text{‘John is looking for an elephant which has two heads.’} \\
(b) & \quad \text{Jean cherche un éléphant qui ait deux têtes. (non-referential)} & \\
\end{align*}
\]

McCawley adopts the solution already discussed in connection with PM 1 and PM 2 and states that referential and non-referential NP’s “will have to be derived from sources which differ as regards whether the relative clause is inside the complement of the verb that demands the subjunctive” (e.g. *cherche*). In other words, the subjunctive relative clause is inside the scope of *cherche*, and the indicative relative clause is outside of it.

I will now compare this treatment of relative clauses with the analysis provided by a late Schoolman, Paul of Pergula. Paul of Pergula considers relative clauses as modifications of the Aristotelian proposition, that is, the one formed by a subject and a predicate. This means that relative clauses
are syncategoremata and can be understood in sensu diviso or de re or in sensu composito or de dicto. In his discussion of the two senses (Paul of Pergula, 1961, p. 150) he is concerned with the semantic influence of the position of the relative clause. I will ignore that aspect here to concentrate on the principle that relative clauses have two kinds of scope. Pergula finds that the Latin sentence Omnis homo est iustus qui est prudens ‘Every man is just who is wise’ exhibits a relative clause in sensu diviso or de re. That is to say that there are two syncategoremata in the sentence: omnis ‘every’, and the relative clause; the quantifier includes the relative clause in its scope. If we compare this situation with PM 1 we can see that the relative clause there was included in the scope of the syncategorema said, just as omnis includes the relative clause in this example (omnis in sensu composito). In summary, this treatment is equivalent to McCawley’s interpretation de dicto for said and his proposal for subjunctive relative clauses in French (Cherche is equivalent to omnis in having the widest scope). Paul of Pergula attributes a different reading to Omnis homo qui est prudens est iustus ‘Every man who is wise is just’, with a relative clause which has not been extrapolated. This relative clause has wide scope, ranging over the quantifier omnis ‘every’; it is a syncategorema in sensu composito or de dicto. There is a certain parallelism between this interpretation and McCawley’s representation of relative clauses in referential position, PM 2: both Pergula and McCawley consider that the relative clause is outside of the scope of the other syncategorematic word (said in PM 2, omnis in Pergula’s example). However, the similarity stops here because Pergula considers that relative clauses exhibit properties of scope while McCawley doubts that the referential/non-referential distinction involves an existential quantifier à la Quine (this would be one way to assign scope to the NP’s and their relative clauses). In summary, Schoolmen assign scope to relative clauses in the same manner they assign it to quantifiers and other modifications; McCawley places the relative clause at different points in a tree but without assigning scope to it.

A last case of de re/de dicto distinction in transformational grammar is that of phrasal conjunction versus sentence conjunction (Lakoff and Peters, 1966). Lakoff and Peters point out that there are two types of conjunction, as the following examples indicate:

(7) John and Mary are erudite.
(8) John and Mary are alike.

(7) embodies a conjunction of assertions as in John is erudite and Mary is erudite while (8) is a conjunction of NP’s. The authors conclude that these two types of conjunction are not derived from the same underlying configuration, and propose two different sources for conjunctive combination in
deep structure: there is a rule combining NP's, and another rule combining S's.

Scholastic logicians were very concerned with the properties of conjunctions and provided analyses very similar to those proposed by Lakoff and Peters for and. I will now quote Peter of Spain on this point. In this particular paragraph, he is discussing or but I think that the conclusions apply to and equally as well. Peter is concerned with truth values, an aspect which has not usually been of interest to linguists, but his linguistic analysis is what I will emphasize.

(The fallacy of) division is a false division of things that should be compounded. There are two kinds of division. The first arises from the fact that a conjunction can conjoin either terms or propositions, e.g. "five is even or odd". Similarly: "every animal is rational or irrational". For if this conjunctive particle 'or' divides one proposition from another, it is false, and its sense is: 'every animal is rational or every animal is irrational'. If it disjoins one term from another, then it is true and its sense is: 'every animal is rational or irrational' in which the whole disjunctive complex is predicated. (Bochenski, 1961, p. 186)

Although this quotation may lead us to believe that it deals with the relative scopes of every and or, the first example Peter of Spain uses, five is even or odd, with no quantifier, should dispel this notion. The discussion centers on the distinction between sentential conjunction and (verb) phrasal conjunction. According to Bochenski (1961) the sense in which or conjoins two propositions (the composite sense) is equivalent to:

(9) For every \( x \): \( x \) is \( A \) or \( x \) is \( B \)

The divided sense, the conjunction of terms, is equivalent to:

(10) For every \( x \): \( x \) is \( (A \) or \( B) \).

If Peter of Spain were to speak in modern terms he would assign the label of sentential conjunction to (9) and phrasal conjunction to (10). Notice as well that this specific piece correlates quite well with Russell's analysis of some-phrases versus a-phrases discussed in note 6.

In conclusion, this paper has attempted to establish a relationship between Quine's referential and notional senses of certain propositional attitudes and the Scholastic notions of modality de re and modality de dicto. These very same notions have also been compared with current linguistic analyses in transformational grammar which involve in some way or other the notion of scope: Karttunen's treatment of indefinite NP's (1969), McCawley's analysis of noun phrases as definite descriptions together with certain aspects of relative clauses (1970, 1971), and Lakoff and Peters' phrasal and sentence conjunction (1966). In each case a specific connection with a Scholastic
antecedent has been established which shows a parallel analysis and a similar point of view.

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