

SOME CONSIDERATIONS IN MEDIEVAL TENSE LOGIC

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I In medieval logic we find a distinction between categorematic and syncategorematic terms.¹ Categorematic terms are those that can be used as the subject and/or the predicate of a sentence; syncategorematic terms are those that cannot serve the role of subject and/or predicate of a sentence. Some syncategorematic terms are of particular interest to logicians and were discussed by medieval logicians; among such terms discussed we find 'all', 'some', 'is', 'if', 'only', 'and', 'or', 'not', etc.

Peter of Spain explains at the beginning of his *Treatise on Syncategorematic Words*:

Because a thing is or is not, a proposition is said to be true or false. But truth or falsity is caused in a proposition by syncategorematic words, such as 'only', 'alone', 'but', 'with the exception of', and so on. Therefore syncategorematic words signify something or other. But they do not signify things capable of functioning as subjects or predicates. Therefore they signify characteristics of things which are characteristics of things capable of functioning as subjects or predicates. However, there is nothing in a true or false statement except a subject and a predicate and their characteristics. Nevertheless they do not signify characteristics of that which is a subject or of that which is a predicate, as 'white', 'black', 'well', 'badly', and the like, do; rather they signify a characteristic of a subject as subject or of a predicate as predicate. [3], p. 17.

Syncategorematic words signify characteristics of terms rather than characteristics of things. They serve the syntactic role of indicating how terms are qualified and how they are to be interrelated.

In discussions of syncategorematic terms by medieval logicians, we find some include consideration of the terms 'incipit' ('begins') and 'desinit' ('ceases'). Though these terms are of little interest to contemporary logicians, medieval logicians thought 'begins' and 'ceases' were syncategorematic terms of particular interest to logicians.² I will briefly consider why this is so.

A logic which analyzes the language of mathematics can be a logic of eternal or atemporal truths and falsehoods, but in the physical world things change. While the statement ' $2 + 3 = 5$ ' is true for all time, in all places,

in all possible worlds, this is not so for the statement 'B. Russell is smiling', which changes in truth value depending upon when and where or in reference to which context it happens to be said. We might argue that 'B. Russell is smiling' can be treated as eternally true or false if we simply add to it the always understood pragmatic markers of time, place and world.

We do not have to add any pragmatic markers to mathematical statements in order to determine their truth value. In recognizing that this is necessary for statements about the physical world, we recognize that these statements differ in a significant way from the statements of mathematics and, in order to deal with them using the same logical framework, we attempt to accommodate them to the logic of mathematics.

We cannot examine the concept of 'begins' or 'ceases' without taking into account what was or was not, what is or is not, what will be or will not be. A logic of eternal truths, such as a logic of mathematics, is not adequately equipped to deal with these temporal concepts.

Contemporary propositional and predicate logic is a logic of mathematics adapted to other linguistic contexts. Medieval logicians, on the other hand, attempted to develop a logic of natural language. In starting from natural language, they dealt with Latin as spoken and thus incorporated tensed statements into their logic. From this viewpoint, thereby taking into account differences in truth value related to differences in tense, a present tense statement like 'B. Russell is smiling' is sometimes true and sometimes false; it is true if B. Russell is smiling when the statement is uttered and false if he is not.³ No contingent statement is eternally true; its truth value is relative to when it is uttered or inscribed and therefore considerations of tense play an important role.

Viewing logic as an analysis of the formal properties of natural language, medieval logicians found it relevant and important to examine the formal properties of language signs indicating tense. We can see this to be important since temporal considerations are involved in determining the truth value of contingent propositions. Thus, while contemporary logicians do not show an interest in these terms, medieval logicians did, in part because they were concerned with the logic of natural language (the language of tensed statements, of change). Contemporary logicians have been interested more centrally in the logic of mathematics.

But why did medieval logicians include consideration of *the particular terms 'incipit' and 'desinit'* in their study of syncategorematic terms? The particular importance of these terms is probably based on their role:

1. In arguments relating to the proof of God's existence (e.g., Anselm's proof that God is eternal and must exist since He cannot begin to be nor can He cease to be; forms of the cosmological proof for God's existence; etc.).

2. In arguments relating to creation of the world (e.g., arguments to show that the world did begin to be in opposition to Aristotle's contention that it is eternal).

3. In scientific discussions concerned with the analysis of change, coming to be and passing away, etc., where, as based on Aristotle's approach to these questions, beginning to be something and ceasing to be something are of principal concern. (The particular analysis of 'incipit' and 'desinit' presented by medieval logicians probably has its roots in Aristotle's discussion in his *Physica*, particularly Books VI and VIII.)

II I will, in the following discussion, consider Peter of Spain's analysis of the signification, the meaning of the syncategorematic terms 'incipit' and 'desinit'. Peter pointed out that things begin and end both in time and in space; that is, he said 'incipit' and 'desinit' "signify inceptions or cessations of mutable things or they signify the being or non-being of things in their initial and final boundaries" [3], p. 59. He, however, concentrated his attention on the temporal sense of these terms.

Peter said there are two senses of the terms 'begins' and 'ceases', which he expressed in the following rules of signification [3], pp. 60-61:

I. The verb 'begins', when it is connected with permanent things whose being is acquired indivisibly, affirms a positing of the present and a negation of the past.

II. The verb 'begins', when it is connected with successive things and with permanent things whose being is not acquired instantly, affirms a negation of the present and a positing of the future.

III. The verb 'ends', connected with everything when it is added to being itself, affirms the negation of the present and the positing of the past.

IV. The verb 'ceases', when it is added to the non-being of successive things, affirms the positing of the present and the negation of the future.

Peter stated that "Things are called permanent whose whole beings exist simultaneously and not one part after another, as are a man, wood, a stone." Included in the domain of permanent things would be, for example, individuals (or substances) and their properties. Successive things are those "whose beings are not simultaneously whole but rather according to the prior and the posterior, so that one part succeeds another, for example, motion, an action, time" ([3], p. 59). Included in the domain of successive things would be, for example, processes, the parts of which exist successively and cannot co-exist.

'Begins' and 'ceases' vary in meaning relative to the predicate they qualify. In this respect, Peter distinguished two types of predicates and, relative to this, two senses of 'incipit' and 'desinit'. In Rules I and III, giving sense 1 of 'incipit' and 'desinit', 'begins' or 'ceases' qualifies a predicate which denotes a property acquired instantaneously. What begins to be *P* at the same instant ceases to be not-*P*. What ceases to be *Q* at that same instant begins to be not-*Q*. That is, for whatever begins to be *P* instantaneously, it is *P* and was not-*P* (Rule I); it is not not-*P* and was not-*P* (Rule III). This sense of 'begins' and 'ceases' is fairly unproblematical.

Sense 2 of 'incipit' is presented in Rule II above. In sense 2 of 'begins', this term qualifies a predicate which denotes a property that is not acquired instantaneously, that is, a property which comes to be through a process. 'Begins' is used in this sense in the statement, 'Socrates begins to be white', for, Peter explained "something is only said to be white through an excess of white over black which is acquired through motion." Now, "the first instant in which something can be said to be white cannot be given except by speaking of the perfect being of the white which is acquired at the terminus of the movement" ([3], pp. 60-61). When we say that a thing begins to be white, from this viewpoint, we indicate that a process is underway, a process in which an object is changing and becoming whiter. The statement 'Socrates begins to be white' signifies 'Socrates now is not white but immediately after this he will be white'.

That which begins to be P instantaneously (begins₁) also ceases to be not- P instantaneously (ceases₁). Likewise that which begins to be P progressively (begins₂) must also cease to be not- P progressively (ceases₂). Peter explained sense 2 of 'ceases' in Rule IV above. According to Rule III, when 'ceases' qualifies an affirmative predicate, e.g., a predicate which denotes what we might call a positive property (one acquired instantaneously), then 'S ceases to be P ' signifies 'S now is not- P and S was P ' (Rule III). In Rule IV, Peter explained that when 'ceases' qualifies a negative predicate of successive things, things undergoing some process, e.g., not- P , a predicate which denotes what we might call a privative property, then 'S ceases to be not- P ' signifies 'S now is not- P and S will immediately after this be P ' (not-not- P). In a process as, for example, becoming white (whitening), the first instant in which something is white cannot be given; corresponding to this, the first instant in which it is no longer not white cannot be given.

In a process such as becoming white, becoming bald, becoming hot, we cannot isolate the instant t_1 at which the object has acquired the property in question, as clearly distinct from an instant immediately prior to t_1 , let us say t_0 , when the object did not have the property. Peter's analysis introduced us to what is commonly called the problem of vagueness. The property is acquired gradually over time and thus, while at some time the object will unmistakably have acquired the property, the exact instant of acquiring the property cannot be distinguished and labeled—when S is in fact P is vague, unclear, uncertain.

It is nonetheless appropriate at some point in the process wherein S is acquiring a property P to say 'S begins to be P ', meaning by this, according to Peter, 'S now is not- P but S will be P immediately after this'. But, Peter added, "the first instant at which something is white cannot be given"⁴—that is, the first instant at which a property is present, considering a property which is acquired as the result of a process, cannot be identified. Thus 'S begins to be P ' indicates not that P is present as a property of S but rather that P is about to be identifiable as a property of S . Peter introduced the problem of vagueness in recognizing sense 2 of 'incipit' and 'desinit'. But was his analysis adequate?

When we say that 'Plato begins₂ to be bald at t_0 ', then 'Plato is bald at t_0 ' is false. But is it true to say that Plato is not bald at t_0 , as Peter did in his analysis? Consider the statement: 'That ten year old child, John, is not bald at t_0 '. That is, he is simply and plainly not bald. He will not be bald at any time in the foreseeable future, if ever. Plato, we are told, is beginning to be bald; he is now not bald—but this is not to say that he is simply and plainly not bald. In fact, he is becoming progressively balder and at which point in time he is no longer not bald and is definitely bald is not clear; we cannot precisely locate any such point. As stated above, the first instant at which he no longer is not bald cannot be specified. Thus, while it is true to say 'Plato begins₂ to be bald at t_0 ', it is false to say 'Plato is bald at t_0 '; but, in that Plato will definitely be bald immediately after t_0 , and in a process the instant of change cannot be specified precisely, is 'Plato is not bald at t_0 ' true or false? Should we not somehow distinguish not bald, when we mean having a substantial head of hair, from almost bald, nearly bald, just about bald—that is, not clearly bald, but also not clearly not bald.

I am here questioning the adequacy of Peter's analysis wherein 'S begins₂ to be P at t_0 ' means 'S is not- P at t_0 but S will be P immediately after t_0 '. I question whether it is in fact adequate to say that when S begins to be P at t_0 , that S is not- P at t_0 ; when 'S begins to be P at t_0 ' is true, S has started to be P , S is nearly P or in part P , not clearly P but also not clearly not- P . From this viewpoint, we might argue: (1) It is false to say both 'S is P at t_0 ' and 'S is not- P at t_0 ', for neither is identifiable as clearly the case; or (2) It is true to say both 'S is P at t_0 ' and 'S is not- P at t_0 ', for S is nearly P or somewhat P yet still not wholly and clearly P .

The law of the excluded middle is assumed in a logic with exclusive negation, but, and this is essentially the question posed in the above discussion, in a world of becoming, a world of mutable objects which undergo processes of change, is the law of the excluded middle a metaphysical truth? It is my contention that the law of the excluded middle is fundamental to defining exclusive negation, but is not a metaphysical law. There would seem to be a genuine distinction between being white, being just about white (i.e., beginning to be white and ceasing to be not white), and being clearly and simply not white. A logic of exclusive negation does not reflect these distinctions, distinctions which we in fact find in the world, and for this reason, it can be argued, falls short of allowing for an adequate analysis of 'begins₂' and 'ceases₂'. Peter introduced the problem of vagueness in his analysis of 'incipit' and 'desinit', and this is a significant insight on his part, but, for the reasons indicated above, I would question the adequacy of dealing with this problem in the context of a logic with exclusive negation wherein the law of the excluded middle is regarded as a metaphysical truth.

Finally, the following problem remains with respect to Peter's analysis. According to Peter, 'Plato begins₂ to be bald at t_0 ' means 'Plato is not bald at t_0 and he will be bald immediately after t_0 '. But let us say that upon my uttering this statement, Plato quite suddenly dies of a heart

attack. Thus he will in fact never be bald. Was it then not true to say at t_0 'Plato is beginning₂ to be bald'? 'Begins₂' involves a prediction about the future, but does it require the actual fulfillment of that prediction in order for the initial statement to be true? Surely not. Under Peter's analysis, when 'Plato begins₂ to be bald' is uttered at t_0 , then Plato dies on the spot and never becomes actually bald, the statement 'Plato begins₂ to be bald at t_0 ' is false, because the future contingent statement 'Plato will be bald immediately after t_0 ' is false. But this surely will not do.

We often say such things as: 'He began to be brown at t_0 , but he had to leave the seaside resort suddenly and he never became brown', or 'He began to smile at t_0 , but a sad thought flitted across his mind and he frowned instead', or 'He began to speak at t_0 , but his wife looked at him sharply and he never uttered a sound'. Were 'He begins to speak', 'He begins to be brown', and 'He begins to smile' false when uttered at t_0 since each signified a future contingency which turned out not to be the case? Surely not. Though he didn't speak, his mouth opened at t_0 . Although he never became brown, he was somewhat tanned at t_0 . Although he didn't smile, his lip curled slightly at t_0 . There were signs of a process, and on the basis of numerous experiences of similar processes, there were good grounds for assuming that—all things being equal—this process would end as the others had. That is, 'S begins₂ to be P at t_0 ' means 'S is not- P at t_0 , and a process is underway at t_0 which always results in P as its final state'.

Socrates begins₂ to be brown at t_0 if he is not brown at t_0 , and if the process, let us say of tanning, is in fact underway. We generally have signs that a process of this sort is underway. Still we may be mistaken. We may take certain events as evidence of a process although they are not signs of that process at all—we misread the situation. Then 'S begins₂ to be P at t_0 ' is false. But if the process of tanning, for example, is indeed underway at t_0 , then we can justifiably expect that at the completion of this process (immediately after t_0) Socrates will be brown, and our statement is true. Thus, for 'S begins₂ to be P ' to be true it is not necessary that S will actually be P at some future time (as stated in Peter's analysis), but only that signs of S becoming P are present now. That is, the process of S becoming P is actually underway.

NOTES

1. cf., Moody [2], p. 16ff. for a discussion of Albert of Saxony's analysis and Buridan's analysis of these terms. See also [5].
2. The Kneales, in discussing syncategorematic terms, say, "The fact that medieval logicians found it worthwhile to write separate treatises about such words shows that they appreciated their importance for formal logic. But it is probably a mistake to suppose that these signs were universally recognized as formal in a very strict sense. For the words 'incipit' and 'desinit' (meaning 'begins' and 'stops') were sometimes included among *dictiones syncategorematicae*, although they are concerned with temporal distinctions" [1], pp. 233-234. Kneale's estimate is very questionable; it seems clear that the medieval logicians sought to give a formal treatment of these temporally dependent terms.

3. *cf.*, Prior [4], for a contemporary attempt to give a formal treatment of temporal considerations from a similar perspective.
4. C. S. Peirce, prior to his earliest publications on logic and thereafter, avidly studied Peter's writings on logic. (See my paper, "Peirce's earliest contact with scholastic logic", *Transactions of the C. S. Peirce Society*, vol. 12, winter, 1976, pp. 46-55.) Peirce's concern with a logic of vagueness may have had its roots in his study of Peter's work.

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