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# Non-Monotonic Reasoning in Medieval Theology: Problems and Assumptions

*Marcin Trepczyński*

University of Warsaw,
Krakowskie Przedmieście 3,
00-927 Warsaw, Poland

*e-mail*: m.trepczynski@uw.edu.pl
https://orcid.org/0000-0003-0612-2597

*Abstract*:
Some interesting cases of non-monotonic reasoning have already been identified in medieval theological texts. Jacob Archambault proved in 2015 that the argumentation presented by St Anselm of Canterbury in his *Proslogion* has non-monotonic "embeddings". My own contribution from 2011 indicated that we can argue that a non-monotonic logic underlies some discussions provided by St Thomas Aquinas in his *Summa theologiae*, and showed that Boethius of Dacia used non-monotonic reasoning in his *De aeternitate mundi*. In this article, I would like to briefly present these examples and verify whether we can speak about similar cases in medieval Biblical exegesis. My aim is to outline particular problems connected with the identification of non-monotonicity which are specific to theology, as well as assumptions that should be adopted to successfully discuss this issue.
*Keywords*: non-monotonic reasoning, non-monotonic logics, medieval theology, Anselm of Canterbury, Bonaventure, Thomas Aquinas, Boethius of Dacia.

## 1. Introduction

In a nutshell, reasoning is monotonic when after adding new premises which are consistent with previous ones, we can still draw previous conclusions. Thus, as long as the set of premises grows, the set of conclusions grows too. It can be described by an increasing function which, according to mathematical terminology, is monotonic. However, it may happen that although the set of conclusions generally grows along with the growing set of premises, it suddenly fails to grow. That is, after adding some new premises which are consistent with the previous ones, some conclusions cannot be drawn anymore. Such a reasoning is called non-monotonic.

This label is applied to not only reasoning, but also to such concepts as: inference, theory, deductive system or logic. To quote Drew McDermott, "The word 'nonmonotonic' refers to first-order theories in which next axioms can wipe out old theorems" [10, p. 33], or as McDermott put it in an earlier work with Jon Doyle, "'Non-monotonic' logical systems are logics in which the introduction of new axioms can invalidate old theorems" [11, p. 41]. According to Dov Gabbay, "the non-monotonic deductive systems are built from rules which rely on $\underline{P}$ and when $\underline{P} \cup \underline{P}'$ is

encountered the old deduction may fail" [5, p. 439]. In practice, the term "non-monotonic logics" may have been coined mainly thanks to Alfred Tarski, who introduced abstract logics as consequence operations. Such logics – as Philippe Besnard puts it – "are often identified with closure operators over sets of formulas of a logical language" [2, p. 77]. A classical consequence operator (classical logic) should satisfy at least the following three conditions, axioms or principles (for: $X$ and $Y$ – sets of sentences and $C$ – the Tarskian consequence operator): 1) $X \subseteq C(X)$ (Reflexivity); 2) $C(C(X)) = C(X)$ (Idempotence); 3) $X \subseteq Y \Rightarrow C(X) \subseteq C(Y)$ (Monotony). If it does not satisfy the last one, such an operator or such a logic is non-monotonic, and thus it is also non-classical. Many systems can be generated in which that third condition is replaced by a weaker one (cf. [8], [2]), like, for example, the condition of cumulativity, as David Makinson showed [7]. Let us underline that it does not mean that such logics or systems necessarily exclude classical inference or consequence. To illustrate: in an "expert system," Gabbay indicates, "one may take classical logic as the deductive component and some default system as the non-monotonic component" [5, p. 440]. Finally, we should note that we can speak about non-monotonicity in terms of an inference relation between sets of propositions or sentences. It is generally accepted that such a non-monotonic relation is represented by the symbol "$\mid\!\sim$" instead of the symbol of the classical relation "$\vdash$". Thus, a non-monotonic relation allows for a situation in which, for $X$ – a set of premises, $K$ – a new set of premises which do not contradict any premise from $X$, and $\alpha$ – any formula, we accept both: $X \mid\!\sim \alpha$, and: $X \cup K \not\mid\!\sim \alpha$.

The idea of non-monotonicity in reasoning, theories or logics has different applications. It can be used to describe everyday reasoning [9], advanced reasoning in difficult circumstances [19], including default logic [13], as well as to model effective decision making for robots, including artificial intelligence [14], [7]. We should also note that the idea of non-monotonicity in reasoning was embodied in the inference theory presented in the Talmud, in tractate *Zevachim* (49b–51a); according to this theory inferences which are generally accepted are not allowed if special configurations of hermeneutic rules on which premises and conclusions are based take place [4], [16].[1] I argue that the idea of non-monotonicity can also be applied to better understand processes of reasoning in theological writings. However, it is not easy to identify non-monotonic reasoning in such texts. It is connected with problems which can lead to serious controversies. I claim that in order to enable a successful debate on this issue, some key assumptions should be formulated.

In the first part of this article, I will briefly present publications which identify non-monotonic reasoning in important medieval theological treatises; however, in one case I will broaden the analysis. Next, I will extend this scope by adding an example from a medieval commentary on the Bible, which I have found recently. On this basis, it will be possible to achieve the main aim of this article – namely, to identify the above-mentioned problems connected with the identification of non-monotonicity which are specific for theology, as well as assumptions enabling farther debate.

## 2. Non-Monotonic Reasoning in Medieval Theology

### *2.1. Anselm's Inconsistent Proslogion*

In 2015, at the 1st World Congress on Logic and Religion, Jacob Archambault indicated, as he called it, "monotonic and non-monotonic embeddings" of St Anselm of Canterbury's famous proof[2] for God's existence, presented in the *Proslogion*. He elaborated this issue farther in an article published two years later. He demonstrated that the *Proslogion* has a special nature. To quote his conclusion:

> The claims of the *Proslogion* should not be read as forming a systematic whole. Instead, in the movement of the work itself, the ascent of Anselm the protagonist sometimes involves a deepening of understanding that modifies or even jettisons claims advanced in earlier parts of the work [1, p. 134].

He gave many examples revealing that Anselm is, indeed, "inconsistent." He showed that the *Proslogion* can be divided into two parts which are parallel. Chapters 1-13 represent *kataphatic* theology, so a discourse based on positive predication about God, and chapters 14-26 belong to *apophatic* (negative) theology, which reflects serious doubt about the possibility of knowing God and effectively saying anything positive about him, and which limits itself to say what God is not than rather what God is. Furthermore, each chapter has its counterpart: ch. 1 is a prologue, which corresponds to the recapitulation presented in ch. 14; ch. 2-4 contain the proof based on the argument of "that than which a greater cannot be thought," whereas in ch. 15-17 Anselm tends to show that God is "greater than can be thought, emphasizing his distance even from the understanding of the believer," Archambault shows [1, p. 131]; ch. 5 considers what God is generally, while ch. 18 "gives this specific content" – what God is actually, and so on. Finally, Archambault argues that this composition based on two parallel parts "exhibits these as two different stages in the spiritual life of Anselm the protagonist" [1, p. 131]. The earlier stage is represented by the *kataphatic* part, and the later by the *apophatic* one. In Archambault's opinion, "each section of the latter half of the work revisits some theme from its earlier counterpart and modifies it in some way" [1, p. 131]. Thus, the whole work has a dynamic nature, reflecting the author's development.

However, it does not mean that what was previously stated will be refuted in the second part. "The religious attitude of Anselm the protagonist requires the maintenance of both the affirmation and the denial at different moments" [1, p. 132]. Hence, his spiritual experience forces Anselm to pursue both discourse strategies, and to some extent to create an inconsistent environment which generates non-monotonic reasoning. It appears to be non-monotonic because the former premises are not negated, and the former reasoning is not challenged; however, the new approach of the second part is different and in some cases it is no longer possible to say about God what was said before. To demonstrate it, Archambault presents deductions, using formal notation. He clearly shows how a certain default rule which worked and made it possible to draw a conclusion in the context of ch. 2-4, no longer works in the context of ch. 15. He also points out a similar mechanism in other places [1, pp. 133-134].

To recapitulate, we can see that Anselm's famous proof indeed has "non-monotonic embeddings." I believe it is not an overstatement to say that in this way the discourse of the *Proslogion* is governed by a non-monotonic logic. However, in my opinion, the most important observation is that this special nature of Anselm's work is strongly related to the situation of the theologian. First, because of the author's spiritual experience and development, as Archambault emphasized. Second, due to the dialectical (in a Hegelian sense) nature of Christian theology, which absorbed two theological traditions which seem opposed to each other, but at the same time work perfectly together, both satisfying the need of talking about God and establishing a proper distance to what can be stated about God, namely: *via positiva* and *via negativa*. In this context, the non-monotonic approach seems natural to Christian theology, and – as we can see – it was adopted, though unconsciously – in the work of one of the most important representants of medieval theology.

### *2.2. Aquinas's Non-Monotonic Theological Didactics*

In an article published in 2011, I tried to show that some parts of Aquinas's discourse presented in his *Summa theologiae* (hereinafter: *ST*) testify to the use of a non-monotonic logic [18]. The best example I found was question 3, article 1 from the first part of the treatise, where Thomas considers the problem of "whether God is a body." In this subsection, I would like to discuss this case in detail. For this reason, it will be relatively longer than the other subsections.

According to a common strategy of 13th-century theological questions and the pattern Aquinas uses in the whole *ST*, at the beginning of q. 3, a. 1, he argues for the starting hypothesis: that God is a body; like always, he presents some of the most important arguments. In this case, he gives five of them, all based on passages from the Bible. Next, he formulates a strong

counterargument and solves the problem in the main part of the article – a section which often starts with the words "I answer that" (*Respondeo*) and which is usually labelled as *responsio* (response) or *corpus* (body – main part). This part is generally based on purely rational analysis and often includes "rational" proofs (that is, ones that do not refer directly to the Christian revelation). In q. 3, a. 1, we find as many as three such proofs. Finally, in the last part Thomas replies to each argument presented in the first part, in the light of his response.

Usually, the most interesting part of Aquinas's questions, or generally medieval questions, are *corpora*, so the main responses to the problem. In our case, the situation is quite the opposite. The scope of this analysis consists of the arguments for the starting hypotheses and their revisions in the responses to those arguments. We will examine what happens within those revisions and how they refer to the previous arguments. In this situation, the *corpora* are not important. Of course, they refer to the main problem posed in each article, but they do not refer directly to the arguments for the starting hypothesis. They have different starting points, and thus, they do not follow the same thread. We can say the same about the counterarguments to those arguments which challenge them not by discussing their premises, but by offering other premises which give the opposite conclusion. Obviously, all those elements are interesting; however, for the sake of brevity, we will concentrate on the threads found in the arguments for the starting hypotheses and directly followed in the responses to them. Let us go through those five examples.

I mark the premises as "P" with indexes, even when they are both premises and conclusions drawn from other premises, and the final conclusions as "C." Logical constants and reasoning indicators (like "but," "for," "therefore," etc.) do not belong to the premises themselves; however, in order to make it more readable, I put the markers "P1," "P2," etc. at the beginning of each phrase which contains both those constants and a new premise. If there is a string of passages from the Bible, I mark them with one P, as one element, for the sake of brevity, although they could be treated as individual premises. The examples are quoted from the English edition of *ST* without modifications of wording.[3] All bolds are mine. In cases when I think it is important to know the original technical term, I give the Latin text in brackets.

The first argument to prove that God is a body runs as follows:

> P1. [A] body is that which has the three dimensions.
> P2. But Holy Scripture attributes the three dimensions to God.
> P3. [F]or it is written: *He is higher than Heaven, and what wilt thou do? He is deeper than Hell, and how wilt thou know? The measure of Him is longer than the earth and broader than the sea* (Job 11:8, 9).
> C. Therefore God is a body.

As we can see, P1 and P2 create a syllogism (which can be recognized as the common syllogistic type Barbara) giving C. It is a deductive reasoning, called an inference, and as for its structure, it is formally correct and thus infallible. However, P2 is not a pure piece of information about God's properties. P2 states that Holy Scripture attributes this property to God. Hence, first, it must be assumed that whatever Holy Scripture says is true (HP1). Here, it is a hidden premise, but in general it is the main assumption of Biblical hermeneutics and Christian theology. Second, P2 must be proven by giving evidence, and this is the role of P3. The set of basic premises consists of P1, P3 and perhaps HP1 as well.

Let us now examine Aquinas's complete response to this argument:

> As we have said above (q. 1, a. 9), Holy Writ puts before us spiritual and divine things **under the comparison** (*sub similitudinibus*) of corporeal things. Hence, when it attributes to God the three dimensions **under the comparison of corporeal quantity, it implies His virtual quantity**; thus, by depth, it signifies His power of knowing hidden things; by height, the transcendence of His excelling power; by length, the duration of His existence; by breadth, His act of love for all. Or, as says Dionysius

> (*Div. Nom.* ix), by the depth of God is meant the incomprehensibility of His essence; by length, the procession of His all-pervading power; by breadth, His overspreading all things, inasmuch as all things lie under His protection.

How does Thomas revise the argument? He refers to the hermeneutic rule presented in the first *quaestio* of *ST*, which is a methodological introduction to the whole work. The rule is: "It is befitting Holy Writ to put forward divine and spiritual truths by means of comparisons with material things" (*ST*, I, q. 1, a. 9). Aquinas gives the following reason for such an approach: "For God provides for everything according to the capacity of its nature. Now it is natural to man to attain to intellectual truths through sensible objects, because all our knowledge originates from sense." Next, he shows that according to this rule the passages quoted in P3 express the incorporeal properties of God, although by comparison to corporeal quantities. Thus, after adding this rule, either it is no longer possible to maintain P2 (if we understand three dimensions as corporal quantities), and thus: to derive C from the set of basic premises, or (if we are open to understand three dimensions in various senses) even if P2 can be upheld, we cannot derive C.

One could claim that Aquinas counters the previous argument. However, the text itself does not confirm such an approach. At this stage, let us note that Thomas adds the rule and shows its implications, but does not say that the premises were wrong or that the inference was invalid or incorrect.

Let us now examine arg. 2:

> P1. [E]verything that has figure is a body,
> P2. since figure is a quality of quantity.
> P3. But God seems to have figure,
> P4. for it is written: *Let us make man to our image and likeness* (Gen 1:26).
> P5. Now a figure is called an image,
> P6. according to the text: *Who being the brightness of His glory and the figure, i.e., the image, of His substance* (Heb 1:3).
> C. Therefore God is a body.

This example is more complicated. P1 is proven by P2; P3 by P4 and P5 taken together; P5 by P6. P1 together with P3 create a syllogism (Barbara) giving C as a conclusion. The basic premises are: P2 (which is a definition), as well as P4 and P6 (which are the Biblical passages). It is debatable whether P1 can really be inferred from P2, as it seems it uses some hidden premises which are disputable. However, Aquinas does not refer to this premise and concentrates on P3, which is based on Biblical passages. His complete reply to arg. 2 is the following:

> Man is said to be after the image of God, **not as regards his body**, but **as regards that whereby he excels other animals**. Hence, when it is said, *Let us make man to our image and likeness*, it is added, *And let him have dominion over the fishes of the sea* (Gen 1:26). Now man excels all animals by his reason and intelligence; hence it is according to his intelligence and reason, which are incorporeal, that man is said to be according to the image of God.

We can see that Aquinas adds a new piece of information, which is a new premise (P7) – namely, that the image in this context should be understood with respect to excellence in comparison to others. Together with another premise (P8), according to which "man excels all animals by his reason and intelligence," it gives a basis for concluding that the image concerns the reason and intelligence, which are incorporeal. In this light, we cannot derive C anymore. However, Aquinas does not negate the conclusion or premises. He also does not claim that the reasoning is invalid.

Thus, the cases of arg. 1 and arg. 2 are similar. Thomas presents new premises, which are consistent with the sets of basic premises. He does not criticize previous reasonings. However, due

to the new premises, the previous conclusions cannot be inferred anymore. Thus, it seems that such a reasoning is non-monotonic, and the logic which is open for such reasoning is non-monotonic too. Let us review the next three arguments. Arg. 3 is much shorter, and very similar to arg. 1:

> P1. [W]hatever has corporeal parts is a body.
> P2. Now Scripture attributes corporeal parts to God.
> P3. *Hast thou an arm like God?* (Job 40:4); and *The eyes of the Lord are upon the just* (Ps 33:16); and *The right hand of the Lord hath wrought strength* (Ps 117:16).
> C. Therefore God is a body.

P1 and P2 (if we rephrase it to the following form: "[According to Scripture:] God has corporeal parts") create a kind of Barbara syllogism which gives C, and P3 constitutes evidence for P2. P1 and P3 are the basic premises. P1 is a metaphysical statement, and P3 is a collection of Biblical passages.

In his reply to this argument, Thomas, again, only adds a hermeneutic rule, and an example showing how it should be applied. The whole answer to the argument is as follows:

> Reply to 3. Corporeal parts are attributed to God in Scripture on account of His actions, and this is **owing to a certain parallel** (*secundum similitudinem*). For instance the act of the eye is to see; hence the eye attributed to God signifies His power of seeing intellectually, not sensibly; and so on with the other parts.

As can we see, this rule, albeit similar to the previous ones, refers to parallelism between God's actions which are intellectual and natural actions in which corporal parts are involved, like the eye in the act of seeing. And again, the rule is consistent with the set of basic premises. The reasoning is not being assessed as invalid. However, we see that according to this rule one cannot infer P2 from P3, and for this reason we cannot infer C.

Arg. 4 has a similar structure:

> P1. [P]osture (*situs*) belongs only to bodies.
> P2. But something which supposes posture is said of God in the Scriptures:
> P3. *I saw the Lord sitting* (Isa 6:1), and *He standeth up to judge* (Isa 3:13).
> C. Therefore God is a body.

P1 and P2 create a syllogism giving C. P2 is proven by P3. P1 and P3 are the basic premises. P1 is a metaphysical statement and P3 are Biblical passages. Aquinas replies: "Whatever pertains to posture, also, is only attributed to God **by some sort of parallel** (*secundum quandam similitudinem*). He is spoken of as sitting, on account of His unchangeableness and dominion; and as standing, on account of His power of overcoming whatever withstands Him."

We can see that Aquinas, again, indicates a rule according to which a kind of parallelism (*similitudo*) must be taken into account when talking about God with respect to such a category as *situs*. This rule is, again, consistent with the set of basic premises (here: P1 and P3). Aquinas does not criticize the argument. He just adds this rule, which either makes it impossible to draw P2 as a conclusion, if it uses the category of posture in a strict (natural) sense, or forces us to read P2 in a way which means that we are no longer allowed to infer C.

Arg. 5 also quotes the passages which refer to location, but this time within relationships of coming to and departing from, in which there is a local term, so an object to which or from which something goes:

> P1. [O]nly bodies or things corporeal can be a local term wherefrom or whereto.
> P2a. But in the Scriptures God is spoken of as a local term whereto.
> P3a. [A]ccording to the words, *Come ye to Him and be enlightened* (Ps 33:6),

P2b. and as a term wherefrom:
P3b. *All they that depart from Thee shall be written in the earth* (Jer 17:13).
C. Therefore God is a body.

P1 and P2a or P2b (they can be taken together of independently) create a syllogism giving C. P3a proves P2a and P3b proves P2b. P1, P3a and P3b are the basic premises. P1 is a metaphysical statement, P3a and P3b are Biblical passages. Aquinas replies:

> We draw near to God by no corporeal steps, since He is everywhere, but by the affections of our soul, and by the actions of that same soul do we withdraw from Him; thus, to draw near to or to withdraw from **signifies merely spiritual actions based on the metaphor** (*sub similitudine*) **of local motion**.

This time he refers to the hermeneutic rule according to which we should understand local motion related to God as spiritual actions. It means that either we cannot infer P2a from P3a and P2b from P3b, if we understand local terms strictly, and thus we also cannot infer C, or we should read P2a and P2b according to the hermeneutic rule (that is, as they are proven by P3a and P3b), but then they cannot be combined with P1, which refers to the strict sense of local terms, so we cannot infer C. As we can see, the rule is consistent with other premises and Thomas, again, does not challenge the reasoning.

Let us now summarize the results of this presentation. All five arguments (which can be perversely labelled as "the five ways of proving God's corporeity") have a similar structure. They prove the starting hypothesis by leading to a single conclusion (that God is a body), which is drawn from the set of premises, in which we find the basic premises and the premises of – so to speak – a higher order, which are proven by these basic ones. The sets of the basic premises always consist of: 1) metaphysical general statements, which seem rather obvious, as elements of Aristotelian metaphysics, and 2) sentences from the Bible. The "higher-order" premises are almost always conclusions based on sentences from the Bible, except P1 in arg. 2, which is proven by P2, being a metaphysical statement. We can also divide the premises into those from which C is drawn directly and the others, "indirect" ones. The sentences from the Bible are always the indirect ones. Next, in each answer Aquinas gives a hermeneutic rule. When replying to arg. 2 the rule says that image of God should be interpreted according to the excellence of man in comparison to other animals. In the remaining answers, the rules refer to the concept of parallelism (*similitudo*) which can be observed between physical attributes, actions involving corporeal parts, staying in some place or being a term "whereto" or "wherefrom" (which we find in the Bible as related to God), and respectively: God's spiritual attributes, God's spiritual actions, God's spiritual situation or relationship to others, being a goal or source of spiritual actions (which express the real sense of Biblical passages).

Now, we can either say that in each case, $C$ is an element of the set of the consequences of (or can be drawn from) the direct premises, or that it is an element of the set of the consequences of the basic premises, or of all the premises. No matter which option we choose, let us label the set of the premises of each argument as $X$. In each case, $C$ is inferred from $X$, and then Aquinas does not negate anything from $X$ and does not claim that any reasoning is invalid, but adds a hermeneutic rule, $R$, which is consistent with $X$. However, then $C$ cannot be inferred anymore. If we thus assume that Aquinas to some extent accepted the arguments as possible, but, as someone who knows more, added an important piece of information which changed the situation, we may claim that he violated the condition of monotonicity, and so his reasoning is governed by a non-monotonic logic. We can present the two steps of each thread (consisting of an argument and a reply) as follows:

(1) $X \mid\sim C$,
(2) $X \cup R \not\mid\sim C$.

One can claim that Aquinas himself would never have proposed any of the five arguments, so he if fact treats them as invalid ones. Thus, he does not uphold the first step in any way. However, if we

stick to the text, we do not find any critique of those arguments. In my opinion, we should follow the discourse, in order to keep its very real nature.

And this nature is special. *ST* was conceived as a textbook for young theologians. In the prologue, Thomas underlines that "we purpose in this book to treat of whatever belongs to the Christian religion, in such a way as may tend to the instruction of beginners." Next, he points out what kinds of problems students of theology faced when reading books of other authors, to then promise that his work will present the sacred doctrine "as briefly and clearly as the matter itself may allow" and without frequent repetitions. Hence, *ST* contains Christian theology, but at the same time, it is an example of theological didactics. This context seems essential to me. It explains, among others, the role and the status of arguments for the starting hypotheses. Aquinas decided to keep the standard structure of medieval questions, and thus he included such arguments. It was important to teach students that each point can and should be discussed. However, in *ST*, he limited himself to presenting the most important ones, and that is why each question only features a few arguments (very often three), instead of thirty, like in many articles of Aquinas's discussed questions (*quaestiones disputatae*). Next, I claim that he did not want to teach the students that if an argument leads to a conclusion which is later opposed in the counterargument and the main answer, it should be criticized as invalid or based on false premises. Otherwise, he would have criticized such a reasoning. In my opinion, he tried to show that the concerns expressed in such arguments are important. They could be formulated by a student who does not know as much as his master. Let us also recall that such discussions, in which students formulated arguments for and against a thesis, to finally listen to the master's answer, were a common practice of 13th-century lessons. So in the didactical context, such arguments should be respected, especially since the five discussed in this article seem quite rational and well-constructed. At least in this particular case, according to this specific context, I claim that Aquinas agreed with them in the sense that it would be acceptable for an unexperienced beginner to conduct such a reasoning. However, as a master he must, first, ask for or give a counterargument, next, give a rational answer, and finally, return to the argument to provide the right hermeneutic tool which the beginner is being trained to use as an exegete. Such a didactical, "open" approach is to some extent bound to be non-monotonic.

### *2.3. Boethius Dacus's Non-Monotonic De aeternitate mundi*

A completely different example of non-monotonic reasoning can be found in the main work of Boethius of Dacia, also called Boethius Dacus, namely, *On the Eternity of the World* (*De aeternitate mundi*). This late 13th-century philosopher discussed one of the hottest problems of his century: did the world have a beginning or not. He tried to show that there is no contradiction between the theses of philosophy and theology with respect to this issue. Christian theology argued that the first sentence of the Book of Genesis clearly proves that the world did have a beginning. However, the most influential ancient philosopher in the 13th century, Aristotle, suggested that the world had never begun. According to Boethius, from the philosophical perspective, it is not necessarily true that the world had a beginning. For this reason, he was accused of being a coryphaeus of the so-called double truth theory, according to which there were two different truths: the theological and the philosophical one. However, in the proemium of *De aeternitate mundi*, he claims that whoever believes that the world is eternal is a heretic. How is it possible? In a paper published in 2019, I argued that in order to understand Boethius's position and to maintain together the inferences formulated in natural science, philosophy and theology, we can refer to non-monotonic logic, as a very helpful framework [17].

Boethius presented different situations of conducting reasoning concerning the eternity of the world, represented by a natural scientist, a Christian (or a theologian), a mathematician, and a philosopher. For the natural scientist the main and only principle is nature. And thus, his premises will be taken from the observation of nature. The natural scientist observes that every event (or movement) has its precedent causes, so the first movement could not be "new" (or produced as new by an immediate cause), unless it was not a first movement. On these grounds the natural scientist

concludes, as Aristotle did in his *Physics*, that there could not be any beginning. At the same time the Christian, on the basis of the Christian revelation, will conclude the opposite. Next is the mathematician, who cannot prove by natural reasons that the world and the first movement were "new," as this problem is indifferent to every mathematical discipline. The metaphysician cannot do this either. However, his background is different, as his discipline is capable of making statements concerning God. He will say he cannot solve the problem because what he knows is that the world depends on divine will as its sufficient cause, and he (as a metaphysician) does not know God's will, so he is unable to judge whether the world – as a result of divine will – was simultaneous with this cause or there was a time when this cause existed without this result, which came later. So for the metaphysician both options are possible [17, pp. 459-460].

To sum up, neither the natural scientist, nor the mathematician, nor the metaphysician can prove that the world had a beginning; however, their knowledge is different, which determines what they can and what they cannot infer. In turn the Christian (or the Christian theologian) has a richer set of premises, as he adds the statements taken from revelation. And on this basis he concludes that the world had a beginning. It is disputable, but we can argue that according to Boethius's idea, the metaphysician knows and accepts the premises of the natural scientist, and the Christian (especially the Christian theologian) knows and accepts the premises of both.

It is very important that according to Boethius, from the absolute perspective, the natural scientist is wrong when talking about the eternity of the world. However, he correctly draws a conclusion from the principles of his science, and so his reasoning is correct and acceptable. Thus, Boethius seems to accept all inferences limited to the premises formulated within particular disciplines, as long as they are logically correct. Hence, according to him, it is acceptable to draw a conclusion about the eternity of the world from the premises available to the natural scientist, but with the metaphysician's richer set of premises it is no longer possible. I claim that this is an example of the use of a non-monotonic logic. Next, the Christian theologian adds other new premises consistent with the premises of the natural scientist, and infers the negation of the natural scientist's conclusion, which constitutes another strong sign of the use of a non-monotonic logic.

In order to show it more clearly, let us present the situations of the natural scientist, the metaphysician and the Christian theologian using symbols (for: $N$ – the set of premises of a natural scientist, $M$ – the set of additional premises of a metaphysician, $R$ – the set of additional premises of a Christian, $\alpha$ – the statement "The world had no beginning"). We are excluding here the mathematician, as he has no premises on which he could base a conclusion concerning the eternity of the world. We can present it in the following way:

(1) the natural scientist: $N \mid\sim \alpha$

(2) the metaphysician: $N \cup M \not\mid\sim \alpha$

(3) the Christian theologian: $N \cup M \cup R \mid\sim \neg\alpha$.

According to this approach, the situation of the theologian is very special. Although he believes he has an absolute perspective (based on divine revelation), he should accept the reasoning of the natural scientist (if it is logically correct), which is relative, as limited to the premises taken from natural science. Hence, the theologian's thinking must be based on non-monotonic logic. The situation of the metaphysician is similar; however, he cannot claim to have the absolute perspective, as he should be aware that his knowledge is not complete.

## 3. Non-Monotonic Reasoning in Biblical Exegesis

In this section, I would like to present an example of non-monotonic reasoning found in the work of another prominent medieval theologian, namely, St Bonaventure of Bagnoregio's *Commentary on the Gospel of John*. This example will show that the phenomenon of non-monotonicity can also appear in exegetical discourse.

The *Commentary* is composed in a special way. Bonaventure comments on the whole text passage by passage, but for each fragment he, first, gives a verse-by-verse explanation, and second, poses a few questions regarding the whole passage or its particular verses and then briefly discusses

them. It is likely that this second step reflects the later work of the author. It definitely makes it more "scholastic." The example analyzed below is one such discussion.

Bonaventure presents the following reasoning related to the words of Christ "Receive the Holy Spirit" (John 20:22): "It seems that he should not yet be giving them the Holy Spirit, since it is said in John 16:7: "If I do not go, the Paraclete will not come to you." Therefore, if he had not yet ascended, he should not yet be giving the Holy Spirit [3, pp. 973-974]."

We can see that the reasoning is intended to indicate an inconsistency of the Gospel or even of Christ's words, as his utterance reported in John 20:22 seems to negate the one reported in John 16:7. Let us reformulate the reasoning, for the sake of clarity:

> P1. It is said in John 16:7: "If I [Jesus] do not go, the Paraclete will not come to you."
> P2. He [Jesus] had not yet ascended.
> C. He [Jesus] should not yet be giving the Holy Spirit.

The reasoning seems correct. In fact, it is an example of *modus ponens*; however, the direct conclusion ("The Paraclete will not come to you") is skipped, and the next conclusion is drawn, based on the assumption that Jesus should not do anything which contradicts his previous utterance (let's include it as a hidden premise – HP). Jesus stated clearly that the Holy Spirit (called the Paraclete) will come after Jesus goes. If this condition is not met (as he has not ascended yet), according to Jesus's words, the Holy Spirit should not come, and so Jesus should not yet be giving the Holy Spirit.

Bonaventure replies:

> I respond that it has to be said that the Holy Spirit is said to be received or to be given, **not by reason of essence, but by reason of effect**.
> So the disciples had the Holy Spirit before the passion, but for the work of their salvation which is by grace. They had the Holy Spirit after the passion, but before the ascension for the forgiveness of sins. They had the Holy Spirit after the ascension for the preaching of our faith. So they were confirmed when the Holy Spirit descended in tongues of fire [3, p. 974].

We can see that Bonaventure does not criticize the earlier reasoning. Neither does he undermine the premises. He just gives a new piece of information, according to which "the Holy Spirit is said to be received or to be given, not by reason of essence, but by reason of effect" (let us mark this new premise as "P3"). P3 makes it possible to claim that we can identify many different kinds of giving and receiving the Holy Spirit by reason of effect, which Bonaventure precisely enumerates (let us mark it as "P4"). One of such acts was performed by Christ when he resurrected and came to the disciples saying "Receive the Holy Spirit." In this perspective, Christ's conditional promise does not exclude the possibility of giving the Holy Spirit before the condition is met, as there are two or even three such actions. Thus, with this new knowledge, we cannot infer the previous conclusion anymore. Let us remark that although it seems that Bonaventure infers P4 from P3, it is a shortcut, as he also needs other premises to draw such a conclusion.

Thus, we can claim that Bonaventure accepts the reasoning, which reflects quite reasonable doubts, but only adds this new perspective to show that those doubts can be dispelled. Hence, his reasoning is non-monotonic. We can present these two steps as follows (for $X$ – the set of the starting premises including P1, P2 and HP, $K$ – the set of new premises, P3 and P4, $C$ – the conclusion of the starting reasoning):

(1) $X \mid\sim C$
(2) $X \cup K \not\mid\sim C$

We can see that to some extent the examples from Aquinas's *ST* were similar to this reasoning, as they were also related to the interpretation of Biblical passages. However, they come from texts of

different natures. *ST* belongs to a part of theological teaching called *disputatio*, as its aim is to discuss theological problems, and, moreover, it was a theological textbook, whereas Bonaventure's text is a commentary on a book from the Bible, and so it represents Biblical exegesis, as well representing a part of theological teaching called *lectio*, which preceded *disputatio*, both in didactic practice and in the order of theological work. We can also indicate a more important difference, though closely related to the first one. In Aquinas's *ST* the "disabled" conclusions were inconsistent not only with another Biblical passage presented in the counterargument (John 4:24: "God is a spirit"), but, before all, with a strong doctrinal statement developed in Christian theology, establishing that God in not corporeal. In Bonaventure's commentary, though, the inconsistency was identified only between Biblical passages. Of course, this seems natural if we take into account the purposes of the exegetical text. I have indicated these differences to underline that non-monotonic reasoning is also a phenomenon present in the part of theological work called *lectio*.

Finally, there is another difference between the examples from Aquinas's and Bonaventure's texts, which will be important in the discussion below. Let us note down that in the second step presented by Bonaventure, there is no hermeneutic rule which indicates how we should interpret the words of the Bible. Instead, Bonaventure adds information which makes the issue to which the starting premise refers more nuanced.

## 4. Problems and Assumptions

In his polemic published in 2012, Patryk Pogoda drew my attention to the most important problem connected with my interpretation of Aquinas's reasonings which I claimed to be non-monotonic [12]. He offered many valuable remarks. However, the essence of his critique can be found in the following sentence: "These reasonings are not examples of non-monotonic reasonings, because the increase of the set of premises is not limited to adding new premises, but is a modification of already-existing premises" [12, p. 131].

According to his view, this modification runs as follows: 1) *X* were read as literal, 2) *X* are read as metaphorical. So in fact, in the "second step" (when Aquinas gives a hermeneutic rule) the sentences *X* are replaced with new sentences *X*, with the same words, but different meaning. Thus, Pogoda's postulate was: first – translation, next – inference. Let us follow this interpretation. It means that Aquinas is not giving a hermeneutic rule as an additional premise, but, by showing such a rule, he is saying: the sentence taken from the Bible is a metaphor, so let us translate it to reveal the exact sentence expressing the spiritual reality of God. Then indeed we have no grounds to claim that Aquinas's reasoning is non-monotonic.

We can also point out another problem with my interpretation. One can claim that in the second step a master or a commentator (like in the examples from Aquinas and Bonaventure) in fact challenges the previous inference and indirectly claims it is invalid. Hence, if we again mark the set of the starting premises as "X" and the new ones as "K", then *K* are not added to *X* to create a richer set together, but they express the critique of the inference, they indicate an error.

These two problems are serious. However, if we concentrate on the text, we will find no trace of either the interpretation according to which sentences from the Bible should be translated or the interpretation which presents the second step as an attack on the first step of the reasoning. Let us also recall that the first problem does not apply to the example from Bonaventure's commentary on John 20:22, because in the second step, there is no hermeneutic rule which could be read as a postulate to translate the Biblical metaphorical sentence into a non-metaphorical one. Bonaventure only adds information which nuances the issue. Finally, in my opinion, the postulate of translation stems from a general opposition to non-monotonic reasoning, based on the assumption that the first step of reasoning should not be conducted, as it is based on premises which are not sufficient to deductively infer the conclusion. Thus, such an approach assumes that only classical logic is allowed. Hence, it *a priori* excludes non-monotonic reasoning. It is then a matter of choice – whether we accept the non-classical approach or not.

However, if we rule out non-monotonic or even non-classical reasoning, we might overlook important features of the theological discourse. For instance, we can explain Anselm's *Proslogion* in terms of classical logic and argue that in the second part he was talking about slightly different concepts than in the first part, and so it is possible to defend the monotonicity of the discourse. But then we will lose a deep and true nerve of this text, which reflects a feeling of inconsistency which appears when an honest theologian talks about God and must somehow reconcile the *via positiva* and *via negativa*. We can also try to read Boethius of Dacia in a monotonic manner. But then we must say that according to Boethius only theological reasoning is allowed, and the reasoning of the natural scientist is invalid, as he did not take into account all possible knowledge. However, this would be contrary to what Boethius actually said.

I see at least a few special features of theological method and practice which are a basis to argue that especially in this field the non-monotonic approach is right. To some extent they relate to what has already been said. They are also intertwined. However, let us try to identify them:

1. Variety of senses. When working directly on Biblical passages, both within *lectio* (the example from Bonaventure) and *disputatio* (the example from Aquinas), the theologian must be open to this variety. Let us note that when Aquinas shows, in *ST* I, q. 3, a. 1, arg. 1, that the three dimensions attributed to God imply God's virtual quantity, he gives two possible ways of interpretation. Thus, he is not sure which of them is right, and perhaps both of them are, or there are also other possible ways to read this passage. The theologian must always be aware that his interpretation may not be the ultimate one and perhaps there is something deeper which can be coded by the passage he is trying to unpack. What is more, medieval theology developed the tradition of the four senses of Scripture (the historical or literal one, and the three spiritual: allegorical, moral/tropological, and anagogical). And in some cases, all four senses can be found in the same Biblical passage. Hence, the right way for the theologian is not to translate Biblical sentences into some unambiguous sentences, but to keep them as they are, and develop their theological reading by grasping new hermeneutic rules [cf. 15]. The examples from Bonaventure and Aquinas can be a good illustration of such a development, at least at the early stage of theological training.

2. Respect for Biblical sentences. This feature is very close to the previous one. It seems that theologians should always directly refer to the words from the Bible, which can always surprise them in later readings. For theologians, they are also considered to be the word of God. Thus, they should not be translated, in order to be ready as premises for inferences, but taken for granted. Hence, in my opinion the proper premises for theological reasoning based on the Bible should be the Biblical sentences, not their interpretation. We can call this approach "nominalist," to underline that the premises in such a reasoning are the exact words from the Bible and not the meaning assigned to them by an interpreter; in short: there are only words, as they are.

3. The humility of the theologian. As an interpreter, the theologian should never be sure if a particular reading of a Biblical passage is right or ultimate. However, this should not be an obstacle to conduct reasoning, although it may be the case that a new hermeneutic rule or perspective will change the situation. Thus, the theologian simply must use non-monotonic reasoning. Next, the example of Anselm's *Proslogion* shows that the humble theologians, after saying something positive about God's attributes, should follow the negative way of interpretation, thus to some extent distancing themselves from what has been said, to find the right balance in theological discourse. It also seems that this reflects the spiritual attitude of such a humble theologian. As Jacob Archambault has shown, in the case of Anselm, such an approach has a non-monotonic nature.

4. The processual or circular nature of theology. We can observe a kind of circulation in theological practice: first, reading the Bible and basic inferences; second, formulation of the doctrine; third, reading the Bible using the doctrine; and again, new inferences, and so on.[4] It seems that the example from Bonaventure represents such a third step, in which the theory concerning receiving the Holy Spirit made it possible to read the Bible in a new light and to reconcile the two passages. This nature assumes a development and a process, in which we must conduct reasoning, but later we can acquire new information, which can make it impossible to infer the previous

conclusion, as in the example from Bonaventure. This special nature is then closely related to non-monotonic reasoning.

5. The compatibility with natural sciences. There is an approach in Christian theology (and in my view it is the most fruitful and today dominant one) according to which theologians respect the results of natural science and claim that their discipline should be compatible with them. The example of Boethius's *On the Eternity of the World* proves that it is feasible. And if theologians follow his path, they must use non-monotonic logic.

However, we can also learn from this presentation that in order to maintain the discussion on the non-monotonic nature of reasoning in theology on various levels, we need to accept some key assumptions. Without them, we will always be in danger of supporting arguments which can subvert the whole discussion. I propose the following assumptions:

1. Biblical exegesis has a special status different than in other disciplines, mainly due to the special status of Biblical sentences.
2. It is legitimate to infer from sentences with an undetermined sense, and so we reject the postulate to first translate the sentences in which the sense is not clear.
3. We should adopt the "nominalist" approach (identity of the sentence is determined by the words of the Biblical text).
4. Pro-classical interpretation of a reasoning will render it classical, and so we should refrain from arguments which *a priori* rule out non-classical approaches.

## 5. Conclusion

Different occurrences of non-monotonic reasoning in theological practice have been presented. They formed a basis for discussing the problems with interpreting the provided examples as non-monotonic, and for pointing out the specific features of theology which support such an interpretation. Next, the discussion served as a starting point for the formulation of a set of assumptions which should be accepted to continue the debate about the non-monotonic or monotonic nature of theological reasoning.

To conclude, in the light of the above-mentioned discussion and assumptions, I think I am allowed to claim that the non-monotonic approach really is inherent in theology. In my opinion, the examples from medieval theology found in the texts of Anselm of Canterbury, Bonaventure, Thomas Aquinas and Boethius of Dacia, are a good illustration of this claim.

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## Notes

1. I would like to thank the anonymous reviewer who has drawn my attention to this fascinating material and to the brilliant analyses. Tractate *Zevachim* is available in English at: https://www.sefaria.org/Zevachim.49b.1?lang=bi
2. Archambault rightly points out that argument and proof are not the same. He shows that, according to the ancient tradition, argument is the main idea and the basic point for a proof: "In the Boethian parlance, an 'argument' (argumentum) is not a set of premises which, when combined in the appropriate manner, lead to a conclusion; rather, it is an aspect of something whereby something further may be inferred about it or something else – typically, it is a concept signified by the middle term of a syllogism." He also refers to Themistian typology to indicate that Anselm uses a topic *from description* and that in this case such an argument is the famous Anselmian phrase: "that than which a greater cannot be thought" [1, pp. 124-125].
3. I use the English translation of *ST* published in the New Advent repository: https://www.newadvent.org/summa/1.htm, and the original text available in Corpus Thomisticum: https://www.corpusthomisticum.org/sth1003.html.
4. This is similar to what Robert B. Jamieson and Tyler R. Wittman identified in John Webster's theory of Biblical reasoning: "Webster distinguishes within biblical reasoning two overlapping, mutually informing modes of reasoning: exegetical and dogmatic" [6, p. xvii].