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## **The question of the existence of God in the book of Stephen Hawking: A brief history of time**

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### **Abstract**

The continuing interest in the book of S. Hawking "A Brief History of Time" makes a philosophical evaluation of the content highly desirable. As will be shown, the genre of this work can be identified as a speciality in philosophy, namely the proof of the existence of God. In this study an attempt is given to unveil the philosophical concepts and steps that lead to the final conclusions, without discussing in detail the remarkable review of modern physical theories. In the first place the concept of causality used by Hawking is analyzed in terms of the classical four aspects of cause, that is *causa formalis*, *materialis*, *efficiens* and *finalis*. Thereafter the classical Aristotelian-Thomistic proof of the existence of God is presented and compared with Hawking's approach. In his argumentation he uses a concept of causality, which in contrast to the classical philosophy neglects completely an ontological dependence and is reduced to only temporal aspects. On the basis of this temporal causality and modern physical theories and speculations, Hawking arrives at his conclusions about a very restricted role of a possible creator. It is shown, that neither from the philosophical nor the scientific view his conclusions about the existence of God are strictly convincing, a position Hawking himself seems to be aware of.

### **Summary**

1. Introduction
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5. Discussion

## The question of the existence of God in the book of Stephen Hawking: A brief history of time

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### 1. Introduction

In 1988 Stephen Hawking, a mathematician and physicist, published a book<sup>1</sup> for the broader public, which soon after appearance became a best-seller. It was translated in more than 20 languages and, in parallel, a series of extended interviews were asked and given for important newspapers and magazines in many countries. Meanwhile more than 6 years have passed, and several studies have dealt with the physical<sup>2</sup> and philosophical<sup>3,4</sup> aspects treated in this book. In the following, a summary of the book and an analysis of the philosophical elements is given in the light of the metaphysics of Aristotle and Aquinas. The focus hereby is laid on the aspects relevant to the question of the existence of God.

After the introduction, a summary of the book will be presented based mainly on quotations of the book. The selections of the quotations of course are already a kind of comment, but in addition to this, explicit remarks are given which help to arrive to the conclusions of the present paper. In the next section, the four aspects of causality in classical metaphysics will be presented. It will be shown that Hawking seems to work with mainly two aspects related to the *causa efficiens* and the *causa formalis*, but without clear distinction between them. In the fourth section the philosophical genre of this book will be identified: a speciality in the philosophical field, namely the proof of the existence of God. For comparison the view of the Aristotelian-Thomistic philosophical tradition will shortly be presented. Finally, in the last section, a discussion will be given, where the mutual relevance of the ideas of Hawking and the Aristotelian-Thomistic philosophy will be studied.

### 2. Summary of the book

The *introduction* by Carl Sagan already gives an important key for the understanding of the book. He writes<sup>5</sup>: *This is also a book about God.....The word God fills these pages.....Hawking is attempting ....to understand the mind of God....the conclusion of the effort...: a universe with no edge in space, no beginning or end in*

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<sup>1</sup>S. Hawking, *A brief history of time, from the big bang to black holes*, Bantam Books, New York, 1988.

<sup>2</sup>M. Sachs, *On Hawking's "A Brief History of Time" and the Present State of Physics*, Brit. J. Phil. Sci. 44(3) (1993), pp 543-547.

<sup>3</sup>W.L. Craig, *'What Place, then, for a creator?': Hawking on God and Creation*, Brit. J. Phil. Sci. (1990), pp 473-491.

<sup>4</sup>R.J. Deltete, *Hawking on God and Creation*, Zygon 28(4) (1993) pp 485-506.

<sup>5</sup>ref. 1, p. X.

*time, and nothing for a Creator to do.* One clearly should have in mind, that besides presenting a popularisation of modern physical pictures about the universe, Hawking is entering the field of philosophy and eventually theology.

Hawking starts his book with a chapter called: *Our picture of the universe*. He gives a short historical description of the different pictures of the universe. About the beginning of the universe he says<sup>6</sup>: *One argument for such a beginning was the feeling that it was necessary to have "First Cause" to explain the existence of the universe.* He adds then immediately an explanation: *Within the universe, you always explained one event as being caused by some earlier event.* It is remarkable, that in this description of cause the time-aspect is essential, that is he seems to neglect ontological causes, which are essential in the classical philosophy, and especially in metaphysics. On the basis of his definition of cause as working only from out the past he comes some two pages later to the first important conclusion about the role of a creator in a universe with a big bang<sup>7</sup>: *An expanding universe does not preclude a creator, but it does place limits on when he might have carried out his job.*

Interesting are his ideas about the fields of science, philosophy (metaphysics) and religion<sup>8</sup>: *Some people feel that science should be concerned with only the first part (the laws that tell us how the universe changes with time); they regard the question of the initial situation as a matter for metaphysics or religion.* For him metaphysics and religion seem to be quite close to each other, and distant to science. Hawking is ending the first chapter with some remarks about a complete unified theory and concludes<sup>9</sup>: *And our goal is nothing less than a complete description of the universe we live in.* This remark gives rise to an important question: is a physicist able, even with a perfect developed theory, to give a complete description of the universe? What to say about the role of biology, medicine, sociology or even philosophy, are they all included in physics?

In chapter 2 about *Space and Time* a history of science is given from the Greek up to the work of Penrose and Hawking. These demonstrated that *Einstein's general theory of relativity implied that the universe must have a beginning and, possibly, an end.*<sup>10</sup> In *The Expanding Universe* he speaks about the understanding of the universe based on general relativity and the state of knowledge in 1970. Thereafter he emphasizes the necessity of quantum mechanics for a next step in a deeper understanding. In chapter 4 *The Uncertainty Principle* he explains some basic principles of quantum mechanics. He concentrates on the uncertainty principle, which he shows to be essential to avoid that *classical general relativity, by predicting points of infinite density, predicts its downfall.*<sup>11</sup> He remarks, that with the uncertainty principle a non-deterministic law in physics has been found. This has consequences also for the role of God, as *scientific determinism ...infringed God's freedom to intervene in the world.*<sup>12</sup>

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<sup>6</sup>ref. 1, p. 7.

<sup>7</sup>ref. 1, p. 9.

<sup>8</sup>ref. 1, p.11.

<sup>9</sup>ref. 1, p. 13.

<sup>10</sup>ref. 1, p. 34.

<sup>11</sup>ref. 1, p. 61

<sup>12</sup>ref. 1, p. 53.

In *Elementary Particles and the Forces of Nature*, chapter 5, he describes, starting from the Greek atomists, the way to an overall theory of the four basic forces: gravitational, electromagnetic, weak nuclear and strong nuclear force. Up to now, there is only a partial result, the grand unified theory (GUT), including electromagnetic, weak nuclear forces and strong nuclear forces. Hawking comments<sup>13</sup>: *This title is rather an exaggeration: the resultant theories are not at all that grand, nor are they fully unified, as they do not include gravity.*

*Black Holes* and *Black Holes ain't so Black* is treated in chapter 6 and 7. He first gives a historical overview, including the work of Penrose and himself, and shows, how general relativity gives rise to singularities, where the concept of space and time are seriously altered. A singularity, a concept taken from mathematical theories, denominates a special point or region in a function, where one has to divide by zero and where the function consequently is undefined. The functions used in the theory of general relativity can mathematically be considered as having a singularity, when they are applied to black holes. Later Hawking will speak about a second similar singularity, when he treats the big bang, the among physicists generally accepted starting point of the universe. For Hawking the concept of singularity is central in his reasoning. For within a singularity the known mathematical description of the physical reality breaks down, that is, there is neither a deterministic nor a statistical description of the events of those regions. In this chapter Hawking is able to demonstrate quite convincingly, that the singularity in the center of a black hole can be circumvented, when one combines general relativity with the uncertainty principle. This seems to be the first combination of the two great theories of modern physics, general relativity and quantum mechanics. The result is an unexpected and at a first sight paradoxical conclusion: black holes are not so black, that is, they may emit energy or matter in form of radiation. Hawking considers this result a *glimpse* of what a fully unified theory would bring in future. It is important to note that with this new approach, Hawking manages to get rid of the first class of singularities that are connected to black holes.

In the following chapter *The Origin and Fate of the Universe* Hawking tackles the problem of the second class of singularities, the big bang and eventually the big crunch. Unlike black holes, which are thought to be superabundant in the universe, the two species of the second class are unique. The big bang is considered as the starting point of the universe with the beginning of time and all physical laws. The big crunch is the final collapse with the end of time and the end of all known physical laws. After explaining in short the physical ideas connected to the big bang and big crunch, Hawking considers the philosophical implications of the big bang singularity: *space-time would have a boundary - a beginning at the big bang.*<sup>14</sup> He then makes a statement about the laws of sciences, which is in accordance with his restricted concept of temporal causality. *These laws may have originally been decreed by God, but it appears that he has since left the universe to evolve according to them and does*

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<sup>13</sup>ref. 1, p. 74.

<sup>14</sup>ref 1, p. 122.

*not now intervene in it.*<sup>15</sup> As one can see, only in the beginning, at the big bang singularity, a decisive role for God is possible.

In the next pages the anthropic principle<sup>16</sup> is introduced and different models of the development of the universe are presented. Hawking speculates about these models based on the general theory of relativity and quantum mechanics and ends with what he calls a *proposal*<sup>17</sup>. Space and time could be finite without boundary or singularity, at least if one introduces the concept of imaginary time. Within his logic of the reduced concept of causality this proposal has *profound implications for the role of God in the affairs of the universe.*<sup>18</sup> These implications, which are the central point of his book, have already been presented in the introduction by Sagan, and is worthwhile to quote once again: *So long as the universe had a beginning, we could suppose it had a creator. But if the universe is really completely self-contained, having no boundary or edge, it would have neither beginning nor end: it would simply be. What place, then, for a creator?*<sup>19</sup> Some pages earlier Hawking already used an expression for the universe, *it would just BE*<sup>20</sup>, which resembles quite strongly the name of God in the Bible<sup>21</sup>: Jahwe (I am who is). One can observe that Hawking in the development of his *proposal* is quite conscious of the speculative character of his argumentation. All statements, like the one just given, are expressed in terms of *would, could, if, may*, etc.

In *The Arrow of Time* Hawking considers the direction time passes, from past via the present to the future, this direction he calls the *arrow of time*. He considers three types of arrows: the thermodynamic, the psychological and the cosmological arrow. The first is related to entropy, that is the amount of disorder in a system. The psychological arrow is associated with the human memory, as we only remember the past. The cosmological arrow is the direction of time in which the universe is expanding. In the light of the "no-boundary proposal" of the universe and the anthropic principle he shows the relation between the different arrows. His argumentation needs further philosophical study, for example it is not clear whether the analogy between a computer memory and the human brain is strong enough to draw conclusions regarding the psychological arrow.

*The Unification of Physics* is the last chapter before the conclusion. Already the great aim of physics has been mentioned: the unification of the four basic forces in one single theory. But even with a complete unified theory, there are two reasons, why a physicist cannot predict events in general: there is the uncertainty principle, where there is *nothing we can do to get around that*<sup>22</sup>. There is another more practical inherent difficulty to solve exactly the equations given by the theory. It is, i.e. not possible to solve exactly the motion of three bodies in Newton's theory of gravity. Being conscious of these fundamental restrictions, Hawking nevertheless puts an aim

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<sup>15</sup>ref 1, p122.

<sup>16</sup>The anthropic principle has been introduced by Hawking and B. Carter, and can be summarised: *we see the universe the way it is because we exist.*

<sup>17</sup>ref 1, p 136.

<sup>18</sup>ref. 1 p.140.

<sup>19</sup>ref. 1 p. 140 f.

<sup>20</sup>ref. 1 p.136

<sup>21</sup>Ex. 3,15

<sup>22</sup>ref. 1 p. 168.

quite ambitious for a physicist: *our goal is a complete understanding of the events around us, and of our own existence*<sup>23</sup>

The last chapter **Conclusion** summarises the way Hawking had led through the exciting area of modern physics. Now he draws conclusions, which he presents like different pieces of a mosaic, and which go far beyond physics into the realm of philosophy and eventually theology. About the situation before the theories of gravity and quantum mechanics are united, he writes. *At the big bang and other singularities, all the laws would have broken down, so God would still have had complete freedom to choose what happened and how the universe began*<sup>24</sup>. According to Hawking, however, with the new still not available unified theory and the no boundary proposal the situation would have changed largely: *If the no boundary proposal is correct, he (God) had no freedom at all to choose initial conditions*<sup>25</sup>.

In the foregoing Hawking made his statements, which he presented all in a conditional form. Now he brings new pieces of thoughts into his mosaic of fundamental ideas regarding the universe, which are worthwhile to be quoted. *Even if there is only one possible unified theory, it is just a set of rules and equations. What is it that breathes fire into the equations and makes a universe for them to describe?*<sup>26</sup> With this almost lyric sentence Hawking expresses what in the metaphysics of Aristotle and Aquinas one could describe in terms of *causa formalis* and *causa efficiens*. The *causa formalis* is necessary, but not sufficient to cause the total effect. Besides this the *causa efficiens* is needed, who gives a set of ideas and 'formulas' an implementation in reality.

In the very same page Hawking invites the philosophers, the people who in contrast to scientists ask *why* instead of *what* the universe is, to *keep up with the advance of scientific theories*<sup>27</sup>. He hopes that after the discovery of a complete theory a new area will come. *Then we shall all, philosophers, scientists, and just ordinary people, be able to take part in the discussion of the question of why it is that we and the universe exist. If we find the answer to that, it would be the ultimate triumph of human reason - for then we would know the mind of God.*<sup>28</sup>

### 3. Philosophical reflections about causality

In the preceding section often the concept of causality has been used, which is one of the central concepts in metaphysics. The classical philosophy of Aristotle and Aquinas considers four aspects of causality, which are present at each causal process<sup>29,30</sup>. These four aspects all are called cause: *causa materialis* and *causa formalis*, *causa efficiens* and *causa finalis*. It has to be stressed that the term *causa* is

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<sup>23</sup>ref. 1 p 169.

<sup>24</sup>ref. 1. p 173.

<sup>25</sup>ref. 1, p.174.

<sup>26</sup>ref.1, p. 174.

<sup>27</sup>ref. 1, p. 174.

<sup>28</sup>ref. 1, p 175.

<sup>29</sup>Aristotle, *Physica* II,2.

<sup>30</sup>Thomas Aquinas, *In II Phys.*, lectio 2, n. 240.

applied by analogy to the four aspects of causality. The *causa efficiens*, the effective cause, is what in common language is meant by cause, it is the *causa agens*, which is dealt with in the principle of causality. In nature, where in general no intelligent causes are involved, one may identify the four aspects as follows. Some objects cause effects on others (*causa efficiens*), and starting from certain material conditions (*causas materiales*) produce certain forms (*causas formales*). The objectives are the forms themselves, intended by their nature and, in certain cases the utility, which results for other objects (*causa finalis*).

It is not an easy undertaking to relate philosophical concepts to everyday experience or experimental physics. In the work of Aristotle, Aquinas and other great philosophers one finds, for example, quite often comparisons and illustrations, which surely can not withstand the critics of modern science. Nevertheless the following concrete case of the ballistic movement of a cannonball will be given. This case may illustrate the contributions of the four aspects of causality in a single causal process. The effective cause is the ignition of explosives in the canon tube, or on a higher level, the action of a soldier in a military action. The *causa materialis* is the ball itself with a certain mass, and the explosives all arranged in a canon tube with a certain direction and inclination. The trajectory or form of the movement, which relates to the *causa formalis*, is determined by the laws of gravity and inertia. These laws are written down in equations, which not only by accident are also called *formulas*. The *causa finalis* is the trajectory (at least, if not perturbed), and eventually, on a higher level, the destruction of a military object. The different aspects of causes can be identified by putting a question: What is responsible, if the material, formal or final aspects of the intended effect have failed, or in the most extreme case, if nothing happened? The last situation, nothing happened at all, is related to the *causa efficiens*. If the explosives were not ignited - for example, the soldier did not fire - then the total effect, the movement of the canon ball, did not occur. If the canon ball had not sufficient strength, so that he broke in pieces, or the explosives were of bad quality, so that there was not a complete ignition, then the *causa materialis* failed. The form of the ballistic movement of the canon ball, will show small deviations from a parabola due to friction, depending on the direction of wind, eventual rotation of the ball, etc. All these effects are related to the *causa formalis*. The final destruction of the military object can also be hindered by being misled by a dummy target, in this case the *causa finalis* of the ball movement failed.

Coming back to Hawking, it is worthwhile to deal more in detail with his concept of cause. In his first chapter he gives an explanation, what is meant by cause: *Within the universe, you always explained one event as being caused by some earlier event*<sup>31</sup>. This explanation, given in common language, one may relate to the *causa efficiens* of metaphysics. One should however bear in mind, that the *causa efficiens* not necessarily relates to an event earlier in time, as will be shown more in detail in the following section. In the same chapter Hawking speaks about a complete unified theory, which should give a *complete description of the universe*<sup>32</sup>. What now is meant by *complete description*, and how physicists do describe reality? A theory in physics is a set of relations between physical quantities expressed in a mathematical

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<sup>31</sup>ref. 1, p. 7.

<sup>32</sup>ref. 1, p. 13.

language: the formula's. Hawking expresses this as follows: a *unified theory, it is just a set of rules and equations*<sup>33</sup>. Philosophically one should relate these rules and equations to the formal aspects of causality, that is, the *causa formalis*. In conclusion one observes a not unique meaning of the concept of causality implicitly used in the reasoning of Hawking. And Hawking without doubt is aware of it. After speaking about the complete unified theory, Hawking is asking himself: *What is it that breathes fire into the equations and makes a universe for them to describe?*<sup>34</sup> It seems, that Hawking here comes back to his first notion of causality, which corresponds more with the *causa efficiens*, and he makes clear, that the formal aspects are not sufficient.

At the very last pages Hawking characterizes the philosophers as people, who in contrast to scientists ask *why* the universe is instead of *what*. Asking what the universe is will result in knowledge about the structure and the relation between the physical quantities, and will therefore result in the study of the formal aspects of causality. Asking *why* is shifting the interest also to the other aspects of causality, mainly the *causa efficiens*, and also the *causa finalis*. Again Hawking seems to consider several aspects of causality, but without using the technical expressions common in philosophy. A very important point regarding the causes has not yet discussed in detail, namely that causality can work on different levels simultaneously. This will be discussed in more detail in the next section.

#### 4. The central question: does God exist?

From the summary in section 2 it may be clear, that although the book is written by a physicist, it also enters the field of philosophy. Hawking deals with a specialized theme of metaphysics, namely the proof of the existence of God. Obviously the genre of the book is not affected by the positive or negative answer to the central question: "Does God exist?" Contemplating the two-three thousand years of history of philosophy from the ancient Greeks up to now, one observes a continuous interest in this central question. All the tools available to philosophers and scientists, as logic, cosmology, metaphysics, history of philosophy and science itself, have been applied to clarify as much as possible the different aspects. Hawking as a scientist gives an important contribution to the scientific part of the question; regarding the philosophical aspects, he uses only a reduced selection of the knowledge until now obtained. The most comprehensive discussion of the proofs of the existence of God is given in the work of Aquinas, who resumed the different demonstrations in the famous five *via*'s<sup>35</sup>. It is not the place here, to discuss in detail his argumentation. Instead we give a summary of the first way<sup>36</sup>, which Aquinas called the *first and most obvious way*, in order to demonstrate the strength of the philosophical argumentation.

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<sup>33</sup>ref. 1, p. 174.

<sup>34</sup>ref. 1, p. 174

<sup>35</sup>Thomas Aquinas, *Summa Theol.* I,2,3.

<sup>36</sup>For the interested reader an English translation of the first way is given below (from St Thomas Aquinas, *Summa Theologiae*, Latin text and English translation, Blackfriars 1964, Eyre&Spottiswoode, London). In contrast to our quotations in the text, which follow closely the Latin of Aquinas, this translation uses more the concepts of today's English. The main difference is the translation of *moveri*, being moved, which is translated as being in process of change.



#### 4.1. The first way of Thomas Aquinas

In the first way Thomas uses ideas that already can be found with Plato<sup>37</sup>, Aristotle<sup>38</sup> and Averroes. He starts from the common experience, that *it is sure, that in this world some things move*. Then he puts his first thesis: *all what moves, is moved by some other*. The proof of it is shortly given by an analysis of the concept of movement. To be moved means to be brought from being *in potentia* to being *in actu*, with other words, brought from being potentially in a certain state to being actually in that state. He comes to the conclusion: *It is therefore impossible, that something in the same aspect and in the same way brings into movement as well is moved or moves itself*. The next step in his argumentation is the thesis: *If the mover himself is moving, then he also has to be moved by some other*. This is a logical extension of the first thesis, and shows that there is a cascade of movers which in turn are moved by other movers. Aquinas now states, that there can be no infinite chain of movers and moved, as otherwise there would be no first mover, and consequently nothing, which could start the movement. His conclusion therefore is, that there must be a first mover, which is not moved by anything. He ends his proof with: *and this is what everybody understands by God*.

About this first via some remarks should be given. Speaking about moving, Aquinas considers all kind of changes, like getting hot, changing of color or change of position. In his second way, a similar proof is given, but then one should read instead of *moved: caused by*. It is of extreme importance to note that in the via's moved or caused by is always moved or caused by *per se*, that is, if the mover or cause stops to move or cause, the effect also stops. With other words, the mover or the cause is acting in the present time. That means that also the cascade of movers and moved or causes and caused is completely in the present. The following example of a cascade or hierarchy of movers, which in a shortened way Aquinas already has mentioned in the explanation of the first way, may be a good illustration. It is the case of a person, who is moving a ball along a certain trajectory, for example a circle. The ball is moved by a

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The first and most obvious way is based on change (*ex parte motus*). Some things in the world are certainly in process of change: this we plainly see. Now anything in process of change is being changed by something else. This is so because it is characteristic to things in process of change that they do not have the perfection towards which they move, though able to have it; whereas it is characteristic of something causing change to have that perfection already. For to cause change is to bring into being what was previously only able to be, and this can only be done by something that already is: thus fire, which is actually hot, causes wood, which is able to be hot, to become actually hot, and in this way causes changes in the wood. Now the same thing cannot at the same time be both actually x and potentially x, though it can be actually x and potentially y: the actually hot cannot at the same time be potentially hot, though it can be potentially cold. Consequently, a thing in process of change cannot itself cause that same change; it cannot change itself. Of necessity therefore anything in process of change is being changed by something else. Moreover, this something else, if in process of change, is itself being changed by yet another thing; and this last by another. Now we must stop somewhere, otherwise there will be no first cause of the change, and, as a result, no subsequent causes. For it is only when acted upon by the first cause that the intermediate causes will produce the change: if the hand does not move the stick, the stick will not move anything else. Hence one is bound to arrive at some first cause of change not itself being changed by anything, and this is what everybody understands by God.

<sup>37</sup>Plato, *Phaedrus*

<sup>38</sup>Aristotle, *Physica* VIII

stick. The stick is moved by a hand. The hand is moved by a set of muscles. The muscles are moved by neural commands. The neural commands are moved by the brains. The brains are moved by the will, etc. The exact identification of the different levels in this cascade of movers may be a point of discussion, but one sees clearly that all movers are acting simultaneously and are acting *per se*. If one of the movers fails, there is no effect, in this case the ball would not follow the original trajectory.

The proof of Aquinas is quite subtle and loses its strength if one introduces even minor changes in the different steps. In the foregoing example, one could consider a ball shot by a soccer player. Once the direct contact between shoe and ball is broken, the ball follows a trajectory that could be the intended one. It could, however, also drastically be changed or even stopped by other movers or causes, like wind or a keeper's hand. In the case of movers as presented in this last example, Aquinas would never conclude that there must be necessarily a finite cascade or a first mover.

Aquinas ends his proof with: *and this is what everybody understands by God*. One has to realise, that all of his reasoning is still in the field of philosophy and not theology. Starting only from the daily experience of the movement of material things and logical thinking, he arrives at the necessity of something, which is the first mover or, in the second via, the first cause. Having obtained this result, it seems that he looks around in order to see, where he could find this first mover. And the results of this exploration: the first mover is just that, what people understand by God. The first mover, a pure philosophical concept, can be identified with God. For Aquinas this God is the God of the Judaeo-Christian tradition.

## 4.2. Hawking and the classical proof of the existence of God

It is useful, to compare the different steps, Hawking is making in his attempt to clarify the question of the existence of God, with the classical proof of the Aristotelian-Thomistic philosophy. Hawking starts by using a reduced concept of causality. We already quoted his explanation of the meaning of being caused, which for him is exclusively causality in time: *Within the universe, you always explained one event as being caused by some earlier event...*<sup>39</sup>. The exclusive use of this kind of temporal causality, Aquinas explicitly excludes for his proof<sup>40</sup>. Besides the use of a causality only acting in time, Hawking seems to work implicitly with not a unique aspect of causality. As in section 3 has been shown, the *causa efficiens* and the *causa formalis* both play a role in the reasoning of Hawking. It can be expected that with the reduced and vague concept of causality, as used by Hawking, the classical proof of the existence of God is strongly weakened.

Applying the temporal concept of causality, Hawking expects an intervention of a possible creator or God only in the beginning of the universe, as already has been shown by the quotations in section 2. As long as there is a beginning, which he identifies with the big bang singularity, there would be a role for a creator. If,

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<sup>39</sup>ref 1, p. 7.

<sup>40</sup>L. Elders, *De Metafysica van St. Thomas van Aquino in historisch perspectief, II: Filosofische godsleer*, Uitgeverij Tabor, Brugge, 1987, p.150, see also Thomas Aquinas, *In V Metaph.*, lectio 3, n.787, and *In II Phys.*, lectio 6, n 195.

however, the physical necessity of a beginning has been eliminated, the crucial question comes: *What place then, for a creator?*<sup>41</sup>. Hawking therefore comes in his main line of reasoning with the temporal concept of causality to the conclusion, that there is no logical need to assume the existence of a creator. Nevertheless, he himself is convinced, that something is missing in his reasoning. Not only the question *what*, but also the question *why* should be asked: *Why does the universe go to all the bother of existing?* This question has not been answered yet, as *up to now, most scientists have been too occupied with the development of new theories that describe what the universe is to ask the question why*<sup>42</sup>. In section 3 we already gave a philosophical analysis of Hawking's remark in terms of the *causa formalis* and *causa efficiens*.

## 5. Discussion

After having gone through the book of Hawking and presented the proof of the existence of God in the Aristotelian-Thomistic philosophy, one may want to look for the mutual implications. Scientists, like philosophers, have their own working field, and the methods in science are quite different from those in philosophy. There is however an overlap: in the object, as scientists are dealing with the material reality as being material and philosophers with the same reality, the material and beyond that also with the immaterial reality. And, of course, there is overlap in the subject, the scientist, who may be thinking as a philosopher, or the philosopher, who is doing science.

One may therefore say, there is an interaction between science and philosophy, and even between science and theology. Hawking himself gives an example, when introducing the Heisenberg uncertainty principle and discussing determinism. *The doctrine of scientific determinism was strongly resisted by many people, who felt that it infringed God's freedom to intervene in the world, but it remained the standard assumption of science until the early years of the century.*<sup>43</sup> If that theory of total determinism in the physical world would have been proven to be true, then God's intervention in the material world would be bound to deterministic laws, and regarding human freedom, one could only consider at most pure internal decisions, which would not affect any physical reality.

If one now considers the main line of argumentation of Hawking, one is at first confronted with his restricted concept of temporal causality, which we have shown is contrary to the one used in classical philosophy. Nevertheless, even if one accepts this concept, his "proof" of non-necessity of a creator is not supported by physical evidence, but of ideas with a highly speculative character. He starts with theories, like the of relativity and quantum mechanics, which are shown to be valid by thousands of experimental verifications and which are accepted by practically all physicist. When discussing big bang, black holes, etc., there the scientific evidence is much weaker, and the ideas have a more hypothetical nature. Introducing, however, imaginary time and the no boundary proposal, Hawking himself is conscious of the speculative nature

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<sup>41</sup>ref. 1, p. 141.

<sup>42</sup>ref. 1 p. 174.

<sup>43</sup>ref. 1 p. 53.

of his reasoning. One should be aware, if the scientist Hawking calls his ideas a proposal and admits that is far from being proven, then a philosopher (say Hawking or any other) may not use this argumentation as a decisive proof for the existence or non-existence of a creator. If one reads the remarks of Hawking in his last chapter (see quotation, ref. 23), he seems to be aware of it.

There is one very interesting question left. The title of the book *A brief history of time* promises worthwhile and perhaps new ideas about time. A widely discussed question in philosophy is, whether the universe is eternal, and - this is not the same question - whether the universe is created. Science was not able to give an answer. With the introduction of the big bang hypothesis, based on the work of Penrose and Hawking, many considered this as the proof, that there was a beginning and therefore a creation. With the no-boundary proposal Hawking has not proven, that the universe is eternal, simple being. What he has shown, is that for a scientist at the top of the knowledge about the universe, the older standard big bang hypothesis is not necessarily true, and that the idea of a universe without beginning can not be rejected on purely scientific reasons. It is therefore still a matter of discussion. Coming back to Aquinas, one finds the problem of creation of the universe in time or creation from eternity<sup>44</sup>. His conclusion is, that it is possible to demonstrate the ontological dependence of the universe from God, but not the beginning in time. Only additional information, as is given in theology by revelation, could give an answer<sup>45</sup>. For Aquinas evidently the answer to this question is not relevant for the demonstration of his 5 via's. This has an enormous impact on the philosophical value of the input of science as has been delivered by Hawking. The main line of his reasoning does not affect the philosophical proof of the existence or non-existence of a creator, at least in the philosophy of Aquinas. What then is the value? Not a small one, one may say, namely bringing people to think and stimulate them to ask why.

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<sup>44</sup>for a discussion, see, e.g. L.J. Elders, *De natuurfilosofie van Sint Thomas van Aquino*, Uitgeverij Tabor, Brugge, 1990, p. 138 ff.

<sup>45</sup> In the Judaeo-Christian tradition this information is found in Gen. 1.1: In the beginning.....