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## Hawking's quantum cosmology

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The book titled A Brief History of Time by Professor Stephen Hawking is visited. His struggle for accepting/denying God the Creator is analyzed from a scientific perspective.

### I- Introduction

The Big Bang theory has revolutionized our understandings about the universe. It states that the space-time continuum has a beginning some time in the past. The Big Bang theory put to an end all other cosmology models based on the concept of eternal time such as hesitation, static, steady state, and oscillating models [1]. Consequently, it put atheists face to face with a possible creator god who caused the universe to come to exist.

A caused/created event must have a causer/creator. The principle is called causality, the cause-and-effect that is always true in macroscopic worlds. Particularly, a caused universe must have a causer according to the common wisdom. However, in microscopic worlds, the physics of quantum mechanics allows the caused/created without the causer/creator [2,3]. Thus, quantum mechanics potentially provides a loophole for escaping God if one knows how to skillfully apply it to cosmology. Professor Stephen Hawking has such skills.

### II- Hawking s quantum cosmology

The Big Bang theory was proposed based on several observations [4], one of which is that galaxies, including the Milky Way that houses the solar system with our planet earth, are receding from one another. The farther the galaxies are with reference to the earth, the faster they are receding. This does not mean that our galaxy, the Milky Way is pinned down to one position. Indeed, it is receding from others too, according to their points of reference. In other words, a person who lives in a different galaxy observes that we, earth people, are receding from him or her too [5].

The expansion of the universe is not the same as the explosion of a grenade. Unlike a grenade explosion, there is no edge, nor a center, nor a place where it expands into, i.e. space-time universe just expands itself. If the universe is expanding, there must have been sometime in the past, the whole universe had zero size from which it has been expanding to the current size. This moment is called the Big Bang.

Einstein's general relativity, a theory that governs the dynamics of macroscopic worlds such as galaxies, or even the whole universe, predicted that at the Big Bang (the age of the universe was less than  $1E-43$  seconds) a singularity occurred. Typically, at the Big Bang:

Time was equal to zero, and

The size of the universe was zero, and

The density was infinite, and

Temperature was infinite, and

Energy was infinite.

At the singularity, all of the known laws of physics including general relativity breakdown. Facing the Big Bang singularity is facing a possible creator. Therefore, if one is to reject God, one has to get rid of the Big Bang singularity. This can be accomplished by marrying quantum mechanics, a theory that rules microscopic world of atoms, electrons, and other fundamental particles, to general relativity, hence quantum cosmology.

How is this marriage possible? Because when the universe was microscopically small, quantum mechanical effect cannot be ignored, stated Professor Stephen Hawking [6]. What happened then if quantum mechanics was in effect?

1- Imaginary time, similar to imaginary number ( $i^2 = -1$ ), could replace real time at the Big Bang, hence there is no need for a singularity [7]. (Singularity occurs in real time only.) In other word, time did not have a beginning.

2- Matter is allowed to pop out to existence from nothingness [2,3,8].

3- Therefore, our existence is not ruled by God, but rather by a probability wave function, similar to the electron wave function, which states that our universe exists because the probability associated with our universe is high. The universe is not a single universe, but rather a multi-verse. Other universes dont exist since their associated probabilities of existence are small [9].

Based on the assumption that quantum mechanics was effective at the Big Bang, Hawking proposed a new model called self-contained universe, one without neither a beginning nor an end. This model helps atheists circumvent the beginning of time and thus the requirement for God the 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? [10]

### **III- Basic problems**

Quantum cosmology has several basic problems. Internationally recognized scientists have provided arguments against it as follows:

1- The self-contained universe only exists in imaginary time. Imaginary numbers are a mathematical tool that has been widely used in science and technology. The space-time universe, where we live, exists in real time [11]. The switching back forth between real time and imaginary time just to circumvent the beginning of time is confusing and contradicting. Even Professor Hawking, in his book, conceded the contradiction:

When one goes back to the real time in which we live, however, there will still appear to be singularities...In real time, the universe has a beginning and an end at singularities that form a boundary to space-time and at which the laws of science breaks down [12].

2- Quantum mechanically, matter can pop out from nothingness to space-time continuum, but it must disappear into nothingness in less than a quintillionth of a second ( $1E-30$  seconds). For a massive system like the universe, the time for it to disappear back into nothingness must be less than  $1E^{-103}$  second (102 zeros between the decimal point and the one) [13].

3- There is a circular reasoning in the concept of the wave function, i.e., the universe exists because the associated probability is high. But how did the wave function come about? An electron wave function exists in the context of space-time that already exists, but a similar probability wave function for the whole universe does not exists prior to the universe [14].

#### **IV- Conclusion**

Energy, space and time must have been created. The beginning of space-time puts atheists face-to-face with God the Creator.

#### **References**

- 1- Hugh Ross, *The Fingerprint of God, Reasons To Believe*, pp. 69-105
- 2- Gerald L. Schroeder, *The Science of God, The Free Press* (1997), p. 24
- 3- Paul Davies, *God and the New Physics, New York: Simon and Schuster* (1983), pp. 25-43, 38-39
- 4- Ned Wright, "What is the evidence for the Big Bang?," [http://www.astro.ucla.edu/~wright/cosmology\\_faq.html#BBevidence](http://www.astro.ucla.edu/~wright/cosmology_faq.html#BBevidence)
- 5- \_\_\_\_\_, "Are galaxies really moving away from us or is space just expanding?" [http://www.astro.ucla.edu/~wright/cosmology\\_faq.html#MX](http://www.astro.ucla.edu/~wright/cosmology_faq.html#MX)
- 6- Stephen Hawking, *A Brief History of Time, A Bantam Book* (1988) p. 115
- 7- Ibid, p. 139
- 8- Ibid, p. 106
- 9- Michio Kaku, *Hyperspace, http://www.deoxy.org/h\_kaku2.htm*
- 10- Stephen Hawking, p. 141
- 11- Fritz Schaefer III, "Stephen Hawking, the Big Bang, and God Part II," <http://www.origins.org/real/ri9501/bigbang2.html>
- 12- Stephen Hawking, p. 139
- 13- Hugh Ross, *The Creator and the Cosmos, Reasons To Believe*, pp. 96-97
- 14- Gerald L. Schroeder, pp. 24-25