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A Precondition for using General Relativity in Quantum Gravity Theory

- It may not always be appropriate to expand new theories from old theories that are used in cosmology without meeting this precondition. -

Hideaki Yanagisawa

Konosu Public Health Center, 4-5-10 Higashi, Konosu, Saitama, 365-0039, Japan
science2001007@ybb.ne.jp

Abstract

Many theories in physics have been expanded from previous theories, sometimes even beyond the preconditions of the original. However, such extensions may not always be justifiable. In this report, a contradiction arising from the use of a theory outside of its preconditions is explained with L'Hopital's rule. The precondition of special relativity is exchangeability of the light pulses among each other. This is also the precondition of general relativity, which was expanded from special relativity. The Schwarzschild radius was calculated from general relativity, although black holes do not allow exchangeability of light. Quantum gravity theory, meanwhile, was expanded from the old quantum theory. However, it is a precondition of the old quantum theory that elementary particles were observed on our Earth. Since they were never observed on a cosmological scale, it may not be right for this theory to be used in cosmology. When a new theory is expanded from an old theory and used in cosmology, scientists must pay attention to such misunderstandings.

Key words: *Big Bang, black hole, quantum theory, relativity theory, cosmology*

Abbreviations

J = fixed number

J_0 = the limit as J approaches 0

K = variable number

x = size that we can consider

P = observed body size

Q = limited basis size in scientist's thought

Q_∞ = infinity basis size in scientist's thought

Introduction

Some physics theories are used outside of the preconditions from which they were originally derived. For example, black holes [1] are explained with the Schwarzschild radius, [2] calculated from general relativity, which was in turn extended from special relativity [3]. Cosmologists, meanwhile, use quantum gravity theory, an extension of quantum theory [4]. In this study, each precondition of special relativity [5] and old quantum theory [6] is shown. Outside of the preconditions, it may not always be appropriate to use expanded theories in cosmology.

Method

Relationship of mathematical indetermination to determination

A relationship between mathematical indetermination and determination is explained by equations (1), (2), (3) and (4), below:

$$F(J) = \lim_{x \to 0} \frac{J}{x}. \qquad (x > 0) \qquad (1)$$

When J is over x as x approaches 0,

$$F(J) = \lim_{x \to 0} \frac{J}{x} = \infty. \qquad (J > 0, x > 0) \qquad (2)$$

When J approaches 0,

$$J_0 = \lim_{K \to 0} K = 0. \qquad (K > 0) \qquad (3)$$

Combining equation (2) and (3), the following equation can be obtained:

$$F(J_0) = \lim_{x \to 0} \frac{J_0}{x} = \frac{\lim_{K \to 0} K}{\lim_{x \to 0} x}. \qquad (K > 0, x > 0) \qquad (4)$$

Since equation (4) is indeterminate, it may not be equal to ∞. According to L'Hopital's rule [7], equation (4) can be determined by differentiating both numerator and denominator with differential calculus if K and x are functions of the same variable. Therefore, the case such as equation (5) is possible:

$$F(J_0) = \lim_{x\to 0}\frac{J_0}{x} = \frac{\lim\limits_{K\to 0} K}{\lim\limits_{x\to 0} x} \neq \infty . \qquad (K > 0,\ x > 0) \qquad (5)$$

However, equation (5) contradicts equation (2). This contradiction is explained as follows. Let

$$J = \frac{P}{Q}. \qquad (P > 0,\ Q > 0) \qquad (6)$$

From equations (2) and (6),

$$F(J) = \lim_{x\to 0}\frac{J}{x} = \lim_{x\to 0}\frac{\frac{P}{Q}}{x}. \qquad (P > 0,\ Q > 0,\ x > 0) \qquad (7)$$

When Q is not infinity, equation (7) becomes

$$F(J) = \lim_{x\to 0}\frac{J}{x} = \lim_{x\to 0}\frac{\frac{P}{Q}}{x} = \infty . \qquad (8)$$

When Q is infinity, P/Q_∞ is equivalent to equation (3).

$$\frac{P}{Q_\infty} = \lim_{K\to 0} K = 0. \qquad (9)$$

From equations (5) and (9),

$$F(J_0) = \lim_{x\to 0}\frac{J}{x} = \lim_{x\to 0}\frac{\frac{P}{Q_\infty}}{x} = \lim_{x\to 0}\frac{\lim\limits_{K\to 0} K}{x} \neq \infty . \qquad (10)$$

Here, the factors for scientist to make a theory from the observed result are observed body size, basis size and the possible size of scientist's theorizing. If the possible size of scientist's theorizing was large, quantum theory could not be made because of very small observed bodies.

P and Q of equation (8) are equivalent to observed body size and basis size, respectively. Furthermore, x of equation (8) is equivalent to the possible size for theorizing in a scientist’s thought. When the precondition of J in equation (2) is not 0, equation (2) is correct. However, upon considering the precondition of J, equation (2) may be false. When J is not 0, equation (2) is equivalent to equation (8). When J approaches 0, equation (2) is equivalent to equation (10).

Relation of Black Holes to General Relativity

A precondition of special relativity is exchangeability of the light pulses among each other [5]. Because the light pulse cannot arrive at the infinity point, exchanging of light is impossible in infinity space. Therefore, special relativity must be used in limited space. This is equivalent to equation (8). Here, because the observed body is an electromagnetic wave, P of equation (8) is a function of time.

Since an observer's thoughts change as a function of time, the possible consideration size (x) of an observer's thought is also a function of time. Therefore, when the space is infinite, equation (10) is possible according to L'Hopital's rule. Since the precondition of special relativity is equivalent to equation (8), the condition of equation (10) is outside of the precondition. As noted above, general relativity was expanded from special relativity [3], and the Schwarzschild radius [2] was calculated from general relativity. Therefore, a precondition of general relativity and the Schwarzschild radius is exchangeability of light. A black hole is explained with the Schwarzschild radius; however, exchangeability of light is denied in a black hole. Therefore, the space in a black hole is considered to be infinite, as in equation (10), meaning that equation (10) can contradict equation (8). Therefore, black holes may contradict the preconditions of general relativity. Black holes must be explained with another theory wherein exchangeability of light is not required.

Relation of Quantum Gravity Theory to Cosmology

In the old quantum theory, observed bodies are elementary particles and their size is very small (i.e., P in equation (8) is small). However, because elementary particle size is within the possibility of consideration in a scientist's thought, quantum theory could be made. The level of its consideration is equivalent to the possible size of scientist's theorizing. Since x to be the possible size of scientist's theorizing became very small with progress of physics, infinity exists. Is an elementary particle size relative to a human body the same as it to the universe?

In old quantum theory, elementary particle size was never observed on a cosmological scale; it was observed with a scale limited by a human's body size. Moreover, as the basis size is limited, the relation of possible consideration size to elementary particle size per basis size is equivalent to equation (8). The universe's size is limited in the Big Bang theory [8]. However, the universe's size is infinite in my theory [9]. Here, movement of an elementary particle is also a function of time. Therefore, when the universe's size is infinite, equation (10) is possible according to L'Hopital's rule. However, equation (10) contradicts equation (8). Quantum gravity theory was expanded from old quantum theory; therefore, it may not be appropriate for quantum gravity theory to be used in cosmology if the universe's size is infinite. A new theory expanded from an old theory must be used within the precondition of old theory. The universe is very large; the use of quantum gravity theory in cosmology may not always be appropriate if the universe's size is limited.

Results

The precondition of special relativity and general relativity is exchangeability of light, which is impossible in a black hole. Therefore, it is a mistake to believe that black holes can only be explained by general relativity. The precondition of the old quantum theory is that elementary particle size is considered by an observer. An observer's basis size is not equivalent to the universe's size. Therefore, quantum gravity theory expanded from the old quantum theory may not always be appropriate in cosmology. When a new theory expanded from an old theory is used, the precondition of the old theory must be considered.

Discussions

When an observed phenomenon cannot be explained with an old theory, scientists use a new theory while ignoring the preconditions of the original. In this report, the relation of a new theory to an old theory was considered. The precondition of an old theory must be applied to a new theory expanded from old theory. Outside of this precondition, it is a mistake to assume that the new theory is always right.

Conclusion

When a new theory is expanded from an old theory, the precondition of old theory must be considered. Black holes may not be explained with only general relativity, and it may not always be appropriate use quantum gravity theory in cosmology.

References

[1] Hawking S. W., "Black hole explosions?," *Nature,* **248** (5443), 1947, 30-31.

[2] Schwarzschild K., "Uber das Gravitationfeld eines Massenpunktes nach der Einsteinschen Theorie," *Sitzungsber. Preuss. Akad. D. Wiss.* 1916, 189-196.

[3] Einstein A., "Die Grundlage der allgemeinen Relativtatstheorie," *Annalen der Physik*, **49**, 1916, 762-822.

[4] Gupta S. N., "Einstein's and Other Theories of Gravitation," *Reviews of Modern*

Physics **29** (3), 1957, 334-336.

[5] Einstein A., "Uber das Relativitatsprinzip und die aus demselben gezogene Folgerungen," *Jahrbuch der Radioactivitat und Elektronik*, **4**, 1907, 411.

[6] Solov'ev E. A., "Classical approach in atomic physics," *European Physical Journal D* **65** (3), 2011, 331–351.

[7] Boas R. P., "Counterexamples to L'Hopital Rule," Amer. Math. Monthly 93, 644-645, 1986

[8] Narlikar J., "What if the Big Bang didn't happen?," New Scientist, March **2**, 1991, 48-51.

[9] Yanagisawa H., "Energy ignored by Einstein: Dark Matter is not Required," *GSJ*, 2011 from http://www.gsjournal.net/files/4277_yanagisawa.pdf