

The New Concepts to Big Bang and to Black Holes: Both Had No Singularity At All

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Abstract: 1. Our Universe was born from Quantum Micro Black Holes (its mass $\approx 10^{-5}$ g), but not from Singularity or Big Bang of Singularity. 2. No Singularity existed in star-formed Schwarzschild's black holes, a steady mini black hole (its mass $\approx 10^{15}$ g) of long lifetime would certainly exist inside as a core to obstruct the collapse of energy-matters to become Singularity. The steady mini black hole ($m_{om} \approx 10^{15}$ g) in black holes instead of Singularity called by General Theory of Relativity (GTR) could resist the gravitational collapse.

Key Words: universe; singularity; big bang; black holes; Plank's era; cosmology

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Preface

(This is a brief introduction to a full text of the article)

Singularity is defined as a point, which has the infinite amount of some physical parameters. It had been proved by General Theory of Relativity (GTR) that our present expanding universe was certainly born from Singularity and Singularity would certainly appear at the center of any star-formed Black Holes (BH). Thus, Singularity is an inevitable result of GTR and is a problem unable to be solved by GTR. Singularity has been still the most difficult and complicated problem in astro-cosmology and science. The problem of Singularity had troubled scientists for over fifty years. But right now, neither classical theory nor non-classical new theory has successfully eliminated Singularity from its mathematical equations, and simultaneously has fitted well with the natural reality and universal evolutionary laws. In mathematical equations of any theories, variations of parameters are consecutive, but the changes between different physical states have always existed the suddenly changed points (mutation or phase transition). Thus, it is very difficult to describe the transformed process of multi-physical states included points of "phase transition" with single or united mathematical equations.

Undoubtedly, there should be some mechanisms or origin or laws in nature to obstruct the occurrence of Singularity. For example, owing to that, the electrons in an atom must obey Uncertainty Principle of Quantum Mechanics (QM), and they cannot fall into the atomic nuclei at all so that all atoms have not collapsed to Singularity.

1. As yet Singularity has not been found in nature, it only appeared in mathematical equations. In nature, the occurrence of Singularity would certainly violate the causality and the second law of thermodynamics, and violate the laws of energy conservation. God would not deliver "Free Lunch" at all in nature. It has not been a problem to deny the existence of Singularity on philosophy, logic or physical intuition. However, it has still been a knotty problem to eliminate Singularities from mathematical equations. When physicist R. P. Feynman was asked why he could get Nobel Prize, he answered jocularly: "I just have let infinities to be hidden." In this article, to negate the existence of Singularity in nature (included at the genesis of our universe and in black holes) is based on that, once the state and the structure of anybody reached before some critical point or "phase transition", it would certainly transform its state and structure, and could avoid the appearance of Singularity. It will not be conceivable that, if there would be infinities to be contained in a limited universe.

2. Once point-shaped particles (such as mass particle, point charge, wave packet) are put into mathematical equations, Singularities would absolutely appear under the final contraction. In all mathematical equations of any theory, if a particle or a charge were permitted to concentrate into an infinitesimal point, that points would inevitably have infinite mass or infinite charge density. Therefore, all classical theories included GTR or QM cannot eliminate Singularities from its mathematical equations. Quantum Electrodynamics (QED) and Quantum Chromodynamics (QCD) must depend upon re-

normalization to eliminate Singularities. Only micro strings in string theories are not the point-shaped structure. Certainly, Singularities would never appear in string theories. However, right now not a string theory has become maturely and successfully. The trace of micro strings cannot be almost observed even in the remote future. Theoretically, string theories built on different dimensionalities may have a great number of kinds; there is no way to know which one is suitable for nature and science. Thus, applying string theories to get rid of Singularities or infinities is only an attractive mathematical game. It will be the same condition for all other new theories, such as quantum gravitation, SUSY or $N = 8$ super symmetry, Theory of Everything (TOE) etc. Any one of them may want to go too far away to become a perfect theory.

3. The specificity of this article is determined by that, **under the condition of having “phase transition”, there will be no need to clean out Singularities from mathematical formulas at the point-shaped structure of particles, but only need to find out the inexistent physical origin of Singularity in some physical state.** In the demonstrative process of negating Singularities, the most microstructures at our universal birth and black holes will not be necessary to be known, only the macro physical states and its transitive process can be considered. It is said: **it will not be necessary to establish complicated new theories and its mathematical equations to solve the unknown problems of microstructure smaller than Plank’s scale (i.e. $d \leq 10^{-33}$ cm, $t \leq 10^{-43}$ s) in this article. Such as Bernoulli’s equation can successfully be used into fluid mechanics, but anybody needs not to know, that nucleons of hydrogen are made up by quarks.** Many new concepts and new conclusions about cosmology and BHs would be drawn out through applying many current classical theories and its mathematical formulas, and through calculating or checking up the current figures in nature and sciences. **(A)** At the genesis of our universe, once pre-universe contracted into -10^{-43} s at the beginning of Plank’s Era, it would stop collapse due to having no enough time to transmit gravity between closest particles, and it would certainly turn into expansion at super-high temperature, it is said, our universe had made a “phase transition” from the past contracted universe to the present expanding universe in the quantum field of Plank’s Era (see 7th paragraph). **A new formula (3c) $t^{3/2} \leq k_1(8\pi G\kappa/(3C^5))$** has derived, and calculated out $t \geq 10^{-43}$ s with the same exactly value. **(B)** At the center of any star-formed BH, a steady mini BH ($m_{om} \approx 10^{15}$ g) instead of Singularity as a solid core could surely obstruct the collapse of energy-matter in BH and keep the very long-term stability of whole BH. Mini BH has been precisely derived by **a new formula (13bd) $r_{om} = 3h/(2\pi C m_s)$** and become a simplified solution of (11c) and TOV

equation. Demonstrations show that pure GTR has no way to solve problems in BH, especially Singularity. In substantiality, principles and equations of GTR are just the space-time geometry with four dimensionalities instead of gravity, and are without thermodynamic effect. Therefore, inside BH described by pure GTR, due to no antagonistic force produced by the thermodynamic effect, the gravitational collapse would inevitably lead to appearance of Singularity. If there had been no Hawking’s theory about BH, there could be no way to find out mini BH (mass $\approx 10^{15}$ g) as a simplified solution of (11c) and TOV equation and no way to find out the long lifetime of mini BH. Just mini BHs can obstruct the occurrence of Singularity in BH.(see 17th paragraph). **(C)** The origin and evolutionary process of our universe at genesis. **(D)** Our universe was born from Quantum Micro BHs (QMBH) (its mass $m_i \approx 10^{-5}$ g). **(E)** “Primordial inflation” was caused by collisions between those MQBHs. **(F)** The present expansion of our universe was caused by the continual collided effects between those MQBHs. **(G)** The evolutionary and vanishing process of our universe in the remote future. **(H)** Whether or not expansion of our universe afterwards will not depend on universal real density ρ , but depend on the total mass M_o of our primordial universal packet. $\Omega = \rho/\rho_c \approx 1$ just shows the natural character of our universe as a gigantic BH. **(I)** Providing another possible explanation to so-called “accelerative expansion” of our universe. **(J)** The physical state and structure of star-formed BHs. **(K)** Destinies of mini BHs and our universe, etc.

4. All above-mentioned new viewpoints are out of old conventions and worthy to be deeply considered. This article will never exclude conclusions in any new theories. Due to that, all current classical theories and formulas have been proved effectively in nature and sciences, new concepts and conclusions in this article should be successful and have practical significance. Although there is no new theory applied in this article, but in answering the outstanding problems in cosmology and BHs, the new concepts are much better than any current classical or new non-classical theories. The biggest problems in this article are not exact, not sufficient and not complete. The criticisms and instructions from professors, scholars and specialists are welcomed and requested earnestly. Let cosmology go forward and develop up in arguments.

* Introductory words for readers: Due to that, this article is very long, it will be best for you to spend your precious 30 minutes to read three paragraphs at first; (1) preface above; (2) conclusions of 7th paragraph in part one; (3) conclusions of 17th paragraph in part two. All other paragraphs are demonstrations or explanations to three paragraphs above.
