

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 Minimum Gravitational 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, but 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. [Nature and Science. 2004;2(3):1-4].

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

Part One. Our Universe was born out from minimum gravitational black holes (MGBHs, its mass $m_t \approx 10^{-5}$ g), but not born out from Singularity or "Big Bang" of Singularity (Full text will be published in next issue).

Contents of Part One:

1. The laws of our universe evolution.
2. In the newborn-hood, the properties of radiations and particles in the states of super high temperature.
3. The condition occurred from Big Crunch of pre-universe to Big Explosion (Big Bang) of present universe.
4. Minimum Gravitational Black Holes (QMBH).
5. Uncertainty principle of QM was applied to quantum gravitation.
6. Reviews to our present universe.
7. **Conclusion:** The origin and process turned from the disappearance of pre-universe to the birth of present universe in Plank's Era (-10^{-43} s $\leq t \leq +10^{-43}$ s).

(A) The transitive origin caused from the big contraction of pre-universe to the big expansion of present universe.

(B) The gradual vanish of pre-universe in the interval of time (-10^{-43} s $\leq t$) \Rightarrow ($t \approx 0$) in Plank's Era.

(C) The genesis of our new universe within Plank's Era of ($t \approx 0$) \Rightarrow ($t \leq +10^{-43}$ s).

(D) "Inflation Era" of the primordial universe ($t > +10^{-43}$ s) \Rightarrow GUT Era.

(E) The reason for nonstop expansion of our universe until present.

(F) Whether or not expansion of our universe at present would not depend on the universal real density ρ , but only depend on the total energy-matters of primordial universal packet M_o , the end of our universe.

(G). About the universal accelerating expansion

(H). The summary conclusion

8. The further explanations.

9. Appendix A: Chart 1.Values Compared Between Figure 1 and Formulas (1a), (1b).

10. Demonstrations to formulas (1a) and (1b).

Part Two. No Singularity in star-formed Schwarzschild's Black Holes, a steady mini BH (mass $\approx 10^{15}$ g) as a solid core inside BH to obstruct the collapse of energy-matters to become Singularity.

Contents of Part Two:

11. The contracting process of the original interstellar clouds (OIC) in universe as a gigantic BH.

12. The mechanisms of objects to resist its gravitational collapse.

13. The stability and equilibrium of a star-formed gravitational BH (Black Hole).

(A) In any BH (mass = M_b), ($5M_o > M_b > 10^{15}$ g), there is always a small BH (m_o) inside.

(B) In any small BH (m_o), a stable mini BH of ($m_{om} \approx 10^{15}$ g) can surely exist.

(C) The space in BH (M_b) is full of energy-matters; the states and structures in BH.

(D) How can the different temperatures (t_o) with the different radius (r_o) in a BH be changed in accordance with the Hawking's theory of BH?

(E) The exchange of energy-matters through Event Horizon, unstableness of the Event Horizon of BH.

(F) The formation of BH, its mass = M_b , ($5 M_o > M_b \geq 10^{15}$ g).

14. The formation of BH (M_b) in limit of ($10^5 M_o > M_b > 5 M_o$) (Suppose BH had established after nuclear fusion).

15. The structure in BH (M_b) of ($10^5 M_o < M_b < 10^{23} M_o$), ($10^{23} M_o$ is the total mass of our present universe in its Event Horizon).

16. The further explanations and two possible models of BHs.

17. Conclusions taken out from applying many current classical theories and formulas.

(A) Mini BH ($m_{om} \approx 10^{15}$ g) is a special solution of formula (11c) [$dP/dR = -GM\rho/R^2$], which is the simplified Tolman-Oppenheimer-Volkoss's equation.

(B) About mini BH ($m_{om} \approx 10^{15}$ g); how to be found out, its properties.

(C) In space of BH, it is full of energy-matters, not a vacuum.

(D) Properties of star-formed gravitational BH.

(E) Star-formed BH is a simple object in nature.

(F) Event Horizon of BH would be always oscillated.

(G) A formed BH is a real BH forever until its final vanish.

18. About the original universal small BHs.

19. The composition, the state and the vanishing process of mini BH ($m_{om} \approx 10^{15}$ g) in star- formed BH, the commonality between universe and BHs.

(A) The composition of mini BH inside.

(B) The vanishing process of mini BHs.

(C) About the artificial bombs of mini BHs.

(D) Concepts and formulas about the birth of our universe.

20. A few words of the writer.

Preface

(This is a brief introduction to the full text of the article. The full text will be published in later issues).

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), as a result, 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" in nature at all. 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 to solve 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 Minimum Gravitational BHs (MGBH) (its mass $m_t \approx 10^{-5}$ g). **(E)** “Primordial inflation” was caused by collisions between those MGBHs. **(F)** The present expansion of our universe

was caused by the continual collided effects between those MGBHs. **(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_0 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 for its full text, 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. The full text, which is published on website (<http://www.sciencepub.net>, Volume 2—Number 3), will be published in later issues.

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