New Explanations to the Accelerating Expansion of Our Universe: It Might Be Caused From the Collision between Two Universal Black Holes in Their Early Years

---- Part 5 of "New Concepts to Big Bang and Black Holes" [1][2]----

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Abstract: In 1998, two groups led by Professor Saul Perlmutter of Lawrence Berkeley National Laboratory 50-232 University of California and Brain Schmidt of Australia National University individually discovered the accelerating expansion of our universe (AEOU) through the observations to the bursts of supernovas Ia, they pointed out, that the remote galaxies are accelerating away from us.[3] Lots scientists regarded the existence of mystical dark energy (DE) of exclusive force or negative energy as the origin of AEOU, some of them are making their great efforts to find out dark energy for winning Nobel prize. Especially, our universe was born from Big Bang about 13.7 billion years ago,[3] no dark energy appeared along with the birth of our universe, it just cropped out about 9 billion years ago.[3] What is dark energy? Nobody knows it at present. Physics Professor of China Science and Technology University, Li Miao jokingly said: "How many specialists of dark energy there are, how many kinds of dark energy may be imagined out."[3] Can AEOU be explained only by dark energy of exclusive force or negative energy? According to theories and the innate natures of black holes (BH), the expansion of a black hole can be caused by swallowing in energy-matters from its outside and by collision with other black holes (BH). The more energy-matters could be swallowed in, the faster expand a black hole (BH) would [see formulas (6b), (6c) below]. In this article, the accelerating expansion of our universe (AEOU) will be explained with the collisions between our universal black hole (UBH) and another one in their early years. Though the demonstrations in this article may be relatively simple; but they are more reasonable than the demonstrations of all current theories to AEOU. [Nature and Science. 2007;5(3):20-29]. (ISSN: 1545-0740).

Key Words: dark energy, dark energy of excusive force, dark energy of negative energy, accelerating expansion of our universe, collision of two black holes, multi-universes, space expansion exceeding light speed, acceleration of the universe

I. The accelerating expansion of our universe has proved the real existence of multi-universes.

The recent observations indicate that, the so-called dark energy did not simultaneously appear with the birth of our universe; it cropped out about 5 billion years later. It clearly shows that, the dark energy surely came from outside of our universe, i.e. from other universes. It is the hard evidence to show the existence of multi-universes. In addition, "Recently, many super-massive BHs (its mass $M_b \approx 10^9 M_\theta$, M_θ –- our sun mass) were discovered in our universal space. According to calculation, its average density is about $\rho_s \approx 0.0183 g/cm^3$."---quoted from paragraph 15 in <New Concepts to Big Bang and Black Holes>.[2] In such super-massive BHs, there would certainly be many stars with its planets. Moreover, there would still be too many energy-matters outside those super-massive BHs. Thus, they could continuously grow up bigger and bigger with swallowing in outside energy-matters. Several billion years later from now on, the intelligent living beings might appear on the planets in some super-massive BHs, they could have no way to know the worlds outside of their BH. It is said, even in our same universe, if there were the intelligent living beings in the different BHs, they could have no way to make any contact each others, because **every black hole (BH) is a completely independent kingdom.** Fortunately, our solar system does not locate in the super-massive BH of our galactic center, otherwise, our mankind may have no way to know the whole galaxy, let alone know our whole universe. Therefore, the relationships between those super-massive BHs in the different galaxies of our universe are just the same conditions between our universe and other universes outside of ours, because **our universe has been a real gigantic universal black hole** (UBH).[1][2] Above-mentioned super-massive BHs in the different galaxies could grow up after swallowing in energy-matters outside or even collide with other BHs, just as our universe would expand its volume by swallowing in energy-matters outside or colliding with another UBH outside of our universe.

II. The proposal of dark energy, any new theories to the explanations of accelerating expansion of our universe must accord with the Flatness and the current precise observational value of ($\Omega = 1.02 \pm 0.02$) of our universe, the dark energy of exclusive force might become a specter unable to be found.

Einstein's Field Equation of General Theory of Relativity (GTR) as below,

$$G\mu\nu = 8\pi G\, T\mu\nu + \Lambda g\mu\nu \quad (1)$$[4]

$G\mu\nu$ is Einstein tensor to describe the geometrical character of time-space; $T\mu\nu$ is energy-momentum tensor of matter field; $\Lambda g\mu\nu$ is a cosmological item, in which Λ is so-called cosmological constant. $\Lambda g\mu\nu$ would have exclusive force, which was added later by Einstein for keeping our universal balance between the gravitational forces and exclusive forces.[4] For convenient analyses, $T\mu\nu$ can be divided into three items below.

$$\text{Let} \quad T\mu\nu = T^1\mu\nu + T^2\mu\nu + T^3\mu\nu \quad (2)$$

According to the recent precise observations and theoretical calculations, $T^1\mu\nu \approx 4\% T\mu\nu$,[3] $T^1\mu\nu$ delegate an item of general visible matters, such as stars, interstellar mediums. According to the observations and theoretical calculations to distributions of rotary speed in many galaxies, $T^2\mu\nu \approx 22\% T\mu\nu$,[3] i.e. $T^2\mu\nu \approx (5 \sim 6)\, T^1\mu\nu$. $T^2\mu\nu$ is an item of dark matters to delegate the invisible matters of gravitational force. $T^3\mu\nu \approx 74\%\, T\mu\nu$,[3] it is so-called dark energy other than $(T^1\mu\nu + T^2\mu\nu)$. The amounts of dark energy with $(T^1\mu\nu + T^2\mu\nu)$ together must maintain Flatness and $(\Omega \rightarrow 1)$ of our universe. However, the predicts of Inflationary Cosmology which was proposed by Guth and Linde, and theoretical researches of cosmological dynamics all required Flatness, Evenness and $\Omega = \rho_r / \rho_o \approx 1$ of our universe, i.e. required that our universal real density ρ_r must extremely approach to our universal critical density ρ_o. Recently, various precise observations have confirmed the correctness of above theory and concepts, i.e. the best observational value of $\Omega = 1.02 \pm 0.02$.[4] Of course, here the required dark energy must have positive energy or gravitational force.

Now, for explaining the newly discovered accelerating expansion of our universe through the observations to the bursts of remote supernovas Ia, many scientists proposed some new theories, they merged above $(T^3\mu\nu + \Lambda g\mu\nu)$ together into one thing -- $\Lambda g\mu\nu$, they considered that $\Lambda g\mu\nu$ included ($T^3\mu\nu = 74\% T\mu\nu$) as unknown and secret dark energy must have exclusive forces or negative energy. A famous delegate of new theories is quantum field theory (QFT), in which ($T^1\mu + T^2\mu\nu = 0$) are considered as the vacuum state or the state of the lowest energy or the basic state of quantum field,[4] i.e. zero point energy of microcosm. However, the macro energy-matters i.e. general matters ($T^1\mu + T^2\mu\nu \neq 0$) of our universe are considered as a excited state of quantum field. Observations to the vacuum state of our universe may very closely accord with $(T^1\mu\nu + T^2\mu\nu) = 0$, thus, $\Lambda g\mu\nu$ is just regarded as vacuum energy, i.e. dark energy of exclusive force to include $T^3\mu\nu$. Unfortunately, **the calculated value of $\Lambda g\mu\nu$ according to QFT is even equal to more than 10^{120} times of the really observational value of $\Lambda g\mu\nu$ in vacuum.** For this reason, QFT has met the greatest trouble to solve Einstein's field equation. Obviously, so much negative energy $\Lambda g\mu\nu$ calculated out by QFT would have no way to maintain Flatness of our universe and identity between the tensor of $G\mu\nu$ in Einstein field equation and the real observational values. QFT seemingly regarded vacuum energy as "the unlimited free lunch". How much vacuum energy could deposit at any place in our universe and be taken out? Why could the negative energy come from vacuum not annihilate with positive energy-matters in our universe? How could guarantee the real Flatness of our universe with 74% dark energy of negative energy $\Lambda g\mu\nu$? Solving above problems may hardly not violate the natural cardinal principle----the law of causality. It can be seen, **any new theories included QFT to the explanations of**

accelerating expansion of our universe must not violate the Flatness of our universe and the recently precise observational value of ($\Omega = 1.02 \pm 0.02$).

In reality, some scientists and some observations did not support the existence of "secret dark energy" and "dark energy of negative energy".

Lioto, scientist of Italy National Institute of Nucleon Physics said: "the accelerating expansion of our universe doesn't need the mystical dark energy, it's just the neglected expansive effect of Big Bang."[5]

Scientists of XMM Newton Astronomical Telescope of Europe Space Bureau observed that the proportions of blazing gases had almost no difference between very old and young clusters of galaxies. It is a better evidence to have showed the non-existence of dark energy[6] and to accord with theoretical demands. Surely, the current total amount of ($T^1\mu\nu + T^2\mu\nu$) is too little to maintain Flatness of our universe and hardly to let our universal real density ρ_r extremely approach to our universal critical density ρ_o. Therefore, $T^3\mu\nu / T\mu\nu \approx 74\%$ must be needed to have positive energy. However, $T^3\mu\nu$ should be an item of dark energy to delegate those not observed and invisible positive energy in our universe.[3][4]

On January, 8, 2007, an America science research group declared that, through effort in several years, they had firstly drawn up the three dimension map of dark matters in our universe. They pointed out that, in our universe, about 1/6 matters are visible matters, more than 80% matters of the rest are dark matters.[7] They really negated the existence of any dark energy.

Modern traditional cosmology generally merged the cosmological item into energy-momentum tensor of matter field, it is about equal to introduce an energy-momentum distribution of an energy density: i.e. $\rho\Lambda = \Lambda/8\pi G$, pressure $p\Lambda = -\Lambda/8\pi G$.[4] **In reality, modern traditional cosmology from introducing items of $\rho\Lambda$ and $p\Lambda$ had really regarded the exclusive forces of heat pressure as the antagonist of gravitational forces in our universe. Thus, the dark energy of exclusive force is not required in modern cosmology.**

III. The expansive laws of BHs after swallowing in energy-matters outside or after the collision between two BHs.

According to Schwarzchild's special solution to the equation of GTR, the necessary condition for the existence of any real gravitational black hole (RGBH) or so-called Schwarzchild's BH (i.e. no charges, no rotating and spherical symmetry) is:

$$R_b = 2GM_b/C^2, \text{ or } R_bC^2/2G = M_b \quad (3)$$ [9][2]

M_b-- the total mass of BH, R_b--the Schwarzchild's radius of BH, C—light speed, M_θ —sun mass, G—gravitational constant,

A. when a BH swallows in energy-matters outside,

$$M_b = 4\pi\rho_b R_b^3/3 \quad (4)$$

From formulas (3) and (4),

$$3C^6 = 32\pi G^3\rho_b M_b^2 \quad (5)$$

$$dR_b = (2G/C^2)dM_b \quad (6)$$

$$dR_b/dt = (2G/C^2)\, dM_b/dt \quad (6a)$$

Formulas (3), (4), (5) and (6) indicate that, when M_b increases 10 times due to swallowing in energy-matters outside, its density ρ_b would lower 100 times, and R_b equally increases 10 times.

The relative expansive speed V_b of Event Horizon of any BH is: $V_b = 2dR/dt$, so,

$$V_b = (4G/C^2)\, dM_b/dt \le 2C \quad (6b)$$

In case $dR_b/dt = C$, and dt = 1 second, then $dM_b/dt = 2\times10^{38}$g/sec, it is almost equal to swallow in 10^5 solar system in 1 second. $V_b = 2C$ may be the greatest limit of swallowing in energy-matters outside for a BH.

The expansive acceleration a_b of the Event Horizon of any BH is: $a_b = dV_b/dt$, hence,

$$a_b = (4G/C^2)d^2M_b/dt^2 \quad (6c)$$

Formula (6c) expresses that, **the accelerating or decelerating expansion a_b of the Event Horizon of a BH is directly proportional to the increasing or decreasing speed of energy-matters to be swallowed**

in by that BH. Then, its swallowing in energy-matters outside is the normal functions of any BHs. From formulas (3) and (6),

$R_b + dR_b = (2G/C^2)(M_b + dM_b)$ (6d)

B. According to formula (3), **if two BHs of M_{b1} and M_{b2} had collided**, R_{b1} and R_{b2} are their respective Schwarzchild's radius, then, $R_{b1}C^2/2G = M_{b1}$, and $R_{b2}C^2/2G = M_{b2}$, as a result,

$\mathbf{M_{b1} + M_{b2} = (R_{b1}+R_{b2})\, C^2/2G}$ **(7)**

A new BH would be formed after collision, its mass $M_{bn} = M_{b1} + M_{b2}$, its Schwarzchild's radius $R_{bn} = (R_{b1}+R_{b2})$.

Conclusion: From formulas (6d) and (7), once a BH had formed, no matter whether it increased or decreased energy-matters or even collision with another BH, it would be a BH forever before its disappearance with becoming the minimum gravitational black holes (MGBHs) of 10^{-5}g.[1][2]

IV. Our universe has been a real universal black hole (UBH).

For explaining the characters of our universe as a real UBH, two more accurate observational values about our universe will be adopted to do some calculations below (a). The current age A_u of our universe from Big Bang to the present is: $\mathbf{A_u=13.7\times10^9}$**yrs**.[3] (b**). Hubble's constant $\mathbf{H_o= (0.73\pm0.05)\times100kms^{-1}Mpc^{-1}}$** [4]. If above two values are more reliable, the results are as follows. (a). If our galaxy locates in a gigantic universe enough, the current visible radius R_{uv} of our universe is: $\mathbf{R_{uv} = C\times A_u = 1.3\times10^{28}}$**cm,** it is said, the farthest stars, which may be observed, is about 1.3×10^{28}cm away from us, it just is the distance of light travel in the universal age A_u. The visible Event Horizon of our universe is equal to $2R_{uv}$. (b). The real observed density ρ_r **of our universe is:** $\mathbf{\rho_r = 3\, H_o^2/(8\pi G) \approx 10^{-29}g/cm^3}$.

A. Now according to the observed real density $\rho_r \approx 10^{-29}g/cm^3$, our UBH ($M_{ub}$) can be calculated from laws of BH. Let M_{ub} are the total energy-matters of our real UBH, R_{ub} is its real Schwarzchild's radius. From formulas (3) $R_{ub}C^2/2G = M_{ub}$, and (4) $M_{ub} = 4\,\pi\,\rho_r\, R_{ub}{}^3/3$, and $\rho_r \approx 10^{-29}g/cm^3$, then, **our UBH is formed by: $\mathbf{M_{ub}= 8.5\times10^{55}g}$, $\mathbf{R_{ub} = 1.265\times10^{28}cm}$, $\mathbf{\rho_r \approx 10^{-29}g/cm^3}$.**

B. The definite evidences verify that, our universe (M_{ub}) is a real UBH. If our universe is a real gigantic UBH, it was only originated from small BH or from the mergence of many BHs. So, it should be formed by numbers N_{ub1} of original BHs (i.e. MGBHs its $M_b \approx 10^{-5}$g, $R_b \approx 1.5\times 10^{-33}$cm, $T_b \approx 0.65\times10^{32}$K, see reference [1]) at the birth from Big Bang, so, $N_{ub1} = M_{ub}/MGBH = 8.5\times10^{55}/10^{-5} = 8.5\times10^{60}$. At the same time, from formula (7), $N_{ub2} = R_{ub}/R_b = 1.265\times10^{28}cm/1.5\times10^{-33}cm = 8.43\times10^{60}$. **Due to $\mathbf{N_{ub1} = N_{ub2}}$,** then, **it is a reliable evidence to show that our universe is a real gigantic UBH.**

C. **The Flatness and ($\mathbf{\Omega = \rho_r / \rho_o = 1}$) are the innate natures of our UBH**: according to Hubble's law, in our universe, the relative expansive speed V_p of any point P, which has a distance R_p to a certain spherical center, is equal to,

$V_p = H_o\, R_p$ (8)

From formula (3) and (4), on the Event Horizon of our UBH, when R_p prolongs to equal to R_{ub}, so, $V_p = C$, then,

$H_o{}^2 = 8\pi G\, \rho_o /3$ (9)

Since our universe has been a real UBH, it must be a close spherical body; so, $\mathbf{\rho_o}$ is the critical density of our UBH and is a sole value only decided by $\mathbf{M_{ub}}$ or $\mathbf{R_{ub}}$ from formulas (3) and (4).[2] However, the real density ρ_r is originated from the same observed H_o, i.e. $H_o{}^2 = 8\pi G\, \rho_r /3$. Certainly, ρ_r should be completely equal to ρ_o in formula (9), **because $\mathbf{\rho_o}$ and $\mathbf{\rho_r}$ are all come from the same $\mathbf{H_o}$.** So, **($\mathbf{\Omega = \rho_r/\rho_o = 1}$) is the innate nature of our UBH. Thus, $\mathbf{\Omega = \rho_r/\rho_o = 1}$ should conversely verify that our universe is a real UBH.**

D. Now owing to $R_{ub} < R_{uv}$ ($R_{ub} = 1.265\times10^{28}$cm, $R_{uv} = C\times A_u = 1.3\times10^{28}$cm), the farthest real boundary which can be observed by mankind is only the Event Horizon R_{ub} of our UBH, but not the Event Horizon R_{uv} of virtual M_{uv}.

If ρ_{ov} is defined by some theories other than the theory of BH as the critical density of our universe, strictly speaking, formula (3) cannot be adopted to determine ρ_{ov}, because the amounts of the real current M_{uv} outside our UBH can't be known. However, in modern cosmology, ρ_{ov} is just a presumed values, and calculated out on the assumption that M_{uv} and R_{uv} accord with formula (3). Thus, **M_{uv}, R_{uv} and ρ_{ov} would be artificially formed a new virtual UBH (M_{uv})** bigger than our current UBH with a definite $R_{uv} = C\times A_u$. That virtual UBH would be: $R_{uv} = 1.3\times10^{28}$cm, $M_{uv} = 8.77\times10^{55}$g, $\rho_{ov} = 0.95\times10^{-29}$g /cm^3. Therefore, **the so-called Ω has really become to $\Omega = \rho_r/\rho_{ov}$** $= 10^{-29}$g/0.95×10^{-29} = 1.05. **However, ρ_r/ρ_{ov} is a true proportion of two real densities of two UBHs, but not a proportion between real density and critical density of the same universe. Only owing to $R_{ub} \approx R_{uv}$, $M_{ub} \approx M_{uv}$, $\Omega = \rho_r/\rho_{ov} \approx 1$** at present, **it had been wrongly applied by most cosmologists as a discriminant to judge the future destiny of our universe: close universe or open universe. Since our universe is a real UBH as above demonstrations, it is a close universe. There is no significance to define Ω for any BH included our UBH.**

Therefore, our current visible universe is equal to our UBH-- M_{ub}, but not the virtual UBH-- M_{uv}.

If there'll be still much energy-matters enough outside our UBH (M_{ub}), after n years, M_{ub} will enlarge to the present virtual M_{uv}. n = $(R_{uv} - R_{ub})/C = (1.3\times10^{28} - 1.265\times10^{28})/3\times10^{10} = 3.7\times10^{8}$yrs. However, at that time, the age A_u of our universe won't be 13.7×10^9 yrs, but equal to $A_u + n = 14.07\times10^9$yrs.

E. The Event Horizon of our UBH, $2R_{ub} \le (2R_{uv} = 2C\times A_u)$. It shows that, the relative expansive speed V_{ub} of the Event Horizon of our UBH has exceeded light speed C on average (i.e. $V_{ub} \approx 2C$) all the way from Big Bang to the present.

F. The calculated age of our universe t_o: According to the old formula, $t_o = 1/H_o = 1/(0.73\pm0.05)\times100$kms^{-1}Mpc^{-1} $\approx 13.3\times10^9$ yrs, but according to the revised General Theory of Relativity (GTR), $t_o \approx 2/3\times1/H_o \approx 9\times10^9$yrs.

V. The accelerating expansion of our universe (AEOU) should be caused from collision between two UBHs in the early years.

From above demonstration, **since our visible universe is our UBH—M_{ub}, but not M_{uv}, thus, AEOU = AEOUBH (accelerating expansion of our UBH).**

The accelerating expansion of our universe (AEOU) was observed and demonstrated through the observations and calculations to the bursts of remote supernovas Ia. The AEOU happened about after 5×10^9yrs of the birth of our universe or about 9×10^9yrs ago. In this article below, the AEOU will be explained and demonstrated by the collisions between two universal black holes (UBHs).

Assuming that, **about 9×10^9yrs ago, our smaller UBH M_{ub1} collided with or dropped in another greater UBH M_{ub2},** what had happened since then? Of course, such collision was a long-term process.

Suppose M_{ub1} was the total mass of our smaller UBH, $R_{ub1}$was its Schwarzchild's radius, N_{o1} was numbers of MGBHs ($M_b \approx 10^{-5}$g, $R_b \approx 1.5\times 10^{-33}$cm, $T_b \approx 0.65\times10^{32}$K) to form M_{ub1}.

Suppose M_{ub2} was the total mass of the greater UBH, R_{ub2} was its Schwarzchild's radius.

The conditions after collision between M_{ub1} and M_{ub2} are analyzed as below.

A. Once our smaller M_{ub1} dropped in the greater M_{ub2} about 9×10^9yrs ago**,** from formula (7), so, $M_{ub1} + M_{ub2} = (R_{ub1} + R_{ub2})\, C^2/2G$, it is said, due to capturing M_{ub1}, M_{ub2} had to increase its Schwarzchild's radius to $(R_{ub2} + R_{ub1})$. Thus, M_{ub2} in Δt times got the expansive speed of its Event Horizon V_{ub22}, $V_{ub22} = R_{ub1}/\Delta t$. If the Event Horizon of M_{ub2} did not fully expand to R_{ub2} before collision, M_{ub2} should have a speed V_{ub21} of repercussions of initial Inflation. If there might be energy-matters outside swallowed in by M_{ub2}, it would get other expansive speed V_{ub23}. Then, **the total expansive speed of M_{ub2}'s Event Horizon V_{ub2} of M_{ub2} is: $V_{ub2} = (V_{ub21} + V_{ub22} + V_{ub23})$.**

B. Let's look back to our original M_{ub1}, once the original M_{ub1} dropped into M_{ub2} about 9×10^9yrs ago, it could swallow in energy-matters from M_{ub2}, from formula (7), **M_{ub} is our present UBH turned from M_{ub1}**, so, $M_{ub} = M_{ub1} + \Delta M_{ub12} + \Delta M_{ub13} = (R_{ub1} + \Delta R_{ub12} + \Delta R_{ub13})\, C^2/2G = R_{ub}C^2/2G$. If M_{ub1}did not fully expand to R_{ub1} before collision, M_{ub1}should have a speed of its Event Horizon V_{ub11} of repercussions of initial Inflation. Under the general condition, M_{ub1} could only swallow in ΔM_{ub12} from M_{ub2}, it would lead R_{ub1} more expand to ΔR_{ub12} and get expansive speed $V_{ub12} = \Delta R_{ub12}/\Delta t$. However, **due to that M_{ub2} had**

the total expansive speed V_{ub2} = (V_{ub21} +V_{ub22} +V_{ub23}), M_{ub2} could let M_{ub1} cause an additional space expansion ΔR_{ub13}, and led M_{ub1} swallow in more energy-matters ΔM_{ub13}. So, M_{ub1} could get an additional space expansive speed V_{ub13}= Δ R_{b13}/Δt. Thus**, the total expansive speed of M_{ub1}'s Event Horizon V_{ub1} of M_{ub1} is: V_{ub1}= V_{ub11}+ V_{ub12}+ V_{ub13}.**

Conclusion:

Due to that our smaller UBH M_{ub1} dropped in another greater UBH M_{ub2}, and M_{ub1} could swallow in energy-matters from M_{ub2} over 9 billion years. It can be seen that, the main reason of accelerating expansion of our smaller UBH should have swallowed too much energy-matters from M_{ub2} and got V_{ub12}. The secondary reason might be the space expansion V_{ub13} caused from the expansive speeds V_{ub2} of M_{ub2} after collision. If no that collision happened about 9×10^9yrs ago, the mass of our UBH would be a bit smaller than the original M_{ub1}, but not the current greater M_{ub}; its Event Horizon would be a bit smaller than $2R_{ub1}$, but not the current $2R_{bu}$, because the energy-matters lost by emitting Hawking radiations were extremely little. **Owing to $R_{bu} \approx C\times A_u$, it indicates that, the relative expansive speed of the Event Horizon of our UBH has almost been equal to 2C all the time**. Thus, according to the principle of formula (7), the original mass of our UBH was M_{ub1}, so, $M_{ub1}/ M_{ub} \approx (13.7\times10^9 - 9\times10^9)/ 13.7\times10^9 \approx 4.7\times10^9 /13.7\times10^9 \approx$ 34.3%, correspondingly, the original $R_{ub1}$of M_{ub1}, $R_{ub1}/R_{ub} \approx$ 34.3%; the increased mass after collision from about 9×10^9 years ago to the present is ΔM_{ub}, so, $\Delta M_{ub}/M_{ub} \approx 9\times10^9/13.7\times10^9 \approx$ 65.7%, the increased ΔR_{ub} of ΔM_{ub}, $\Delta R_{ub}/R_{ub} \approx$ 65.7%. Thus, $M_{ub} = M_{ub} = \Delta M_{ub}$, and,

$M_{ub} / M_{ub} \approx$ 34.3%, $R_{ub1}/R_{ub} \approx$ 34.3%

$\Delta M_{ub}/M_{ub} \approx$ 65.7%, $\Delta R_{ub}/R_{ub} \approx$ 65.7% (10)

VI. The different evolutionary processes and the same destiny of two kinds of black holes (BH),

A. The evolutionary processes of BHs collapsed from compact stars of mass $\geq 3M_\theta$,

After a compact supernova of mass $\geq 3M_\theta$ collapsed, its remains would become a BH; all mass should expand full of the whole spherical space of R_b. (annotation: most scientists considered that a Singularity existed at the center of any BH,[9] but author confirmed that no Singularity existed in nature and in any BHs at all.[1][2]). Then, According to Hawking's theory about BHs, if any energy-matters existed outside of a BH, they could be gradually and thoroughly swallowed into BH. In that process, BH would expand its volume and R_b, lower its temperature. Once no more energy-matters outside, BH would only emit Hawking Radiations to outside very slowly and simultaneously shrink its volume as well as raise its temperature. At last, such BH would contract into minimum gravitational BHs (i.e. MGBH, its $M_b \approx 10^{-5}$g, $R_b \approx 1.5\times 10^{-33}$cm, $T_b \approx 0.65\times10^{32}$K, see reference [1]). Once a BH contracted to MGBHs, it could contract its volume no more, but disintegrate and vanish at once at the most fierce burst, because the exclusive forces caused from the highest temperature in MGBHs had been much greater than the gravitational forces of all energy-matters. [10][1][2] It would be the common destiny of all BHs.

According to Hawking's theories about BHs, the lifetime τ_b (from the formation of M_b to MGBH) of a BH (its mass is M_b) is:

$\tau_b \approx 10^{-27} M_b^3$ (s) [11][1][2] (11)

For example, if a compact star of mass $\approx 3M_\theta$ collapsed to a BH and no energy-matters outside to be swallowed in, its lifetime $\tau_b \approx 2\times10^{65}$yrs.

$d\tau_b \approx 3\times10^{-27} M_b^2\, dM$ (s)[12][2] (11a)

Suppose our current UBH $M_{ub} = 8.5\times10^{55}$g, stop to expand its volume due to no more energy-matters outside and start to emit Hawking Radiations. After 1 year later, i. e. $d\tau_b$ = 1 year, the mass loss dM of our UBH in a year is about: $dM \approx 3\times10^7\times10^{27}/[3\times(8.5\times10^{55})^2) \approx 10^{-74}$g/yr.

B. The evolutionary processes of our real gigantic universal black hole (UBH).

The evolutionary process of our universe as a universal black hole (UBH--$\mathbf{M_{ub}}$) is different with above BHs collapsed from a compact star. Author had demonstrated in the past article <New Concepts to Big Bang And Black Holes—Both Had No Singularity at All (Part 1 and part II)>[1][2] that, our universe was born and evolved from the mergence and collision between the large amounts ($N_{ub1} = N_{ub2} = 8.5\times10^{60}$, see IV.) of the same original MGBHs, (its $M_b \approx 10^{-5}$g, $R_b \approx 1.5\times10^{-33}$cm, $T_b \approx 0.65\times10^{32}$K), but not born from Singularity confirmed by the most modern scientists. Just those mergence and collision created the Big Bang of our UBH[1] about 13.7×10^9yrs ago.

The future evolution of our universe as a UBH will depend on whether and how much energy-matters still exist outside of our UBH or no. If no energy-matters exist outside of our UBH at present, our UBH can only emit Hawking radiations, and gradually lose its mass M_{ub} now available. After emitting Hawing radiations in a extremely long period of time, our gigantic UBH will finally contract to MGBHs of 10^{-5}g and instantly vanish at the strongest burst, which will happen after τ_b years, $\tau_b > 10^{-27} M_{ub}^3 = 10^{-27}\times(8.5\times10^{55})^3 > 10^{133}$yrs.

However, our universe has still expanded. It shows that there are large amounts of energy-matters outside of our UBH. Therefore, our UBH will gradually swallow in all energy-matters outside. After that, our UBH will stop to expand and only emit Hawking radiations until it finally contract to become MGBHs of 10^{-5}g and instantly vanish at the strongest burst.

Although two kinds of BHs would have its respective different evolutionary processes, but their final destiny should be the same, they could only contract into MGBHs of 10^{-5}g and instantly vanish at the strongest burst.

C. What did the super-massive BHs (its mass ≈ 10^9M_θ) in the center of every cluster of galaxy come from? They might be all born at the same time with our UBH and formed by much less numbers of the same MGBHs than numbers of our UBH. Just those much smaller BHs as the core of the clusters of galaxies could attract so much energy-matters outside its Event Horizon and swallow in outside energy-matters to become gradually the current super-massive BHs in the universal age A_u. Just their existences and evolutions might lead the appearance of Quasars and lead the galaxy formation in the remote past. Their evolutionary process and final destiny in future will be the same with above two kinds of BHs, but their lifetimes will be between lifetimes of both.

BHs collapsed from compact stars would impossible grow up to a super-massive BH of mass ≈ 10^9M_θ in our universal age A_u, because each of them does not locate in the center of its cluster of galaxies or galaxy, they are all lack of food. In addition, their ages are all too young.

VII. In our universe, all energy-matter particles always have their respective gravitational forces and the exclusive forces produced by their heat energy, which have been the natural antagonist of gravitational force. Dark energy of exclusive force is not needed and can not really exist.

In our universe, any BHs included our UBH are all the stable entities of extremely long lifetime. Since it is so, the stability and balance inside every BH is very important. In the universe, every energy-matter particle has its mass (gravitational force) and heat energy (temperature) together, even neutrinos and lights are no exceptions (any light has its equivalent mass m_s, $m_s = h/C\lambda$, for heat, $m_s = \kappa T/C^2$). Gravity and heat pressure always form a pair of contradictions co-existed in any particle. Thus, the stability of any BH is the result of the antagonisms and balances between gravitation and heat pressure inside BH.

In any original nebulas or nebulous clusters of our UBH, at any point, under the condition of ideal spherical symmetry, the gas heat pressure P and gravitational force of a particle m_s should be considered as a state of heat-dynamic equilibrium. ρ—density, G—gravitational constant. κ-- Boltzmann's constant, R—distance between the center of M and m_s, M—the total mass in sphere of R,

$dP/dR = -GM\rho/R^2$ [8][2] (12)

$P = n\kappa T = \rho\kappa T/ m_s$ [8][2] (13)

In our universe, since formulas (12) and (13) can be universally applied to the gas states of any galaxies and clusters of galaxies, it doesn't matter whether a super-massive BH may exist in their center or not. **They had been already applied with other equations of border conditions by author to successfully solve many difficult problems in general BHs and our UBH[2].** Both formulas show that, in our UBH, only the exclusive forces of heat energy are always and forever resisting the shrinkage of gravitational forces of energy-matters. Even white dwarfs and neutron stars are all the results of stability between the gravitational forces and heat pressure under some special conditions (see Tolman-Oppenheimer-Volkoff's equation). In the universe, the disintegrated explosions of anything are all the results of its heat pressure inside much greater than its gravitational forces.

In our universe, except gravitational force, there are other three forces, i.e. electric force, weak force and strong force. They may integrate particles into some very solid body in the extremely short distance; such as diamonds, white dwarfs, and neutron stars. However, **only the various balances between**

gravitational force and heat pressure would play a decisive role in the process of universal evolutions. Enough large amounts of energy-matters in high density could crash any solid bodies included neutron stars into particles or continuously collapse into black holes (BH). Once after a big compact star collapsed to a BH, its outside always had much energy-matters for being swallowed in, so, it would no more shrink but conversely expand its volume. **Only the extra-high temperature turned from the gravitational collapse can resist or defeat the further gravitational contraction in BHs.**

In reality, BHs in different size are just the results of the balances between the different heat pressure and the different gravitational force of energy-matter particles.

Thus, in reality, in our universe, the dark energy of exclusive force would not be needed at all for resisting the gravitational force.

VIII. The further analyses and conclusions are demonstrated as below:

Although above demonstrations and calculations are almost qualitative analyses, but not precise and complete quantitative analyses. However, some reliable and significant conclusions can be still drawn out as follows.

A. According to above calculations, under the condition of the current age of our UBH, $A_u = 13.7\times10^9$ years, the **average expansive speed V_{ub1} on the opposite side of Event Horizon of our UBH had almost reached 2C**, i. e. $V_{ub1} \approx 2C$ (on average) or $R_{ub} \le (C\times A_u = R_{uv})$. It shows that, the mass center of our UBH has time enough to transmit its central gravitational forces to the energy-matters on the whole Event Horizon. Thus, $(R_{uv.} = C\times A_u \ge R_{ub})$ is the necessary condition to maintain the stability of our UBH at present, so, our whole UBH inside can keep Flatness and Evenness. Once if $R_{ub} > R_{uv}$, it shows that, the energy-matters of some parts $(R_{ub} - R_{uv})$ in our UBH could not be effected by the gravitational forces of mass center, the whole UBH would not be stable.

B. Two different expansions of our UBH happened in its whole evolutionary process. The expansion of ($V_{ub1} > 2C$) might only happen due to the space expansions of our UBH. For example, $V_{ub1} >> C$ happened at the Inflation just after Big Bang, because at that moment the expansion of our UBH was created by the mergence of large amounts of the same minimum gravitational BHs (i.e. MGBHs, its mass = 10^{-5}g),[1] their instant mergence created the **whole space Inflation** of our new born UBH. It is completely different with the **expansion of Event Horizon of our UBH,** which is caused only by swallowing in energy-matters outside, such expansion **hardly cause ($V_{ub1} > 2C$) as well as ($R_{uv} < R_{ub}$)** [see formula (6b), $V_b \le 2C$].

C. **If no collision between our original UBH (M_{ub1}) and M_{ub2} happened about 9 billion years ago and if no energy-matters outside to be swallowed in, M_{ub1} was just an isolated UBH**. (a). It could only have a decelerating expansion by the repercussions of initial Inflation after Inflation up to sufficient expansion. Then, R_{ub1} could reach to $R_{ub1} = 2GM_{ub1}/C^2$, $V_{ub1} = 0$**,** and expand no more; but started to shrink its volume by sustained emitting Hawking Radiations. Such conditions should just happen 9 billion years ago, because according to formula (10), $M_{ub1}/ M_{ub} \approx 34.3\%$, $R_{ub1}/R_{ub} \approx 34.3\%$. (b). After that, M_{ub1} would extremely slowly decrease its mass until M_{ub1} contracts to MGBHs of 10^{-5}g and instantly vanish at the strongest burst. Thus, **our original UBH (M_{ub1}) would have no way to get the accelerating expansion after Inflation to its vanishing point.**

D. Since $R_{ub} \approx C\times A_u$ is a total value and $V_{ub1} = 2C$ is a average value in our real universal age A_u, as a result, the conditions of ($V_{ub1} > 2C$ or $V_{ub1} < 2C$) could appear in some different special periods**. The space expansion of our UBH exceeding light speed of ($V_{ub1} > 2C$) should happen two times in our universal age A_u. (a).** The greatest accelerating expansion of $V_{ub1} >> 2C$ happened at the instant of Inflation after Big Bang. The space Inflation was created by the mergence of large amounts of the same MGBHs (its mass = 10^{-5}g). (b). $V_{ub1} > 2C$ might happen again in the early period of collision. Just our original smaller UBH--M_{ub1} collided with and dropped in another greater UBH--M_{ub2} about 9 billion years ago, it let M_{ub2} have a great expansive speed V_{ub2}, and lead our M_{ub1} get a ultra space expansive speed V_{ub13}**.** In addition, M_{ub1} could get another expansive speed V_{ub12} due to swallowing in energy-matters from M_{ub2}. Just ($V_{ub13}+V_{ub12}$) could cause the accelerating expansion of our UBH(M_{ub1}) and might let $V_{ub1} > 2C$ (see paragraph V). Thus it can be seen, **only the mergence or collision of BHs might probably cause the space expansion and probably let the expansive speed (V_{ub1} > 2C) sometimes, and might probably create (R_{ub} > R_{uv}) temporarily.**

E. (a).Since V_{ub1}>2C had happen two times in our universal age A_u,, for keeping $R_{ub} \approx C\times A_u$, [$V_{ub1}$<< 2C or $V_{ub1} \rightarrow 0$] should have definitely happened in a long-term period before collision of our original UBH(M_{ub1}). **After Inflation, owing to no energy-matters swallowed in by M_{ub1}, M_{ub1} could only do** a **long-term deceleration by the repercussions of initial Inflation all the way** and finally reached the sufficient expansion of R_{ub1} before collision. If M_{ub1} = 34.3%M_{ub} now available [see formula (10)], R_{ub1} would expand from R_{ub1} <<<34.3% R_{ub} after Inflation to R_{ub1} = 34.3% R_{ub} before collision. At the time of R_{ub1}= 34.3% R_{ub}, R_{ub1} had reached to the expansive limit, i.e. $V_{ub1}\approx 0$. Such conditions are with the same of above (a) of C. (b).**Thus, after collision about 9 billion years ago, owing to the space expansion and swallowing in much energy-matters enough caused by collision, V_{ub1} of our UBH (M_{ub}) had to have an accelerating process from ($V_{ub1}\approx 0$) to (V_{ub1} > 2C)** for keeping $R_{ub} \approx C\times A_u$**.** (c). Of course, if the accelerating expansion of our UBH (M_{ub}), which was turned from M_{ub1} after collision, reached to the limit of V_{ub1}>2C, M_{ub} would be closely followed by a decelerating expansion from the limit of V_{ub1} > 2C to $V_{ub1} \approx$ 2C some time or other, for example, it happened 7 billion years ago. Probably some alternate expansions might happen several times. (d). From then to the present, owing to much energy-matters enough outside to be swallowed in, our UBH could keep the expansive speed of $V_{ub1} \approx$ 2C all the way.

From above D and E, it can be seen, just a long-term deceleration before collision and acceleration after collision had happened, then, the observations could show the obviously accelerating expansion of our UBH about 9 billion years ago and later.

F. If our original UBH (M_{ub1}) at the birth was just equal to the current M_{ub}, i.e. M_{ub1}= 100% M_{ub} now available, if no collision between UBHs had happened any time and if no energy-matters to be swallowed in all the time; what a evolutionary image of our UBH might happen? (a). The Inflation of our newborn UBH after Big Bang would lead to the Event Horizon R_{uv} of our visible universe much smaller than the original R_{ub} of our UBH, i.e. R_{uv} <<< R_{ub}. (b). After that to the present, the deceleration of V_{ub1} from V_{ub1}>> 2C to V_{ub1} << 2C until V_{ub1}= 0; so, the original R_{ub} might be the decelerating expansion all the way due to repercussions of initial Inflation until $R_{ub} = 2GM_{ub}/C^2$ and V_{ub1}= 0 at present. (c). Owing to the increase of R_{uv} proportional to the growth of our universal age A_u ($R_{uv} = C\times A_u$), it could finally let R_{uv} catch up to R_{ub} of decelerating expansion, i. e. $R_{uv} = R_{ub} = C\times A_u$ and V_{ub1}= 0, which was the completely sufficient expansion of R_{ub}. (d). After that, R_{ub} would expand no more, but start to shrink its volume due to emitting Hawking Radiations until the final disappearance. It is said, **in this fictitious model, only the sustained decelerating expansion of our UBH would exist after Inflation to the present due to the repercussions of initial Inflation, no accelerating expansion appeared at any time. It may indirectly indicate that the collision of our UBH (M_{ub1}) with another UBH (M_{ub2}) might truly happen about 9 billion years ago.**

G. Suppose there was other evolutionary mode of my UBH. If our original UBH was extremely small at the birth of the universe, its continuous growth from the birth to the present only depended on swallowing in the very large amounts of energy-matters outside to keep its expansive speed of Event Horizon V_{ub1} = 2C at every moment, i.e. $V_{ub1} \equiv$ 2C. Thus, such expansive mode could also maintain $R_{ub} \equiv R_{uv} \equiv C\times A_u$= 1.3×10^{28}cm at present. However, in this evolutionary mode, no accelerating or decelerating expansions happened, and no Inflation after Big Bang happened too. Therefore, this evolutionary mode did not accord with the real conditions of our UBH, because no Inflation after Big Bang was impossible.

After reviewing the different evolutionary modes of our universe from sections C to G**, only the conditions of section E better accorded with the real evolutionary process of our UBH. It clearly shows that the accelerating expansion of our universe was caused from the collision between two UBHs about 9 billion years ago**.

H. $R_{uv} = C\times A_u = 1.3\times10^{28}$cm, it originates from the supposition of $A_u = 13.7\times10^9$ years. However, R_{ub} = 1.265×10^{28}cm, it originates from the supposition of Hubble's constant $H_o = (0.73\pm0.05)\times 100 kms^{-1}Mpc^{-1}$. The values of both R_{uv} and R_{ub} are so much close and almost equal to the same value, it let us have no way to judge accurately whether the current expansive speed V_{ub1} of the Event Horizon of our UBH will still keep 2C or has started to slow down to a little slower than 2C. The former case shows that, there will still be very much energy-matters of M_{ub2} outside for being swallowed in by our UBH at present; the latter case shows that, the energy-matters of M_{ub2} outside of our UBH have reduced [see formulas (6b) and (6c)].

I. The very large amounts of ΔM_{ub} swallowed in from M_{ub2} by our original UBH (M_{ub1}) after collision about 9 billion years ago would completely turn into energy inside our current UBH. However, from formula (10), ΔM_{ub} / M_{ub} = 65.7%, and M_{ub1}/ M_{ub} =34.3%. **Have all ΔM_{ub} changed into so-called dark energy of gravitational force in our current UBH? Do all current visible and dark matters of our UBH come from the original UBH M_{ub1}?** How shall we imagine about dark energy**,** if our original UBH--M_{ub1} = 26% M_{ub} = $T^1\mu\nu + T^2\mu\nu$ (see paragraph II), and ΔM_{ub} = 74%M_{ub} = $T^3\mu\nu$?

J. No matter how much energy-matters of M_{ub2} remain, but they are limited after all. Once M_{ub2} is completely swallowed in by M_{ub1} in future, then, the future M_{ub} = M_{ub1} + M_{ub2}, and the future R_{ub} = R_{ub1} + R_{ub2} = (M_{ub1} + M_{ub2})2G/C^2. At that time, R_{ub} will reach to complete expansion, V_{ub} = 0. Then, M_{ub} will start to contract itself by emitting Hawking Radiations until it finally become MGBHs of 10^{-5}g and at once vanish at the strongest burst.

-----The End------

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