HOW A BLACK HOLE UNIVERSE THEORY MIGHT RESOLVE SOME COSMOLOGICAL CONUNDRUMS

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Proposed Running Head: A New Theory of Cosmology Based on the 2013 Planck Survey

ABSTRACT

Estimates for visible universe radius, mass, and average density, derived from data from the 2013 Planck Survey, fall tantalizingly close to logarithmic projection lines for Schwarzschild black holes (Tatum, 2015). Since the estimated mass and average density numbers derived from this survey are for baryonic ("ordinary") matter only, even conservative estimates for mass and average density contributions from dark matter would appear to project the total mass and average density numbers among the numbers one would expect for a giant black hole the size of our visible universe. It is worth asking whether these findings are merely coincidental and of no significance or whether they hold a deeper, heretofore hidden, significance for our universe. This paper attempts to address this question in a scientific way, interjecting along the way some of what we think we know about black holes and what we definitely do not know about them. Particular attention is given to how a black hole universe theory would appear to resolve some longstanding cosmological conundrums, including the possible nature of dark energy, the cosmological constant problem, the flatness problem, and the black hole information paradox. In addition, the nature of the ubiquitous ratio c^2/G is briefly discussed as a potential link between relativity and quantum mechanics.

Key Words: Black Hole, Visible Universe, Planck Survey, Dark Matter, Dark Energy, Cosmological Conundrums, Quantum Gravity, Cosmological Constant Problem, Flatness Problem, Black Hole Information Paradox Infinite Singularity Problem, Cosmological Redshift

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Estimates for visible universe radius, mass, and average density, derived from data from the 2013 Planck Survey, fall tantalizingly close to logarithmic projection lines for Schwarzschild black holes (Tatum, 2015). Since the estimated mass and average density numbers derived from this survey are for baryonic ("ordinary") matter only, even conservative estimates for mass and average density contributions from dark matter would appear to project the total mass and average density numbers among the numbers one would expect for a giant black hole the size of our visible universe. It is worth asking whether these findings are merely coincidental and of no significance or whether they hold a deeper, heretofore hidden, significance for our universe. We should at least entertain the question, "What could it possibly mean if our universe was a particularly large black hole?" This paper will attempt to address this question in a scientific way, interjecting along the way some of what we think we know about black holes and what we definitely do not know about them. Particular attention will be given to how a black hole universe theory would appear to resolve some longstanding cosmological conundrums.

The first obvious question to ask about black holes is whether they even exist. This question has been seriously entertained by scientists ever since black holes appeared to be a mathematical solution to Einstein's equations for general relativity. Since this paper is not meant to be a historical review article on the existential debate concerning black holes, suffice it to say that the majority of modern astrophysicists and cosmologists have convinced themselves of the existence of black holes ranging from very small (even microscopic) up to supermassive galactic in size. In fact, there is now very persuasive scientific evidence that most, if not all, galaxies have a very large black hole at their center.

Particularly with respect to this paper, there are two very important questions about black holes which appear to be unresolved: "What is the upper size limit for a black hole" and "What must the inside of a black hole be like?"

The author is not aware of a convincing argument for an upper size limit for any type of black hole. Theoretically, one could start with a hydrogen gas cloud of any size greater than about 10 solar masses and have it gravitationally collapse into an ever-enlarging black hole, for however long there is mass falling across the event horizon or sufficient mass-energy applied by dark energy. For later discussion, the reader should keep in mind this concept of an ever-enlarging black hole as a potential model for our own universe (particularly with respect to theoretical "white holes").

But what do we make of the fact that we have not observed black holes larger than the galactic supermassive variety? Certainly, we know that absence of evidence is not necessarily evidence of absence. For reasons given in the author's Journal of Cosmology companion paper (Tatum, 2015), it may be that we have not observed black holes considerably larger than the galactic supermassive variety because such giant black holes might be expected to have features (including lack of a significant accretion disc and a nearly flat topology owing to extremely low average density) which would likely make them virtually impossible to detect from Earth.

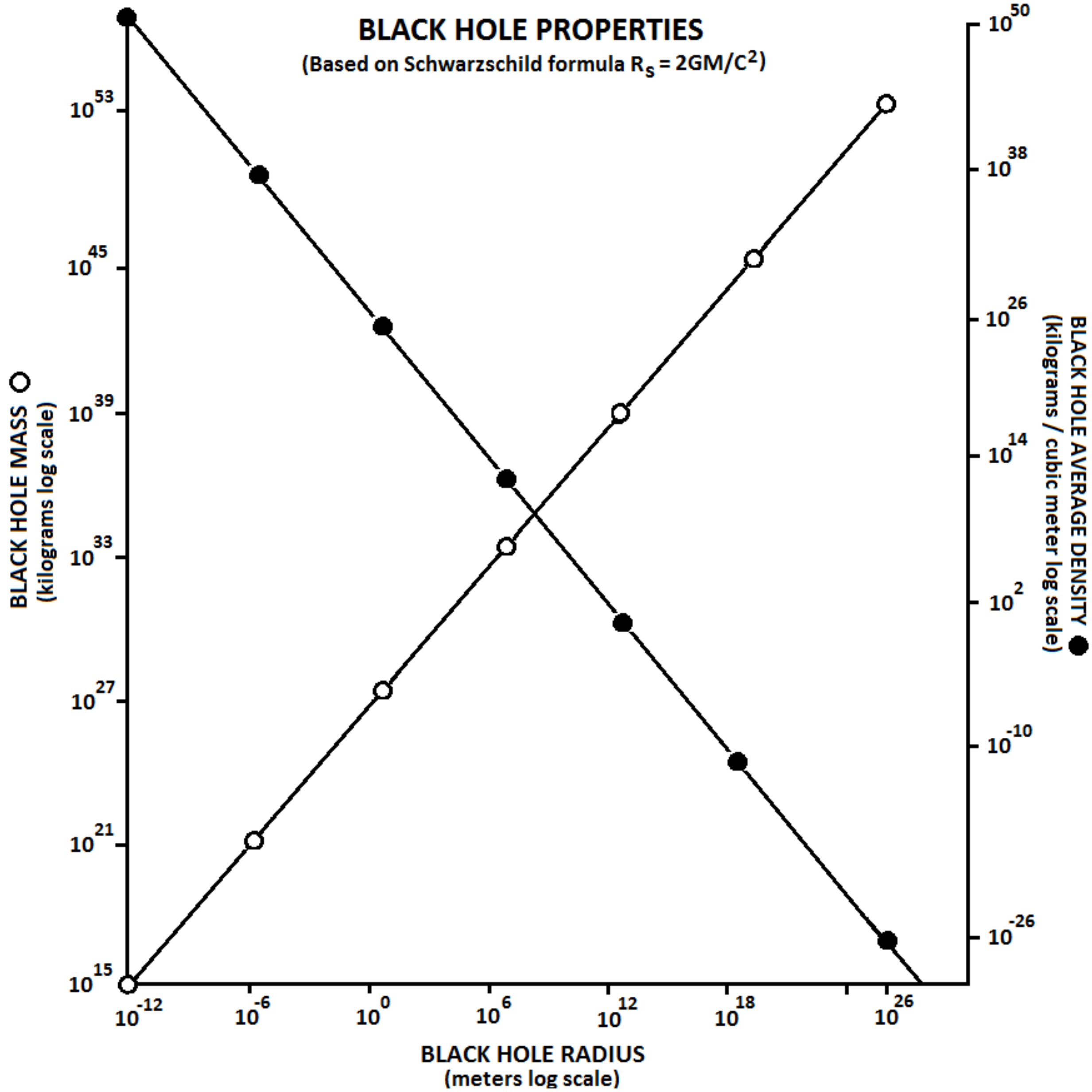
As for the question regarding the interior conditions of a black hole, one can only approach the answer using current theory, since direct observation of the interior from outside the event horizon is, by the definition of a black hole, impossible.

For the purpose of this paper, the interior of a black hole is defined as everything inside the event horizon, since this is the entirety of the unknown territory of any black hole of any size. To restrict all attention to the state of space-time at the geometric center of a black hole (an infinitesimal part of this unknown territory) is considered to be an intellectual trap and too limiting for this theoretical discourse. While a microscopic black hole would be expected to have extremely high internal density, pressure, and temperature (with corresponding Hawking radiation), progressively larger giant black holes would be expected to have opposite internal features, as shown in Table 1 and Fig. 1 of this author's companion paper. For convenience, they are reproduced on the following pages.

TABLE 1

BLACK HOLE FEATURES FOR A GIVEN SCHWARZSCHILD RADIUS			
RADIUS (METERS)	MASS (Kg) ($M = c^2R/2G$)	DENSITY (Kg/m^3) ($3c^2/8piGr^2$)	RELATIVE INTERNAL TEMP
10^{-12}	$.675 \times 10^{15}$	1.61×10^{50}	Extremely High (10^9 K?)
10^{-6}	$.675 \times 10^{21}$	1.61×10^{38}	Less Extremely High (10^8 K?)
10^{0}	$.675 \times 10^{27}$	1.61×10^{26}	Exceedingly High (10^7 K?)
10^{6}	$.675 \times 10^{33}$	1.61×10^{14}	Moderately High (10^6 K?)
10^{12}	$.675 \times 10^{39}$	1.61×10^{2}	Cool (10^2 K?)
10^{18}	$.675 \times 10^{45}$	1.61×10^{-10}	Extremely Cold (10 K?)
10^{26}	$.675 \times 10^{53}$	1.61×10^{-26}	Near Absolute Zero (2.7 K?)

FIGURE 1


BLACK HOLE PROPERTIES
(Based on Schwarzschild formula $R_S = 2GM/C^2$)
BLACK HOLE MASS (kilograms log scale)
10^{15}
10^{21}
10^{27}
10^{33}
10^{39}
10^{45}
10^{53}
BLACK HOLE AVERAGE DENSITY (kilograms / cubic meter log scale)
10^{50}
10^{38}
10^{26}
10^{14}
10^{2}
10^{-10}
10^{-26}
10^{-12}
10^{-6}
10^{0}
10^{6}
10^{12}
10^{18}
10^{26}
BLACK HOLE RADIUS (meters log scale)

For reasons given in the companion paper, there is good reason to believe in the relative comparisons within the internal temperature column of Table 1, despite the guesswork as to the absolute magnitude of these temperatures. It is also interesting to note that the smooth progression from extremely small, dense and hot to extremely large, sparse and cold follows the commonly accepted forward sequence of standard big bang cosmology.

General relativity makes no distinction between the two directions of time. A typical metaphor for this is a frame-by-frame movie which can project in either forward or reverse sequence. This time-reversal aspect of general relativity opens the way for consideration of a theoretical "white hole," a black hole derivative which reverses direction and spews matter and space-time outward in all directions. According to Alan Guth, in his book, The Inflationary Universe, a white hole singularity is exactly the kind of initial singularity that was hypothesized in the standard form of the big bang theory (Guth, 1997, p. 265). All that was presumably needed was for cosmic inflation to fix the flatness problem. Furthermore, Alan Guth hypothesized that something short of an infinite singularity, somewhere around 10^{93} grams per cubic centimeter, might be the density condition sufficient to generate the false vacuum necessary for cosmic inflation, which “would be expected to occur at about 10^{19} GeV” and be “associated with the unification of gravity with the other forces.” (Guth, 1997, p. 268).

Lately, other cosmologists have given serious consideration to the concept of a white hole. A July 25, 2014 article from RT News, entitled “Mysterious black holes may be exploding into white holes,” reported an interview with Nature science writer Ron Cowen and physicists Carlo Rovelli and Hal Haggard from Aix-Marseille University (Cowen, 2014). They hypothesize that a black hole might reach a point where it cannot collapse any further, and ultimately reverses the process, expelling its contents outwards. They postulate that gravitational time dilation prevents those of us on the outside of the event horizon from being able to witness such an event (or to experience simultaneity of events outside and inside the event horizon).

Given the above theoretical considerations along with the properties of progressively larger black holes (Table 1), one could, with a little imagination, picture the inside-the-event-horizon perspective of an ever-growing black hole to be much like what is postulated for our universe at each stage of big bang cosmology, however, with the exception that a hyper-rapid period of cosmic inflation would appear to be unnecessary to achieve the topological flatness of a giant universe size black hole. The latter effect might be achieved over whatever time scale it takes for such a black hole to accumulate mass-energy and grow. A hyper-rapid exponential growth phase is not necessary for a black hole to achieve any particular size. It is believed that the growth rate of a black hole depends entirely upon its feeding schedule of mass-energy. As such, one could not look at a black hole and tell exactly how old it is. Two absolutely identical black holes, as viewed from the outside, may have widely divergent conventional chronological ages, due to widely divergent feeding schedules. A giant black hole the size of our universe could, in theory, have all the time in the world to achieve such a size and topological flatness, and not necessarily be accurately aged by our present day standard of Earth years.

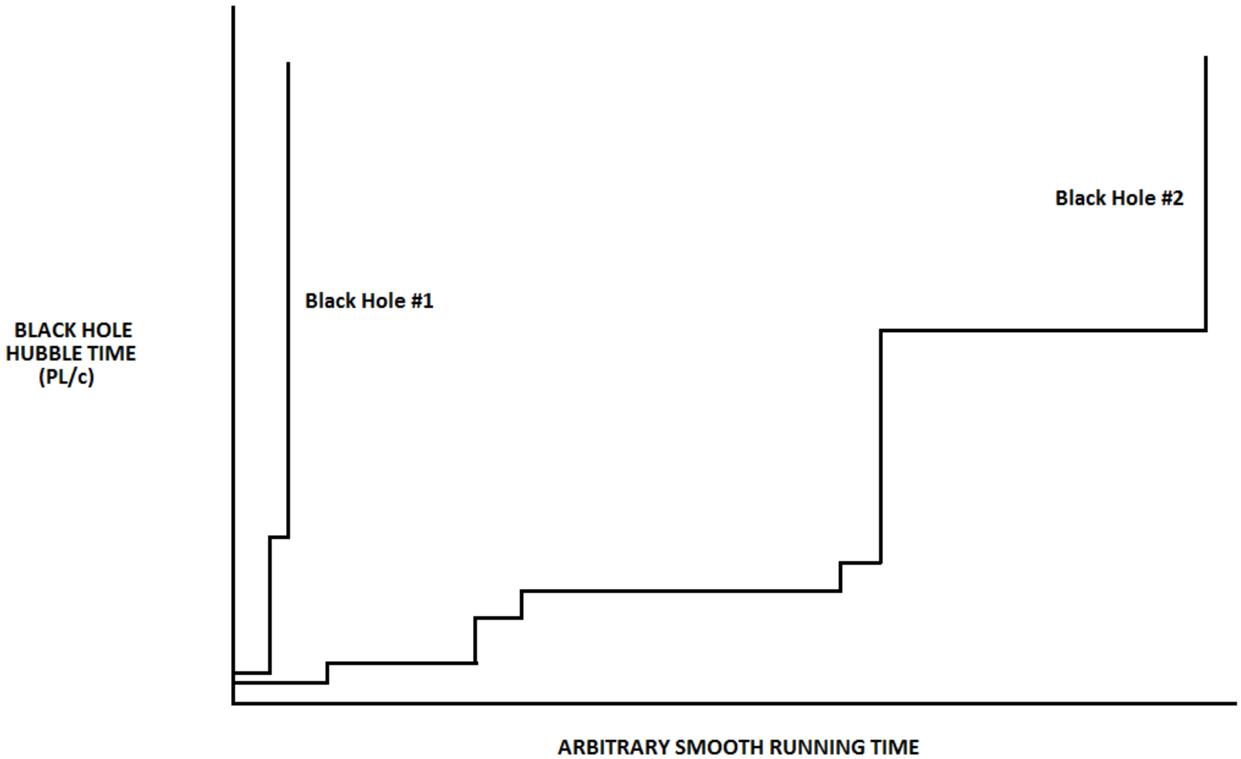
One might argue that the most recent (Planck) survey to determine the latest value of the Hubble parameter would indicate a universal age of 13.78 billion years. However, one can calculate a theoretical Hubble parameter for the inside of a black hole as follows: if we assume a universe size black hole of the proper length radius (PL) of 13.78 billion light-years (1.3×10^{26} meters), and a velocity c (for central mass velocity relative to stationary photons along geodesics orthogonal to the event horizon), we can adopt a Hubble formula for the inside of a black hole (H_o = c/PL) to give us a value of $3 \times 10^8/1.3 \times 10^{26}$, which equals 2.3×10^{-18} s^{-1}, which converts to 71.28 (km/s)/Mpc. This value is comparable to the most recent observational Hubble parameter value of 67.8 (km/s)/Mpc, in part because it makes use of a proper length value derived from the observational data. However, the use of c/PL in this particular type of calculation is believed to be unique. It also points to the distinct possibility that the so-called "cosmological redshift" may actually be gravitational redshift, and have nothing to do with superluminal "stretching" of space-time. It is interesting that the above calculation uses special relativity theory (speed limit c) for a general relativity object (black hole) and appears to approximate an observational Hubble parameter by modelling the inside of a giant black hole the size of our universe!

The point of the last paragraph is that a giant black hole of a given radius (more specifically its proper length corresponding to speed limit c) has an associated calculable Hubble parameter which simply relates to its size, no matter what its chronological age is according to some arbitrary smooth-running clock. It is also obvious that a black hole Hubble parameter calculated in this manner would necessarily decline in value with every increase in radius (i.e., c/PL decreases at a rate depending upon the mass-energy feeding schedule of the black hole). If it were to take in more mass-energy, thus increasing its mass and radius, its Hubble parameter would be expected to decrease accordingly. As an aside, it is interesting to note that measured Hubble parameters have shown a declining trend over the past century, although this is almost certainly an artifact of differing measurement procedures, rather than a real decline in the parameter in such a short period of time.

The inverse Hubble parameter (PL/c), called Hubble time, increases in direct proportion to the proper length radius, creating an illusion that it is a measure of smoothly continuous time since the origin of the black hole universe. However, as we can see by Fig. 2 (below) of black hole Hubble time vs. arbitrary smooth running time (say, measured by a mechanical or orbital clock), two black hole universes at the same value for Hubble time (i.e., the same mass and radius) can have vastly different times as measured by the clock. If our universe were in fact a giant black hole, the notion that it is exactly 13.78 billion years old might have to be reconsidered.

FIGURE 2

Black Hole Hubble Time vs. Arbitrary Smooth Running Time



Possible Implications of a Black Hole Multiverse Theory

By definition, a black hole universe starts out in a parent universe. Its new matter has to come from outside the event horizon. Whether or not one chooses to call the entire structure a nested (as opposed to parallel) multiverse is a matter of semantics. Suffice it to say, the parent universe supplies the child black hole universe with a one-way flow of matter, energy and time. In addition, general relativity (in particular, gravitational time dilation) necessitates that the relative time of the parent universe passes quickly in relation to the child black hole universe as the feeding process continues. Whether the parent and child could be part of an infinite hierarchy of giant black hole universes is, of course, a matter of speculation. However, if the parent universe were not also a giant black hole universe, one would inevitably return to the most fundamental question in cosmology: "How did the (parent) universe come about?" This is always the problem with finite multiverse theories. One eventually gets back to the fundamental question of cosmology, like a dog chasing its tail.

Gravitational time dilation allows a perspective from the inside of a giant black hole to be one of an entirely new universe compared to the parent universe, one with a relative oceanic time scale in comparison. With a little imagination, one could picture a "fractal black hole multiverse," an infinite hierarchy of nested black hole universes in which the relative time perspective is defined by which side of the black hole event horizon you are on. If you are the outsider, your life passes in a flash in relative comparison to the insider. And if the insider's own black hole universe has black holes of its own, he/she would be the rapidly ageing outsider to the slowly evolving and mass-accumulating universes within those black holes, etc., etc. Matter and time would only flow in the direction from any parent black hole universe to any child black hole universe. In this way, one can imagine an infinity of self-similar and yet different hierarchical universes, each preceding one dissipating into "heat death" at the end of its own (relatively short) time. It would, in fact, be this flow of mass-energy and time into the child universe which would enlarge that particular black hole universe. Although this would seem to be a violation of conservation of mass-energy for any one universe (if it were mistakenly assumed to be a closed system), there would be no such violation for the multiverse as a whole. There would also be no violation of the second law of thermodynamics, because heat cannot flow back out from the inside of a giant black hole, which should have a Hawking temperature approximating absolute zero. One may think of a fractal black hole multiverse as somewhat like an endless series of waterfalls relentlessly cascading from one into the next, with each preceding (higher) waterfall dissipating as the next (lower) one grows.

The gravitational time differences of parent and child giant black hole universes offer a way to better understand dark energy. The temporal and unidirectional nature of the relationship implies that the parent universe expires (dissipates) before the child. What this means is that the inevitable progression towards an absolute zero temperature universe in a pure vacuum state ("heat death") would necessarily occur first in the parent. One can see that this process would gradually but continuously apply vacuum energy (dark energy) to the child universe. Thus, gravitational time dilation may be the reason why vacuum energy is not an all or none phenomenon. The "cosmological constant problem" may see a solution in this model. Particle physicists have been deeply puzzled by the apparent difference between the calculated energy density of a pure vacuum and the measured vacuum energy density, a difference which is in the range of approximately 120 orders of magnitude (10^{120}) (Weinberg, 1989). This has been one of the most vexing problems in cosmology. But, frankly, there is no reason why the parent universe should have such a vastly different vacuum energy density in comparison to the black hole child. The only expectation is that there be at least a vacuum energy gradient of some sort, however slight. It should also be noted that the 2013 Planck Survey showed data in support of a constant value for dark energy lambda, refuting the idea of quintessence. In the currently-postulated black hole model, continuous growth of the black hole should occur from accumulation of the dark energy mass equivalent, even after all surrounding mass objects have been ingested.

Furthermore, the "black hole information paradox" could be resolved by the idea of a fractal black hole multiverse, since information passing into a black hole is not lost, but just passed from one universe to the next within the multiverse.

A rearranged equation of the Schwarzschild formula, $M/r_s = c^2/2G$, shows that a black hole of any size, at equilibrium, has a constant value for M/r_s, equaling approximately 0.675×10^{27} kg/m^3. With respect to incorporating quantum gravity into a black hole universe theory, c^2/G is a very interesting number. The constant c^2 is actually a ratio of two constants in its own right (K_e from Coulomb's constant of electrostatics and K_A from Ampere's force law of magnetism), so that c^2/G can also be regarded as a construct of three large scale constants of nature (electricity/magnetism/gravity). Furthermore, string theorists will recognize that c^2/G is the ratio of the Planck mass [$(hc/G)^{1/2} = 2.17651 \times 10^{-8}$ kg] to the Planck length [$(hG/c^3)^{1/2} = 1.6162 \times 10^{-35}$ m)], where h in this case is the reduced Planck constant. So $m_P/l_P = c^2/G = K_e/K_A/G$, all of which equal approximately 1.35×10^{27} kg/m. It seems important that a ratio which is characteristic for a particular type of black hole, and is comprised of three large scale constants of nature, equates with a ratio derived from quantum mechanics.

The ratio of Planck mass to Planck length is sometimes called the Planck tension. One can also think of kg/m as units of mass-energy per unit length. This can be thought of as mass-energy compacted into a single dimension, which is what one might expect for the most compact state of matter and energy at the center of the classic black hole. This would not be a true singularity of infinite properties, but perhaps the closest nature can come to it. Could it be that the formula used for simple black holes of any measurable size ($M/r_s = c^2/2G$) in some way reflects a transition from the most compacted state of mass-energy?

It seems to this author that the ratio c^2/G might provide a useful link between relativity and quantum mechanics. For instance, the M/r_s ratio might be expected to hold all the way down to the level of the singularity. The "infinite singularity problem" in general relativity equations basically boils down to the (1-2GM/r) term, where all hell breaks loose when we consider the radius of the cosmological object, in isolation, as it approaches zero. However, if one is considering a black hole, one cannot treat its radius in isolation! Notice the M/r value in this term. So, substituting $c^2/2G$ for M/r gives $[1 - 2G(c^2/2G)]$, which reduces to $(1 - c^2)$ for the topological curvature of the cosmological object, <u>but only for a black hole or related object (MECO?)</u>. This should be the most extreme (hyperbolic) curvature of the black hole singularity, but it is most certainly not infinity. Thus, the recognition that black holes have a fixed M/r ratio avoids the "infinite singularity problem" entirely.

As for making any predictions from a black hole universe theory, one could surmise that the signal event from the formation of our particular universe (in a larger multiverse) would likely be detectable in the form of gravity wave distortion of the cosmic microwave background (CMB) radiation pattern, originating from the initial formation of our black hole. Whatever one wishes to call this most compacted possible state of mass-energy (not the mythical infinite singularity), it would be expected to ring like a bell in the form of space-time gravity waves, from the extreme nature of such an event (as viewed from inside the event horizon). One should not necessarily interpret this as proof of cosmic inflation (as currently modeled), since it could be the signal event of a black hole/white hole universe.

It should also be noticed that $c^2/2G = m_p/2l_p = 0.675 \times 10^{27}$ kg/m^3. So, another way to look at the fixed M/r_s value of a black hole of any size is $Sm_p/S2l_p$, where S is simply the time-dependent scalar. This approach should work at the smallest possible quantum scale of a black hole, where the scalar takes on a value of 1, all the way up to a black hole the size of our visible universe, where the scalar takes on a value of 1.342×10^{61}. Notice that 1.342×10^{61} times the Planck mass value of 2.716×10^{-8} kg equals 2.92×10^{53} kg, and 1.342×10^{61} times twice the Planck length value of 1.616×10^{-35} m equals 4.34×10^{26} m. The reader is encouraged to read the author's companion article and compare these values to the 2013 Planck survey results. The fractal nature is obvious.

Plugging the m_p and $2l_p$ values for M and r_s, respectively, into the Schwarzschild and average density formulas given in the companion article provides a theoretical quantum black hole singularity average mass density corresponding to $3c^2/8Gpir_s^2$, or $3(9 \times 10^{16})/[(8)(6.67 \times 10^{-11})(3.14)(2 \times 1.616 \times 10^{-35})^2]$, which reduces to 1.54×10^{92} g/cm^3, Guth's predicted density range for uniting gravity with the other forces (Guth, p. 268)!

Thus, this author suggests that a black hole model of our visible universe could be highly useful, whether or not one wishes to accept our universe as the ultimate giant black hole. In conclusion, the following three proofs are offered in support of the arguments made in the companion paper and the current paper. The reader is invited to attempt a logical refutation.

A LOGICAL DARK MATTER ARGUMENT FOR A BLACK HOLE UNIVERSE (PROOF)

Axioms:

1. A black hole is defined as the entire entity which is bounded by the event horizon (at Schwarzschild radius r_s).
2. Any object whose radius is equal to or smaller than its Schwarzschild radius is a black hole.
3. At equilibrium, the ratio of black hole mass M to Schwarzschild radius r_s is a constant for a Schwarzschild black hole of any size, as defined by the rearranged Schwarzschild formula $M/r_s = c^2/2G$.
4. A black hole grows in size by accumulating mass, resulting in a corresponding increase in Schwarzschild radius.
5. General relativity places no limit on the maximum size (thus, average density) of a Schwarzschild black hole. As such, although a microscopic black hole may be extremely dense, a sufficiently large black hole may be extremely sparse.
6. Any matter within a black hole cannot escape during the lifespan of the black hole.
7. If a universe were to start as a black hole it would remain a black hole during the lifespan of the universe.
8. The visible universe is defined as everything within the bounds of its light sphere, encompassing any expansion of the spacetime continuum.
9. The 2013 Planck Survey results indicate a universal age of approximately 13.78 billion years; application of "cosmological redshift" to this estimate gives a universal light sphere radius of approximately 46 billion light-years, or about 4.3×10^{26} m. The Planck Survey results also indicate an average baryonic density of

4.08×10^{-28} kg/m^3, corresponding to universal total baryonic mass of 1.46×10^{53} kg.

10. Observational evidence (Rubin, etc.) indicates the presence of universal dark matter in abundance, anywhere from 1-5 times the baryonic mass.
11. The mass quantity in the Schwarzschild formula, derived directly from conservation laws embedded within general relativity, includes all gravitational mass (dark as well as baryonic).
12. Assuming the low end of the dark matter estimate (1 X), a total universal mass of 1.46 x 2 equals 2.92×10^{53} kg. The corresponding Schwarzschild radius $r_s = 2GM/c^2$, which is $[2(6.67 \times 10^{-11})(2.92 \times 10^{53}]/(9 \times 10^{16})$, which is 4.32×10^{26} m (see axiom 9).
13. Assuming the high end of the dark matter estimate (5 X), a total universal mass of 1.46 x 6 equals 8.76×10^{53} kg. The corresponding Schwarzschild radius $r_s = 2GM/c^2$, which is $[2(6.67 \times 10^{-11})(8.76 \times 10^{53}]/(9 \times 10^{16})$, which is 1.3×10^{27} m.
14. Referring back to axioms 12 and 13, the low side estimate for universal dark matter mass contribution corresponds to a Schwarzschild radius equal to our visible universe radius and the high side estimate (currently in favor with cosmologists) for universal dark matter mass contribution corresponds to a Schwarzschild radius considerably larger than our visible universe radius. For the significance of these calculations, the reader is referred back to axiom 2.

Logical Conclusion: Our universe is a giant black hole.

MASS DENSITY COMPARISONS BETWEEN OUR VISIBLE UNIVERSE (ALLOWING FOR SPACE-TIME EXPANSION) AND A GIANT BLACK HOLE (A PROOF)

AXIOMS:

1. The mass M of a Schwarzschild black hole is $r_s c^2/2G$.
2. The threshold average mass density of a Schwarzschild black hole is M/V, which is $(r_s c^2/2G)/[(4/3pir_s^3)]$, which simplifies to $3c^2/8piGr_s^2$. Note that r_s is the Schwarzschild radius of axiom 1.
3. The 2013 Planck Survey yielded a Hubble parameter (H_0) value corresponding to a universal age estimate of 13.78 billion years; allowing for superluminal expansion of the space-time continuum, this value corresponds to a universal light sphere radius r of approximately 46 billion light-years, or about 4.3×10^{26} m.
4. A theoretical Schwarzschild black hole the radius of our visible universe (4.3×10^{26} m) would, according to axiom 2, have a threshold average mass density value of $3(9 \times 10^{16})$ divided by $[(8)(3.14159)(6.67 \times 10^{-11})(18.49 \times 10^{52})]$, which reduces to 8.71×10^{-28} kg/m^3.
5. A NASA website (map.gsfc.nasa.gov/universe/uni_matter.html) reports the current best estimate of total composite universal average mass density to be 9.9×10^{-30} g/cm^3, which equals 9.9×10^{-27} kg/m^3. The margin of error is reported to be 0.5%. Please note that this universal average mass density estimate is more than 11 times higher than the threshold average mass density of a black hole of the same radius (see axiom 4).

6. The NASA study indicates (on the same website) a flat universe very close to the critical average mass density estimate of 10^{-26} kg/m^3, according to the widely-accepted critical mass density formula, $Ro_c = 3H_0^2/8piG$, wherein Hubble parameter (H_0) equals v/r, the ratio of velocity of recession v to object distance radius r.
7. A keen observer will note the similarity between the black hole density formula (axiom 2) and the universal critical density formula (axiom 6). In fact, the black hole density formula differs only by substitution of c^2/r_s^2 for H_o^2.
8. A universe which is not already a black hole must have a universal light sphere radius r greater than its calculated Schwarzschild radius r_s. Alternatively, one can say that a universe with a light sphere radius less than or equal to its calculated Schwarzschild radius must already be a black hole.
9. Axiom 8 is evidence that a squared Hubble parameter term (H_o^2) cannot be greater than c^2/r_s^2. Therefore, it is impossible for a universe which is not already a black hole to have a critical average mass density value greater than the threshold average mass density of a Schwarzschild black hole of the same light sphere radius. Alternatively, <u>a visible universe with an average mass density value greater than the corresponding black hole threshold density value of $3c^2/8piGr_s^2$ must be a black hole.</u>

Logical Conclusion: According to the NASA observational data (see axiom 5), the contents of our visible universe light sphere are within a black hole. More simply, <u>our universe is a giant black hole</u>.

LOGICAL ARGUMENT FOR HOW A BLACK HOLE UNIVERSE THEORY DOES NOT INHERENTLY REQUIRE SPACE-TIME STRETCHING

Let's assume the most conservative possible estimate of the radius of our visible universe (a light sphere radius of 13.78 billion light years). Let's allow for no stretching of space-time whatsoever. This gives a radius in meters of $(13.78 \times 10^{9})(9.46 \times 10^{15}$ m/L-Y) equaling 1.303×10^{26} m. Using the $(4/3)\text{pir}^3$ formula gives a light sphere volume of 9.267×10^{78} m^3. Let's now use the Planck Survey total composite average mass-energy density estimate of 9.9×10^{-27} kg/m^3 (reported on NASA's website at map.gsfc.nasa.gov/universe/uni-matter.html) to obtain a best estimate of total mass-energy within our universal light sphere. Multiplying the volume and density numbers gives us (9.267×10^{78} m^3) times (9.9×10^{-27} kg/m^3) which equals 9.174×10^{52} kg. Finally, let's calculate what the Schwarzschild radius would be for this total mass-energy, using the Schwarzschild formula $r_s=2GM/c^2$. This gives our universal light sphere a Schwarzschild radius of $2(6.67 \times 10^{-11})(9.174 \times 10^{52})/(9 \times 10^{16})$ m, which equals 1.36×10^{26} m. And since this slightly exceeds the non-stretching value of 1.303×10^{26} m, the contents of our universal light sphere should be within a giant black hole without space-time stretching. This supports the idea that "cosmological redshift" may actually be gravitational redshift. To include space-time stretching, please also see my preceding average density argument (proof) for a black hole universe with a 46 billion light-year radius, also using NASA's numbers.

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TABLES

Table 1

BLACK HOLE FEATURES FOR A GIVEN SCHWARZSCHILD RADIUS			
RADIUS (METERS)	MASS (Kg) ($M = C^2R/2G$)	DENSITY (Kg/m^3) ($3C^2/8piGr^2$)	RELATIVE INTERNAL TEMP
10^{-12}	$.675 \times 10^{15}$	1.61×10^{50}	Extremely High (10^9 K?)
10^{-6}	$.675 \times 10^{21}$	1.61×10^{38}	Less Extremely High (10^8 K?)
10^{0}	$.675 \times 10^{27}$	1.61×10^{26}	Exceedingly High (10^7 K?)
10^{6}	$.675 \times 10^{33}$	1.61×10^{14}	Moderately High (10^6 K?)
10^{12}	$.675 \times 10^{39}$	1.61×10^{2}	Cool (10^2 K?)
10^{18}	$.675 \times 10^{45}$	1.61×10^{-10}	Extremely Cold (10 K?)
10^{26}	$.675 \times 10^{53}$	1.61×10^{-26}	Near Absolute Zero (2.7 K?)

FIGURES

FIGURE 1

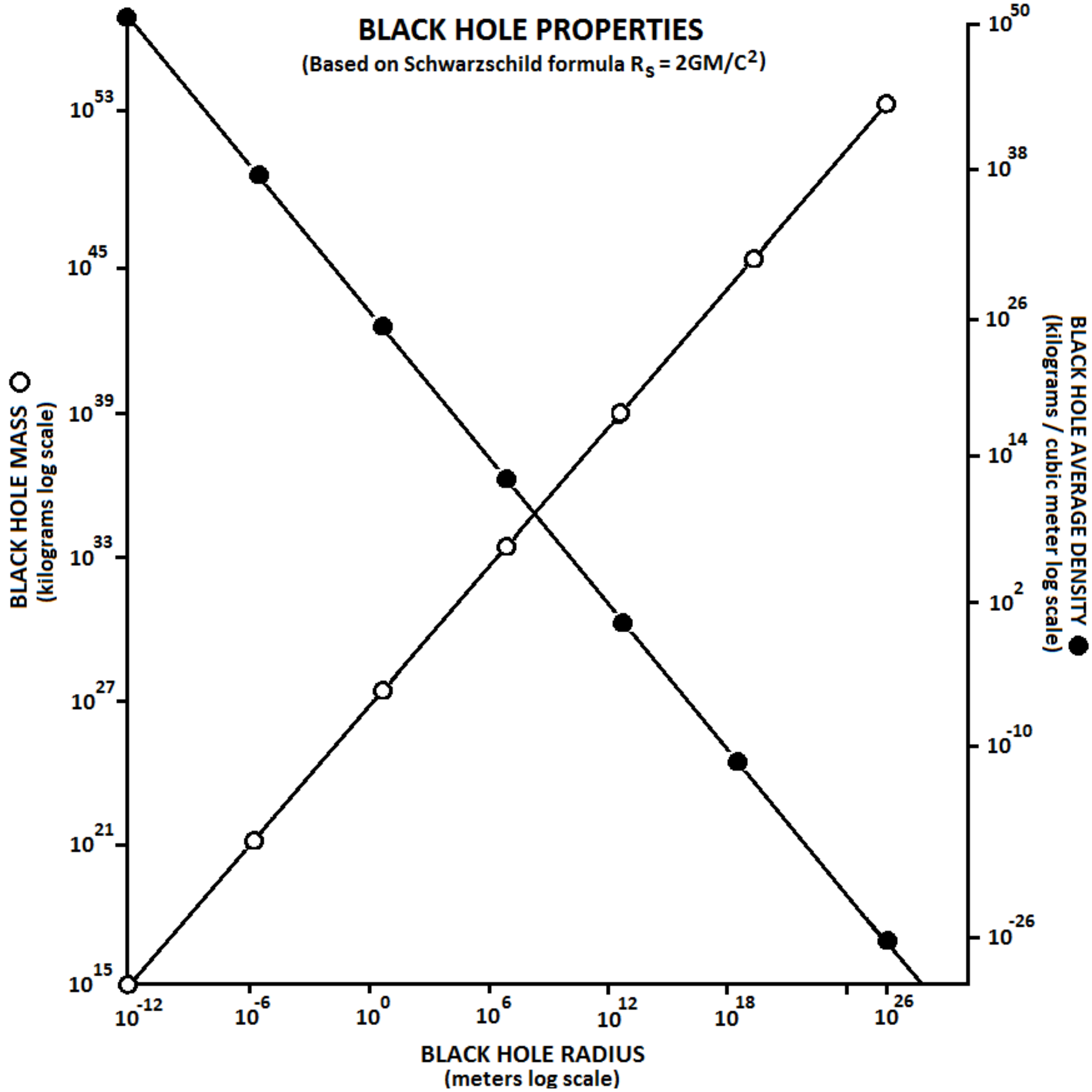

FIGURE 2

Black Hole Hubble Time vs. Arbitrary Smooth Running Time