Intermediate and Supermassive Black Holes

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Abstract

There are stellar-mass black holes (SBHs), and there are supermassive (SMBHs). Little theory has developed to explain if or how intermediate-mass black holes (IMBHs) may be clearly distinct from either type. How then do IMBHs exist? Recent Hubble and JWST data on Omega Centauri point toward a better theory of formation. A surprising insight into the 4D multiverse also emerges.

Black holes (BHs) are the favorite place in astronomy and astrophysics where crazy spacetime theories go to die, or mutate and persist. BH environments are often a source of fascination regarding such things as imaginary wormholes, event horizon holograms, and even neutron stars. On the other hand, BHs as they really exist are easy to understand and envision within the proper 21st-century model of particle physics math.

Massive stars whose gravitational fields are too strong for light to escape were first seriously considered in the 18th century by Pierre-Simon Laplace.**[1]** His unique physics model did not disturb contemporary theorists. Euclideans and Newtonians liked to talk about *point* dimensions, which are fine for pure math, but not fine for proper 4D physics. Early 20th-century math ideas of black holes tended to model toward nearly infinite central density. *Quantum corpuscles* at the core are now popular, both for math and physics.

Fortunately, quantum theory soon considered the idea of *core quantum pushback* against incoming particles. Otherwise,"nearly infinite" density within a BH core could suppress random quantum movement itself. Improved theory now has an evolved concept of very dense cores dating back to WWI, where each spherical core is surrounded by its virtual Schwarzschild event horizon, at least for hypothetical, non-rotating black-holes.**[2]**

Current theory says that the larger SMBHs are, of course, highly massive in totality – but they are less dense per unit volume than tiny *solar-mass* black holes, due to different quantum push-back distances.

Micro black holes should be the most dense. However, simply achieving such extreme density also runs into radical quantum pushback. Even the proposed largest colliders likely would fail at this creation task. A spherical black hole of mass similar to that of Mount Everest would have a Schwarzschild radius smaller than one nanometer. Its average density at that size would be so high that no known human mechanism could form such extremely compact objects. If the mass of Mount Everest were squeezed toward a near point, such an object would not last for long, due to its event horizon Hawking radiation.**[3]**

In other words, *there are two opposite forces at work within each BH event horizon:*

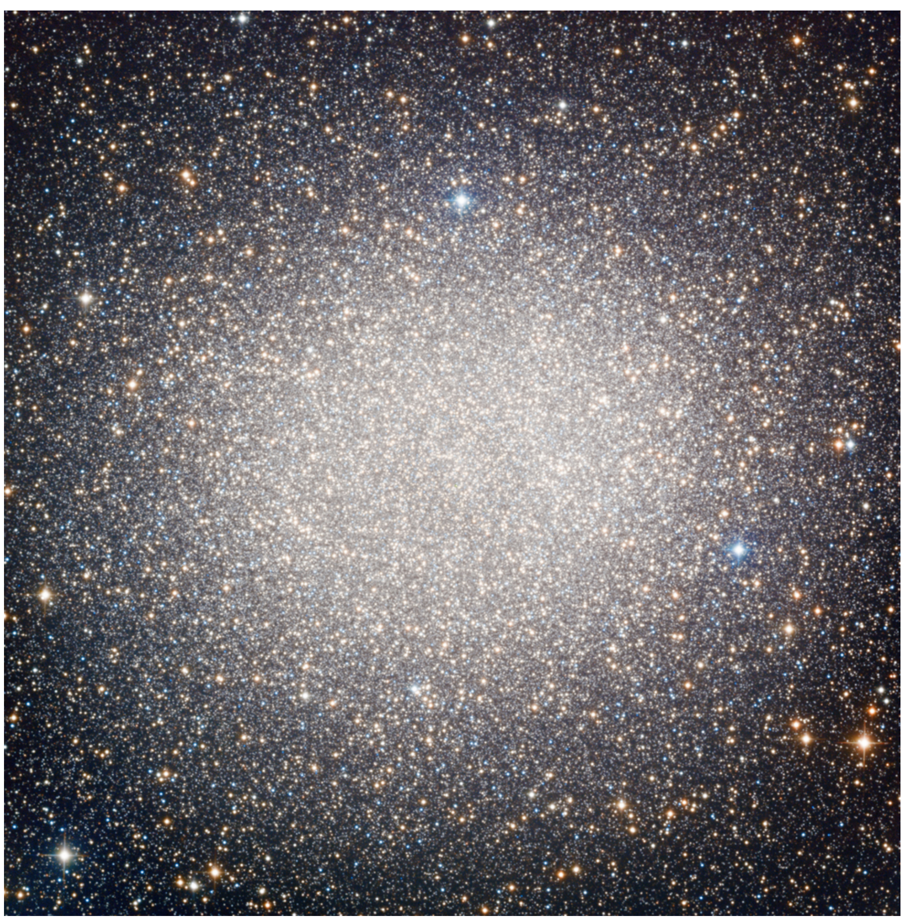
First, there are vast numbers of omnidirectional, incoming yin/yang push particles, the net force of which *increases* by the number of yin/yang impactors. Net force also *decreases* by the smaller surface area of a shrinking core itself.

Second, Coulombic (yang) electromagnetic forces, *repel* distal mass (yin) units within each Schwarzschild horizon, and to an increasingly lesser degree just beyond.

Micro black holes might possibly be formed in an early stage of the evolution of our universe, just after the Big Bang, before stars. Therefore, these hypothetical miniature black holes are called primordial black holes.**[4]** However, no original primordial BH could last from local universes to subsequent local universes.

Intermediate vs. Supermassive Black Holes

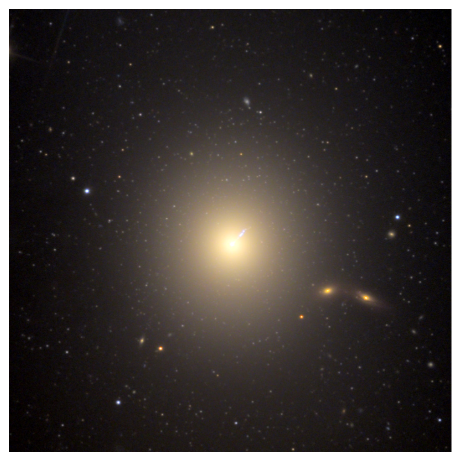
A recent study of the IMBH in Omega Centauri, the Milky Way's largest globular cluster with about ten million stars, points to a mass near 8,200 solar masses (with our Sol's mass = 1).**[5]** This recent fairly precise number comes from both Hubble and Webb data. Previous estimates have gone up to 50,000 solar masses for this IMBH. In evolutionary mass theory such differences among estimates are not qualitatively significant.



Visually, this Omega Centauri galaxy-core remnant, shown above, is simply astounding in a large amateur instrument, such as my scope with its 16” mirror. The image here is only slightly superior to what I have seen. Meanwhile, its visually dark IMBH lurks at the overall globular mass center.

The IMBH therein is only the second where we have been able to calculate enough individual star velocities near the core mass to calculate electromagnetic and gravitational effects from the unseen BH mass on its closely orbiting stars. The other BH where we can measure said effects is *Sagittarius A**, the SMBH of 4.1 million solar masses at the center of our own MW galaxy. It is called *Sgr A*,* being from our relative perspective inside our Sagittarius constellation.

Two great SMBHs have so far been imaged: The first image was achieved in 2019, within M87 (aka NGC 4486), the great elliptical galaxy seen here about 53 million light years away in the Virgo Supercluster. Its great SMBH, *M87*,* has 3 to 4 *billion* solar masses, *or about a thousand times greater mass than the more recently visualized SMBH within our MW.* The *M87** SMBH was first imaged **[6]** showing the black hole (where visible light cannot escape) surrounding the unseen central mass.



All the many standard stars within Omega Centauri have by coincidence roughly the same total solar mass as the singular mass of Sgr A,* our MW supermassive BH.

It is more interesting to note that **[7]** *the total solar masses of the supermassive BH in M87 are about a* ***thousand times*** *that of our Sgr A*.* However, *the total mass of M87 galaxy is only about* ***ten times*** *the total mass of our MW.* Also, they are both ancient galaxies, not much younger than our visible post-BB universe.

We cannot predict the relative sizes and growth rates of central SMBHs only from relative total galactic masses. Yes, there is some correlative causation, but not predictably so. Causation patterns not yet established by data invite new questions about SMBH formation within our local universe itself.

Toward A Better Model of SMBH Sizes

Antique cosmology limits current cosmological paradigms. One of those models relates to relative SMBH sizes. If we strip away the myopic restrictions associated with assuming that our visual universe equals all universal matter, then we have much more room to better explain the SMBH variations for which we already have decent data.

It is proper to assume that ancient large galaxies, be they spiral or elliptical, have had many opportunities to capture nearby smaller galaxies with intermediate black holes.

It is fair to insert more unseen gravity-enhancing Dark Matter into each equation. However, the location of dark matter is also very critical to understanding movement of smaller SMBHs into the larger one. In cases where there is a large galactic halo of dark matter, the net push/shadow *centrifugal* vector outward could offset on the net much of the *centripetal* net force inward. Also, as new baryonic masses are added inward, the calculus changes accordingly.

Dark Matter is not voodoo. It is just another manifestation of primal yin/yang, matter/energy, for which we cannot ever directly measure its very high short string frequencies. We are restricted by our human technology to the few logarithmic dimensions close to ourselves that we can measure. There are many logarithmic linear dimensions both smaller and larger than what we can easily model. The smaller the dimensions, the shorter the yin/yang, beaded electromagnetic (EM) strings therein, and the higher their rotational frequencies.

Actual net push/shadow particulate gravity within the so-called quantum sea – not GR spooky spacetime sheets gravity – does not require full linear dimensional knowledge to correctly model without playing with the algorithms. *We only need to see how General Relativity models somewhat correlate with what is going on with* net particulate gravity and electromagnetic forces *to causally show real gravity.* **[8]**

Central to the modern model of universal push/shadow gravity is the actual 4D "bubble-bath" multiverse. It is because yin/yang particles and short beaded strings zip around from all directions with kinetic force that this model is superior. The multiversal "quantum sea" is thereby the key yin/yang domain both within and among local universes.

We like to imagine that our visible post-Big-Bang universe is ancient. Compared to the full 4D multiverse, our local universe is a fairly recent phenomenon similar to all other 4D local universes. Whereas our local big bang universe has been around for a few *billion* "Earth years," the full multiverse very likely has existed for *trillions* of years. Whereas our local universe will eventually vanish, the multiverse sees our moribund local future as another opportunity to occupy vacated volume.

I don't minimize those who wrongly modeled their vision of the visible universe over a century ago. Indeed, it was only in the 1920s that science learned M31, the great Andromeda Galaxy, is not just another spiral nebula. It is a giant space island similar to our own, also with many hundreds of billions of stars. It is thus not absurd to poetically say there are more stars in our Milky Way than grains of sand on our shores.

Black-hole event horizon Coulombic electromagnetism only allows for matter/energy to gradually escape from within. Given infinite time (whatever that is), so-called Hawking radiation could allow for quantum events to deplete any and all black holes. However, that is not the case within the total multiverse, as new black holes are always forming.

Note these two keys:

(1) The popular formation model only allows for black holes of all sizes to be nearly as old as our own local universe.

(2) It is equally possible that within the full 4D volume of the "bubble bath universe of universes" our own visible universe rapidly grew to occupy "available space" from exhausted earlier universes. Deep physics history includes numerous residual black holes, allowing our visible universe to also host truly ancient black holes among others "only" a few billion years old. This total process repeats itself beyond measurable time.

With the 21st-century model introduced herein of black hole histories, we have now been able to logically envision a most elegant answer to the deep question of what preceded our own big bang. We don't need iffy large hadron particles *to provide the glue.* **[9]**

The evolved 21st-century multiversal model also recognizes that very ancient local universes experienced their radiant stars vanishing long before their black holes.

<u>In other words</u>, when our own Big Bang happened a few billion Earth years ago, the newly released mass/energy flying outward was available to a large number of randomly distributed, much-more-ancient, naked black holes waiting like space magnets inside their own net push/shadow gravity spheres of influence.

Even in physics, the more things change, the more they remain essentially the same. This is the elegant path to multiversal "physics eternity" that avoids the dreaded Second Law of Thermodynamics.**[10]**

References

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