Rethinking Supermassive Black Hole Dynamics

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1. INTRODUCTION

A set of hypotheses regarding supermassive black hole dynamics is offered as an alternative to the proposals of the inflationary Big Bang.

2. HYPOTHESES

2.1. A Core of Planck Particles May Form in an SMBH

Planck particles are often considered to be an idealized model that falls out of dimensional analysis which yields the Planck scale. In this paper, we imagine that Planck particles are real, and that they have the ultimate Planck characteristics (e.g., temperature, energy, wavelength, etc.). Planck particles only form under the most extreme conditions of concentrated matter-energy, such as in the core of a supermassive black hole of sufficient characteristics which are a subject for further research.

2.2. Planck Particles Do Not Participate in General Relativity

A core of Planck particles corresponds to the singularity of general relativity. Planck particles carry the maximum energy possible, the Planck energy, and if surrounded by other Planck particles, they have no available mechanism to transmit energy quanta nor gravitational waves. Planck particles cannot signal their presence gravitationally, nor do they receive gravitational waves from any other matter-energy. It is as if the mass of Planck particles inside a Planck core has temporarily disappeared.

2.3. Planck Particles May Violently Emit from an SMBH

A core of Planck particles is the densest matter-energy possible and is under the most extreme pressure possible. If a Planck core forms in an SMBH and if subsequent conditions allow Planck particles to breach through the surface of the SMBH then there will be a violent emission of Planck plasma from the surface of the Planck core. Some occurrences of SMBH jets may contain and be driven by Planck plasma. It may be that more violent ruptures of the interior Planck core could occur in a merger event between combinations of SMBH, BH and neutron stars.

Understanding the conditions that enable Planck plasma emission is a subject for future research and should presumably be integrated with a new understanding with regards to accretion disk flow. Likewise, there is new science needed for duration of Planck plasma flow, flow rate, and flow cessation.

2.4. Spacetime is Implemented with Standard Matter-Energy

Spacetime is implemented by a superfluid gas of standard matter-energy that is very lightly interacting. The superfluid structure overlays a 3D void of Euclidean space. The specific particles comprising the superfluid are to be determined by future research. For now, imagine the superfluid as a condensate of extremely low energy particles with the characteristics generally assigned to the quantum vacuum. The superfluid particles that implement spacetime can participate in reactions and are transmutable to other standard matter-energy particles (e.g., pair production).

3. BIG BANG-INFLATION VS. PLANCK EMISSION

Inflation proposes to explain several issues with the large-scale structure of the cosmos. Inflation is imagined as a serial, one-time process, coincident with the Big Bang, where exponential expansion was driven by negative vacuum pressure.

Planck emission hypothesizes a parallel, galaxy-local, intermittent, ongoing, and asynchronous process where the differential in pressure between Planck particle phase and a surface exposed to standard matter-energy at lower than Planck energy gives rise to event-local exponential inflation.

3.1. Horizon Problem

Big Bang theory interprets the cosmic microwave background (CMB) as leftover light from the early universe that has redshifted by a factor of z ~= 1090 on its way to our telescope sensors. How do we explain the isotropy to 1 part in 100000 for portions of the cosmos that are not in causal contact? Inflation explains the isotropy of the CMB by proposing a smaller homogenous initial universe that would have been in causal contact prior to inflation and therefore retains isotropy.

The galaxy-local Planck emission process from SMBH has no causal connection issue with the isotropy of the cosmic microwave background. With galaxy-local micro-bangs and galaxy-local inflation, we have a Planck process governed by identical physics throughout the universe. It is therefore natural to expect isotropy.

3.2. Flatness Problem

With Einstein's conception of spacetime as a curvable geometry, it opens the door to the question of the state of universe curvature throughout time. Why is curvature of the cosmos near zero now? If you work backwards, the cosmos would need to be extremely flat at the time of the Big Bang. Why was curvature near zero then?

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Hypothesis 2.4 proposes that spacetime is implemented as standard matter-energy background superfluid gas filling a 3D Euclidean void space. There is no flatness issue to solve since space is given as geometrically flat by this hypothesis.

3.3. The Inflaton Field

Physicists have proposed a hypothetical inflaton field as a factor that enables inflation. With the Planckian emission process there is no inflaton field. Planck particles reacting and decaying into high energy photons, neutrinos, and other standard matter are expected to drive galaxy-local inflation and expansion.

3.4. Galaxy Seeding

Inflation theory predicts that quantum mechanical variation in the early stages of inflation gives rise to structure that seeds galaxies.

With a galaxy-local Planckian process, galaxies are self-seeding in the sense that ingested matter-energy may emit given sufficient conditions and form freshly minted composite particles that seed new celestial objects, including structure that evolves into new galaxies. Therefore, galaxies are the dominant process at their scale and do not need an assist from a Big Bang nor one-time inflation.

3.5. Superluminality

Since general relativity does not apply to Planck particles in the core or plasma, superluminal jets may be possible. In other words, it is the preponderance of spacetime gas that imposes the local speed of light. As Planck plasma pierces spacetime, there is no barrier to superluminal speeds within the plasma. Prior interpretations of jets at narrow observing angles as explanations for observed superluminality may be revisited as some jets may be superluminal in reality.

4. NEW INTERPRETATIONS OF NATURE

New interpretations, insights, and predictions related to the Planck particle emission process may be testable by examining the model fit with observations, combined with parsimony and resolution of tensions in modern physics.

4.1. Cosmic Recycling vs. Origin and End of the Universe

The set of all AGN SMBH which jet Planck plasma intermittently throughout time accomplishes what has previously been described as a one-time inflationary Big Bang. The science of the inflationary Big Bang, particularly the sequence within the timeline, may be roughly compatible with the SMBH Planck plasma emission process reframed for galaxy-local scale. This new interpretation of a recycling universe will obscure the true age of the universe. How long has the universe cycled?

4.2. Galaxy Rotation Curves

Galaxy rotation curve anomalies are ascribed to dark matter in modern astrophysics. However, the galaxy-local Planck emission process provides new mechanisms that may influence galaxy dynamics and will require reconsidering galaxy physics including rotation curves.

Matter-energy is gravitationally non-interacting when it is in Planck particle form interior to a Planck core. This suggests that under sufficient conditions, some matter-energy ingested by an SMBH may subsequently cease to contribute to the mass of the SMBH if that matter-energy reaches the Planck phase. The apparent vanishing of this mass will directly influence the gravitational attraction of the SMBH upon galactic matter.

Emitted Planck plasma will also be gravitationally non-interacting until which point Planck particles have decayed to lower energy matter. The emission and jetting of Planck plasma and the subsequent decay and cooling and generation of new composite matter may produce new galaxy dynamics.

Furthermore, recycled matter-energy produced by Planck plasma decay may also influence galaxy dynamics. It is expected that the ejecta will contribute to new star formation and possibly new child galaxy formation. Furthermore, some of this newly formed matter may be destined to cycle through an emitting SMBH repeatedly.

4.3. A New Redshift Mechanism

When Planck particles emit, a period of rapid inflation occurs locally to the surface of the Planck plasma. High energy photons are one reaction product to expect, and they would experience a form of redshift while transiting the inflation region. This form of redshift is not yet accounted for in modern science.

5. SUMMARY

A hypothesized galaxy-local process of Planck particle emission from supermassive black holes appears to lead to new insights about nature. This process is roughly compatible with existing observations but requires new interpretations with regards to cosmic inflation, Big Bang, galaxy rotation curves, and redshift.

QUESTION/ISSUE	BIG BANG – INFLATION	GALAXY-LOCAL RECYCLING
Where did matter and energy come from?	Unknown	Matter-energy ingested by a black hole supplies the recycling process. Matter (particles) and energy are conserved. Unknown if/how the universe began and where matter-energy originated.
Why does this high energy event occur?	Unknown reason for occurrence when it did. The event is driven by negative gravity per Guth, aka negative vacuum pressure.	SMBH dynamics control the process of Planck particle emission. New research topic. Spin of the SMBH is a likely factor.
How many times has it occurred, will it occur?	Generally thought to be once, although there are bounce and aeon variants.	Ongoing and intermittent.
What is the age of the universe?	~13.8 billion years. This also gives rise to concepts of early times and late times, primordial and other such age/maturity terminology.	Unknown. This opens the door to a far older universe, possibly infinitely old. New research topic.
Degree of universe evolution over time.	Very significant evolution: See the timeline for inflation and the Big Bang. See theories for expansion. See discussion of curvature of the universe. See CMB theory. See interpretations of high redshift observations.	Each galaxy-local mini-bang inflation event is local to a small region of the universe. This opens the door to the idea of a steady-state recycling universe. There is an opportunity for new science to research any ebb and flow of the forms of matter-energy over time at a universe scale.
Does it help explain galaxy rotation curves?	No.	Yes. There are new SMBH dynamics that may help explain galaxy rotation curves. Matter-energy entering Planck state causes mass disappearance from the superfluid. Inflationary jets and ejecta decay may have an effect as well.
How is galaxy seeding explained?	Quantum fluctuations in the primordial soup.	The emission of Planck plasma via SMBH jets causes concentrated matter-energy reaction regions at the knots and termini of the jets. These may be the beginning of child galaxies. See the work of Arp and the Burbidge's regarding anomalous redshift of quasi-stellar objects.
How is Flatness of the Universe explained?	No satisfactory explanation.	Space is 3D and Euclidean. It is not curvy. Einstein's curvature of spacetime is implemented with a bubble of superfluid.
Is an inflaton field required?	Yes.	No.
How is the Horizon problem explained? (Causal connectedness of the CMB to near isotropy – 1 in 100000 variation).	Isotropy of the quantum soup prior to inflation.	Galaxy-local Planck process, governed by the same physics, throughout the universe. Isotropy is natural given that every occurrence passes through the Planck phase.

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