

The Dark Matter Particle: The Ultimate Building Blocks of Nature

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Abstract - The early tiny Universe, perhaps, contained invisible Dark Matter particles that were in their Supersymmetry and occupied a finite space within an Infinite space having no boundary, similar to condition of snow on a rock foundation in the mountainous region that occupies a finite space within an Infinite space. The gravity of the particles compressed the core, resulting into increase in temperature fantastically high, thus converted the early universe into an infinitesimally small, infinitely dense, and hot primordial plasma fire ball, like snow that becomes dense and compact due to gravity. The Supersymmetrical particles, due to high temperature, were separated during quantum fluctuations, similar to melting of snow due to increase in temperature, resulting into release of individual water molecules that after joining are converted into a voluminous flow of water. The fluctuated dark matter particles, in turn, generated Supergravitational waves / energy that moved forward along with dark matter particles with super speed and thus inflated the early universe, similar to voluminous river water that inflates in the steep sloping mountainous region.

There were creations of all the new particles from the dark matter particles by the Supergravitational energy in the inflated region, without any change in the properties of the dark matter, similar to creation of all sedimentary particles from the surrounding foundation rocks by the high velocity of the voluminous river water. The speed of Supergravitational energy was not reduced as a result it didn't allowed the new particles to settle down in its inflated region, similar to high velocity of voluminous river water that neither reduces nor allows the new sedimentary particles to settle down in its inflated reach. There was a great explosion, Big Bang, within the Supergravitational energy carrying all dark matter and new particles after attaining its critical speed and at the same time existence of a space outside that was without boundary, similar to explosion within the voluminous river water carrying all sedimentary particles after reaching its critical state and at the same time existence of an open, continuous mild sloping region. The Supergravitational energy carrying all particles, and by following the law of inverse square, expanded in a space that was without boundary, similar to the voluminous river water carrying all sedimentary particles, which expanded in the already expanded region.

In the expanded region of gravitational energy the dark matter particles were accumulated and settled down first by the ripples of the gravitational waves, followed by the accumulation of the new particles that fell toward the dark matter particle's strong gravitational attractive field and later, as a result of loss in temperature due to radiation, collapsed to a much denser state to form celestial bodies, similar to heavy sedimentary particles that settle down first, by following the law of specific gravity, in deep depressions existing in the foundation rocks, followed by light particles by the symmetrical and asymmetrical ripples of voluminous water, which after solidification, collapse to a much denser state to form sedimentary rocks and great savannahs, respectively. So, the dark matter particles created fertile sites/suitable environment, where new normal matter particles accumulated and condensed to form celestial bodies, similar to the foundation rocks having deep depressions that were caused by tectonics, created fertile sites, where sedimentary particles solidified to form sedimentary rocks and the great savannahs.

In the micro world, since the forces and matters that are made up of smallest particles of smallest wavelengths don't require any foundation or medium, such as rock in the case of macroworld, except space, to move forward, therefore, the dark matter particles that existed within the early tiny universe and also became the source of all the new matter particles in the inflated region to form celestial bodies and their foundation in the expanded region, can be considered the Eternal matter particles. Thus, the Dark Matter and the Eternal Space having no boundary were the basic necessities for the evolution and the development of our universe. Therefore, the Invisible and Eternal Dark matter is – The Ultimate Building Blocks of Nature, i.e. from which everything is made. At present, quarks and electrons are said to be elementary particles. It is believed that if we go to still higher energies, we may, perhaps, not found still smaller particles from quarks and electrons, because these particles have been generated from the Dark Matters during the time of Inflationary stage of early universe. Quark may be associated with some force or force particle, such as the photon, and photon must be associated with a matter particle. If anything new, beyond quarks and electrons, is to be searched then the Dark Matter will have to be investigated and analyzed.

Keywords - Dark Matter, Dark Energy, Eternal space, Supersymmetry, Quantum Gravity, Quantum Fluctuations, Supergravitational energy, Inflation, Symmetrical and Asymmetrical ripples, Expansion, Deep Depression

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1 INTRODUCTION

The knowledge of elementary particles, relativity and quantum mechanics are the basic tools for

understanding the Big Bang for evolution of our universe. Thus, at present, there is a scientific theory of evolution of our universe – the Inflationary Big Bang Theory. However, there are, still, a few number of important questions unanswered:

1. Is the space occupied by our observable universe that came into existence after Inflationary Big Bang, the only space, i.e. a finite space, or else, our observable universe containing all the celestial bodies, including Dark matter and Dark energy of spacetime fabric, is occupying a Finite space within an Infinite space having no boundary or edge – that is Eternal?
2. What were the environmental or boundary conditions at the mysterious, first, 1 tic?
3. Was there a tiny universe devoid of matter and then the matter suddenly created from nothing by relativity and Quantum Mechanics?
4. How Quantum Mechanics and Relativity came in picture when there was nothing, because relativity comes in picture when something happens or is relative to, and Quantum Mechanics and Relativity allow masses to be created out of energy in the form of particle / antiparticle pairs? What was the source of energy?

5. Is the Dark matter particle or wave or energy – The Ultimate Building Blocks of Nature – an Eternal object along with space without boundary?

This paper makes an attempt to explain, like how and why, all the points mentioned above, and thus the mystery behind the evolution and development of our Universe.

2 NATURE AND MOVEMENT OF FORCE FIELD

Today, we believe that all forces are transmitted by fields [9]. This concept / belief in the micro world can be seen in the force field of a bar magnet, as illustrated by the reaction of iron filings. However this concept / belief in the macroworld can be seen, like ripples or waves generated parallel to outer surface of the stone that is hit to a pond. In microworld such forces are neither touched nor can be seen. They are felt by touching only; they are Invisible. But, in the macroworld, such ripples / forces can be seen and touched.

The force fields or ripples or waves that are in the form of an arc or circle, in practical, are not made up of continuous line or object. For an example, in the macroworld, the ripples or waves in a pond, appears to be continuous arc or circle, but in reality are made up after joining smaller water molecules those themselves are made up of protons, neutrons and electrons [7]. So, a force field in the form of a ripple or wave that makes a continuous line is made up of smaller matter particles that

themselves are made up of smaller force particles. In real sense, it means that each matter particle, such as a quake ought to have a partner particle that is a force particle, and each force particle, such as the photon, ought to have a partner particle that is a matter particle. [9]

Thus, every continuous thing in the microworld and macroworld in this Universe, including light, gravity and gravitational energy is made up of force associated with a matter particle, or it can be called a continuous line made up of matter particles having force particles. So, in the microworld, unless there is continuous radiation / emission of smallest particles containing force particles from the source, the force field or wave or ripple can't be possible. Thus there is nothing like continuous thing.

In the force field of a bar magnet, the invisible matter particles consisting of smallest force particles emanate from one pole to other. All the force particles in turn, join in the space and form an arc, stretching from one pole of the magnet to the other. So, the force field in a bar magnet is also not a continuous line of force. However, the maximum curvature at the center of the arc, may be due to stretching of the waves / force particles perpendicular to the direction of travel of the wave and compression of the force particles perpendicular to the wave, i.e. stretching of the wave / force particles towards on either side of direction of wave and compression in the central part of direction of wave, resulting into appearance of the force field

like a bow, which is illustrated by the reaction of iron filings. When a gravitational wave came along, it would stretch things in one direction (perpendicular to the direction of travel of the wave) and compress things in the other direction (perpendicular to the wave) [6].

In the microworld, the forces that are transmitted by fields in the form of curved geometry are due to their inherent properties. What happens when the matter particles of some wavelength emanate from the source, they all join and immediately take a shape of curved geometry, depending upon the wave lengths of particles; here the curved geometry is nearly flat, which is because of the reason that the force fields are made of the particles of small wave lengths and amplitudes and also passing through a smooth, continuous medium. But in case the force fields come across a rigid medium, such as ocean waves striking against a hard rocky shore, then there will be first rise of the ripples due to presence of a hard surface or absence of a smooth, continuous medium, and later turning into froth; it means there will be destruction of waves when they come across a hard medium. In case there is no obstruction or hurdle coming in the way of the ripples / forces, then the next wave, emanating from the source, will push / thrust the first wave, further ahead, resulting into a continuous propagation of ripple / waves / fields. Thus the force of a bar magnet and the ripple in a pond are some of the examples of the nature of movement of force fields.

3 BASIC ELEMENTS RESPONSIBLE FOR CREATION OF OUR UNIVERSE

It is believed that, perhaps, the following three elements were instrumental in evolution and development of our universe:

i) **Dark Matter associated with Dark Energy.**

The Dark Matter associated with Dark Energy, it is believed, is not at all affected by strong and weak nuclear forces, electromagnetic forces and even weak gravitational forces (author's view); it means Dark Matter is not at all affected by these forces. But, it appears, to be affected by Supergravitation forces, only, such as during Inflated stage of the universe. So, it has its own inherent characteristics / properties and thus are not be affected by transformation. [The particles associated with energy might be in their Supersymmetry.] This dark matter, it is believed, maintained its all original characteristics, even after creation of new particles from it by the Supergravitational forces / energy, i.e. it remained the same original Dark Matter.

ii) **Environment**

The type of environment in which the Dark Matter having energy existed. The surrounding environment played a major role in the evolution and development of Dark Matter, through the stages of quantum gravity, quantum fluctuations, inflation and finally expansion, to create our universe. The early universe containing Dark Matter particles,

perhaps, occupied a Finite space within an Infinite space that was smooth, continuous, empty, and without boundary or edge. Thus, the surrounding environment, in which the space was without boundary, was the key in the evolution and development of our universe. In a finite space the forces wouldn't have travelled to far distance and thus would have bounce back.

iii) **Time**

Time was the most important factor in evolution and development of our universe. The events and things associated with them do not happen instantly or in an arbitrary or random manner, but within a definite time frame and systematic way, which fall within the realm of science.

4 THE EARLY UNIVERSE

4.1 Space Related to Early Universe

There are prevailing views about the early Space, which are summed up in the following paragraphs. All the matter and energy now in the universe were concentrated at extremely high density – a kind of cosmic egg; reminiscent of the creation myths of many cultures – perhaps into a mathematical point with no dimensions at all. It was not that all the matter and energy were squeezed into a minor corner of the present universe; rather, the entire universe, matter and energy and the space they fill, occupied a very small volume. There was not much room for events to happen in [1]. There was no pre-

existing space or time. The most important aspect of the event at $t = 0$ is that our space and time came into existence. Matter did not explode out into space; space expanded and carried with it everything that existed [5].

The present study reveals that if the early universe was a tiny point or object then, perhaps, it might have occupied some finite space. [Any point, whatever its dimensions will always occupy some space.] If it was occupying some space then, there should have been either an empty space or an object outside relative to this tiny point and vice – versa.

4.2 Empty Space

Our current theories say that the energy of empty space due to virtual particles is absurdly huge – these theories are clearly wrong [5]. In Heinsberg uncertainty principle, the value of field and its rate of change play the same role as the position and velocity of a particle. That is the more accurately one determined, the less accurately the other can be. An important consequence of that is that there is no such thing as empty space. That is because empty space means that both the value of a field and its rate of change are exactly zero. [If the field's rate of change were not zero, the space wouldn't remain empty.] Since, uncertainty principle doesn't allow the values of both the field and the rate of change to be exact, space is never empty. It can have a state of minimum energy, called the vacuum, but that state is subject to what are called Quantum jitters, or vacuum fluctuations – particles and fields quivering in and out of existence. [9]

The present research indicates that there is nothing like empty space in a medium wherein there is continuous propagation of particles / waves (matter and energy) / ripples at certain speed from one corner, i.e. source to another corner of the universe. In this system or environment, the value of field and its rate of change are not equal or not zero, since there is continuous propagation of particles/waves (matter and energy) within the system from source to other corner of the universe.

In the macroworld on the earth, for an example, a river flows from its source to the ocean, at different velocities in its different reaches. It doesn't flow straight, instantly, i.e. in one go from source to the ocean, but takes time. However, we see a continuous flow of the river between source to the ocean. It means there should have been some empty space somewhere within the total length of the river. But, it is not so, because there is continuous flow / addition of water into already existing river water body, between source and the ocean. So, the field's rate of change is not zero here. There is continuous flow of water having some velocity, as a result the river channel is filled with water, all the time, and thus looks as if the river that started flowing from the source at some point of time is reaching to the ocean in one go, i.e. instantly. Nevertheless, when the river might have started flowing, for the first time, from its source, there might have been an empty space that is devoid of water, between the mouth of the river and the ocean [3].

Similarly, there is no empty space between sun and the earth, though the gravitational energy and the light and heat that are radiated from the sun take some time to reach the earth. But, the space between the sun and the earth is not empty. This is due to reason that there is continuous propagation of gravitational energy that carries light and heat from the rotating sun in the space that was already occupied by gravitational waves intertwined with heat and light, even before formation of the earth. It means the field's rate of change is not zero here and thus the space in between the sun and the earth doesn't remain empty.

However, in the beginning of the early universe, there might have been an empty space just adjacent to the tiny early universe. In the absence of an empty space without boundary outside of tiny point, it is hard to believe the events of quantum fluctuations, inflations, and expansion. But, when there was propagation of Supergravitational energy / waves that carried the Dark Matter and new matter particles from the early tiny to the present expanded universe, the space, now, we see is occupied by these particles. Thus, the space occupied by our observable universe is not empty, at present.

So, the early tiny universe was occupying a finite space within a space that wouldn't have been finite, because, again the boundary conditions would have come in picture. Thus, the space outside of early, tiny universe was an open, dark, cold, smooth, continuous, empty – nothing to happen and having no boundary or edge: The space is Infinite – can

neither be finite, nor can be created or destroyed; the space is Eternal.

As space outside of early tiny universe was containing neither any form of energy nor any form of matter / mass, therefore, there was neither gravity nor gravitational energy in it. The gravity is due to mass and energy and the gravitational energy / waves are produced due to rotation / movement of them, which cause the movement of the surrounding medium or the movement of the particles from the source into an empty space. So, the gravitational waves are intimately related to energy and mass. Thus, there can't be gravity unless there is mass and energy and gravitational waves / energy unless there is movement of the particles from the source and / or movement of the surrounding medium by the rotating source.

The presence of mass and energy in the immediate space outside of the early, tiny universe would have obstructed the systematic events, like quantum fluctuations, inflation and finally expansion.

5 QUANTUM GRAVITY

When our universe was within a tiny point, it, perhaps, consisted of Dark Matters that themselves consisted of smallest force particles, i.e. dark matter particles associated with dark energy particles. Thus, everything within the tiny point could be in Supersymmetry, i.e. all were intertwined and collapsed and caused gravity that might have compressed core and pushed its temperature very

high. So, the temperature within the early tiny universe is attributed to the self gravity of the Dark Matters. In Supersymmetry the force particles and the matter particles and hence force and matter, are really just two facets of the same thing [9]. [There is a deep relationship between gravity and thermodynamics, the science of heat. We know that, as we go deep into the earth, there is a rise in 1°C of temperature for every hundred meter. The temperature is simply a measure of the average energy of the particles.] In consequence, since the thing within that tiny point were dark matter particles having force particles, the charged particles absorbed all the light, resulting into an opaque body, a non-transparent primordial plasma fireball. This was, perhaps, the reason that the early universe was infinitesimally small, infinitely dense and infinitely hot.

6 QUANTUM FLUCTUATIONS

As soon as the dark matter particles became infinitely hot, the quantum fluctuations came into picture, in which the individual dark matter particles / energy that were earlier in their Supersymmetry state or intertwined moved so fast to avoid recollapse. This behavior of the dark matter particles and energy, in turn, generated Supergravitational energy / force / waves that carried forward all the infinitely hot particles. However, the characteristics / properties of the dark matter particles associated with energy remained unaffected by transformation, like quantum fluctuations.

The Supergravitational waves / energy / ripples moved forward parallel to outer surface of the original tiny object. However, the Supergravitational energy were within the limit of Uncertainty Principle because of existence of a cold, smooth, continuous, empty space outside, having no boundary. This was the reason that the Supergravitational energy carrying all hot particles could not spread everywhere in an arbitrary or random manner. The force was maximum in the central part and gradually decreasing / reducing towards on either side, similar to ripples in a pond.

7 INFLATION

After quantum fluctuations the Supergravitational waves / energy, that carried all hot dark matter particles, thrust the outer layer of the fluctuated region, where there was difference in temperature due to change in medium, i.e. very hot to very cold, and inflated along with dark matter particles in the form of Euclidean geometry by virtue of their inherent property. [All forces are transmitted by fields. Here the wavelengths and amplitudes of the matter particles are so small that the force fields look almost a flat surface.] At this time the super gravitational energy / waves dominated over all other forces and particles. One would expect that at such high temperatures the strong and weak nuclear forces and the electromagnetic force would all be unified into a single force [8] [10]. This was similar to the snow melted water. Here the voluminous water starts flowing with high velocity due to

gravity either along the pre – existing steeply sloping depressions or depressions caused by its high velocity / current in the foundation rock [3]. In this case also the high velocity / current of water dominates over all other particles and forces.

In the course of time, the Supergravitational energy generated all the new particles [all contents – 10^{80} of the present universe] from the dark matter particles that were being carried forward by them, similar to the voluminous river water that generated all types of sedimentary particles from the adjoining rocks, like metasedimentary, by its high currents, or inflated state, in the steeply sloping mountainous valley having gorges and gullies. Here the voluminous water erodes assimilates and finally carries all the sedimentary particles further ahead.

The above phenomenon is continuous in the case of the river, as there is continuous discharge of water from snow covered mountainous region, which attains its high velocity in the steeply sloping valley. But, this was not possible in the case of early universe, since all the Mark Matter particles existing within early tiny universe were already subjected to quantum fluctuations and, in turn, followed by Inflation and expansion.

At the same time the super gravitational waves / energy didn't generated the excess new particles from the dark matter particles more than its carrying capacity. As a result there was no accumulation and collapse of all particles in the inflated reach. Thus, there was no reduction in the speed of Supergravitational waves / energy, similar

to high velocity of voluminous river water in its inflated state.

In case there would have been generation of excess new particles (matter) than the negative Supergravitational energy / wave then these excess new particles along with dark matter particles would have slowed down the speed of Supergravitational energy. As a result, because of unfavorable environment, there would not have been expansion of the universe. If this was the condition then there would have been formation of a kind of soup, instead of galaxy clusters, galaxies, stars and planets that were formed in the expanded region of the universe.

8 BIG BANG AND EXPANSION

The Big Bang starts at the end of inflation. To explain Big Bang, let us first understand it in the macroworld. The inflation followed by Big Bang [sudden burst with large sound] in the macroworld can be explained by rock / land slide that occurs on the steeply sloping abutments of a river valley in a mountainous region. Generally, the land / rock slide should not happen. Everything within a mountain in a river valley should remain intact, subject to the condition that the rock formation is a massive and dense body having no discontinuities and, which is not subjected to any external agency, like rain water and / or earthquake. The rain water can't percolate through massive and dense body that is free from discontinuities and thus can't cause large land / rock slide, neglecting shaking by earthquakes.

But, if a steeply sloping rock formation in a mountainous region, overlooking a valley that is an open and free space, consists of rock formation having discontinuities, then there is every possibility of inflation or increase in the volume of the rock mass followed by failure with a large sound or Big Bang in the rock mass. How and why it happens both in macroworld and microworld is explained in the following steps:

1. Existence of a steeply sloping mountainous region in a river valley, which consists of a rock formation having discontinuities and is exposed to an open, free and empty space, neglecting wind pressure, similar to early tiny universe when there were smallest particles of smallest wavelengths in their Supersymmetry or intertwined and surrounded by an open, free and empty space outside having no boundary or edge.
2. Constant percolation of rain water through the discontinuities in the rock mass, thus making all the joints free due to loss in cohesion, similar to increase in temperature due to compression of the core by the gravity of dark matter's smallest particle of smallest wavelengths (dark matter with dark energy), thus making them free.
3. The voluminous water, contained within all open discontinuities, flows towards the core of the affected rock mass, where it compresses the core due to its gravity, resulting pressure pushes the rock mass further out towards already existing an open, free, and an empty space in the river valley, dramatically expanding or increasing the

volume or inflating the total affected rock mass, similar to speeding up of hot dark matter particles after quantum fluctuations and, in turn, generating Supergravitational waves / energy that inflated along with dark matter particles and new particles, in the outside medium that didn't obstruct its speed of inflation.

4. The inflated rock mass after reaching at certain critical stage, i.e. after reaching its critical limit of deformability, i.e. when the rock mass doesn't have strength to withstand the pressure exerted on it, fail with a large sound, i.e. a Big Bang, in the presence of a medium that is an open free and an empty space, neglecting wind pressure. Similarly, in the early universe there was a Big Bang within the Supergravitational energy / waves carrying all dark matter particles and the new particles, after their critical speed and presence of an environment that didn't created any obstruction, but, instead, facilitated first into explosion and later into expansion that was possible only due to existence of an smooth and continuous space outside, having no boundary or edge.

It thus, indicates that had there been absence of a pre – existing smooth and continuous space outside, then the expansion of gravitational energy / waves along with all the particles would not have been possible, because the reduced speed of the gravitational energy / waves wouldn't have created the space outside after Big Bang. Moreover, if the outside region / space consisted of mass and energy, then also the expansion of the universe would not

have been possible. Therefore, the inflation and expansion of the universe was possible only when the space outside of the early tiny universe was a cold empty, open, smooth and continuous medium having no boundary or edge.

In the expanded region on the earth, the river settles the heavy sedimentary particles first followed by light particles, because of specific gravity, in the deep depressions in the foundation rock, which were caused by tectonics [4]. The lower heavier sedimentary particles after solidification, i.e. compaction and lithification, convert into sedimentary rocks and the upper finer particles convert into alluvium that makes great savannahs. The river finally flows over the alluvium, due to specific gravity, and doesn't have enough energy / current / velocity to generate new particles from the surroundings rocks. At this stage the river has its carrying capacity, only. These sites or sedimentary basins provided suitable environment for the evolution and development of horizontally moving higher forms of lives, such as fish, reptiles, mammals, and ultimately vertically moving human race with head raised up. In addition, most of our agricultural fields, habitats and petroliferous basins of the world are located at these sites [2].

Similarly, in the expanded region of the universe, once the dark matter particles having much more mass were accumulated due to gravitational force / energy, they generated their strong gravity / gravitational attractive field. After this the normal matter (new particles) were first accumulated due to

gravitational ripples / waves and later fell towards the centre of dark matter particles strong gravitational attraction. Finally, when the normal matter cooled by radiation, they collapsed to a much denser state by dominating over gravitational attraction of the dark matter particles and finally condensed to form large celestial bodies, like galaxy clusters, galaxies, stars, and planets.

It may be analyzed that there are practically no formation of sedimentary rocks and great savannahs without transforming or converting the foundation rocks, existing right from the source of the river water to the place of their formation. These features are formed from the sedimentary particles that were generated by the high current from the foundation rocks in the inflated region of the river water, leaving the properties of the foundation rocks unaffected, which was due to beyond the power of high velocity / current of the voluminous water. Similarly, the celestial bodies were not formed from the Dark Matter that existed in the expanded region of the universe, but these bodies have been formed by the new particles generated by the Supergravitational energy from the Dark Matter when these were available in the inflated region of the Universe, leaving the properties of the Dark Matter unaffected, which was due to beyond the power of the Supergravitational waves.

9 CONCLUSION

The Dark Matter particles associated with dark force particles (energy) could stay in the empty space

during the time of early tiny universe. The new particles (all 10^{80} contents of the present universe) were generated by the Supergravitational Energy in its inflated region from the Dark Matter and were carried forward. In the expanded region of the gravitational waves / energy the Dark Matters were first accumulated and collapsed within the gravitational waves, resulting into creation of depressions / curvature by their strong gravity, followed by accumulation and collapse of normal new particles in the strong gravitational attractive field of the Dark Matter, which were, with passage of time, converted into celestial bodies. So, it is the Dark Matter that existed right from early tiny universe to inflated state to expanded region of the universe, which became the source of all creations, without losing its fundamental properties / characteristics even after subjected to Supergravitational waves.

Further, as the water is due to emission of gases from the rocks of earth that was initially very hot and without an atmosphere, similarly the Supergravitational energy / waves were due to Super speed of Dark Matter particles right from the time of quantum fluctuations to inflation to expansion, by following the law of Inverse Square.

Thus, the Dark Matter, an Unseen and Eternal matter is - The Ultimate Building Blocks of Nature. And Dark Energy associated with Dark Matter permeates our universe and is occupying a Finite space within an Infinite space that is without boundary or edge – an Eternal space. The Dark Matter associated with dark energy might be

exerting its huge gravitational forces on the normal matters and energy due to its association with Dark Energy.

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