Solution to quantum gravity and other enigmas of the dominant paradigm

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September 29, 2021

Abstract. The main ideas of the future paradigm have been already stated, but were rejected owing to a lack of knowledge, untimeliness, or other reasons. It remains for us to look at the choices taken by traditional physicists at crucial points in history and to reconsider them with due regard to the accumulated knowledge. These new choices must eliminate as many contradictions in the present physical theories as possible. If we imagine physics as a crossword puzzle, then the goal is to choose those answers that do not contradict each other at the intersections.

Keywords: new paradigm, Nikola Tesla, unification, gravity, dark energy, dark matter, photon birth, refraction, diffraction.

1. Introduction

In his article "Do we need a new paradigm in physics?," Robert Oldershaw listed 12 problems of the old paradigm, which are indicative of the need for a new paradigm [1].

Oldershaw's arguments are convincing, i.e., the time to replace the old paradigm with a new one is long overdue. The next stage is to determine which requirements should be met by a candidate theory to replace the old paradigm.

As the first problem, Oldershaw chose the incompatibility of general relativity (GRT) with quantum mechanics.

In 2001, Lee Smolin also wrote about the search for quantum gravity [2]:

> "… atoms do fall, so the relationship between gravity and the quantum is not a problem for nature." (p. 6)

Smolin came to the following conclusion about the existence of false assumptions in two theories:

> "If it is a problem for us, it must be because somewhere in our thinking there is at least one, and possibly several, wrong assumptions."

From Smolin's reasoning, it follows that the main feature needed for a quantum gravity is the ability to explain why atoms fall.

The two theories of general relativity and quantum mechanics are built on different bases, which prevents their unification. Thus, refinement is required for both theories to achieve a unified basis.

Here, we unify general relativity and quantum mechanics based on the insights of Tesla, Einstein, and Newton.

2. Unification of general relativity and quantum mechanics

The ingenious inventor Nikola Tesla developed his inventions based on his own ideas about the physical world. As one of his revelations, he stated:

> "By being set in movement this fluid, the ether, becomes gross matter. Its movement arrested (halted), the primary substance reverts to its normal state." [3]

Much is conveyed in this short phrase:

a) The name "primary substance" indicates the primary material from which the world was created.

b) When in motion, the primary substance turns into matter.

c) From the two previous items, it follows that particles and atoms are vortices of primary material.

d) Stopping the vortex means returning to the initial state, i.e., a vacuum.

Because the concept of primary substance was absent at the time of Tesla (and until now), he hesitated in choosing a suitable definition of this essence and called it liquid or ether. However, this essence is neither liquid nor ether, because liquids are composed of atoms and molecules, but the primary substance is not.

Moreover, the primary substance cannot be ether because the ability to transform into matter was not attributed to ether.

In our work [4], we use the terms "unorganized mass" for the primary substance and "ordinary mass" for matter. By using these terms, we aim to emphasize the common nature of these masses and the possibility of their interconversion.

Point (c) of Tesla's revelation requires a change in the standard model of particle physics, which Oldershaw included in his list of unsolved problems, calling it a heuristic [1].

In 1704, John Toland [5] wrote:

> "Tho the Matter of the Universe be every where the same, yet, according to its various Modifications, it is conceiv'd to be divided into numberless particular Systems, Vortexes, or Whirlpools of Matter." (p. 187)

By conceiving particles as vertices of the medium, we eliminate their collisions with the medium, much like waves on the water surface do not collide with the carrier of the waves.

If we accept Tesla's paradigm, then it is necessary to consider what amendments are needed in the GTR to ensure compatibility with Tesla's paradigm.

In the famous book "Gravitation" by Misner, Thorne, and Wheeler [6], the authors stated:

> "… nowhere has a precise definition of the term "gravitational field" been given." (p. 399)

Hence, it is necessary to clarify the gravitational field in terms of Tesla's fundamental medium. In a little-known work of Albert Einstein, John Suffield [7] found a direct indication that the gravity field is an inhomogeneity of "the energy–density of space."

Because our goal is to unify the foundations of these concepts, it should be recognized that Einstein's "energy–density of space" is the same as Tesla's "primary substance."

This unification becomes the foundation of the new paradigm. In this paradigm, time is absolute, as in quantum mechanics (see [8]).

In general, it was shown in [4] that this new paradigm simplifies general relativity: a four-dimensional tensor with ten arbitrary functions is replaced by one scalar field.

3. Primary test for the suitability of the new paradigm

As mentioned above, according to Smolin, the new paradigm must explain why atoms fall in a gravitational field. To achieve this goal, we have refined the concept of the gravitational field and have greatly changed the standard model of particle physics.

We found that these steps were sufficient to achieve the set goal.

To fully reveal the mechanism of gravity, we must describe the properties of the universal medium:

1. The universal medium tends to equalize its density: the medium density property goes from a zone with higher density to a zone with lower density, resulting in a "density wave". It looks like the temperatures of solids in thermal contact equalize due to heat conduction.

A wave in the fundamental medium does not constitute a transfer of the medium, but rather the propagation of a density zone, as there is no movement of parts of a rigid body when heat propagates in it.

2. The speed of the density wave depends on the density of the medium through which the wave passes: a higher medium density corresponds to a lower speed of the density wave, and vice versa.

Figure 1 shows a density wave moving in a non-uniform vacuum, where the velocities of its edges differ.

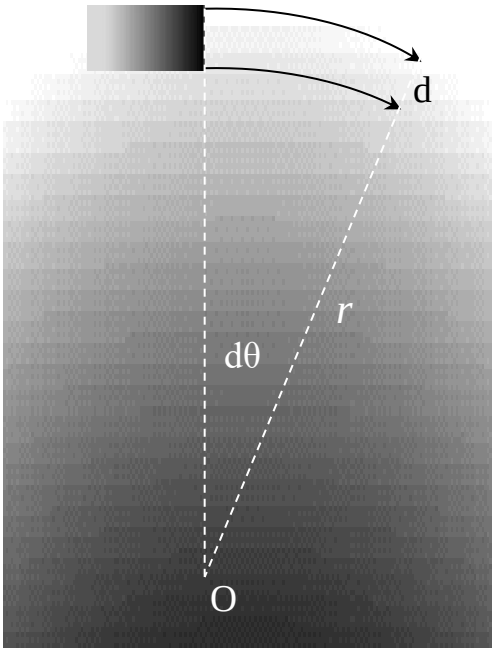


Fig. 1. A density wave deviates in a gravitational field because of a difference in the wave velocity of its edges.

We find the angle of rotation of the density wave in an inhomogeneous vacuum $d\theta$ by considering two similar triangles (Fig. 1):

$$d\theta = \frac{u\,dt}{r} = \frac{(u+d\,\nabla u\sin\alpha)dt}{r+d} = \nabla u\sin\alpha\,dt, \qquad (1)$$

where α is the angle between ∇u and the direction of the wave velocity $\vec{u}$ and d is the wave width. The rotation occurs in the plane parallel to ∇u and $\vec{u}$.

If the direction ∇u is fixed, then the change in the angle α depends only on the direction $\vec{u}$. Therefore, $d\theta = d\alpha$. Then, we obtain

$$d\alpha = \nabla u \sin\alpha \, dt. \qquad (2)$$

For point P on the wave front, the vertical component of the velocity is (see Fig. 2)

$$u_z = u \cos\alpha.$$

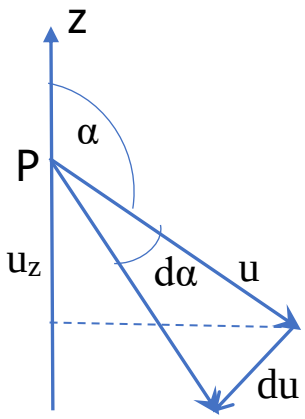


Fig. 2. Change in the vertical velocity component for point P on the wave front of a particle-vortex during free fall. The direction of the z-axis is vertical and coincides with the direction of ∇u.

A change in angle α by $d\alpha$ leads to a change in the vertical component u_z of the velocity u by

$$du_z = -u \sin\alpha \, d\alpha + \cos\alpha \, du. \qquad (3)$$

Substitution of $d\alpha$ from Eq. (2) into Eq. (3) yields

$$du_z = -u \nabla u \, sin^2\alpha \, dt + \cos\alpha \, (\nabla u \cdot \vec{u} \, dt).$$

Hence, the vertical acceleration of point P is

$$a_z = \frac{du_z}{dt} = -u\,\nabla u\,sin^2\alpha + \cos\alpha\,(\nabla u \cdot \vec{u}) = -u\,\nabla u(sin^2\alpha - cos^2\alpha). \qquad (4)$$

Points at the front of the vortex wave are located on either the external or inner surface of the particle as well as transitions between these regions; therefore, the factor $sin^2\alpha$ varies for different points of the wave front. As a result, some sections have a greater acceleration, alternately stretching parts of the vortex in the vertical direction.

In a uniform vacuum, $\nabla u = 0$; therefore, $a_z = 0$ for any angle α.

We can express the vertical acceleration a_z for point P in terms of u_z by considering $cos^2\alpha = (u_z/u)^2$. Then, we find

$$a_z = -u\,\nabla u(1 - 2cos^2\alpha) = -u\,\nabla u\,[1 - 2(u_z/u)^2]. \qquad (5)$$

Equation (5) clearly illustrates how the infinite acceleration of a freely falling body in a gravitational field is prevented: as the vertical component of the wave velocity u_z increases, the acceleration a_z tends to zero and can even become negative.

An illustrative explanation of this acceleration in a gravitational field is given in an article titled "How a gravitational field accelerates particles and atoms" [9].

In the new paradigm, elementary particles are stable vortices in which density waves circulate; thus, in accordance with Eq. (5), the wave front experiences acceleration in the direction of the gravitational field. In different phases of wave rotation, the angle α varies, but over the period of revolution, the acceleration is averaged, and the main acceleration factor is $u\,\nabla u$, which is the same for all particles.

It is important to note that there are no gravitons or gravitational forces in the described mechanism of gravitation. Einstein also believed that the gravitational force is fictitious.

Gravitational acceleration is a consequence of the turn of the wave front of a vortex-particle in an inhomogeneous medium.

In Section 6, we will show that the creation of new particles is also based on the same principle, thus demonstrating the simplicity of this paradigm.

4. Solving the problem of dark energy/matter

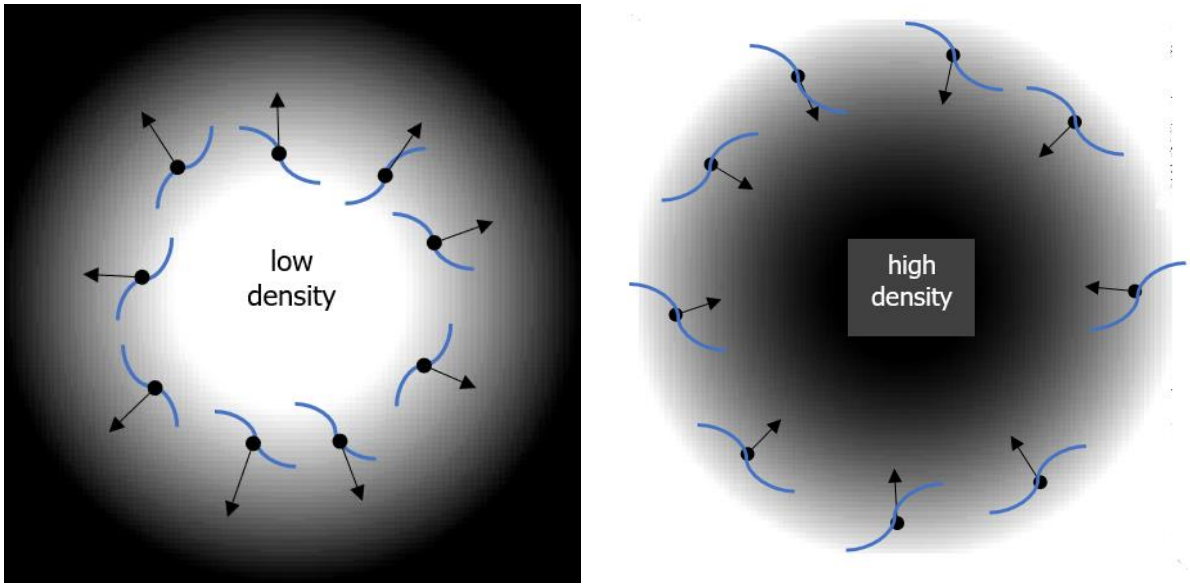
Oldershaw's list of problematic enigmas contains the "enigmatic dark matter" and "enigmatic dark energy acceleration" [1].

A refined and expanded understanding of the gravitational field easily solves both problems. According to this view, the common observation of gravity involves two processes. The first process is the creation of an inhomogeneous field around massive bodies due to a partial loss of their mass.
Here, we remember Tesla's statement: "Its movement arrested (halted), the primary substance reverts to its normal state." [3]

This view implies that gravity can exist without massive bodies, if an inhomogeneity in the gravitational field is created without the participation of massive bodies.
In particular, if a zone of low density is surrounded by a denser medium, then the acceleration of bodies will be directed outward (Fig. 3a). This is a case of so-called dark energy.

According to B. Pogorelsky [10], many large zones with a low medium density were formed as a result of the big bang because the unorganized mass transformed into ordinary mass at that time. As a result, the density of the unorganized mass dropped sharply.

In contrast, if a region of increased medium density is surrounded by zones of lower density, then the acceleration will be directed toward the center (Fig. 3b). Astrophysicists refer to this case as the phenomenon of dark matter.



a) b)

Fig. 3. Influence of the direction of a vacuum density gradient in the boundary zone on the apparent acceleration of galaxies. a) The vacuum density is lower inside the zone than outside; therefore, it appears as though "dark energy" pushes the galaxies away. b) The vacuum density is higher inside the zone than outside; thus, it appears as though "dark matter" attracts galaxies.

In all cases, the acceleration of gravity is directed toward a higher vacuum density, and the apparent difference between dark matter and dark energy is associated with the direction of the convexity of the intermediate zone.

5. Unification of optical phenomena

The new paradigm enables us to consider, from a single position, the deflection of a ray of light from a star when it passes near the sun and the refraction and diffraction of a ray as it passes near an opaque obstacle. This paradigm also allows us to predict an unexpected deflection of a ray of light in the gap between Casimir plates, which we have verified experimentally.

Let us start with Einstein's predicted deflection of star light as it passes near the sun. According to the new paradigm, the sun loses part of its mass, which turns into unorganized mass and thus creates a higher medium density near the sun surface. Consequently, a gravitational field is created.

A similar process occurs during diffraction at the edge of an opaque obstacle. The obstacle loses part of its mass and forms a medium inhomogeneity near its surface. The light beam is deflected toward the denser medium, i.e., toward the obstacle, and we observe the phenomenon of diffraction.

The foregoing allows us to achieve unification: the deflection of star light traveling past the sun is similar in nature to diffraction at the edge of an opaque obstacle. With this unification, the deflection of star light near the sun can be viewed as an example of diffraction.

More than 300 years ago in his letter to Robert Boyle [11], the great Isaac Newton had already hypothesized an intermediate layer around bodies as follows:

> "I suppose the rarer aether within bodies, and the denser without them, not to be terminated in mathematical surfaces, but to grow gradually into one another."

Then, Newton continued:

> "…this may be the cause why light, in Grimaldi's experiment, passing by the edge of a knife, or other opaque body, is turned aside, and as it were refracted..."

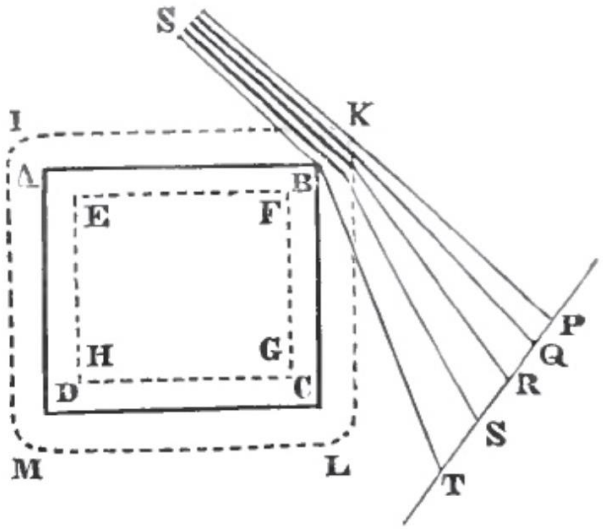


Fig. 4. Drawing by Isaac Newton in his letter to Robert Boyle [11] in 1679.

That is, Newton believed that diffraction resulted from the refraction of photons in a boundary layer at the edge of an opaque obstacle (Fig. 4).

Newton's description can be made fully compatible with our idea of the refraction of photons in a boundary layer if one replaces the "rarer aether" with the "denser aether" and vice versa. This inversion of the ether density in Newton's letter has already been discussed by Eric Baird [12].

Newton could not confirm his idea experimentally because the density gradient near an open obstacle in his example was insufficient for detection.

Due to the disintegration of a portion of atoms, the unorganized mass inside material bodies has a density higher than that in open space. As a result, a large density gradient is obtained at the boundary of transparent media. Therefore, in refraction, the beam is deflected at large angles that are inaccessible for diffraction.

There is an illusion that the beam changes direction abruptly, but in reality, it moves in a steep arc (Fig. 5).

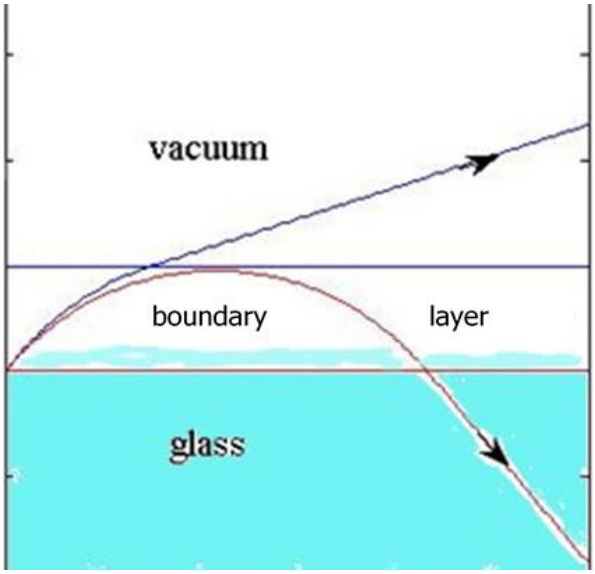


Fig. 5. Two possible trajectories of a photon: refracted (blue) and "reflected" (red).

This approach allows us to explain the phenomenon of "total internal reflection," in which there is actually no reflection. Rather, the ray either has time to enter a less dense medium without turning back or not (see Fig. 5). In the second case, the ray will return to its original denser medium [4].

In [4], we derived the law of refraction from the formula for the deviation of a photon in a gravitational field without the Huygens wave theory or reflection!

Based on these considerations, we concluded that the density of the medium in the gap between opaque Casimir plates should be higher than that near the open edge of an obstacle in ordinary diffraction.

Thus, the deflection of the beam during the transition from the outer space to the inside of the gap should be more pronounced than that with ordinary diffraction.

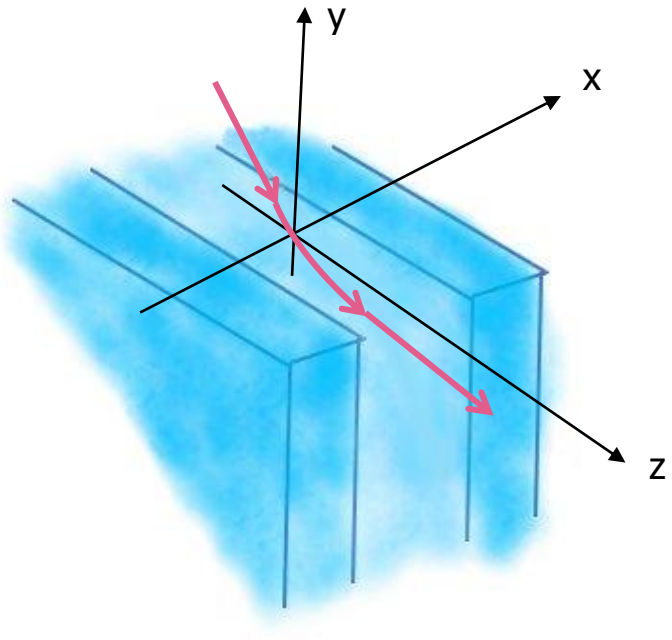


Fig. 6. A laser beam enters from above into the gap between the plates and is refracted in their merged boundary layer. This layer is invisible; however, for clarity, it is depicted by a fog.

We have confirmed this prediction for a beam entering the interior of the gap between Casimir plates. The medium density was sufficiently high to be detected, although the density was lower than that inside, for example, in glass.

The experimental set-up is shown in Fig. 6. The laser beam enters the gap between two opaque plates, where the merged boundary layer is present. Because the speed of light in this region differs from the speed of light at a distance, the beam should be refracted, which was confirmed by our experiment (see [4]).

Because there is no obstacle to diffraction between the Casimir plates, it is impossible to predict this phenomenon using the Fresnel wave theory of light.

6. Mechanism for creating photons "out of nothing"

Every physics student knows that atoms emit photons. Yet, it remains unclear where the photons came from, when there were no atoms at the beginning of the universe.

The proposed new paradigm can answer this question. The answer is based on only one natural property of the medium. The speed of the density wave depends on the density of the medium through which it propagates; therefore, the density wave changes direction in an inhomogeneous medium.

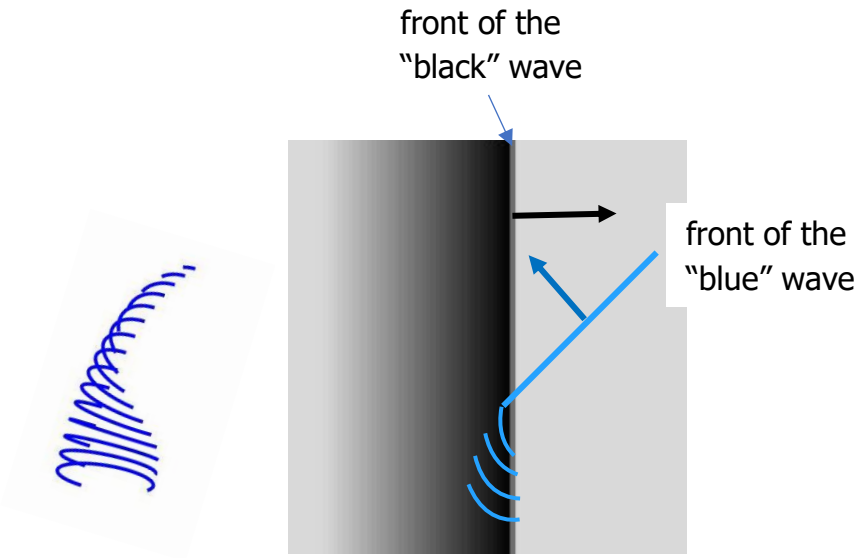


Fig. 7. Crossing waves generate photons. The front of the blue wave bends, the wave itself swirls, and a fragment of a toroidal vortex is obtained (shown on the left). The color of the wave serves only for identification; in reality, the unorganized mass is invisible.

Figure 7 demonstrates a transition of a wave structure into a vortex-photon when two density waves intersect.

As the density gradient of the medium increases, the turn of the wave front becomes steeper, and the frequency and energy of the generated photons increase.

If photons of various energies were not so stable, our world would not be as diverse as it is.

In the new paradigm, the laws of the macrocosm and microcosm do not differ, highlighting the simplicity and clarity of the new paradigm. As an illustration, we present the swirling of the sea wave as it reaches the shore (Fig. 8).

Fig. 8. The swirling of the sea wave when it comes ashore.

This swirling occurs for the same reason as the swirling that produces photons (Fig. 7). Namely, as the wave approaches the shore, the lower water layer is decelerated by the bottom, which leads to a difference in the velocities of the water layers, as in the case of the intersection of two density waves.

Conclusion

Many authors have stated that the growing number of unsolved enigmas of the old paradigm indicates the need for a new paradigm.

This article proposes a new paradigm as a candidate to replace the old paradigm. This paradigm is based on Nikola Tesla's concept of a primary medium from which all mass is created.

Clarifications were made to the GRT regarding the definition of a gravitational field, and the GRT and quantum mechanics were unified,

which required major changes to the standard model of particle physics.

We have shown that the new paradigm provides an answer to the question of why atoms fall.

From Oldershaw's list of enigmas, the phenomena of dark energy and matter are also explained. The enigma of Planck's constant is solved in a separate article [13].

The new paradigm enables us to reveal the unified nature of optical phenomena such as diffraction, refraction, and the deflection of a star's ray near the sun.

A refined understanding of gravitation can enable the development of aircraft that use gravity to move. Pilots of such devices will not experience overload at high accelerations.

This set of solved problems testifies to the accuracy of the chosen paradigm and promises new discoveries.

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