Water Analogy for Describing Gravity Phenomena and Properties of Antimatter in Spacetime

1 Introduction

If we observe a vessel with water on which metal thumbtacks, polystyrene balls, and polystyrene dust are floating, we can observe phenomena from which - by analogy - we can draw conclusions about many mysteries of the Universe.

2 Experiment with Thumbtack and Ball

We carefully place a thumbtack on the water (analog of M). Earth's gravitational field (force G-1) pulls it into the water, but surface tension (water cohesion forces) prevents it from sinking. We also place a polystyrene ball on the water (PS ball as an analog of antimatter). Force G-1 also pulls it into the water but weaker, because the density of the ball d_1 is less than the density of water d_2. The thumbtack has density d_3, which is greater than d_2. We can write:

$$d_1 < d_2 < d_3. \tag{1}$$

We call the meniscus around the thumbtack a *pit* (D), and around the PS ball - a *hill* (H). The water is in a metal vessel. Due to adhesion forces, water climbs up the vessel walls, creating a hill (H)around them.

3 The World of Flatworms (Fl)

On the thumbtack, in a 2D world, live *flatworms* (Fl). They observe that the thumbtack attracts another thumbtack. They believe this is the result of the curvature of their spacetime (CP3D) around the thumbtack. Fl think that the *mass* M of the thumbtack curves their CP. We, from the 3D + 1D world (time, together CP4D), know that the pit around the thumbtack is the result of true gravity G-1 from the 4D world, but Fl are unaware of this and cannot see it because they cannot look at the water from above. Fl do not even see the water; it appears to them as their P2D space. If we add time as a dimension to their P2D, we can write it as CP3D.

Fl also threw onto the water several dozen particles of finely ground polystyrene as an analog of antihydrogen. Fl conducted the *alpha-g* experiment to check whether aH attracts or repels M. They observed that the PS particles (i.e., aH) fall into the thumbtack's pit. Everyone applauded and drank champagne. But Fl were mistaken. The intrinsic curvature of CP around the PS particle is negligible compared to the pit of the thumbtack, i.e., their "Earth". The PS particle does not have enough energy to escape the potential well (pit) of the thumbtack. The particle therefore falls to "Earth" despite trying to push away from it. Its mass m is too small:

$$m \ll M. \tag{2}$$

4 Adhesion Force and Analogy of Force G-2

Since the PS ball floats on water, part of its volume protrudes above the surface. Due to adhesion force, water tries to climb up the walls of the PS ball, creating a hill around it. The PS particle is so small that all effects are minimal: both (D) (from Earth's attraction) and (H) from force G-2. However, a micro-hill forms overall. The smaller the polystyrene fragment, the greater the role of force G-2.

The analog of water adhesion force is force G-2 - the adhesion force of CP4D to antimatter A and matter M. Only around A, due to buoyancy and force G-2, CP creates a hill. For aH, due to force G-2, we also have a micro-hill overall (since aH also floats in CP4D). The following attract: (D)–(D) and (H)–(H). The following repel: (D)–(H), i.e., pit from hill. This is why the PS ball (as A) sticks to the edge of the vessel - there is a hill there.

Around the PS particle (as aH), thanks to force G-2, we also have a micro-hill overall, and as mentioned, (H) and (D) repel. Since (D) from Earth is large and (H) is tiny, aH falls in the potential well of Earth's G-1. For large masses, A and M will repel each other.

CP4D is subject to adhesion force both to Aand M. Whether a pit or hill forms around A/M depends on the buoyancy of A and sinking of M in CP. The greater the adhesion force of CP4D to A, the larger the hill and the stronger the repulsion of A from M. A separates from M, reaches the boundary of the vessel, and then climbs up, creating a hill around its walls.

In the real world, the "buoyancy" of antimatter in CP4D is a mysterious phenomenon. It may not result from the density difference between A and M. Perhaps antihydrogen and hydrogen have identical density but differ in some mysterious parameter that causes A to "float" in CP4D, which - like water - "climbs" up A and curves CP4D in a different way.

5 Another Analogy: Explaining Gravity in CP5D

Fl built a machine to travel from CP3D to CP4D. What did they see? Their CP3D metric is not geometry, but ordinary water on which a thumbtack of mass M (in kg/m^2) floats. Their formulas for gravitational force and curvature of the CP3D metric were false, but... strangely enough - they worked. Fl saw that it is not the thumbtack that changes the CP3D metric, but the true mass M (i.e., Earth) that pulls the thumbtack into the water, and the water's surface tension prevents it from sinking. Fl saw that the true formula for gravitational force is:

$$F = G\frac{M \cdot m}{r^2}. \tag{3}$$

It has no relation to CP3D, but to CP4D. Fl saw that M is enormous (Earth's mass) and that it is not the mass of the thumbtack (which was "Earth" for Fl). They discovered the true gravitational constant, which has no relation to their CP3D.

This analogy shows that for us, beings from CP4D, it is very difficult to describe gravity from the perspective of an observer in CP5D. The author has undertaken such an attempt and is aware that it is highly speculative.

6 Analogy for Mass and Spacetime

Imagine we have a crumpled paper sheet (CPS) and a straightened paper sheet (SPS). Both entities are one. Matter is essentially compressed CP, like a paper sheet that can be partially straightened. Matter is like "compressed CP"; it is another form of CP, like water and water vapor. To compress CP into matter, a very large amount of energy is needed ($E = mc^2$).

In summary: CP and matter are closely connected at the most fundamental level of existence.

According to my hypothesis, CP can store energy within itself (we partially compress the sheet or compress it to CPS) or release it (the sheet straightens). The energy for this work comes from the interaction of branes of antimatter and matter.

According to GR, matter and CP are one actor (matter) and one stage (CP). The stage is passive and merely a background for the actor. In my hypothesis, CP and M are like one actor playing two roles simultaneously.

From this analogy follows a key conclusion: the movement of mass in spacetime is not merely the movement of an object against a static background. It is the movement of the local deformation of spacetime itself, inextricably linked to it. Mass moves together with its own "attached" curvature, flowing through the dynamic and elastic structure of CP. This mutual coupling may be the source of the apparent paradoxes and relativistic phenomena we observe.

7 Balloon Analogy for Changing Spacetime Metric Around Mass

Consider a symmetric balloon with a small thickening of the material (a defect). When we inflate the balloon, the internal pressure causes stresses in the material. The key issue is how the defect affects local stresses and shape.

1. **Thickening as a defect**: The thickening means that at this point the material is thicker than in the surroundings. Thicker material is stiffer (less prone to stretching) than thin material.

2. **Behavior during inflation**:

   - When the balloon inflates, the thin material stretches more easily, while the thicker part (thickening) stretches with more difficulty.
   - As a result, the surrounding thin material will stretch more, while the thickening remains relatively unstretched.

3. **Shape at the thickening site**:

   - Because the thickening is stiffer, it will not bulge outward as much as the surroundings. Instead, it will form a local "indentation" (thus it will be closer to the center of the balloon relative to the adjacent bulging areas).

- The surrounding thin material will form a "hill" (bulge), while the thickening will be recessed inward.

4. **Analogy**: This can be compared to inflating a balloon with a patch of thicker material - the patch does not stretch like the rest, so it creates a concave area.

Therefore, during inflation, the stiffer thickening cannot keep up with the stretching of the soft surroundings, leading to a local indentation.

Through this balloon analogy, mass creates an "indentation" in the fabric of CP.

1. **"Inflation" by** B_{an}: Repulsion between branes tensions our brane B_{ma}, striving to "flatten" it or give it a uniform shape.

2. **Reaction of the "Thickening" (Mass)**: Mass, as a region of enormous energy density, **resists** this tension. It is "stiff".

3. **Formation of the "Pit"**: The surrounding "soft" (empty) space yields to the tension and stretches. As a result, the stiff thickening (mass) **falls behind**, creating a relative indentation - **local curvature of the spacetime metric**.

8 Supplement 7.1 to the Balloon Analogy

In the analogy described in point 7, the curvature (bulging) of the balloon shell around the thickening on the surface (defect) creates an "indentation", meaning the thickening is located closer to the center of the balloon relative to the adjacent areas bulging "upward".

One can imagine another mechanism of curvature of the CP metric under the influence of the interaction of B_{an} on B_{ma}. It seems that this mechanism is much closer to the water analogy with a pin. B_{an} not only tensions the CP itself through mutual repulsion of branes, but may also push "defects" of spacetime (i.e., energy concentrations) out of the CP itself. This time the change of the CP metric will be reversed. CP concentrations will be pushed "upward", while the neighboring environment will undergo much weaker pushing.

For visualization of this phenomenon, a fragment of a balloon shell was used, on the surface of which a small steel ball was placed. After directing the ball above a neodymium magnet, strong bulging of the shell was observed depending on the distance of the ball from the magnet (Photo No. 1).

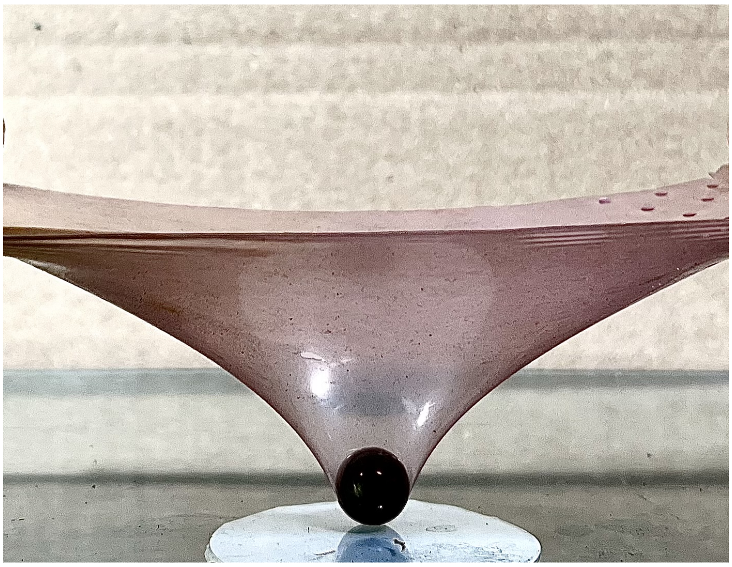

Figure 1: Photo No. 1 - Visualization of CP metric curvature using a neodymium magnet (as B_{an}) and a steel ball as matter on the surface of B_{ma}

For better understanding of the phenomenon, a short visualization of the experiment was prepared. The recording is available at: `https://youtu.be/nddIabCUlkQ`. We encourage you to watch the video material.

It should be emphasized that the additional mechanism of curving the CP metric by B_{an} does not affect the validity of the presented hypothesis.