Intuitive Physics

How Toys Predicted the End of the Accelerating Universe

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Abstract

I present a research method based on constructing simple physical models from everyday objects. Through an analogy to sonar scanning the ocean floor of physics, these models indicate directions for further research, which finds confirmation in the latest cosmological discoveries, including the groundbreaking DESI 2025 results concerning the lack of accelerating expansion of the Universe. I present a specific geometric model of quasi-antimatter (qAn) as the source of observed cosmological effects.

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1 Introduction: From Play to Methodology

1.1 The Simple Problem in a New Perspective

This work presents a research method based on solving simple problems in physics through the construction of conceptual-geometric models. Unlike traditional mathematical approaches, this method generates rich phenomenological insights from minimal geometric assumptions, demonstrating its value through a series of predictions in fundamental physics and cosmology.

1.1.1 Traditional vs. Conceptual Approach to Simple Problems

- **Traditional simple problem:**
  - Input: mathematical equations + initial parameters
  - Output: quantitative predictions
  - Example: "Solve the Schrödinger equation for a given potential"
- **Proposed approach to simple problems:**
  - Input: system of concepts, analogies and geometric principles
  - Output: qualitative predictions and phenomenological explanations
  - Example: "If mass is compressed geometry, and motion is deformation, then rotating mass must generate a magnetic field"

1.2 The Sonar Method in Fundamental Physics

To predict new phenomena in nature, we use analogies of simple everyday objects – cardboard tubes, colored corks, plastic lids, springs [1] – for visualizing and explaining the fundamental forces governing the Universe.

The method functions like sonar scanning the ocean floor of physics:

- **Sonar phase:** Conceptual models "scan" reality, indicating: "SOMETHING IS HERE!"
- **Diving phase:** Traditional research methods (mathematical formalism) go "underwater" to investigate the indicated areas in detail

2 Hydrodynamic Analogy: A Window to Reality

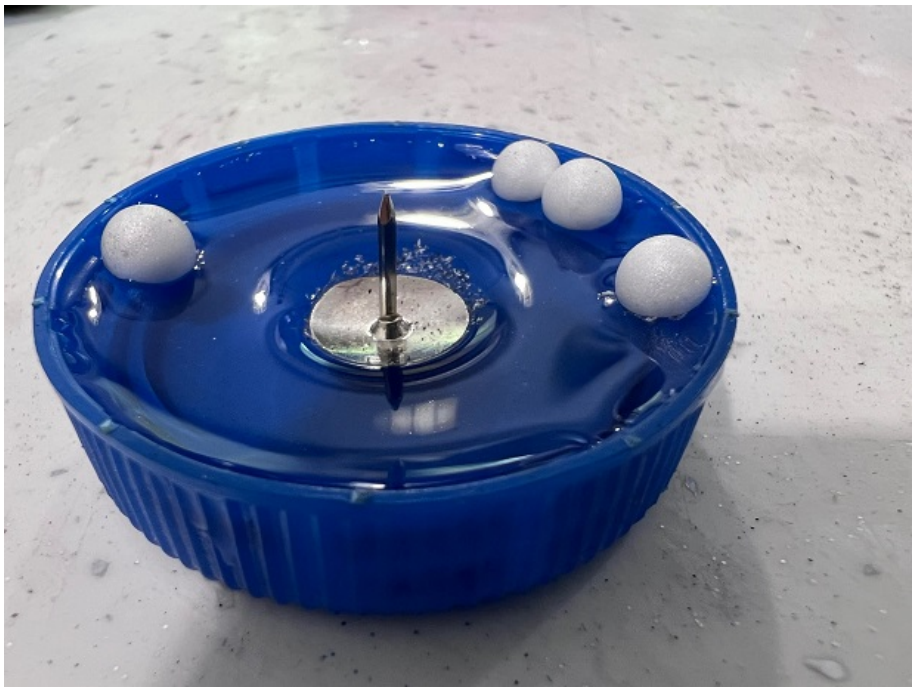

Figure 1: Thumbtack, polystyrene ball

2.1 The Water Theater

Let's imagine a water vessel as our laboratory:

- **Water** is 4D spacetime
- **Metal thumbtack** is matter (M) – creates concave meniscus (depression)
- **Polystyrene ball** is antimatter (A) – creates convex meniscus (hill)
- **Vessel edge** is the boundary of the Universe

2.2 What Do We See in the Theater?

We observe fascinating phenomena:

- Thumbtacks attract each other – their depressions merge
- Balls attract each other – their hills merge
- But thumbtack and ball repel each other – depression and hill don't want to cooperate
- Balls "escape" to the vessel edges – just as antimatter could "escape" to the boundaries of the Universe

2.2.1 Two Interpretations

Idea 1: PS ball as antimatter

- Antimatter repels from the Universe
- **Prediction:** Antihydrogen falls slower than hydrogen

Idea 2: PS ball as quasi-antimatter

- Lack of accumulated antimatter in the Universe
- **Prediction:** Antihydrogen falls the same as hydrogen
- Basis for dark energy and matter hypothesis

3 First Sonar Blades: Confirmation from the Depths

In 2025, a groundbreaking paper was published by the research team from Yonsei University (Son et al.) in the journal *Monthly Notices of the Royal Astronomical Society*. Analyzing Type Ia supernova data [6] using the latest measurements from the DESI instrument, these authors reached a conclusion that directly confirms predictions generated by my conceptual models.

3.1 Common Ground: Questioning the Foundation

Both works – mine, based on analogies, and Son et al.'s work, based on quantitative observational analysis – meet at one fundamental point: **they question the reality of accelerating expansion of the Universe in the form postulated by the standard ΛCDM model**.

- **My "sonar" (conceptual models)** indicated that the mechanism behind observations attributed to the cosmological constant Λ might not be a constant parameter, but rather a dynamic geometric state (quasi-antimatter [3], qAn) at the boundaries of the Universe.
- **The "diving" (Son et al.)** showed that after accounting for the systematic error related to the age of supernova progenitor stars (so-called *progenitor age bias*), the observational signal of accelerating expansion **disappears**. Supernova data, after correction, indicate a non-accelerating Universe ($q_0 > 0$).

3.2 Convergence: Map and Terrain

This independent confirmation is crucial for validating the sonar method:

1. **Map Accuracy:** My models with thumbtacks and balls, in their qualitative simplicity, **indicated the right research direction** before traditional science provided hard evidence.

2. **Complementarity of Approaches:** While Son et al.'s work shows *how* we might have been mistaken (calibration bias), my work proposes *what* dark energy might actually be.

3. **Paradigm Revolution:** Both works, each in their own way, call for abandoning the rigid ΛCDM model.

4 Theater of Light: How Thumbtack Menisci and Ball Hills Told a New Story of Redshift

4.1 Alternative Explanation of Hubble's Constant

In conventional cosmology, galaxy redshift is interpreted solely as an effect of Universe expansion described by FLRW equations. In the presented model of geometric quasi-antimatter (qAn), the observed value of Hubble's constant H_0 receives a fundamentally different explanation.

4.2 Boundary Structure of the Universe

According to calculations, quasi-antimatter forms a spherical boundary layer with thickness:

$$\Delta R = 1.47 \times 10^{21}\,\text{m} \approx 155\,000\,\text{light years}$$

located just beyond the boundary of the observable Universe. qAn, being a geometric state of spacetime, is transparent to electromagnetic interactions [4], but influences photons exclusively through spacetime geometry.

4.3 Photon-qAn Interaction Mechanism

Light from distant galaxies undergoes interactions exclusively with gradients of qAn geometric fields:

$$F_{\text{resultant}} = -F_{\text{meniscus\_H}}$$

where the only interaction is geometric repulsion through the convex qAn meniscus.

4.4 Mathematical Description of Redshift

The total observed redshift is a superposition:

$$z_{\text{obs}} = z_{\text{exp}} + z_{\text{qAn}}$$

where:

- z_{exp} – redshift from real expansion
- z_{qAn} – redshift from interactions with qAn geometric fields

Redshift from qAn is described by an integral along the light path:

$$z_{\text{qAn}} = \int_0^d \alpha_{\text{meniscus}}(\mathbf{r}(s))ds$$

where $\alpha_{\text{meniscus}}(\mathbf{r})$ is the local interaction coefficient with the gradient of the qAn geometric field.

4.5 Explanation of Observations

4.5.1 High H_0 Value

Hubble's constant decomposes into components:

$$H_0^{\text{obs}} = H_0^{\text{exp}} + H_0^{\text{qAn}}$$

where $H_0^{\text{qAn}} \gg H_0^{\text{exp}}$, which explains the observed values without requiring rapid physical galaxy recession.

4.5.2 Redshift Isotropy

Spherical symmetry of the Morpheus Sphere [2] ensures:

$$z_{\text{qAn}}(\hat{\mathbf{n}}_1) = z_{\text{qAn}}(\hat{\mathbf{n}}_2) \quad \forall \hat{\mathbf{n}}_1, \hat{\mathbf{n}}_2$$

which explains the homogeneity and isotropy of observed redshift.

4.6 Cosmological Consequences

- **Smaller real expansion**: Physical expansion rate of the Universe is slower than would follow from H_0^{obs}
- **Universe age**: Possibly greater age of the Universe than 13.8 billion years

- **Solution to Hubble tension**: Differences in H_0 measurements result from varying sensitivity of methods to the qAn component
- **Redshift without expansion**: Part of observed redshift doesn't require physical galaxy motion

5 Conclusions and Further Directions

The sonar method doesn't replace traditional science, but complements it - indicating directions worth investigating before we dedicate years of work to "diving" in the wrong place.

- **Prediction of systematic errors in cosmology** - models indicated that "acceleration" might be a measurement artifact, confirmed by DESI 2025 results
- **Geometric sources of "dark energy"** - concept of quasi-annihilation at the Universe edge offers alternative explanation
- **Complex nature of redshift** - model suggests redshift may result from geometric interactions, not just expansion
- **Anticipation of ΛCDM crisis** - conceptual methods predicted the need to revise the standard cosmological model long before observations

NOTE

The main value of this work lies in the **ideas**
generated by models made from corks and tubes.

Mathematics is merely an **afterthought**
and may contain imperfections.

References

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