A Tale of Deep Symmetry in the World

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13.09.2025

Abstract

This tale is an attempt to see the invisible. Using simple objects - cardboard tubes, colored corks, and plastic lids - we create a map to understand the deepest symmetries governing our Universe. We tell a story about how matter and antimatter may be merely two sides of the same coin, how energy is encoded in geometry, and why our world, despite this perfect symmetry, seems to break free from it.

Version Important Notice

Note: This version contains errors. It is recommended to use **version 2.0 [1]**, which includes corrections and significant changes.

Figure 1: Illustration of the model with tubes and corks. Red cork (KRed) symbolizes positive charge, green cork (KGren) - negative charge. Paper tube (TP) represents rest energy, crushed paper (ZKP) - polarized spacetime. Small lid (MP) represents the geometric polarization of spacetime. Full description of all elements can be found in the document Analogia.pdf.

1 Proton: Not Just a Particle

Let's imagine a proton. In the standard picture, it's a tiny ball carrying a positive charge. But to go deeper, we must "disassemble" it into its fundamental parts. In our story, a proton is not a single entity, but rather a **complex state of fundamental reality**.

Let's introduce our actors:

- **Paper Tube (TP)**: This is pure rest energy, $E = m_p c^2$. It is the fuel, the raw material from which matter is built.
- **Crushed Paper Sheet (ZKP)**: This is **curved and polarized spacetime**. Its specific "shape" or "polarization" - which we denote as **ZKP(+)** - is what manifests to us as positive charge and other proton properties.
- **Red Cork (KRed)**: This is just a **marker**, a label. It symbolizes positive charge, which is the **effect** of the hidden, geometric nature of ZKP(+), not its cause.

Our proton is therefore: **P(+) = [KRed] + [TP] + [ZKP(+)]**. It is energy ($E = mc^2$) trapped in a specifically twisted region of spacetime, labeled with "+".

2 In Gravity's Workshop: Unpacking and Flipping

Gravity is the great architect and destroyer. In extreme conditions - in the hearts of dying stars or at the threshold of black holes - its power reaches absurd levels. It provides the energy (**E_grav**) needed to "unpack" the proton.

The Flipping Process

Step 1: Unfolding
Extreme gravity provides energy to unfold the proton's compressed spacetime.

$$\mathrm{P}(+) = [\mathrm{KRed}] + [\mathrm{TP}] + [\mathrm{ZKP}(+)] \rightarrow [\mathrm{PBlu\text{-}O}] + m_p c^2 + E_{\mathrm{grav}}$$

Where **PBlu-O** is a large blue lid symbolizing the unfolded, fundamental spacetime (RKP). The mass energy ($m_p c^2$) is released, ready for reuse.

Step 2: Inversion (Flipping the Coin)
Part of the gravitational energy (E_{grav}) goes into performing work - **flipping** the geometric state. This is a crucial, non-intuitive step. Adding a second "positive" polarization (**MP(+)**) to an existing one does not strengthen it, but rather **overloads** the system, causing it to "flip" to the opposite state.

$$\mathrm{MP}(+) + \mathrm{MP}(+) = \mathrm{MP}(\text{-}) \quad \text{or equivalently} \quad \mathrm{MP}(+) + E_{\mathrm{grav}} = \mathrm{MP}(\text{-})$$

The geometry has been **flipped**.

Step 3: Re-compression
The previously released mass energy ($m_p c^2$) is now used to re-"crush" the already **flipped** spacetime (with polarization **MP(-)**) back into condensed form **ZKP(-)**. A new object is created. Since its internal geometry now has negative polarization, we mark it with a **green cork (KGren)** - a symbolic indicator of negative charge.

$$[\mathrm{PBlu\text{-}O}] + [\mathrm{MP}(\text{-})] + m_p c^2 \rightarrow [\mathrm{TP}] + [\mathrm{ZKP}(\text{-})] + [\mathrm{KGren}] \equiv \mathrm{aP}(\text{-})$$

The birth of an antiproton.

Nothing is lost in this process. Energy is conserved. Only the **geometric state** of the fundamental "substance" of the world changes, and this change brings with it a change of label (cork).

3 Two Worlds: The Mirror Reflection of Reality

The true elegance of this story reveals itself when we look at the bigger picture. Our model allows us to construct not one, but **two symmetric universes**.

Row I: Our Universe

- **KRed** = Marker of **Positive** Charge (+)
- **KGren** = Marker of **Negative** Charge (-)
- **P(+)** = [KRed] + [TP] + [ZKP(+)] (Our proton)
- **aP(-)** = [KGren] + [TP] + [ZKP(-)] (Our antiproton)

Row II: The Mirror Universe

- **KRed** = Marker of **Negative** Charge (-) **(Change!)**
- **KGren** = Marker of **Positive** Charge (+) **(Change!)**
- **P(-)** = [KRed] + [TP] + [ZKP(-)] (Mirror proton)
- **aP(+)** = [KGren] + [TP] + [ZKP(+)] (Mirror antiproton)

In this world, **geometric polarization defines matter differently**. What is matter to us (ZKP(+)), there - due to changed conventions (corks) - manifests as **antimatter (aP(+))**.

And here we come to a breathtaking point:

The proton (P(+)) from our Universe is *identical* to the antiproton (aP(+)) from the Mirror Universe.

The mirror proton (P(-)) from that Universe is *identical* to the antiproton (aP(-)) from ours.

We have just discovered **CPT** - the deepest symmetry of nature. The simultaneous transformation of:

- **C (charge)** - by changing the meaning of corks,
- **P (parity)** - by inverting the geometric polarization (MP),
- **T (time)** - implicitly, by comparing two persistent states,

leads to a world that is **indistinguishable** from the original! The physical laws describing a proton in our world are **identical** to those describing a mirror antiproton in that world.

4 The Moral of the Story: Symmetry and Its Breaking

Our tale of cardboard tubes and corks reveals something profound: the fundamental architecture of reality appears to be perfectly symmetrical. Matter and antimatter are merely a matter of perspective, convention, the local "setting" of our geometry and labels. We are not searching for something that "destroyed" antimatter, but rather for a **vanishingly small asymmetry** in the laws of physics, a tiny "gremlin" that distinguished antimatter from matter in the first fractions of a second after the Big Bang.

Matter and antimatter are not two separate entities, but merely two states of the same geometric essence – differing only in the local polarization of spacetime and an arbitrary label.

This model naturally leads to three fundamental questions, each residing on a different conceptual level.

Question 1: Within Our Universe

Where did the antimatter (aP(-)) in our Universe go? This is the classic, unsolved question of modern cosmology. Our current story **does not address this topic**. It is a subject for a separate "tale".

Question 2: Between Worlds

Why is our local reality a realization of the "Heads" state (World I), and not "Tails" (World II)? The answer to this question is both simple and profound: it was a **random choice**. At the moment of the Universe's birth, in the process of cooling and symmetry breaking, a fundamental "coin" was tossed. It had to land on one of two perfect sides. An inhabitant of the "Tails" world would ask themselves the identical question: "Where did the 'Heads' world go?".

Question 3: Crossing the Symmetry Barrier

Is it possible, within our World I, to create an object that is the geometric and charge counterpart of a proton from World II – namely, P(-)?

This is the question that **interests us the most**. It leads directly to a series of predictions that could be verified experimentally. We believe the answer is: **Yes**. This, too, is a separate topic for another story.

A process analogous to the described "inversion" under extreme gravity – but perhaps achievable under controlled laboratory conditions – could provide the means for a **local twisting** of the geometric state of spacetime?

This story is not the end. It is an invitation to further inquiry. An invitation to look at a simple set of objects and see in them a reflection of the deepest laws of the cosmos.

References

[1] A. Okupski (2025). *Deep Symmetry 2.0.* Zenodo. https://doi.org/10.5281/zenodo.17566899