



# A Tale of Deep Symmetry in the World

## Version 2.0 – Fundamental Modification

Reference to: [1]

Arkadiusz Okupski

November 9, 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, appears to break free from it.

### Note on Hypothesis Evolution

**Constitutes a profound modification** of the earlier work [1]. This version 2.0 introduces significant changes and corrections compared to the original concept.



Figure 1: Illustration of the model with tubes and corks. Red cork (KRed) symbolizes positive charge, and green cork (KGren) - negative charge. Paper tube (TP) represents rest energy, and crumpled paper sheet (ZKP) - charge-polarized spacetime. Small lid (MP) represents p-spin - the resultant orientation of geometric polarization.

## 1 Proton: Not Just a Particle

**Terminological note:** The concepts used in this geometric model differ from standard quantum physics concepts. Just as we introduced:

- p-gluon [2] (instead of gluon) for spacetime quantum
- ECV/CCV for spacetime states

we now introduce:

**p-spin** = resultant orientation of geometric polarization within CCV. p-spin is the fundamental geometric "arrow" that distinguishes the Heads World from the Tails World.

In standard physics, spin is a quantum property. In our model, **p-spin** is an emergent geometric property resulting from the collective alignment of p-gluon vortices in a compact configuration.

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

Let us introduce our actors:

- **ECV (Expanded Vacuum Configuration):** Ground state, the "unfolded sheet" of spacetime. ECV possesses an inherent **geometric polarization**. It can adopt one of two stable values, analogous to coin sides: **ECV(+)** ("Heads") or **ECV(-)** ("Tails"). These states are not related to electric charge, but to fundamental geometry.
- **CCV (Compact Vacuum Configuration):** Excited state, the "crumpled sheet", identified with the presence of matter-energy. CCV represents a state where spacetime is compressed and densified, manifesting as matter or energy. Compression (CCV) does not remove geometric polarization; on the contrary – it **enhances and solidifies it**, limiting fluctuation freedom.
- **Geometric Polarization:** Fundamental, binary asymmetry (+, -) characterizing the state of spacetime, analogous to coin sides. It is this polarization, in combination with labeling convention ("tags"), that defines what we perceive as *matter versus antimatter*.

And what about the **ECV(0)** state? The models are uncompromising here: **ECV(0) is a metastable state, physically impossible to maintain**. It is like a coin standing on its edge. Maintaining such a state would require continuous energy input against the system's natural tendency toward minimum energy. **Nature does not tolerate prolonged lack of choice** at the level of fundamental geometry. If ECV(+) is the front side of the sheet, then ECV(-) is the back side. There is no third option. ECV(0) exists not as a state that can be "inhabited", but as a **potential barrier**, a transitional moment of "inversion" that enables complete transition between the Heads World and the Tails World.

## 2 In the Workshop of Gravity: Unpacking and Inversion

**Gravity is the great architect and destroyer.** Under 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" and "rebuild" the proton. The energy  $m_p c^2$  appearing in the description is either packed into the tube and is part of the proton, or it can be released and await reuse to create  $aP(-)$  or another particle. Meanwhile,  $E_{grav}$  is the "process fuel", and  $m_p c^2$  is the "stored energy charge" that changes packaging.

### 3 Two Worlds: The Mirror Reflection of Reality

Let us look at the bigger picture. Our model allows the construction of not one, but **two symmetric universes** corresponding to different symmetries of nature.

**Note on the inversion process:** The  $ECV(0)$  state serves as a transitional "geometric gate" through which the system must pass to change the fundamental polarization of spacetime. Energy  $E_{grav}$  is supplied mainly to overcome this potential barrier, while  $m_p c^2$  constitutes the conserved "energy charge" transferred between configurations.

#### World I: Our Universe

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

##### Step 1: Unpacking

$$P(+) = [KRed] + [TP] + [CCV(+)] \xrightarrow{E_{grav}} [ECV(+)] + m_p c^2$$

##### Step 2: Smoothing ECV(+)

$$[ECV(+)] + E_{grav} \rightarrow [ECV(0)]$$

##### Step 3: Repacking

$$[ECV(0)] + m_p c^2 \xrightarrow{E_{grav}} [TP] + [CCV(-)] + [KGren] = aP(-)$$

#### World II: The Mirror Universe

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

##### Step 1: Unpacking

$$P(-) = [KRed] + [TP] + [CCV(-)] \xrightarrow{E_{grav}} [ECV(-)] + m_p c^2$$

##### Step 2: Smoothing ECV(-)

$$[ECV(-)] + E_{grav} \rightarrow [ECV(0)]$$

##### Step 3: Repacking

$$[ECV(0)] + m_p c^2 \xrightarrow{E_{grav}} [TP] + [CCV(+)] + [KGren] = aP(+)$$

Note. The change of CCV polarization from plus to minus and vice versa during inversion is partially explained in [2]. In this world, **geometric polarization defines**

**matter differently.** What is matter for us ( $CCV(+)$ ), there – due to changed conventions (corks) – manifests as **antimatter** ( $aP(+)$ ).

The model implies a fundamental symmetry:

**The proton in our world corresponds to the antiproton in the mirror world**

**The proton ( $P(+)$ ) from our Universe is *mirror-equivalent* to the antiproton ( $aP(+)$ ) from the Mirror Universe.**

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

Our model suggests a **geometric interpretation of CPT symmetry** – the deepest symmetry of nature. Simultaneous reversal of:

- **C (charge)** – by changing the meaning of corks,
- **P (parity)** – by inverting geometric polarization (ECV),
- **T (time)** – whose geometric meaning in the model remains an open question,

suggests the possibility of a world **physically indistinguishable** from the original!

**Symmetry T is the greatest mystery of CPT.** While C and P have clear geometric interpretations in our model, T remains transcendent - perhaps it is the guarantee that the fundamental "logic" of reality remains invariant regardless of the direction in which time flows.

The physical laws describing the proton in our world **could be identical** to those describing the mirror antiproton in that world.

## 4 Neutron and Antineutron: The Geometric Mystery of Neutral Particles

The geometric model also reveals its depth in the case of neutral particles. In World I (p-spin +1), **two geometric counterparts of the neutron** coexist:

- **Neutron:**  $[TP] + [CCV(s+)]$  (no cork - no charge)
- **Antineutron:**  $[TP] + [CCV(s-)]$  (no cork - no charge)

**The difference between neutron and antineutron** lies not in electric charge (both neutral) nor in p-spin (both in World I), but exclusively in the **geometric polarization of CCV** - the fundamental setting of the "interior" of spacetime, where  $s+$  and  $s-$  denote different degrees of geometric freedom unrelated to charge.

**Neutron inversion process:**

$$Neutron = [TP] + [CCV(s+)] \xrightarrow[\text{through } ECV(0)]{E_{grav}} [TP] + [CCV(s-)] = Antineutron$$

In the standard model, the difference between neutron and antineutron manifests through different quark composition. In the geometric approach, this is a **purely geometric difference** of internal spacetime polarization. The antineutron is not an "alien from an antiworld", but a native object of our world with inverted internal geometry.

This perspective explains why the antineutron can be stable in our Universe - it constitutes a natural, geometric variant of a neutral particle, differing only in the internal organization of spacetime.

## Experimental Verification: Beta Decay

The geometric difference between  $CCV(s+)$  and  $CCV(s-)$  manifests experimentally in **beta decay**, where:

- **Neutron** ( $CCV(s+)$ ):  $n \rightarrow p + e^- + \bar{\nu}_e$
- **Antineutron** ( $CCV(s-)$ ):  $\bar{n} \rightarrow \bar{p} + e^+ + \nu_e$

These opposite decay processes constitute **experimental evidence** for the fundamental geometric difference between neutron and antineutron, despite their identical charge neutrality. In the geometric model, the difference in **decay direction** results directly from the opposite polarization  $CCV(s+)$  vs  $CCV(s-)$ , where spacetime geometry **controls the flow** of charges in the decay process, much like the shape of a gutter controls the direction of flowing water.

## 5 The Moral of the Tale: Symmetry and Its Breaking

Our tale of tubes and corks reveals something profound: the fundamental architecture of reality appears to be perfectly symmetric. **Matter and antimatter are merely a matter of perspective** - conventions, "settings" of our local geometry and labels.

### What Have We Discovered?

- **Geometric Polarization (ECV+/ECV-)** is the fundamental "setting" of space-time, analogous to coin sides
- **Three Types of Inversion** correspond to different symmetries of nature:
  - **Type I (C)**: Charge change within a world
  - **Type II (P)**: World change with preserved charges
  - **Type III (CPT)**: Full symmetry by changing both world and charge
- **ECV(0)** is a potential barrier - a transitional state enabling passage between worlds

### Three Fundamental Questions

This model naturally leads to three questions, each at a different level of depth:

#### Question 1: Within Our World

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

#### Question 2: Between Worlds

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

### Question 3: Crossing the Barrier

Is it possible within our World I to produce an object that is the geometric counterpart of the proton from World II - i.e.,  $P(-)$ ?

This question **interests us most**. It leads directly to predictions verifiable experimentally. We believe the answer is: **Yes**.

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

## The Ultimate Discovery: The Geometric Essence of CPT Symmetry

The physical laws describing the behavior of the proton ( $P(+)$ ) in our Universe *could be identical* to the laws describing the behavior of the antiproton ( $aP(+)$ ) in a world with inverted geometric polarization and charge conventions.

This is the potential core of CPT symmetry - the deepest symmetry of nature. Although the proton and antiproton are **different objects** (differing in charge, baryon number, spinor properties), their **behaviors could be mirror reflections** in a world with inverted geometry.

### What Does This Mean Exactly?

In our model, the pair:

$P(+)$  in World I (ECV+, KRed=+) and  $aP(+)$  in World II (ECV-, KGren=+)

**could be described by identical equations of motion** thanks to compensation:

- **Difference in geometric polarization** (ECV+ vs ECV-) compensates for:
  - difference in **spinor properties**
- **Difference in charge conventions** (KRed=+ vs KGren=+) compensates for:
  - difference in **electric charge**
  - difference in **baryon number**

### Deeper Understanding

Our model with tubes and corks **suggests a geometric intuition for CPT symmetry**, but simplifies certain aspects:

**What the model correctly captures:**

- The idea that matter and antimatter are "two sides of the same coin"
- The role of geometric polarization in parity symmetry ( $P$ )
- The conventional nature of charge labels in charge symmetry ( $C$ )

- The fact that full symmetry requires simultaneous reversal of C, P and T

### Where the model simplifies:

- **Spinor nature of fermions** - proton and antiproton are different spinor states
- **Quantum properties** - full description requires quantum mechanics
- **Weak interactions** - which by themselves violate CP symmetry
- **Operation T** - whose geometric meaning remains unclear

### Why Is This Important?

Despite these simplifications, the presented geometric model provides **deep intuition**: it suggests that CPT symmetry need not be merely abstract mathematics, but may result from fundamental "geometric interchangeability" between:

**Geometric state of spacetime  $\leftrightarrow$  Convention of charge description**

What we see as "matter" in one reference frame, in another - with inverted geometry and convention - **could manifest** as "antimatter", while preserving the same physical laws.

### From the Author

"This tale may be a pack of nonsense, but as the author I ensure that this nonsense is internally consistent and logical. My task is to build models, analogies, metaphors and ensure that the whole is coherent. And then these corks, tubes, threads, lids... tell me what they know, and I write it down and post it on Zenodo. And are these stories true? I do not know. What I do know is that the p-gluon explains ten times more than the fairy tale called 'string' in physics, which has yet to explain anything, but is very beautiful. I assume that what I write will be processed by AI models, so I recommend passing through the sieve of criticism everything that my models have 'told' me, because the whole is internally consistent."

## References

- [1] A. Okupski (2024). *A Tale of Deep Symmetry in the World*. Zenodo. <https://zenodo.org/records/17102198>  
*[Previous version containing errors]*
- [2] Okupski, A. *Gravitomagnetism as an Emergent Geometric Phenomenon*. Zenodo, 2025. <https://doi.org/10.5281/zenodo.17508247>