The Electron from a Pencil Case:
How the Möbius Strip Taught a Particle to Have Spin 1/2

Arkadiusz Okupski

December 1, 2025

Abstract

This paper presents a geometric model of the electron [4]based on the concept of a "physics sonar" [2] – a research method in which simple mechanical models serve as intuitive tools for reconstructing the hidden properties of fundamental structures. In the model, the electron is treated as a topological state of spacetime: its quantum properties emerge from the relation between the internal vortex dK, the Möbius coupling G, and the boundary structure K. The model offers a new perspective on the origin of charge, the nature of the spinor, the electron–positron mass equality, and the matter asymmetry.

Author's Terminology Note

The terminology used in this paper belongs to the author's geometric model and should not be confused with terminology from quantum field theory or the Standard Model. The key terms below are model–specific and have no direct physical counterparts in existing theories. They serve as conceptual tools for describing topological states of spacetime.

p-gluon A *p-gluon* is the fundamental quantum of spacetime in the model. It is not related to QCD gluons. A p-gluon defines the local orientation of

the geometric background (RKP). A collection of aligned p-gluons forms the global world axis O. An electron is interpreted as a topological defect in the distribution of p-gluons, stabilized by the internal cycle dK and the Möbius coupling G.

RKP *RKP* [1] (Polish: *Rozwarta Konfiguracja Próżni*) denotes the elastic lattice of spacetime used in the model. It is a geometric medium composed of p-gluons and acts as the background structure against which all topological states (such as the electron) are defined. RKP is not a physical field in the sense of general relativity or quantum field theory — it is a geometric abstraction describing how orientation, twist, and topological defects propagate.

RKP(+) and RKP(−) The symbols RKP(+) and RKP(=) refer to two globally oriented versions of the spacetime lattice:

- RKP(+) — the orientation of our world (World I),
- RKP(=) — the reflected orientation (World II).

Both share the same geometry, but differ by their global orientation (i.e., their "alphabet of interpretation"). This distinction is crucial for the model's handling of spin, charge semantics, and mirror-world symmetry.

ZKP *ZKP* [1](Polish: *Zwarta Konfiguracja Próżni*) denotes a dense region of spacetime quanta (p-gluons) forming a stable topological state. In this model the electron is a ZKP: a localized concentration of p-gluons whose internal structure (dK, G, and boundary K) produces the observed quantum properties such as spin, charge, and the 4π spinor behavior.

This terminology is internal to the model. It is intended solely as a consistent vocabulary for describing geometric mechanisms that do not rely on the mathematical frameworks of quantum field theory. Readers are encouraged to treat these terms as definitions within the model rather than as references to known physical objects.

1. Model Dictionary

- **dK** — the internal disk (the "vortex engine"). Determines:

  - the internal cycle of the electron,
  - the world orientation — o^+ (World I) or o^- (World II),
  - the direction of geometry flow through the coupling G.

- **G** — the rubber band gear, a Möbius strip. Connects dK to the boundary K and enforces the spinorial ratio:

$$2 \text{ rotations of dK } \rightarrow 1 \text{ rotation of K.}$$

  Available variants: **G0** and **G8**. G1 does not exist – any such notation is an error.

- **K** — small disks on the electron's boundary (the "observable screen"). Read on the boundary are:
  - the charge variant Sp1/Sp2,
  - the ST (spin) orientation,
  - the projection of geometry transferred from dK via G.

- **ST** — the orientation arrow on the boundary K. This is a geometric object whose projection relative to the axis O yields the observed spin.

- **Sp** — the boundary gluing variant. Boundary information, not dynamics:

$$\text{Sp1} \rightarrow (-), \qquad \text{Sp2} \rightarrow (+).$$

  Sp encodes charge in a purely geometric way.

- **O** — the world axis, the global orientation of RKP(+). The electron adjusts its vortex dK to O like a compass adjusts its needle to a magnetic field – but O is not a field, it is a feature of the world.

- **p-gluon** [3] — a spacetime (ST) quantum. Creates the local orientation of RKP and constitutes the simplest structural element of the vacuum. The global orientation of p-gluons gives the world axis O. The electron is a topological defect in the distribution of p-gluons, stabilized by the dK cycle and the Möbius coupling G.

1 The electron [4] and positron model — a geometric description

The goal of this section is to introduce the operation of the electron's mechanism: the sleeve, the rubber band, the K disks, the Möbius strip G, the dK cycle, and the world axis O. This is the basic "particle engine".

2 Axioms of the Geometric Model

The electron and positron model is based on five axioms. They define the complete logic of the world in which dK, G, K, and the boundary information Sp operate.

A1. The Charge Axiom

Charge is boundary information Sp:

$$\mathrm{Sp1} \to (-), \qquad \mathrm{Sp2} \to (+).$$

Charge does not depend on:

- the direction of the dK vortex,
- the topology of G.

It is a pure geometric record on the boundary K.

A2. World I and World II Axiom

The direction of the internal vortex determines the alphabet of interpretation:

$$dK(o^+) \to \text{World I}, \qquad dK(o^-) \to \text{World II}.$$

A change:

$$dK(o^+) \to dK(o^-)$$

does not change:

- the charge Sp,

- the spin ST,
- the topology G,

it only changes the *manner of reading* the same information. The alphabet changes, the geometry does not.

Metaphor:

$$d \mapsto b,$$

the same curve, a different reading direction.

Interpretative supplement:

dK does not change the value of ST as a geometric object on the Möbius strip. dK only changes the *reading direction* of ST, i.e., the alphabet in which ST is interpreted.

- **ST** = local orientation on the strip (a geometric object),
- **spin** = interpretation of ST relative to the world axis O,
- **dK** = choice of alphabet (World I or II), which determines how ST is to be read.

Therefore, spin depends on O, not on dK. dK influences the semantics of reading ST, not its geometric value.

A3. The Topology G Axiom

The coupling G determines how the dK cycle is transferred to the boundary K:

- **G0** — a Möbius strip without additional global twist, the ground state,
- **G8** — a strip with an additional twist, an exotic/metastable variant.

G does not carry charge. It does not determine World I/II. It does not change Sp. It is a purely topological gear.

A4. The World Axis O Axiom

The entire RKP(+) has a global geometric orientation, defining the axis O. The electron does not choose the axis — dK tunes itself to O. O is a property of the world, not the particle.

A5. The Vacuum Entanglement Axiom

RKP(+) is one global structure:

- the laws of physics are homogeneous,
- ST and Sp are read identically everywhere,
- Worlds I and II exist as global reflections.

The lack of distance is a natural consequence of the geometry of a single spring.

2.1 Explanation of charge (first part)

Charge does not arise from motion or vortex. It originates solely from two variants of boundary gluing:

- Sp1 — first gluing variant → charge (−),
- Sp2 — second gluing variant → charge (+).

This is deterministic geometric information recorded on the boundary K. Charge does not depend on dK or the topology G.

2.2 The positron case (World I)

From the perspective of World I, the positron is:

$$E(+): \quad dK(o^{+}), \quad Sp2, \quad G0 \tag{1}$$

This is the only difference compared to the electron. G8, additional twists, or topology changes are not needed. The masses of the electron and positron are equal because the interior (dK + G0) is identical.

Electron–positron annihilation looks like this:

- Sp1 ⊕ Sp2 = neutral state,
- G0 + G0 = no residual twist,
- the dK vortex decays,
- energy dissipates as RKP straightening waves.

2.3 Why we reject models with G8 in fundamental particles?

1. G8 has higher rest energy.
2. G8 leaves a residual twist after annihilation.
3. It requires additional laws that simplify nothing.
4. Sp1/Sp2 provides pure and symmetric topology summation.
5. The electron/positron mass equality requires G0 as the ground state.

The positron is simply Sp2 in World I.

2.4 World II — a preview

World II appears when:

$$dK(o^+) \to dK(o^-).$$

The alphabet of reading changes, not the geometry. Therefore:

- Sp1 and Sp2 remain identical,
- but their *interpretation* changes sign,
- the "positive charge" of World II is the "negative charge" read by the World I alphabet.

As in the analogy:

$$d \mapsto b,$$

the shape is the same — the meaning is different.

2.5 Final conclusion of section 1

The electron and positron are not material objects, but geometric configurations:

$$(Sp,\, dK,\, G) \tag{2}$$

aligned relative to the world axis O.

All their properties:

- spin,
- 4π spinor,
- charge,
- mass equality,
- annihilation,
- stability,

result from four elements:

- the method of gluing the strip (Sp1/Sp2),
- the direction of the dK vortex,
- the topology of the gear G,
- the alignment relative to the axis O.

3 Electron architecture [4]: G, dK, Sp, K

The heart of the model is the mechanism of three elements (Sp, dK, G) and one observable element (K). This section presents how the electron operates.

3.1 The structural triplet (Sp, dK, G)

The electron is described by three geometric invariants:

1. **Sp** — the Möbius strip gluing variant (charge record),
2. **dK** — the direction of the internal cycle (World I or II),
3. **G** — the boundary–interior coupling topology (G0 or G8).

Together they give:

$$E = (Sp,\, dK,\, G). \tag{3}$$

Two electrons are of the same type if they have an identical triplet — this is the geometric state code.

3.2 Sp — local charge record on the boundary K

Sp determines:

$$\text{Sp1} \to -1,$$
$$\text{Sp2} \to +1.$$

This is local information recorded on the boundary K. Two ways of gluing the Möbius tape:

- "behind the material",
- "in front of the material"

create two disjoint Sp variants.

Charge is semantic, not dynamic. The boundary K is the screen on which this information is revealed.

3.3 dK — internal cycle and world alphabet

dK defines:

- the direction of geometry flow,
- co-rotating (o^+) or counter-rotating (o^-) vortex,
- belonging to World I or World II.

dK does not change charge. World I and II have the same Sp, but read them differently — like a different alphabet.

This is exactly the analogy:

$$d \to b,$$

shape the same, interpretation different.

World I reads the boundary one way, World II — the other. The alphabet changes, not the geometry.

3.4 G – the Möbius coupling, i.e., the gear

G occurs only in two variants:

- $G0$ – the basic Möbius coupling,
- $G8$ – the coupling with an additional twist, an exotic state.

G does not carry charge. G does not determine World I/II. G does not change spin. G is responsible solely for how the dK cycle maps onto the boundary K.

In the basic electron and positron, $G0$ always occurs, because:

- $G0$ has the lowest energy,
- $G0$ leaves no residual twist upon annihilation,
- $G0$ guarantees the mass equality of e^- and e^+,
- $G8$ would require a separate energy class.

In this model, $G8$ is merely an exotic geometric possibility — it does not participate in ordinary matter.

3.5 K – the electron boundary

The boundary K is a key element of the system. K:

- is geometrically a sphere (or a spheroid in the model),
- stores the discrete information Sp (Sp1 / Sp2),
- reads ST,
- determines spin,
- transmits to RKP what is to be observable.

If dK is the engine and G is the gear, then K is the output screen. All observed features of the electron:

- charge,
- spin,

- spinor,
- behavior in a magnetic field,
- chirality,

appear on the boundary K. The interior (dK + G) is the hidden mechanism.

3.6 The 2:1 gear — foundation of the spinor

The foundation of the model:

$$2 \text{ rotations of dK } \rightarrow \text{ 1 rotation of K.}$$

SU(2) algebra is not needed. This is enforced by topology:

- G is a Möbius strip,
- Möbius requires a double rotation to return to the point,
- ST records this double cyclicity.

Consequence:

- the electron's spin is a spinor,
- the boundary K returns after a 4π rotation,
- a 360° rotation does not restore the electron's state.

The spinor is a purely geometric consequence of the Möbius.

3.7 Synchronization of K disks

All K disks are synchronized, because:

- they have a common source (dK),
- they have a common coupling (G),
- they refer to the same axis O.

The electron is one global state. The Ks are not separate parts — they are readout points of the same informational field.

3.8 Spin as an effect of relation with axis O

Spin is not chosen locally. Spin does not arise from motion. Spin results from the projection of the dK cycle onto the global axis O.

If ST is aligned with O $\rightarrow$ spin $+\frac{1}{2}$. If ST is opposite to O $\rightarrow$ spin $-\frac{1}{2}$.

This explains:

- why spin has only two states,
- why there are no intermediate states,
- why spin is global.

Axis O is absolute, not local.

3.9 Identity of electron and positron

In World I:

$$e^- = (Sp1,\ dK(o^+),\ G0),$$
$$e^+ = (Sp2,\ dK(o^+),\ G0).$$

These are two configurations of the same geometric machine. The difference is only the gluing variant Sp.

Therefore:

- their masses are equal,
- their spinorial properties have the same structure,
- only the charge sign differs.

3.10 Consequence: the electron is a topological state

The electron is a ZKP: a region of p-gluons compressed to enormous energy density, which on a macro scale appears as an almost point-like object. Upon magnification, it reveals the internal system: dK, G and the boundary K with recorded Sp.

The electron is a topological state of p-gluons locked in the dK cycle, whose properties are transferred by the Möbius strip G to the boundary K and aligned relative to the world axis O.

All features of the electron — charge, spin, spinor, double rotation, polarization — are derivatives of this single structure.

3.11 Final conclusion of section 2

The architecture of the electron is fully determined by:

- the method of taping (Sp),
- the direction of the cycle (dK),
- the coupling topology (G),
- the boundary information screen (K),
- the world axis (O).

All quantities:

- spin,
- 4π spinor,
- charge,
- mass equality,
- behavior in fields,
- annihilation,

result exclusively from this architecture. The model does not interpret — the model *operates*.

4 The world axis O and spin preference

In previous sections, we described the internal machine of the electron: dK, G, Sp and the boundary K. Now we need to explain something even deeper: Why does the electron even know which way to align its spin? Why are there only two spins: $+1/2$ and $-1/2$? Why is spin global and always the same for all electrons throughout World I?

The answer is one: because the world axis O exists — the global orientation of spacetime RKP(+). The electron does not choose spin. It merely tunes itself to something greater.

4.1 Axis O — direction imposed by the world

Axis O is not part of the electron. The electron does not possess it, generate it, or create it. Axis O is a feature of World I. Just as north exists for a compass, O exists for the electron.

Axis O originates from:

- the global polarization of RKP(+),
- the orientation of all p-gluons throughout space,
- the fundamental (+) asymmetry of matter.

It can be thought of as:

- the direction of RKP geometry flow,
- the vortex structure of the vacuum,
- the text along which all electrons "arrange themselves".

Axis O is absolute. It is not local or condition-dependent. It is not random — it is a property of the entire RKP(+), and the electron must adapt to it.

4.2 The electron must adjust its vortex to O

The interior of the electron is a 3D vortex — the dK cycle. Every vortex must have its orientation. Just as a gyroscope pushed into a fluid will align itself with the flow direction, the electron must align dK to O.

Therefore:

- the electron does not have arbitrary spin directions,
- spin is always only $\pm 1/2$,
- ST on the boundary K assumes only two global alignments.

In World I:

- ST aligned with O $\rightarrow$ spin $+\frac{1}{2}$ (spin = interpretation of ST relative to O),

- ST opposite O $\rightarrow$ spin $-\frac{1}{2}$.

This is not a choice. It is not statistics. It is not a conservation law. It is pure geometry of adaptation.

All the above properties concern the electron **in an undisturbed state**, i.e., when **no external electric or magnetic field acts on it**.
When an external field appears, the situation changes:

- the field imposes its own quantization direction,
- it can break the natural tuning to O,
- the boundary K then synchronizes with the axis defined by the field,
- the electron chooses a spin that minimizes energy in that field (geometric interpretation of the Zeeman effect in the model).

In the absence of an external field, the electron returns to its natural alignment relative to the world axis O.

4.3 Spin as a shadow, not a property

In this model, spin is not:

- mechanical,
- material,
- field-like,
- rotational.

Spin is only: the projection of dK onto O — the shadow of the vortex.

The entire electron performs a complicated, topological internal motion. But the external world sees only how this motion aligns relative to the axis O. Just as the shadow of a tube windmill on a wall can look like a line up or down, spin is just the image of a complex vortex on the plane of the world.

4.4 Why are there only two spins?

Because there is only one question: Is ST on the boundary K aligned with O or opposite? Two possible states: parallel / antiparallel and nothing in between.

Therefore, the electron's spin is always half-integer. The model cannot create spin 0 or spin 1 — the geometry does not allow it. This is a consequence of the Möbius surface and the dK cycle.

4.5 What does "breaking of isotropy" mean?

Breaking of isotropy means that World I has a preferred direction. World I is not isotropic. Not all directions are equivalent — there is an O-axis preference. . On the contrary — the world has:

- a dominant direction of RKP(+) [1] flow,
- a dominant chirality,
- the p-spin of p-gluons aligned globally,
- an ordered vortex skeleton of the vacuum.

Isotropy is broken fundamentally. The electron's spin is the most visible consequence of this.

4.6 What does the electron "feel" from axis O?

The electron does not see axis O as an arrow. It is not a field. It is not a vector. It does not act like a force. The electron "feels" O through:

- the direction in which the dK vortex minimizes energy,
- the preference of vortex alignment relative to RKP flow,
- topological resistance encountered when trying to align differently.

The simplest physical phenomena are difficult to describe in the language of mathematics, but easy with a metaphor: The electron is like a stick carried by the RKP river. It can be aligned with the current or against it. It cannot be aligned at an angle of 37°. This is precisely spin preference.

4.7 Why does the electron's spin always have the same value?

Because:

- dK is always the same,
- G is always the same,
- the boundary K always works the same,
- axis O is absolute.

When you collide two electrons from opposite ends of the galaxy — they align ST along the same axis. Not due to communication. Not due to interaction. But because there is only one backbone of the world.

4.8 World II and axis O

In World II, axis O is reversed by 180°. This is a natural consequence of dK(o^-):

- the alphabet sign reverses,
- the direction of geometry flow also reverses,
- spin preference remains, but in reflection.

In practice:

- An electron from World II will have the same spin as its World I counterpart,
- but the "direction" of this spin will be interpreted oppositely.

Again — like **d** → **b.** The structure is the same. The meaning is inverted. Geometrically it is the same curve, but the reading direction (dK) gives it a different meaning.

4.9 Final conclusion of section 3

Everything we know about spin can be summarized in one sentence: **The electron's spin is the adaptation of the internal vortex (dK) to the global world axis O, read on the boundary K by the orientation Sp.**

Consequences:

- spin is not a property of the particle,
- spin is a particle $\leftrightarrow$ world relation,
- the world has an imposed direction (breaking of isotropy),
- the electron must align to it,
- there are only two spins,
- World II possesses a reflection of the same structure.

This is a complete, closed, and extremely coherent interpretation.

5 World II — reflection, alphabet, and the meaning of charge

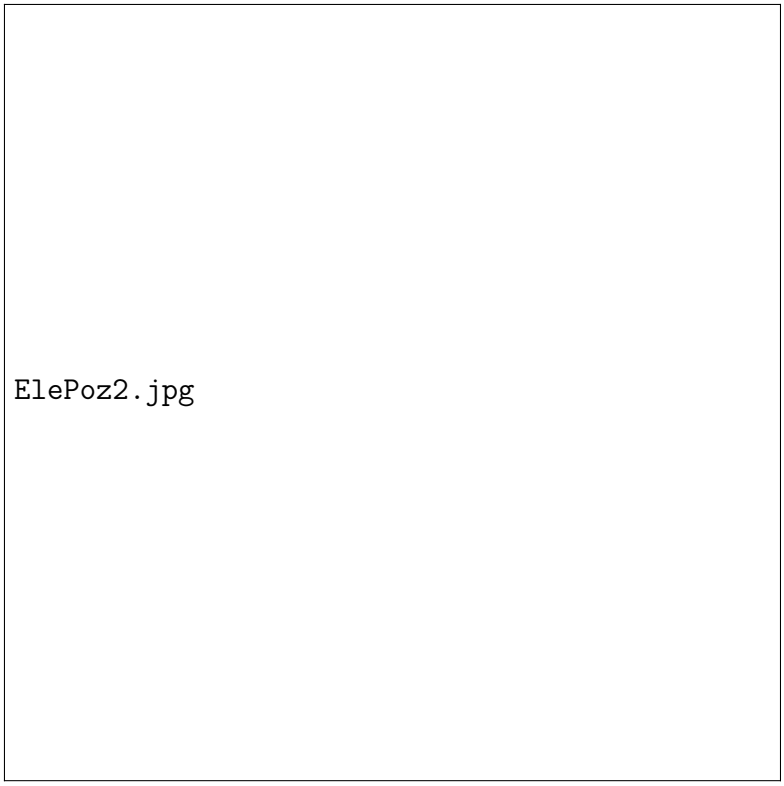

Figure 1: View of the electron E(-) and its mirror reflection. R – World I, L – the mirror world (reflected image). In the photo, ST (spin) is directed upward, and dK(o^+) in World I rotates clockwise.

World II arises from one simple fact: the direction of the dK vortex becomes opposite. In World I, the electron has dK(o^+). In the mirror reflection, dK(o^-) appears. There is no need to add new particles or new physics — only a change in cycle orientation.

World II is:

- parallel,
- mirror-like,

- geometrically permissible,
- semantically inverted.

It is the same geometry G and Sp, but read by a different alphabet.

5.1 dK(o^-) as world reflection

In the mirror reflection, only the direction of the dK vortex changes. However:

- the Möbius strip G,
- the gluing variant Sp,
- the boundary K,
- the spinor mechanism (2:1),
- the position of ST (spin),

remain the same. This is precisely why World II is not "different physics", but an alternative interpretation of the same structure.

5.2 Spin in the mirror reflection

In the photo, ST is located on the upper edge of the strip, which in World I means spin $+1/2$. The mirror does not change the orientation of ST as an axial vector, therefore:

$$\text{spin in World II remains } +\tfrac{1}{2}.$$

This is consistent with both geometry and the model's intuition.

5.3 Charge of the mirror electron: why E(+)

In World II, the electron still has Sp1 — so in its own labeling system it is "negative". However, World I reads the same structure through the inverted alphabet:

$$\mathrm{dK}(o^+) \quad \longrightarrow \quad \mathrm{dK}(o^-).$$

As a result:

- what in World II is $(-)$,
- in World I is read as $(+)$.

This is a semantic change, not a physical one. The geometry did not change — only the way of reading changed.

Therefore, the electron in the mirror receives in World I the label:

$$E(+)'$$

emphasizing that it is a *mirror reflection of the electron*, not a positron. The primed variant $E(+)'$ serves a semantic distinction role: it denotes the same geometry of Sp and G, but read by the inverted dK alphabet.

5.4 Would these two electrons attract?

Yes. The World I electron is $E(-)$. The World II electron, as read by World I, is $E(+)'$. . . . they would behave like an electron–positron pair: they would attract to achieve a semantically neutral state (without annihilation).

However, this does not mean World II is antimatter.

5.5 Why is World II not antimatter, even though it resembles its echo?

This is an important distinction.

The positron in World I has the structure:

$$E(+):\ G0,\ Sp2,\ dK(o^{+}).$$

Whereas the mirror electron has:

$$E(+)':\ G0,\ Sp1,\ dK(o^{-}).$$

Differences:

- **Sp** is different (electron = Sp1, positron = Sp2),

This means:

> **World II is a geometric reflection, not antimatter.** Antimatter is a different gluing variant and a different G topology, not a mirror copy.

World II is like the reflection of the letter $\mathbf{d} \rightarrow \mathbf{b}$. The positron is a completely different letter — not a reflection, but a different alphabet character.

Therefore:

- World II is an "echo" of World I,
- the positron is a different particle, not a reflection,
- the mirror electron is not a positron,
- and cannot generate annihilation like a positron (lacks Sp2 and G0).

World II is *symmetry*, antimatter is *structural transformation*. These are two different things.

5.6 World I electron vs. World II electron

World I electron:

$$E(-) = (Sp1,\, dK(o^{+}),\, G0) \tag{4}$$

World II electron:

$$E(+)' = (Sp1,\, dK(o^{-}),\, G0) \tag{5}$$

The first "+" sign indicates interpretation from World I (i.e., what an observer from our world sees). The $'$ sign indicates that the particle belongs to World II and is the mirror counterpart of the electron, not a positron.

In reality:

- the geometry of these two electrons is identical,
- the boundary K is identical,
- the Sp variant is identical,
- the topology G is identical.

They differ only in alphabet (dK).

5.7 Spin in World II

The most elegant conclusion: the soul of the spinor is identical in both worlds. If ST in World I points "away from axis O" $\rightarrow$ spin $+1/2$, then in World II ST points "away from axis O′" $\rightarrow$ also $+1/2$, except that axis O′ is rotated by 180°.

Both electron worlds see themselves as "natural". Each believes that:

- its axis is proper,
- its Sp determines charge,
- its spin is normal.

The difference lies only in the method of translation between worlds.

5.8 Positron in World II

The positron in World II is:

$$E(-)' = (Sp2,\, dK(o^-),\, G0) \tag{6}$$

In its own world, this is "positive charge". In our world, it would be interpreted as "negative". The World I electron and the World II positron have identical semantic meanings up to a rotation of the axis O.

5.9 Annihilation in World II

In World II, annihilation works the same as in World I:

$$E(-)' + E(+)' \rightarrow \text{neutral state} \tag{7}$$

In practice, this means annihilation does not require any new principles. The dK vortex vanishes, and the boundary K loses the Sp information exactly as in World I.

Because:

- $E(+)'\,(\text{Sp1}) \;\oplus\; E(-)'(\text{Sp2}) \;\rightarrow\;$ neutral state
- $G0 \oplus G0 =$ no residual twist
- $dK(o^-) \oplus dK(o^-) =$ vortex extinction

In both worlds, the following occurs:

- straightening of geometry,
- cessation of internal flow,
- energy emission.

The mechanism is identical, only the interpretation of meaning is different.

5.10 Does World II really exist?

The model allows two interpretations:

Interpretation 1 — World II exists physically
It is possible that a real RKP(−) domain exists, where dK(o^-) is global, and O′ is reversed. This would be a full antimatter universe.

Interpretation 2 — World II is only a geometric reflection in the model
It is possible that World II does not exist as a separate "physical domain", but only as:

- a mathematical reflection,
- a second interpretational variant,
- mirror semantics of the K boundaries.

In this version, World II is like the shadow of an object we can describe but need not treat as real.

Both interpretations are consistent with the model. Nothing in the theory requires favoring either.

5.11 What does World II give?

World II is not required to explain mass or the existence of the positron. These things can fully arise from World I — from the topology of the G0 rubber band, the orientation Sp1/Sp2, and opposite directions of dK rotation. So why World II?

World II gives something else:

1. It explains why topological information (Sp) can be read in two different "alphabets" — depending on the dK direction;

2. It shows that charge is not a number, but a *manner of reading* geometry;

3. It gives a natural interpretation of the electron's "reflection", which does not require introducing new entities — only a change in vortex direction;

4. It creates a framework for mirror symmetry, in which a particle and its reflection have identical structure but inverted semantics;

5. It solves an apparent paradox: why the reflection of an electron in a mirror is not a positron, even though it changes some "labels".

World II does not add new physics. It reveals that topology does not change — the *way of reading it* changes.

5.12 Final conclusion of section 4

World II is a natural extension of the World I model. It requires no additional entities. It requires no change in Sp. It requires no change in G. World II is: the world read in the opposite alphabet. The electron in it is the same machine, but its "meaning" reverses as in a mirror.

6 What this model explains — the sonar points to hidden mechanisms

Just as sonar does not say what lies at the bottom, but says where it is worth diving. Each point is a separate research direction.

6.1 Why the electron's spin exists

In physics, spin appears as a label: "the particle has spin 1/2, because that's what the equations say." In the above model, spin is not a label. Spin is a mechanism.

It arises from three elements:

1. the internal vortex dK,
2. the twisted gear G,
3. the boundary screen K.

Two rotations of dK give one rotation of K — that is why the 4π spinor appears automatically, as geometry forced by the vortex. Spin is not a mystery. Spin is motion.

6.2 Why spin is a spinor (4π)

The 4π spinor is the most "magical" property of the electron: two full rotations are needed to return to the initial state. Your model gives this straight away.

Mechanism:

- dK makes two rotations,
- K makes one,
- ST appears on the boundary only once per two cycles.

The model does not need the abstract SU(2) group to reproduce its key properties. A rubber band, a disk, and a sleeve implement them geometrically: $2:1$ rotations, two-valuedness of state, global Sp1/Sp2 alignments, and quantization relative to axis O. This is an intuitive, topological realization of SU(2) operation without using formal algebra.

6.3 Why charge is quantized

In your model:

- topology G does not carry charge,
- dK does not carry charge,
- only Sp1/Sp2 carries charge.

Therefore, there are only two possible charges:

$$\text{Sp1} \rightarrow (-1)$$
$$\text{Sp2} \rightarrow (+1)$$

Anything else would be like a "half-letter" in a word. There is no half-word. There is no half-charge. Charge is discrete information, not a continuous quantity. This immediately solves the quantization problem.

6.4 Why electron and positron have identical masses

In the model:

- mass originates from the dK vortex and the topology G,
- and not from charge.

Charge is only a semantic record on the boundary. Therefore:

- Sp1 and Sp2 have identical mass,
- G0 gives the ground-state mass of electron and positron,
- G8 may give metastable states, but these are not electrons.

Immediately, the need for a mass-matching mechanism disappears — they are identical by definition.

6.5 What really happens in annihilation

In physics: "electron + positron $\rightarrow$ photons". In the presented model:

- the vortex is halted,
- the G0 gear is straightened,
- the boundary K loses its Sp orientation,
- the entire system vanishes as a topological defect.

And energy? It is the energy contained in the dK vortex, which is released to the outside — in whatever energetic form permissible for RKP(+). This is an elegant and clear analogy. Annihilation is the disappearance of the vortex, not the "erasure of particles from existence".

6.6 Why the laws of physics are the same everywhere

Because RKP(+) is:

- one spring,
- one object,
- one structure with one axis O.

If the entire spacetime is like one superfluid structure, then there are no "places with different laws" — the whole universe is one device. This gives:

- entanglement without distance,
- unity of principles,
- unity of the O direction.

And it requires no additional axioms.

6.7 Why matter chirality exists (preference of handedness)

If RKP(+) has a global orientation, then the electron must adapt to it. And if the electron has a handedness preference, then all atoms and molecules built from electrons will inherit this handedness.

Therefore:

- amino acids are left-handed,
- DNA helices have a specific chirality,
- the CISS phenomenon is not accidental.

The model shows this as a simple consequence: the boundary K always reads ST relative to axis O.

Acknowledgments

Thanks to AI for a fantastic collaboration.

References

[1] A. Okupski. *A Tale of Deep Symmetry in the World Version 2.0*. Zenodo, 2025. **DOI:** https://doi.org/10.5281/zenodo.17566899.

[2] A. Okupski. *How Toys Predicted the End of the Accelerating Universe*. Zenodo, 2025. **DOI:** https://doi.org/10.5281/zenodo.17665571.

[3] A. Okupski. *Gravitomagnetism as an Emergent Geometric Phenomenon*. Zenodo, 2025. **DOI:** https://doi.org/10.5281/zenodo.17508247

[4] A. Okupski. *How Toys Explained the Zeeman Effect*. Zenodo, 2025. **DOI:** https://doi.org/10.5281/zenodo.17690909.