EN_18: GENESIS: Geometric Cosmology of the Neutron

The Origin of Matter, Galaxies and Cosmic Structure

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Framework: Einstein-VED
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1. Introduction: The Refutation of Dark Energy

Current cosmology postulates the existence of **dark energy** to explain the accelerated expansion of the universe. This concept arises from a misinterpretation of redshift and the artificial introduction of a cosmological constant Λ without geometric justification.

In the Einstein-VED framework, **dark energy does not exist**. Redshift is explained by the relation $dt \rightarrow -dz$ (the arrow of time projected onto distance), and the cosmological constant is $\Lambda = 0$ by geometric necessity (EN_0, EN_11).

Furthermore, the framework offers a **complete explanation of the origin of matter and galaxies** that requires neither dark energy nor dark matter. This is that story.

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2. The Genesis: Supermassive Black Holes in Extreme Rotation

The universe did not begin with a soup of particles. It began with **supermassive black holes in extreme rotation**, one for each future spiral galaxy.

2.1. Rotation as the Cross Product of Time Differentials

In 3S+T, rotation is not an accident. It is the natural consequence of the **time differentials** in the three spatial directions not being parallel:

$$\vec{\omega} \propto dt_x \times dt_y \cdot \vec{e}_z + dt_y \times dt_z \cdot \vec{e}_x + dt_z \times dt_x \cdot \vec{e}_y$$

When these differentials reach their maximum value and are orthogonal, rotation is extreme (Kerr limit). That is the initial condition of each primordial supermassive black hole.

2.2. Rotation Energy and Particle Generation

Extreme rotation concentrates energy in the immediate vicinity of the black hole, sufficient to generate the most energetic wave configurations:

- **Family 3 (f3):** top (t) and bottom (b) quarks — the most massive, most unstable
- **Family 2 (f2):** charm (c) and strange (s) quarks — intermediate mass
- **Family 1 (f1):** up (u) and down (d) quarks — minimum energy

2.3. There Were No Primordial Protons

A fundamental consequence of this framework is that **there were no free protons in the primordial universe**. All primordial baryonic matter was in the form of **neutrons**.

The reason is twofold:

1. **Observed electric neutrality:** The universe is exactly neutral (#protons = #electrons). If protons and electrons had been created separately, there would be no reason for their numbers to match. However, if all protons come from neutron decay ($n \rightarrow p + e^-$), the equality is automatic.

2. **Neutron instability:** The free neutron has a mean lifetime of 877 seconds. In an exponentially expanding universe (inflation), after 15 minutes there are no free neutrons left. Therefore, **protons could not have formed before that decay either**.

Consequence: The protons we see in the universe today are all **secondary**, products of primordial neutron decay. There was no primordial "soup of protons and electrons."

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3. Generation of Quark Families from Rotation

3.1. The Decay Cascade

The sequence is: **f3 → f2 → f1**. High-energy particles decay in cascade until reaching the stable ground state:

Family	Quarks	Relative Mass	Stability
f3	t, b	Very high	Unstable, decays rapidly
f2	c, s	Medium	Unstable, decays
f1	u, d	Low	**Stable** (in appropriate combinations)

3.2. The Final State: Neutrons

The most stable combination of f1 quarks that can exist freely is the **neutron** (and, under normal conditions, the proton). But in the black hole environment, the emerging configuration is the neutron:

$$f3 + f2 \longrightarrow f1 \longrightarrow n$$

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4. The Neutron as the Final Relaxation Product

The neutron has crucial properties for cosmology:

Property	Value	Source
Mass	m_n = 939.565420 MeV/c²	EN_6
Mean lifetime (free)	τ_n = 877 s	EN_6, CODATA
Electric charge	0	By composition (udd)
Effective radius	$R_n \approx 0.84$ fm	EN_4
Internal structure	22 modes, $\sqrt{\sum} = 2.1778$	EN_14

The neutron is electrically neutral, massive, and, when free, unstable. These three properties will be decisive in cosmic evolution.

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5. Bipolar Ejection and Decay: The Birth of Hydrogen

5.1. Bipolar Jets

Black holes in extreme rotation eject matter in **two jets** along the rotation axis. In this case, the jets are composed of neutrons.

5.2. Maximum Travel Distance

With a mean lifetime of 877 seconds and velocities close to c, neutrons can travel a maximum distance of:

$$d_{\max} \approx c \cdot \tau_n \approx 2.63 \times 10^{13} \text{ m} \approx 0.0028 \text{ light years} \approx 15 \text{ light minutes}$$

Beyond this distance, neutrons begin to decay.

5.3. The Decay

$$n \rightarrow p + e^- + \bar{\nu}_e$$

Each neutron produces exactly one proton and one electron. Therefore, the number of protons and electrons in the universe will be identical.

5.4. Hydrogen Formation

Protons and electrons, when they meet in space, combine to form **neutral hydrogen**:

$$p + e^- \rightarrow H \quad \text{(ground state, } n = 137\text{)}$$

5.5. Electric Neutrality of the Universe

Since all protons and electrons come from neutron decay, and each neutron produces one pair, **the total charge of the universe is exactly zero**. There is no imbalance to explain.

5.6. Refutation of Big Bang Primordial Nucleosynthesis

The standard model postulates that in the first minutes of the universe, light nuclei (deuterium, helium-3, helium-4, lithium-7) were formed through the fusion of free protons and neutrons.

In the Einstein-VED framework, this is impossible for two reasons:

1. **There are no primordial protons:** Protons only appear **after** neutron decay, not before. There is no time window for protons and neutrons to coexist freely in space.
2. **Exponential expansion:** During the first 15 minutes (the mean lifetime of primordial neutrons), the universe was in a phase of exponential expansion (inflation). The particle density decreased so rapidly that the probability of two neutrons, or a neutron and a proton (if they existed), interacting to form a heavier nucleus is **practically zero**.

Conclusion: There was no primordial nucleosynthesis. All elements heavier than hydrogen were formed **later** inside stars, through successive nuclear fusion in onion-like layers, from the ignition of the first Pop III stars to subsequent stellar generations.

Falsifiable prediction: If primordial gas clouds (without stellar enrichment) were observed with significant amounts of deuterium, helium-3, helium-4, or lithium-7, the framework would be falsified. If, on the contrary, those isotopes are absent or in much lower quantities than predicted by Big Bang nucleosynthesis, the framework would be confirmed.

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6. The Dark Age: Time of Gravitational Gestation

After neutron decay and hydrogen formation, the universe enters a period that cosmology calls the **Dark Age**.

6.1. What Happens During This Period?

- Hydrogen distributes in orbits around central black holes
- Gravity acts slowly, accumulating mass in increasingly dense clouds
- There are no sources of light (stars have not yet been born)
- The universe is literally dark

6.2. Duration of the Dark Age

The time needed for gravity to accumulate sufficient mass can be estimated using the Jeans time:

$$t_J \approx \sqrt{\frac{3\pi}{32 G \rho_0}}$$

For typical universe densities after recombination ($\rho_0 \sim 10^{-22}$ kg/m³), we obtain:

$$t_J \approx 200 - 400 \text{ million years}$$

This range coincides with observations of the first galaxies by JWST (z ~ 10-15).

6.3. The Dark Age as a Consequence of the Absence of Neutrons

A crucial implication of this framework is that **during the Dark Age there were no atoms with neutrons** (deuterium, helium, lithium, etc.). The reason is simple:

- Primordial neutrons decayed completely within the first 15 minutes.
- There was neither time nor sufficient density for composite nuclei to form during inflation.
- The resulting protons and electrons combined to form **exclusively neutral hydrogen** (protium, ^{1}H).

Therefore, the universe during the Dark Age was composed solely of:

- Neutral hydrogen (^{1}H)
- Background radiation (cosmological)
- Residual neutrinos

There was no deuterium, no helium, no lithium. The first appearance of atoms with neutrons in the cosmos occurred **inside the first Pop III stars**, when critical pressure forced electron capture:

$$p + e^- \rightarrow n + \nu_e$$

Once the first stellar neutrons were generated, stellar nucleosynthesis began:

$$n + p \rightarrow d + \gamma$$
$$d + p \rightarrow {}^3\mathrm{He} + \gamma$$
$${}^3\mathrm{He} + {}^3\mathrm{He} \rightarrow {}^4\mathrm{He} + 2p$$

And so on, forming in onion-like layers all elements up to iron (and beyond, in supernovae).

Observational consequence: If we could observe primordial gas clouds that have not undergone stellar enrichment, **they should not contain appreciable amounts of deuterium, helium-3, helium-4, or lithium-7**. Their spectrum would show exclusively hydrogen lines.

The Dark Age was not only dark due to the lack of stars. It was also dark in composition: only hydrogen, nothing else.

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7. The Rebirth of the Neutron and Stellar Ignition

7.1. The Critical Pressure Threshold

When a hydrogen cloud reaches a mass between **150 and 300 solar masses**, the pressure in its core reaches a critical value:

$$P_{\text{crit}} = 1.85 \times 10^{18} \text{ Pa}$$

This value is not arbitrary. It is derived from the geometry of the electron and proton (EN_12):

$$P_{\text{crit}} = \frac{F_{\text{Bohr}}}{a_0^2} \cdot \frac{a_0}{R_p}$$

where:

- $F_{\text{Bohr}} = 8.238 \times 10^{-8}$ N (Bohr force)
- $a_0 = 5.292 \times 10^{-11}$ m (Bohr radius)
- $R_p = 0.8412 \times 10^{-15}$ m (proton radius)

7.2. Forced Electron Capture

Upon reaching P_{crit}, the electron cannot maintain its stable orbital ($n = 137$). It is forced to fall onto the proton:

$$p + e^- \rightarrow n + \nu_e$$

7.3. Frequency Conservation

The frequency of the resulting neutron is not exactly the sum of the proton and electron frequencies. There is an excess:

$$\Delta\nu = \nu_n - (\nu_p + \nu_e) \neq 0$$

This excess cannot disappear because the total frequency must be conserved. It propagates outside the confinement as **energy**: a neutrino.

7.4. The Cycle Closes

- The neutron is **reborn** in the stellar core
- Nuclear fusion begins
- The star ignites
- Light, for the first time, illuminates the cosmos

7.5. The Stellar Engine

This cycle (hydrogen → critical pressure → neutron → fusion) is the **Stellar Engine** that powers stars throughout their lives. It is the same mechanism that, on a galactic scale, will explain the formation of galaxies.

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8. Formation of Spiral Galaxies

8.1. The Central Black Hole as Engine

Each spiral galaxy has at its center a supermassive black hole, a remnant of the genesis. This black hole:

- Continues rotating (though more slowly than at the beginning)
- Continues ejecting matter in jets, though with less intensity
- Is the "heart" that gives coherence to the entire galaxy

8.2. Spiral Arms as Ejection Traces

Spiral arms are not static structures. They are the visible manifestation of the **ejection pulses** from the central black hole. Each pulse generates a density wave that propagates outward, and the superposition of these pulses creates the spiral pattern.

8.3. Stellar Velocities

In a galaxy formed by ejection from the center, one expects:

Property	Prediction	Observation (Gaia)
Tangential velocity	Increases with distance from center	✅ Increases
Velocity dispersion	Increases with distance	✅ Increases
Radial distribution	Poisson pattern with waves	✅ Waves detected
North-south asymmetry	Systematic difference	✅ Asymmetry observed

These predictions **contradict the dark matter model** (which predicts flat or decreasing curves) and **confirm the ejection model**.

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9. The Dual Universe and Temporal Symmetry

9.1. Two Temporal Directions

The process described for matter generation at $t > t_0$ has a **symmetric twin** for $t < t_0$:

Direction	What is generated	What we call it
$t > t_0$ (toward the future)	Particles (f3, f2, f1)	**Matter**
$t < t_0$ (toward the past)	Antiparticles	**Antimatter**

9.2. Same Geometry, Different Perspective

The same geometric configuration (a neutron) will be seen as:

- **Neutron** (matter) if observed from $t < t_0$ toward $t > t_0$
- **Antineutron** (antimatter) if observed from $t > t_0$ toward $t < t_0$

9.3. Two Universes on the Same Timeline

On the **same timeline**, looking in opposite directions, there exist two symmetric universes:

- **Our universe:** $t > t_0$, populated by matter
- **The twin universe:** $t < t_0$, populated by antimatter

9.4. Connection at t_0

Both universes are connected at the present instant t_0. **Supermassive black holes** are the points where both temporal directions meet, allowing the generation of matter and antimatter.

9.5. The Sakharov Dilemma Resolved

Sakharov Condition	Einstein-VED Solution
Baryon number violation	**Not necessary** (total number is zero)
CP violation	**Not necessary** (asymmetry is perspective)
Thermal non-equilibrium	**Not necessary** (the dual universe was always there)

There is no asymmetry. The amount of matter and antimatter in the total universe is exactly the same.

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10. The Temporal Dipole: Quark and Antiquark as Two Sides of the Same Wave

10.1. Dipolar Structure of the Confined Wave

A confined particle (such as a proton) is a **standing wave in 3S+T** that, from our perspective ($t > t_0$), extends into the past.

What we call a "particle" is the **visible half of the dipole**:

- **Toward the past** ($t < t_0$): the wave comes toward us $\rightarrow$ **quark** (matter)
- **Toward the future** ($t > t_0$): the wave continues from us $\rightarrow$ **antiquark** (antimatter)

The complete wave is an inseparable dipole.

10.2. Confinement Breaking in Collisions

When two particles collide at t_0 , confinement breaks:

1. The wave splits at the breaking point
2. The part that came from the past ($t < t_0$ toward t_0) emerges as a **quark** traveling toward the future
3. The part that continues (t_0 toward $t > t_0$) emerges as an **antiquark** also traveling toward the future

Both travel toward the future from our perspective, but their temporal origins are opposite. That is why:

- One has positive charge (quark)
- The other has negative charge (antiquark)

10.3. Particle Jets

This is exactly what is observed in accelerators: jets of particles that always contain quark-antiquark pairs.

It is not that pairs are "created" from nothing. It is that the dipolar structure that the wave always had is revealed.

10.4. Why Quarks Cannot Be Separated

> One cannot separate a quark from its antiquark because they are the same wave seen from two opposite temporal directions. Separating them would be equivalent to breaking the temporal continuity of the wave, which is impossible.

If you try to "extract" a quark, what happens is that the accumulated energy generates a new quark-antiquark pair from the vacuum (from the part of the wave going toward the future), and the original quark recombines with the new antiquark, forming a meson.

You never get a free quark. You always get hadrons, because the wave is inherently dipolar.

11. Observational Verification I: JWST, Gemini and SPLUS

11.1. Mass of the First Stars (Pop III)

Observatory	Object	Inferred mass	Concordance
JWST	LAP1-B (z~12.9)	Clusters of 10-1000 M⊙	✅ Range includes 150-300
Gemini North	ULAS J1342+0928 (z=7.54)	PISN progenitor: **~280 M⊙**	✅ Within range

11.2. Chemical Signatures of PISN

Observation	Value	Prediction
[Mg/Fe] in ULAS J1342	**-1.11**	< -1 (PISN of ~280 M⊙)
[Fe/H] in SPLUS J2104	**-4.03**	< -4 (second generation)

11.3. Conclusion

The observations from JWST, Gemini and SPLUS —published between 2021 and 2025, and therefore prior to the geometric calculations of EN_12 (2026)— **retrospectively confirm** the predictions of the Stellar Engine:

- First star masses: 150-300 M⊙
- PISN signatures with [Mg/Fe] < -1
- Existence of second-generation stars with [Fe/H] < -4

The geometric calculations were performed without prior knowledge of these data. Their coincidence constitutes an independent verification of the theoretical framework.

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12. Observational Verification II: Gaia Analysis

12.1. The Images

All images from the Gaia analysis are available at: https://estradad.es/teorias/gaia_analisis/img/

Image	Description	Interpretation
`velocidad_gsm hasta_40kpc_del_centro_v_t 40kpc.png`	Tangential velocity up to 40 kpc	Increases with distance (ejection from center)

Image	Description	Interpretation
`velocidad_gsm_hasta_80kpc_del_centro v_t 80kpc.png`	Tangential velocity up to 80 kpc	Trend continues
`velocidad gsm hasta 200kpc del centro v_t 200kpc.png`	Tangential velocity up to 200 kpc	Continues increasing (no dark matter halo)
`velocidad_asimetria_norte_sur.png`	North-south asymmetry	Systematic difference (bipolar ejection)
`influencia_de_las_estrellas_grafo revela_oleadas_que_parten_del_centro.png`	Density waves from the center	Discrete ejection pulses (Poisson)
`estrellas_en_el_entorno_a_40kpc_del_centro_galactico.gif`	3D distribution up to 40 kpc	Coherent structure, not random
`velocidades estelares hasta 100kpc del centro.png`	Velocity synthesis	Global model confirmation

12.2. What the Data Show

Observed pattern	Ejection model prediction	Dark matter model
Tangential velocity **increases** with distance	✅ Yes	❌ Predicts flat or decreasing curve
Velocity dispersion **increases** with distance	✅ Yes	❌ Does not predict it
Density waves from the center	✅ Yes (discrete pulses)	❌ Does not predict them
Systematic north-south asymmetry	✅ Yes (bipolar ejection)	❌ Does not predict it

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13. Methodology: GSM Velocity Calculation

13.1. Input Data

For each star, Gaia provides:

Parameter	Symbol	Description
Right Ascension	RA	Angular coordinate
Declination	DEC	Angular coordinate
Parallax	π	Inverse of distance
Proper motion in RA	$\mu_\alpha \cos\delta$	Annual angular displacement
Proper motion in DEC	μ_δ	Annual angular displacement
Radial velocity	v_r	Radial velocity (when available)

13.2. Distance

$$d \approx \frac{1}{\pi} \quad \text{(with bias corrections)}$$

Only stars with relative parallax error < 20% are included.

13.3. Apparent Tangential Velocity

$$v_{\tan} = 4.74 \cdot \mu \cdot d \quad \text{(km/s)}$$

where $\mu = \sqrt{(\mu_\alpha \cos\delta)^2 + \mu_\delta^2}$ (in mas/year).

13.4. Transformation to Galactic Coordinates

Convert (RA, DEC) to galactic coordinates (l, b) and then to heliocentric Cartesian coordinates (U_h, V_h, W_h).

13.5. Solar Velocity Vector

Subtract the Solar System's motion relative to the galactic center:

Component	Value	Source
$U_\odot$	11.1±0.7 km/s	Schönrich et al. 2010
$V_\odot$	245.8±3.1 km/s	Includes galactic rotation
$W_\odot$	7.8±0.3 km/s	Schönrich et al. 2010

13.6. Final GSM Velocities

$$\begin{aligned} U_{\text{GSM}} &= U_h - U_\odot \\ V_{\text{GSM}} &= V_h - V_\odot \\ W_{\text{GSM}} &= W_h - W_\odot \end{aligned}$$

13.7. GSM Tangential Velocity

$$v_{t,\mathrm{GSM}} = \sqrt{U_{\mathrm{GSM}}^2 + V_{\mathrm{GSM}}^2}$$

13.8. Distance to Galactic Center

$$R = \sqrt{X^2 + Y^2}$$

where X, Y are galactocentric Cartesian coordinates in the plane.

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14. Reproducibility and Open Science

All data, graphs, analyses, and programs used in this document are publicly available on GitHub for independent verification:

Repository: https://github.com/quark-cha/materia_oscura

Any interested researcher can access, download, run, and reproduce all the results presented here.

Science is not built on faith. Anyone who wants to verify that I am not speaking empty words can go to the code and the data.

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15. Refutation of Dark Matter and Dark Energy

15.1. Dark Matter: A Historical Error. It Does Not Exist as Such.

15.1.1. The Origin of the Error

In the 1970s, Vera Rubin observed that the orbital velocities of stars in spiral galaxies did not decrease with distance from the center as planets do in the solar system. Instead of a Keplerian curve ($v \propto 1/\sqrt{r}$), the velocities seemed to **tend** to a constant (flat curves).

To explain this discrepancy without abandoning Newton's law of gravitation, the existence of **dark matter** was postulated: an invisible halo of mass that would envelop galaxies.

I do not believe that dark matter is real. It is not a particle, not a substance, not a field. It is a term added unnecessarily, due to a misunderstanding of the observations.

15.1.2. What the Gaia Data Really Show

The ESA's Gaia mission has measured with unprecedented precision the positions, distances, and motions of more than one billion stars in our galaxy. The data (Gaia DR3, 2022) reveal a pattern that flatly contradicts dark matter models.

The complete analysis, with graphs and programs, is available at the GitHub repository indicated in the previous section. Any researcher can reproduce the results and verify that I am not speaking empty words.

15.1.3. The Correct Interpretation: Ejection from the Center

The Gaia data show that the tangential velocity of stars **increases** with distance from the galactic center, and that the velocity dispersion also **increases**. This is incompatible with a dark matter halo (which would predict flat curves and constant dispersion).

The observed pattern is what is expected if the galaxy's matter was **ejected from its center** (Sagittarius A*), not accumulated from an external halo. The ejection pulses, north-south asymmetry, and concentric density waves are direct evidence of this process.

15.1.4. Conclusion

Dark matter does not exist as such. It was an interpretative error of Vera Rubin's observations. The Gaia data demonstrate that galactic dynamics is explained by ejection from central black holes, not by invisible matter halos.

Anyone who wants to verify this has the data and code on GitHub. Science is not built on faith.

15.2. Dark Energy

The dark energy model was introduced to explain:

- Accelerated expansion of the universe (interpreted from redshift)
- Non-zero cosmological constant Λ

In the Einstein-VED framework:

- Redshift is explained by $dt \rightarrow -dz$ (arrow of time projected)
- The cosmological constant is $\Lambda = 0$ by geometry (EN_11)
- Accelerated expansion is an interpretative artifact

Conclusion: Dark energy does not exist.

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16. Conclusion: The Neutron as the Primordial Brick

> The universe did not begin with a soup of particles. It began with rotating black holes, which engendered neutrons. The neutrons decayed into protons and electrons, and hydrogen filled the cosmos. For hundreds of millions of years, gravity worked in silence, accumulating mass until pressure broke the electron orbital. Then, neutrons were reborn, and light turned on for the first time.
>
> Every spiral galaxy is the footprint of that process. Every star, an echo of the Stellar Engine. And we, who now look at the sky, are the result of that long geometric chain.
>
> Dark energy does not exist. Dark matter does not exist. There is only geometry, time, and waves waiting to find their form.

> The universe is deterministic. We are free because we do not know the future. And in that ignorance lies our greatness.
>
> **God does not play dice. We are the dice.**

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