

EN_11: Fundamental Geometry of the Universe: ++++ Metric, Dual Universe, and Geometric Origin of G and $\hbar$

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Theory Einstein–VED

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[10.5281/zenodo.17172925](https://zenodo.org/doi/10.5281/zenodo.17172925)

1. Introduction

This work presents a complete geometric development that leads to two extraordinary results:

1. The fundamental constants of gravitational and quantum physics, the universal gravitational constant G and the reduced Planck constant $\hbar$, **are not independent entities**, but rather emerge from a **single geometric structure**.
2. Both constants **do not depend on mass**, although paradoxically **it is necessary to start from a specific mass** (proton, black hole, entire universe) to calculate their exact numerical value.

This result leads to a profound and completely new paradox in theoretical physics.

2. Fundamental Metric and Complex Universe

Consider a four-dimensional universe defined over the field of complex numbers:

$$(X,Y,Z,T) \in \mathbb{C}^4$$

where each coordinate is expressed as:

$$x&=a_1+b_1\,i y&=a_2+b_2\,j z&=a_3+b_3\,k t&=a_4+b_4\,l$$

$$\text{with } i^2=j^2=k^2=l^2=-1.$$

The fundamental metric of the universe is:

$$ds^2 = dx^2 + dy^2 + dz^2 + dt^2 \quad (+ + + +)$$

This metric **does not distinguish between space and time**: all dimensions are geometrically equivalent.

3. Dual Universe: Real and Imaginary Parts

The complex structure induces a **natural duality**:

- The **real part** (a_1, a_2, a_3) defines the **observable physical space**.
- The **imaginary part** $(b_1\,i, b_2\,j, b_3\,k, b_4\,l)$ defines a **three-dimensional vector time**, not directly observable.

The physical universe we perceive is only a **real projection** of a broader universe, which possesses an imaginary part with physical properties.

4. Projection to the Minkowski Metric

By projecting the ++++ metric onto the real-imaginary subspace, the Minkowski metric is naturally recovered:

$$ds^2 = - dt^2 + dx^2 + dy^2 + dz^2 \quad (- \ + \ + \ +)$$

The negative sign of time arises **not as a postulate**, but as a consequence of the complex structure of the universe.

This provides a profound geometric interpretation of time: time is not an illusion, but the **structural synthesis** that generates space.

5. Fundamental Geometric Radii

For any mass M , two fundamental radii are defined:

5.1 VED Radius (wave confinement)

$$R_{VED} = \frac{2nh}{\pi Mc}$$

This radius describes the exact confinement of waves in 3S+T spacetime.

5.2 Schwarzschild Radius

$$R_{Sch} = \frac{2GM}{c^2}$$

This radius describes the gravitational geometry associated with the mass.

6. Constant Product of Radii

Define the geometric product:

$$Y = R_{VED} \cdot R_{Sch}$$

Substituting the above expressions:

$$Y = (\frac{2n\hbar}{\pi Mc})(\frac{2GM}{c^2}) = \frac{4n\hbar G}{\pi c^3}$$

Fundamental Result

- **The mass M cancels exactly**
- **The product Y does not depend on mass**

This fact is strictly mathematical and not approximate.

7. Geometric Expression of G and $\hbar$

From the definition of Y we obtain:

$$G = \frac{\pi c^3}{4n\hbar} Y$$

$$\hbar = \frac{\pi c^3}{4nG} Y$$

This demonstrates that:

- G and $\hbar$ **emerge from the same geometric constant Y**
 - Neither is fundamental on its own
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8. Inverse Relationship Between G and $\hbar$

The product of both constants is:

$$G \cdot \hbar = \frac{\pi c^3}{4n} Y$$

Therefore:

- G is **geometrically inverse** to $\hbar$
- Knowing one, the other is completely determined

This is not a dimensional coincidence, but a direct consequence of the geometry of the universe.

9. The Paradox of Mass

Here appears a deeply surprising result:

- G and $\hbar$ **do not depend on mass**
- However, **to calculate their exact numerical value it is necessary to start from a specific mass**

This implies:

- Mass **does not define** the constants
- Mass acts as a **necessary geometric reference** to access their value

This phenomenon has no precedent in known physics.

10. Physical Interpretation

1. The universe is geometrically **real–imaginary**
 2. Time is a **three-dimensional complex vector**
 3. Space emerges as a **differential of time**
 4. Fundamental constants are **geometric properties**
 5. Mass is a **measurement instrument**, not an origin
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11. Conclusion

This development shows that:

- The ++++ metric is more fundamental than the Minkowski metric
- Time is not an illusion, but the structural key of the universe

- G and $\hbar$ originate from a single geometric constant
- The mass paradox reveals a new layer of physical reality

We are faced with a surprising, coherent, and deeply revealing structure, which opens a completely new path for understanding fundamental physics.

12. Future Work

- Complete English development
 - Numerical implementation in Python
 - Extension to cosmology and the complete universe
 - Study of the topology underlying the geometric constant Y
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