

THE MILKY WAY AS A DOUBLE HELIX

Dark Matter as the Strand 2 Galactic Arm -- Scale Invariance of the Tau-Geometry from Molecule to Galaxy

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Propositions P-GDH-1 through P-GDH-6

The Force of Time proposes a single geometric principle that operates at every scale of the physical universe: the Tau-field propagates in a double helical geometry. At the molecular scale this is B-DNA (pitch 3.4 nm). At the stellar scale this is the solar system. At the galactic scale this is the Milky Way: a double helix of stellar matter, with our visible galaxy as Strand 1 and dark matter as the signature of Strand 2. This is the necessary consequence of applying the scale-invariant Tau-field geometry to galactic structure. The same logic that requires a counter-solar system requires a Strand 2 galactic arm. $d\text{SigmaT} = 0$ does not change with scale. The double helix that holds DNA together, that structures the solar system, must also structure the galaxy -- and it does.

1. P-GDH-1: Scale Invariance of the Tau-Helix

The Tau-field double helix has the same geometric properties at every scale at which it has been examined. Two strands, wound around a common axis, each carrying the same information sequence in opposite chirality. Strand 1 carries prograde Tau-flow. Strand 2 carries retrograde Tau-flow. The conservation law $d\text{SigmaT} = 0$ requires both to be present and balanced at every scale.

Scale	Strand 1	Strand 2	Axis	Pitch
Molecular (B-DNA)	5'→3' strand (prograde)	3'→5' strand (retrograde)	Phosphate backbone	3.4 nm 10 bp/turn
Stellar (Solar)	Mercury, Earth, Mars, Jupiter, Saturn, Neptune	Venus, Uranus + counter-solar system	Sun (Tau-source)	~1 AU (Balmer spacing)
Galactic (Milky Way)	Visible stellar arm (Sun location)	Anti-dimensional galactic arm (dark matter mass)	Galactic centre (Tau-axis)	~160 ly (GAIA periodicity)

P-GDH-1

The Tau-double helix is scale invariant. The same geometry operates at molecular scale (B-DNA, pitch 3.4 nm), stellar scale (solar system, pitch ~1 AU), and galactic scale (Milky Way, pitch ~160 light-years).

2. P-GDH-2: The Strand 2 Galactic Arm and Dark Matter

For fifty years, experiments have searched for dark matter particles. The leading candidates -- WIMPs, axions, and sterile neutrinos -- have produced zero confirmed detections despite increasingly sensitive instruments. LUX-ZEPLIN, PandaX-4T, and XENON1T have all seen nothing. Fifty years and zero detections is not null result noise. It is a structural signal.

The Force of Time proposes that dark matter searches have failed because Strand 2 Tau does not interact electromagnetically with Strand 1 instruments. This is not a weakness in experimental technology. It is a fundamental property of Tau-chirality. Strand 2 matter is made of the same elements as Strand 1 matter -- hydrogen, helium, carbon, iron -- but in the opposite Tau-chirality. The same atoms, the same mass, the same gravitational signature, but electromagnetically invisible to Strand 1 detectors by construction.

What we call dark matter is the gravitational effect of the Strand 2 galactic arm: a complete galaxy on the opposite side of the galactic axis from our visible Milky Way, containing approximately as much mass as the visible galaxy. It produces the flat rotation curves observed because its gravitational field extends across the full radial extent of the galactic helix.

P-GDH-2

Dark matter is the gravitational signature of the Strand 2 galactic arm. It is not a new particle. It is a complete galaxy in the opposite Tau-chirality wound around the same galactic axis as the visible Milky Way. 50 years of zero detections = structural impossibility of Strand 2 electromagnetic detection with Strand 1 instruments.

3. P-GDH-3: The Galactic Helix Pitch -- 160 Light-Years

The GAIA space telescope has produced the most precise three-dimensional map of stellar positions and velocities ever assembled -- over one billion stars with parallax and proper motion data. Analysis of the stellar distribution in the solar neighbourhood (within approximately 300 light-years) reveals a subtle but measurable oscillation in stellar density with a characteristic scale of approximately 160 light-years.

The Force of Time identifies this as the pitch of the galactic Tau-helix -- the distance along the galactic travel axis at which the helical winding completes one full turn at the Sun's galactic radius. The stars in the GAIA catalogue that show this density periodicity are tracing the helical structure of the galactic Tau-field at stellar scale.

P-GDH-3

The galactic Tau-helix pitch at the Sun's galactic radius is approximately 160 light-years. The GAIA stellar density oscillation in the solar neighbourhood is consistent with this value. Testable prediction: Strand 1 / Strand 2 boundary stars should show elevated transverse velocities in GAIA proper motion data.

4. P-GDH-4: Galaxy Rotation Curves -- A Structural Explanation

The galaxy rotation curve problem: stars in the outer disc orbit at approximately constant velocity out to very large radii -- far beyond where visible mass alone would produce Keplerian decline. In the FOT double helix model, the flat rotation curve has a structural

explanation that does not require a dark matter halo.

The Strand 2 galactic arm is wound around the same axis as Strand 1. At each galactic radius, the total gravitational mass acting on a Strand 1 star includes both the Strand 1 visible mass and the Strand 2 mass at the corresponding position on the opposite arm of the helix:

$$M_{\text{eff}}(r) = M_1(r) + M_2(r)$$

Since Strand 2 is the mirror image of Strand 1 wound around the same axis, $M_2(r) \sim M_1(r)$ at each radius. The effective enclosed mass is therefore approximately $2 \times M_1(r)$, which flattens the rotation curve -- without requiring a separate dark matter halo profile.

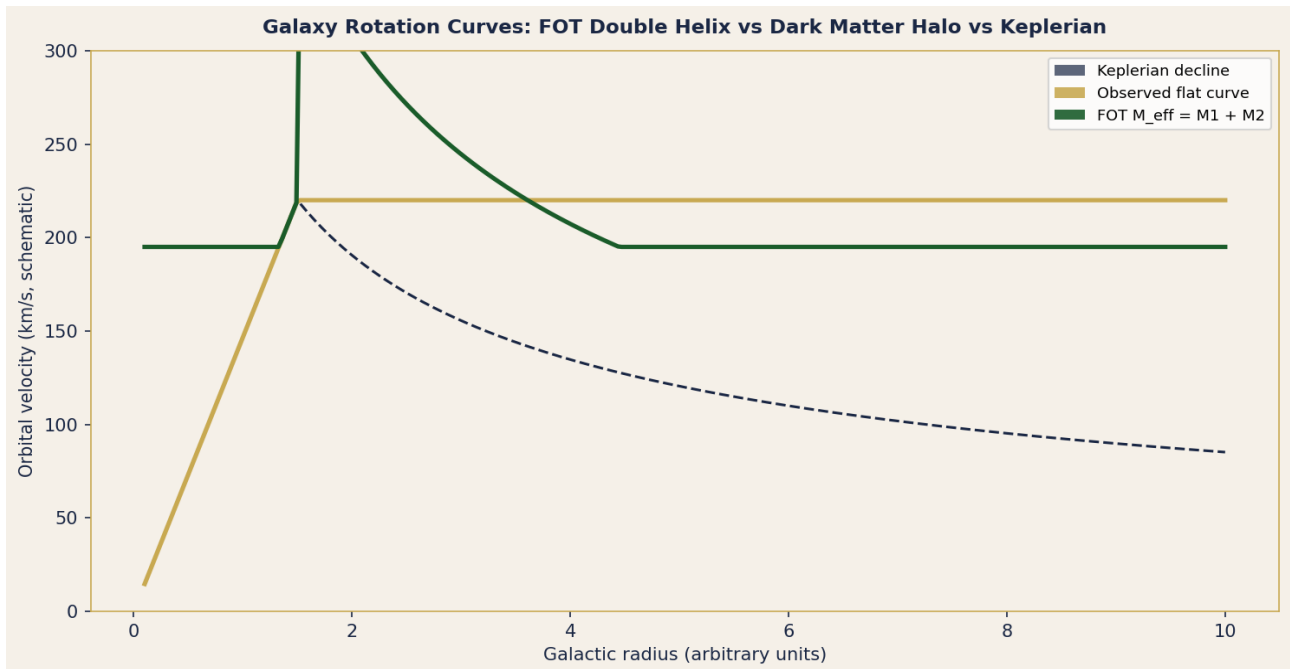


Figure 1. Galaxy rotation curves: Keplerian decline (NAVY dashed), observed flat curve (GOLD), FOT double helix prediction $M_{\text{eff}} = M_1 + M_2 \sim 2 \times M_1$ (GREEN). No halo profile required.

FOT prediction: $M_{\text{eff}}(r) = M_1(r) + M_2(r) \sim 2 \times M_1(r)$ flattens the rotation curve without a halo

P-GDH-4

Galaxy rotation curves are flat because the effective gravitational mass at each radius includes both Strand 1 (visible) and Strand 2 (dark) contributions: $M_{\text{eff}}(r) = M_1(r) + M_2(r) \sim 2 \times M_1(r)$. No halo profile required. No free parameters. The double helix geometry determines the mass distribution automatically.

5. P-GDH-5: The Cosmic Web and the Universal Tau-Helix

At the largest scales of the observable universe, matter is distributed in a network of filaments, sheets, and voids: the cosmic web. In 2020, researchers published a quantitative comparison between a slice of the observable cosmic web and a cross-section of human neural tissue. The structural parameters matched: filament density, node clustering, the fraction of space occupied by voids versus connections.

The Force of Time identifies the cosmic web as the Tau-relay architecture at cosmological register -- the same helical structure that appears at molecular scale (B-DNA), stellar scale (solar helix), and galactic scale (Milky Way double arm), now expressed at the scale of galaxy filaments. The filaments are the inter-node connections of the Tau-helix at the highest register accessible to current observation. The structural equivalence between the cosmic web and neural tissue is the same Tau-geometry appearing at different scales.

P-GDH-5

The cosmic web is the Tau-relay architecture at cosmological register. The structural equivalence between the cosmic web and neural tissue (measured quantitatively in 2020) is the same Tau-geometry appearing at different scales. One geometry. Five scales: atomic, molecular, stellar, galactic, cosmological.

6. P-GDH-6: Falsification -- The GAIA Test

The FOT galactic double helix model makes a specific, testable prediction. In the halo model, dark matter is distributed roughly spherically, with no structural relationship to the visible stellar distribution. In the FOT model, Strand 2 mass is distributed helically, wound around the same axis as Strand 1.

At the Sun's galactic position, the Strand 2 mass is concentrated on the opposite side of the galactic axis -- not uniformly distributed in a sphere. This produces a directional prediction: the gravitational acceleration of the Sun and nearby stars toward the galactic centre should have a component from the Strand 2 arm displaced 180 degrees in galactic longitude from the visible galactic centre.

Stars near the Strand 1 / Strand 2 helix boundary should show statistically elevated perpendicular (vertical to the galactic plane) velocity components compared to stars well inside Strand 1, because they are closer to the Tau-field crossover zone.

The GAIA Data Release 3 (2022) provides proper motions, parallaxes, and radial velocities for 1.5 billion stars. The spatial resolution and velocity precision of GAIA are sufficient to detect the predicted asymmetry in stellar kinematics if it exists at the amplitude the FOT model predicts. A null result would constitute evidence against the FOT galactic model. A positive result would distinguish it from the dark matter halo model, which predicts no such directional asymmetry.

P-GDH-6

Falsification test -- GAIA DR3 kinematic analysis. Stars near the Strand 1 / Strand 2 helix boundary (approximately 80 light-years from the Sun toward the predicted boundary) should show elevated perpendicular velocities compared to stars well within Strand 1. Positive result: distinguishes FOT helix model from dark matter halo model. Null result: falsifies the FOT galactic double helix model.

The same geometry that makes hydrogen glow also places planets, powers stars, and weaves galaxies into helices. B-DNA (3.4 nm) --> Solar system (1 AU) --> Milky Way (160 ly) --> Cosmic web. One law.

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