

The Knot We Live In

The Solar System, the Galaxy, and the Zodiac, Read from the Net

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This essay is one winding of "The Net" (Konstapel, August 2026). It adds no postulate. It uses only what the foundation document already contains: one strand, phase closure, the machine (load — discharge — relax), tension as the constitutive relation $g(\chi)$, and the context principle. Everything else is arithmetic.

1. One knot, three depths

Picture a fishnet drawn tight around a heavy knot. The meshes near the knot are stretched. Far away they relax into the open weave. Now recall the fractal rule of the Net: a knot at one rung is a whole net at the rung below.

This essay reads one knot at three depths. The solar system is a knot inside the galaxy. The galaxy is a knot inside the cosmic web. And the zodiac — the oldest sky map humans keep — turns out to be the ring on which all three depths are readable at once, from inside.

No new theory appears at any depth. The same winding returns, deeper each time. That is what identity over scale means.

2. The solar system as a knot

2.1 The field around the knot

The Sun is the principal knot of our region. Its mass is stored resonance: closed light, held in windings. Around any knot the net is tense, and around a point-knot in three dimensions that tension thins out as $1/r^2$. This is not a force sent from Sun to planet. Knot and field are one state, simultaneous. Sakharov's reading holds here: gravity is the elasticity of the vacuum.

A planet is a smaller knot, phase-closed inside that field. A phase-closed winding in a $1/r^2$ tension field is an ellipse. The closure condition, written in numbers, is Kepler's third law: $T^2 \propto a^3$. Kepler is not a decree from outside the medium. It is the constitutive relation $g(\chi)$ of this rung, seen edge-on.

2.2 Selection by fit

Resonance is choosy. Only windings that return in phase with themselves persist; all others unwind. The solar system displays this selection openly, in both directions.

What fits, stays. Io, Europa and Ganymede circle Jupiter in periods locked at $1 : 2 : 4$ — whole-number fits, the overtones of a string at planetary scale. Neptune and Pluto run at $3 : 2$, which is why they never meet although their paths cross.

What does not fit, is gone. The asteroid belt is scored with empty lanes: the Kirkwood gaps, at the periods that would run 3 : 1, 5 : 2, 7 : 3 and 2 : 1 with Jupiter (near 2.50, 2.82, 2.95 and 3.27 AU). Those windings did not close in phase and were unwound. The belt is the choosiness of resonance made visible — a frequency spectrum with allowed and forbidden bands, drawn in rock.

2.3 The machine at every layer of the knot

Load slowly, discharge suddenly through the weakest points, then relax. The cycle runs on every timescale this knot contains.

Fast: solar flares follow a power law over eight decades of energy — many small discharges, few giant ones. Middle: impact craters and asteroid sizes follow power laws of the same shape. Slow: the formation of the system itself. A charged cloud closed into a knot. The disc knotted itself into planetesimals. The record of heavy early bombardment, roughly four billion years back, is the great discharge. What we inhabit now is the relaxed state after it — which is exactly why the system is so empty and so periodic. A ground state looks like this.

2.4 The winding edge, computed

A knot ends where its own winding tension gives way to the ground-state tension of the largest winding. The Net fixes that threshold as a number: $a_0 \approx 1.2 \times 10^{-10} \text{ m/s}^2$, the measured acceleration below which local tension yields to the background (Appendix A.2 of the foundation document; empirically $a_0 \approx cH_0/2\pi$).

The edge of the solar knot is then the radius where the Sun's field thins to a_0 . All steps:

- The Sun's gravitational parameter: $GM_{\odot} = 1.327 \times 10^{20} \text{ m}^3/\text{s}^2$.
- Set $GM_{\odot} / r^2 = a_0$, so $r = \sqrt{GM_{\odot} / a_0}$.
- $GM_{\odot} / a_0 = 1.327 \times 10^{20} / 1.2 \times 10^{-10} = 1.106 \times 10^{30} \text{ m}^2$.
- $\sqrt{1.106 \times 10^{30}} = 1.05 \times 10^{15} \text{ m}$.
- One astronomical unit is $1.496 \times 10^{11} \text{ m}$, so $r \approx 7,030 \text{ AU}$.

That radius lands inside the Oort cloud — the comet reservoir inferred by Oort in 1950, whose inner, densest region is placed by dynamical models at a few thousand to twenty thousand AU. The knot therefore has two edges, and they are not the same thing. The flow edge is the heliopause near 120 AU, where the Sun's wind meets the interstellar medium; Voyager 1 crossed it in 2012. The winding edge is near 7,000 AU, where the Sun stops being local.

Comets are the knots of that transition layer: bound, but barely. When the larger net loads — the galactic tide, a passing star — the edge discharges, and comets fall inward. A comet shower is the winding edge doing what every loaded edge does.

3. The galaxy as a knot

One rung up, the same reading. The Milky Way is a knot; stars and solar systems are its sub-knots. No new physics is admitted at the door. The test is whether the same two numbers — a_0 and the constitutive crossover — carry this rung too. They do.

3.1 The crossover, measured

Across thousands of galaxies, the observed acceleration of stars tracks the acceleration expected from visible matter along one universal curve: the Radial Acceleration Relation (McGaugh, Lelli & Schombert, 2016; 153 galaxies, scatter consistent with measurement error). Above a_0 the curve is Newtonian. Below a_0 it bends onto $g_{\text{obs}} \approx \sqrt{g_{\text{bar}} \cdot a_0}$.

The standard picture reads this as evidence for invisible particles, arranged — galaxy by galaxy — so as to reproduce one smooth curve. The Net reads the curve itself: it is $g(\chi)$, the medium's equation of state, crossing over from the tensed regime near the knot to the collective ground-state regime of the largest winding. One curve, because it is one medium.

3.2 The flat rotation curve, computed

In the collective regime the closure condition changes form. Setting the centripetal acceleration v^2/r equal to $\sqrt{g_{\text{bar}} \cdot a_0}$ with $g_{\text{bar}} = GM_{\text{b}}/r^2$, the radius cancels:

- $v^4 = G \cdot M_{\text{b}} \cdot a_0$.

The velocity stops depending on r . That is the flat rotation curve, derived in one line, and it is the measured Baryonic Tully–Fisher relation. For the Milky Way, all steps:

- Baryonic mass (stars plus gas): $M_{\text{b}} \approx 7 \times 10^{10} M_{\odot} = 1.39 \times 10^{41} \text{ kg}$.
- $G \cdot M_{\text{b}} = 6.674 \times 10^{-11} \times 1.39 \times 10^{41} = 9.3 \times 10^{30} \text{ m}^3/\text{s}^2$.
- $v^4 = 9.3 \times 10^{30} \times 1.2 \times 10^{-10} = 1.11 \times 10^{21} \text{ m}^4/\text{s}^4$.
- $v = (1.11 \times 10^{21})^{1/4} \approx 1.8 \times 10^5 \text{ m/s} \approx 183 \text{ km/s}$.

Measured rotation speeds in the Milky Way run between roughly 190 and 230 km/s, depending on radius. A zero-parameter estimate from visible mass alone lands within about fifteen percent. No halo was fitted. Nothing was tuned.

3.3 The Sun sits on the crossover

Where does the galactic knot pass from its tensed regime into the collective one? At the radius where the field of the visible mass thins to a_0 :

- $r = \sqrt{(G \cdot M_{\text{b}} / a_0)} = \sqrt{(9.3 \times 10^{30} / 1.2 \times 10^{-10})} = \sqrt{(7.7 \times 10^{40})} \approx 2.8 \times 10^{20} \text{ m}$.
- One kiloparsec is $3.086 \times 10^{19} \text{ m}$, so $r \approx 9 \text{ kpc}$.

The Sun orbits at 8.2 kpc. We live almost exactly on the crossover — on the mesh where the net passes from tight to open weave. This is worth saying plainly: the century-long ambiguity of our own galaxy's dynamics is not bad luck. It is our address.

4. The zodiac: the map of the knots above

Now the oldest instrument. The zodiac is the band of sky, some eight degrees either side of the ecliptic, divided since Babylon into twelve constellations. Read from the Net, it is not fate and not accident. It is one ring of sky on which the planes and directions of every higher winding are readable from inside our knot.

The band itself is our knot's equator. The ecliptic is the plane in which the solar winding closed — the plane of the disc, kept by conservation of the turning. Projected outward, that plane becomes a ring on the sky. The zodiac is the human record of that ring: the meshes of our own knot, drawn on the night.

Sagittarius holds the next knot up. The centre of the galaxy — Sagittarius A*, twenty-six thousand light-years inward — lies in a zodiacal constellation. The band crosses the galactic plane twice, in Sagittarius and at the Taurus–Gemini border. So the ring of our knot's equator carries, marked on it, the axis of the rung above.

Virgo holds the knot above that. The Virgo Cluster — more than a thousand galaxies at some fifty-four million light-years — is the nearest major knot of the cosmic web, and the mass centre of our local basin lies in its direction. The Local Group's motion carries a measured component toward it. The supercluster rung, too, is marked on the ring.

Leo marks the greatest frame. The apex of the CMB dipole — the direction of our measured 370 km/s through the background light — points just south of the band, at the Leo–Crater border. The deepest motion we can measure at all points along the same stretch of sky.

Precession is the slowest visible winding. The Earth's axis turns once around the ecliptic pole every 25,772 years, and the equinox point walks backward through the twelve signs. The "ages" of the zodiac are the human bookkeeping of that turning — the one winding slow enough to be recorded only across civilizations.

One honest flag. That the ring of our ecliptic passes so close to the directions of Sagittarius A*, the Virgo Cluster and the dipole apex is a fact of our particular winding, not a law of the medium. Another knot would carry another ring with other marks. But that is exactly what the context principle says a map is: measure inside one tension state and you chart that state. The zodiac charts ours. The figures drawn on the constellations are human; the positions they mark are knots. Correspondence across depths, on one band — no arrow of cause anywhere, and none needed.

5. Status

In the style of the foundation document's ledger.

Measured. The 1 : 2 : 4 lock of the Galilean moons; the 3 : 2 lock of Neptune–Pluto; the Kirkwood gaps at the listed resonant radii; the flare and crater power laws; the heliopause at 120 AU; the RAR across 153 galaxies; the CMB dipole at 370 km/s; the 25,772-year precession.

Derived here, from a_0 and $g(\chi)$ alone. Kepler's third law as the closure condition of a $1/r^2$ field. The winding edge of the solar knot at 7,030 AU, landing in the inner Oort region. The flat rotation velocity of the Milky Way at 183 km/s against 190–230 measured, with zero fitted parameters. The galactic crossover at 9 kpc, with the Sun at 8.2 kpc sitting on it.

Candidate. Do the period ratios of the planets carry the Bronze Mean recursion (1, 1, 4, 13, 43, 142)? This system is the cleanest test the candidate will ever get: planetary periods are known to ten decimal places. If the sequence lives in the phase fits of any system, it is findable here — or refutable here.

Open. Whether the alignment of ring and higher knots (Section 4) carries information beyond position — whether the map is also, at any depth, a gauge. The foundation document leaves the observer's entry into the net deliberately open (its task 3); this question belongs to that one, and is left with it.

Annotated references

1. **H. Konstelap, "The Net — The Vacuum from the Smallest Strand to the Greatest Knot" (Leiden, August 2026).** The foundation document. One primitive (the strand), the machine, the context principle, the constitutive relation $g(\chi)$, the a_0 pin, and the status ledger this essay extends. Everything here refers back to it and to nothing else in the series.
2. **D. Kirkwood, "On the theory of meteors" / belt gap analyses (1866 onward).** The original identification of the empty lanes in the asteroid belt at Jovian resonances. Read here as the unwound windings — selection by fit, negative print.
3. **P.S. Laplace, *Mécanique Céleste* (1799–1825), on the Io–Europa–Ganymede lock.** The 1 : 2 : 4 relation, stable for four billion years. Read here as whole-number phase closure — selection by fit, positive print.
4. **J.H. Oort, "The structure of the cloud of comets surrounding the Solar System" (Bull. Astron. Inst. Neth., 1950).** The comet reservoir at thousands of AU, inferred from orbit statistics. Read here as the winding edge of the solar knot, whose radius Section 2.4 computes at 7,030 AU.
5. **E.C. Stone et al., "Voyager 1 observes low-energy galactic cosmic rays..." (Science, 2013).** The heliopause crossing near 120 AU. Read here as the flow edge — distinct from the winding edge, as a river's bank is distinct from its watershed.
6. **E.T. Lu & R.J. Hamilton, "Avalanches and the distribution of solar flares" (ApJ, 1991).** The flare power law across eight decades. The machine's fingerprint on the star at the centre of our knot.
7. **M. Milgrom, "A modification of the Newtonian dynamics..." (ApJ, 1983).** The identification of a_0 as the acceleration below which dynamics change regime. Read here not as modified law but as the tension threshold of the medium.
8. **S. McGaugh, F. Lelli & J. Schombert, "Radial Acceleration Relation in rotationally supported galaxies" (PRL, 2016).** One universal curve, 153 galaxies, scatter at measurement error. Read here as $g(\chi)$ seen edge-on: the medium's equation of state.
9. **S. McGaugh, "The Baryonic Tully–Fisher relation..." (ApJ, 2005; 2012).** $v^4 = G \cdot M_{\text{b}} \cdot a_0$, measured across the full range of galaxy masses. The one-line derivation of Section 3.2 is this relation, read constitutively.
10. **A.-C. Eilers et al., "The circular velocity curve of the Milky Way..." (ApJ, 2019).** The measured rotation of our own galaxy, against which the 183 km/s estimate is set.
11. **R.B. Tully, H. Courtois, Y. Hoffman & D. Pomarède, "The Laniakea supercluster of galaxies" (Nature, 2014).** The basin we inhabit, defined by converging flows. The rung whose direction Section 4 finds marked in Virgo.
12. **Planck Collaboration, CMB dipole measurements.** Our 370 km/s through the background light — the deepest measured motion, pointing at the Leo–Crater border.
13. **A. Sakharov, "Vacuum quantum fluctuations in curved space and the theory of gravitation" (Doklady, 1967).** Gravity as vacuum elasticity. The licence for reading Kepler and the RAR as constitutive relations of one medium.

One strand. Two states. One machine. The solar system, the galaxy and the zodiac are one knot, read at three depths — and the zodiac is the ring on which all three can be read at once.