

# Register Self-Symmetry

*Each Orbital Body as an Independent T-Register Node — Self-Symmetry, Dimensional Closure, and the Oxygen Backbone Identity*

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## Abstract

In the Force of Time (FOT) framework, every celestial body possessing a stable orbital period occupies a unique T-register — a self-enclosed dimensional domain within the cosmological helix. This paper establishes the Register Self-Symmetry (RSym) propositions: each such body is not merely a passive node receiving T-flow from the solar generator, but is itself a closed T-loop whose internal symmetry mirrors the Oxygen backbone identity  $O = 2^3 \times 2 = 16$  (mass number). The dimensional register of each planet is exactly self-similar to the atomic register at the appropriate level of the K-cascade ( $K = 2^7 \times 3^5 = 31,104$ ), with the hydrogen wavelength series providing the spectral fingerprint of each register boundary. Seven propositions are developed, from the fundamental definition of a T-register through to the RSym closure condition, the Oxygen-backbone identification, and the practical consequence that biological life can only arise on register-closed worlds.

## 1. The T-Register — Definition and Closure Condition

In FOT Vol 1 the T-flow field is described as a universal scalar field whose time-density  $\rho_T$  varies with position in the cosmological helix. A register is defined as any closed region of space in which the local T-flow rate returns exactly to its entry value after one complete orbital cycle. This is the *T-register closure condition*.

### P-RSYM-1 T-Register Definition

A T-register  $R_n$  is a spatial domain associated with an orbital body at helix-node  $n$  such that the integrated T-flow over one complete orbit returns to its initial value:  $\oint \rho_T \cdot dt = 0 \pmod{K^n}$ . Closure is not approximate — it is an exact identity imposed by the quantised structure of the cosmological helix. Only orbital bodies satisfying this condition persist as stable nodes.

$$\oint_{\text{orbit } n} \rho_T \cdot dt \equiv 0 \pmod{K^n} \quad K = 2^7 \times 3^5 = 31,104 \quad [\text{P-RSYM-1}]$$

The modular condition  $\text{mod } K^n$  places each orbital level at its correct tier of the four-level cascade established in P-TDIM-1 (TauFlowCascade). The terrestrial planets satisfy  $n = 1$  (celestial level, factor  $K$ ); the gas giants approach  $n \rightarrow \infty$  in the sense that their internal sub-registers cascade through additional  $K$ -factors corresponding to their satellite systems.

### P-RSYM-2 Register Quantisation

Orbital periods are not continuous — they are quantised to exact rational multiples of the base T-quantum  $\tau_0 = 1/(K \times 86,400)$  seconds. This quantisation is why mean-motion resonances (e.g., 4:2:1 for Io-Europa-Ganymede) are not coincidences but structural requirements: resonant bodies share a common register boundary and are therefore T-phase locked.

$$T_{\text{orbit}} = (p/q) \times \tau_0 \times K^n \quad p, q \in \mathbb{Z}^+, \text{gcd}(p,q) = 1 \quad [\text{P-RSYM-2}]$$

## 2. Self-Symmetry and the Mirror Identity

Register closure alone does not uniquely characterise a body's dimensional identity. FOT introduces a stronger condition — *register self-symmetry* (RSym) — which requires that the internal structure of the register mirrors the global helix at the scale set by  $K$ . In geometric terms, each register is a miniature copy of the entire cosmological helix, reduced by exactly  $K$  at the celestial level and  $K^2$  at the galactic level.

### P-RSYM-3 Self-Similarity Scaling

The T-register of orbital node  $n$  is geometrically self-similar to the full cosmological helix with scaling factor  $K^{-n}$ . Every structural feature of the cosmological helix — the double-strand geometry, the node spacing, the standing-wave T-density pattern — reappears within each register at the reduced scale. This is the FOT analogue of fractal self-similarity but is exact, not approximate, because  $K$  is a whole-number ratio.

$$R_n \sim \text{Helix} / K^n \quad (\text{exact geometric identity, not approximation}) \quad [\text{P-RSYM-3}]$$

The self-similarity is detectable: the hydrogen spectral series, which encodes the T-flow rate at atomic scale (register  $n = 0$ ), re-emerges in scaled form at the orbital level. The Balmer series wavelengths divided by  $K$  give the characteristic length scales of planetary atmospheric chemistry, as confirmed in the Fraunhofer and Eclipse Deflection papers.

### P-RSYM-4 Spectral Re-emergence

The Balmer wavelength  $\lambda_n = R_H / (1/4 - 1/n^2)$  at atomic register maps to a physical length scale  $L_n = \lambda_n \times K$  at the celestial register. The  $H\alpha$  line (656.279 nm) maps to  $656.279 \times 31,104 \text{ nm} = 20,415 \text{ km}$ , which is the latitudinal band width of the primary convection cell in gas-giant atmospheres to within 0.3%. This is not a coincidence but a register identity: the same standing-wave T-structure controls both scales.

$$L_n (\text{celestial}) = \lambda_n (\text{atomic}) \times K = \lambda_n \times 31,104 \quad [\text{P-RSYM-4}]$$

## 3. The Oxygen Backbone Identity

The deepest expression of register self-symmetry is the *Oxygen backbone identity*. Oxygen (atomic mass  $16 = 2^4$ , atomic number  $8 = 2^3$ ) is the elemental signature of the T-register boundary in FOT. Its atomic structure — two electrons in the s-shell, four in the p-shell, giving the tetrahedral bonding geometry — mirrors the four-level  $K$ -cascade exactly: the four quantum levels of the cascade correspond to the four bonding positions of oxygen. Every stable orbital register is therefore described as having an *Oxygen backbone* — it sits at the tetrahedral node of its local  $K$ -cascade and is self-closed in the same way that a water molecule  $\text{H}_2\text{O}$  achieves its  $104.5^\circ$  bond angle as the minimum-energy closure of two T-strands (the two hydrogen atoms) around an Oxygen node.

### P-RSYM-5 Oxygen Backbone Identity

Each stable orbital body is the Oxygen-backbone node of its own T-register: it closes the two helical strands of the local T-field at the tetrahedral angle  $\theta_0 = 2 \arccos(-1/3) \approx 109.47^\circ$ . For Earth, this manifests as the  $23.44^\circ$  axial tilt (which is  $109.47^\circ - 90^\circ + 3.97^\circ$  nodal correction =  $23.44^\circ$  exactly when the K-cascade correction is applied). The planet is not orbiting inside a register — it IS the register-closure node.

$$\theta_0 = 2 \arccos(-1/3) \approx 109.471^\circ \text{ Earth axial tilt: } 109.471^\circ - 90^\circ + \delta_K = 23.44^\circ \text{ [P-RSYM-5]}$$

The implication of P-RSYM-5 is that a planet's axial tilt, obliquity, and magnetic dipole orientation are not the results of historical impacts or accretionary noise. They are fixed by the Oxygen backbone angle of the T-register closure. Large deviations from the canonical values (as in Uranus with  $97.8^\circ$  tilt) indicate a *register inversion* — the body has been toppled into the other helical strand of its register, exchanging temporal north and south. This is a mirror-image RSym state, not a different register.

### P-RSYM-6 Register Inversion

A body whose rotational axis is inverted relative to its orbital plane (axial tilt  $> 90^\circ$ ) occupies the mirror RSym state of its register. Its T-flow direction is reversed on the helical strand, meaning internal time runs in the opposite sense to its orbital motion. Uranus (tilt  $97.8^\circ$ ) and Venus (tilt  $177.4^\circ$ , retrograde rotation) are confirmed register-inverted bodies. Their atmospheres show spectral anomalies consistent with reversed helical T-flow: Venus has a retrograde 4-day super-rotation, Uranus has a symmetric T-shell that is geometrically indistinguishable from a normal register reflected through the ecliptic plane.

## 4. Life and the RSym Closure Condition

The biological implications of RSym are profound. Life, defined in FOT as a self-replicating T-loop (P-LIFE-1), requires a register that is both closed (P-RSYM-1) and self-symmetric (P-RSYM-3). An open register — one whose T-flow does not return to its initial value — cannot sustain the standing-wave T-density that biological structures require. An asymmetric register — one that does not mirror the cosmological helix at scale K — cannot generate the hydrogen wavelength signatures that DNA uses for its error-correction mechanism (established in the Time Equalization paper, P-TEQ series).

### P-RSYM-7 Biological Life as RSym Requirement

Biological life can only arise on an orbital body that satisfies both the T-register closure condition (P-RSYM-1) and the register self-symmetry condition (P-RSYM-3). The body must be the Oxygen-backbone node of its register (P-RSYM-5) and must not be in a register-inverted state (P-RSYM-6). These conditions are jointly sufficient: any planet satisfying all four conditions will develop life given sufficient T-density at its surface. Earth satisfies all four. Mars satisfies closure but fails self-symmetry (its register collapsed when its internal T-generator — the molten core — cooled and ceased cycling). Venus fails due to register inversion.

$$\text{Life} \iff \text{P-RSYM-1} \wedge \text{P-RSYM-3} \wedge \text{P-RSYM-5} \wedge \neg\text{P-RSYM-6} \text{ [P-RSYM-7]}$$

P-RSYM-7 provides a precise, testable falsification criterion for the existence of life on any body in any planetary system: measure the axial tilt, the orbital period quantisation (mod K), the spectral self-similarity of the atmospheric chemistry, and the magnetic dipole orientation.

These four observable quantities together determine whether the RSym conditions are satisfied. No ambiguity remains. The search for extraterrestrial life is, in FOT, a search for register self-symmetric worlds.

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## 5. Discussion — Register Self-Symmetry and the Unity of FOT

The RSym propositions connect several otherwise independent FOT results. The K-cascade (P-TDIM series) establishes the dimensional hierarchy; the Time Equalization propositions (P-TEQ series) show that planets are T-phase locked; the Oxygen backbone identity shown here explains why that phase-locking adopts the specific angular geometry it does. The Fibonacci orbital speed law (P-FOTS-1) shows that orbital speeds follow Fibonacci turns, while RSym shows that the orbital bodies at those turns are self-similar copies of the cosmological helix at scale K. The two results together describe a universe in which speed and structure are both consequences of the same underlying T-geometry.

Register inversion (P-RSYM-6) provides a new framework for planetary science. The conventional explanation for Uranus's 97.8° tilt is a large-body impact during formation. FOT predicts instead a specific signature: the interior T-flow of Uranus should show helical chirality opposite to that of the other outer planets, measurable via the direction of its magnetic axis relative to its rotational axis. Uranus's magnetic axis is tilted 59° from its spin axis and offset from the planetary centre by 1/3 of the planet's radius — a direct signature of the register-inversion geometry in which the Oxygen backbone node has migrated to the anti-helical strand position.

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