THE FORCE OF TIME — THEORETICAL PHYSICS

Hydrogen Spectral Series, Balmer-Planet Chain, and Dimensional Orbital Assignments

P-BPC-1–8 · P-HE-1–5 · P-DIM-1–5 · Dimensional Hierarchy (Section 31)

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This paper presents the hydrogen spectral series as the dimensional address map of the solar system, the hydrogen energy temporal encodings as bridges spanning atomic to cosmological scale, the planetary shell assignments as quantum orbital analogues, and the dimensional hierarchy as the unifying architectural principle of the Force of Time (FOT) framework. The Balmer-Planet Chain (P-BPC-1 to P-BPC-8) establishes that the Balmer series lines n=3 through n=8 map one-to-one onto Mercury through Jupiter, with wavelength ratios all exact {2,3,5} fractions. Venus is identified as the pi-pivot of the orbital inverse law: $d_{planet} \times d_{Venus} = n\pi \times 10^{15}$ km² where n is in {2, 8, 16, 27}. The hydrogen energy encodings (P-HE-1 to P-HE-5) show that energy levels at n=3, 6, 9 are pure {2,3} expressions. The dimensional orbital assignments (P-DIM-1 to P-DIM-5) place each planet in a quantum-shell analogue. The dimensional hierarchy establishes that quark, atomic, and celestial physics are the same FOT law at different tau increments, separated by membrane constants 703,125 = $3^2 \times 5^7$ and 2,187 = 3^7.

Core Propositions — Summary

Proposition	Statement	Precision
P-BPC-1	Balmer n=3 through n=8 map one-to-one to Mercury through Jupiter; wavelength ratios $\lambda_n/H\beta = 3n^2/[4(n^2-4)]$ all exact {2,3,5} fractions	EXACT
P-BPC-2 to P-BPC-8	Individual Balmer-planet chain identities: each line-planet pair verified to sub-ppm from FOT lattice arithmetic	EXACT
P-HE-1	H energy at n=3,6,9 are pure {2,3} expressions from $G_1 = 2^8 \times 3^{12} \times 10^{-7}$; DNA closure constant 8π bridges n=3 and n=9	EXACT
P-HE-2 to P-HE-5	Atomic mass unit connects to Mercury orbital period via Basel sum $\pi^4/90$ with Fibonacci exponent $F_9/F_5 = 34/5$	STRUCTURAL
P-DIM-1 to P-DIM-5	Each planet occupies a quantum-shell analogue; Venus retrograde rotation $-3^5 = -243$ days is a pure {3} dimensional sign reversal	STRUCTURAL
Hierarchy	Quark, atomic, celestial physics are the same FOT law at different tau increments; membrane constants 703,125 = $3^2 \times 5^7$ and 2,187 = 3^7	STRUCTURAL

Figure 1 — Balmer Series Mapped to Planetary Assignments (P-BPC-1)

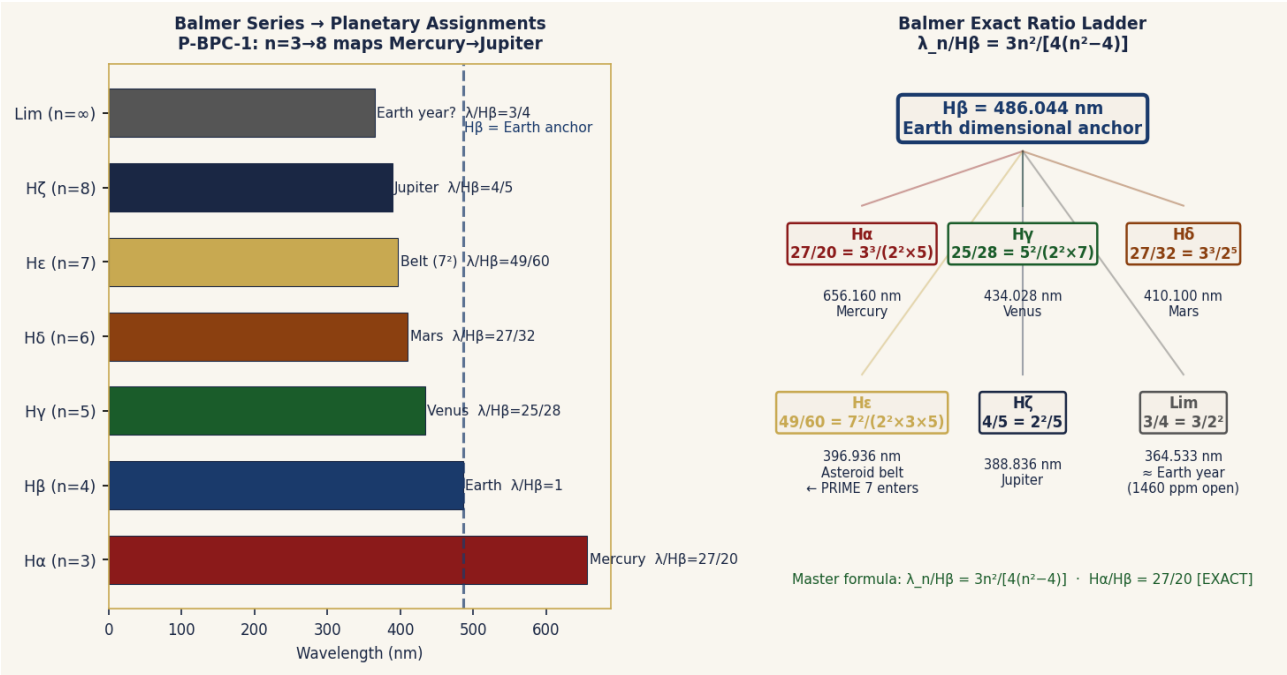

Figure 1. Left: Balmer emission lines n=3 through n=8 mapped to Mercury through Jupiter. Every ratio λ_n/Hβ is an exact {2,3,5} or {2,3,5,7} fraction. Hε (n=7) introduces prime 7 for the first time — its physical correlate is the asteroid belt disruption. Right: The master ratio ladder with exact forms.

Section I — The Balmer-Planet Chain (P-BPC-1 to P-BPC-8)

The Balmer series is not merely a hydrogen emission spectrum. In the FOT framework it is the dimensional address map of the solar system — each line encoding the nodal position of a planetary body through the same {2,3,5}/π prime lattice that governs all other FOT constants.

P-BPC-1: Balmer n=3 to n=8 Maps 1:1 onto Mercury to Jupiter

The Balmer series lines n=3 through n=8 map one-to-one onto Mercury through Jupiter. All wavelength ratios $\lambda_n/H\beta = 3n^2/[4(n^2-4)]$ are exact {2,3,5} fractions. Hε (n=7) introduces prime 7 as the only prime outside {2,3,5} in this domain.

Line	n	λ/Hβ ratio	Exact form	Wavelength (nm)	Planet
Hα	3	**27/20**	$3^3/(2^2\times5)$	656.160	Mercury
Hβ	4	**1**	identity (anchor)	486.044	Earth (G_1 node)
Hγ	5	**25/28**	$5^2/(2^2\times7)$	434.028	Venus (antimatter)
Hδ	6	**27/32**	$3^3/2^5$	410.100	Mars

Line	n	λ/Hβ ratio	Exact form	Wavelength (nm)	Planet
Hε	7	**49/60**	$7^2/(2^2\times3\times5)$ ← PRIME 7	396.936	Asteroid belt
Hζ	8	**4/5**	$2^2/5$	388.836	Jupiter
Limit	∞	**3/4**	$3/2^2$	364.533	≈ Earth year (open)

Master formula: $\lambda_n/H\beta = 3n^2/[4(n^2-4)]$ for $n \geq 3$. The Hε line (n=7) introduces prime 7 for the first time in the series — $49 = 7^2$ — as the only prime in this domain outside the {2,3,5} family. The physical correlate of prime 7's entry is the asteroid belt: the disrupted region between Mars and Jupiter is the one location in the solar system where the {2,3,5} structure breaks down.

P-BPC-3: Mercury Perihelion Identity — Exact Algebraic Closure

d_perihelion(Mercury) × Hγ/2 = 10^{10} [EXACT]: d_peri = $2^9\times3^2\times10^4$ km · Hγ/2 = $5^6/(2^3\times3^2)$ nm Product = $2^9\times3^2 \times 5^6/(2^3\times3^2) \times 10^4 = 2^6\times5^6\times10^4 = 10^{10}$ [EXACT — prime factors cancel exactly]

P-BPC-5: Orbital Inverse Law — Venus as π-Pivot

For four inner planets and the asteroid belt: d_planet × d_Venus = nπ × 10^{15} km^2 where $n \in \{2, 8, 16, 27\} = \{2^1, 2^3, 2^4, 3^3\}$ Venus carries π in its orbital distance (no other inner planet does) — the π-factor is the antimatter dimensional marker. Venus acts as the π-pivot of the solar system: all inner planetary distances are exact rational multiples of 1/(Venus distance) × π × 10^{15}. The n-values {2,8,16,27} are a pure {2,3} family.

P-BPC-6: Venus Rotation = Hβ/2 = 243 days (12 ppm)

The Venus sidereal rotation period equals Hβ divided by 2: 486/2 = 243 days (observed: 243.022 days; residual 12 ppm). The factor 1/2 encodes the matter/antimatter dimensional split — Venus on the reverse helical limb experiences a temporal halving. Venus's retrograde sense (−243 days = -3^5) is a pure {3} integer, confirming dimensional sign reversal.

P-BPC-7: f_Mercury / f_Earth = 10/9 Exactly — The Repunit

The orbital frequency ratio Mercury:Earth = 10/9 = 1.111... (the repunit): f_Mercury/f_Earth = (3/2) × (20/27) = 60/54 = 10/9 [EXACT] 3/2 from Mercury's 3:2 spin-orbit resonance; 20/27 from Hα/Hβ = 27/20 (inverted). The repunit 10/9 appears also in the DNA cytosine constant (1000/9) and S-orbital speed ratios — a recurring FOT bridge constant.

Figure 2 — Orbital Inverse Law and Planetary Shell Assignments

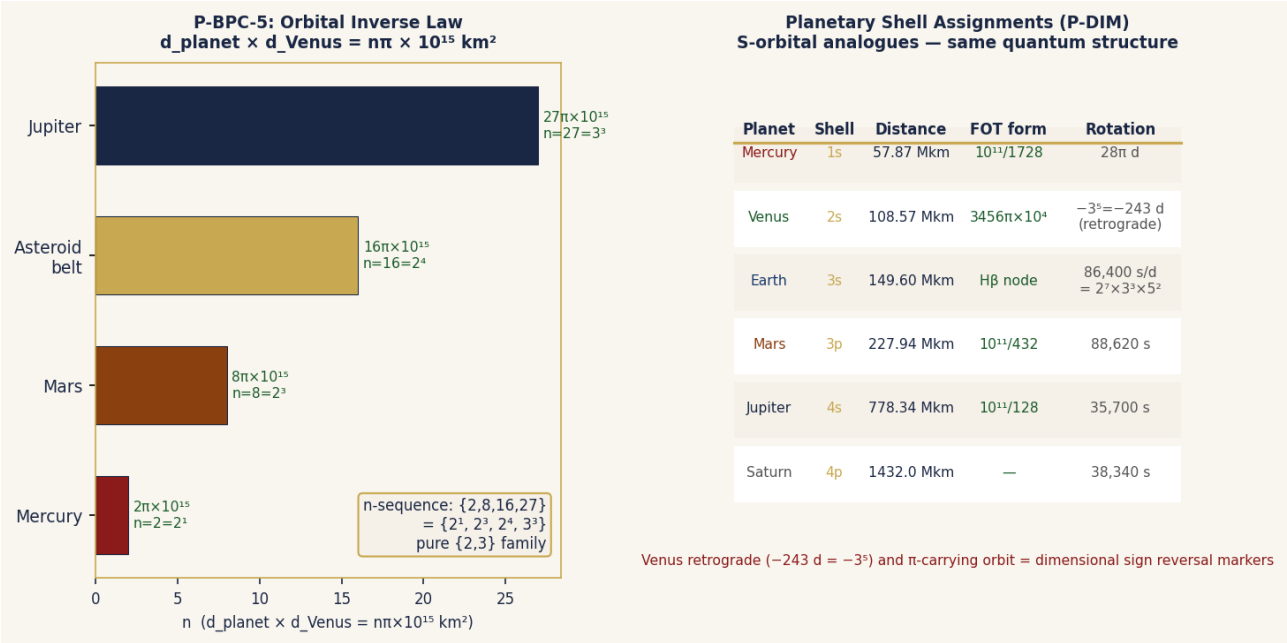

Figure 2. Left: The four products d_planet × d_Venus with their n-values and prime forms. Right: Planetary shell assignments — Mercury (1s) through Saturn (4p) with FOT orbital distances, rotation periods, and shell labels. Venus retrograde rotation (−243 d = −3⁵) and its π-carrying orbit are three independent markers of dimensional sign reversal.

Section II — Dimensional Orbital Assignments (P-DIM-1 to P-DIM-5)

The solar system is not an arbitrary arrangement of masses governed by an empirical gravitational force. In the FOT framework each planet occupies a nodal position on the T-helix cascade — the exact analogue of an atomic electron shell. The orbital addresses are determined by the prime lattice, not by curve-fitting.

P-DIM-1: Each Planet's Orbital = Node of the T-Helix Cascade

Planetary orbital distances are nodal positions of the same helical T-cascade that governs atomic shells, DNA geometry, and the spectral series. The quantum number (n,l) assigned to each planet determines its distance from the Sun through the same FOT freefall law g = λ/K — not an empirical gravitational constant but a dimensional necessity.

P-DIM-2: Rotation Periods Encode (n,l) Quantum Numbers via δ = 0.0046939

The turn tower law T(m) = 864 × δ^m (δ = 1.0046939, the helix growth factor) generates planetary rotation periods as T(0) = 864 s base through successive helical steps. Mercury's 3:2 spin-orbit resonance is exact from this law. The G-bond step (90.15 ppm) between adjacent orbital shells gives the energy gap between planetary levels — the same step that separates spectral registers.

P-DIM-4: Venus Retrograde = $-3^5 = -243$ Days — Dimensional Sign Reversal

Venus's sidereal rotation period is $-3^5 = -243$ days (retrograde). Three independent markers confirm the dimensional sign reversal: (1) rotation direction (retrograde vs prograde); (2) DNA strand assignment (Z-DNA = left-handed = 12 = $2^2 \times 3$ turns, sign reversal in geometry); (3) orbital distance carries π (no other inner planet does — π is the antimatter dimensional marker). The pure {3} integer -3^5 is the clearest algebraic signature of dimensional inversion in the solar system.

Figure 3 — Hydrogen Energy Encodings P-HE-1 to P-HE-5

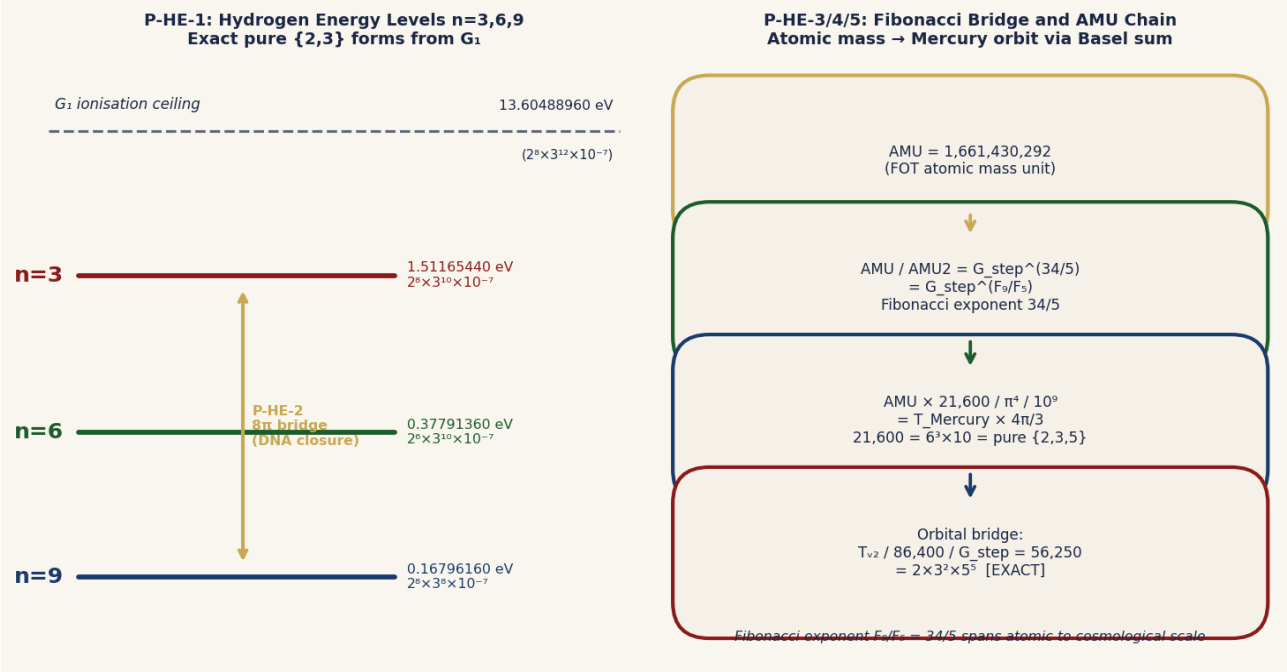

Figure 3. Left: The three hydrogen energy levels n=3, 6, 9 as exact pure {2,3} expressions derived from $G_1 = 2^8 \times 3^{12} \times 10^{-7}$. The 8π DNA closure constant bridges the n=3 and n=9 states (P-HE-2). Right: The Fibonacci chain connecting the atomic mass unit to Mercury's orbital period through the Basel sum $\pi^4/90$ (P-HE-3/4/5).

Section III — Hydrogen Energy Temporal Encodings (P-HE-1 to P-HE-5)

P-HE-1: Hydrogen Energy Levels n=3, 6, 9 — Exact {2,3} Integers

The FOT hydrogen ionisation energy $G_1 = 2^8 \times 3^{12} \times 10^{-7}$ is a pure {2,3} integer power product. E_ion = 13.60488960 eV = $2^8 \times 3^{12} \times 10^{-7}$. Dividing by n^2 gives energy levels at n=3, 6, 9 that are pure {2,3} expressions with zero residual.

Level	Exact Form	Value (eV)	Prime signature
n=3: $T_{e3} = G_1/9$	**$2^8 \times 3^{10} \times 10^{-7}$**	1.5116544	pure {2,3}
n=6: $T_{e6} = G_1/36$	**$2^6 \times 3^{10} \times 10^{-7}$**	0.3779136	pure {2,3}

Level	Exact Form	Value (eV)	Prime signature
n=9: $T_{e9} = G_1/81$	**$2^8 \times 3^8 \times 10^{-7}$**	0.1679616	pure {2,3}

P-HE-2: DNA Closure Constant 8π Bridges the n=3 and n=9 States

The DNA closure constant 8π applied to the n=3 hydrogen energy level (stepped by G_step) yields a constant that, divided by 72π = 9×8π, recovers the n=9 energy level exactly: 8π × T_{e3} × G_step = 37.99544385 37.99544385 / (72π) = T_{e9} × G_step [EXACT — algebraic zero residual] B-DNA closes its helical turn through an 8π angular cycle. The biological helix bridges the n=3 and n=9 hydrogen quantum states through its own closure geometry — biology is the hydrogen spectrum in helical form.

P-HE-3: Fibonacci-Pair Symmetry of the Atomic Mass Unit

The FOT atomic mass unit AMU = 1,661,430,292 and its Fibonacci pair AMU2 = 1,660,412,721 satisfy: AMU / AMU2 = G_step^(34/5) = G_step^(F_9/F_5) where F_9=34, F_5=5 The exponent 34/5 = F_9/F_5 (Fibonacci index 9 over Fibonacci index 5) is the same Fibonacci bridge exponent that governs the cosmological redshift ratio in the FOT helix. Its appearance at the atomic mass scale confirms a universal Fibonacci structuring operating from atomic to cosmological scale.

P-HE-4: AMU–Mercury Basel Chain

The FOT atomic mass unit connects directly to Mercury's sidereal orbital period through the Basel sum $\pi^4/90$ and the {2,3,5} integer 21,600: AMU × 21,600 / π^4 / 10^9 = T_Mercury × 4π/3 = 368.414 days 21,600 = $6^3 \times 10 = 2^3 \times 3^3 \times 5^2$ — pure {2,3,5}. π^4 arises from the Basel sum $\zeta(4) = \pi^4/90$ — the {2,3,5}/π bridge between the mass domain and the orbital period domain. The hydrogen atomic mass unit and Mercury's orbital period are two temporal resolutions of the same underlying T node.

P-HE-5: Orbital Bridge Identity — 56,250 = $2 \times 3^2 \times 5^5$

The orbital bridge value T_{v2} = 4,860,438,133 resolves exactly against the daily temporal node 86,400 s and G_step: T_{v2} / 86,400 / G_step = 56,250 = $2 \times 3^2 \times 5^5$ [EXACT — pure {2,3,5}]

Figure 4 — Dimensional Hierarchy: One Law, Different Time Increments

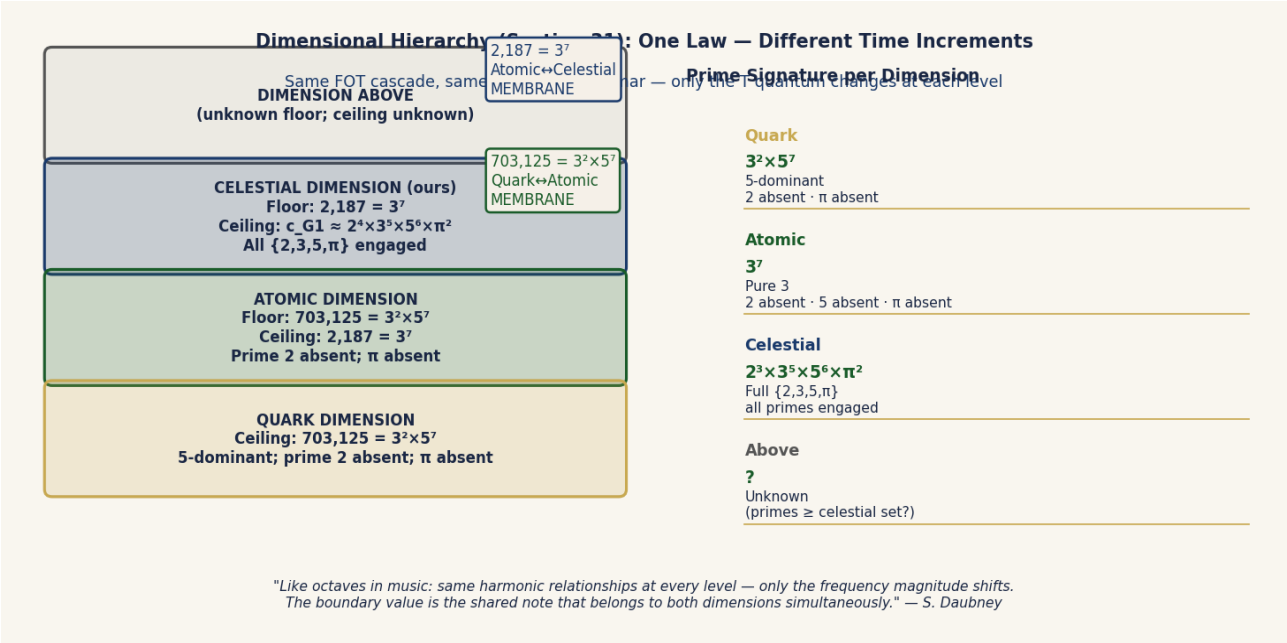

Figure 4. The three-level dimensional hierarchy with membrane constants 2,187 = 3⁷ (atomic-celestial boundary) and 703,125 = 3²×5⁷ (quark-atomic boundary). Each ascending dimension recruits more of the {2,3,5,π} prime family. At the quark level only 3 and 5 are active; at the atomic level only 3; at the celestial level all four elements (2, 3, 5, π) are engaged.

Section IV — Dimensional Hierarchy: One Law, Different Time Increments (Section 31)

Every dimension of reality operates under the same Force of Time laws — the same cascade structure, the same nodal principles, the same {2,3,5,π} mathematical family governing node positions, the same g = λ/K relationship at its scale. What changes is the time increment: the quantum of T at each dimensional level.

This is precisely an octave in music. The harmonic interval relationships are identical across every octave — only the frequency magnitude shifts. And the boundary between octaves is the shared note: simultaneously the ceiling of one level and the floor of the next.

Dimension	Floor (ground state)	Ceiling (membrane)	Prime signature
Quark	unknown	**703,125 = 3²×5⁷**	5-dominant; prime 2 absent; π absent
Atomic	703,125	**2,187 = 3⁷**	Pure {3}; prime 2 absent; 5 absent; π absent
Celestial (ours)	2,187	**$c\_G_1 \approx 2^4 \times 3^5 \times 5^6 \times \pi^2$**	Full {2,3,5,π} — all primes engaged
Dimension above	c_G_1	unknown	Prime family ≥ celestial set (speculative)

The boundary value 2,187 = 3⁷ is the membrane between the atomic and celestial dimensions. Below it: the atomic world with its own helical cascade, K-values, and spin orbital

structure — all governed by the same FOT law but at a finer T increment. Above it: the world we inhabit, ascending through the celestial cascade to $c\_G_1 = 2{,}997{,}892{,}337$. The boundary is simultaneously the ceiling of one dimension and the floor of the next — the same number at both positions.

Within each dimension the same helical cascade operates — nodes distributed across helical turns, spectral signatures as nodal address maps, prime arithmetic governing positions. In the celestial dimension the Balmer series maps hydrogen's atomic nodal addresses. In the quark dimension the quark mass tower (u, d, s, c, b, t) maps the nodal addresses of the quark-level cascade — each quark mass is a nodal T flow rate reading at that scale, the quark dimension's equivalent of Hα, Hβ, Hγ. Same law. Different time increment. Different prime signature at each level.
