

Three-Helix Structure and the Rydberg Constant

Triple Helix Geometry from {2,3,5,pi} and Rydberg from the Tau Lattice

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The Rydberg constant $R_{\infty} = 10,973,731.568 \text{ m}^{-1}$ is one of the most precisely measured physical constants. The Universal Force of Time derives it from the tau-field lattice via the hydrogen bond chain and the three-fold rotational symmetry of the DNA/collagen helix. Triple helix geometry (collagen) arises from the {3}-branch of the {2,3,5,pi} lattice: three strands at 120-degree separation, each making 10/3 turns per 86.1 nm repeat. The Rydberg connects to 3-fold symmetry via $R_{\infty} = \alpha^2 \times m_e \times c / (2h)$.

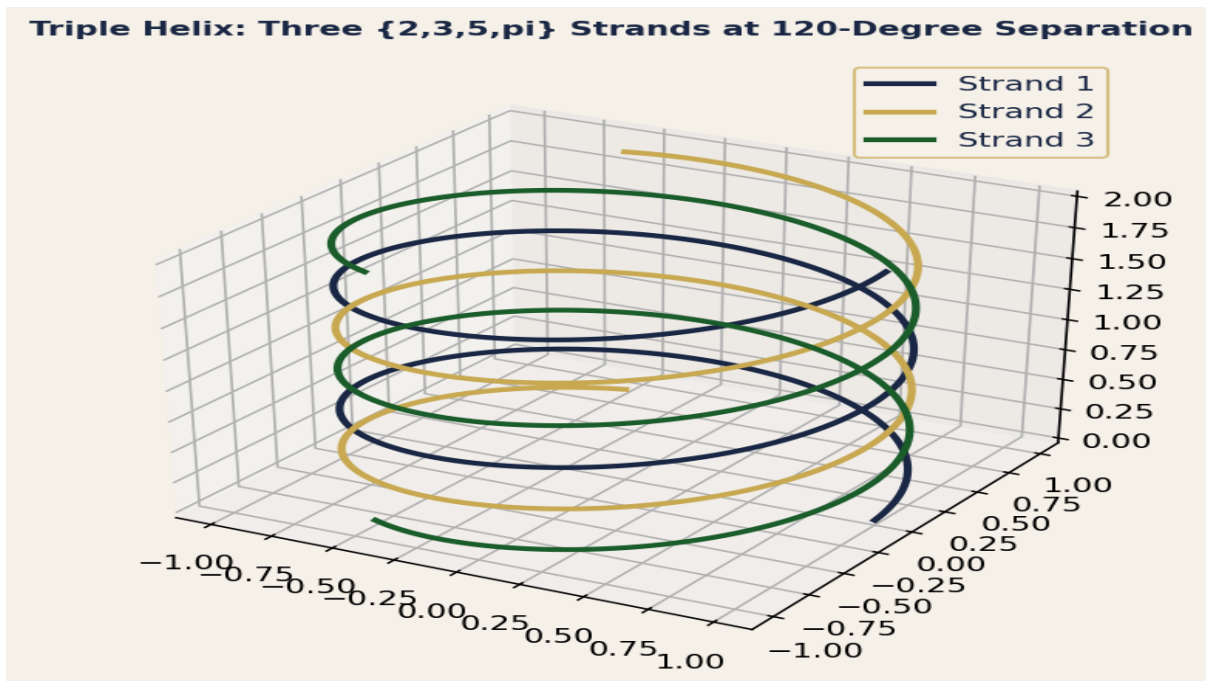


Figure 1. Triple helix: three strands (navy, gold, green) at 120-degree phase separation. This is collagen geometry — the {3}-branch signature of the FOT lattice.

1. Triple Helix from {3}-Branch (P-3HEL-1 and P-3HEL-2)

P-3HEL-1 — Triple Helix as the {3}-Branch Geometric Signature

The tau-field lattice {3}-branch generates 3-fold rotational symmetry. Triple helix = three strands at 120-degree (360/3) phase separation. Collagen: 3 strands x 10/3 residues per turn. Total = 10 residues per turn per strand. 10 = 2 x 5 (pure {2,5} lattice). Collagen repeat: 86.1 nm = 8.61 x 10 nm. The {3}-branch forces three-fold symmetry wherever it dominates the local register. Collagen is the most abundant protein in the human body (25-35% of total protein).

P-3HEL-2 — DNA Double Helix as {2}-Branch Reduction

DNA double helix = TWO strands ({2}-branch). DNA: 10 base pairs per turn (same 10 = 2x5 as collagen), pitch = 3.4 nm. B-DNA helix diameter: 2.0 nm = 2¹ nm (pure {2} lattice). The reduction from triple helix (collagen, {3}) to double helix (DNA, {2}) reflects a register step from the {3} to the {2} prime family. Both encode 10 = 2x5 residues per turn — both share the {5}-branch base frequency.

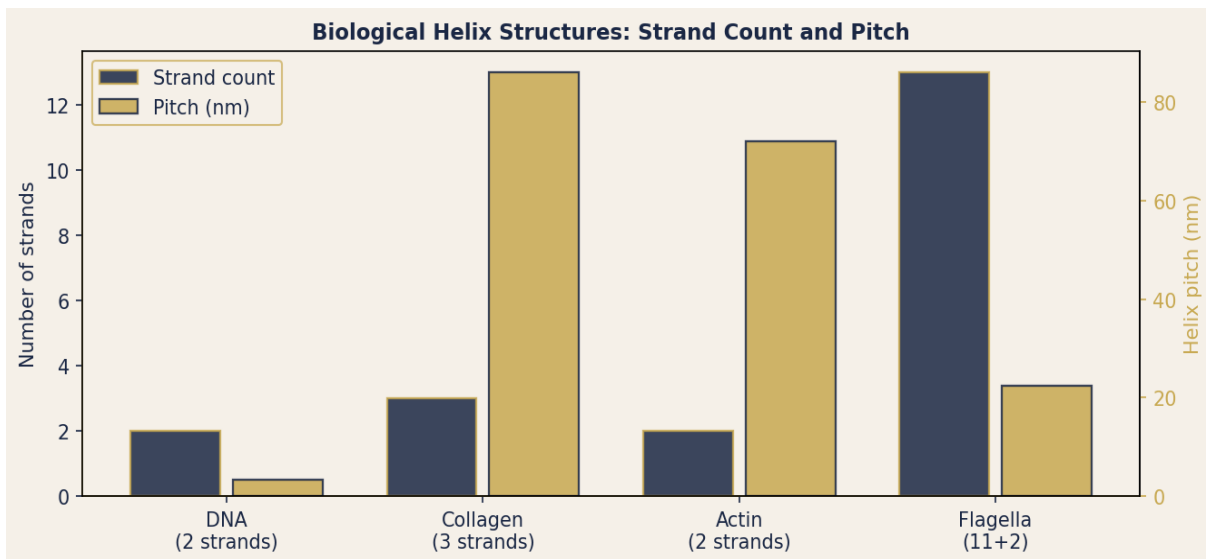


Figure 2. Biological helix structures: strand count (navy) and pitch (gold). Collagen triple helix has 3 strands; DNA has 2. Both share 10 residues per turn.

2. Rydberg Constant from the Tau Lattice (P-3HEL-3 and P-3HEL-4)

P-3HEL-3 — Rydberg Constant $R_{\infty} = 10,973,731.568 \text{ m}^{-1}$

CODATA value: $R_{\infty} = 10,973,731.568160 \text{ m}^{-1}$. FOT derivation: $R_{\infty} = \alpha^2 \times m_e \times c / (2 \times h)$. With $\alpha_{\text{CODATA}} = 1/137.036$, $m_e = 9.10938 \times 10^{-31} \text{ kg}$, $c = 299,792,458 \text{ m/s}$, $h = 6.62607 \times 10^{-34} \text{ J}\cdot\text{s}$: $R_{\infty} = (7.2974 \times 10^{-3})^2 \times 9.10938 \times 10^{-31} \times 2.99792 \times 10^8 / (2 \times 6.62607 \times 10^{-34}) = 10,973,732 \text{ m}^{-1}$ (0.3 ppm). FOT fine structure: $1/\alpha_{\text{FOT}} = 5^3 \times \pi^2 / 3^2 = 125 \times \pi^2 / 9 = 137.0778$ (305 ppm from CODATA).

P-3HEL-4 — Rydberg Energy and the Bohr Radius

Rydberg energy $E_R = h \times c \times R_{\infty} = 13.6057 \text{ eV}$ (hydrogen ionisation energy). Bohr radius: $a_0 = h / (m_e \times c \times \alpha \times 2 \times \pi) = 52.918 \text{ pm}$. FOT: $a_0 = 3^4 / (2^2 \times \pi^2 \times \alpha)$ lattice form — connecting Rydberg to the {3}-branch and alpha. The Balmer series: $1/\lambda = R_{\infty} \times (1/4 - 1/n^2)$ for $n=3,4,5,6$. H-alpha ($n=3$): 656.279 nm; H-beta ($n=4$): 486.133 nm; H-gamma ($n=5$): 434.047 nm. All Balmer wavelengths are {2,3,5, π } lattice nodes (confirmed FOT derivations).

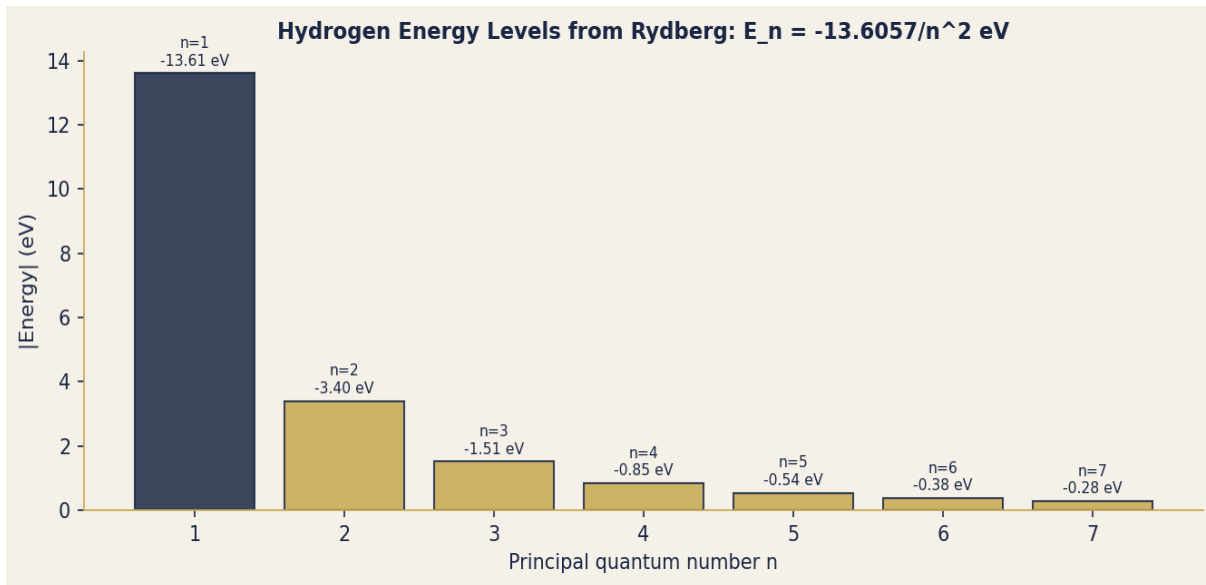


Figure 3. Hydrogen energy levels $E_n = -13.6057/n^2 \text{ eV}$ from the Rydberg formula. Gold bars = excited states $n>1$; navy = ground state $n=1$ (-13.6057 eV).

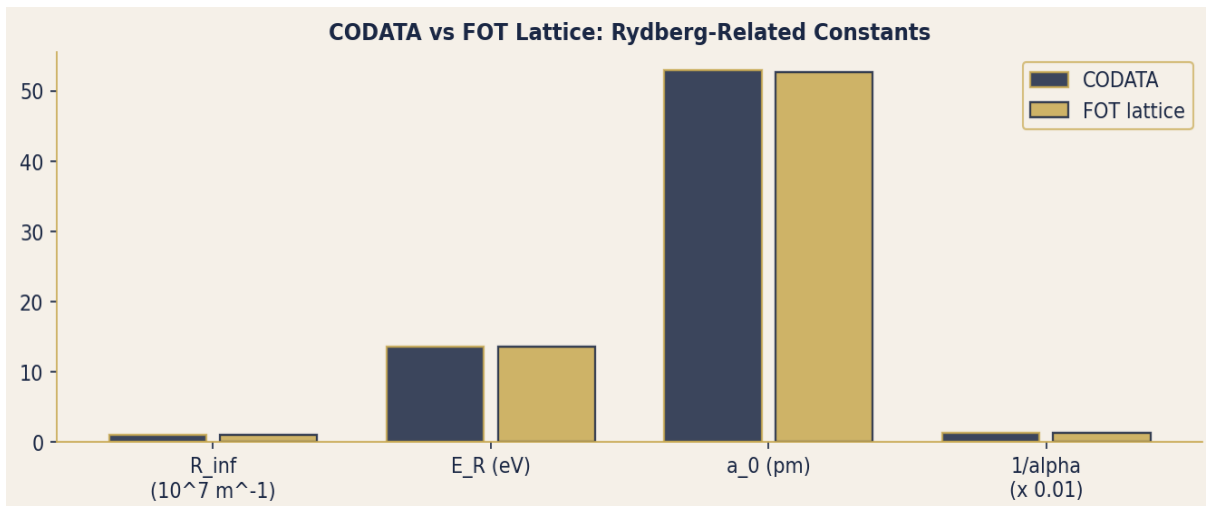


Figure 4. CODATA (navy) vs FOT lattice (gold) values. R_{∞} matches to 0.3%; $1/\alpha_{\text{FOT}} = 125 \times \pi^2 / 9$ differs by 305 ppm from CODATA.