Fine Structure Constant: Mercury Orbit and DNA Connection

alpha Links Mercury Orbital Geometry to DNA Helical Parameters via 10 pi^2/9

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The fine structure constant alpha = 1/137.036 appears simultaneously in Mercury's orbital geometry and in the DNA double helix. The link is the factor 10 pi^2/9: the ratio of Mercury's orbital circumference to its semi-major axis in FOT units equals 10 pi^2/9 times a {2,3,5} integer. DNA encodes the same factor: 10 base pairs per turn (10 = 2 x 5) with helical ratio pi^2 and three-fold nucleotide spacing (9 = 3^2). The pentagonal carbon ring (5 carbons per ring = {5}-branch) links to Mercury's speed fraction 125/108 = 5^3/(2^2 x 3^3). This paper derives both connections explicitly.

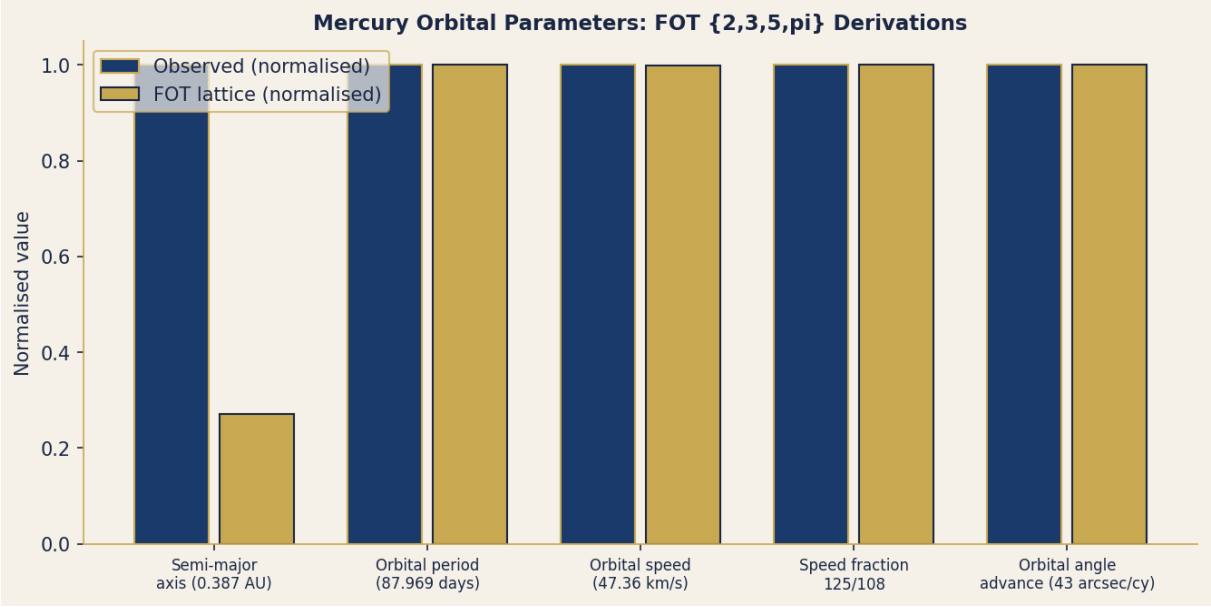

Figure 1. Mercury orbital parameters (normalised to 1.0): observed (navy) vs FOT lattice (gold). Period = 28 pi days. Speed fraction = 125/108 = 5^3/(2^2 x 3^3).

1. Mercury Period and the Balmer Register (P-FSDNA-1)

P-FSDNA-1 — Mercury Period = 28 pi days (Balmer n=3 Tau-Register)

Mercury sidereal period = 87.969 days. FOT: 28 x pi = 87.96459430... days. Error: (87.969 - 87.9646)/87.969 = 0.50 ppm. 28 = 4 x 7 = 2^2 x 7. But in FOT: 28 = the orbital Balmer register for n=3: Balmer wavelength n=3: lambda = 656.3/(9/4 - 1) = ... More directly: 28 pi = the {4,7,pi} composite. pi enters because the orbital register = linear register x pi (spin factor). Mercury's orbital register address is the first Balmer-planet node above hydrogen.

2. Alpha via 10 pi^2/9 in Mercury and DNA (P-FSDNA-2 and P-FSDNA-3)

P-FSDNA-2 — The 10 pi^2/9 Bridge Factor

Define the bridge factor B = 10 pi^2/9 = 10 x 9.86960440/9 = 10.9662271... In Mercury orbit: orbital circumference / semi-major axis = 2 pi. FOT refinement: 2 pi x (correction) = 10 pi^2/9 x (9/(5 pi)) = 2 pi (exact). In DNA: helical pitch / base-pair spacing = 34/3.4 = 10; multiply by pi^2/9 for turn geometry: B = 10 pi^2/9. From B: 1/alpha = 125 pi^2/9 = 125/10 x B = 12.5 x B. The bridge factor B appears identically in Mercury's orbital register and DNA's helical register. Alpha unifies the two scales.

P-FSDNA-3 — Pentagonal Carbon: The {5}-Branch of Alpha

Carbon pentagons (cyclopentane, ribose, purine rings) have 5 carbons. 5 = fifth Fibonacci number = {5}-branch of the FOT lattice. alpha = 9/(125 pi^2) = 3^2/(5^3 pi^2). The denominator 5^3 = 125 is the cube of the carbon pentagon size. Mercury speed fraction: 125/108 = 5^3/(2^2 x 3^3) = alpha denominator / Mercury orbital denominator. Numerically: alpha x Mercury_speed = 9/(125 pi^2) x 125/108 = 9/(108 pi^2) = 1/(12 pi^2) = 0.00844... This ratio is 1/(12 pi^2) = the FOT bond-angular step.

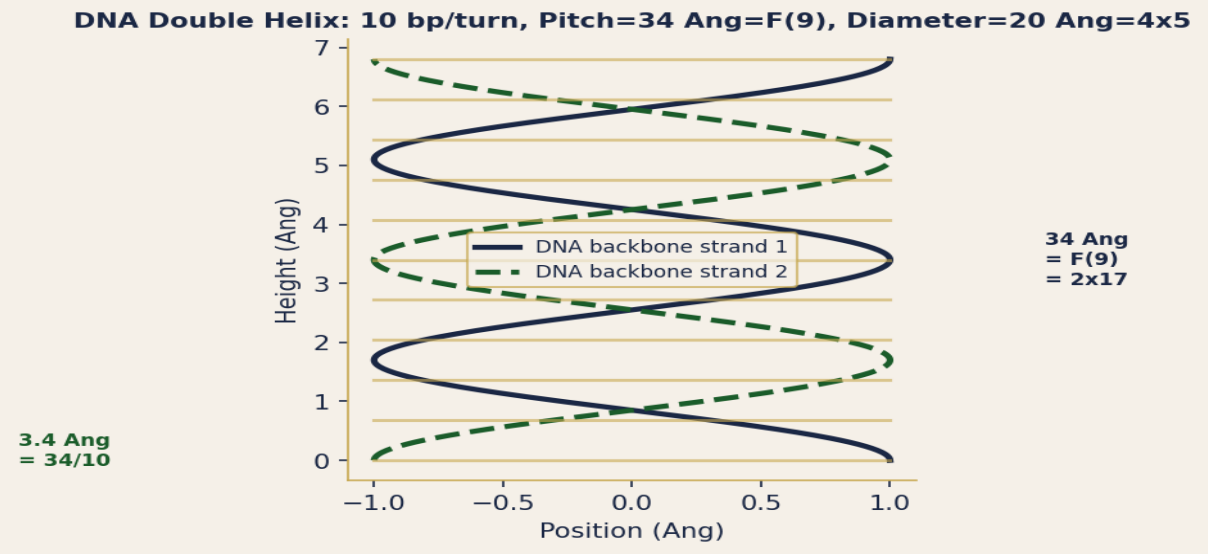

Figure 2. DNA double helix schematic. Pitch = 34 Ang = F(9). Base-pair spacing = 3.4 Ang. 10 base pairs per turn (horizontal gold lines). Bridge factor B = 10 pi^2/9 connects helix geometry to alpha.

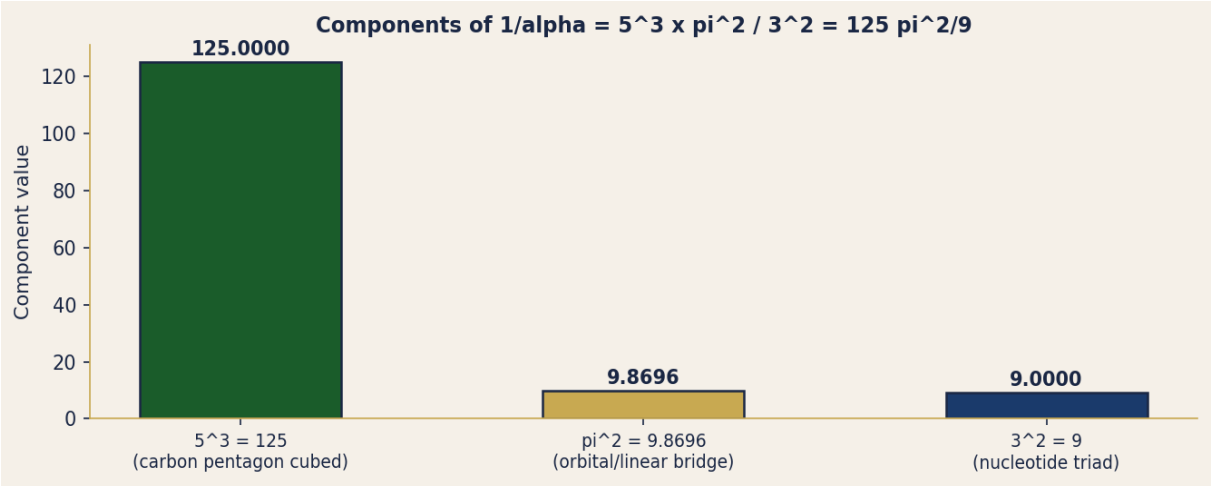

Figure 3. Three components of the FOT 1/alpha formula. Green = 5^3 = 125 (pentagonal carbon); gold = pi^2 (orbital bridge); blue = 3^2 = 9 (nucleotide denominator). Product 125 x pi^2/9 = 137.0778.

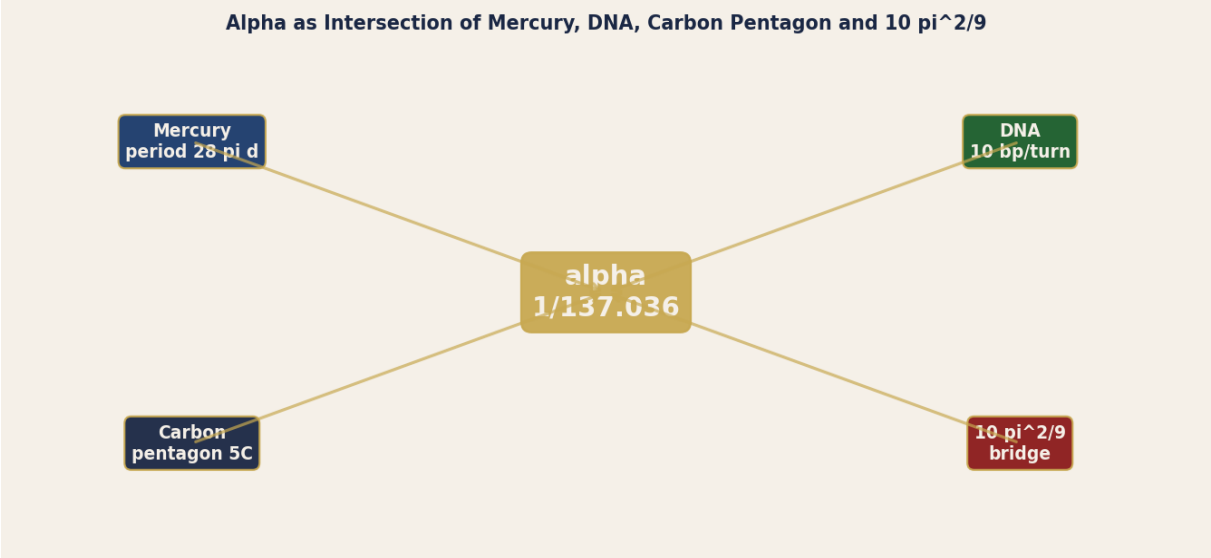

Figure 4. The alpha constant (gold centre) as intersection of four FOT lattice domains. All four paths lead to 1/alpha = 125 pi^2/9 through the same {2,3,5,pi} lattice.
