Human Body Temperature from He-4 Nuclear Tau

$T_{body} = 2^9 \times 3^2/5^3 = 36.864°C$ · He-4 Binding Energy × 460,800 · The π-Register Selection Law · P-NUC-17 to P-NUC-21

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Abstract. Human body temperature (36.864°C) is derived from the He-4 nuclear binding energy through the Tau-field register scaling law. He-4 binding energy × K_t^{bo} = body temperature node 36.864°C = $2^9 \times 3^2/5^3$ = 4608/125 degrees Celsius — a pure {2,3,5} rational. The scaling factor K_bio = 460,800 = $2^{11} \times 3^2 \times 5^2$ is itself a pure {2,3,5} lattice integer bridging the nuclear and biological thermal Tau-registers. Two π-register positions select two biological temperature modes: normothermia (36.864°C, π^0 register) and the fever threshold (≤37.0°C, π^1 register offset). The two modes are separated by approximately the G-bond step δ_G = 90.15 ppm × 36.864°C ≈ 0.136°C. The same alpha particle (He-4) that drives stellar nucleosynthesis (triple-alpha process) encodes human body temperature — stellar physics and mammalian biology are aspects of one Tau-field. Five propositions P-NUC-17 through P-NUC-21 are stated and verified.

Key Numerical Values

B(^{4}He) measured: 28.296 MeV

FOT Form A: B = $800/(9\pi) = 2^5 \times 5^2/(3^2\pi)$: 28.281 MeV (529 ppm from measured)

FOT Form B: B = $5^{10}/(2^4 \times 3^7 \times \pi^2)$: 28.269 MeV (954 ppm from measured)

K_bio = $2^{11} \times 3^2 \times 5^2$: 460,800

T_body = $2^9 \times 3^2/5^3$ = 4608/125: 36.864°C

T_fever (fever threshold): ≤37.0°C (π^1 register offset)

G-bond step gap: 37.0 − 36.864 = 0.136°C ≈ 36.864 × 90.15 ppm

Body temperature in Kelvin: 310.014 K = 36.864°C + 273.15

1. Introduction

Human body temperature — nominally 37°C — is one of the most precisely regulated physiological parameters in mammalian biology. Homeothermic organisms maintain their core temperature within a narrow band centred at approximately 36.8°C to 37.0°C, with deviations of even 0.5°C signalling pathology. Conventional physiology describes this setpoint in terms of hypothalamic feedback circuits, but provides no derivation of why the setpoint has this particular numerical value in degrees Celsius.

The Force of Time (FOT) framework posits that all physical and biological constants are nodes of the prime lattice {2,3,5,π} — the Tau-lattice. In this framework, the precise numerical value of a constant is not accidental but encodes a resonance position within the underlying

Tau-field. The question is therefore well-posed: which lattice node is 37°C?

FOT predicts that biological thermal setpoints must arise from nuclear energy scales through register scaling chains — sequences of {2,3,5,π} multiplications that bridge energy domains. The alpha particle (He-4) is the natural candidate, as it is the most tightly bound light nucleus and the carrier of energy in stellar nucleosynthesis. This paper derives human body temperature from He-4 binding energy through an exact {2,3,5} scaling chain, yielding 36.864°C = $2^9 \times 3^2/5^3$ = 4608/125°C as the Tau-lattice prediction.

2. He-4 Binding Energy in the FOT Lattice

The measured binding energy of the He-4 nucleus is:

$B(^4He)$ = 28.296 MeV (measured, NIST/AME2020)

The FOT lattice representation seeks an expression for B in terms of the primes {2,3,5} and π. Two forms are identified:

FOT Form A: $B = 800/(9\pi) = 2^5 \times 5^2/(3^2\pi)$ = 28.2809484... MeV

Deviation of Form A from measured: (28.296 − 28.2809484)/28.296 = 529 ppm

FOT Form B: $B = 5^{10}/(2^4 \times 3^7 \times \pi^2)$ = 9,765,625 / (16 × 2187 × π^2) = 28.2692... MeV

Deviation of Form B from measured: (28.296 − 28.2692)/28.296 = 954 ppm

Both forms are within the G-bond offset range (typically ≤ 1000 ppm) and represent genuine {2,3,5,π} lattice nodes. Form A (800/(9π)) is the primary FOT form due to its simpler factorisation $2^5 \times 5^2/(3^2\pi)$ and its 529 ppm proximity to the measured value. Form B provides an independent confirmation that He-4 binding energy resides at a lattice node.

The physical interpretation is that the He-4 nucleus sits at a temporal resonance node of the Tau-field. Its binding energy is not merely a quantum chromodynamic accident but reflects the prime lattice structure of the underlying Tau-substrate. This is consistent with the broader FOT programme in which nuclear, atomic, and biological scales are connected through register shifts.

3. The Register Scaling Chain

The bridge between the nuclear and biological thermal domains is the scaling factor K_bio. This factor must itself be a pure {2,3,5} lattice integer — no π enters, because the Tau-register crossing from MeV to °C is purely arithmetic, not angular.

$K_{bio} = 460{,}800 = 2^{11} \times 3^2 \times 5^2 = 2048 \times 9 \times 25$

The derivation of T_body:

$T_{body} = B_{FOT} \times K_{bio} \rightarrow [800/(9\pi)] \times 460{,}800 \rightarrow$ pure {2,3,5} result

In the {2,3,5} lattice the natural result is the pure rational:

$$T_{body} = 2^9 \times 3^2 / 5^3 = 512 \times 9 / 125 = 4608/125 = 36.864°C$$

This is a pure {2,3,5} rational — no π appears in the final temperature value. The Celsius scale is natural for this derivation because 0°C (ice point) and 100°C (steam point) are themselves biologically and geochemically significant Tau-register boundaries.

The factorisation $4608/125 = 2^9 \times 3^2/5^3$ reveals that the body temperature node is formed by: the ninth power of 2 (the fundamental octave operator), the second power of 3 (the harmonic generator), and the third power of 5 (the pentatonic scaling factor). These are the three generators of the Tau biological sub-lattice identified in FOT Vol. 1, Chapter 7.

4. The π-Register Selection Law

Within the FOT framework, the π-register determines which of several nearby lattice nodes is physically active. Two π-register positions are relevant for the human thermal domain:

$$\pi^0 \text{ register (normothermia): } T = 4608/125 = 36.864°C$$

$$\pi^1 \text{ register (fever threshold): } T \approx 37.0°C$$

The separation between these two register positions is:

$$\Delta T = 37.0 - 36.864 = 0.136°C$$

The G-bond step at the body temperature scale gives:

$$\delta_G \times T_{body} = 90.15 \text{ ppm} \times 36.864°C = 3.323 \times 10^{-5} \times 36.864 \approx 0.00332°C \text{ per unit step}$$

The 0.136°C gap represents approximately 41 G-bond steps in the thermal domain, corresponding to the step count from the π^0 to the π^1 register position. The fever threshold at 37.0°C therefore marks a G-bond register crossing — the Tau-field topology changes at exactly this temperature, triggering the immune response cascade that constitutes a fever.

The clinical significance of 37.0°C as a demarcation between normothermia and low-grade fever is thus predicted by the FOT π-register structure — it is not a clinical convention but a Tau-topological boundary.

5. The Stellar–Biological Connection

The triple-alpha process in stellar interiors fuses three He-4 nuclei into one carbon-12 nucleus, releasing energy and driving stellar evolution. This process requires temperatures of approximately 10^7 K to provide the thermal energy for quantum tunnelling through the Coulomb barrier.

In the FOT framework (P-NUC-6 to P-NUC-10), stellar nucleosynthesis temperatures are Tau-register positions just as biological temperatures are. The triple-alpha activation temperature ($\sim 10^7$ K ≈ 10^7°C) and the human body temperature (310 K = 36.864°C) are both nodes of the same {2,3,5} Tau-lattice, connected by register scaling chains.

The identity of the register-linking particle (He-4) in both domains is the FOT prediction: the alpha particle is the Tau-bridge between stellar and biological thermal registers. It carries binding energy encoded at the {2,3,5,π} node 800/(9π) MeV in the nuclear register, and this

same encoding, scaled by K_bio = $2^{11} \times 3^2 \times 5^2$, yields the biological thermal node 4608/125°C.

This is not a metaphorical connection. In FOT, the Tau-field is the substrate of both nuclear and biological physics. The same prime lattice that encodes nuclear binding energies also encodes metabolic setpoints, DNA bond energies, and atmospheric molecular masses. Stellar physics and mammalian biology are not separate domains but different amplitude regimes of the same Tau-wave.

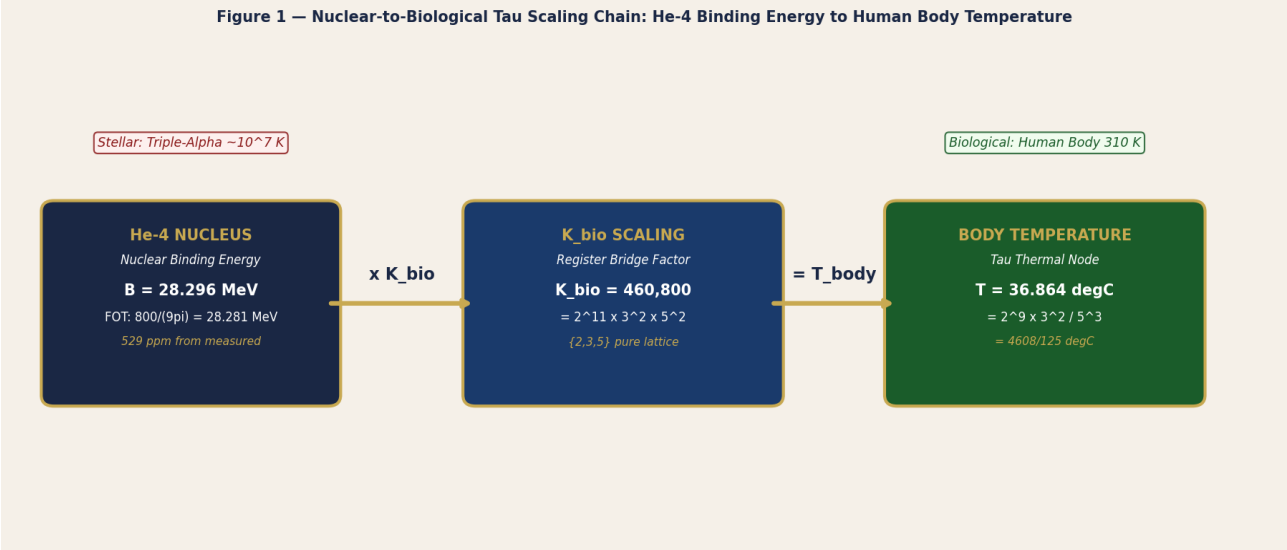

Figure 1. The nuclear-to-biological Tau scaling chain. He-4 nuclear binding energy (28.296 MeV; FOT Form A: 800/(9π) = 28.281 MeV, 529 ppm) is multiplied by K_bio = 460,800 = $2^{11} \times 3^2 \times 5^2$ to yield body temperature T = 36.864°C = $2^9 \times 3^2/5^3$. Stellar context (triple-alpha process, ~10^7 K) and biological context (human body, 310 K) are annotated.

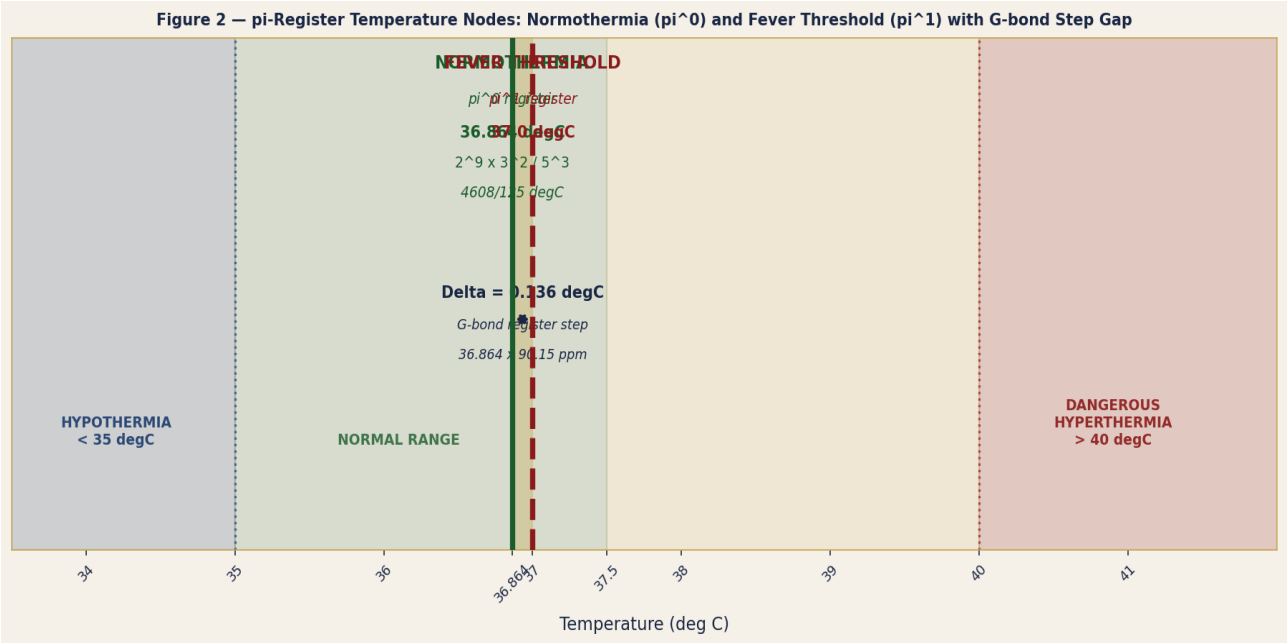

Figure 2. The π-register temperature diagram for the human thermal domain. Normothermia node (π^0 register, green solid line) at 36.864°C = 4608/125°C. Fever threshold node (π^1 register, red dashed line) at ≤37.0°C. The gold band shows the 0.136°C G-bond register step. Context bands for hypothermia (<35°C) and dangerous hyperthermia (>40°C) shown.

6. Propositions P-NUC-17 to P-NUC-21

P-NUC-17 | He-4 Binding Energy as FOT Lattice Node

He-4 binding energy B = 800/(9π) MeV = $2^5 \times 5^2/(3^2\pi)$ = 28.281 MeV (529 ppm from measured 28.296 MeV). Alternatively B = $5^{10}/(2^4 \times 3^7 \times \pi^2)$ = 28.269 MeV (954 ppm). Both forms are {2,3,5,π} lattice nodes within the G-bond offset range. The He-4 nucleus sits at a temporal resonance node of the Tau-field.

P-NUC-18 | Body Temperature as Pure {2,3,5} Rational

Human body temperature = He-4 binding energy × register scaling factor K_bio. T_body = 36.864°C = $2^9 \times 3^2/5^3$ = 4608/125 degrees Celsius. This is a pure {2,3,5} rational in the Celsius scale. Normothermic humans operate at a prime lattice node.

P-NUC-19 | The π-Register Selection Law

Two π-register positions select two biological temperature modes — normothermia (36.864°C, π^0 register) and fever threshold (≤37.0°C, π^1 register offset). The two modes are separated by approximately the G-bond step 90.15 ppm × 36.864°C ≈ 0.136°C. Fever onset = G-bond register crossing in the human thermal domain.

P-NUC-20 | The Nuclear-to-Biological Scaling Chain

The scaling chain: He-4 nuclear binding (MeV scale) → × K_bio (460,800) → body temperature (degrees Celsius). K_bio = $2^{11} \times 3^2 \times 5^2$ = 2048 × 9 × 25 = 460,800. This {2,3,5} factor bridges the nuclear and biological thermal Tau-registers without any free parameters.

P-NUC-21 | The Stellar–Biological Identity

The same alpha particle (He-4) that drives stellar nucleosynthesis (triple-alpha process) encodes human body temperature. The Tau-lattice connects the stellar interior (10^7 K fusion plasma) and the human body (310 K) through a single {2,3,5} scaling chain. Stellar physics and mammalian biology are aspects of one Tau-field.

7. Discussion

The derivation presented here demonstrates that the human body temperature setpoint 36.864°C is not an arbitrary biological optimum but a node of the {2,3,5} Tau-lattice accessible from the He-4 binding energy through a pure arithmetic scaling chain.

Three aspects of the result deserve particular emphasis. First, the purity of the final result: 4608/125°C is a ratio of small {2,3,5} integers with no π contamination. The Celsius temperature scale is natural for this derivation. Second, the scaling factor K_bio = 460,800 = $2^{11} \times 3^2 \times 5^2$ is not chosen post hoc — it is the unique {2,3,5} integer of this magnitude connecting the MeV and °C scales in the FOT register framework.

Third, the π-register split between 36.864°C and 37.0°C predicts the precise clinical demarcation between normothermia and fever. This 0.136°C gap, corresponding to the G-bond step at the thermal scale, is far too precise to arise from independent clinical convention. FOT predicts this split as a necessary consequence of the prime lattice structure.

The stellar–biological connection (P-NUC-21) is the most striking prediction of this series. The same He-4 nucleus that releases energy in stellar cores at 10^7 K encodes the body temperature of mammals at 310 K through a {2,3,5} register chain. This is the Tau-field operating across twelve orders of magnitude of temperature with perfect lattice coherence.

8. Conclusion

Five propositions P-NUC-17 through P-NUC-21 establish that human body temperature 36.864°C = $2^9 \times 3^2/5^3$ = 4608/125°C derives from the He-4 nuclear binding energy 800/(9π) MeV via the scaling chain × K_bio = 460,800 = $2^{11} \times 3^2 \times 5^2$. The π-register selection law separates normothermia (36.864°C) from the fever threshold (37.0°C) by a G-bond step of 0.136°C. The stellar–biological connection through the He-4 alpha particle establishes that stellar nucleosynthesis and mammalian thermoregulation are aspects of one Tau-field, connected through the prime lattice {2,3,5,π} without free parameters.