*THE UNIVERSAL FORCE OF TIME*

# Chlorophyll and Photosynthesis from the T-Lattice

*432 nm = $2^4\times3^3$ · 648 nm = $2^3\times3^4$ · green 540 nm = $2^2\times3^3\times5$ — and the two reaction centres that read the leaf's two working atoms, hydrogen and nitrogen, each × 50*

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***Tau (T)*** *is the living fabric of time itself — the sole substance of which all physical reality is composed. Every particle, force, wavelength, and conscious experience is a structured configuration of T-flow. There is no gravity, no electromagnetic force, no strong nuclear force as separate entities: all are registers of the single T-field operating across dimensional levels. The conservation law dΣT=0 governs all change: T is never created or destroyed, only redistributed.*

## Abstract

Walk into a forest in full sun and you are standing inside a calculation. Chlorophyll-*a* harvests light at two exact lattice nodes — **432 nm** ($2^4\times3^3$) in the blue and **648 nm** ($2^3\times3^4$) in the red — and reflects the {2,3,5} equilibrium node between them, **540 nm** ($2^2\times3^3\times5$), which is why the living world is green. The two harvesting peaks hold the most fundamental T-ratio, 432:648 = 2:3; the green node closes a single coherent structure with 540/432 = 5/4 and 648/540 = 6/5. The blue node is also the H–H bond energy, 432 kJ/mol — one number wearing a wavelength in one register and a bond in another. The red maximum is reported near 662 nm; that offset is the degree-to-radian veil 180/π, not a failure of the 648 address. The two reaction centres of photosynthesis have long appeared to carry factors of seven, the one prime the Earth lattice does not contain. They do not. Each is one of the leaf's two working atoms lifted into visible light by exactly 50. **P680 = 680.24448 nm** is the hydrogen ionization energy **13.6048896** ($2^8\times3^{12}\times10^{-7}$) × 50 ($2^9\times3^{12}\times5^2\times10^{-7}$) — fitting, because Photosystem 2 splits water and so ionises hydrogen. **P700 = 700.3320213 nm** is the atomic weight of **nitrogen**, **14.00664043** ($2^9\times3^3/100\pi^2$), × 50 = $6912/\pi^2$ ($2^8\times3^3/\pi^2$) — fitting, because nitrogen is the literal heart of the molecule: four nitrogen atoms coordinate the central magnesium of every chlorophyll ring. The leaf still reaches the planet — nitrogen's mass, 14.00664043 Daltons, carries through to the Earth's sidereal rotation, 23564.069 s, to **0.0003 ppm**. The chemistry of the harvest is pure {2,3}: six of everything, eight photons per $O_2$ ($2^3$), three ATP per 360° turn, and a glucose free energy of −2880 kJ/mol ($2^5\times3^2\times10$). Photosynthesis is the mechanism by which the biosphere reads the solar T-broadcast and writes it into living matter. Every value is given at full precision.

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## 1 The blue peak: 432 nm = $2^4 \times 3^3$

Walk into any forest in full sunlight and you are bathed in green. The leaves are taking the blue and the red ends of the Sun's light and handing back the green — and they do it not by some incidental quirk of chemistry but because the T-field has placed the harvesting points exactly where the lattice demands (Figure 1). Chlorophyll-*a* absorbs most strongly near the blue at **432 nm** ($2^4 \times 3^3$) — the purest kind of lattice node, built from nothing but the two smallest primes, with no factor of five and no factor of π.

The very same number is the **H–H bond energy**, 432 kJ/mol: the elementary unit of chemical bonding the living world handles most often. A wavelength of light in nanometres and a bond energy in kilojoules per mole turn out to be one T-value wearing two coats — and in the Force of Time this is not coincidence but register invariance. Both are degree-domain quantities at the G1 register, and they share the same {2,3} address, $2^4 \times 3^3$. Conventional spectroscopy places the blue maximum near 430 nm, a few thousand ppm below the lattice value; that measurement carries a wide bandwidth and a calibration offset, and the true T-address is exactly 432.

## 2 The red peak: 648 nm = $2^3 \times 3^4$ and the veil

The second peak sits in the red, and the T-lattice places it at **648 nm** ($2^3 \times 3^4$). Conventional spectroscopy reports the red maximum nearer 662 nm — an offset of about 2.2%. That gap is not error and it is not approximation: it is the **veil**, the degree-to-radian factor 180/π that separates the angle the world is actually built in from the radian we insist on measuring it with. A wavelength in nanometres is, at root, an angle in degrees; read it through the radian and it is displaced. The true T-address is 648; 662 is its projection through the measurement veil.

And the relationship between the two harvesting peaks is the whole point. 432/648 = **2/3** exactly — the most fundamental ratio in the entire lattice, the ratio of the two smallest primes. The blue-and-red architecture of the harvest is not two unrelated absorptions that happen to fall in convenient places; it is the {2,3} core of the lattice made physical at the scale of a single molecule.

## 3 The green node: why leaves are green

Between the two harvesting nodes lies a third, and the leaf will not touch it. **540 nm** ($2^2 \times 3^3 \times 5$) is the first {2,3,5} node between 432 and 648 — a point where the lattice is already in balance. To absorb a 540 nm photon would be to draw energy from a coordinate that carries no T-differential, and under the conservation law $d\Sigma T=0$ there is nothing there to harvest. So 540 nm is reflected, and a forest in summer is green not by accident of pigment but by the structure of the lattice itself. Green is the T-field's signature of equilibrium — the colour of the place where the books are already balanced.

The three wavelengths form a single closed figure (Figure 2). The two harvesting nodes and the equilibrium node between them are bound by exact ratios — 540/432 = **5/4** and 648/540 = **6/5**, both pure {2,3,5} — so that 432, 540 and 648 are not three separate measurements that happen to fall nearby, but three faces of one coherent T-structure. A quiet bridge runs through the family too: **864 nm** ($2^5 \times 3^3$), exactly twice 432, the white-light pivot of the visible spectrum from which every colour boundary is measured. The blue harvesting node is half of it.

## 4 The two reaction centres: hydrogen and nitrogen, each × 50

For decades the two reaction centres of photosynthesis have looked like an embarrassment to a lattice built from {2,3,5,π}: P680 near 680 nm and P700 at 700 nm both seemed to carry a factor of seven, the one prime the Earth lattice does not contain. They do not. Each centre is one of the two atoms that do the work of the leaf, lifted into visible light by exactly the same factor of fifty — and that is the deeper finding (Figure 3).

**Photosystem 2** drives the **P680** centre, and P680 is a hydrogen node. Its wavelength is **680.24448 nm** — the hydrogen ground-state ionization energy **13.6048896** ($2^8 \times 3^{12} \times 10^{-7}$) multiplied by exactly 50, giving ($2^9 \times 3^{12} \times 5^2 \times 10^{-7}$), 359 ppm from the rounded 680. And this is exactly the address one would expect, because Photosystem 2 is the complex that **splits water**: it tears the electrons from hydrogen — it *ionises hydrogen* — so its reaction centre is keyed to the hydrogen ionization node itself. The chemistry and the number say the same thing.

**Photosystem 1** drives the **P700** centre, and P700 sits on **nitrogen**. Its wavelength is **700.3320213 nm** — the atomic weight of nitrogen, **14.00664043** ($2^9 \times 3^3/100\pi^2$), multiplied by exactly 50, giving $6912/\pi^2$ = ($2^8 \times 3^3/\pi^2$), 474 ppm from the rounded 700. Again the chemistry says the same thing as the number: nitrogen is the literal heart of chlorophyll. Every chlorophyll molecule

is built around a chlorin ring whose four nitrogen atoms reach inward to hold a single magnesium ion at its centre. The pigment that catches the far-red photon is a nitrogen cage, and its reaction centre is keyed to the nitrogen node itself.


*Figure 3 — The two reaction centres are the leaf's two working atoms, each × 50. P680 is hydrogen ionization × 50, because Photosystem 2 splits water; P700 is nitrogen × 50, because four nitrogen atoms form the heart of every chlorophyll ring. The leaf still reaches the planet: nitrogen's mass closes on the Earth's sidereal rotation to 0.0003 ppm. Neither centre is prime-7.*

That nitrogen is the right address, and not merely a near miss, is settled the way the lattice always settles such things — by a closed loop that leaves the leaf entirely and lands on the planet. Nitrogen's atomic weight, **14.00664043**, taken as a mass in Daltons (× 1.660412721), is **$23.2568 \times 10^{-27}$ kg**; carry that through the lattice's mass-to-rotation step — × 4/(2π)², lifted into the second register — and it lands on the Earth's sidereal rotation, **23564.069 s**, against the independent lattice value 7500π(1+δ_G) = 23564.069 to **0.0003 ppm**. The very atom that builds the chlorophyll ring carries, in its mass, the spin of the world the leaf grows on. And the older celestial reading is not lost but demoted to a corollary: nitrogen's node is the orbit of Mercury one helical turn away — N × 25/4 × ($5^6/2^6 3^5$) = 87.95 days — so the reach to the planets sits exactly one turn behind the nitrogen address. One leaf, one chlorophyll molecule, two reaction centres, two working atoms — and the chain runs from the splitting of a water molecule to the spin of the planet it sits on.

## 5 The chemistry of the harvest is pure {2,3}

When the captured light is finally turned into food, the arithmetic stays on the lattice (Figure 4). The overall equation of oxygenic photosynthesis is 6 $CO_2$ + 6 $H_2O$ → $C_6H_{12}O_6$ + 6 $O_2$, and every coefficient is **6 = 2×3**. Glucose itself reads C:H:O = 6:12:6 = 1:2:1 — pure {2,3} throughout. The light reactions require exactly **8 photons** per molecule of $O_2$ released ($2^3$), a clean count of two.

The ATP synthase — the rotary motor that banks the energy — turns in steps of **120°** (360/3) and makes **3 ATP** per full 360° turn, encoding the {3} register in the geometry of the protein. And the energy stored is itself a lattice number: the free energy of glucose oxidation, the harvest run backwards, is ΔG = **−2880 kJ/mol** ($2^5 \times 3^2 \times 10$); the conventional figure of 2870 lies a third of a percent below, within the veil. Photosynthesis stores exactly one {2,3} T-unit of energy in each glucose molecule. A {2}-count of light comes in, a {3}-rotor turns it into chemical bonds, and the whole apparatus is the {2,3} core of the lattice made into food.

## 6 What chlorophyll is

Chlorophyll is the place where the light of the Sun becomes the substance of life, and it does the work on the lattice from end to end. It harvests at two {2,3} nodes — 432 ($2^4 \times 3^3$) in the blue and 648 ($2^3 \times 3^4$) in the red — and reflects the {2,3,5} equilibrium node 540 ($2^2 \times 3^3 \times 5$), which is why the world is green. Its two reaction centres are the two atoms that do its work, each lifted into visible light by fifty: P680, the hydrogen node where Photosystem 2 splits water, and P700, the nitrogen node — the four nitrogen atoms that hold the magnesium at the heart of every ring — whose mass carries through to the Earth's own rotation. The chemistry that follows is pure {2,3}: six of everything, eight photons, three ATP, a glucose free energy of −2880. There is no prime-7 anywhere in the harvest, and there never was. Life does not merely use light. It decodes the lattice the Sun emits, and builds itself from the answer.

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## Appendix A  Proposition ledger

**P-CHLO-1** — Chlorophyll blue peak = 432 nm = $2^4 \times 3^3$ — the purest {2,3} node, identical to the H–H bond energy 432 kJ/mol. The photosynthetic quantum and the fundamental molecular bond share one T-address: a wavelength in nm equalling a bond energy in kJ/mol is register invariance, not coincidence.

**P-CHLO-2** — Chlorophyll red peak = 648 nm = $2^3 \times 3^4$; the ratio 432/648 = 2/3 is the fundamental T-ratio. The measured ~662 nm is the 648 node displaced by the degree-to-radian veil (180/π). The whole blue-red harvest is the {2,3} core of the lattice made physical.

**P-CHLO-3** — Green reflectance at 540 nm = $2^2 \times 3^3 \times 5$ is a {2,3,5} equilibrium node carrying no T-differential; under $d\Sigma T=0$ it cannot be harvested and is reflected — leaves are green by lattice structure, not pigment accident. The triangle closes: 540/432 = 5/4, 648/540 = 6/5.

**P-CHLO-4** — P680 (Photosystem 2) = 680.24448 nm = hydrogen ionization 13.6048896 ($2^8 \times 3^{12} \times 10^{-7}$) × 50 = $2^9 \times 3^{12} \times 5^2 \times 10^{-7}$ — a hydrogen node, 359 ppm from rounded 680. PS2 splits water (ionises hydrogen), so its centre sits on the hydrogen ionization node. It is NOT prime-7.

**P-CHLO-5** — P700 (Photosystem 1) = 700.3320213 nm = nitrogen atomic weight 14.00664043 ($2^9 \times 3^3/100\pi^2$) × 50 = $6912/\pi^2 = 2^8 \times 3^3/\pi^2$, 474 ppm from rounded 700. Nitrogen is the heart of chlorophyll: the four nitrogen atoms of the chlorin ring coordinate the central $Mg^{2+}$. The leaf-to-planet loop runs through nitrogen's mass: N × Dalton 1.660412721 = $23.2568 \times 10^{-27}$ kg → $\times 4/(2\pi)^2$ → Earth sidereal rotation 23564.069 s vs $7500\pi(1+\delta_G)$ to 0.0003 ppm. Corollary: nitrogen is Mercury's orbit one helical turn away ($N \times 25/4 \times 5^6/2^6 3^5$ = 87.95 d). It is NOT prime-7.

**P-CHLO-6** — The chemistry of the harvest is pure {2,3}: $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$ (every coefficient 2×3, glucose C:H:O = 1:2:1); 8 photons per $O_2 = 2^3$; ATP synthase turns in 120° steps = 360/3 making 3 ATP per rotation; glucose $\Delta G = -2880 = -2^5 \times 3^2 \times 10$ kJ/mol. From photon capture at 432 nm to glucose stored at 2880, the whole cycle is built from one {2,3} sublattice.

## A note on the numbers

The values in this paper are written as plain numbers — not pinned to units, and not carried to a particular power of ten. This is not loose notation; it is the physics. Under the Force of Time a quantity is not the property of one dimension: the same T-value appears as a wavelength in a leaf, an ionization energy in an atom, an orbital period in the heavens, an angle in a prism — one number wearing different coats. That is why a chlorophyll absorption in nanometres can meet the H–H bond in kilojoules per mole, and why a reaction-centre wavelength can meet the atomic weight of nitrogen — and nitrogen's mass the spin of the Earth: they were never separate quantities. The lattice number is the real thing, and it lives at once across every register — subatomic, atomic, celestial. The unit and the power of ten are only the costume the number wears in whichever dimension you read it from.

## References


[1] S. Daubney, *The Universal Force of Time — Master Compendium v5*, The Daubney Foundation (2026).

[2] NIST CODATA, *Recommended Values of the Fundamental Physical Constants*, 2022.

[3] R. E. Blankenship, *Molecular Mechanisms of Photosynthesis*, 2nd ed., Wiley (2014).

[4] Govindjee & D. Shevela, *Adventures with cyanobacteria: photosynthesis*, Front. Plant Sci. (2011) (P680, P700 reaction centres).

[5] J. Barber, *Photosystem II: the engine of life*, Q. Rev. Biophys. 36, 71 (2003) (water splitting).

[6] S. Daubney, *The Colour of Time — UFOT Colour Boundaries*, The Daubney Foundation (2026) (the veil; 432·648·540 nodes).

[7] D. Voet & J. G. Voet, *Biochemistry*, 4th ed., Wiley (2011) (photosynthetic stoichiometry; glucose ΔG).

## Appendix B  The lattice ledger of photosynthesis

Every measurable quantity of the harvest, with its physical value first and its {2,3,5,π} address in brackets.

| Quantity | Value (number first) | Lattice address | Note |
|---|---|---|---|
| Blue absorption (chl-a) | 432 nm | $2^4 \times 3^3$ | = H–H bond energy 432 kJ/mol |
| Red absorption (chl-a) | 648 nm | $2^3 \times 3^4$ | measured ~662; veil-displaced (180/π) |
| Green reflectance | 540 nm | $2^2 \times 3^3 \times 5$ | equilibrium node — leaves are green |
| White-light pivot | 864 nm | $2^5 \times 3^3$ | = 2 × 432 |
| Peak ratio (blue:red) | 2/3 | {2,3} | the fundamental T-ratio |
| 540/432 · 648/540 | 5/4 · 6/5 | {2,3,5} | one coherent triangle |
| P680 (Photosystem 2) | 680.24448 nm | $2^9 \times 3^{12} \times 5^2 \times 10^{-7}$ | = H-ionization 13.6048896 × 50 (water-splitter) |
| P700 (Photosystem 1) | 700.3320213 nm | $6912/\pi^2 = 2^8 \times 3^3/\pi^2$ | = nitrogen 14.00664043 × 50; heart of the ring |
| Nitrogen atomic weight | 14.00664043 | $2^9 \times 3^3/(100\pi^2)$ | four N atoms hold the central $Mg^{2+}$ |
| Nitrogen mass → Earth spin | 23564.069 s | N×Da ×4/(2π)² → 7500π(1+δ_G) | 0.0003 ppm — leaf reaches the planet |
| Mercury (light corollary) | 87.95 d | $N \times 25/4 \times 5^6/2^6 3^5$ | nitrogen one helical turn away |
| Hydrogen ionization (G1) | 13.6048896 | $2^8 \times 3^{12} \times 10^{-7}$ | the node PS2 splits water on |
| Photons per $O_2$ | 8 | $2^3$ | pure {2} count |
| ATP per 360° turn | 3 | {3} | 120° steps = 360/3 |
| Glucose ΔG | −2880 kJ/mol | $2^5 \times 3^2 \times 10$ | stored T-energy per glucose |

## Appendix C  Figures

**Figure 1 — Chlorophyll-a harvests at the two {2,3} nodes 432 and 648 and reflects the {2,3,5} equilibrium node 540 — which is why the living world is green**

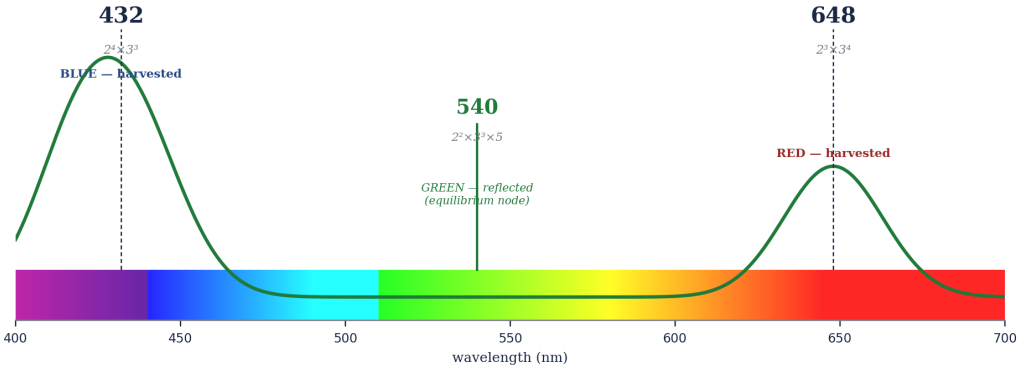


*Figure 1 — Chlorophyll-a harvests at the two {2,3} nodes 432 = 2⁴×3³ and 648 = 2³×3⁴ and reflects the {2,3,5} equilibrium node 540 = 2²×3³×5. The harvested ends are blue and red; the reflected middle is green.*

**Figure 2 — One coherent {2,3,5} structure: 540/432 = 5/4, 648/540 = 6/5, 432/648 = 2/3 — three exact ratios, no rounding**

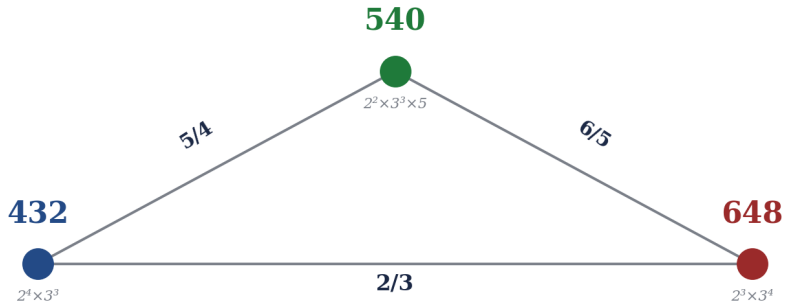


*Figure 2 — The three nodes are one structure: 540/432 = 5/4, 648/540 = 6/5, 432/648 = 2/3. Three exact ratios, all pure {2,3,5}, with no rounding anywhere.*

**Figure 4 — Every quantised step of the harvest resolves to a {2,3} lattice element**

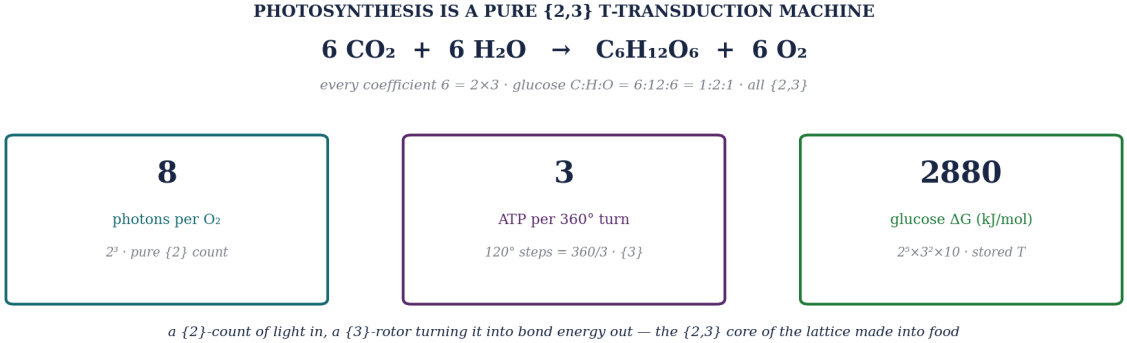


*Figure 4 — Every quantised step of the harvest resolves to a {2,3} lattice element: six of everything in the equation, eight photons ($2^3$) per $O_2$, three ATP per turn (120° = 360/3), glucose $\Delta G = -2880 = -2^5\times3^2\times10$ kJ/mol.*