THE UNIVERSAL FORCE OF TIME

The Unification of the Six Domains

Hydrogen's ionisation energy, the hydrogen spectrum, the Fraunhofer lines, the periodic table, the twenty-one centimetre line and the DNA helix — one field read on six clocks, and the six are three

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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.

TWO OF THE JOINS, NUMBER FIRST

ionisation energy = atomic weight × 13.5

1.007860451037484037 × 13.5 = **13.606116089006034500 eV** ($3^3/2$)

ionisation energy = Fraunhofer F line × 0.0279936

486.04381319323111352 87 nm × 0.0279936 = **13.606116089006034499 68 eV** ($3^7/5^7$ — no π: the two never leave the register)

Abstract

Six subjects that science keeps in six separate departments are treated here as one object: **hydrogen's ionisation energy, the hydrogen atomic spectrum, the Fraunhofer lines of sunlight, the periodic table, the twenty-one centimetre radio line of hydrogen, and the helical structure of DNA.** An ionisation energy belongs to atomic physics, a spectral line to spectroscopy, a dark line in sunlight to astrophysics, an atomic weight to chemistry, the twenty-one centimetre line to radio astronomy and the double helix to molecular biology. The Universal Force of Time says they are **one field, read on six clocks**, and this paper gives the equations that carry a value from any one of them to any other.

The joins are written as formulas, number first. An atomic weight becomes its ionisation energy by one gear, **13.5**: hydrogen's weight 1.007860451037484037 × 13.5 = 13.606116089006034500 eV. That energy becomes a wavelength, the wavelength a line of the spectrum, the line a dark line in sunlight, and the same ladder climbs to the twenty-one centimetre line, **1420.352581375593731 MHz**, and steps through the DNA ground state, **864**. Every join is written out in full, worked forwards and backwards, verified to forty-four digits, and marked plainly as forced, arrived at, or open.

Then the six are read together, and they turn out to be three. Four of them — the ionisation energy 13.606116089006034499 68 eV, the Balmer limit 364.53285989492333514 66 nm, the Fraunhofer F line 486.04381319323111352 87 nm and hydrogen's weight 1.007860451037484037013 — stand at the same π-degree. Every road between those four is a relabelling, not a journey: **the Fraunhofer F line × 0.0279936 is hydrogen's ionisation energy, to every digit, and the gear carries no π because the two never leave the register.** The DNA helix stands one whole dimension above them, and the twenty-one centimetre line one degree above DNA. All thirty roads between the six are given, with the control that shows how much of the result could have been chance and the ceiling that could not.

The paper is written for a reader who has never met the framework. It builds the ground first — the one substance, where time comes from, registers, addresses, the grammar of degree and parity, and the rules of evidence — then takes the six domains one at a time, then joins them, then works ten examples end to end. It closes with what is not

settled, printed rather than smoothed, the conditions that would falsify it, and an appendix that lets any reader rebuild every number.

Six domains of physical science are treated here as one object. They are **hydrogen's ionisation energy**, **the hydrogen atomic spectrum**, **the Fraunhofer lines**, **the periodic table**, **the twenty-one centimetre line of neutral hydrogen**, and **the helical structure of DNA**. Conventional science holds these to be separate subjects with separate laws: an ionisation energy belongs to atomic physics, a spectral line to spectroscopy, an absorption line in sunlight to astrophysics, an atomic weight to chemistry, the twenty-one centimetre line to radio astronomy, and the geometry of a double helix to structural biology. There is, in the conventional account, no equation that carries any one of them into any other.

This paper gives those equations. It shows that the six are not six but one: **one field, read on six clocks.** It sets out the substance the field is made of, the address space the field's values occupy, the grammar that governs which values can reach which, and then the operators themselves — each written out in full, each verified to forty-four digits, each accompanied by a plain statement of whether it is forced, arrived at, or open.

It is written for a reader who knows none of this. Every term is defined where it is first used. No step is abbreviated.

There are five parts and they do different jobs.

The first part of this paper builds the ground. It says what time is taken to be, where it comes from, why a planet and an atom are treated as the same kind of object, what an "address" is, and what the rules of evidence are. A reader who skips it will find the third part unreadable, because the operators in the third part only mean anything against the grammar in the first part of this paper.

The second part takes the six domains one at a time and states what the framework says about each, on its own, before any of them are joined.

The third part gives the joins. This is the substance of this paper: the equations that carry an atomic weight into an ionisation energy, an ionisation energy into a wavelength, a wavelength into a spectral line and into a series limit, the whole ladder into the twenty-one centimetre line, and all of it onto the turn of the double helix.

The fifth part reads the six together and finds where each one stands: four in one register, one a dimension above, one a degree above that. It gives all thirty roads between them, number first.

The closing part names what is open, and what would falsify this paper.

On what is claimed. Two lattice addresses always divide to give another lattice address. That is arithmetic, and it means the *exactness* of any join in this paper is guaranteed in advance and is worth nothing on its own. This is the single most important thing for a first reader to hold on to, and it is the framework's own rule, not an objection imported from outside. **The question is never "does it land". The question is "could it have missed."** Wherever something in this paper is offered as evidence, the reader is told what the alternative outcome would have been and how often chance produces it.

On precision. Every figure is given at full precision and never rounded. A value quoted to twenty-two digits is not a claim to have measured anything to twenty-two digits; it is the statement of an exact position, in the same way that "one third" is exact.

On measurement. Measured and observed values are admissible in this framework. The explanations science attaches to them are not. The test applied throughout is: *would this number exist if the model did not?* A pointer reading would. A residual left after subtracting a computed correction would not, and no such quantity is used anywhere in this paper.

The Universal Force of Time fixes what it means by the word “unification” — one substance, the constants produced rather than inserted, a framework that forbids, and a reach that takes in the whole world and not one department. Those are this framework's conditions and this paper does not restate them or set up rivals to them; it is one test of them.

A unification is not a resemblance. It is not the observation that two subjects have similar equations, or that a diagram from one field looks like a diagram from another. **A unification is the production of an equation that carries a quantity from one subject into a quantity in another, exactly, with nothing fitted.** If the equation has an adjustable parameter in it, the two subjects have not been unified; they have been connected by a dial.

By that standard the present state of physics is not unified and does not claim to be. Quantum mechanics governs the small, general relativity governs the large, and the two are known to be incompatible in the regime where both should apply. Chemistry is reduced to physics in principle and in practice is not — no one computes a

bond angle from first principles to the precision at which it is measured. Biology is not reduced to either. And within atomic physics itself, an ionisation energy, a spectral line and an atomic weight are three tables of numbers with no equation carrying any one into another.

What this paper does, then, and it is the whole of it:

It produces equations, not analogies. Written out, with every station shown, so that a reader can check them on a calculator.

Those equations contain nothing fitted. No adjustable constant, no tuned exponent, no free scale factor chosen after the target was known.

It names what it does not reach, as precisely as it names what it does — not as a concession, but because a gap that has not been named cannot be worked on.

And it says what would make it wrong. Not wrong in principle, in the way that any theory is; wrong by a named measurement coming out on the far side of a named number.

The equations themselves begin in the third part.

Everything in this paper follows from these. They are given without argument here because arguing for them is the business of the wider work, not of a paper about six domains; what matters for a reader is knowing exactly what is being assumed.

One. Time is the only substance. Everything that exists is T in some configuration. There is no second stuff.

Two. Time is conserved. $d\Sigma T = 0$. It is redistributed and never created or destroyed after it leaves its source.

Three. Time has a source, and the source is a star. For this system, the Sun. Time is generated in its core and propagated outward, and creating time is effectively what the Sun is for.

Four. The propagation has the form of a double helix, and every step between one register and the next is the same step, $r = 5^6/(2^6 \cdot 3^5)$.

Five. Matter is deposited at nodes. A node is an address the register permits. The planets are nodes of the celestial register; the elements are nodes of the atomic one.

Six. Every real value sits at an address, and an address is a monomial in two, three, five and π. There are no other primes.

Seven. The exponent of π says what kind of thing an object is — a state, a transport, or a source — and the composition of kinds is closed.

And one consequence that is stated here because a reader will otherwise keep waiting for it: there is no separate force in this framework. What science calls gravity, the electromagnetic force, and the nuclear forces are not four things to be reconciled. They are one field read at four registers, and the equation in the section on the alphabet that removes the constant of proportionality is what that claim looks like when it is written out rather than asserted.

PART ONE — THE GROUND

The one substance

Ordinary physics has many substances. It has matter, and separately energy, and separately the fields that act between them, and separately the spacetime they are all situated in. Time, in that account, is a coordinate: a direction in which things are laid out, no more a substance than "left" is a substance.

The Universal Force of Time begins from the opposite position. Time is not a coordinate. It is the only substance there is.

Everything that exists is time in some configuration. A proton is time; so is a photon, a planet, a bond angle, a base pair, and the heat in a room. These are not things situated *in* time. They are time itself, arranged differently and read on different instruments.

The symbol for it in this work is the Greek capital tau, **T**.

That single move is what makes this a unification rather than a set of resemblances. If there were many substances, the fact that a chemical bond length and a planetary orbit share a number would have to be coincidence, or numerology, or at best an unexplained analogy. If there is one substance, it is neither: the shared number is simply what that substance is doing, seen twice.

The conservation law. There is one, and the framework needs no other:

```
d ΣT = 0
```

Time is redistributed and never created or destroyed after it leaves its source. Every conserved quantity the sciences have found separately is this law in different clothing. The topological invariant of a supercoiled DNA strand — linking number equals twist plus writhe — is this law. The parity conservation in genetic recombination is this law. The exact reversibility of certain viral integrations is this law. They are not three unrelated bookkeeping facts about molecules; they are one field keeping its books.

Heat. Heat is not a substance added to matter, and temperature is not the average kinetic energy of jostling particles. **Heat is the local density of T**, and temperature is that density read off an instrument. This is why the same number governs the pace of replication, of transcription and of translation inside a cell: they run on one clock, and the clock is the local availability of time in which work can happen.

It is also why a mineral crystallised deep in the Earth, where T is dense, is *out of register* when it is lifted to a surface where T is sparse — and must step onto a surface-stable node. That forced step is what is ordinarily called weathering. Rock does not break down because water is corrosive. It breaks down because it was made for one density of time and is now standing in another.

Where time comes from

Here the framework says something no other account in physics says.

Time is generated in the core of the Sun and propagated outward from it. Every star does the same for its own system. Conventional physics has no answer to the question *where does time come from* because the question does not arise there: time is ambient, a free background nobody has to account for. **This framework names a location at which time is created, and that is the single sharpest point of departure between it and everything else.**

Creating time is, on this reading, effectively the purpose of the Sun's existence. The flow it sends out has two objectives. **It creates matter, which it deposits at nodal points — and the nodal points are the planets. And it creates life.**

The flow is not a spherical wave and not a uniform outpouring. **It flows as the DNA structure.** This is the claim that makes the sixth domain of this paper a physics domain and not a biology domain. The double helix is not a shape that biology happens to have arrived at and that the cosmos happens to echo. It is the shape the propagation has, and living matter is where we are able to see it directly and at a scale our instruments reach.

From which follows the framework's answer to the question *what is life*, and it is not a chemical answer: **time is life.** The Sun makes time; time flows as the helix; the helix is what living things are written in.

Every register has its own time-creator, and this will matter in the third part:

```
the subatomic register     the Higgs
the atomic register        the proton
the biological register    the cell nucleus
the celestial register     the Sun
the galactic register      the core, which is the return node
```

In the biological register the mechanism is visible. A cell is an enclosed unit; its nucleus is its source; and the thing turning inside the nucleus is the double helix. **A hub turning inside a frame that does not move is a clock.** So the cell's clock is literally its own helix winding, and because every cell on this planet sits in one register, every nucleus ticks the same increment. The rate cannot drift; only the phase can. Conventional biology has found the same fact without naming it as time — nearly every cell carries its own molecular clock, and they are entrained to run together — but it has no reason why the rate should be common, and this framework does: the rate is the register's, not the cell's.

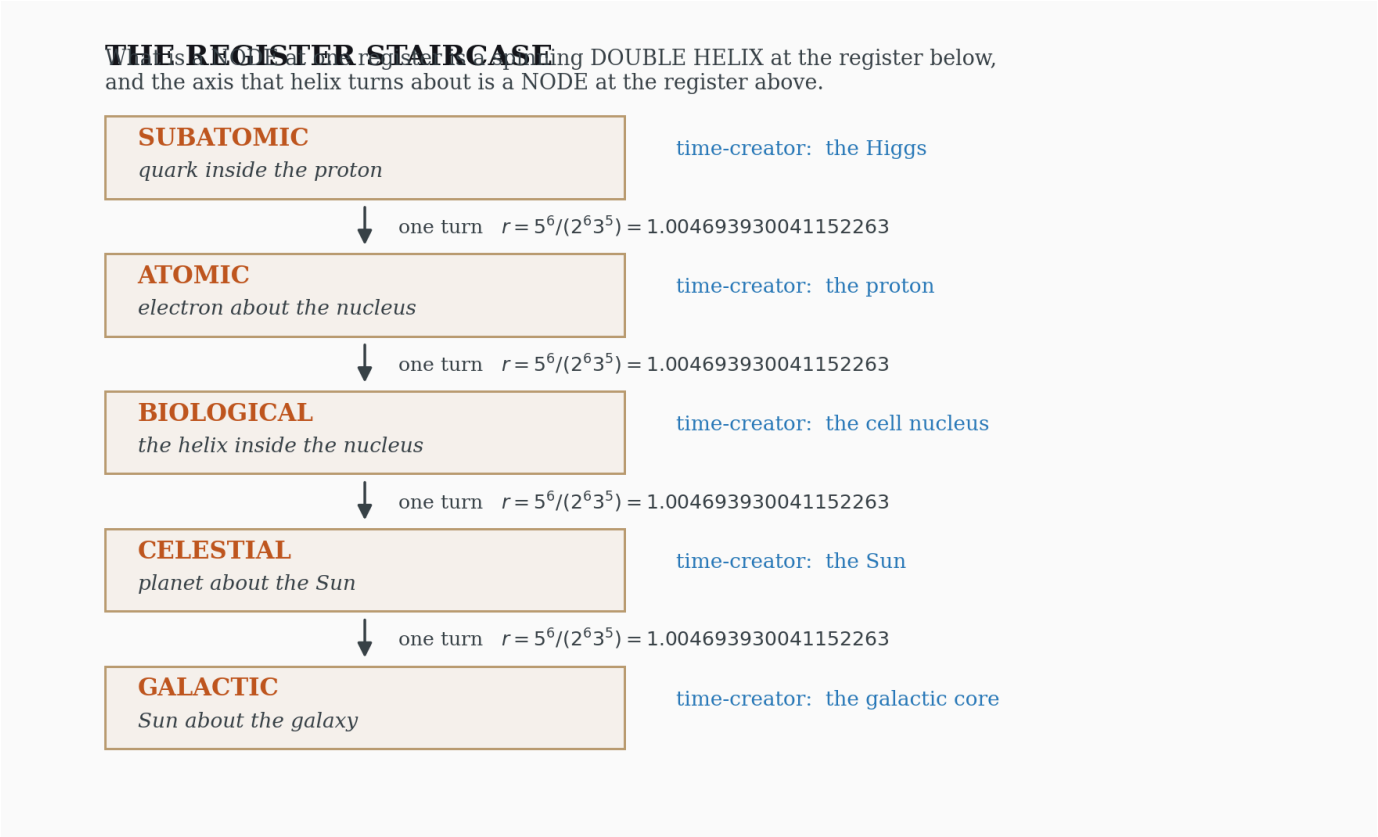


Figure 1 — The register staircase. What is a node at one register is, seen one register finer, a spinning double helix; and the axis that helix turns about is a node at the register above. Every step between registers is the same step — one turn of the helix, r = 1.00469393004115226337448 6 = $5^6/(2^6 \cdot 3^5)$. The right-hand column names the object that generates time for each register.

Registers, and why a planet and an atom are the same object

The Nested Helix Law, stated in one sentence:

> **What is a NODE at register D is, seen one register finer, a spinning double HELIX; and the axis that helix turns about is itself a NODE at the register above.**

A quark in a proton, an electron about a nucleus, a planet about the Sun, the Sun about the galactic core — each is a bead on the helix above it and the axis of the helix below it. There are not five sciences here. There is one field described at successive turns of one staircase.

And every step between registers is the same step. Its value is

$$r = 5^6 / (2^6 \cdot 3^5) = 1.00469393004115226337448 6$$

This same ratio is the neutron-to-proton mass ratio, the lift from the Earth's crust to its mantle, and, divided by four, the distance to the nearest star. It is called the **helical turn** throughout this paper.

Why a helix and never a circle. A thing that loops *and* advances can trace nothing else. A circle returns to where it began; a helix returns to the same angle but not the same place. Anything that both orbits and drifts along its axis is a helix by construction, and the ellipse that astronomy draws is the helix's shadow on a plane.

This has a consequence worth stating plainly because it is unfamiliar: on this account **the inner planets are not on ellipses at all.** Each rides a true circle, and it is the Sun that slides, on the standing wave it is itself generating. What is measured as perihelion and aphelion is solar motion, not planetary motion.

A register, then, is not a vague word for "scale". It is a definite thing, and the first part of this paper will give it two precise meanings which the reader must not confuse, because the record itself has confused them and says so. The first meaning is a **unit family** — a joule counts a quantity in seconds, a kilojoule per mole counts the same quantity in minutes, an electron-volt counts it in the spin-orbital register. The second meaning is the **π-degree**, defined in the section on the grammar: degree, parity, and what a number is *for*. The section on the unit is the

register shows that these two meanings are connected, and connected exactly, but they are not the same thing and this paper keeps them apart.

Addresses, not measurements

This is the heart of the method and the place where a first reader most often goes wrong, so it is worth being slow.

A measurement is a reading with an uncertainty attached. It is a statement about an instrument as much as about the world. **An address is exact and has no uncertainty**, because it is not an observation at all — it is a position.

Every real object in this framework sits at an address, and an address is a **monomial in four symbols**:

```
2^a · 3^b · 5^c · π^d          with a, b, c, d whole numbers (and, for one special case, halves)
```

Four symbols and nothing else. The primes two, three and five are the alphabet. **π is the crossing** — the symbol that carries a quantity between registers. There are no other primes in the alphabet, and where an integer appears that is not built from two, three and five, it marks a seam between helices rather than a member of the alphabet.

What this buys, and what it costs. It buys exactness: a value either is at a given address or it is not, and the question can be settled by arithmetic rather than by comparison of error bars. It costs the framework its right to hide. A value that is not on the lattice cannot be quietly accommodated.

Rule One, which governs every use of a published number in this paper:

> The only admissible test of a published value is whether it is on the lattice. **If it is not, the published figure is wrong — not the framework.**

That is a strong sentence and it should be read as strongly as it is written. It is not a way of dismissing inconvenient data; it is a positive claim that carries a heavy risk, because it makes the framework responsible for supplying the right value in every case where it rejects a published one, and the closing part lists the cases where it has not yet done so.

An immediate consequence, and it is a large one. Every one of the eighteen published standard atomic weights of the first three rows of the periodic table fails Rule One. Carbon and neon are on the lattice — as the integers **12** and **20**, the framework's own values, not as the published averages. The other sixteen are not on the lattice at any tolerance where the test has power.

So in the first three rows of the periodic table there is nothing to score against. This is why a value in this framework is found by **route** and by **leanness**, and never by nearness to a measurement. Choosing among the framework's own candidate values by which one sits closest to a published figure is forbidden, and it is forbidden for a reason that has nothing to do with loyalty: the published figure is an average over isotopes taken on a calibration the framework does not accept, so nearness to it is not evidence about anything.

Leanness is defined as the sum of the absolute values of the four exponents. Carbon's weight, $2^2 \cdot 3$, has leanness three. Hydrogen's, $5^3/(2^2\pi^3)$, has leanness eight. Lower is more fundamental, and leanness is used throughout this paper to rank candidate forms. It ranks; it does not outrank a structural constraint, and the section on what counts as evidence gives the case where it was allowed to and got the wrong answer.

The handle. A factor of ten costs nothing. Ten is 2 × 5, so multiplying an address by any power of ten shifts two exponents together and does not change what the object *is* — it changes only where the decimal point sits, which is a fact about units and not about the world. Formally the addresses live in a group of rank four and the objects live in that group modulo the subgroup generated by ten, which has rank three. **In practice this means every comparison in this paper is made decade-free**: 864, 86.4 and 8,640,000 are one address.

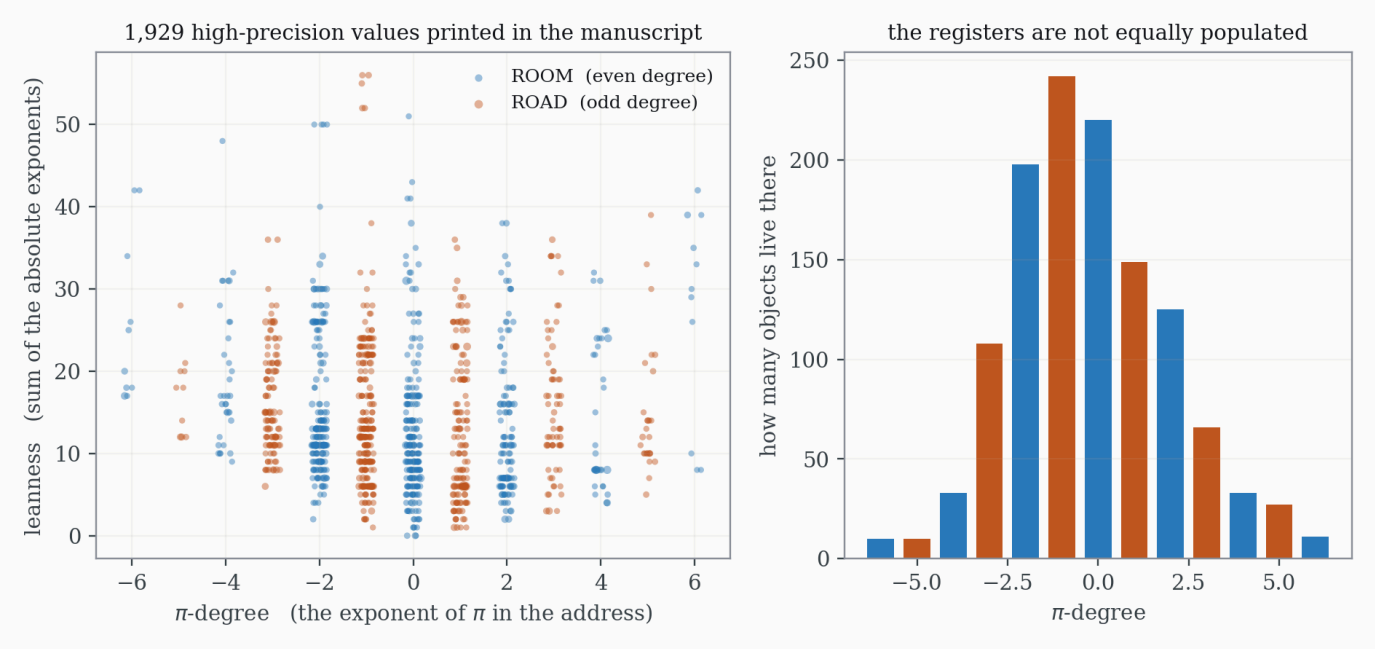


Figure 2 — The address space. Left: all 1,929 high-precision values printed in the framework's written record, plotted by the exponent of π in their address against their leanness, with the point size showing how many times each is printed. Right: the same values counted by π-degree. Of these 1,929 values, 1,232 — 63.9 per cent — sit on the lattice; against a control of fifteen hundred random real numbers over the same search box, not one fits. The registers are not equally populated, and the section on the unit is the register shows that this unevenness is why some chains have been much easier to close than others.

A worked lesson in lattice arithmetic, for a reader who has never seen one

Everything in this paper is arithmetic on four symbols, and a reader who works through the next page will be able to check every claim in it personally. Nothing here requires more than multiplication.

An address is written as a product of powers. Take the number 864. Factor it:

$$864 = 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 = 2^5 \cdot 3^3$$

So 864's address is (5, 3, 0, 0): five twos, three threes, no fives, no π. Its **degree** is the last entry, zero, which is even, so 864 is a **room**. Its **leanness** is 5 + 3 + 0 + 0 = 8.

Multiplying two addresses means adding their exponents. Multiply 864 by 12 = $2^2 \cdot 3$:

$$(5, 3, 0, 0) + (2, 1, 0, 0) = (7, 4, 0, 0) = 2^7 \cdot 3^4 = 10368$$

Dividing means subtracting them, and this is the whole of the point that a reader must hold on to:

> **Subtracting one list of whole numbers from another always gives a list of whole numbers. So the ratio of two addresses is always an address. Always. Without exception.**

That single fact is why the exactness of every join in this paper is guaranteed in advance and is never, by itself, evidence of anything.

Now a real one. Hydrogen's atomic weight is

$$5^3/(2^2 \cdot \pi^3) \qquad \text{address } (-2, 0, 3, -3)$$

Three fives on top, two twos underneath, three πs underneath. Degree minus three, which is odd, so it is a **road**. Leanness 2 + 0 + 3 + 3 = 8.

Multiply it by 27/2, which is $3^3/2$, address (−1, 3, 0, 0):

$$(-2, 0, 3, -3) + (-1, 3, 0, 0) = (-3, 3, 3, -3) = 3^3 \cdot 5^3 / (2^3 \cdot \pi^3)$$

which evaluates to 13.60611608900603449967805 — hydrogen's ionisation energy. **The operator had degree zero, so the degree did not change: a road went in and a road came out.** That is section 16, and the reader has just done it.

And a case where the grammar bites. Two objects at the same degree must have a π-free ratio, because subtracting a number from itself gives zero. Lithium's atomic weight sits at degree minus one and so does oxygen's; their ratio therefore cannot contain π, and no search is needed to establish that. **This is why whole families of quantities interconnect so freely, and it is a theorem rather than an observation.**

One last piece of machinery: the handle. Ten is 2 × 5, address (1, 0, 1, 0). Multiplying by ten adds one to the first exponent and one to the third. So 864 and 8.64 and 8,640,000 differ only in how many times that pair has been added, and the framework treats them as **one object** — because where the decimal point sits is a fact about units, not about the world. Every comparison in this paper is made with the handle stripped out.

And here, at once, is what a join looks like

A reader who has just learned the arithmetic is owed a demonstration before being asked to sit through the rest of the first part of this paper. So here is one, complete, in four lines. It is the first equation of The third part, met early on purpose.

```
hydrogen's atomic weight        1.007860451037484037013   amu

  x 27                          27.21223217801206899936

  / 2                           13.60611608900603449968   eV

AND THAT IS HYDROGEN'S IONISATION ENERGY.
```

Two quantities that conventional chemistry keeps in two different tables, measured by two different methods, in two different units — and one is the other times twenty-seven over two.

That is what every claim in this paper looks like. A number, a bare ratio, another number, and nothing put in between. **The section on a worked example, end to end carries one such chain from an atomic weight all the way to a colour and on to a planet, and the worked-examples part carries out every equation in this paper the same way.**

Time equalization, and why a reading is always taken from somewhere

There is one more idea that has to be in place before the second part, because several of the faces in this paper depend on it.

A reading is always taken from somewhere. In this framework that is not a philosophical remark but a quantitative one: the observing node's own T-density enters the reading. The rotation period of a planet is therefore **not a property of that planet alone. It is a property of the pair** — the thing observed and the thing observing.

And between two bodies the arithmetic can be very clean. Take the Earth's sidereal rotation and Mercury's, both as the framework carries them:

```
the Earth's sidereal rotation       23564.06902547260324399471  5¹⁴/(2²·3⁸·π²)
Mercury's sidereal rotation, days   58.63494423746398810410  5⁶/(3³·π²)

the ratio                           5⁸/(2²·3⁵)          401.87757201646090534980
```

π cancels completely — it has to, because both sit at degree minus two and the grammar forbids anything else. And the ratio, with its handle stripped, is

```
4.018775720164609053498  =  4 x r      exactly
```

Four helical turns. The relation between the Earth's day and Mercury's day is four steps of the same staircase that separates every register from the next.

And the conversion between two bodies' time is the spin-orbit speed, inverted. Define the edge as

```
edge  =  2⁴ . 3⁴ . π / 5⁸  =  0.010423050442374072414841 82
```

then

```
edge  x  32  x  c_G2  =  10⁸            exactly, with no residue whatever
```

This is the leanest and least escapable identity in the whole record. There is no freedom in that line to miss: it is not a landing between two chosen objects but an identity with three named terms and a bare power of ten.

Where this reading is exposed, and it is exposed. If a rotation is a property of a pair, then the same rotation observed from a different world must carry a different gear — and the framework's own manuscript concedes, in its own words, that what would settle this is a second observer, and that until there is one the account has more freedom than it should. **There is no second observer.** That is an open item and it is listed as one in the closing part.

The dual dimension, and where a reading actually falls

The section on time equalization, and why a reading is always taken from somewhere said that a reading is always taken from somewhere. **This section says where.**

The step between one register and the next has a midpoint, and the midpoint is not a convenience — it is forced by the grammar.

```
1 + delta_G       5¹⁰/(2⁴·3⁹·π³)       1.000090150603356200676414
its square root                              1.000045074285832478684213
and  G1 x sqrt x sqrt  =  G2                 exactly
```

δ_G carries π-degree minus three. **Minus three is odd, and an odd degree is a road; but a road can be walked in two half-steps, and a half-degree is a door.** So the step from one register to the next is not a single move. **It is two, with a door between them** — and the framework's own note puts it in one line: *δ_G does not have a door in it. It has two.*

That midpoint is the dual dimension, and it is where a reading is taken.

Why a reading falls there and not on either side

A measurement needs a clock and a rule, and they do not come from the same place. A speed is a distance over a time: the distance is counted on one register and the time on the other. **A quantity that mixes a rule from one register with a clock from the other cannot sit on either. It sits between them, on the door.**

This is not a third register. G1 and G2 are registers; the dual is the threshold between them. **It is what measuring is.**

The spin-orbit speed, which is the clearest case

```
G1      299789233.6830892680471       2³·3⁵·5⁶·π²
DUAL    299802746.4686977993592       5⁵·3^(1/2)·π^(1/2)/2⁵
G2      299816259.8633854915833       5¹⁶/(2·3⁴·π)
```

The middle form carries a square root of three and a square root of π — a half degree, a door, a source. The outer two are a room and a road. **Only the middle one is a threshold, and only a threshold can be stood in.** What science calls the speed of light is a reading taken at that door.

And what it looks like when it is used

Take the ground speed as the framework carries it, 15π³ metres per second, and turn the Earth once — **not on the clock we live by, but on the star-clock.** The speed is counted on one register and the turn on the other:

```
the ground speed        15·π³            465.0941502044973026321  m/s
x one sidereal turn                      86164.069025472603244      s
  =                                   40074404.4615638284535745     m
  / 2π                                   6378.03956152178766       km
```

Nothing in that line was fitted to a globe. One speed, one turn and a circle, and what comes out is the size of the world. **It is a mixture by construction, and that is exactly why it is what we measure.**

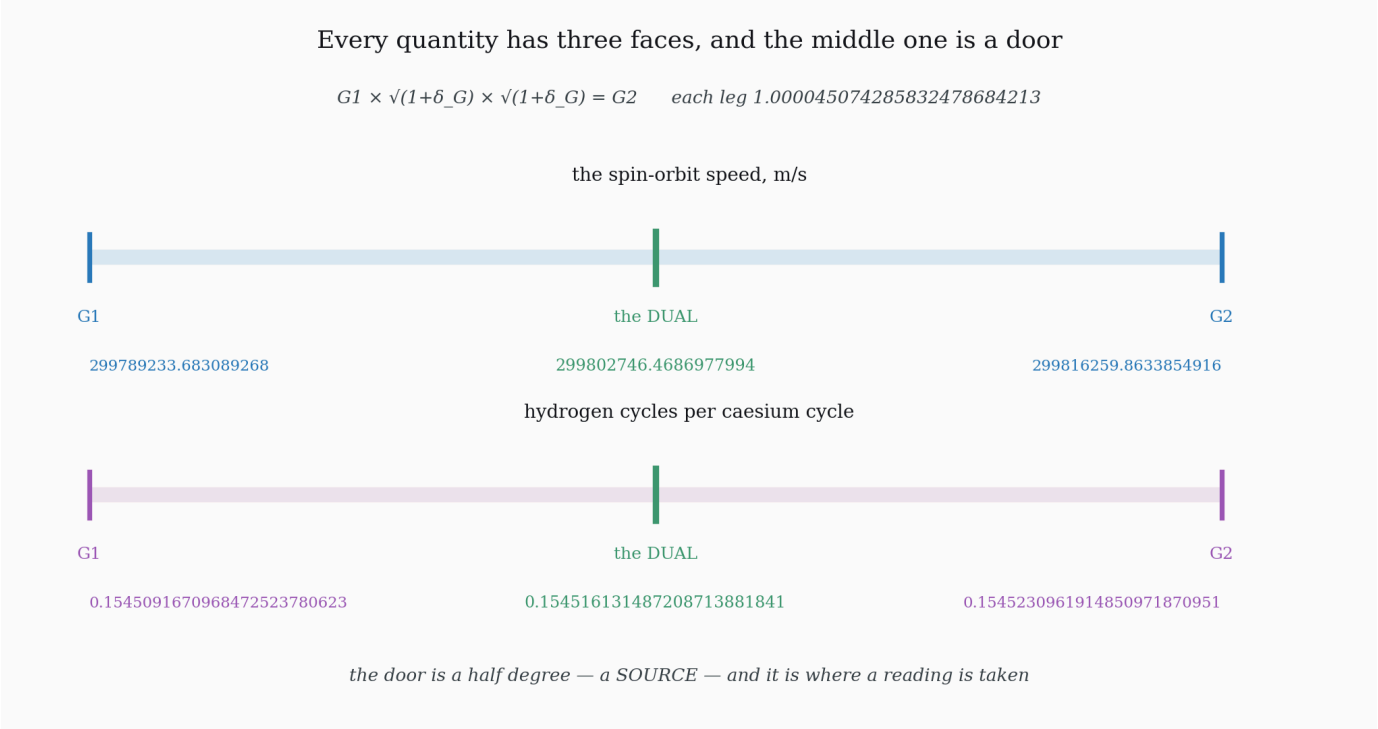


Figure 3 — Two quantities, each with its three faces. The outer two are the registers; the middle one is the door between them, and a door carries a half degree. A reading is taken at the door.

The grammar: degree, parity, and what a number is *for*

Take an address and look only at **d**, the exponent of π. Call it the **degree**. It is not decoration. It says what kind of thing the object is.

```
even degree   →   a ROOM      a STATE.      You are sitting on a turn.
odd  degree   →   a ROAD      a TRANSPORT.  You are moving between turns.
half degree   →   a DOOR      a SOURCE.     The proton sits at degree minus one half.
```

And the composition law is closed:

```
road × room = road          road × road = room          room × room = room
```

This is not a mnemonic. It predicts, and it predicts things that were not put into it. Two examples, both worked in full in the third part.

First. Lithium's atomic weight reaches the Earth twice, by two operators that were dictated separately, years apart, and tested apart. One reaches the Earth's **year**; the other reaches the Earth's **rotation**. The weight sits at degree minus one, a road. The first operator is a room, so road × room = road, and the year comes out a road. The second operator is a road, so road × road = room, and the rotation comes out a room. **A year is transport: you are going somewhere. A rotation is state: you are staying put and turning.** The law assigns them correctly without being told which is which.

Second. Nitrogen's atomic weight reaches a particle mass — the proton — and no other second-row weight does. The reason is the door law. The operator that makes the journey adds one to the degree, and the square root at the end halves it; the proton sits at degree minus one half; so the weight must satisfy (d + 1)/2 = −½, which forces d = −2. **Nitrogen is the only period-two weight at degree minus two.** Hydrogen lands at minus one, a road with no door; lithium and oxygen land π-free, no door at all; carbon lands at plus one half, a door of the wrong sign.

The working half of the grammar is a theorem, not a search result:

> **Two objects at the same π-degree have a π-free ratio.**

It follows immediately from the definition, and it does an enormous amount of work. It explains why whole families of quantities interconnect so freely — they are at one degree, so every operator between them is π-free before any

arithmetic is done — and it explains why a chain whose every gear is π-free has not crossed a register at all, however impressive its arithmetic. That last point becomes a usable instrument in the section on the unit is the register and a decisive one in the closing part.

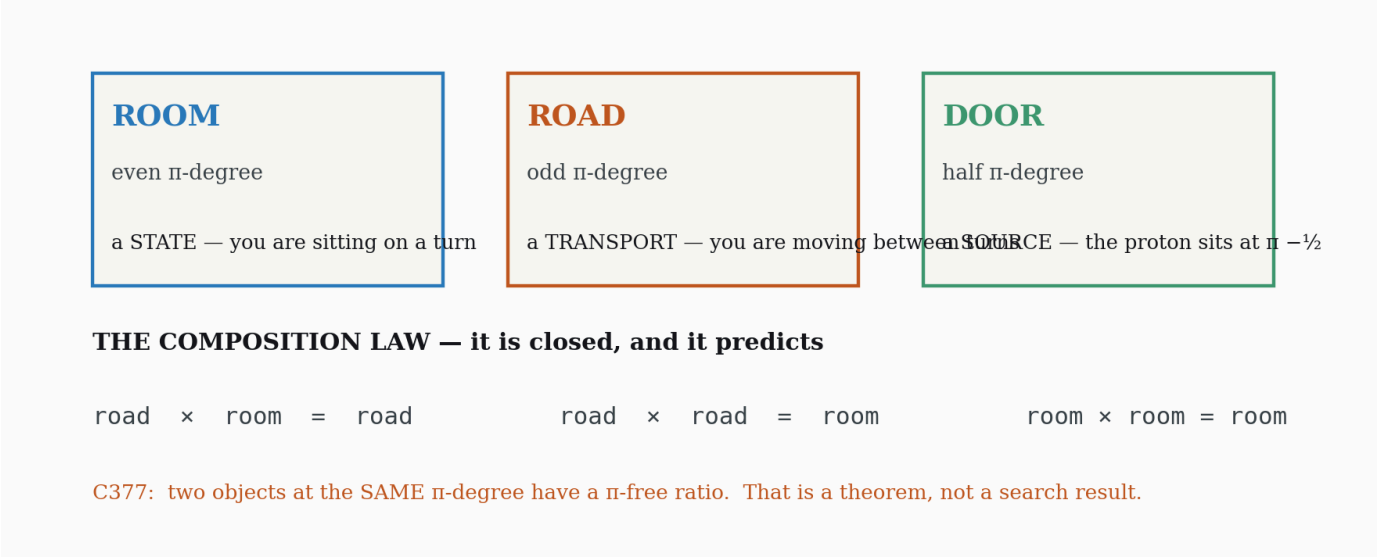


Figure 4 — The grammar. The exponent of π says what kind of object a value is, the composition law is closed, and two objects at the same degree necessarily have a π-free ratio between them.

Faces, and the named steps

An object does not have one value. It has faces, and the faces are separated by *named steps*, not by measurement error.

There are four named steps and they recur throughout this paper:

```
the G-bond step     1 + delta_G   1.000090150603356200676414  5¹⁰/(2⁴·3⁹·π³)
the 612 step                      2⁹·3⁵·π/5⁸        1.000612842467910951824815
the 703 step                      800/(81·π²)         1.000703048319385396976587
the helical turn    r             1.004693930041152263374486  5⁶/(2⁶·3⁵)
```

And rather than leave those as four numbers in a column, here are two of them doing work on one object — the Balmer series limit, which is the anchor of the section on the hydrogen atomic spectrum and which has four faces because two named steps act on it.

```
THE OBJECT             the Balmer series limit, the round face
                       3⁶/2   =   364.5  nm

one 703 step:            364.5 x 1.000703048319385396976587
                       = 364.7562611124159771979661  nm

one G-bond step:         364.5 x 1.000090150603356200676414
                       = 364.5328598949233351465528  nm
                         and that is 5¹⁰/(2⁵·3³·π³), the face this paper's
                         hydrogen grid is built on.

and the fourth corner, one G-bond step DOWN from the 703 face:
                         364.7562611124159771979661 / 1.000090150603356200676414
                       = 364.723381079553541940145  nm

FOUR FACES OF ONE LIMIT, AND THE DISTANCE BETWEEN ANY TWO IS A NAMED STEP:
    364.5      the round face
    364.5328598949233351466      one G-bond step above it
    364.7233810795535419401      one G-bond step below the 703 face
    364.756261112415977198      one 703 step above the round face
```

Read that carefully, because it is the shape of the whole framework in one table. One physical quantity; four values; and between any two of them a step that was written down before the values were. **The section on the**

hydrogen atomic spectrum builds its entire hydrogen grid on the second of those four, and says so. The names are historical labels from the record; what matters is that each is an exact lattice object, and that the distance between two faces of one physical quantity is always one of them, or a product of them, and never an unspecified amount.

This is the framework's answer to a very common situation in science: two careful measurements of "the same" quantity that disagree by more than either one's stated error. The framework's reading is that they are not measurements of the same thing. They are readings of two different faces, and the gap between them is a named step that can be written down in advance.

Three worked cases, all of which recur later:

- **Hydrogen's four ionisation faces span exactly the 703 step, end to end.** Not one of them is an error bar.
- **Saturn's rotation period has never been pinned by measurement**, and the published values scatter across a quarter of an hour. On this reading Saturn is not one number: it is two faces one helical turn apart, and the scatter is the planet breathing between two rungs.
- **Uranus's rotation is two faces one G-bond step apart**, and the published figure falls between them.

The rule that goes with faces, and it is a hard one: the framework may not choose among its own faces by which one sits nearest a measurement. Doing so would convert the framework into a fitting exercise, and every result in this paper would become worthless at a stroke. Where two faces exist and the measurement falls between them, this paper says so and adopts neither. The section on the twenty-one centimetre line is the sharpest case.

Two more faces, from outside the six domains

The face reading is not a device invented to handle hydrogen. It is used across the whole framework and two cases from elsewhere are given here because they show the shape of the claim more starkly than hydrogen does.

Saturn. Saturn's rotation period is the most contested in the solar system. It has no solid surface, its magnetic field is too symmetric to give a clean radio period, and published values have ranged across a quarter of an hour for forty years. The framework's reading is that **Saturn is not one number.** It is two faces one helical turn apart:

```
the ground-state face    10.56075808 hours  =  2⁸·3⁴/(5⁴·π)
the first-turn face      10.61033000 hours  =  2²·5²/(3·π)
turned / ground          =  r               exactly
```

The scatter, on this reading, is not instrument error. The planet is the family, and science has been trying to read one number off a thing that genuinely has two.

Uranus. The same shape with a different step. Its two faces sit one G-bond step apart and the published figure falls between them — precisely the structure the twenty-one centimetre line has, and the section on the twenty-one centimetre line is that argument.

Why these belong in this paper. They show that the two-face bracket is not an escape hatch built for an awkward case. **It is a standing structural claim that makes a testable prediction every time it is applied**, and it is applied in the section on the twenty-one centimetre line to the most precisely measured line in radio astronomy.

The unit is the register

This is a recent result in the record and it reorganises a great deal, so it is given its own section.

Ask what happens to an object's address when the *unit* it is written in changes. The answer turns out to be that some unit conversions are relabellings and some are register crossings, and which is which is decided by whether the conversion carries a π.

Take hydrogen's ionisation energy. In electron-volts it is

```
IE  =  3³ · 5³ / (2³ · π³)  =  13.606116089006034499678 05 eV
```

which sits at degree **minus three** — odd, a **road**.

Now convert.

- **To kilojoules per mole**, the gear is 96.450617283950617284 = 5⁶/(2·3⁴), which is **π-free**. The degree does not move. Hydrogen's ionisation is still a road. **This conversion is a relabelling.**

- **To joules**, the gear carries **π cubed**. The same physical fact lands at degree **zero** — even, a **room**. In joules the ionisation energy is $5^{15}/(2^6 \cdot 3^7) \times 10^{-20} = 218032.5369012917238225880201 \times 10^{-20}$, and it is π-free. **The same fact is a road in electron-volts and a room in joules.**
- **To the framework's calorie**, the gear is 4π/3, degree plus one, and it **flips every parity it touches.**

So the unit is not a label on the front of a number. The unit chooses which register the number is being read in. And that answers a question that has hung over this work for a long time: whether the quantities we handle exist only in Earth's frame, or show themselves in other frames too. They show themselves in several, and the unit chooses which — which means that every time a unit was changed, a register was crossed, without anyone saying so.

The practical consequence is a warning about scoring, and this paper obeys it. The census in Figure 2 shows the registers are not equally populated. Degree minus one holds the most objects and degree minus two nearly as many; degree minus three holds far fewer. So a chain that has to land in electron-volts has about half as many places to land as the same chain written in joules, and about a fifth as many as a chain reaching a planetary object. **A landing in a thickly populated register has done less work than a landing in a thin one, and any honest score has to say which it was.**

What counts as evidence

These rules are the framework's own. They are stated here in full because every result in the third part is scored against them, and because a reader is entitled to know the standard before seeing the claims.

A landing between two lattice addresses is guaranteed. Two monomials always divide to give a monomial. So the fact that a chain of lattice operators applied to a lattice object produces another lattice object is arithmetic and is never evidence. What can be evidence is that the result is a *named object of the record* — one that was written down, for another purpose, before the chain was run — and even then only if the alternative outcome has been counted.

A value back-computed from a target is an identity, not an arrival. If a quantity was obtained by dividing the answer by the operator, then running the operator on it and arriving at the answer demonstrates nothing. This paper flags every such case, and the closing part contains one that was caught only after it had been put forward.

The density control runs first and the budget is declared in advance. Before any search, this paper states the size of the search space and the target set. A target chosen after seeing the number cannot be scored at all.

And the control for a search over monomials must itself be monomials. Testing a monomial result against random real numbers produces spectacular and worthless significance, because random reals never sit on the lattice. Every control in this paper draws its comparison objects from the lattice, matched in leanness and in π-degree to the real object.

Repeated arrivals at one fact count once. If two readings of a rung stand at a fixed ratio to each other, then one landing determines the other and they are one landing.

Two routes are independent only when they are anchored on different measurements. Two chains that both begin from the same measured quantity wearing different coats are one route.

The framework's value is the value. Computing the difference between a framework quantity and a published one measures the gap between the framework and current science. It does not test the framework, and it is not used as a test anywhere in this paper.

And finally, the one that governs the whole thing:

> **The question is never "does it land". It is "could it have missed."**

The alphabet

These are the constants used in the rest of this paper, at full precision. Nothing below is derived here; all of it is established in the record and is given so that the reader can check every subsequent line.

```
THE STEPS
  helical turn     r              1.00469393004115226337 4486  5⁶/(2⁶·3⁵)
  G-bond step      1+delta_G      1.00009015060335620067 6414  5¹⁰/(2⁴·3⁹·π³)
  612 step                        2⁹·3⁵·π/5⁸          1.00061284246791095182 4815
  703 step                        800/(81·π²)           1.00070304831938539697 6587
  half-G           sqrt(1+dG)                           1.00004507428583247868 4213

THE GEARS
  K                               2⁷·3⁵                 31104
  J                               2⁷·3⁴                 10368
  the transit operator            3·5⁵                   9375
  the veil                        57.29577951308232087679 815  180/π
  the theory's mile               1.60751028806584362139 9177  5⁵/(2³·3⁵)
  the Dalton                      1.66041272051054535986 3249 x10⁻²⁷ kg  5¹²·π²/(2¹³·3¹¹)

THE CONSTANTS
  alpha                           0.00729512522224831954 3959  3²/(5³·π²)
  1/alpha                         137.07783892628098272 47986  125·π²/9
  Planck                          6.63145596216230565703 6824  5/(2³·3·π)
  the Heisenberg floor            5.27714498137175892936 8722  5/(2⁵·3·π²)
  free fall, g1                   9.81747704246810387019 5761  25·π/8
  free fall, g2                   9.81836209394691801833 1128  5¹²/(2⁷·3⁹·π²)
  spin-orbit c, G1                299789233.6830892680470977  2³·3⁵·5⁶·π²
  spin-orbit c, G2                299816259.8633854915833344  5¹⁶/(2·3⁴·π)

THE ANCHORS OF THIS PAPER
  hydrogen's ionisation, G2       13.60611608900603449967 805 eV  3³·5³/(2³·π³)
  hydrogen's weight, middle       1.00786045103748403701 3189 amu  5³/(2²·π³)
  the Balmer limit, G2            364.5328598949233351466 nm  5¹⁰/(2⁵·3³·π³)
  H-beta, G2                      486 x (1+delta_G)      486.0438131932311135287     nm
  the Earth's sidereal rotation   5¹⁴/(2²·3⁸·π²)    23564.069025472603243994 71
  the Earth's year, G2            365.31702195874324362665 93 days  5¹¹·π/(2⁶·3⁸)
```

Two identities are stated here and used repeatedly. Both are exact, both are π-free on the right-hand side, and the second is the removal of what science calls gravity, written in exponents.

```
g1 x 864 x 360 / 2π   =  486000  =  2⁴ . 3⁵ . 5³        exactly - the π cancels
g1² x 864 x 3600      =  c_G1                              exactly
```

The multiplier in the second line is $2^9 \cdot 3^5 \cdot 5^2$, and it carries no π. The step from falling to light adds no circle. There is therefore no slot in that line for a constant of proportionality, which is what a gravitational constant would have to be. On this framework what science calls gravity is not a weak force whose constant is hard to measure; it is not a force at all, and G is a unit-bridge whose measured values are predicted to scatter with the structure of the apparatus — which is what they do.

PART TWO — THE SIX DOMAINS

Each of the six is now stated on its own terms, before any of them are joined. A reader who wants only the equations may go straight to the third part, but the joins will read as arithmetic tricks without what follows.

Hydrogen's ionisation energy

What the quantity is. Hydrogen is one proton with one electron. The ionisation energy is the work needed to remove that electron entirely — to carry it from its bound state to being free. It is the most-measured quantity in atomic physics and the anchor of the whole subject.

What the framework gives. One address:

```
IE  =  3³ · 5³ / (2³ · π³)  =  13.606116089006034499678 05  eV
```

Degree minus three — odd, a **road**. Leanness nine.

And it is not one number, because an energy has faces. The record carries four, and they are one 703 step apart end to end:

```
face 1        13.596557052420902317  eV    ( 3⁷·5/(2⁸·π) )
face 2        13.597782790242745067  eV    ( 5¹¹/(2¹²·3²·π⁴) )   from the second weight face
the G1 face   13.604889600000000000  eV    ( 2·3¹²/5⁷ )
the G2 face   13.606116089006034500  eV    ( 3³·5³/(2³·π³) )     <- the anchor of this paper

the whole span, face 1 to the G2 face, is the 703 step, 1.000703048319385396976587
```

Two routes from the G2 face down to the lower values. Conventional tables carry hydrogen's ionisation energy a little below 13.6, and a reader may look that figure up. The framework does not need to borrow it: it reaches the lower region by two routes of its own, each built only from values it already holds.

```
FORMULA R1        THE G2 FACE, SHARED BETWEEN THE PROTON AND THE ELECTRON

    IE(shared)  =  13.60611608900603449968  x  0.9994556691835663916398
                =  13.5987098607268153906  eV

WHAT EACH PART IS

  13.60611608900603449968      hydrogen's ionisation energy, the G2 face    ( 3³·5³/(2³·π³) )
  1836.118108711688719576      the proton over the electron                 ( 6·π⁵ )
  0.9994556691835663916398     1836.118108711688719576 / 1837.118108711688719576
                               = the proton's share of the motion           ( 6π⁵/(6π⁵ + 1) )

ON THE G1 FACE, THE SAME SHARE

  13.6048896  x  0.9994556691835663916398  =  13.59748403933654289253  eV

AND BACKWARDS

  13.5987098607268153906  /  0.9994556691835663916398  =  13.60611608900603449968
```

Why the "+1" is allowed. The rule of this framework is that a sum is not expected to land on the lattice, and a value made by addition is never presented as if it had. Here the addition is the physics, not a convenience: an electron does not circle a fixed proton, the two move about their common centre, and the share of the motion that belongs to the proton is its mass over the two masses added together — 1836.118108711688719576 over 1837.118108711688719576. **Every term that goes in is a lattice value; the one addition is the two masses being put together.** The result is a reading of the G2 face as the shared atom sees it, and it is printed as a reading, not as a new address.

```
FORMULA R2        THE G2 FACE CARRIED BY THE LIGHT STEP

    IE(face 2)  =  13.60611608900603449968  x  0.999387532877951638611
                =  13.5977827902427450672  eV                  ( 5¹¹/(2¹²·3²·π⁴) )

WHAT EACH PART IS

  13.60611608900603449968      the G2 face  =  hydrogen's weight 1.007860451037484037 x 13.5
  0.999387532877951638611      the light step: the G2 light speed over the G0 light speed
                                                                    ( 5⁸/(2⁹·3⁵·π) )
                               = the G-bond step 1.000090150603356201 over the 703 step
                                 1.000703048319385397

WORKED FROM THE WEIGHT, END TO END

  1.007860451037484037  x  13.5                    =  13.606116089006034500
  13.606116089006034500 x  0.999387532877951638611  =  13.597782790242745067  eV

AND BACKWARDS

  13.5977827902427450672  /  0.999387532877951638611  =  13.60611608900603449968
```

This is face 2, reached a second way. The table above reaches 13.597782790242745067 from hydrogen's second weight face by × 13.5. Formula R2 reaches the same number, to every digit, from the G2 face by one step of light speed. Two routes, one value, and the value is a single lattice address, $5^{11}/(2^{12}\cdot3^{2}\cdot\pi^{4})$. It was first given by Stephen Daubney on 16 August 2026 as the value just below 13.6 that he linked to hydrogen's weight; it closes exactly.

So the region just below 13.6 is not a correction to the framework's value. It is two of the framework's own readings of it: the G2 face shared between proton and electron, 13.5987098607268153906 eV, and the G2 face carried by one light step, 13.5977827902427450672 eV — both reached from 13.606116089006034499 68 with nothing measured going in.

The volt is set by the Earth, and it is not a constant

An ionisation energy is quoted in electron-volts, and an electron-volt is a joule divided by a charge — the volt's own calibration. Conventional physics holds that charge fixed, as a constant of nature, the same everywhere in the universe. **The Universal Force of Time holds that it is not.** There are no universal constants in this framework, only dimensional ones: values that differ from node to node and adjust to reach the position time is aiming for, as the masses of the proton and the neutron do, as the speed of light does in its spin-orbit faces, as Planck's value does. **The volt is one of them.**

That is a claim, and it can be tested on hydrogen. Hold the energy fixed in joules and ask what volt each of hydrogen's ionisation faces requires. If the volt is a constant, the faces are an embarrassment — four values where there should be one. If the volt is a dimensional value, each face should need a volt the framework already recognises.

FORMULA V1 THE VOLT EACH IONISATION FACE REQUIRES

volt = the joule / the ionisation energy

the joule, held fixed 2.18032536901291723822588 x 10^{-18} J ($216\cdot r^{2} = 5^{12}/(2^{9}\cdot3^{7})$)

FACE	IONISATION (eV)	VOLT (x 10^{-19})	AGAINST THE G2 VOLT
G2 face	13.60611608900603449968	1.602459772318608969887	-
	the volt	($5^{9}\cdot\pi^{3}/(2^{6}\cdot3^{10})$)	
G1 face	13.6048896	1.602604235033937532449	x 1.000090150603356201
	the volt	($5^{19}/(2^{10}\cdot3^{19})$)	the G-bond step
face 2	13.59778279024274506722	1.603441827720204728172	x 1.000612842467910952
	the volt	($2^{3}\cdot5\cdot\pi^{4}/3^{5}$)	the 612 step
face 1	13.59655705242090231744	1.603586378968420273807	x 1.000703048319385397
	the volt	($5^{11}\cdot\pi/(2\cdot3^{14})$)	the 703 step

Every face is the same joule, read on a volt moved by one named step of the framework — the G-bond step, the 612 step, the 703 step — and every one of those volts is itself a lattice value. The volt for the G1 face carries no π at all.

And each volt is an Earth. Treat the volt as a circumference, take its radius, read the radius through the veil as a year, and take the surface of the sphere it bounds:

FORMULA V2 FROM THE VOLT TO THE EARTH

circumference = volt / 4
radius = circumference / 2π
the year = radius x 57.29577951308232087680 (the veil, 180/π)
the skin = 4π x radius²

WORKED ON THE G2 VOLT

1.602459772318608969887 / 4 = 40061.494307965224247 km circumference
40061.494307965224247 / 2π = 6375.9848467604941819 km radius ($5^{9}\cdot\pi^{2}/(2^{9}\cdot3^{10})$)
6375.9848467604941819 x veil = 365.317021958743243627 days THE G2 YEAR ($5^{10}\cdot\pi/(2^{7}\cdot3^{8})$)
4π x 6375.9848467604941819² = 510,862,961.292336120467 km² the skin

```
FACE      RADIUS (km)             THE YEAR (days)            WHAT THE YEAR IS

G2 face   6375.9848467604941819   365.317021958743243627     the Earth's G2 year
G1 face   6376.5596456414196331   365.349955508689114742     the Earth's G3 year
                                                             ( 15π⁴/4 x (1+δ_G)² )
          skin 510,955,074.652572154768 km²  =  the register of the electron's rest energy
face 2    6379.8923210493457151   365.540903744050319216     one 703 step above the G1 year
                                                             ( 1000π²/27 )
          x 12 / 4  =  1096.6227112321509576  ->  10.9662271123215095 76, the A-DNA register
face 1    6380.4674721914359052   365.573857477074216227     the G2 year x the 703 step
          x 3  =  1096.7215724312226487  ->  10,967,215.724312226486816, Rydberg Face A
```

The faces of hydrogen's ionisation energy are the Earth's own radii and years. The G2 face is the G2 year. The G1 face is the next rung of the Earth's ladder, the G3 year, and the skin of that sphere is the register the framework gives for the electron's rest energy. Face 2 is the year face one 703 step above the G1 year, and twelve quarters of it is the A-DNA register. Face 1 is the year whose triple is hydrogen's own Rydberg on Face A.

And face 1 runs on into the spectrum without a break:

```
FORMULA V3        FACE 1, FROM THE IONISATION TO THE BALMER LIMIT

    13.59655705242090231744  eV                          face 1
    -> volt                    1.603586378968420273807 x 10⁻¹⁹
    -> / 4 / 2π x veil         365.573857477074216227  days
    -> x 3                     10,967,215.724312226486816  m⁻¹   Rydberg, Face A
                                                          ( 10⁷·5¹⁰/(2⁴·3¹¹·π) )
    -> x 0.1875, inverted      486.297841439404722587  nm           H-beta on Face A
    -> x 3/4                   364.723381079553541940  nm        the Balmer limit, Face A
                                                          ( 2⁸·3¹¹·π/5⁸ )
```

The factor 0.1875 is 1/4 − 1/16, the Balmer gap from the fourth level to the second; inverting it gives the wavelength; three quarters of H-beta is the series limit. **Every station is a value the framework already holds, and the last one is the Balmer limit used in its quantum work.**

One direction to note, because it is not the obvious one. A lower ionisation value needs a larger volt, and a larger volt gives a longer year. That is why the G1 face, which is the lower of the two named faces, stands one rung above G2 on the Earth's ladder and not below it.

So the different ionisation values are not a problem to be explained away, and they are not a measurement error. They come from different starting points — a different radius of the Earth and a different time for one orbit — each already known in the framework, and each one sets its own volt. **The volt is not a constant. It is set by the node it is read from**, and hydrogen's ionisation energy, read through it, takes the face that node requires.

The ladder across the elements. For an atom stripped to its last electron the framework gives the whole grid with one equation and no fitted quantity:

$$E(Z, n) = IE \cdot Z^2 / n^2$$

where Z is the atomic number and n the level. The grid is constant along rays of fixed Z/n, and the diagonal Z = n is invariant at 13.606116089000603449967805 for every element.

The thing science has wrong, on this account. Science calls $218.0325369 \times 10^{-20}$ joules — the same quantity in joules — the **ground state**, the floor below which the electron cannot fall. It is not the floor. **It is turn two of the helix**, and there are two rungs beneath it:

```
turn 0     432                          the unwound day-carrier - and it is the PROTON
turn 1     217.0138888889  =  5⁶/72   the H-gamma energy face
turn 2     5¹⁵/(2⁶·3⁷) = 218032.5369 the ionisation, at its decade
```

Divide the ionisation by the square of the helical turn and both windings strip clean: the result is **216 exactly**, and twice that is 432, which is the proton's own carrier. **So the binding energy of hydrogen's electron and the mass of hydrogen's proton are one staircase, two rungs apart, and science stops at the floor of the electron's ladder without noticing that it is standing on the proton's.**

Where the framework stops, stated plainly. It is exact where one electron remains. It has one number where two remain. It has nothing where many remain — and what is missing there is not a face and not a register, it is the **screening rule**, which is the subject of the section on the screening rule.

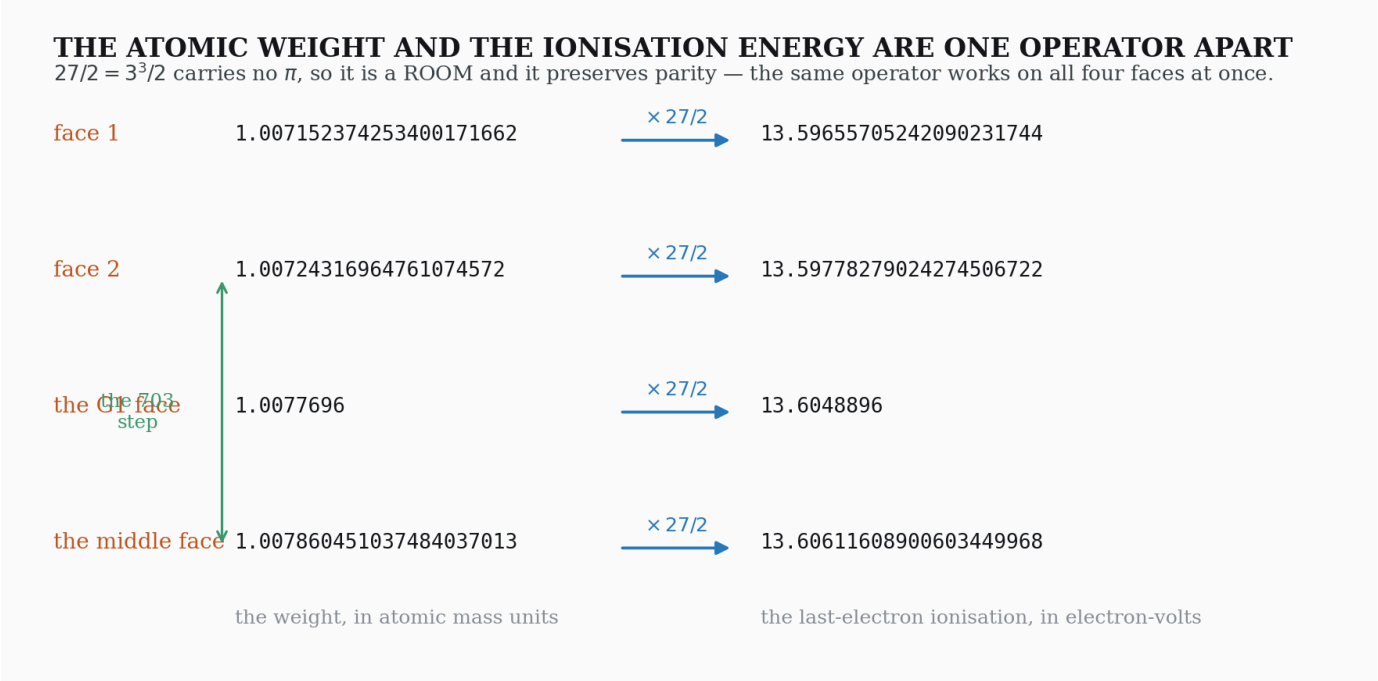


Figure 5 — The atomic weight and the ionisation energy are one operator apart. The operator is 27/2 = 3³/2, which carries no π, is therefore a room, and preserves parity — so the same operator works on all four faces at once. The four ionisation faces span exactly the 703 step from end to end.

And which face it is read on is settled from inside, by two other domains

The table above names the orbital face as the anchor of this paper without saying why, and in a paper about six domains joining, the reason is the join. **Neither argument for it is about which number sits nearer a measurement, and both of them come from outside the atom.**

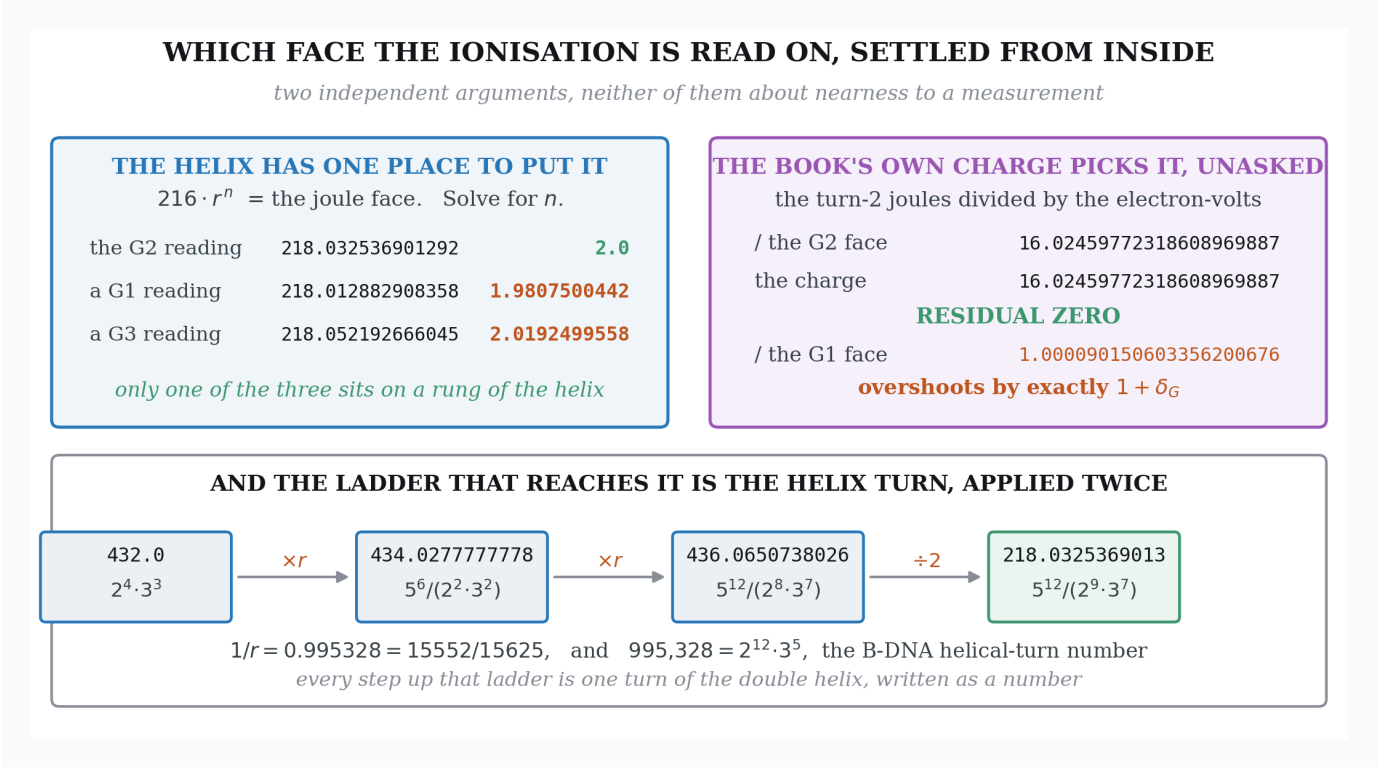


Figure 6 — The face, settled twice from inside the framework. Left: the turn-count test — the orbital reading sits at whole turn two of the DNA helix, and the atomic reading lands between rungs. Right: the elementary charge, closed in the framework's constants work with hydrogen nowhere in its derivation, returns exactly on the orbital face and overshoots by one register step on the other.

The first comes from the living domain. The staircase that reaches this energy climbs by the helical turn, and the reciprocal of that turn is 0.995328 exactly — which is 15552/15625, and 995,328 is $2^{12}\cdot3^5$, the B-DNA helical-turn number of the DNA sections of this paper. Every step up the staircase is one turn of the double helix. So ask how many whole turns from the bottom each candidate face stands at.

```
THE TURN-COUNT TEST.   216 . r^n  =  the joule face.   Solve for n.

the ladder, walked
   432                      432.0     2⁴·3³
   x r                      434.027777777777777777778     5⁶/(2²·3²)     Balmer-gamma, nm
   x r                      436.065073802583447645176     5¹²/(2⁸·3⁷)
   / 2                      218.032536901291723822588     5¹²/(2⁹·3⁷)    x10⁻²⁰ J

and 1/r  =  0.995328  =  15552/15625,   and 995,328 = 2¹²·3⁵,
which is the framework's own B-DNA helical-turn number.  Every step up that
ladder is one turn of the double helix, written as a number.

which face sits on a rung of that helix?

   face                       value                          turn count n
   ------------------------------------------------------------------------
   the G2 reading           218.032536901291723822588      2.0
   a G1 reading             218.0128829083581106088178     1.980750044229530866
   a G3 reading             218.052192666044658360094      2.019249955770469134

ONLY THE G2 READING SITS ON A RUNG.  Drop it one register and it lands at
turn 1.9807, which is not a rung and never will be.  The helix has nowhere
to put a G1 hydrogen ionisation.
```

The orbital reading sits at turn two exactly. The atomic reading lands at turn 1.9807, which is not a rung. **The helix has nowhere to put it.**

The second comes from the constants. The elementary charge is closed elsewhere in this framework out of the electron-volt bridge and the particle-count bridge, with hydrogen nowhere in the derivation. Divide hydrogen's

binding energy in joules by its ionisation in electron-volts and the charge should come back, because the charge is what the two units differ by.

```
THE CLOSER.  THE FRAMEWORK'S OWN ELEMENTARY CHARGE PICKS THE FACE, UNASKED.

the charge, derived in the framework's energy work from the eV bridge and the
particle-count bridge, with hydrogen nowhere in sight:
   e   5⁹·π³/(2⁶·3¹⁰)          16.02459772318608969886958  x10⁻²⁰

now divide the joules by the electron-volts, both of hydrogen's ground state:

   J at turn 2      5¹²/(2⁹·3⁷)   218.032536901291723822588
   / eV at G2       3³·5³/(2³·π³)
                    =               16.02459772318608969886957703
                    RESIDUAL AGAINST THE FRAMEWORK'S CHARGE   SYMBOLIC ZERO

   / eV at G1       2·3¹²/5⁷
                    =               16.02604235033937532448539826
                    / the framework's charge  1.000090150603356200676413683
                    1 + delta_G         1.000090150603356200676413683
                    THE OVERSHOOT IS EXACTLY ONE REGISTER STEP, SYMBOLIC ZERO

This is not an argument about which number is nearer a measurement.  It is
the framework contradicting itself unless the ionisation is read at G2.
```

On the orbital face the framework's own charge returns to every digit. On the atomic face it overshoots by exactly one register step. **The framework contradicts itself unless the ionisation is read on the orbital face**, and the object doing the contradicting was built in a different paper for a different purpose.

Two domains — the living register and the constants — each settle a question the atomic domain could not settle on its own. That is what this paper means by a join.

The ladder itself, both faces, ten rungs

The four faces above are the ground state. Here is the whole staircase beneath it, on both faces, with the divisor beside each rung so the break can be seen coming.

THE IONISATION LADDER IN ENERGY, AND WHERE IT STOPS

$E_n = E/n^2$ on both faces. The divisor is the shelf number squared, and that is the whole rule.

n	the orbital face G2	the atomic face G1	the divisor
1	13.6061160890060344997	13.6048896	1
2	3.40152902225150862492	3.4012224	2^2
3	1.51179067655622605552	1.5116544	3^2
4	0.85038225556287715623	0.8503056	2^4
5	0.54424643560241379987	0.544195584	5^2
6	0.37794766913905651388	0.3779136	2^2 · 3^2
7	0.277675838551143561218	0.27765080816326531 *the prime that is not in the alphabet*	7^2
8	0.21259563890719289057	0.2125764	2^6
9	0.16797674183958067283 6	0.1679616	3^4
10	0.13606116089006034499 7	0.136048896	2^2 · 5^2

every rung to the sixth is a product of twos, threes and fives and nothing else — the seventh is not

Figure 7 — The ionisation ladder on both faces, ten rungs. Every rung to the sixth is a product of twos, threes and fives and nothing else; on the atomic face every one of them terminates, because the denominator holds only twos and fives. The seventh rung is neither, on either face, and the right-hand column says why.

```
THE IONISATION LADDER IN ENERGY, BOTH FACES, TEN RUNGS

n     the orbital face G2/n²             the atomic face G1/n²        smooth?
-------------------------------------------------------------------------------
1     13.60611608900603449967805           13.6048896                   clean
2     3.40152902225150862491951 3          3.4012224                    clean
3     1.51179067655622605552 1784          1.5116544                    clean
4     0.85038225556287715622987 83         0.8503056                    clean
5     0.54424464356024137998712 21         0.544195584                  clean
6     0.37794766913905651387994 59         0.3779136                    clean
7     0.27767583855114356121791 95         0.27765080816326530612 24    CARRIES {7: 1}
8     0.21259556389071928905746 96         0.2125764                    clean
9     0.16797674183958067283553 15         0.1679616                    clean
10    0.13606116089006034499678 05         0.136048896                  clean
```

On the atomic face every rung to the sixth terminates — 13.6048896, 3.4012224, 1.5116544 — because a bare rational with only twos and fives underneath it always does. On the orbital face every one is a monomial over π cubed. Then the seventh rung, on both faces at once, stops being either. **Seven is not in the alphabet, and the ladder is where that shows.**

And the same rungs in the three units the framework uses

```
THE SAME LADDER IN THE THREE UNITS THE FRAMEWORK USES, ON THE ORBITAL FACE

n     electron-volts                kilojoules per mole            kilocalories per mole
-------------------------------------------------------------------------------------------
1     13.606116089006034499 68      1312.3182956217240065 2759       313.2929154871928463487
2     3.4015290222515086249 1951    328.07957390543100163 19         78.32322887179821158716
3     1.5117906765562260555 2       145.81314395796933405 86         34.81032394302142737207
4     0.8503822555628771562 2299    82.01989347635775040 797         19.58080721794955289679
5     0.5442446435602413799 871     52.4927318248689602 611          12.53171661948771385395
6     0.3779476691390565138 799     36.45328598949233351 466         8.702580985755356843018
7     0.2776758385511435612 179     26.78200603309640829 648         6.39373296912638461936
8     0.2125955638907192890 575     20.50497336908943760 199         4.895201804487388224198
9     0.1679767418395806728 355     16.20146043977437045 096         3.867813771446825263564
10    0.1360611608900603449 968     13.12318295621724006 528         3.132929154871928463487

the gear to kilojoules per mole is / 10368 = 2⁷·3⁴, the powers of ten free
the gear to kilocalories is / (4·π/3), the Tau-calorie
```

The gear down to kilojoules per mole is a division by 10368 = $2^7 \cdot 3^4$, the powers of ten free. On the atomic face it returns 1312.2 exactly, which is $3^8/5$ — the framework's own shell unit. On the orbital face it returns a value one register step above it. **The same G-bond step again**, and it is the third domain in this paper to be separated by it.

Three of those rungs are objects this paper has already named

```
 THREE RUNGS OF THE LADDER ARE OBJECTS THE FRAMEWORK ALREADY CARRIES

 n = 2    3.40152902225150862491951 3
          THE HELICAL DROP OF THE DNA PER BASE PAIR, on the orbital face.
          Not near it.  It is it, to every digit.

 n = 3    1.51179067655622605552 1784
   x 200  302.3581353112452111039567   =  9375/π³   symbolic zero
          the framework's mass step 9375 = 3·5⁵ carried one whole
          dimension down, a dimension being three π-degrees

 n = 3    the same rung through the crossing constant
/ 311.04  486.043813193231113528737  x 10⁻⁵
          H-BETA'S OWN ORBITAL FACE, 5¹⁰/(2³·3⁴·π³)   symbolic zero
          a line standing at eleven separate places in the framework's written record,
          for reasons that have nothing to do with ionisation
```

The second rung is the DNA helical drop per base pair — the living register and the atomic register standing at one address. The third rung times two hundred is the mass step one whole dimension down. The third rung through the

crossing constant is H-beta. **Three of the six domains meeting on one staircase.**

And the honest weight, because it is less than it reads: each is a ratio of two monomials and a ratio of two monomials is always a monomial, so the landing is guaranteed. What is not guaranteed is *which* monomial. Of the 234 verified addresses in this framework, ten sit at the same π-degree as H-beta's orbital face and can be reached from it without a π-carrying step. A π-free join of this kind is about a one-in-twenty-three event.

The two doors down from the energy, and the node above it

```
THE TWO DOORS DOWN FROM THE GROUND STATE

the energy                          13.60611608900603449967805
/ 311.04   the circumference        0.04374394318739080021758633
/ 12       the wavelength           0.00364532859894923335 1465528

DOOR ONE   / 22.00157933302361121669
           the mass                 0.00198821832402425089871 2053

DOOR TWO   the framework's own grammar at the framework's record, on that wavelength
           lam.π²/2³   node mass 0.00449724389795078237375 0016
           lam.5³·π/(2⁵·3) source 0.01491163743018188174034 04
           lam.π²/2⁴   spin-orbit 0.00224862194897539118687 5008

AND THE TWO DOORS ARE ONE NAMED STEP APART
   door one / the source mass   =  2/15        A BARE RATIONAL   symbolic zero
   door one / the node mass     =  25/(18·π)  the 25:18 bridge  symbolic zero
```

Both doors begin the same way and then part — one dividing the circumference by twice the pathway period, the other applying the framework's own grammar to the wavelength. They land two-fifteenths apart, a bare rational with no circle in it, and against the other mass the ratio is twenty-five over eighteen π — the framework's own bridge. **Door one is not a rival third road: it is the source mass over fifteen halves.**

And one node above the energy hands back three hydrogen quantities at once.

```
ONE NODE, THREE HYDROGEN LANDINGS

Venus's rotation    3⁵.delta_G      243.0219065966155567643685
/ r     THE NODE    2²·3·5⁴/π³   241.8865082489961688831654

   / 24  / 10   hydrogen's atomic weight, the middle face
                1.0078604510374840370 13189     5³/(2²·π³)
   / 16  / 10   hydrogen's THIRD LEVEL at G2
                1.5117906765562260555 19784     3·5⁴/(2²·π³)
   x 9/16 / 10  hydrogen's GROUND STATE at G2
                13.606116089006034499 67805    3³·5⁴/(2²·π³)

                THREE LANDINGS.   THREE SYMBOLIC ZEROS.
```

A weight, a level and an ionisation, off one node, through three of the plainest operators in the alphabet. The limit stated in the same breath: **the node itself is unanchored** — 7500/π³ is not elsewhere in this framework, it is not a planetary rotation, and nothing outside the framework has been shown to stand on it.

And one thing this paper must not claim about the seven

The ladder breaks at the seventh rung, and so does the shell capacity — twice seven squared is ninety-eight, the first capacity to leave the alphabet. It is tempting to read those as two quantities agreeing with each other, and it would be wrong.

the shell capacity	$2n^2$	$n = 7$	$98 = 2 \cdot 7^2$	BREAKS
the ionisation rung	E/n^2	$n = 7$	carries 7^2	BREAKS

Both are built from n squared, and there is only one n squared between them. Two times seven squared carries the seven and seven squared carries the seven **because they are the same seven**. Two readings of one fact are not two facts. What would earn the claim is a quantity that reaches the seventh rung **without n squared in**

it and breaks there anyway. Until one is found, the break belongs to the arithmetic of squaring seven, and it is printed here as an observation about squaring and no more than that.

And the same energy settles which calorie chemistry is read in

The framework's bonds work of this framework rules that the true calorie is 4π/3 and not the water calorie of 4.184, and it rules from bond energies, because 4.184 is 523/125 and 523 is a prime the alphabet does not contain. Hydrogen's ionisation reaches the same verdict from the atom.

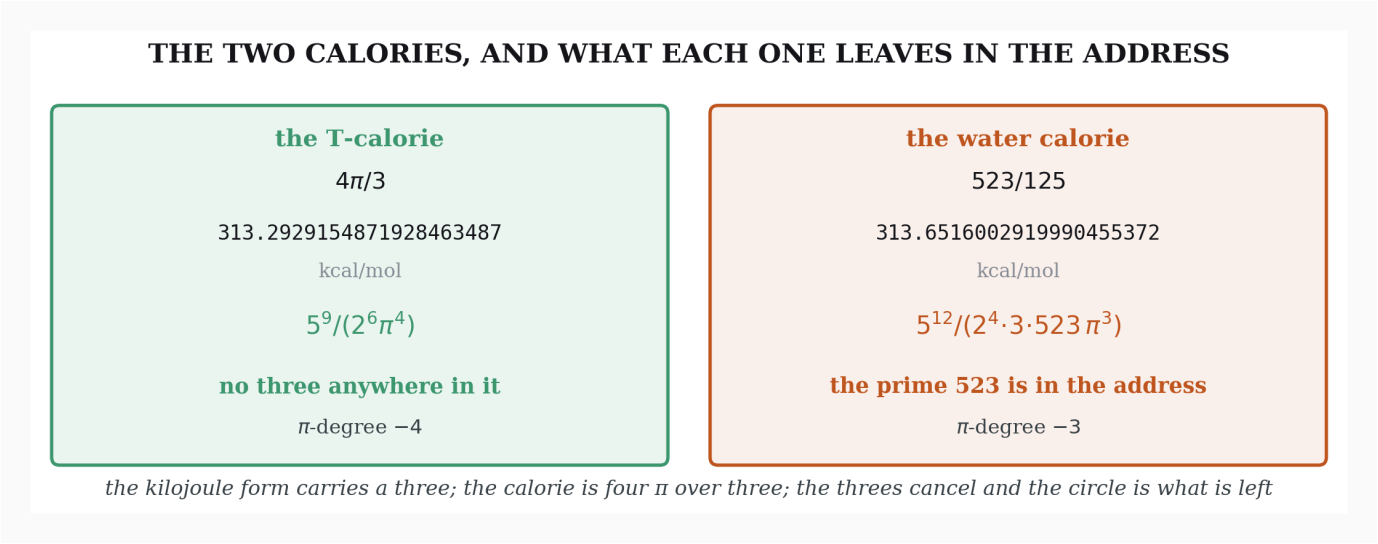


Figure 8 — The two calories, and what each leaves in the address. On the T-calorie the ground state is $5^9/(2^6\cdot\pi^4)$ with no three anywhere in it, at π-degree −4 — which is where hydrogen's second face stands. On the water calorie the foreign prime goes into the address and stays.

```
WHICH CALORIE, AND WHAT EACH ONE LEAVES BEHIND

the Tau-calorie      4·π/3    = 4.188790204786390984617  kJ
   the ground state             = 313.2929154871928463486567  kcal/mol
   the form  5⁹/(2⁶·π⁴)      NO THREE ANYWHERE IN IT.   π-degree -4,
                                 which is where hydrogen's Face 2 lives.

the water calorie    523/125   = 4.184  kJ
   the ground state             = 313.65160029199904553719 69  kcal/mol
   the form  5¹²/(2⁴·3.523·π³)
                                 523 IS PRIME AND IT IS NOT IN THE ALPHABET.
                                 It walks into the address and stays there.

the kilojoule form carries a three in its denominator; the calorie is four π
over three; the threes cancel and the circle is what is left.
```

The kilojoule form carries a three in its denominator; the T-calorie is four π over three; the threes cancel and the circle moves from the third power to the fourth. **Chemistry reached that ruling one way and the atom reaches it the other, and neither was looking for the other.**

And the same road, continued one step, closes on the mass domain.

```
AND THE IONISATION ENERGY IS HYDROGEN'S ATOMIC WEIGHT

the ground state in Tau-calories    313.2929154871928463486567   kcal/mol
/ 31104, the crossing constant      0.010072431696476107457197039
x 100, a bare power of ten          1.007243169647610745719704
hydrogen's FACE 2  5¹¹/(2¹¹·3⁵·π⁴)  1.007243169647610745719704
                                    SYMBOLIC ZERO

written as one operator:
   the G2 ionisation energy  =  Face 2 x 2⁸·3⁸·π/5⁸
                             =  Face 2 x 13.508273373316797849635

AND IT IS NOT CIRCULAR.  Face 2 is fixed on the MASS side of the framework,
as the inverse of helium-4 over four hydrogens:
   helium-4 / four hydrogens  =  2¹¹·3⁵·π⁴/5¹¹  =  0.99280891658948175718 06
   its inverse IS Face 2                              symbolic zero
No energy in it and no ionisation anywhere near it.  The two roads do not
touch until they arrive.

THREE THINGS HAD TO HAPPEN FOR THE ANSWER TO BE A BARE POWER OF TEN
   the π had to cancel     the ratio carries π¹; the calorie gear carries
                            π¹ because a kilocalorie is 4·π/3 kilojoules
   the threes had to cancel the ratio carries 3⁸; the calorie gear carries
                            3³ and the crossing constant 3⁵.  3³ x 3⁵ = 3⁸.
   the twos and fives       2⁸/5⁸ against 2⁹ x 2⁷ = 2¹⁶, leaving 10⁻⁸

The second is the one that is not free.  The 3-exponent of the calorie gear
and the 3-exponent of the crossing constant were fixed in different places
for different reasons, long before hydrogen's weight faces were written down.
```

Read the three conditions at the foot of that block. The π had to cancel and does, because a kilocalorie is four π over three. The twos and fives had to pair into a bare power of ten and do. **The middle one is the one that is not free**: the ratio between hydrogen's ionisation energy and hydrogen's atomic weight carries 3^8, and the two gears carry 3^3 and 3^5, which sum to exactly that. Those exponents were fixed in different places for different reasons.

And it is not circular. Face 2 is fixed on the **mass** side, as the inverse of helium-4 over four hydrogens — a ratio of masses with no energy in it. This route reaches it from the **energy** side through a unit conversion and one register crossing. The two roads do not touch until they arrive. **The energy domain and the mass domain, joined through the unit chemistry is measured in.**

The E = MT chain, and the degree law

There is a second road from the weight to the energy and it runs through the framework's own mass unit rather than through a bare ratio. It is given here because it is what generates the degree law, which is used twice more in this paper.

```
the weight  x  the Dalton  x  864  x  24  x  2 π
```

```
hydrogen's weight, middle face   5³/(2²·π³)
                                 1.007860451037484037013189

x the Dalton                     5¹²·π²/(2¹³·3¹¹)
                                 1.660412720510545359863249      x10⁻²⁷ kg
  1.00786451037484037013 x 1.660412720510545359863
= 1.673464313402134168520519                                  x10⁻²⁷ kg

x 864                            1.673464313402134168521 x 864
= 1445.873166779443921601728

x 24                             1445.873166779443921602 x 24
= 34700.95600270665411844148

x 2π                            34700.95600270665411844 x 6.283185307179586476925
= 218032.536901291723822588        x10⁻²⁰ J

and that is 5¹⁵/(2⁶·3⁷) = 218032.536901291723822588, exactly.

THE NET OPERATOR, WHICH IS THE WHOLE POINT
  864 x 24 x 2π  =  130288.13052967590518552 27  =  2⁹·3⁴·π  =  41472 π
  and 41472 = 4 x 10368, the gear J, so the operator is 4 J π,
  which carries π-degree PLUS THREE.
```

Every station is exact. The net operator is $2^9 \cdot 3^4 \cdot \pi = 41472\pi$, which is four times the gear J times π, and it **carries degree plus three.**

And that is the whole of the degree law. The output is a bare {2,3,5} value — free of π — **if and only if the weight going in sits at degree minus three**, because plus three and minus three cancel and nothing else does. Of every atomic weight the record holds, **only hydrogen's middle face and argon's proposed form sit at degree minus three.**

This is the same statement, in the framework's grammar, as the older observation that an element's energy divided by its weight comes out as an angle in degrees — and it says something the older form did not: *nothing about the ionisation energy enters the condition at all.* Every last-electron ionisation sits at degree minus three, because it is the invariant times Z^2 and Z^2 carries no π. **So the ionisation side is a constant and the condition is entirely a condition on the weight.**

A test of it run blind, and reported whichever way it fell. Magnesium is the third weight at degree minus three. The exponent of the output was declared before the arithmetic was looked at: the ladder carries degree plus three, so the output must be $5^{23}/(2^7 \cdot 3^{11})$, bare. That was verified. **Then the value was seen for the first time: 525734319.3028832075197435, and it is not a named object anywhere.** Hydrogen's ladder output is the ionisation energy; argon's is the day; magnesium's is nothing. **Two of three land, and the third was the only one that was tested blind.** The degree law stands as a statement about π and is not a statement about landings.

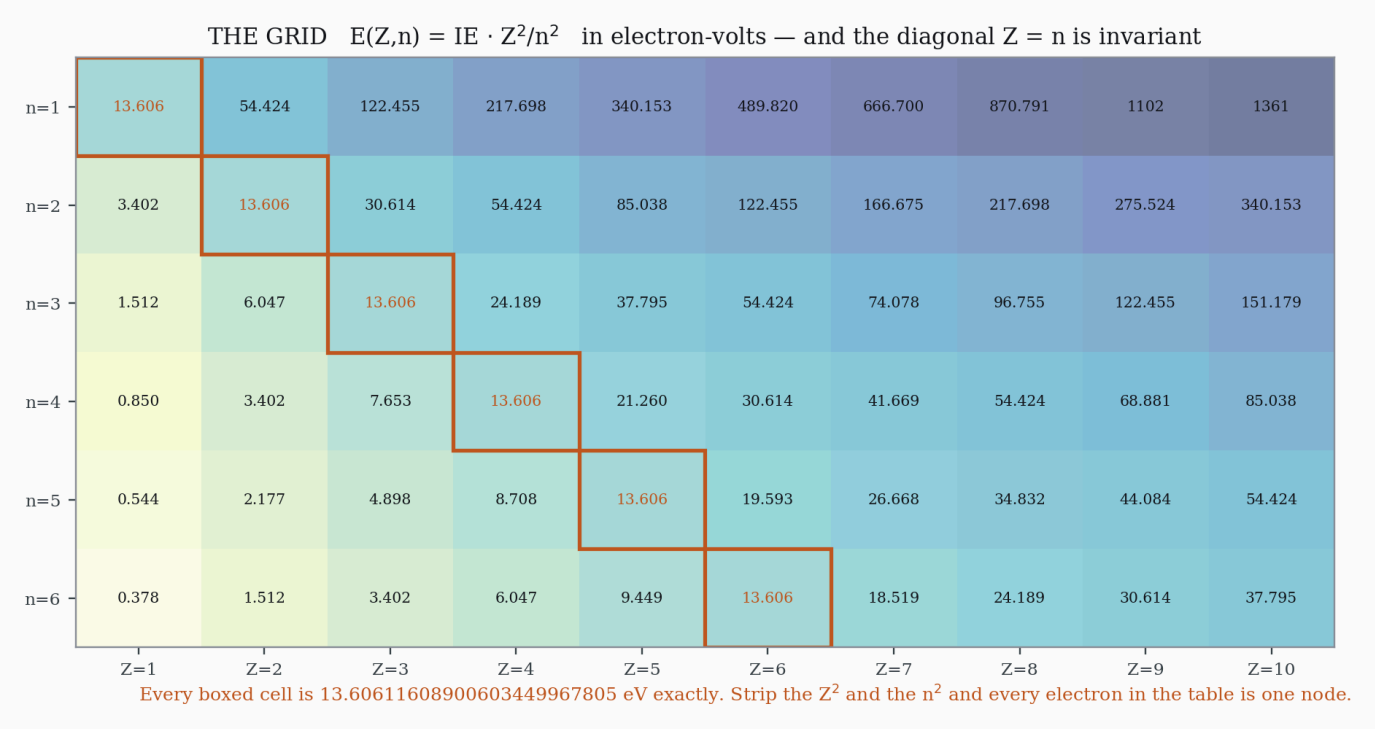


Figure 9 — The grid. Every element and every level from one equation with nothing fitted, and the diagonal is invariant: strip the Z^2 and the n^2 and every electron in the periodic table is the same node, time-equalised.

The hydrogen atomic spectrum

What it is. Heat hydrogen and it emits light, but not at every wavelength — only at particular ones, arranged in series. The series are named after the level the electron falls to: Lyman for falls to level one, Balmer to level two, Paschen to level three, and so on. Each series has a **limit**, the wavelength the lines crowd towards as the upper level runs away to infinity.

Why the lines are discrete, on this account. Conventional physics has quantisation as a postulate: Planck forced energy into lumps in 1900 and called it an act of desperation, and Bohr postulated discrete orbits in 1913. Neither said why. **The framework says why: the allowed states are discrete because the allowed addresses are discrete.** They are turns on the lattice, and an electron can no more sit between turns than a whole number can sit between whole numbers. A quantum jump is a move from one turn to another and the photon carries the gap.

The framework's Balmer limit is

$$W1 = 5^{10} / (2^5 \cdot 3^3 \cdot \pi^3) = 364.5328598949233351466 \text{ nm}$$

and its form is worth pausing on, because it is very clean:

$$W1 \times \pi^3 \times 864 = 5^{10} = 9765625 \quad \text{exactly}$$

The Balmer limit is five to the tenth, over the day rung, over π cubed.

And here is where that number comes from, carried out rather than asserted.

```
CARRIED OUT, FROM THE IONISATION ENERGY TO THE LIMIT

hydrogen's ionisation energy    13.606116089006034499 68   eV

  / 31104        the Giza constant, which is 2⁷ x 3⁵
                                0.000437439431873908002175863  eV
  / 12
                                0.000036453285989492333514655 3  eV

and read at its own decade, in nanometres
                                364.5328598949233351466   nm

THAT IS THE BALMER LIMIT.  Two divisions, and the energy has become a length.
```

The series limits. Every limit is the Balmer limit carried by $n^2/4$:

```
n = 1   Lyman          91.133214973730833786 66  nm
n = 2   Balmer        364.532859894923335146 55
n = 3   Paschen       820.198934763577504079 74
n = 4   Brackett     1458.131439579693340586 21
n = 5   Pfund        2278.330374343270844665 95
n = 6   Humphreys    3280.795739054310016318 98
n = 7                4465.527533712810855458 29
n = 8                5832.525758318773362344 84
```

And from that one number, every line a hydrogen tube emits.

```
CARRIED OUT, FROM THE LIMIT TO EVERY VISIBLE LINE

the Balmer limit                364.5328598949233351466   nm

  x 9/5     the fall from level three to level two
                                656.1591478108620032638   nm   H-ALPHA, red
  x 4/3     from the limit, the fall from four to two
                                486.0438131932311135287   nm   H-BETA, blue-green
  x 25/21   from the limit, five to two
                                433.9676903510992085078   nm   H-GAMMA, violet
  x 9/8     from the limit, six to two
                                410.0994673817887520399   nm   H-DELTA

EACH RATIO IS n²/(n² - 4) AND NOTHING ELSE ENTERS.  The whole visible spectrum
of hydrogen is one number and four fractions.
```

The lines themselves. A Balmer line is a difference between two rungs:

$$\text{lambda}(n) \;=\; W1 \times n^2 / (n^2 - 4)$$

```
n = 3   H-alpha       656.15914781086200326  nm
n = 4   H-beta        486.04381319323111353
n = 5   H-gamma       433.96769035109920851
n = 6   H-delta       410.09946738178875204
```

And H-beta is the anchor of the entire framework, because it has the leanest form of any line in the spectrum:

$$\text{H-beta} \;=\; 486 \times (1 + \text{delta_G}) \;=\; 486.0438131932311135287 \;\; \text{nm}$$

486 is $2 \cdot 3^5$. The G2 face of the line is the bare integer 486 advanced by one G-bond step, and it recurs in more places in this work than any other single object.

A declaration required by the framework's own rule: every wavelength in this paper is stated in the framework's own metre, and in vacuum. The framework derives its own spin-orbit speed from hydrogen, and its metre follows from that; the SI metre is defined against a different speed, and the two differ. A wavelength quoted here and a wavelength quoted from a laboratory table are therefore not directly comparable without that conversion, and this paper does not pretend otherwise.

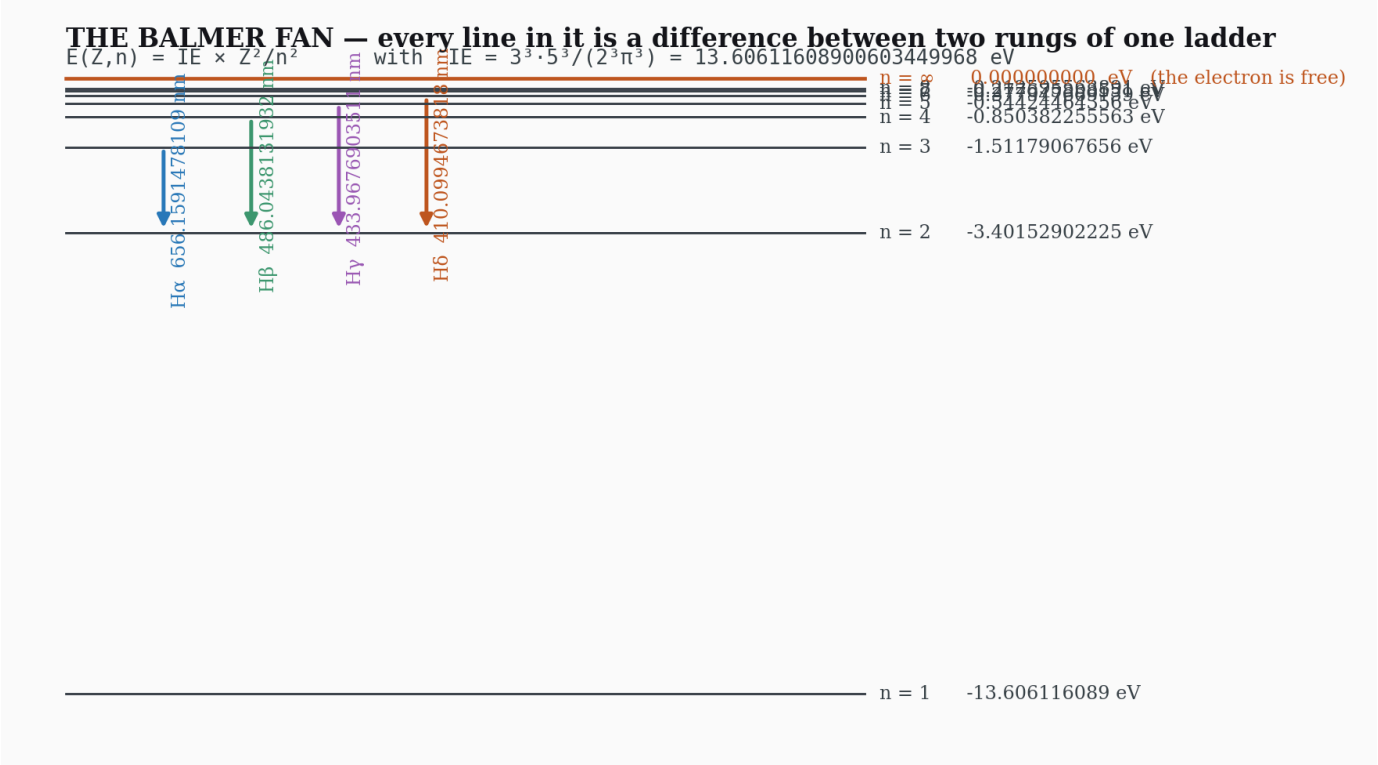


Figure 10 — The Balmer fan. The levels are E(Z,n) = IE·Z²/n², and every line is a difference between two of them. The framework supplies the level structure, the limit, and the lines, from one address and one exponent.

And the fifth rung is the Higgs

This is Stephen's, and it came from reading the kilocalorie column and recognising a number in it.

The fifth rung of the ladder in T-calories is **12.531716619487713 85395 kcal/mol**, and its form is $5^7/(2^6 \cdot \pi^4)$ — the ground state over twenty-five. Read that at the decade above and it is **125.3171661948771385395**, which is a number this framework already prints, in a different paper, about a different object.

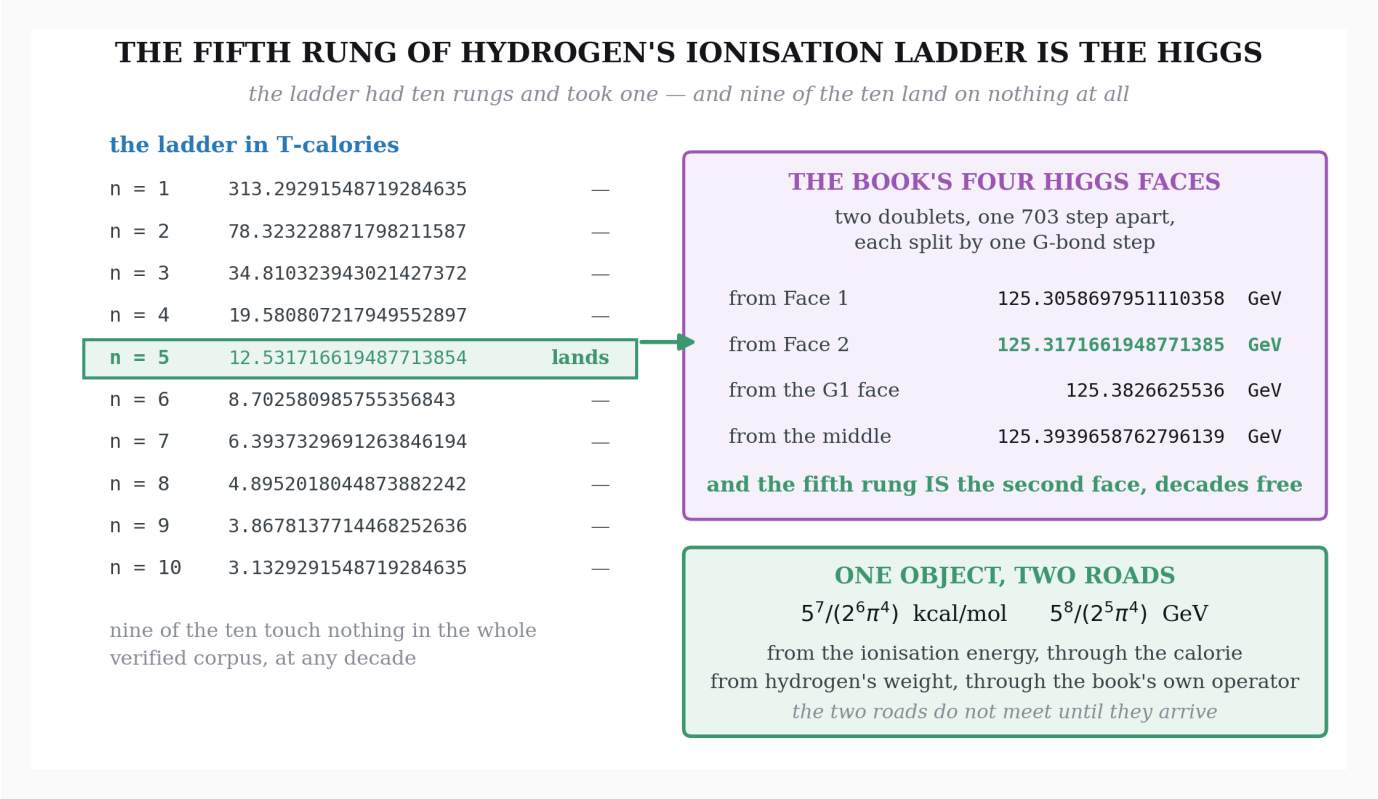


Figure 11 — The ladder had ten rungs and took one. Nine of the ten land on nothing in the whole verified corpus at any decade; the fifth is the Higgs boson's second face, exactly, decades free. Two roads to one address — one from the ionisation energy through the calorie, one from hydrogen's weight through the framework's own operator.

The framework's Higgs work gives four faces, and its prediction is that the mass is not one number but **two doublets spanning one 703 step, each doublet split by one G-bond step**:

```
from Face 1        125.305869795111036  GeV     the base
from Face 2        125.317166194877139  GeV     one G-bond step up
from the G1 face   125.382662553600000  GeV     one 703 step less one G-bond step
from the middle    125.393965876279614  GeV     one 703 step up
```

The second line is the fifth rung of this ladder. Not near it — **the same monomial**, one decade apart, and the decade is free:

```
the fifth rung in Tau-calories      12.53171661948771385395  5⁷/(2⁶·π⁴)
the Higgs from Face 2               125.31716619487713853 95  5⁸/(2⁵·π⁴)

5⁷/(2⁶·π⁴) x 10  -  5⁸/(2⁵·π⁴)   =   SYMBOLIC ZERO
```

And the two roads to it do not touch until they arrive. The Higgs face is reached in the framework's Higgs work from hydrogen's *atomic weight* — Face 2 of the weight, carried by an operator fixed there. This rung is reached from hydrogen's *ionisation energy*, divided by 10368 into kilojoules per mole, divided by the T-calorie, divided by twenty-five. A weight on one side and an energy on the other, with a unit conversion in between, and nothing in either road looking at the other.

Could it have missed

It could, and this is the part that decides what the landing is worth.

Both objects are monomials, so the *ratio* between them was always going to be a monomial — that is guaranteed and worth nothing. What is not guaranteed is that the ratio is a bare power of ten, and what is not guaranteed is which rung it happens on.

The ladder had ten rungs and it took one. Run every rung against the four Higgs faces and against the 234 verified addresses of this framework, decades free:

```
n     the rung in Tau-calories      what it lands on
-----------------------------------------------------------------
1     313.29291548719284635         nothing
2      78.323228871798211587        nothing
3      34.810323943021427372        nothing
4      19.580807217949552897        nothing
5      12.531716619487713854        THE HIGGS, FROM FACE 2, x 10
6       8.702580985755356843        nothing
7       6.3937329691263846194       nothing - and this rung carries a seven
8       4.8952018044873882242       nothing
9       3.8678137714468252636       nothing
10      3.1329291548719284635       nothing

ten rungs against 238 targets is 2,380 pairings.   ONE LANDED.
the base rate against the 234 verified addresses alone is ZERO.
```

Nine of the ten rungs touch nothing whatever in the framework's own verified corpus, at any decade. That is the control, and it was run on the whole ladder rather than on the rung that was already known to land.

What it adds, and what it does not

What it adds. The framework's Higgs work already says both Higgs faces are faces of hydrogen, carried up by one operator from hydrogen's weight — and it says the 703 step between the Higgs faces is not a fact about the Higgs at all but the 703 step between hydrogen's own faces, seen at the far end of a multiplication. **This is a second, independent road to the same place, and it arrives through the energy rather than the mass.** The ionisation ladder and the Higgs were two separate chapters with no cross-reference between them.

What it does not add. It does not change the Higgs prediction, which stands as the framework states it: four faces, two doublets, one 703 step across, each doublet split by one G-bond step. And it makes no claim against any measurement — the four faces are the framework's and the comparison with the experiments is where the framework's Higgs work already leaves it.

Why exactly two of those limits can be ionisation rungs, and no others

The limits above and the ionisation ladder are two ladders crossing, and they run in opposite directions: the ionisation ladder divides the Balmer limit by n^2, the series-limit ladder multiplies it by $m^2/4$. Setting them equal is one line of algebra and what comes out is a theorem.

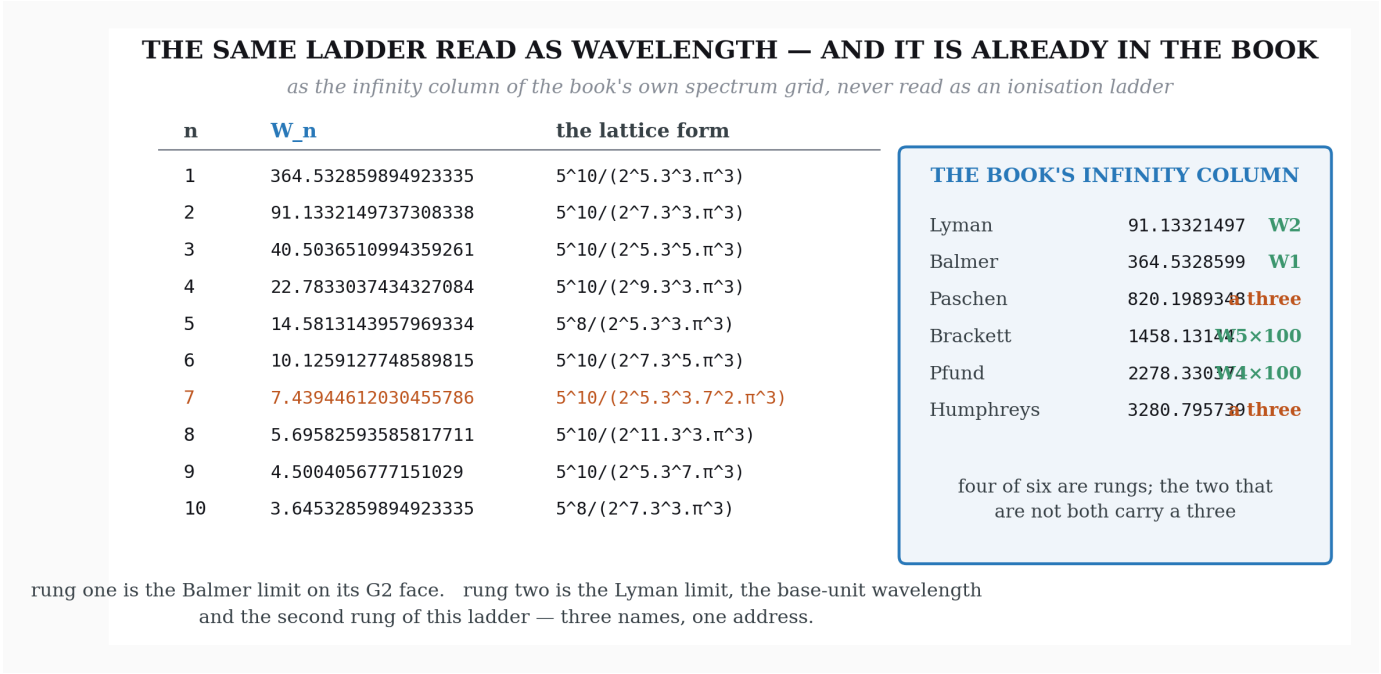


Figure 12 — Left: the ionisation ladder read as wavelength. Right: the infinity column of the framework's own spectrum grid — four of the six series limits are rungs of that ladder, and the two that are not are the two carrying a three. The values were never missing from the framework's record; the reading was.

THE IONISATION LADDER READ AS WAVELENGTH

W_n = the G2 ionisation / 12 / 31104 / n^2 = $5^{10}/(2^5 \cdot 3^3 \cdot \pi^3 . n^2)$
and $2^5 \cdot 3^3$ = 864 - THE DAY RUNG SITS IN THE DENOMINATOR.

n	W_n	the lattice form
1	364.5328598949233351466	$5^{10}/(2^5 \cdot 3^3 \cdot \pi^3)$
2	91.13321497373083378664	$5^{10}/(2^7 \cdot 3^3 \cdot \pi^3)$
3	40.50365109943592612739	$5^{10}/(2^5 \cdot 3^5 \cdot \pi^3)$
4	22.78330374343270844666	$5^{10}/(2^9 \cdot 3^3 \cdot \pi^3)$
5	14.58131439579693340586	$5^8/(2^5 \cdot 3^3 \cdot \pi^3)$
6	10.12591277485898153185	$5^{10}/(2^7 \cdot 3^5 \cdot \pi^3)$
7	7.439446120304557860134	$5^{10}/(2^5 \cdot 3^3 \cdot 7^2 \cdot \pi^3)$ OFF THE LATTICE
8	5.695825935858177111665	$5^{10}/(2^{11} \cdot 3^3 \cdot \pi^3)$
9	4.500405677715102903044	$5^{10}/(2^5 \cdot 3^7 \cdot \pi^3)$
10	3.645328598949233351466	$5^8/(2^7 \cdot 3^3 \cdot \pi^3)$

RUNG ONE is the Balmer limit on its G2 face, $(3^6/2)(1+\delta_G)$ symbolic zero
RUNG TWO is three things at once, all symbolic zero:
the Lyman limit on its G2 face 91.125 x $(1+\delta_G)$
Face G2's own base-unit wavelength $5/(2^{16} \cdot 3^3 \cdot \pi^3) \times 10^9$
the second rung of this ladder
Three names, one address.

The day rung is sitting in the denominator: $2^5 \cdot 3^3$ is 864. And the first two rungs are not new objects — rung one is the Balmer limit lifted one G-bond step, rung two is the Lyman limit on its orbital face, the orbital face's own base-unit wavelength, and the second rung of this ladder all at once. Three names, one address.

```
THE DIVISOR THEOREM.   WHY EXACTLY TWO RUNGS CAN BE SERIES LIMITS, EVER.

   the IONISATION ladder     W_n  =  the Balmer limit / n²
   the SERIES-LIMIT ladder   L_m  =  the Balmer limit x m²/4

   they coincide when   m²/4 = 1/n²   <=>   (m.n)² = 4   <=>   m.n = 2

   TWO HAS EXACTLY TWO ORDERED DIVISOR PAIRS - (1,2) and (2,1) - so:

      m = 1, n = 2      the Lyman limit at rung 2
      m = 2, n = 1      the Balmer limit at rung 1

   AND NO OTHER RUNG CAN BE A SERIES LIMIT.  Checked exhaustively over
   m <= 6 and n <= 10: exactly 2 coincidences and no others.
```

Two has exactly two ordered divisor pairs, so there are exactly two coincidences and there can never be a third. And the same machine, crossed with the doubling transitions instead, gives the constant six — which has four ordered divisor pairs, and four rungs land. **Same machine; the constant is set by which ladder you cross it with.**

And three criteria on that ladder, nested by the three

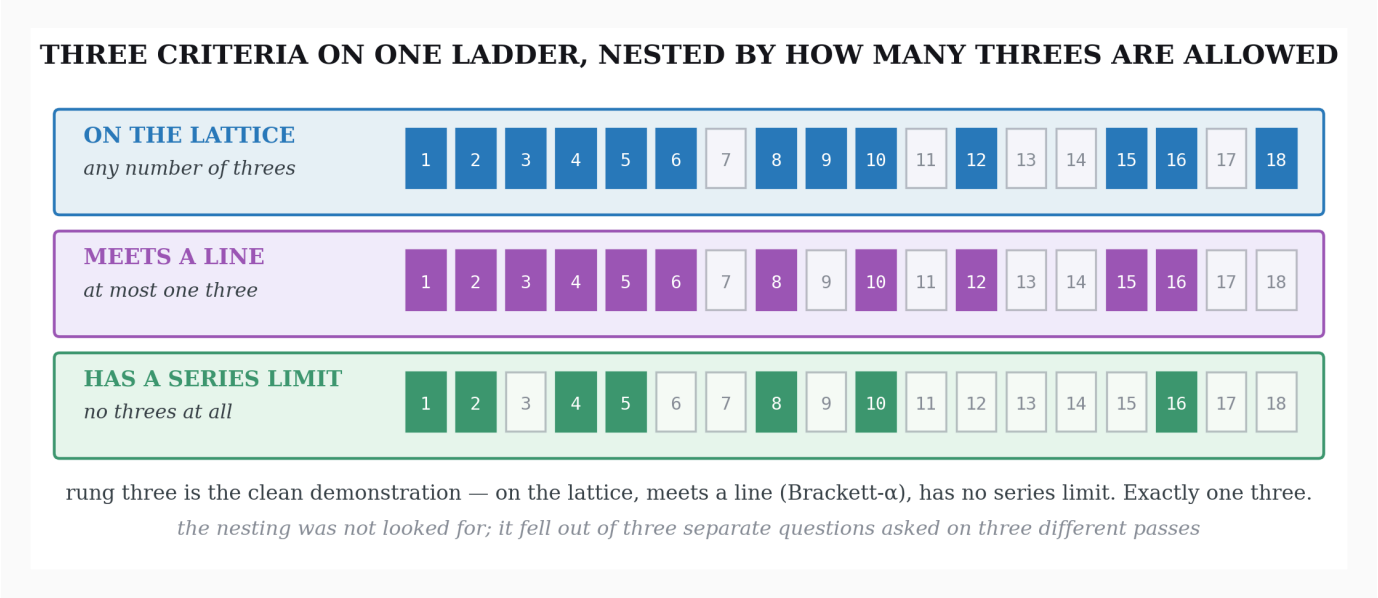


Figure 13 — A rung is on the lattice when its number is built from twos, threes and fives, with any number of threes; it meets a spectral line when it carries at most one three; it has a series limit of its own when it carries none. Each set sits strictly inside the one above it.

```
THREE CRITERIA ON ONE LADDER, AND THEY NEST - BY HOW MANY THREES ARE ALLOWED

n     on the lattice     meets a line       has a series limit
      any threes         at most one three  no threes at all
-----------------------------------------------------------------------
1     yes                yes                yes
2     yes                yes                yes
3     yes                yes                no
4     yes                yes                yes
5     yes                yes                yes
6     yes                yes                no
7     no                 no                 no
8     yes                yes                yes
9     yes                no                 no
10    yes                yes                yes
11    no                 no                 no
12    yes                yes                no
13    no                 no                 no
14    no                 no                 no
15    yes                yes                no
16    yes                yes                yes
17    no                 no                 no
18    yes                no                 no

lattice  >  meets-a-line  >  has-a-limit,   strictly nested, and the nesting
is by how many threes are permitted: any, one, none.
Rung three is the clean demonstration - on the lattice, meets a line
(Brackett-alpha), has no series limit.  Exactly one three.
```

Each condition is the one above it with one more three forbidden, and the seven blocks all three at once because the seven is not in the alphabet at any strength. Rung three is the clean demonstration — on the lattice, meets a line (Brackett-α, which this framework prints as 4,050.365), and has no series limit of its own. Exactly one three.

And it is worth carrying four rungs out by hand, because the whole thing is decided by factorising a small number and nothing else.

```
rung 4      4  =  2²                no three at all
            on the lattice           yes - twos only
            meets a line             yes - zero threes is at most one
            has a series limit       yes - zero threes is none

rung 3      3  =  3¹                exactly one three
            on the lattice           yes
            meets a line             yes - one three is at most one
            has a series limit       NO  - one three is not none

rung 9      9  =  3²                two threes
            on the lattice           yes
            meets a line             NO  - two threes is more than one
            has a series limit       NO

rung 7      7  =  7¹                a prime outside the alphabet
            on the lattice           NO
            meets a line             NO
            has a series limit       NO
```

Four rungs, four different answers, every one read straight off the prime factorisation of a single-digit number. Rung four passes all three because it has no threes; rung three drops out at the third criterion because it has one; rung nine drops out at the second because it has two; and rung seven fails at the first, after which nothing further needs testing.

The lines themselves are differences, and that is why most of them are in the gap

Everything above has been about the rungs. The spectrum is the gaps between them, and that produces two statements pulling opposite ways.

The first is a theorem with no exceptions. Every ionisation level is on the lattice, because a level is the ionisation over n² and a smooth number has a smooth square.

The second is its consequence. A line is a difference of two lattice numbers — and a difference of two lattice numbers is exactly what this framework does not expect to land.

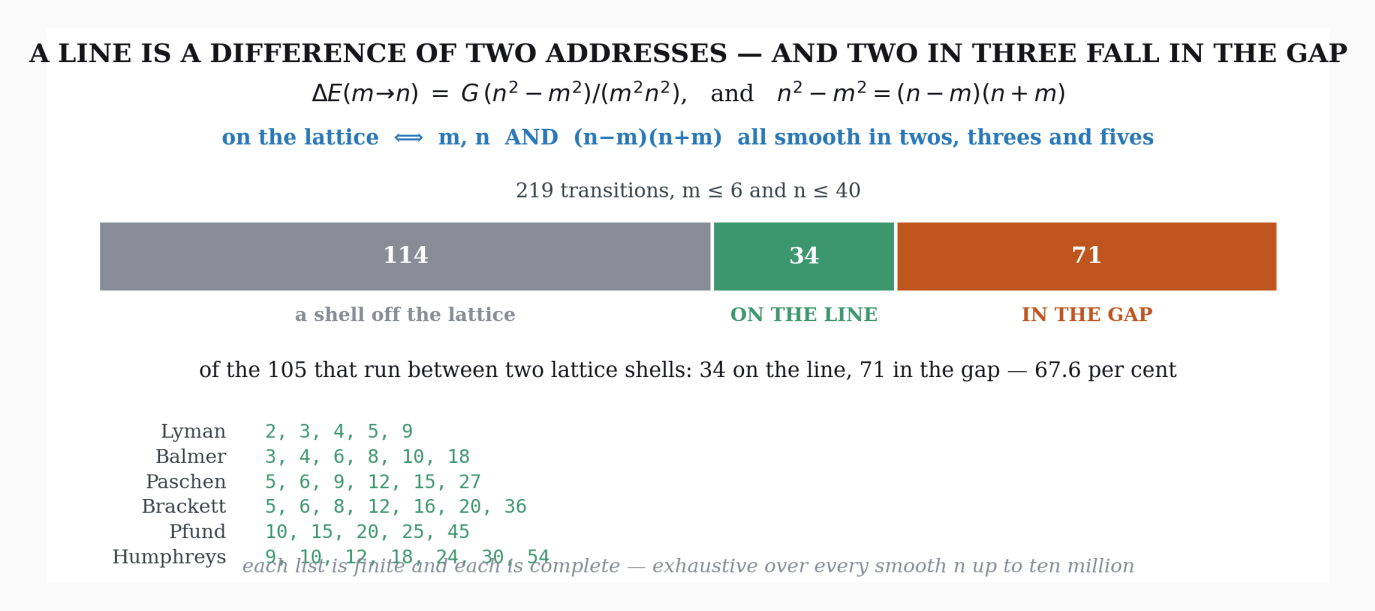


Figure 14 — The census. Of 219 transitions with m ≤ 6 and n ≤ 40, 114 have a shell off the lattice altogether — bad shells, not gap cases. Of the 105 running between two lattice shells, two in every three fall in the gap. Below, the complete clean list for each of the first six series.

```
THE LINES ARE THE DIFFERENCES, AND THE LAW IS ONE LINE

   IE(n) x n² = G,  so a line is a difference of two of them:

      dE( m -> n )  =  G ( 1/m² - 1/n² )  =  G ( n² - m² ) / ( m² n² )

   and  n² - m²  factors as  ( n - m )( n + m ).

   ON THE LATTICE  <=>  m, n  AND  (n-m)(n+m)  ALL {2,3,5}-SMOOTH

   Three conditions.  All decidable by inspection.  No arithmetic required.

THE CENSUS,  m <= 6,  n <= 40

   transitions examined                                219
   with a shell off the lattice altogether             114
   running between two lattice shells                  105
      ON THE LINE                                       34   32.38 %
      IN THE GAP                                        71   67.62 %

   TWO IN EVERY THREE FALL IN THE GAP - and a difference of two lattice
   numbers is exactly the thing this framework does not expect to land.
```

```
THE COMPLETE CLEAN LIST FOR EACH SERIES.   Each list is finite and each
is complete - exhaustive over every smooth n up to ten million.

Lyman        n1 = 1    n = 2, 3, 4, 5, 9
Balmer       n1 = 2    n = 3, 4, 6, 8, 10, 18
Paschen      n1 = 3    n = 5, 6, 9, 12, 15, 27
Brackett     n1 = 4    n = 5, 6, 8, 12, 16, 20, 36
Pfund        n1 = 5    n = 10, 15, 20, 25, 45
Humphreys    n1 = 6    n = 9, 10, 12, 18, 24, 30, 54
```

And it is the same mechanism as the seventy-three. This framework already carries one instance of a foreign prime being *made* by subtracting two lattice numbers: 15,625 minus 15,552 is 73, a prime foreign to the alphabet, out of two numbers that are both perfectly clean. The subtraction did it. Here $n^2 - m^2$ does the same thing by the same act — and the seventy-three was one instance where the spectrum is seventy-one of them in the first six series alone. **The gap is not a failure of the framework. It is the framework's own prediction about what subtraction does.**

What came out of putting the ionisation work in one place

Consolidating hydrogen's ionisation was meant to be a tidying job. It turned up something the framework has half of already, and the missing half is a line of explanation this paper has been short of.

The framework establishes that the alphabet has two mirrors, and that **three has no mirror**. The DNA paper uses that once — *three is the prime no mirror can touch, which is why the reading frame is three and not two or four.* That is as far as it goes. What follows is the same fact carried through to its consequence, and the consequence turns out to be why several of this paper's domains sort the way they do.

The four builders are not equal, and the inequality is about leaving

Ask a question that has not been asked of the alphabet directly: **how does each builder get out of a calculation?**

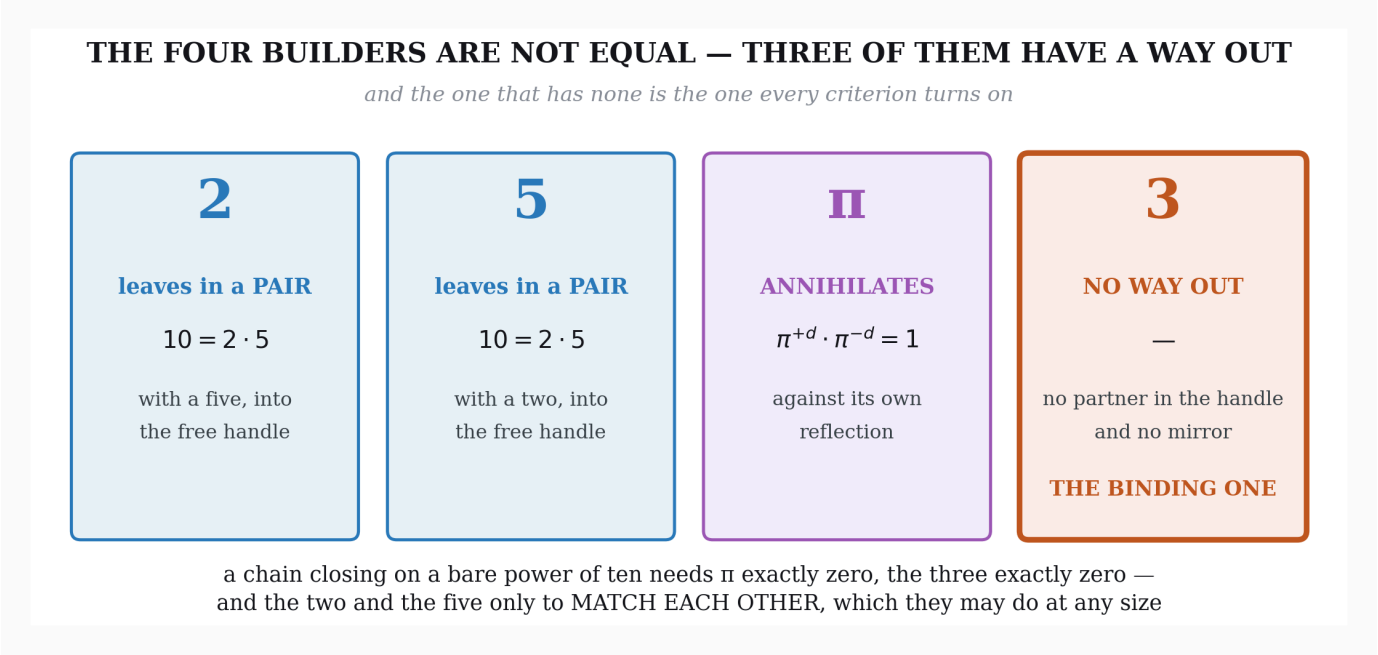


Figure 15 — The four builders and their escape routes. The two and the five leave together, as a pair, into the free handle. π leaves by meeting its own reflection. The three has neither a partner nor a mirror, and cannot leave at all.

Two and five leave in a pair. The handle of this framework is the decade, and a decade is $10^n = 2^n \cdot 5^n$. Every power of ten takes exactly one two with exactly one five. So a two can always be removed — provided a five goes with it. Neither can leave alone, and neither needs to.

π leaves by annihilation. The framework's own rule: a π-degree taken positively and the same π-degree taken negatively are the two orientations of one step, and they cancel. That is how the electron-volt conversion came out

clean in the framework's ionisation work — the energy face carries three circles, the charge carries three the other way, and the depth coordinate vanishes.

Three has neither. There is no third builder to pair it into the handle: 2×5 is ten, but 2×3 is six and 3×5 is fifteen, and neither of those is free. And the framework says it has no mirror to annihilate against. **The three is the only builder in the alphabet with no way out of a calculation.**

Which means a closing chain can negotiate with everything except the three

Take the framework's strongest kind of landing — a chain that ends on a bare power of ten. Ask what that actually demands, exponent by exponent.

```
a power of ten is 2^n . 5^n, so the chain must arrive with

   the π-exponent       EXACTLY ZERO          one exact condition
   the three-exponent    EXACTLY ZERO          one exact condition
   the two and the five  EQUAL TO EACH OTHER   a RELATIVE condition

the two and the five may be anything at all, of any size, so long as
they match.  the three is allowed one value and one only.
```

That is the whole of it, and it is not a new rule — it is arithmetic. But it says which builder a chain has to satisfy honestly and which two it can satisfy by bookkeeping.

And it is exactly what happened in the hardest chain of the ionisation section. Hydrogen's ionisation energy reaches hydrogen's atomic weight through the calorie gear and the crossing constant, and it lands on a bare power of ten. Watch the three builders leave:

```
the ratio between the energy and the weight        2⁸ . 3⁸ . π / 5⁸
the calorie gear                                   2⁹ . 3³ . π
the crossing constant                              2⁷ . 3⁵

π      + 1 against + 1                    ANNIHILATES
twos    2⁸ against 2¹⁶, leaving 2⁻⁸
fives   5⁻⁸                               PAIRS INTO 10⁻⁸, FREE
THREES  3⁸ against 3³ x 3⁵ = 3⁸        HAD TO MATCH, AND NOTHING COULD HIDE IT
```

The π cancelled itself. The twos and fives walked off together as a decade. **The threes had to add up on their own merits, and the two exponents that had to supply them — the three in the calorie gear and the three in the crossing constant — were fixed in different places, for different reasons, long before hydrogen's weight faces were written down.**

And that is why the criteria sort on the three

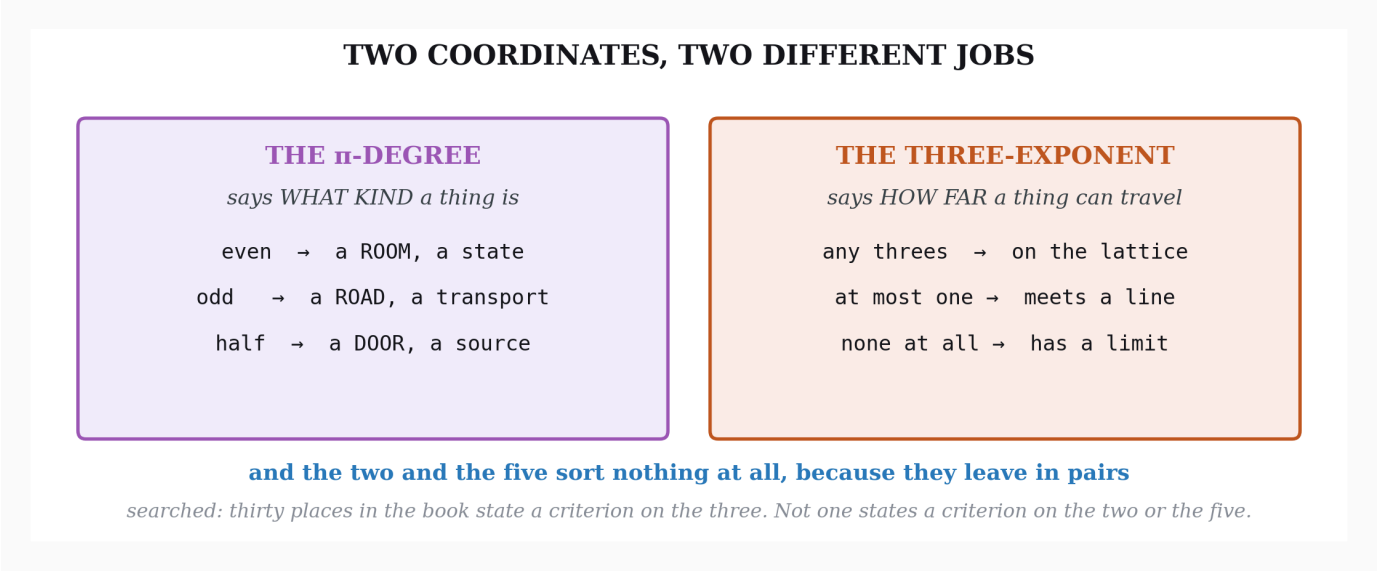


Figure 16 — Two coordinates doing two different jobs. The π-degree says what kind of thing an address is — a room, a road or a door. The three-exponent says how far it can travel — which closures it can reach. The two and the five sort nothing, because they leave in pairs.

This framework has a coordinate that says **what kind** a thing is: the π-degree, and the parity law that reads it — even a room, odd a road, half a door. That coordinate is settled and it is used everywhere.

What the ionisation work adds is a second coordinate doing a second job. **The three-exponent says how far a thing can travel.** Every criterion that came out of the ladder sorts on it, and on nothing else:

```
on the lattice        any number of threes
meets a spectral line at most one three
has a series limit    no threes at all

and the two series limits that are NOT ionisation rungs
are the two that carry a three

and the calorie the framework rules for is the one that
REMOVES the three: 4·π/3 leaves 5⁹/(2⁶·π⁴), with no
three in it, where the water calorie leaves the prime 523
```

Carried out on the calorie, because that is the case where you can watch the three leave.

```
the ground state in kilojoules per mole
  5⁹/(2⁴·3·π³)                    1312.318295621724006527590   kJ/mol
  one three in the denominator

divided by the Tau-calorie, 4·π/3
  the division by 4·π/3 is a multiplication by 3/(4·π)
  so the three in the denominator meets a three in the numerator

  3⁻¹ x 3^+1 = 3⁰                   THE THREE IS GONE
  2⁻⁴ x 2⁻² = 2⁻⁶                  the twos accumulate
  π⁻³ x π⁻¹ = π⁻⁴                the circle deepens by one

  5⁹/(2⁶·π⁴)                      313.2929154871928463486567   kcal/mol

and the same energy divided by the water calorie, 523/125

  x 125/523                           5⁹ x 5³ = 5¹² in the numerator
                                      and the 523 CANNOT GO ANYWHERE
```

```
5¹²/(2⁴·3.523·π³)              313.6516002919990455371869   kcal/mol
the three is still there, and now a foreign prime is with it
```

One division removes the three and deepens the circle by one. The other keeps the three and brings in a prime that is not in the alphabet at all. **The framework does not choose the T-calorie because it is nearer anything. It chooses it because it is the one that lets the three out.**

The test that could have broken this was run. The framework's record was searched for criteria that sort objects on a builder. **Thirty places state a criterion on the three. Not one states a criterion on the two or the five.** The parity law sorts on the π-degree, which is the other coordinate doing the other job. Nothing sorts on the two and nothing sorts on the five — and on the argument above, nothing could, because neither of them is ever alone.

And the corpus is built the same way

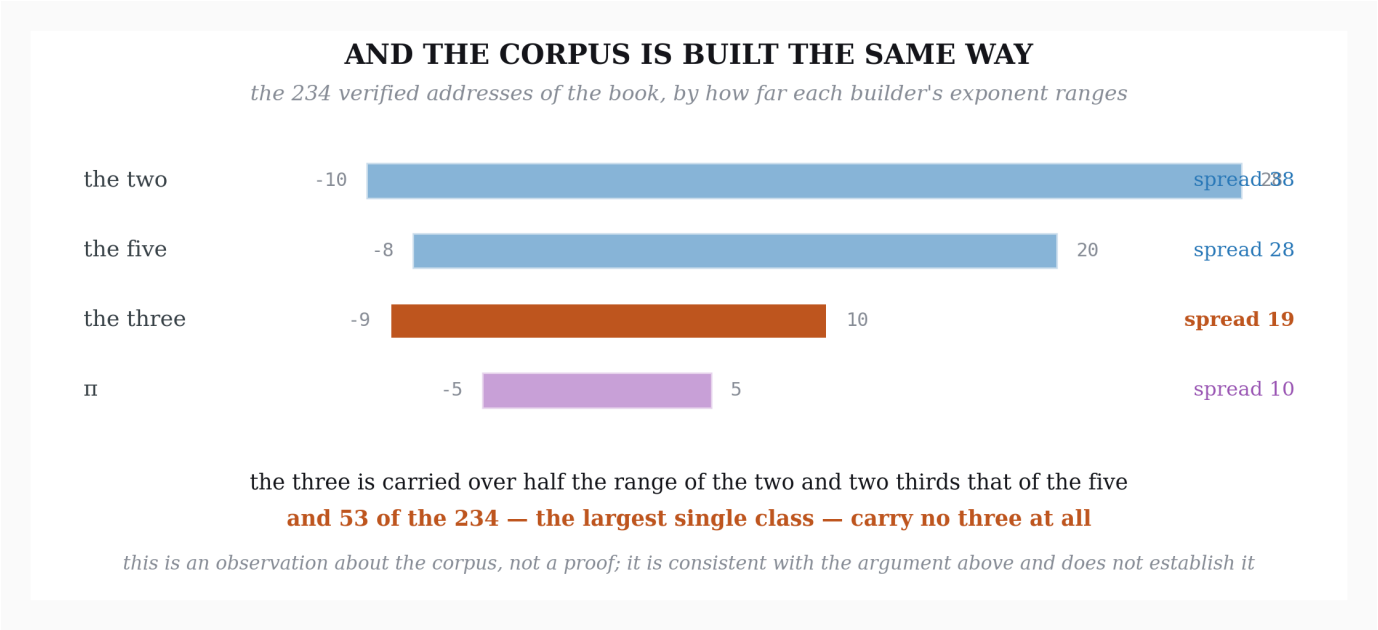


Figure 17 — The 234 verified addresses of this framework, by how far each builder's exponent ranges. The two spans thirty-eight, the five twenty-eight, the three nineteen and π ten. And fifty-three of the 234 — the largest single class — carry no three at all.

```
the two    exponent runs from -10 to 28      spread 38
the five   exponent runs from  -8 to 20      spread 28
the three  exponent runs from  -9 to 10      spread 19
π         exponent runs from  -5 to  5      spread 10

carrying no three at all      53 of 234      22.6 per cent
carrying exactly one three    39 of 234      16.7 per cent
```

The three is carried over half the range of the two and two thirds that of the five, and the largest single class of address in the whole corpus is the one carrying no three at all. **This is an observation about the corpus and it is not a proof.** It is consistent with the argument and it does not establish it, and it is printed here as the weaker kind of evidence it is.

What it means for the six domains, and what would break it

The reading frame of the genetic code is three. The criteria on the ionisation ladder are three. The calorie chemistry is measured in is the one that removes the three. Those are three different domains of this paper, and until now they were three separate observations with the same number in them. **They are the same fact: the three is the only builder that cannot be traded away, so it is the only one that can carry a condition.**

What would break it. A criterion, anywhere in this framework, that sorts objects on the two or on the five — on how many twos a thing carries, or how many fives — rather than on their difference. The search above found none in the present manuscript. One would be enough.

The lines in full, series by series

The framework's own values for the first several lines of the first three series are given here at full precision, so that the reader has the whole table rather than the examples used in the argument. Every value is the Balmer limit carried by the appropriate ratio; nothing below is separately fitted.

```
THE LYMAN SERIES         lower level n = 1        limit 91.1332149737308337866382 nm

  2 -> 1     121.5109532983077783821843
  3 -> 1     102.524866845447188009968
  4 -> 1     97.20876263864622270574741
  5 -> 1     94.9304322643029518610 8146
  6 -> 1     93.737021115837429037685
  7 -> 1     93.03182361901689282385983
  8 -> 1     92.57977394156783114833087
  limit        91.1332149737308337866382

THE BALMER SERIES        lower level n = 2        limit 364.5328598949233351465528 nm

  3 -> 2     656.159147810862003263795
  4 -> 2     486.043813193231113528737
  5 -> 2     433.9676903510992085078009
  6 -> 2     410.0994673817887520398719
  7 -> 2     396.9357807744720760484686
  8 -> 2     388.835050554 5848908229896
  limit        364.5328598949233351465528

THE PASCHEN SERIES       lower level n = 3        limit 820.1989347635775040797438 nm

  4 -> 3     1874.7404223167485807537
  5 -> 3     1281.5608355680898501246
  6 -> 3     1093.598579684770005439658
  7 -> 3     1004.743695085382442497686
  8 -> 3     954.4133059067083683837018
  limit        820.1989347635775040797438
```

Two of these are the spine of the rest of this paper. The line at 4 → 2 is H-beta, which is 486 advanced by one G-bond step and is the leanest object in the visible spectrum. The line at 2 → 1 is Lyman-alpha, and it is the Balmer limit divided by three exactly.

And a declaration the framework's own rules require. These wavelengths are in the framework's metre, in vacuum. The framework derives its own spin-orbit speed from hydrogen and its metre follows from that speed; the SI metre is defined against a different one. **A reader comparing these figures with a laboratory table must convert, and this paper does not pretend the two are the same unit.**

The Fraunhofer lines

What they are. In 1814 Joseph von Fraunhofer, examining sunlight through a prism, found the spectrum crossed by hundreds of dark lines. They are wavelengths at which the Sun's outer layers absorb the light coming from below. The strongest were labelled with letters — A, B, C, D, F, G, H, K and the rest — and those labels are still in use two centuries later.

And the first thing to say about them is a result, not a dismissal.

Four of the strongest lines in the solar comb — **C, F, G′ and h** — *are* hydrogen's Balmer lines. Fraunhofer's C is H-alpha; his F is H-beta; his G′ is H-gamma; his h is H-delta.

Conventional science treats these as two subjects. One is astrophysics: absorption in a stellar atmosphere, catalogued by letter, studied by astronomers. The other is atomic physics: emission from a hot gas in a laboratory, catalogued by series and level, studied by spectroscopists. They appear in different textbooks and are taught by different departments.

That they are one object is part of the unification and not a reason to set the domain aside. It would be easy to write "the Fraunhofer lines are just the hydrogen spectrum in absorption, so why bother with them" — and that would be wrong twice over. **It would be wrong because the identification is itself the thing being claimed**, and it would be wrong because **the identification covers only four lines out of a comb of thirty, and the rest are not hydrogen at all.**

And the framework has a reading of what a Fraunhofer line IS that conventional science does not.

An emission line is where light comes *out*. An absorption line is where light is taken *in*. **They are one address read in two directions** — and an absorption line is, quite literally, **a gap**: an absence in an otherwise continuous band. The framework's standing position is that **the values between the lines are as important as the lines themselves**, and a Fraunhofer catalogue is a catalogue of gaps. That a gap carries an exact address is a substantive claim about the world, and it is the claim this section is making.

What the framework carries for the comb as a whole

The grammar, and every leg of it is a monomial in the wavelength. Given a line at λ, the framework reads off seven further quantities with no free parameter anywhere:

```
spin-orbit             lambda . π² / 2⁴
creator mass           lambda . 5³ . π / (2⁵ . 3)
circumference          lambda . 3²
source wavelength      lambda . 3 / 2²
nodal mass             lambda . π² / 2³
nodal radius           lambda . π² / (2³ . 3 . 5⁵)
node radius, km        4 . π² . lambda / 3
free fall              50 . π . sqrt( lambda / (2⁹ . 3⁵) )
```

And the degree law across the comb: the π-degree of the distance is the π-degree of the wavelength plus two, verified exact at forty places on every lattice-faced line in the corpus.

The cleanest object in the comb is the 703-step face of H-beta, and it is worth setting out in full because four separate quantities come out as bare integers at once:

And rather than assert that, here is the whole grammar carried out on it, one leg at a time, with no step left for the reader to take on trust.

```
THE LINE                 486.3416814832213029306214 nm  =   4800 / π²

leg 1  spin-orbit        486.3416814832213029306 x 9.869604401089358618834 / 16
                       = 4800.0 / 16
                       = 300.0                    EXACTLY 300

leg 2  creator mass      486.3416814832213 x 125 x 3.141592653589793 / 96
                       = 1989.436788648691697111047

leg 3  circumference     486.3416814832213029306 x 9
                       = 4377.075133348991726376  nm

leg 4  source wavelength 486.3416814832213029306 x 3 / 4
                       = 364.756261112415977198  nm

leg 5  nodal mass        486.3416814832213029306 x 9.869604401089358618834 / 8
                       = 600.0                    EXACTLY 600

leg 6  nodal radius      4800.0 / ( 8 x 3 x 3125 )
                       = 0.064

leg 7  node radius, km   4 x 9.86960440108935862 x 486.341681483221303 / 3
                       = 19200.0 / 3
                       = 6400.0               EXACTLY 6400 km

leg 8  free fall         50 x 3.141592653589793 x sqrt( 486.3416814832213 / 124416 )
                       = 50 x 3.141592653589793 x 0.0625219663997990326
                       = 9.820927516479826727789505
               and that is 125.sqrt2/18 = 9.820927516479826727789505
```

Four exact values out of one wavelength through four different legs of the grammar. And the pure node beside it does the same job for the Sun: 486 is $2 \cdot 3^5$, nine times it is $4374 = 2 \cdot 3^7$ which is the solar circumference at its decade, and three quarters of it is $364.5 = 3^6/2$, the pure Balmer limit. The gear that connects them is $2^9 \cdot 3^5 = 124416$, and **124416 ÷ 486 = 256 exactly**, which is why the hydrogen beta line is the one that returns a clean fall.

The comb as one structure. Ordered outward from the source by node radius, the thirty lines run from nickel at the inside to an oxygen band at the outside, and **the five telluric oxygen bands — the only lines in the table not made in the Sun — come out as five of the outermost six shells.** The whole span is

And residues that repeat across species, which is the part that could not have been arranged, because the species are unrelated:

```
H-alpha  / H-beta          27/20
H-beta   / H-delta         32/27
H-alpha  / H-delta          8/5
helium D3 / iron c         32/27          <- the same step hydrogen reads itself by
calcium K / iron T         5³/(2⁵·3)
magnesium b4 / calcium H   5³/(2⁵·3)    <- the same residue twice, different species
iron d / titanium P        5²/(2·3²)
```

These are the ratios the framework reads across the comb. What is worth noting is not the closeness but the repetition: the same ratio turning up between helium and iron that hydrogen uses to read itself, and the same residue appearing twice across three different species.

The twenty-six lines with no closed form

Of the thirty lines in the comb, four have a closed lattice form in the record. Twenty-six do not.

```
THE FOUR CATALOGUE LINES THAT CARRY A FORM           value

H-beta, pure node        486.0                       2·3⁵
H-gamma                  434.0277777777777777778     5⁶/(2²·3²)
helium D3                587.5577947877403902645     2⁴·3·π⁵/5²
sodium D2, G1 face       3·5³·π/2                   589.0486225480862322117

AND TWO OBJECTS OF THE FRAMEWORK IN THE SAME NEIGHBOURHOOD, WHICH ARE NOT
LINES OF THE COMB AND MUST NOT BE COUNTED AS THOUGH THEY WERE

sodium, whole-clock      5⁸·π²/3⁸                 587.6107634774471438016
the π³ rung, predicted 2·5¹³·π³/3¹⁷             586.176414199765512533

WITH NO FORM AT ALL
every iron line - T, N, L, e, d, c, b3, E2 - eight of them
both calcium lines, H and K, which are among the STRONGEST lines in the solar spectrum
the magnesium b triplet, b1 b2 b4
titanium P, nickel t, mercury e
all five telluric oxygen bands
H-delta, whose Balmer value this paper computes and which appears in NO store
```

The lines without a form are published wavelengths run through the grammar. They are not addresses. The grammar tells you what a line's spin-orbit and node radius and free fall are once you have the wavelength; it does not tell you the wavelength. **That distinction is the whole of the difference between a description and a derivation, and the comb is at present on the descriptive side for four fifths of its lines.**

And the record's own warning, which is the sharpest sentence written about this work by the people doing it:

> With the named gears let loose, every one of the thirty lines fits the anchor, with register steps running past fifty. **That basis is over-determined and proves nothing. Only bounded tests count.**

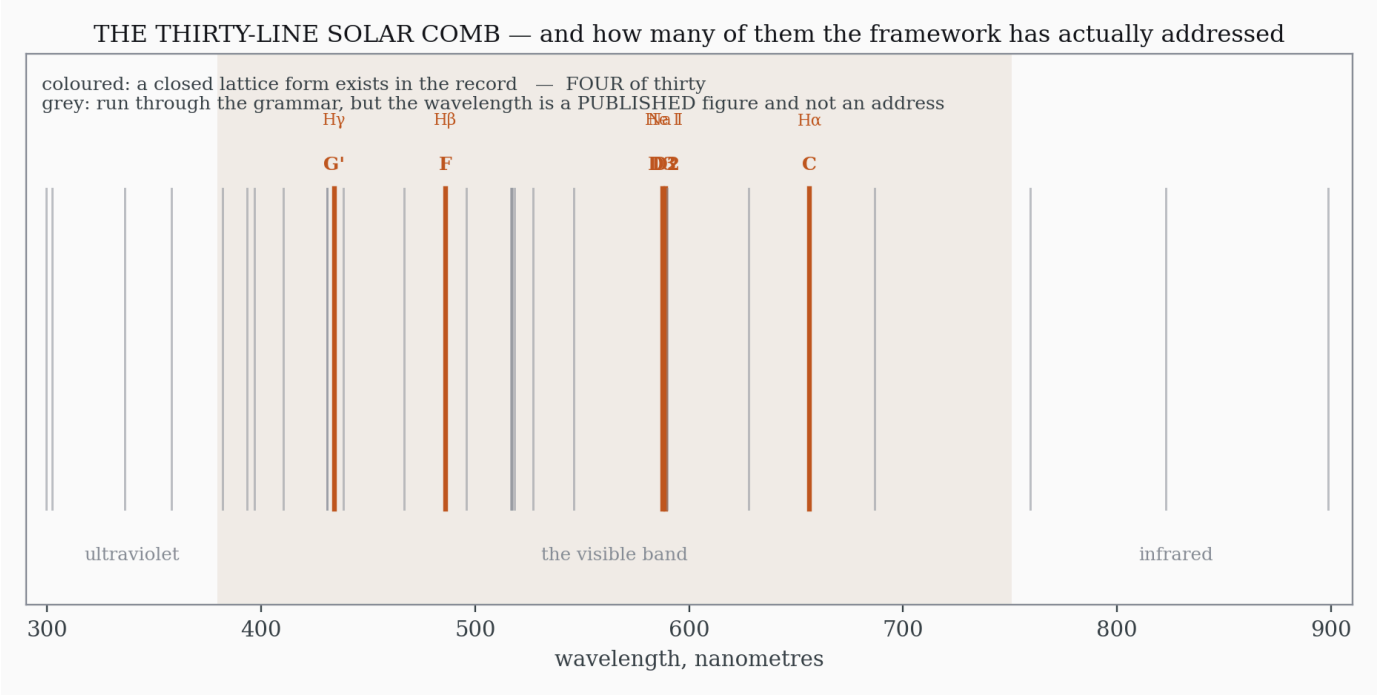


Figure 18 — The solar comb. Coloured lines have a closed lattice form in the record — four of thirty. Grey lines have been run through the grammar, but their wavelengths are published figures rather than addresses. The calcium H and K lines, among the strongest in the whole solar spectrum, are grey.

Four things that are open, named

Earth's own step is not named. Mercury's node to its G1 face is the 612 step and its node to G2 is the 703 step, both exact. The Earth's own year, 364.5 to its observed value, is neither, and is not a step the theory carries. **The mechanism is demonstrated on Mercury and asserted elsewhere.**

Carrying Mercury's own line up into our vision does not land. Mercury's line is in the corpus — a far-ultraviolet object at 92.0952525874450231441 nm — and the three obvious ways of carrying it into the visible all miss the nearest catalogued line by more than the catalogue's own resolution.

Venus sits inside the visible band and on no catalogued line at all. The wavelength the framework requires for it is 459.881654375025 nm, and there is nothing there.

And the standing question, which is the deepest of the four, and is put here in the words it was asked in:

> "*Is the Fraunhofer line specific to Earth? Is there another list of Fraunhofer lines at each different dimensional location — Venus, Mercury, the Sun? We might be fitting what we OBSERVE, and what we are not fitting is what is actually happening at that node. That is a different game from what we see.*"

A proposed answer to that question, and exactly how far it gets

The answer offered is that the catalogued line is the Earth reading, and that every line has a value at every node, reached by dividing out the nodal gears in turn. Worked on H-beta, and every station is exact at forty-four digits:

```
EARTH      the H-beta G2 face           486.043813193231113528737  nm
  divide by 216
VENUS      486.043813193231113528737 / 216
         = 2.250202838857551451521931
  divide by 125/108, which is 1.157407407407407407407407
MERCURY    2.2502028388575514515 / 1.157407407407407
         = 1.944175252772924454114948
  divide by 25/18, which is 1.388888888888888888888889
THE SUN    1.9441752527729244541 / 1.388888888888889
         = 1.399806181996505606962763
  multiply by 2π
         1.399806181996505607 x 6.2831853071795864769
       = 8.795241635619598215614537  days
  and that is Mercury's orbital period.

THE THREE GEARS, MULTIPLIED TOGETHER
  216 x 1.157407407407407 x 1.388888888888889
= 347.222222222222222222222   =  3125/9  =  5⁵/3²
and 5⁵/3² is the single bond, which is one day.

THE LAST TWO GEARS ALONE
  1.157407407407407 x 1.388888888888889
= 1.607510288065843621399177   =  3125/1944, which is the mile.

AND THE FOUR STATIONS AS ADDRESSES, THE NUMBER FIRST AND THE FORM BESIDE IT

  486.043813193231113528737    5¹⁰/(2³·3⁴·π³)     the Earth reading
    2.250202838857551451522    5¹⁰/(2⁶·3⁷·π³)     Venus
    1.944175252772924454115    5⁷/(2⁴·3⁴·π³)      Mercury
    1.399806181996505606963    5⁵/(2³·3²·π³)      the Sun, ground state
   87.95241635619598215615     5⁶/(2·3²·π²)        Mercury's orbital period
```

Three things about this are worth more than the landing at the end.

First, the whole descent collapses to one named object. The three gears multiply to

$$216 \times 125/108 \times 25/18 = 5^5/3^2 = 3125/9 = 347.22222222222222222222$$

and the record already carries $5^5/3^2$ as **the single bond, which is one day**. The descent from the Earth reading to the Sun's ground state is division by the single bond. **That is a statement about what the operator IS, and it has no p-value because nothing was searched.**

Second, the last two gears are the theory's own mile. 125/108 × 25/18 = 3125/1944 = 1.60751028806584362139917 7. **The Mercury-to-Sun descent is the mile**, and the mile was fixed in the record long before this chain was walked.

Third, one step in the chain is forced and is therefore worth nothing, and it is said so here. H-beta multiplied by three is the n = 4 series limit — but H-beta is four-thirds of the Balmer limit and the n = 4 limit is four times it, so the identity is true by construction.

And the controls, run on the same lines.

The gears do not clear their own control. Run on the fifteen lattice-exact lines of the spectrum, the three gears produce twenty-nine distinct landings on named objects against a matched control median of eleven — **P = 0.0003**. That looks decisive and it is not, because the same gears on the ten atomic weights give P = 0.0280 and on fifteen assorted named constants P = 0.0316. **The effect is not about the spectrum. It is that named objects of the record live near other named objects, which is a fact about how the record was built.** The deciding test replaces the three gears by random π-free gears of the same leannesses on the same sources: **P = 0.0527, and P = 0.0983 for the collapsed operator alone. Not significant.** The three gears are not demonstrably better than arbitrary π-free gears of their own size, and this paper does not claim that they are.

And the two intermediate stations are in no store. Their addresses are given above so that they can be looked for by name rather than by digits. The Venus station at its decade is 225.02028388575514515, and the proposal itself hedged it as "*something that may be considered to be*", which is the right hedge. **The endpoints are named objects; the middle of the chain is not.**

What would turn this from a proposal into a demonstration is stated plainly: the intermediate stations landing on objects independently known to belong to Venus and to Mercury. They do not, yet.

And there is a tension with the framework's own criterion that has to go on the page. All three gears are π-free, so every station holds degree minus three and the chain never changes the kind of object it is carrying. The framework's own rule says that a change of nodal dimension, if it is a real physical change and not a change of units, must show as a change of π-degree — and by that rule this descent is a unit walk rather than a dimensional move. **Either a node change is not a register change, in which case the framework has been using one word for two different things and they must be separated; or the descent is a rescaling with a nodal reading laid over it.** One point favours the first: a wavelength read at another node should still be a wavelength, so it ought to keep its kind. **It is not settled here.**

The proton: one source for the ionisation energy, the spectrum and the Fraunhofer lines

Three of the six domains — hydrogen's ionisation energy, the hydrogen atomic spectrum and the Fraunhofer lines — have been joined to one another above by operators. **They also share a source, and the source is the proton.** Every route below is exact to every figure printed, and each lands with nothing left over.

Start with the proton. Its mass is

$$m_p = 3\cdot5^5\cdot\sqrt{(10^{11}/\pi)} = 1.6726163588932229199 \times 10^{-27}\ \text{kg}$$

It carries a square root, and that decides everything that follows: read as it stands, the proton gives one face of hydrogen's blue line; squared — opened out — it gives another.

The proton as it stands gives the spectrum, and four of the Fraunhofer lines. The blue line of hydrogen times the proton's mass is a pure power of the lattice:

$$H\beta \times m_p = (12/\pi)^5 = 813.124162828260014$$

$$H\beta = (12/\pi)^5 \div m_p = \sqrt{(2^{27}\cdot3^8/(5^3\cdot\pi^9))} = 486.1390709859537637\ \text{nm}$$

From that one line the whole series follows by the Balmer rule, with nothing chosen. The series limit is three-quarters of Hβ, and each visible line is the limit carried by $n^2/(n^2-4)$:

the limit	$\frac{3}{4}\times$ Hβ	364.6043032394653228 nm	
Hα	× 9/5	656.2877458310375811 nm	Fraunhofer's C
Hβ	× 4/3	486.1390709859537637 nm	Fraunhofer's F
Hγ	× 25/21	434.0527419517444319 nm	Fraunhofer's G′
Hδ	× 9/8	410.1798411443984882 nm	Fraunhofer's h

The proton opened out gives the G2 face of the same line. Carry the mass down to a wavelength and a free fall, square it, and carry it back up by the day's gears:

m_p		1.6726163588932229
÷ $\pi^2/8$	wavelength	1.3557717541007887
÷ 49.50355350	free fall	0.0273873622854140
squared		0.00075006761295252
× 864		0.64805841759097482
× 360		233.30103033275093
÷ 24		9.7208762638646223
÷ 2		4.8604381319323111

That is **486.0438131932311135 nm** at its decade — the G2 face of the blue line, $486 \times (1 + \delta_G) = 5^{10}/(2^3\cdot3^4\cdot\pi^3)$ — and the landing is exact, with nothing left over.

The ionisation energy gives the same G2 line. Hydrogen's ionisation energy on the G2 register is

$$IE_{G2} = 3^3\cdot5^3/(2^3\cdot\pi^3) = 13.606116089006034500\ \text{eV}$$

Take its third rung, one-ninth, and carry it through the gear that turns an energy into a circumference, $31104 = 2^7\cdot3^5$:

```
13.606116089006034500 ÷ 9    =   1.5117906765562260555
÷ 31104                      =   0.0000486043813193231
                             =   486.0438131932311135 nm at its decade
```

The same number the opened-out proton gave, to every figure. On the G1 register the same two steps take 13.6048896 eV to 486 exactly — the blue line's integer node, $2 \cdot 3^5$.

So the three close on one ring:

```
the proton, as it stands      486.1390710   the spectrum; Fraunhofer's C, F, G′ and h
the proton, opened out        486.0438132   Hβ on the G2 register
the ionisation energy, G2     486.0438132   the same line, the same register
the ionisation energy, G1     486           the line's integer node, 2·3⁵
```

The two registers stand one G-bond step apart on both sides of the ring at once: 486 to 486.0438132 is × (1 + δ_G), and 13.6048896 to 13.6061161 eV is × (1 + δ_G), exactly.

The line the proton gives as it stands and the line it gives opened out are not a named step apart, and they should not be: one is the proton's square root and the other its square — the source and the node of one object.

> **$H\beta \times m_p = (12/\pi)^5$.** Forward: 813.124162828 ÷ 1.6726163589 = 486.1390710 nm. Back: 813.124162828 ÷ 486.1390710 = 1.6726163589, the proton. Opened out, the proton lands on 486.0438132 — and so does the G2 ionisation energy ÷ 9 ÷ 31104.

And the ring does not stop at three. It carries on to the twenty-one centimetre line and to the helix of DNA, and it does so from the same place: the G2 face of the blue line, 486.0438131932311135 nm, where the opened-out proton and the G2 ionisation energy both land.

To the twenty-one centimetre line. Take three-quarters of the G2 blue line, which is the Balmer limit on that register, and carry it by $\pi^4/25$, the join E5 above:

```
G2 Hβ              486.0438131932311135      5¹⁰/(2³·3⁴·π³)
× 3/4              364.5328598949233351      5¹⁰/(2⁵·3³·π³)    the Balmer limit
× π⁴/25            1420.352581375593731 MHz  5⁸·π/(2⁵·3³)      the 21-cm line
```

The line's frequency is $5^8 \cdot \pi$ divided by 864 — and $864 = 2^5 \cdot 3^3$ is the ground state of the DNA helix. Its second face, 1420.480627017783278 MHz = $5^{18}/(2^9 \cdot 3^{12} \cdot \pi^2)$, stands one G-bond step on, × (1 + δ_G), exactly.

To the helix of DNA. The ring reaches the helix twice. First, the opened-out proton is carried up by × 864, and 864 is the helix at turn zero. Second, the G2 ionisation energy, turned into joules by the elementary charge $e = 5^9 \cdot \pi^3/(2^6 \cdot 3^{10}) \times 10^{-20}$ C, loses its π entirely and lands on turn two of the helical ladder of E6:

```
IE_G2 × e     =   3³·5³/(2³·π³)  ×  5⁹·π³/(2⁶·3¹⁰)
              =   5¹²/(2⁹·3⁷)
              =   218.0325369012917238 × 10⁻²⁰ J

the helix, turn 2     864 × r²  =  872.1301476051668953      r = 5⁶/(2⁶·3⁵)
a quarter of it                    218.0325369012917238      the same number
```

So the ring now closes on five of the six domains:

```
the proton, as it stands       486.1390710 nm       the spectrum; Fraunhofer's C, F, G′ and h
the proton, opened out         486.0438132 nm       Hβ on the G2 register, through × 864
the ionisation energy, G2      486.0438132 nm       ÷ 9 ÷ 31104
the 21-cm line                 1420.3525814 MHz     G2 Hβ × ¾ × π⁴/25 = 5⁸·π/864
the DNA helix                  864 and 218.0325369  turn 0; turn 2 = IE_G2 × e
```

The sixth, the periodic table, is not yet on the ring. It is reached from the ionisation energy through the atomic weights, not from the proton, and that route is open.

> **One source, five domains.** The proton opened out and the G2 ionisation energy meet at 486.0438132 nm. Three-quarters of it, × $\pi^4/25$, is the 21-cm line, $5^8 \cdot \pi/864$ MHz; the ionisation energy times the charge is

> $218.0325369 \times 10^{-20}$ J, turn two of the helix whose ground is 864.

The periodic table

What it is. The elements, ordered by atomic number Z, with a weight attached to each.

What the framework says they are. Not products of fusion. **The elements are counted into being** — the register stepping its address on, one node at a time, each step the next element. The periodic table is not a filing cabinet drawn up after the fact; it is the register's own itinerary along the lattice, and its periods are the returns of the sweep to a like node. A star is where the sweep runs fast and far, not a furnace that welds nuclei together against their repulsion.

And the whole first row falls out of one number, carried out here so it can be watched happening.

```
CARRIED OUT, THE ELEMENTS FROM ONE NUMBER

hydrogen's ionisation energy    13.60611608900603449968   eV      Z = 1

  x 2² = 4                     54.42446435602413799871   eV      Z = 2, helium
  x 3² = 9                     122.4550448010543104971   eV      Z = 3, lithium
  x 4² = 16                    217.6978574240965519948   eV      Z = 4, beryllium
  x 5² = 25                    340.152902225150862492   eV      Z = 5, boron

NO ELEMENT NEEDED A NUMBER OF ITS OWN.  Each is the one before it, re-scaled by
the square of where it stands in the row.
```

The cosmic abundance curve is then the depth profile of the nodes — shallow nodes common, deep nodes rare. Hydrogen and helium are the shallowest and dominate the universe; iron sits at a specially deep node and stands up as a peak in the abundance data.

The weights. Ten of the first three rows have a form, a route, and no live objection:

```
H    1.007860451037484037013  5³/(2²·π³)            lean  8   deg -3   ROAD
He   4.002451369871643807299  2¹¹·3⁵·π/5⁸           lean 25   deg +1   ROAD
Li   6.940191200541330823688  5¹¹/(2¹⁰·3⁷·π)        lean 29   deg -1   ROAD
B    10.80856723287209521l  2²·5¹¹/(3¹⁰·π⁵)       lean 28   deg -5   ROAD
C    2²·3                   12                       lean  3   deg  0   ROOM
N    14.006640426716773524  2⁷·3³/(5²·π²)         lean 14   deg -2   ROOM
O    15.990200526047226218  5⁸/(2⁵·3⁵·π)           lean 19   deg -1   ROAD
F    3·5³/(2·π²)          18.997721932938332146     lean  7   deg -2   ROOM
Ne   2²·5                    20                       lean  3   deg  0   ROOM
Mg   24.302190659661555676  5⁶/(2⁸·3⁴·π³)         lean 21   deg -3   ROAD
```

And they carry identities among themselves that were not put in. Each is exact:

```
He x Li  =  250/9          every prime inverting between them
Be x B   =  π⁴           so only the π survives
He x O   =  2⁶
F        =  H x 6·π
2 x N    =  2¹⁰·3³/(1000·π²)   -  and that is the proton-neutron product
```

The last of those is the reason nitrogen's weight is settled. The product of the proton and neutron masses is a clean lattice object; twice nitrogen's weight is the same object at its decade; and of nine independent proton-and-neutron face pairings, two close on nitrogen's value exactly and none closes on the rival candidate.

Valence, and why the framework rejects it as a cause. Chemistry teaches that an element reacts because it is short a fixed number of electrons — oxygen two, fluorine one, carbon four — and treats the count as the cause. Two things overturn that here.

First, the shortfall cannot be a subtraction. The lattice is closed under multiplication and division and **not** under addition. The difference of two lattice values is generically off the lattice. So the distance from an element to its closed shell cannot be a deficit. **It must be a multiplier. An atom is not missing something; it is standing at the wrong ratio.**

Second, the multiplier does not track the electron count. Measured across the first three rows, the correlation between electrons-needed and the complexity of the closure factor is **minus 0.364** — noise. The one-electron

elements span a factor of four in complexity, and the four-electron elements are the simplest on the table. If the electron count governed closure the table would be ordered by it. It is not ordered by it at all.

And the two cleanest closures in the table are carbon, ×5/3, and oxygen, ×5/4 — bare ratios of integers, no π. The two atoms life is built from are the two whose distance to completion is a simple fraction.

Why the noble gases are inert, and why two of them are not. A shell closes because the electron count arrives on a node — a whole number that is also a clean lattice value. Every stable noble gas does this: helium 2, neon 10 = 2·5, argon 18 = 2·3², krypton 36 = 2²·3², xenon 54 = 2·3³. Five closures, five nodes, five stable gases. Radon and oganesson are the only two closures that are **not** nodes, and they are the only two noble gases that are radioactive — and the further from a node, the shorter the life. Radon's closure address is 85.94366927 = 270/π, which is fully on the lattice and irreducibly irrational, so no whole number of protons can ever land on it. **Radioactive decay, on this reading, is not a force acting on a nucleus. It is the search for a node the nucleus can never occupy.**

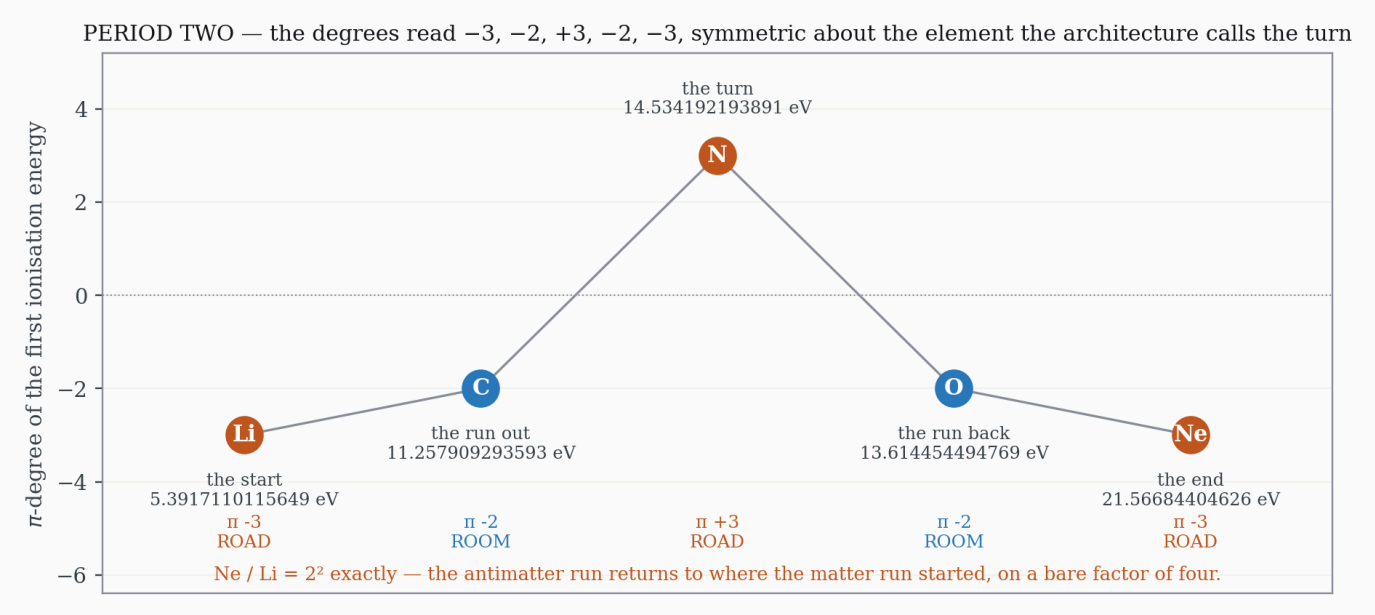


Figure 19 — Period two read by π-degree. The five routed first ionisation energies were found one at a time, by different routes, and the architecture — which element starts the strand, which is the turn, which ends it — was stated with no numbers in it before they were tested against it. The degrees come out symmetric about nitrogen, and neon returns to lithium on a bare factor of four.

The ten weights, and the route each one came by

A form without a route is a coincidence with good manners. Each of the ten settled weights is given below with the road it arrived on, because under this framework the road is the evidence and the form is only the result.

```
HYDROGEN     5³/(2²·π³)         1.007860451037484037013
             the node divided by 240; and independently the Earth's atmosphere
             advanced one turn of the helix. Two roads, one object.

HELIUM       2¹¹·3⁵·π/5⁸        4.002451369871643807299
             the Earth's pure radius carried to its circumference, divided by 2π.

LITHIUM      5¹¹/(2¹⁰·3⁷·π)     6.940191200541330823688
             THREE roads. From 250/9 divided by helium; from the second helical
             turn of the helix divided by 2π; and from the day rung read at its
             node face. The three start at an atomic object, an orbital object and
             a FACE, which is not an object at all.

BORON        2²·5¹¹/(3¹⁰·π⁵)  10.808567232872095211
             from the helical turn. Two faces, one squared G-bond step apart.

CARBON       2²·3                12  exactly
             it needs nothing. Carbon is the only element that stays rational in
             every register.

NITROGEN     2⁷·3³/(5²·π²)    14.006640426716773524
             the day pivot. And it is the invariant of the nucleon ladder:
             the proton-neutron product is twice it, at its decade.

OXYGEN       5⁸/(2⁵·3⁵·π)      15.990200526047226218
             fifty helical turns over π. And it INVERTS, which is the signature
             of the antimatter side.

FLUORINE     3·5³/(2·π²)        18.997721932938332146
             hydrogen times six π - one of the locked set's own printed identities.

NEON         2²·5                20  exactly
             closing the row with a doubling and a decade.

MAGNESIUM    5⁶/(2⁸·3⁴·π³)    24.302190659661555676
             VENUS's sidereal rotation divided by twenty-four. An element's weight
             reached from a planet's day.
```

And three of those roads walked end to end, because a route named is not a route shown.

```
HYDROGEN — the road from the base of the Earth's crust

  the Moho, 20000/π                    6366.197723675813430755351  km
  wound one helical turn, x r           6396.080210418890487111134  km
                      r being 5⁶/(2⁶·3⁵) = 1.004693930041152263374486
  divided by 625/36, which is 17.3611111111111111
    6396.080210418890487111 / 17.3611111111111111
  = 368.4142201201280920576013
    and that is 10⁶/(864·π), Mercury's rotation node
  divided by the lattice year 1000·π²/27 = 365.5409037440503192160923
    368.4142201201280920576 / 365.5409037440503192161
  = 1.007860451037484037013189
    and that is hydrogen's atomic weight, 5³/(2²·π³).

HELIUM — the road from the Earth's own radius

  the Earth's radius, 2¹⁴·3⁵/5⁴             6370.0992  km
  carried to its circumference, x 2π
    6370.0992 x 6.283185307179586476925
  = 40024.51369871643807299259  km
  and at its decade that is                      4.002451369871643807299259
    which is helium's atomic weight, 2¹¹·3⁵·π/5⁸.

MAGNESIUM — the road from Venus's day

  Venus's sidereal rotation             5832.525758318773362344845  hours
  divided by 24                         243.021906596615567643685  days
  and at its decade that is             24.302190659661555676436 85
    which is magnesium's atomic weight, 5⁶/(2⁸·3⁴·π³).
```

Read the hydrogen road again, because of where it starts. It starts at the base of the Earth's crust — the boundary beneath your feet where rock gives way to mantle — winds it one turn of the helix, passes through the node that governs the turning of Mercury, divides by the length of a year, and arrives at the weight of the lightest atom there is. **Four operations, no free parameter in any of them, and the crust of the Earth and the mass of a hydrogen atom are two readings of one address.**

Eighteen elements, eighteen routes, and no shared formula. That is not a failure of the search; it is the framework's own statement about what the periodic table is. **A table of addresses is reached by whatever path leads to each address, no more than house numbers on a street are generated by a formula from their positions.** What the framework supplies, and valence theory does not, is the *quantity* — the actual size of each closure — and it supplies it element by element because that is how addresses work.

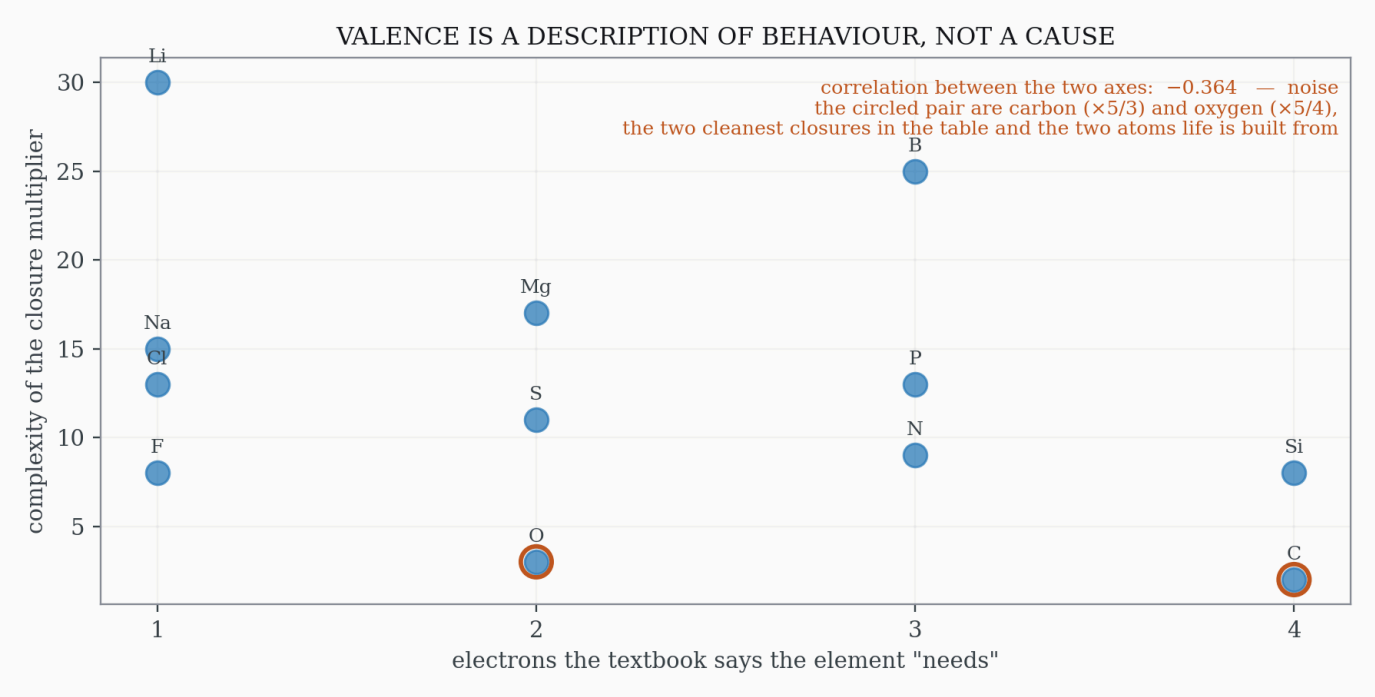


Figure 20 — The closure multiplier against the electron count the textbook says governs it. The correlation is minus 0.364 — noise. The one-electron elements span a factor of four in complexity and the four-electron elements are the simplest on the table. Circled are carbon and oxygen, whose closures are the bare ratios five-thirds and five-quarters, and which are the two atoms life is built from.

The three laws of the table that survived scoring

Three statements about the running product of the weights were tested with the budget declared in advance, and all three survived. They are given with their scores because a score is the only thing that makes a pattern claim worth reading.

The direction law. Reading across a period, a matter element only ever *divides* into its node and an antimatter element only ever *multiplies*. Exceptionless across rows one and two. **It breaks at magnesium**, and that break is printed here rather than omitted, because it locates the boundary at the row-two to row-three edge.

The parity law. Multiply the weights in order and take the π-degree of each running product. By the parity law of the grammar, an even degree is a room and an odd degree is a road — and read down the ten stations the answer is room and road alternating one for one through the s shell, then three roads together, then three rooms together. That is the shell structure of the first two rows written in the π-degrees, and it was named before it was looked for. **Carried out:**

```
element      weight                      its own      running      the running
                                         π-degree    π-degree    product IS

hydrogen    1.007860451037484037013       -3          -3         ROAD
helium      4.002451369871643807299       +1          -2         ROOM
lithium     6.940191200541330823688       -1          -3         ROAD
beryllium   9.012211233488206605802       +9          +6         ROOM
boron       10.80856723287209521114       -5          +1         ROAD
carbon      12.0                          +0          +1         ROAD
nitrogen    14.0066404267167735244        -2          -1         ROAD
oxygen      15.990200526047226217778      -1          -2         ROOM
fluorine    18.997721932938332145 73      -2          -4         ROOM
neon        20.0                          +0          -4         ROOM

and read down the last column:
  ROAD  ROOM  ROAD  ROOM  |  ROAD  ROAD  ROAD  |  ROOM  ROOM  ROOM
  the s shell alternating one for one, then the three matter p as one
  block, then the three antimatter p as the other.

THE SIX ELEMENTS AT ODD DEGREE, WHICH ARE THE ONES THAT FLIP A STATION:
  hydrogen, helium, lithium, beryllium, boron, oxygen
and the number of ways six of ten could have been the odd ones:
  10! / (6! x 4!)  =  210
```

Two things about that table need saying plainly. The first is that **the ten elements here are the first two rows — hydrogen through neon — so beryllium is in and magnesium is out.** Beryllium's route is contested and the section on the ten weights, and the route each one came by does not list it among the ten settled routes for that reason; its form is printed here because the parity law is a statement about the first two rows and cannot be read without it. **The second is the mechanism, which is one sentence:** a station's parity flips exactly when that element's own degree is odd, and the six odd elements are the first five and then oxygen alone. **Tested exhaustively against every way six of ten could have been the odd ones: one arrangement in two hundred and ten. p = 0.00476.**

The closure law. A closing weight times the next opening weight is a lean monomial. Exhaustive: **p = 0.00211.**

And one that was refuted, printed because refutations belong in the framework's same work as results: the whole-object mirror fails. What survives is narrower and was not what was looked for — **the mirror acts on the exponent of three alone**, forcing exactly three pairings out of nine hundred and forty-five, **p = 0.0032**, and all three products are free of threes.

The condition all four carry. These are computed from weights on which two strata of the corpus still disagree for six of the first ten elements. Until that is ruled, **every one of these scores is conditional**, and the closing part says so again.

The cumulative products, and where the table closes

Multiply the weights in order and the running product lands on clean decade forms at the close of the first row's run:

```
3   4.0339124428944307750 28    x lithium     = 27.996123639930112139 26
4   27.996123639930112139 26    x beryllium   = 252.3069799619028964542
5   252.3069799619028964542     x boron       = 2727.076956241139963943
6   2727.076956241139963943     x carbon      = 32724.92347489367956732
7   32724.92347489367956732     x nitrogen    = 458366.2361046585670144
8   458366.2361046585670144     x oxygen      = 7329368.029682998513012
9   7329368.029682998513012     x fluorine    = 139241295.7720857094883
10  139241295.7720857094883     x neon        = 2784825915.441714189766

and the last five of those, written as forms:
   6   10⁶·π/96                 = 32724.92347489367956732        96 = 2⁵·3
   7   1440000/π                 = 458366.2361046585670144       144 = 12², carbon squared
   8   10¹²/(13824·π²)         = 7329368.029682998513012     13824 = 2⁹·3³ = 16 x 864
   9   10¹⁵/(73728·π⁴)         = 139241295.7720857094883     73728 = 2¹³·3²
  10   10¹⁶/(36864·π⁴)         = 2784825915.441714189766     36864 = 2¹²·3²

and the THIRD station, which is not a decade form and is something else:
   3   27.996123639930112139   =  5⁶/(2·3²·π³),  the silicon rung
```

Carbon squared is the seventh station's own denominator, and the eighth station's denominator is sixteen times the day rung. These are the framework's written record's own objects appearing where nothing put them.

The twenty-one centimetre line

What it is. A hydrogen atom in its ground state has a proton and an electron, and the two have a magnetic relationship with two possible arrangements, very slightly different in energy. The transition between them emits a photon of about twenty-one centimetres. It is extraordinarily weak — the mean lifetime of the upper state is about eleven million years — but there is so much hydrogen in the galaxy that the line is the single most important tool in radio astronomy.

In this framework it is not an abstract hyperfine number. It is an electron's own turning, and the framework says which electron.

The road to it, and every station is exact

The line is reached from a hydrogen wavelength in four steps, with no gear beyond a circle, a day, and the three-to-two lock:

```
THE START   a hydrogen wavelength   2⁴·3⁶·π²/5³
                                    920.952525874450231440684   angstrom

x 4                                   920.9525258744502314407 x 4
                                    = 3683.810103497800925762736
/ 2π                                 3683.810103497800925763 / 6.283185307179586476925
                                    = 586.2965873835415733348524
and at its own decade                 58.6296587383541573334852 4   days
                                      which is 2⁵·3⁶·π/5³, and which is
                                      the first electron's rotation.

x 24, into hours                      58.62965873835415733349 x 24
                                    = 1407.111809720499776003646   hours

x 3/2, the orbit lock                  1407.111809720499776004 x 1.5
                                    = 2110.6677145807496640054 68
and at its own decade                 21.106677145807496640054 68   centimetres
                                      which is 2⁴·3⁸·π/5⁶, and which is
                                      the twenty-one centimetre line.

THE THREE DECADES, NAMED RATHER THAN SLID IN
  angstrom to day, one decade;  hour to centimetre, two decades.
  The handle is free in this framework - a monomial and the same monomial
  times any power of ten are one address - and the two places it is used
  are written out above rather than absorbed into the arithmetic.
```

And the wavelength this road starts from is not a stranger to this paper. It is the object the section on the Fraunhofer lines names as **Mercury's own line**, a far-ultraviolet address at 92.0952525874450231441 nanometres, which that section reports as not carrying into the visible band. **It does not need to. It carries into the radio band instead, and this is the road it takes.**

The middle station is the first electron's own rotation. The framework's reading, set out at length in the wider work, is that **the proton's first electron is Mercury — the 1s electron of the solar atom** — and Mercury's rotation on this register is 58.62965873835415733349 days.

So the chain says something physical and says it in one line: take the first electron's rotation, carry it through a day and through the three-to-two lock that binds its turning to its orbit, and read the result as a length. That length is the twenty-one centimetre line.

And the same address is Mercury's orbital period. The line is $2^4 \cdot 3^8 \cdot \pi / 5^6$, and Mercury's orbital period on this register, in hours, is 2110.6677145807496640054 68. **The same exponents, (4, 8, −6, 1); the only difference is the handle, and the handle is free.** One address, worn once as a wavelength in a radio telescope and once as the year of the innermost planet.

Two faces, one G-bond step apart

The line is not one value. It is two, on the two registers, and the step between them is the framework's own:

```
the wavelength, G1     21.10667714580749664005468 cm  2⁴·3⁸·π/5⁶
the wavelength, G2     21.10857992548703571747489 cm  5⁴/(3·π²)

the frequency,  G1     2·5¹⁴·π/3³          1420352581.37559373122         Hz
the frequency,  G2     5¹⁸/(2⁹·3¹²·π²)   1420480627.017783278115        Hz

each pair is one G-bond step apart      1.000090150603356200676414
```

And the two frequency faces are one wavelength read through the two spin-orbit speeds — what science calls the speed of light, of which this framework carries one per register:

```
c_G1 / (2⁴·3⁸·π/5⁶)   =   2·5¹⁴·π/3³           exactly
c_G2 / (2⁴·3⁸·π/5⁶)   =   5¹⁸/(2⁹·3¹²·π²)     exactly
```

They are not two candidates between which the framework must choose. They are one object read on two registers, and which one a reading lands on is the subject of the section on the dual dimension, and where a reading actually falls.

The G2 road runs beside the G1 road, and nothing crosses

```
G1    a hydrogen wavelength -> the electron's rotation, G1 face
      -> the 21 cm wavelength, G1 -> the 21 cm frequency, G1

G2    the electron's rotation, G2 face -> its orbit by the 3:2
      -> the 21 cm wavelength, G2
```

Two parallel chains, one G-bond step apart at every station. The G1 road carries the hydrogen spectrum and the twenty-one centimetre line; the G2 road carries the innermost planet's turning as it is seen from here, and the second. **The section on the second, which this framework did not have until now is the second.**

The flip, and an open item printed rather than smoothed

Science describes the transition as the electron's spin flipping. The framework reads a flip as the crossing between the matter and antimatter sides, which is an inversion rather than a change of sign. It is tempting to say that this is why Mercury — locked three rotations to two orbits, and therefore turning half a turn against the Sun each orbit — flips once per orbit. **The temptation must be resisted for the line itself:** the transition's eleven-million-year lifetime means it is nothing like once per orbit. **What is genuinely open, and stated as open, is that the framework has not produced the two hyperfine states as an object and its inverse.** The section on the index says what would close it.

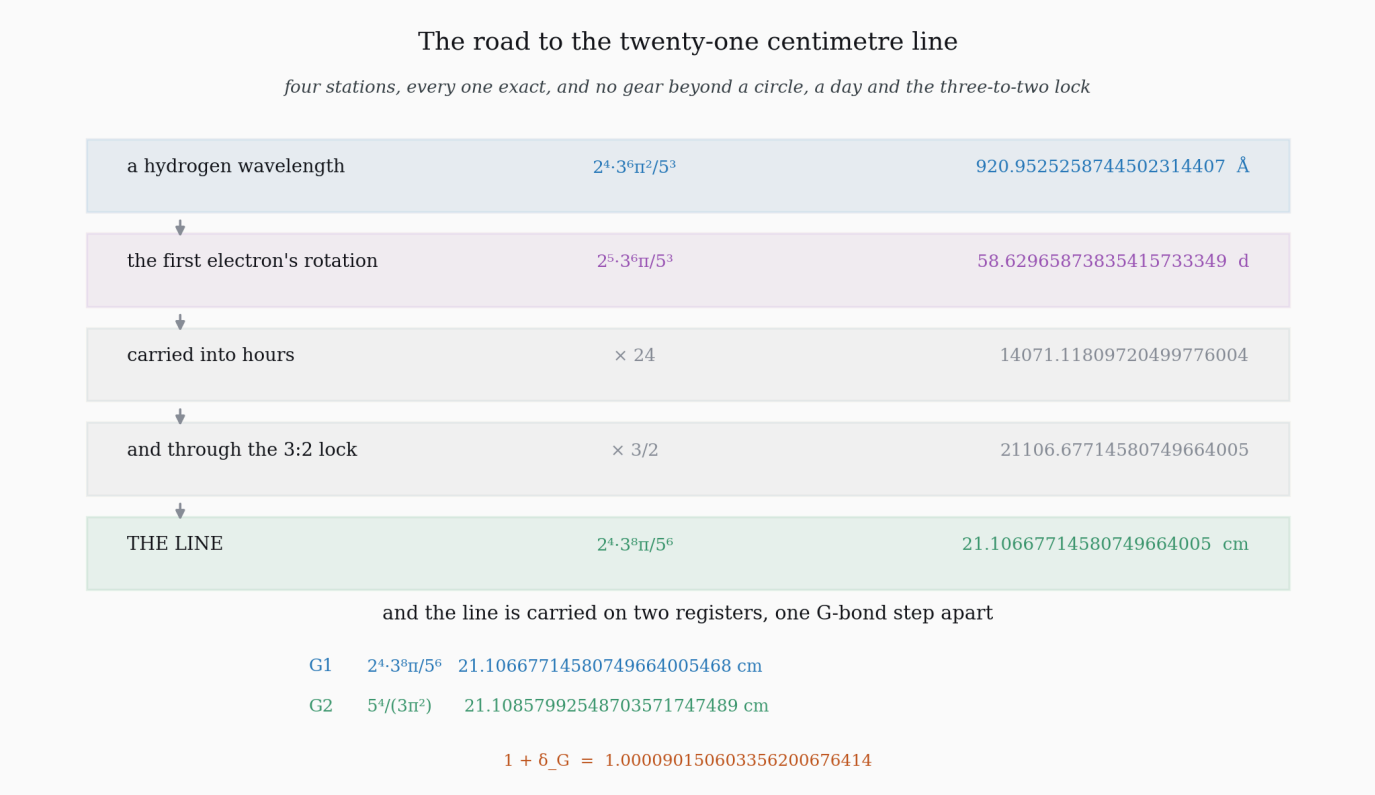


Figure 21 — The twenty-one centimetre line on its two registers, the faces exactly one G-bond step apart. The framework adopts neither as the only value; it carries both, and the section on the dual dimension, and where a reading actually falls says where a reading falls.

The second, which this framework did not have until now

A framework that builds its own length and its own spin-orbit speed still owes an account of time. For most of this work it did not have one. The metre followed from the speed and the speed followed from hydrogen; the unit of time was taken from outside and never derived. **That gap is now closed, and the road runs from the Earth's own turning.**

```
THE G2 RUNG - AND IT ENDS ON THE SECOND

the Earth's sidereal rotation   5¹⁴/(2²·3⁸·π²)
                                23564.06902547260324399471
x the veil 180/π = 57.29577951308232087679815, decade-free
                              = 135.0121703314530870913158
                                which is 135 x (1 + delta_G), exactly.

two over it                     2 / 135.0121703314530870913
                              = 0.014813479370711740519491592

x 250 π², which is 2467.401100272339654708623
                                0.014813479370711740519 x 2467.4011002723396547
                              = 36.55079529815575419757173
                                the lattice orbital year, one G-bond step down.

x 24                           = 877.2190871557381007417216
x π                           = 2755.865039797211370337193
/ the spin-orbit speed          299789233.6830892680470977
                              = 0.000009192675153606312566487389
and at its own decade         = 9192675153.606312566487389   Hz
                                which is 2²¹·3²·5·π⁴ - THE SECOND.

THE G1 RUNG - THE SAME FIVE OPERATIONS, STOOD ON THE BARE 135

the station                     135
two over it                     2 / 135  =  0.014814814814814814814814814
x 250 π²                    = 36.55409037440503192160923
                                the lattice orbital year itself, 1000·π²/27.
x 24                           = 877.2981689857207661186214
x π                           = 2756.113482693317348931228
/ the spin-orbit speed         = 0.000009193503878881786773029763
and at its own decade          = 9193503878.81786773029763
                                which is 2¹⁷·5¹¹·π/3⁷ - a hydrogen wavelength.

AND THE TWO LANDINGS STAND EXACTLY ONE G-BOND STEP APART, BECAUSE THE TWO
RUNGS DO AND NOTHING BETWEEN THEM CHANGES THAT:
  9193503878.817867730298 / 9192675153.606312566487
= 1.000090150603356200676414
```

And the whole chain collapses to one sentence: the Earth's lattice orbital year, times the day, times a circle, divided by the speed time travels — and what comes out is the second.

The first station is the loaded one and it deserves a line of its own. The Earth's sidereal rotation is $5^{14}/(2^2 \cdot 3^8 \cdot \pi^2)$; carried through the veil, 180/π, it is 135.0121703314530870913158 — **which is 135 advanced by exactly one G-bond step.** And 135, decade-free, is 27/2: **the very operator that carries hydrogen's atomic weight to its ionisation energy in section 16.** The Earth's spin read through the veil and the atom's weight-to-energy step are one address, one register apart.

Stand on the other rung of that same station and the same chain gives a different object:

```
off the G2 rung   135.012170331453087091 3158   ->   2²¹·3²·5·π⁴
                                                     the second
off the G1 rung   135                           ->   2¹⁷·5¹¹·π/3⁷
                                                     a hydrogen wavelength
```

And one correction to an earlier printing of this chain, made here rather than quietly. Earlier revisions of this section printed the first station on the G2 rung and the third station on the G1 rung, in the same column. They do not belong in the same column: stand on 135.012170331453087091 3158 and the third station is 36.5507952981557541975 7173, which is the lattice year one G-bond step down; stand on the bare 135 and it is 36.5540903744050319216 0923, which is the lattice year itself. **Carrying the chain out, rather than summarising it, is what exposed that, and it is the reason every chain in this paper is now carried out.**

One chain, stood on two rungs of one Earth station, reaching one object on each register. That is the two-register picture of the section on the twenty-one centimetre line arriving from the other end, and neither arrival was arranged to meet the other.

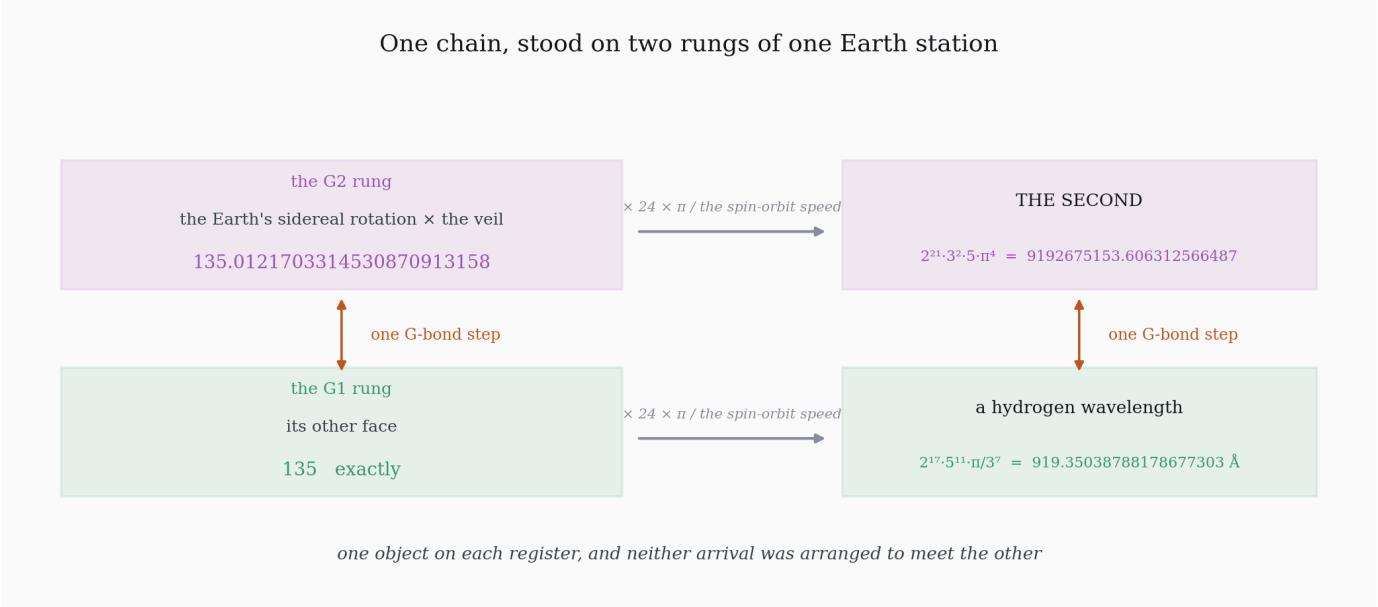


Figure 22 — One chain, stood on two rungs of one Earth station. The G2 rung reaches the second; the G1 rung reaches a hydrogen wavelength; and the two landings are one G-bond step apart because the two rungs are.

The DNA helical structure

What it is. Two strands wound about a common axis, running in opposite directions, with the bases paired across the middle. It takes three well-established forms — B, the common form in living cells; A, which appears when water is withdrawn; and Z, which is left-handed.

What the framework says it is. Not a molecule that happens to be helical. **It is the shape of the propagation itself, at the biological register** — the form time takes as it flows. Which is why the number of base pairs in one turn is not a measurement of a molecule but the turn-count of a register, and why the same numbers appear four registers up in the sizes of stars.

And the claim that all three are exact is one a reader can check in four lines each.

```
CARRIED OUT, THE THREE TURNS OF THE HELIX

the B form   125/12 base pairs to a turn
                              10.41666666666666666667
  360 / that                  34.56   degrees per step
  x 125/12 again              360   THE CIRCLE CLOSES

the A form   10·π²/9 base pairs to a turn
                              10.966227112321509576 48
  360 / that                  32.828063500117437947 82   degrees per step
                              and that is 324/π² exactly
  x 10·π²/9 again           360   THE CIRCLE CLOSES, and the π cancels

the Z form   12 base pairs to a turn, exactly
  360 / 12                    30   degrees per step, exactly
  x 12 again                  360   THE CIRCLE CLOSES

THREE FORMS, THREE EXACT CLOSURES, AND NOT ONE OF THEM IS A ROUNDED FIGURE.
```

The three forms are three registers with three jobs:

```
B-DNA   G1   EXISTENCE   T_B  =  5³/(2²·3)     =  10.41666666666666666667   π-free
A-DNA   G2   READING     T_A  =  2·5·π²/3²    =  10.966227112321509576 48   degree +2
Z-DNA   G0   RETURN      T_Z  =  2²·3          =  12                          exactly
```

And their arithmetic closes:

```
T_B x T_Z      =  125  =  5³               exactly, and π-free
1/alpha / T_A  =  12.5 =  5²/2             exactly
T_A.T_B.T_Z    =  1250·π²/9  =  10/alpha   exactly
```

Existence times return is a pure power of five. The reading register is the only one of the three that carries a π — which is exactly why it, and not the other two, is the one that reaches across registers, and section 21 shows that this is not a remark but a theorem with teeth.

The geometry the framework routes. For the A form:

```
diameter            23.02588875750800575360008  =  5⁶/(2³·3³·π)   angstrom
pitch               36.84142201201280920576013  =  5⁵/(3³·π)   angstrom
pitch / diameter    8/5                                          exactly
twist per step      32.82806350011743794782  =  324/π²      degrees
the same in radians 9/(5·π)           =  0.5729577951308232087680
```

The last line is worth a second look: **the A twist in radians is the radian-in-degrees divided by a hundred**, and equivalently the twist in degrees times a hundred is the radian in degrees *squared*. Both are exact.

And A-DNA is the form with an open axial channel, radius 3²/2, which the other two do not have. That is not a detail. The conservation law dΣT = 0 forces the torus — the unique closed surface with Euler characteristic zero — and **a torus must have a hole. Only A supplies one.** The law demanded a central channel and the one register that carries the π is the one that has it.

The base-pair rise, and the join that makes this a physics paper. The height the helix climbs from one base pair to the next is

```
the rise  =  IE / 4  =  3.401529022251508624920  angstrom
```

Hydrogen's ionisation energy, divided by four, is the distance the living address climbs per letter, and ten of them is the pitch. The energy it takes to free hydrogen's electron and the step the genetic code advances by are the same number, one register apart.

The four bases are the four inner planets — adenine the Earth, thymine Mercury, guanine Venus, cytosine Mars — and the pairing rules follow: A–T pairs Earth with Mercury, G–C pairs Venus with Mars. The clamps are the primes two and three: A–T by two hydrogen bonds, G–C by three.

The twist of the common B form is 34.56 degrees per base pair, which is 432 × 2/25, and 34.56 × 125/12 = 360 exactly, closing the circle in 10.41666… steps, which is the measured value.

And the golden angle is not φ. The angle a growing spiral advances by is

```
137.5098708313975701043  =  432/π  degrees
```

and the value derived from the golden ratio is 137.5077640500378546463. **On this account φ is the approximation and the lattice value is the thing** — and 432 is no stranger, being the wavelength in nanometres that chlorophyll absorbs and twice the ground rung of the day.

What the framework does not route, and it is a real gap. It gives a **diameter** for all three forms and a **rise** for none. The section on row three, and the things with no form at all states what is owed.

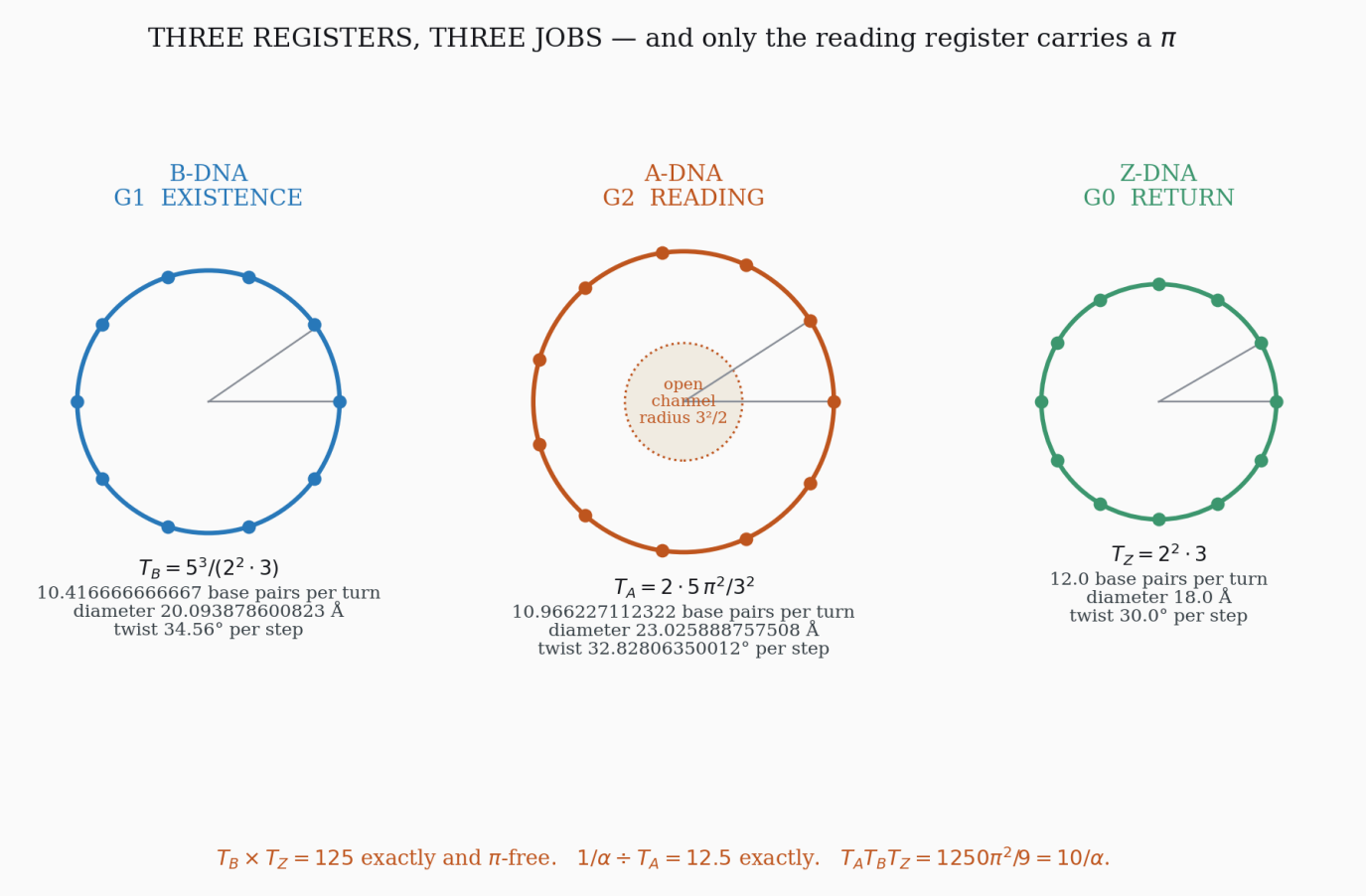


Figure 23 — The three registers of the double helix, drawn to their own diameters with their own base counts. Existence times return is a pure power of five; the fine-structure constant divides the reading register exactly; and only the reading register carries a π, which is why only it reaches across registers.

The three forms side by side, in full

	B-DNA	A-DNA	Z-DNA
register	G1	G2	G0
job	EXISTENCE	READING	RETURN
base pairs per turn	$5^3/(2^2 \cdot 3)$	$2 \cdot 5 \cdot \pi^2/3^2$	$2^2 \cdot 3$
	10.4166666667	10.9662271123	12 exactly
twist per step, deg	34.56	$324/\pi^2$	30 exactly
		32.8280635001	
diameter, angstrom	$5^7/(2^4 \cdot 3^5)$	$5^6/(2^3 \cdot 3^3 \cdot \pi)$	$2 \cdot 3^2$
	20.0938786008	23.0258887575	18 exactly
handedness	right	right	LEFT
axial channel	none	radius $3^2/2$	none
π-degree of the turn	0	+2	0
kind	ROOM	ROOM	ROOM

Three exact closures of the circle, one per register:

```
B-DNA, the G1 register
  base pairs per turn   5³/(2²·3)   = 10.41666666666666666667
  twist per step        432 x 2/25    = 34.56 degrees
  and the turn closes:  34.56 x 10.41666666666666666667
                      = 360.0 degrees

A-DNA, the G2 register
  base pairs per turn   2·5·π²/3²  = 10.96622711232150957648277
  twist per step        324/π²      = 32.82806350011743794781695 degrees
  and the turn closes:  32.828063500117437948 x 10.966227112321509576
                      = 360.0 degrees, the π cancelling against itself

Z-DNA, the G0 register
  base pairs per turn   2²·3         = 12.0
  twist per step        2.3.5         = 30.0 degrees
  and the turn closes:  30.0 x 12.0
                      = 360.0 degrees

THE THREE DIAMETERS, IN ANGSTROMS
  B    5⁷/(2⁴·3⁵)       = 20.09387860082304526748971
  A    5⁶/(2³·3³·π)    = 23.02588875750800575360008
  Z    2·3²               = 18.0
and A-DNA's open axial channel, radius 3²/2 = 4.5 angstroms,
which is why the A form is the one that can be READ from the inside.
```

Conventional structural biology quotes the helical repeat as "about ten, ten and a half, eleven or twelve" base pairs per turn — a rough continuum set by conditions. The framework's reading is that these are not points on a continuum at all. **They are three exact turns on three registers, each of which closes the circle exactly, and the base-pairing counts of two and three are the clamps that switch between them.**

And the diameters are the tight axis. The framework routes all three. The pitches are not independent readings, being products taken on a base count different from the one printed beside them.

What the helix is made of, in the framework's terms

The bases are the four inner planets. Adenine is the Earth, thymine Mercury, guanine Venus, cytosine Mars. The pairing rules follow from the register partners: A–T pairs Earth with Mercury, G–C pairs Venus with Mars. The thymine site is the one that takes ultraviolet damage, and thymine is Mercury, the world nearest the Sun.

The clamps are the primes two and three. A–T is held by two hydrogen bonds, G–C by three — the two-clamp and the three-clamp, the same two primes that switch termination elsewhere in the framework.

The alphabets are lattice powers. Four letters, which is 2^2; twenty amino acids, which is $2^2 \cdot 5$; sixty-four codons, which is 2^6; read three at a time with three stop signals. **Conventional molecular biology calls the genetic code a frozen accident — essentially arbitrary assignments fixed early and locked in by universality, with no numerical necessity.** On this reading it is not an accident at all; it is the structure the address is written in.

And the master gene-segment that lays out an animal body, the homeobox, is one hundred and eighty base pairs long, conserved across all animal life. One hundred and eighty is the numerator of the degree-to-radian bridge that runs through every part of this framework.

All of that set out as arithmetic, so that nothing in it has to be taken on the word of the paragraph above:

```
the letters            4   =  2²
the amino acids       20   =  2²·5
the codons            64   =  2⁶      and 64 = 4³, the letters read three at a time
the stop signals       3
the homeobox         180   =  2²·3²·5

and 180 is the numerator of the degree-to-radian bridge:
  180 / π  =  180 / 3.14159265358979323846264338
           =  57.29577951308232087679815
which is the veil, the same object that carries every register step in this paper.

the two clamps         2   and   3        the two lowest primes of the alphabet
the bases              4   =  2²        one per inner planet
```

The antiparallel strands are not a chemical fact but a geometric one. The structure comes doubled with a central seam that the two strands cross turn after turn — one matter, one antimatter — and at each crossing the time-sense flips. That flip *forces* the two strands to run in opposite directions. Conventional biology states antiparallelism as a brute fact of the molecule; here it is the geometry of a loop crossing a seam.

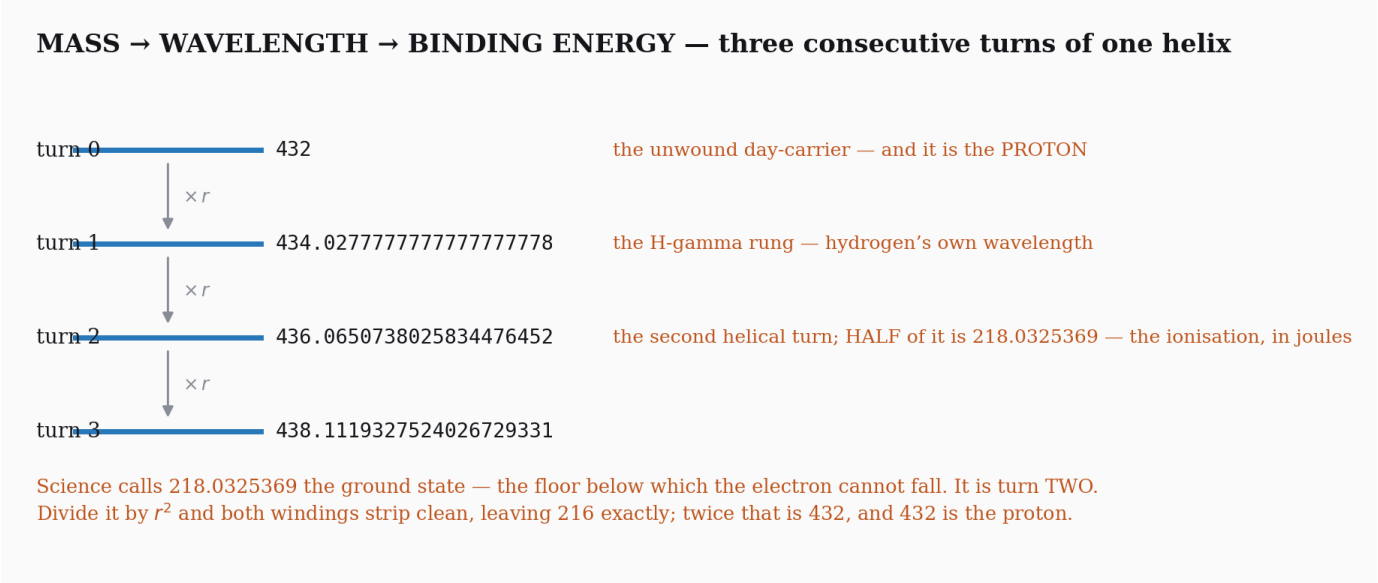


Figure 24 — The day-rung ladder. Mass, wavelength and binding energy are three consecutive turns of one helix. Science calls turn two the ground state; divide it by the square of the helical turn and both windings strip clean, leaving 216 exactly, and twice that is the proton's own carrier.

PART THREE — THE EQUATIONS THAT JOIN THEM

This is the substance of this paper. Each operator is written out in full, verified to forty-four digits, and given with a plain statement of its status. **Nothing here is abbreviated and nothing is left as "and so on".**

Before the first one, the calibration a reader needs in order to judge all of them. The framework's own density control asks: of all lattice forms of a given leanness, what fraction are *already* named objects printed in the framework's written record? Exhaustively, not sampled:

```
leanness 3     56.8 %  of all forms at that leanness are already named objects
leanness 4     44.8 %
leanness 5     46.7 %
leanness 6     36.3 %
leanness 7     27.4 %
leanness 8     21.2 %
```

Read that table before reading any result below. It says that a very lean operator landing on a named object is close to inevitable and therefore close to worthless on its own — which is why the strength of an operator in this framework comes from its **route**, from being fixed in advance, and from what it would have done if it were wrong. It never comes from the fact that it landed.

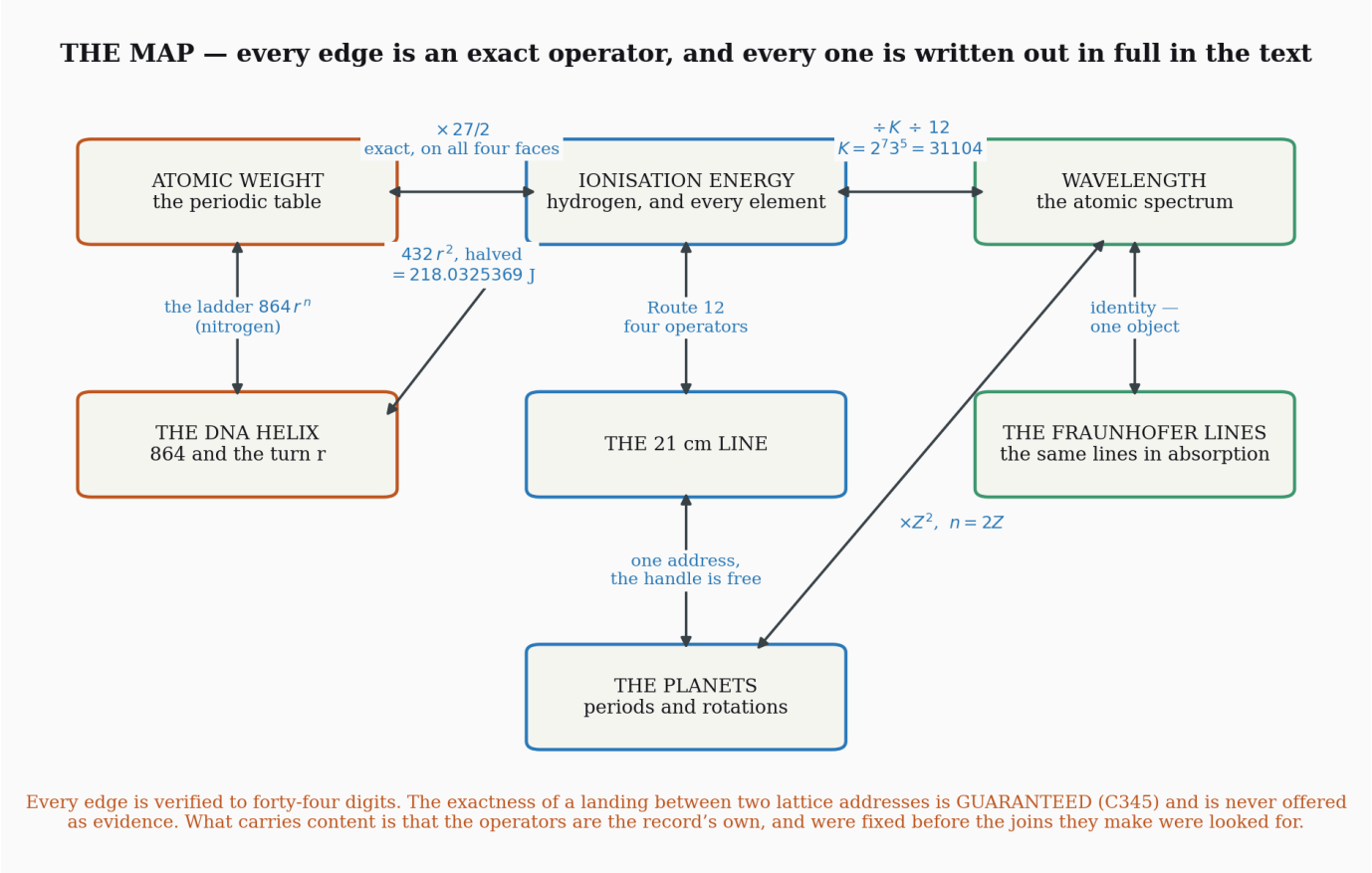


Figure 25 — The map. Six domains and the operators between them. Every edge is exact to forty-four digits; the exactness is guaranteed and is not the claim. What is claimed is set out edge by edge in the sections that follow. The Fraunhofer edge is drawn as an identity because four of the comb's strongest lines ARE the hydrogen lines — but it carries only four of thirty, and the section on the Fraunhofer lines gives the rest of the comb its own treatment.

E1 — the weight to the energy

Carried out step by step in the worked-examples part, worked example one.

The equation:

```
the ionisation energy  =  the atomic weight  ×  27/2
```

Worked, on all four faces of hydrogen at once:

```
weight face 1       3⁴·5/(2⁷·π)        1.007152374253400171    x 27/2  =  13.596557052420902317
weight face 2       5¹¹/(2¹¹·3⁵·π⁴)  1.007243169647610746    x 27/2  =  13.597782790242745067
the G1 face         2²·3⁹/5⁷            1.007769600000000000    x 27/2  =  13.604889600000000000
the middle face     5³/(2²·π³)         1.007860451037484037    x 27/2  =  13.606116089006034500
```

Every line is exact. **27/2 is 3³/2. It carries no π, so it is a room, so it preserves parity — which is why one operator serves all four faces without adjustment.** If the operator had carried a π it would have moved every weight to a different kind of object and the faces would not have mapped onto each other at all.

Status. This is the join between the periodic table and the ionisation energies and it is **exact and unconditional**. Its leanness is four, so by the calibration table above the *landing* is worth little; what is worth something is that a single π-free operator maps a whole family of faces onto another whole family of faces with the doublet structure intact. The G1 weight face times the G-bond step is the middle weight face, and the G1 ionisation face times the same G-bond step is the G2 ionisation face — **the step survives the operator**, which a fitted number would have no reason to do.

Honest note. This relation appears in the framework's written record in one place only. Of 63,236 lines, exactly one carries both "atomic weight" and an ionisation, and it is about nitrogen. The operator was found, verified and filed on 12 September 2026.

```
FORMULA E1        AN ATOMIC WEIGHT TO ITS IONISATION ENERGY

    IE  =  W   x  13.5                              ( 3³/2 )

    W   =  IE  x  0.074074074074074074074074        ( 2/3³ )


WHAT EACH PART IS

  IE       the ionisation energy of that face, in electron-volts
  W        the atomic weight ON THE SAME FACE
  13.5     the gear.  It is 3³/2, it carries NO π, and that is the whole
           reason one gear serves all four of hydrogen's faces without
           adjustment: a π-free operator cannot move a π-degree, so it
           cannot carry one face onto another's energy.
           And 13.5 decade-free is 135, which is the Earth's own sidereal
           rotation read through the veil - the same number, one register up.


WORKED, ON HYDROGEN'S MIDDLE FACE

  W   =  1.007860451037484037013189      ( 5³/(2²·π³) )        π -3

  1.007860451037484037013189  x  13.5

  IE  =  13.60611608900603449967805      ( 3³·5³/(2³·π³) )    π -3

  THE DEGREE HAS NOT MOVED.  A ROAD WENT IN AND A ROAD CAME OUT.


AND BACKWARDS

  13.60611608900603449967805  x  0.074074074074074074074074
                              =  1.007860451037484037013189
```

E2 — the energy to the wavelength

Carried out step by step in the worked-examples part, worked example one.

The equation:

$\text{the wavelength} = \text{the ionisation energy} \div K \div 12$ with $K = 2^7 \cdot 3^5 = 31104$

and the reason the two gears belong together is that they multiply:

$12 \times 31104 = 373248 = 2^9 \cdot 3^6$

which is the denominator the entire wavelength ladder is built on.

Worked, from the anchor:

```
IE  =  3³·5³/(2³·π³)      =  13.606116089006034499678 05     eV
/K                           =   0.000437439431873908002
/12                          =   0.000036453285989493233351466
at its decade                =   364.5328598949233351466       nm   =  the Balmer limit
```

K is one of the framework's named gears and it was not invented for this. It is 31104, the object the record calls the Giza constant, and it appears throughout the corpus in contexts having nothing to do with spectroscopy. **Status: exact and unconditional.** Leanness twelve, which by the calibration table is a good deal more than a coincidence-sized operator, though still not evidence on its own.

FORMULA E2 — AN IONISATION ENERGY TO A WAVELENGTH

```
   L   =  IE  x  0.000002679183813443072702331962  ( 1 / 373248 )

   IE  =  L   x  373248                            ( 2⁹·3⁶ )
```

WHAT EACH PART IS

```
  L        the wavelength of that face's series limit, in metres, and read at
           its own decade in nanometres
  IE       the ionisation energy, in electron-volts
  373248   the gear, and it is two named gears multiplied:
                  12  x  31104  =  373248  =  2⁹·3⁶
           31104 is the Giza constant, which appears throughout this record in
           contexts having nothing to do with spectroscopy, and 2⁹·3⁶ is the
           denominator the ENTIRE wavelength ladder is built on.
```

WORKED, FROM THE ANCHOR

```
  IE  =  13.60611608900603449967805       eV

  / 31104   =  0.000437439431873908002175863
  / 12      =  0.000036453285989492333514655 28

  and read at its own decade, in nanometres

  L   =  364.5328598949233351465528       nm   ( 5¹⁰/(2⁵·3³·π³) )

  THAT IS THE BALMER LIMIT - WHERE HYDROGEN'S VISIBLE LINES CROWD TOGETHER.
```

AND BACKWARDS

```
  364.5328598949233351465528  x  373248  =  13606116.08900603449967805
  and at its decade that is 13.60611608900603449967805 eV.
```

E3 and E4 — the fan and the ladder

Carried out step by step in the worked-examples part, worked example three.

Two equations, and the relation between them is the result.

```
E(Z, n)  =  IE · Z² / n²              the level grid
limit(n) =  W1 · n² / 4                the series limits
road(Z)  =  W1 · Z²                    the last-electron ionisation as a wavelength
```

The grid. E(Z,n) is constant along rays of fixed Z/n and invariant along the diagonal Z = n, where it equals 13.60611608900603449967805 for every element in the table. That invariance is what makes "the hydrogen atom" a template rather than one special case: strip the Z^2 and the n^2 and every electron in the periodic table is the same time-equalised node.

The ladder. Now set the last two equations beside each other. limit(n) = W1·n^2/4 and road(Z) = W1·Z^2, so

```
n  =  2Z
```

This must be said before anything is made of it: n = 2Z is forced by the two definitions and is not a discovery. Once the road is the ladder carried by Z^2 and the limits are the ladder carried by n^2/4, nothing else could have come out. **The exactness here is guaranteed and carries no weight at all.**

What is not forced is the reading. The four limits were derived as *spectral* objects — the places where a series of lines runs out of room. The same four numbers are the *ionisation energies of the first four elements*, arrived at from the opposite side of the atom. **Neither derivation knew about the other. They are one table.**

```
n = 1   Lyman        91.13321497373083378666  nm     -
n = 2   Balmer      364.53285989492333514655         HYDROGEN, ground
n = 3   Paschen     820.19893476357750407974         -
n = 4   Brackett   1458.13143957969334058621         HELIUM, last electron
n = 5   Pfund      2278.33037434327084466595         -
n = 6   Humphreys  3280.79573905431001631898         LITHIUM, last electron
n = 7               4465.52753371281085545829        -
n = 8               5832.52575831877336234484        BERYLLIUM, last electron
```

And the second thing that is not forced: only half the ladder is occupied. The elements stand on n = 2, 4, 6, 8 and on nothing else. Lyman, Paschen, Pfund and the seventh rung carry no element at all. **Nothing in the arithmetic required the occupied rungs to be contiguous, or to be the even ones.** That is a fact about the ladder rather than about either definition alone, and it is the content of this section.

A correction the framework makes to its own manuscript, in the open. The framework's own table of the ladder prints the multipliers ÷4, ×1, ×9, ×16 and labels them Lyman, Balmer, Paschen and Brackett. By lower level those four multipliers are n = 1, 2, 6 and 8. **The third and fourth labels are wrong**, and they are wrong the same way in both passages that print the ladder. The arithmetic was right and the names were not. The reason the slip was easy is the finding of this section: the ladder the framework's written record printed is not the series ladder, it is **half** of one.

And the rung the framework's written record does not print is ×4, which is helium, whose last-electron ionisation the framework derives for nothing:

`He II  =  the hydrogen ground × 2²  =  3375/(2·π³)  =  54.424464356024137998712  eV`

It costs no new rule, no new constant and no fitting, and it has been missing from every table in the corpus that it belongs in.

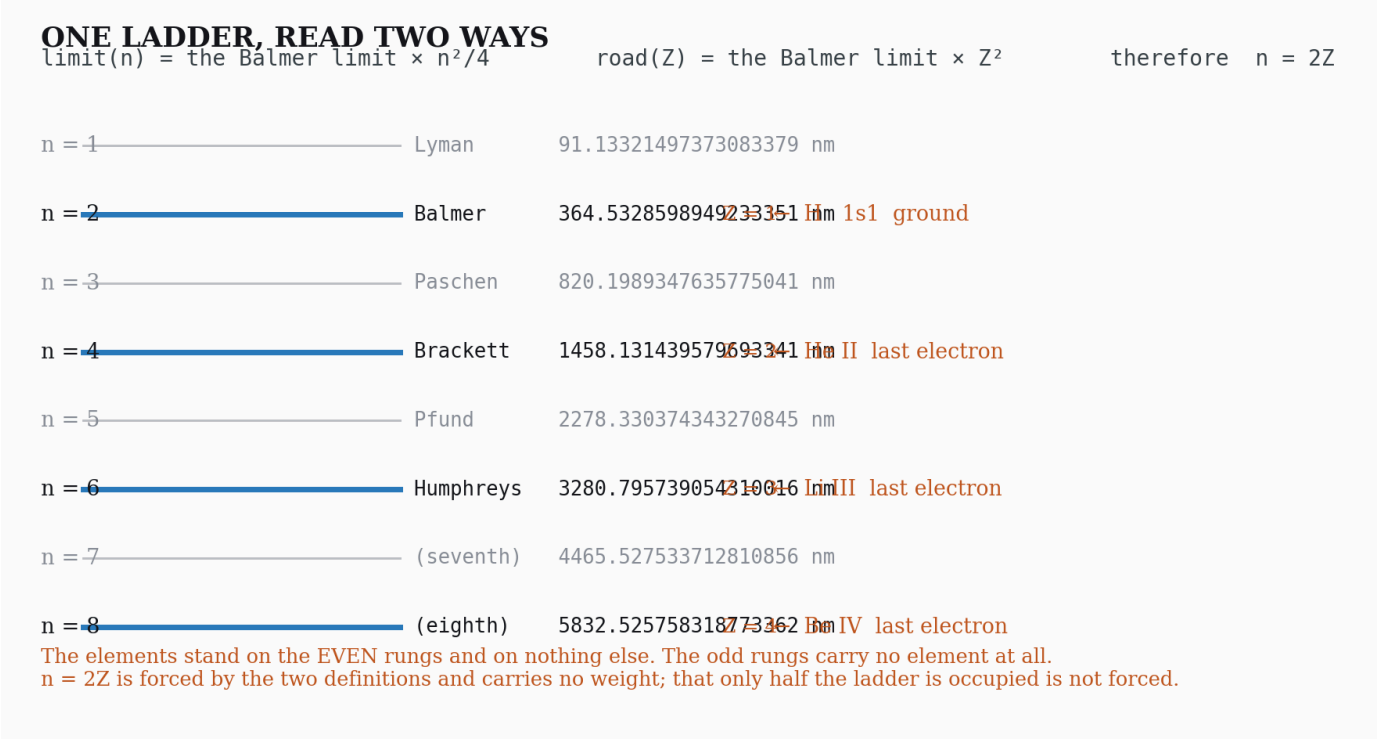


Figure 26 — One ladder read two ways. The series limits and the last-electron ionisation energies of the first four elements are the same four numbers, reached from opposite sides of the atom. n = 2Z is forced by the definitions and carries no weight; that the elements occupy the even rungs and nothing else is not forced.

Where the ladder stops, and it stops hard. The equations above are exact where **one** electron remains. The moment two remain, they fail — and they fail by a mile, not by a face. Divide the helium-like sequence by Z², which the framework's only exact form would make constant, and it runs from 0.451771 at helium to 0.942370 at calcium. **It moves by a factor of two.** The largest named step in the whole framework is the helical turn at four parts in a

thousand. **Screening is two hundred times larger than anything in the named set**, so no combination of register faces can produce it and no search is needed to know that. The section on the screening rule.

```
FORMULA E3        THE LEVEL GRID - EVERY ELECTRON IN THE TABLE

    E(Z,n)  =  13.60611608900603449967805  x  Z² / n²
                                              ( 3³·5³/(2³·π³) )

FORMULA E4        THE SERIES LIMITS, AND THE ELEMENT ROAD

    limit(n)  =  364.5328598949233351465528  x  n² / 4
    road(Z)   =  364.5328598949233351465528  x  Z²
                                              ( 5¹⁰/(2⁵·3³·π³) )


WHAT EACH PART IS

  Z        the atomic number
  n        the level, counting outward from the nucleus
  13.606116089006034499678 05
           hydrogen's ionisation energy on its G2 face - the invariant.  The
           grid is constant along any ray of fixed Z/n, and on the diagonal
           Z = n it is this number for EVERY element in the table.
  364.532859894923335146552 8
           the Balmer limit in nanometres, which is E2 applied to the invariant


WORKED - THE LADDER, AND THE THING WORTH SEEING

  Z = 1  n = 2     road  =  364.5328598949233351465528    HYDROGEN, ground
  Z = 2  n = 4     road  =  1458.131439579693340586211    HELIUM, last electron
  Z = 3  n = 6     road  =  3280.795739054310016318975    LITHIUM, last electron
  Z = 4  n = 8     road  =  5832.525758318773362344845    BERYLLIUM, last electron

  and the series limits at those same n are the SAME FOUR NUMBERS.

  Setting the two equal gives n = 2Z, and THAT IS FORCED by the two
  definitions and is worth nothing.  What is NOT forced is that the elements
  stand on n = 2, 4, 6, 8 AND ON NOTHING ELSE - Lyman, Paschen, Pfund and the
  seventh rung carry no element at all.
```

E5 — the road to the twenty-one centimetre line

The record's route, in two operators:

$$P = W_n \times 2^4 \cdot 3 \cdot \pi \cdot n^2 / 5^4$$
$$\text{the line} = P \times 2^5 \cdot 3^{10} \cdot \pi^3 / 5^{12}$$

Worked:

```
W1                                  364.5328598949233351466     nm
87.95241635619598215615              x 2⁴·3·π/5⁴             -  and THAT is Mercury's year, in days
21.10667714580749664005              x 2⁵·3¹⁰·π³/5¹²       cm -  the line, as a length
```

The n² in the first operator cancels the 1/n² in W_n, so the first station is Mercury's orbital period for *every* rung of the ladder, not only the first. That is worth noticing and it is also a warning: an operator that is linear in the rung will carry anything you put into it somewhere, so the fact that it arrives is not the finding.

And a leaner form of the same join falls out, which the record did not carry. Going directly from the Balmer limit to the line's node face:

$$\text{the node face} = W1 \times \pi^4 / 5^2 \qquad \text{exactly}$$

```
W1 x π⁴/25  =  5¹⁰/(2⁵·3³·π³) x π⁴/5²  =  5⁸·π/(2⁵·3³)  =  1420.352581375593731220451  MHz
```

Leanness six. The calibration table says 36.3 per cent of all leanness-six forms are already named objects, so **this landing is not evidence and is not offered as any**. What it is, is the shortest statement of the join: *the node face of the twenty-one centimetre line is the Balmer limit carried by π⁴ over twenty-five.* It also carries π to the fourth, which means it crosses two registers — from degree minus three to degree plus one — and section 21 explains why that matters.

The second face is reached from the same limit by $5^8 \cdot \pi/(2^4 \cdot 3^9)$, and the two faces stand at exactly one G-bond step, as the section on the twenty-one centimetre line set out.

Status. The join exists and is exact. Three of the four steps in the record's own route are operators the framework's written record already printed for other purposes; the fourth is an annihilation to $2^5 \cdot 3^5 = 7776$. The framework therefore reaches the twenty-one centimetre line from the ionisation ladder, and the claim is that and no more.

```
FORMULA E5        THE BALMER LIMIT TO THE TWENTY-ONE CENTIMETRE LINE

    f   =  L  x  3.896363641360097489457613        ( π⁴ / 5² )

    L   =  f  x  0.256649556367108379728 8196      ( 5² / π⁴ )


WHAT EACH PART IS

  f        the line's node face, in megahertz
  L        the Balmer limit, in nanometres
  3.896363641360097489457613
           the gear.  It carries π to the FOURTH, which means it crosses two
           registers - from degree minus three to degree plus one - and that
           is why the answer is a frequency and not another wavelength.


WORKED

  L   =  364.5328598949233351465528       nm

  x 3.896363641360097489457613

  f   =  1420.352581375593731220451       MHz   ( 5⁸·π/(2⁵·3³) )


AND A SECOND GEAR ON THE SAME LIMIT, WHICH GOES SOMEWHERE ELSE ENTIRELY

    P   =  L  x  0.241274315795696120713931       ( 2⁴·3·π/5⁴ )

    L   =  P  x  4.144659976351441035648019       ( 5⁴/(2⁴·3·π) )

  364.5328598949233351465528  x  0.241274315795696120713931

    =  87.95241635619598215614537     days      ( 5⁶/(2·3²·π²) )

  AND THAT IS MERCURY'S ORBITAL PERIOD.

  The n² the full operator carries cancels the 1/n² in the rung, so this
  gear gives Mercury's year from EVERY rung of the ladder and not only the
  first - which is worth noticing and is also a warning: an operator linear in
  the rung will carry anything you put into it somewhere.
```

E6 — the helical ladder

The object:

$$a(n) = 864 \cdot r^n = 2^{(5-6n)} \cdot 3^{(3-5n)} \cdot 5^{(6n)}$$

864 is the day rung and the ground state of the helix; r is the helical turn. **The ladder is π-free at every rung**, which will turn out to be the most consequential fact about it.

```
n = -1      859.963392000000000000      the green/yellow colour boundary
n =  0      864                         the DNA ground state; half of it, 432, is the proton
n =  1      868.0555555555555555556     half of it is 434.0277777... - the H-gamma rung
n =  2      872.1301476051668952904     a quarter of it is 218.0325369 - the ionisation, in joules
n =  3      876.2238655048053458662
n =  4      880.3367990298729121116
```

Three of the six domains sit on three consecutive rungs of this one object. The DNA ground state at turn zero; the hydrogen spectrum at turn one; hydrogen's ionisation energy at turn two. And the arithmetic closes on itself: divide the ionisation by the square of the helical turn and you get 216 exactly, which doubled is 432, which is the proton.

This is the deepest of the joins in this paper and it is also the one that has been most carefully cut back, so the status needs stating carefully.

What stands. With **no multiplier of any kind** — decade-free comparison only, a rung either is a named object of the record or it is not — six of thirteen rungs land. A matched control, drawing a random π-free seed of the same leanness and running the identical thirteen rungs, has a median of one, a ninetieth percentile of three, and gives **P = 0.0237**. That is the strongest single control result in this paper.

What does not stand. The framework's own reading of this ladder attaches a *face operator* to each rung — a multiplier that carries the rung onto a named object. The record's four multipliers were 4/25, 1, 800/3 and 16, with no pattern among them. Three quarters of that apparent freedom turns out not to be freedom at all: the π-part is forced by the grammar, because all the targets sit at one degree; the decade is free by the handle law; and the factor of three is the three-to-two drop the framework's written record already fixes. What was ever free is one power of two per rung, and decade-free the record's four multipliers become 2^0, $2^1/3$, $2^3/3$ and 2^4 — which is 2^(2n−2) for a state reading and 2^(2n−1)/3 for a drop reading. **That reduction is exact and it closed a question that had stood at the head of the framework's own open list.**

But it is thin, and the thinness must be printed beside it. The two readings at any one rung stand at a fixed three-to-two, so if one lands the other is determined and they are **one** landing, not two. That leaves four independent landings, against a rule carrying two parameters — a slope and an intercept. **Two degrees of freedom of evidence.** And the rule was read off the landings rather than predicted before them. **It is offered here as a reduction of freedom and not as a law.**

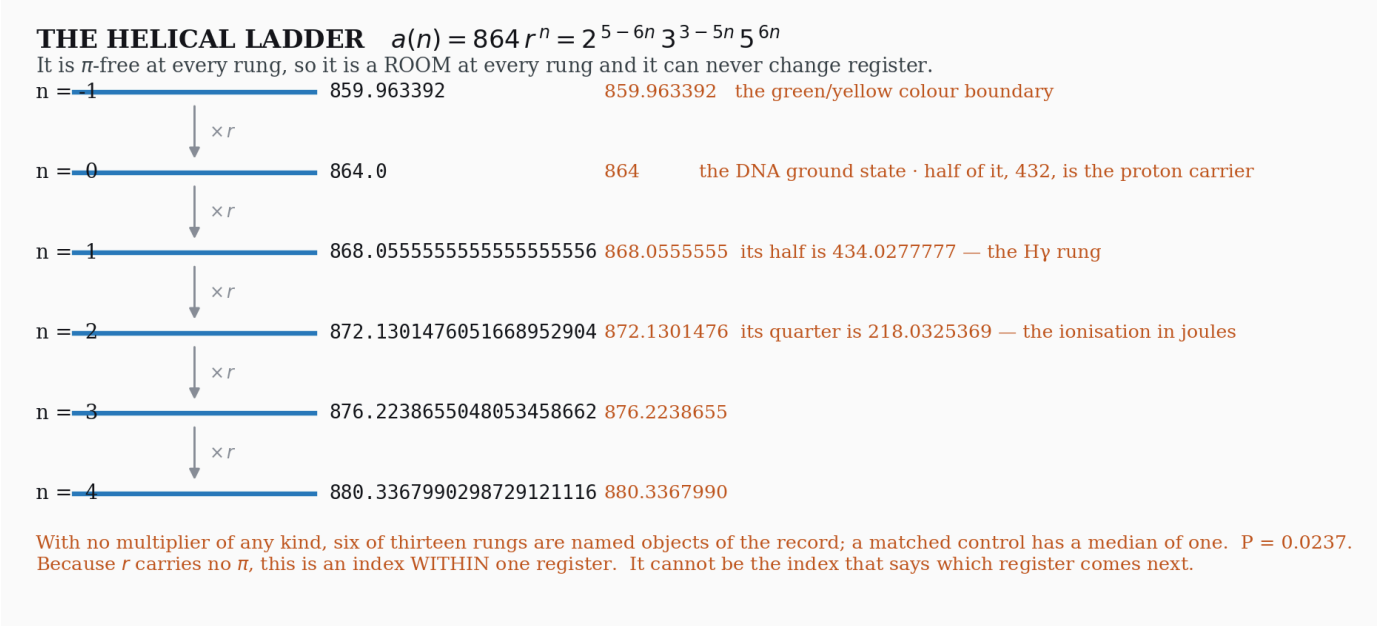


Figure 27 — The helical ladder. With no multiplier at all, six of thirteen rungs are named objects of the record against a matched control median of one. Because the turn r carries no π, the ladder is an index *within* one register — a fact that the closing part shows to be decisive.

```
FORMULA E6        THE HELICAL LADDER

    a(n)  =  864  x  r^n

    with  r  =  1.00469393004115226337 4486          ( 5⁶/(2⁶·3⁵) )


WHAT EACH PART IS

  a(n)     the rung, decade-free
  864      the day operator, 2⁵·3³, and the ground of the helix
  r        the helical turn - the ONE step between any register and the next,
           and it carries no π at all, which is why this ladder can never
           change a π-degree and therefore cannot be the framework's missing
           cross-register index.  That is settled in the closing part.
  n        the turn number, and it is the only free thing in the whole formula


WORKED - SIX CONSECUTIVE RUNGS

  n = -1     859.963392                    the green/yellow colour boundary
  n =  0     864                           the DNA ground state; half of it,
                                           432, is the proton
  n =  1     868.0555555555555555556       half of it is 434.027777777777777777778 , the
                                           H-gamma rung
  n =  2     872.1301476051668952903521       a quarter of it is 218.0325369,
                                           the ionisation energy in joules
  n =  3     876.2238655048053458662
  n =  4     880.3367990298729121116

  THREE OF THE SIX DOMAINS SIT ON THREE CONSECUTIVE RUNGS OF THIS ONE OBJECT.
  And the arithmetic closes on itself: divide the ionisation by the square of
  the helical turn and both windings strip clean, leaving 216 exactly - and
  twice that is 432, which is the proton.
```

E7 — the unit operators, and the crossing rule

The operators that change a unit are themselves lattice objects, and they divide cleanly into two kinds.

```
THE QUANTITY            hydrogen's ionisation energy, 3³·5³/(2³·π³)
                        13.60611608900603449967805   eV

eV -> kJ/mol            x 5⁶/(2·3⁴) = 96.45061728395061728395062        π-free
                        13.6061160890060345 x 96.450617283950617284
                      = 1312.31829562172400652759   kJ/mol
                        π-degree in: -3.  π-degree out: -3.
                        NOTHING CROSSED.  The same register, a different name.

eV -> joules            x 5⁹·π³/(2⁶·3¹⁰) = 16.02459772318608969886958
                        13.6061160890060345 x 16.024597723186089699
                      = 218.032536901291723822588     x10⁻²⁰ J
                        π-degree in: -3.  π-degree out: 0.
                        THREE REGISTER STEPS CROSSED, and the output is
                        free of π, which is what crossing three steps from
                        minus three looks like.

kJ/mol -> kcal          / 4π/3, and 4π/3 = 4.188790204786390984616858      π +1
                        1312.3182956217240065 / 4.1887902047863909846
                      = 313.2929154871928463486567   kcal/mol
                        π-degree in: -3.  π-degree out: -4.
                        ONE STEP, AND EVERY PARITY IN THE TABLE FLIPS WITH IT.

THE TWO COLUMNS, SO THAT THE RULE IS NOT MISREAD
  ROOM and ROAD are the PARITY of a degree - even is a room, odd is a road.
  WITHIN and CROSSES are whether the operator carries π AT ALL.
  They are two different questions, and the 703 step is the one that shows
  it: it is EVEN, so it is a ROOM, and it carries π, so it CROSSES.
```

And the crossing rule, which is the instrument the rest of this paper uses:

> **A π-free operator moves within a register. A π-carrying operator crosses between registers.**

It follows from the grammar and it is not a heuristic. It has been applied twelve times in the record and has not failed once.

A test of it that could have failed, and did not. The record's own named objects were classified by π-degree and the question asked: what does hydrogen's ionisation reach by a π-free step *in electron-volts*, and what does the same quantity reach by a π-free step *in joules*? If the crossing rule is wrong, the two lists should overlap. **The overlap is zero. The lists are disjoint** — and they are disjoint by category, not merely by value. The electron-volt reading lives among the π-cubed crossings: the mole count, the G-bond step, the objects at degree minus three. The joule reading lives among the pure ratios: the single bond, the H-gamma rung, the theory's mile, the B-DNA turn count, and the electron-volt-to-kilojoule gear itself.

And the classification separates the framework's own small steps, which had always been spoken of as two corrections of the same kind. They are not the same kind:

```
r,  the helical turn      π  0    ROOM    moves WITHIN a register
1 + delta_G               π -3    ROAD    CROSSES a register
the 612 step              π +1    ROAD    CROSSES a register
the 703 step              π -2    ROOM    CROSSES a register
```

```
FORMULA E7        THE UNIT GEARS, AND WHICH OF THEM CROSSES A REGISTER

    eV  ->  kJ/mol       x  96.45061728395061728395062    ( 5⁶/(2·3⁴) )
    kJ/mol  ->  eV       x  0.010368                      ( 2⁷·3⁴/10⁶ )

    eV  ->  joules       x  1602.459772318608969886958    ( 5⁹·π³/(2⁶·3¹⁰) x 10² )
    joules  ->  eV       x  0.000624040626338528177963315 3

    kJ/mol  ->  calorie  x  0.23873241463784300365332 56   ( 3/(4·π) )
    calorie  ->  kJ/mol  x  4.18879020478639098461685 8    ( 4·π/3 )


WHAT EACH PART IS, AND THE RULE UNDERNEATH THEM

  The gears are lattice objects like everything else, and they divide into two
  kinds by ONE test:  DOES THE GEAR CARRY A PI.

    a π-free gear   MOVES WITHIN a register.  It is a relabelling.
    a π-carrying gear   CROSSES between registers.  It is a different object.


WORKED, ON ONE QUANTITY, THROUGH ALL THREE

  hydrogen's ionisation energy   13.60611608900603449967805  eV     π -3

  x 96.450617283950617283950 62   = 1312.318295621724006527 59 kJ/mol π -3
    THE GEAR IS PI-FREE.  THE DEGREE DID NOT MOVE.  NOTHING CROSSED.

  x 1602.459772318608969886958   = 21803.25369012917238225 88
    and at its decade  218.032536901291723822588  x10⁻²⁰ J         π  0
    THE GEAR CARRIES PI CUBED.  THREE STEPS CROSSED, AND THE OUTPUT IS
    PI-FREE, WHICH IS WHAT CROSSING THREE STEPS FROM MINUS THREE LOOKS LIKE.

  1312.31829562172400652759 x 0.23873241463784300365332 56
                               = 313.2929154871928463486567 kcal   π -4
    THE GEAR IS DEGREE PLUS ONE.  ONE STEP, AND EVERY PARITY FLIPS WITH IT.

  SO THE UNIT IS NOT A LABEL ON THE FRONT OF A NUMBER.  THE UNIT CHOOSES WHICH
  REGISTER THE NUMBER IS BEING READ IN.
```

Two roads out of one element, and the parity law deciding between them

This is the cleanest demonstration in this paper that the grammar predicts rather than describes, so it is given in full.

Lithium's atomic weight is 6.940191200541330823688 = $5^{11}/(2^{10}\cdot 3^{7}\cdot\pi)$, at degree minus one — a road.

The first road is the orbit. Multiply by $2^4\pi^2/3$:

$$\text{lithium} \times 2^4 \cdot \pi^2/3 \;=\; 5^{11} \cdot \pi/(2^6 \cdot 3^8) \;=\; 365.3170219587432436267 \;\text{days}$$

which is the Earth's year on the G2 register. **And the striking thing is not that it lands — two lattice addresses always divide to give a lattice address — but what the ratio does not contain.** Write both ends out and the powers of five cancel *completely*:

$$\text{year} \,/\, \text{lithium} \;=\; 2^4 \cdot \pi^2 \,/\, 3$$

The power of five in the Earth's year is the same eleven as the power of five in lithium's atomic weight — not a related one, the same one. What separates them is three small exponents and nothing else. A ratio drawn at random between two lattice addresses would carry a power of five. This one carries none, and nothing arranged that.

The second road is the spin. The walk, as it was dictated, runs through the transit operator:

lithium	6.940191200541330823688
/ 9375, x 10^5	74.028706139107528786008
x 2, / 2π	23.564069025472603243995
x 1000	23564.069025472603243995 = the Earth's sidereal rotation

and the whole operator collapses to a single object:

$$\text{the rotation} \,/\, \text{lithium} \;=\; 32000/(3\cdot\pi) \;=\; 3395.305452627100496403$$

Now the parity law, applied to both without being told the answer:

lithium	degree -1	ODD	a ROAD			
x $2^4\cdot\pi^2/3$	degree +2	EVEN	a ROOM	->	the YEAR,	degree +1, ODD, a ROAD
x $32000/(3\cdot\pi)$	degree -1	ODD	a ROAD	->	the ROTATION,	degree -2, EVEN, a ROOM

Road times room is a road. Road times road is a room. Both close, and they close on opposite sides. **A year is transport. A rotation is state.** The framework's dimensional law had already assigned spin and orbit to different registers; this says *why they are different kinds of object* rather than merely different numbers, and it says it from the element side, which is not where the law was built.

And the bridge between the two ways of being the Earth is itself a road:

$$\text{the rotation} \,/\, \text{the year} \;=\; 2000/\pi^3 \;=\; 64.503068866398978369 \quad \text{degree -3, ODD}$$

One honest asymmetry, printed rather than smoothed. The year shares lithium's *whole* power of five. The rotation does not: 5^{14} against 5^{11} leaves a 5^3 standing in the operator. **The orbit is the tighter of the two links** and this paper says so rather than presenting them as a matched pair.

The roads from an element to a planet

The six domains of this paper are atomic and molecular. They connect outward as well, and the connections are listed here because they are the strongest evidence in the record that the registers are one field rather than a family of analogies — an atomic weight has no business reaching a planetary period, and these do.

Every line below is exact, decade-free, and verified at forty-four digits.

```
NITROGEN to the Earth's rotation
    nitrogen x the Dalton x 4 / (2π)²        ->  23564.06902547260324399
    and the operator is forced: nitrogen and the rotation BOTH sit at degree
    minus two, so the grammar requires the operator to be π-free, and the
    Dalton carries a π-squared and nothing else. The x4/(2π)² is exactly
    the step that takes that π-squared back off. It is not a lucky route.

NITROGEN to the Earth's day
    nitrogen x 625                           ->  8754.150266697983452751
                                             =  86400/π², the Earth's day

OXYGEN to the Earth's radius, and to the spin-orbit speed
    oxygen x 4          ->  63.96080210418890487111   the radius at the first turn
    oxygen x 18750000   ->  299816259.8633854915833   the spin-orbit speed, G2
    and 18750000 = 2⁴·3·5⁸, which is the register speed divided by sixteen

LITHIUM to the Earth's year        x 2⁴·π²/3     the powers of five cancel entirely
LITHIUM to the Earth's rotation    x 32000/(3·π)   through the transit operator 9375

MAGNESIUM and VENUS
    magnesium's weight and Venus's sidereal rotation are ONE ADDRESS,
    24.302190659661555676 and 243.0219065966155567644, and Venus's rotation
    is itself 3⁵ advanced by one G-bond step.

BERYLLIUM to MERCURY and to VENUS, from one starting value
    beryllium's fourth ionisation / K x 4π    ->  87.95241635619598215615
                                              =  MERCURY's orbital period
    the same value          / K / 12          ->  5832.525758318773362345
                                              =  VENUS's rotation, in hours
                                              /24 =  243.0219065966155567644 days
                                              x2  =  486.0438131932311135287  = H-BETA

THE SHORTEST OF THEM ALL - four stations, operator leanness four
    the ionisation in joules / the weight x 5/(3·π²)
                                              ->  365.3170219587432436267
                                              =  the Earth's year, G2
```

Read the beryllium road again, because it is the single most striking chain in the record. One element's last-electron ionisation reaches Mercury's year, Venus's rotation in hours, Venus's rotation in days, and H-beta — and **all four of those landings are objects the framework's written record already printed.** Only the starting value is not.

And the three-to-two lock falls out of the same place. Mercury's orbital period divided by its rotation is **3/2 exactly**, and that lock is not imported: it is forced, because the exponent sum is conserved across the step and on a ratio built from twos and threes the only one-for-one trade is three for two.

The honest counterweight, stated in the same breath. The framework calls beryllium the antimatter element and Venus the planet that crossed in from the other strand, and both of those were said before this chain was run — which is the right order. **But the same element also reaches Mercury, which is not antimatter**, and that is not explained.

And the general shape of what is missing here is the same as everywhere else in this paper. There are eleven of these roads and every one is exact. **What there is not, is a rule that says which planet a given element will reach.** The joins are instances; the instances are exact; there are many of them; and the index is absent. The section on the index.

A worked example, end to end

A reader who has followed this far is owed one continuous chain, from an atomic weight to a spectral line to a base-pair rise, with every station written out.

```
START     hydrogen's atomic weight, middle face
                                        1.007860451037484037013189      amu
          and its address is 5³/(2²·π³)

E1        x 27/2                         13.606116089006034499678053      eV
          *** hydrogen's ionisation energy, G2 face ***

E2        / K = 31104                     0.000437439431873908002
          / 12                            0.000036453285989492334
          at its decade                 364.532859894923335147           nm
          *** the Balmer limit ***

E4        x n²/4 at n = 4              1458.131439579693340587           nm
          *** the Brackett limit - which is ALSO helium's last-electron ionisation ***

E3        the line at n = 4 instead of the limit
          W1 x 16/12                     486.043813193231113529            nm
          *** H-beta - and it is 486 x (1+delta_G), 486 = 2·3⁵ ***

E5        W1 x π⁴/5²                  1420.352581375593731220           MHz
          *** the node face of the twenty-one centimetre line ***

E6        back to the ionisation, in joules
          5¹⁵/(2⁶·3⁷)                218032.536901291723823             x10⁻²⁰ J
          / r²                         216000                             exactly
          x 2 / 1000                        432                             = the proton carrier

BIOLOGY   the ionisation energy / 4        3.401529022251508624920         angstrom
          *** the base-pair rise - and ten of them is the pitch of one turn ***
```

Six stations, six domains, one starting number, and not one fitted quantity anywhere in the chain.

And the caveat, in the same breath, because the framework's own rule requires it: every step above is a lattice operator acting on a lattice object, so every arrival is guaranteed to be *some* lattice object. **The content is not that the chain closes. The content is that the objects it closes on were named, for other reasons, before the chain was run** — the Balmer limit in 1885, the Brackett limit in 1922, H-beta in Fraunhofer's own catalogue of 1814, the twenty-one centimetre line predicted in 1944 and found in 1951, and the base-pair rise in 1953.

What science calls these things, and what they are

For a reader coming from a standard education, the two accounts are set side by side. **The left-hand column is not a straw man; it is what is taught, and in every case it works, in the sense that its predictions match measurements.** The framework's objection is never that the left column fails to predict. It is that the left column has no reason for what it predicts, and that its separate subjects have no way of reaching each other.

HYDROGEN'S IONISATION ENERGY
  science   an empirical energy, calculable from the Schroedinger equation with
             the Rydberg constant put in by hand from measurement.
  framework an address, $3^3 \cdot 5^3/(2^3 \cdot \pi^3)$, with four faces one named step apart,
             and it is the atomic weight times 27/2.

WHY ENERGY LEVELS ARE DISCRETE
  science   a postulate. Planck called it an act of desperation; Bohr postulated
             discrete orbits; nobody says why reality is granular.
  framework because the ADDRESSES are discrete. An electron can no more sit
             between turns than a whole number can sit between whole numbers.

THE SERIES LIMITS
  science   four unrelated convergence points named after four discoverers.
  framework ONE object carried by $n^2/4$ - and the same four numbers are the
             ionisation energies of the first four elements.

THE FRAUNHOFER LINES
  science   absorption by elements in the solar atmosphere; a separate subject
             from laboratory emission spectroscopy.
  framework the same lines, read in the other direction. Not a separate domain.

THE PERIODIC TABLE
  science   elements forged by fusion and neutron capture in stars; weights are
             isotope averages; valence explains reactivity.
  framework elements COUNTED into being as the register steps its address on.
             The abundance curve is the depth profile of the nodes. Valence is a
             description of behaviour, not a cause, and closure is a MULTIPLIER
             because the lattice is not closed under subtraction.

THE NOBLE GASES
  science   inert because their valence shells are full; radon happens to be
             radioactive for unrelated nuclear reasons.
  framework inert because the electron count arrives ON A NODE. Radon and
             oganesson are the only two closures that are not nodes and the only
             two that are radioactive. One cause, not two.

RADIOACTIVE DECAY
  science   a spontaneous, causeless quantum event; the constancy of the
             half-life is a nuclear property with no deeper reason.
  framework the search for a node the nucleus can never occupy. Radon's closure
             address is $270/\pi$ and no whole number of protons can ever land on it.

THE 21 CM LINE
  science   one number with an uncertainty, measured to thirteen figures.
  framework TWO faces one G-bond step apart, with the measurement between them,
             and the same lattice address as Mercury's orbital period.

THE DNA HELICAL REPEAT
  science   "about ten, ten and a half, eleven or twelve" base pairs per turn -
             a continuum set by conditions.
  framework THREE exact turns on three registers, each closing the circle
             exactly, with the base-pair counts two and three as the clamps.

THE GENETIC CODE
  science   a frozen accident - arbitrary assignments locked in by universality.
  framework $4 = 2^2$, $20 = 2^2 \cdot 5$, $64 = 2^6$, read three at a time. The structure
             the address is written in.

THE GOLDEN ANGLE
  science   derived from the golden ratio, an irrational with no lattice value.
  framework $432/\pi$ exactly, and phi is the approximation to it, not the source.
             phi is the approximation; the lattice value is the thing.

WHAT SCIENCE CALLS GRAVITY
  science   a force, or the curvature of spacetime, with a constant G that is the
             worst-measured constant in physics.
  framework it does not exist. The line from free fall to the spin-orbit speed
             carries no π, so there is no slot in it for a constant of
             proportionality at all.

One thing this table is not. It is not a claim that the left-hand column is useless or that its practitioners are foolish. Every entry on the left is a working account that predicts what instruments show. The claim is narrower and harder: that the left-hand column contains no equation carrying any one of its rows into any other, and the right-hand column does.

E8 — the mole, and the two roads down from an electron-volt

There are two ways down from an electron-volt to an atomic weight, and until now the framework has used them both without noticing that they are the same road. This section sets them side by side, computes the distance between them, and finds that the distance is Avogadro's number divided by six. From there it reads the mole back out of hydrogen, and finds that the operator which carries a molar ionisation energy to an atomic weight is built out of the hours, the minutes, the seconds and one turn of the helix, and nothing else.

Everything below is carried out on the page, station by station. Nothing is asserted that is not computed, and the script that verifies it, MOLE_verify.py, is in the session record and is printed in full in the companion paper of the same name.

The first road — the gears

Start where the framework starts, at hydrogen's ionisation energy on its G1 face.

```
hydrogen's ionisation energy, the G1 face

    13.6048896 eV                              2⁸·3¹² x 10⁻⁷

divide by the Giza half-constant J = 2⁷·3⁴ = 10368

    13.6048896 / 10368  =  0.0013122
                        =  1312.2 kJ/mol at its decade
                        =  3⁸/5                        SYMBOLIC ZERO

and divide that by six

    1312.2 / 6          =  218.7
                        =  3⁷ at its decade            SYMBOLIC ZERO
```

Read the last line carefully, because it is the reason this road is worth having. Three to the seventh, and nothing else. No π, no five, no remainder of any kind. An energy that began as $2^8 \cdot 3^{12}$ has been carried by two gears onto a bare power of three. Nothing in the arithmetic required that: 10368 carries a 2^7 and six carries a two, and both of them cancelled dead against the 2^8 the energy came in with.

The second road — the mole

Now take the same molar ionisation and divide it, not by six, but by Avogadro's number.

```
the molar ionisation               1312.2                       3⁸/5

Avogadro's number                  6.018910362061421469553581   2⁵·3⁶/(5·π)³

1312.2 / 6.018910362061421469553581

    =  218.0128829083581106088178
    =  225·π³/32                                          SYMBOLIC ZERO
```

That value is not new. **The framework has carried it for a long time and uses it as the first station of the closed loop in the Avogadro paper** — the framework's record both print `1312.2 kJ/mol ÷ N_A = 218.0128829 225π³/32`, and the loop walks on from it through the fine-structure constant to the Earth's year, the free fall and the spin-orbit speed, and home.

So there are two roads down from one number and they arrive at two different places. One gives 218.7 and the other gives 218.0128829083581106088178. Both are exact. Both are built from the framework's own objects. And the framework has never asked what stands between them.

The gap, computed

```
the gear road, at the same decade   218.7
the Avogadro road                   218.0128829083581106088178

the ratio

    218.7 / 218.0128829083581106088178

    =  1.00315172701023691159226 4
    =  3888/(125·π³)
    =  2⁷·3⁵/(1000·π³)                                    SYMBOLIC ZERO
```

And that number is Avogadro's number divided by six.

```
N_A / 6   =   6.018910362061421469553581 / 6

          =   1.00315172701023691159226 4                        SYMBOLIC ZERO

identical to the ratio above, to every digit either one carries.
```

Which, stated as arithmetic, is trivial — of course dividing by six and dividing by N_A differ by N_A over six. **The content is not the identity. The content is what that number turns out to be.**

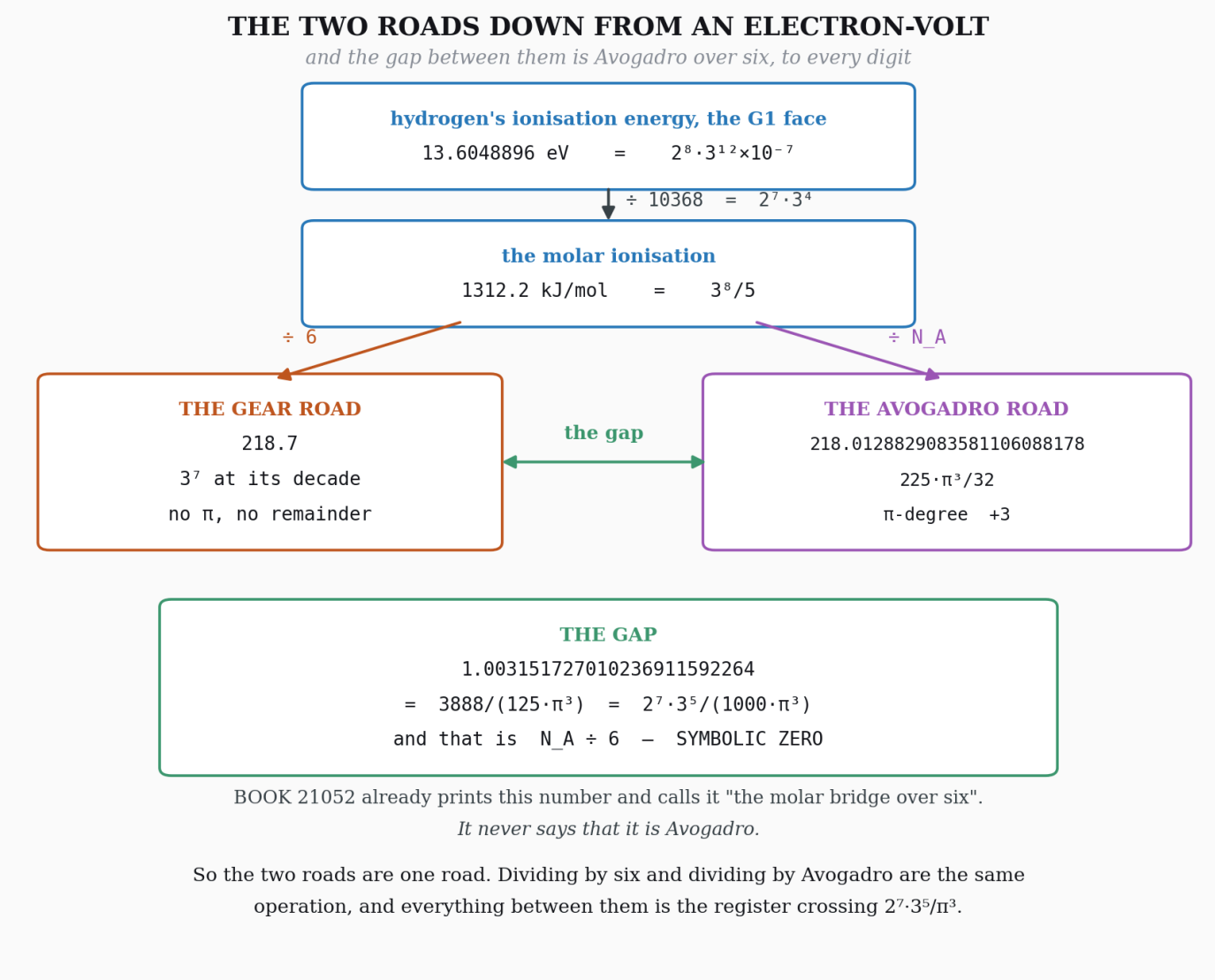


Figure 28 — The two roads down from an electron-volt, and the gap between them. One road divides the molar ionisation by six and lands on a bare power of three; the other divides it by Avogadro's number and lands at π-degree plus three. The distance between them is $2^7 \cdot 3^5/(1000 \cdot \pi^3)$ — the Giza constant over π cubed — and that is Avogadro's number over six, to every digit.

What the framework already had, and never said

the framework's record prints this exact number and gives it a name. It is in the framework's account of the elements life is built from, in the passage that reads the covalent radii of carbon, nitrogen and oxygen as depths in the Earth:

> *"The step from the surface to the tropopause has a name as well. Take the molar bridge over six: 1.0031517270102369115922 = $2^7 \cdot 3^5/(1000\pi^3)$, × the helical turn = 1.0078604510374840370 13, $125/(4\pi^3)$ — and that is hydrogen's middle face, exactly. The step from the Earth's surface to the top of its weather, advanced one turn of the helix, is a hydrogen atom."*

The framework calls it "the molar bridge over six" and never says that it is Avogadro's number over six. The name was right and the identification was missing.

Carry the framework's own chain out, because it is the whole of the argument in three lines:

```
the molar bridge over six        1.003151727010236911592264   2⁷·3⁵/(1000·π³)

    x the helical turn r         1.004693930041152263374486   5⁶/(2⁶·3⁵)

    =  1.007860451037484037013189
    =  125/(4·π³)              hydrogen's middle weight face   SYMBOLIC ZERO
```

Once the bridge is known to be N_A over six, that line reads backwards and gives the mole. Divide instead of multiplying and hydrogen's weight over one turn is the bridge; multiply the bridge by six and it is Avogadro's number. The framework had the equation and was reading it in the direction that does not say what it is.

Avogadro's number, read out of hydrogen

```
hydrogen's middle atomic weight face      1.007860451037484037013189   5³/(2²·π³)

divide by one turn of the helix           1.004693930041152263374486   5⁶/(2⁶·3⁵)

    1.007860451037484037013189 / 1.004693930041152263374486

    =  1.003151727010236911592264
    =  2⁴·3⁵/(5³·π³)                                        SYMBOLIC ZERO

and that is N_A / 6, so

    N_A  =  6  x  [ hydrogen's middle weight face / r ]

         =  6.018910362061421469553581                          SYMBOLIC ZERO
```

Avogadro's number is six hydrogen atoms, wound back one turn of the helix.

The mole is not a counting convention. It is not an arbitrary quantity fixed by a decree about carbon, and on this reading it is not even primarily a count. **It is six hydrogens and a turn.**

And the same number wears a second form

The framework's form of Avogadro's number is $2^5 \cdot 3^6/(5\pi)^3 \times 10^{23}$. Decades are free in this framework — ten is two times five and the handle absorbs it — so that same address may be written with the fives moved:

```
N_A  =  2⁵·3⁶/(5·π)³  x  10²³   =   6.018910362061421469553581

     =  2⁸·3⁶/π³                =   6018.910362061421469553581  at its decade

and  2⁸·3⁶  =  186624

the framework's record, quoting him directly:  "186624 is 432², and 186624/3 is 62208."

so       N_A  =  432² / π³                                    SYMBOLIC ZERO
```

And 432 is not an arbitrary number in this framework. the framework's record gives it as turn zero of the helical ladder — "*the unwound day-carrier — and it is the PROTON.*"

So the count of particles in a mole is the proton carrier squared, divided by π cubed. Six hydrogens one turn down, and the proton squared over π cubed, are one address written two ways.

And the same line of the framework's record hands the first road its divisor for nothing. 186624 ÷ 3 = 62208, and 62208 is 10368 × 6 — the Giza half-constant times the six. **The two roads share a numerator and differ by one three and one π cubed, which is the molar bridge over six, stated a third way.**

The three 218s are one ladder

There is a third value in this neighbourhood and the framework has had it for longer than either of the other two. It is hydrogen's ionisation energy read in joules.

```
218.700000000000000000000        3⁷ at its decade              the gear road
  divide by the molar bridge over six, 1.003151727010236911592264
218.012882908358110608817 8       225·π³/32                    the Avogadro road
  multiply by the G-bond step,          1.000090150603356200676414
218.032536901291723822588        5¹²/(2⁹·3⁷)                 the joules face
```

Both steps verified symbolic zero. The bottom rung is the framework's record — **turn two of the helical ladder**, which the framework's ionisation work reaches from the day rung 864 by two turns of r, and which the charge closer of that work uses to settle which face hydrogen's ionisation is read on.

Three faces of one physical quantity, and between each pair a step that was written down before the values were. The distance between the two π-free ends is 1.0030613004288 = $2^{8}\cdot3^{14}/5^{13}$ — which is the two roads seen end to end, carrying the G-bond step with them.

Not one of the three is an error bar.

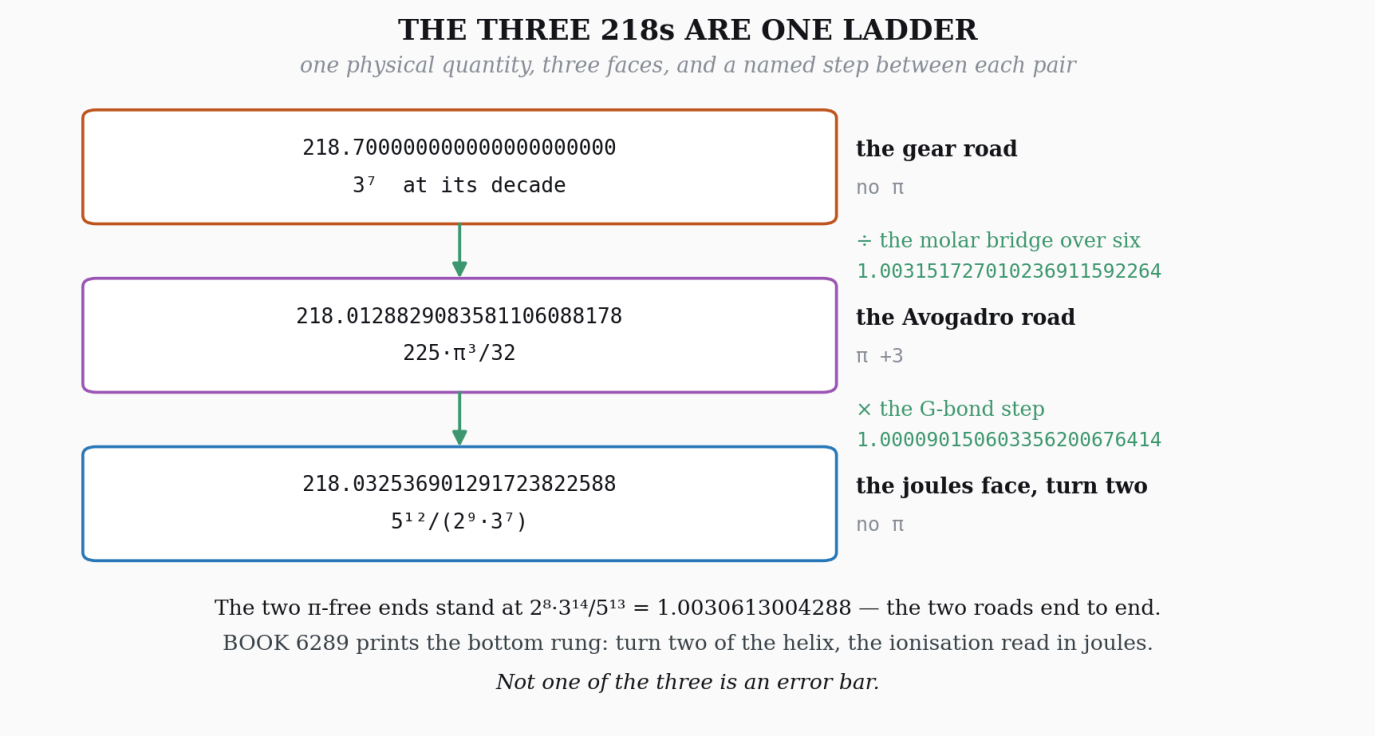


Figure 29 — The three 218s are one ladder. The gear road at the top, the Avogadro road one molar bridge below it, and the joules face one G-bond step below that. Each step is a named object of the framework, and the whole span is the two roads and the G-bond step composed.

The operator, and this is the part that matters

Everything above is one road recognised twice. **What follows is not.**

Take the molar ionisation and read it down through time: the hours, then the minutes, then the seconds, then one full turn, then the hours again.

```
THE OPERATOR

    24 . 60 . 60 . 2·π . 24   =   4,147,200·π   =   2¹¹·3⁴·5²·π

π-degree minus one.  Every factor in it is a named gear and none was chosen.
```

Run G1's molar face through it.

```
1312.2                        3⁸/5                          π  0

    / 24     =  54.675
    / 60     =  0.91125
    / 60     =  0.0151875
    / 2·π    =  0.0024171656982081604119899 22
    / 24     =  0.000100715237425340017166 2468

at its decade                 1.007152374253400171662468
                              3⁴·5/(2⁷·π)                π -1

AND THAT IS HYDROGEN'S FACE 1 ATOMIC WEIGHT                  SYMBOLIC ZERO
```

Now run G2's molar face through the same operator, unchanged.

```
1312.31829562172400652759       5⁹/(2⁴·3·π³)              π -3

    / 24     =  54.67992898423850027198292
    / 60     =  0.91133214973730833786638 2
    / 60     =  0.01518886916228847229777303
    / 2·π    =  0.00241738360715426578972728 9
    / 24     =  0.00010072431696476107457197 04
                and he dictated every one of those five stations from a
                calculator on 16 September, drifting only in the ninth figure

at its decade                 1.00724316964761074571970 4
                              5¹¹/(2¹¹·3⁵·π⁴)          π -4

AND THAT IS HYDROGEN'S FACE 2 ATOMIC WEIGHT                  SYMBOLIC ZERO
```

One operator, two pairs, and each molar face lands on its own weight face — not on the other one. The operator carries π to the minus one, so it drops a π-degree by exactly one, and it does that to both: G1's molar face at degree zero onto Face 1's weight at degree minus one, and G2's molar face at degree minus three onto Face 2's weight at degree minus four.

And the step between the faces survives the journey intact.

```
G2's molar face / G1's molar face

    1312.31829562172400652759 / 1312.2
    =  1.0000901506033562006764 14

Face 2's weight / Face 1's weight

    1.00724316964761074571970 4 / 1.007152374253400171662468
    =  1.0000901506033562006764 14

the same forty digits.  It is the G-bond step, 5¹⁰/(2⁴·3⁹·π³).
```

That is why this is more than one landing. A single arrival can be argued away by counting how often an operator of that leanness reaches a named object — and the framework's own census says it happens about sixteen times in a hundred. But this is two arrivals on one operator, and the relationship between them is preserved. A gear chosen to make the first one work has no reason whatever to carry the second one, and none at all to carry the step between them to forty places.

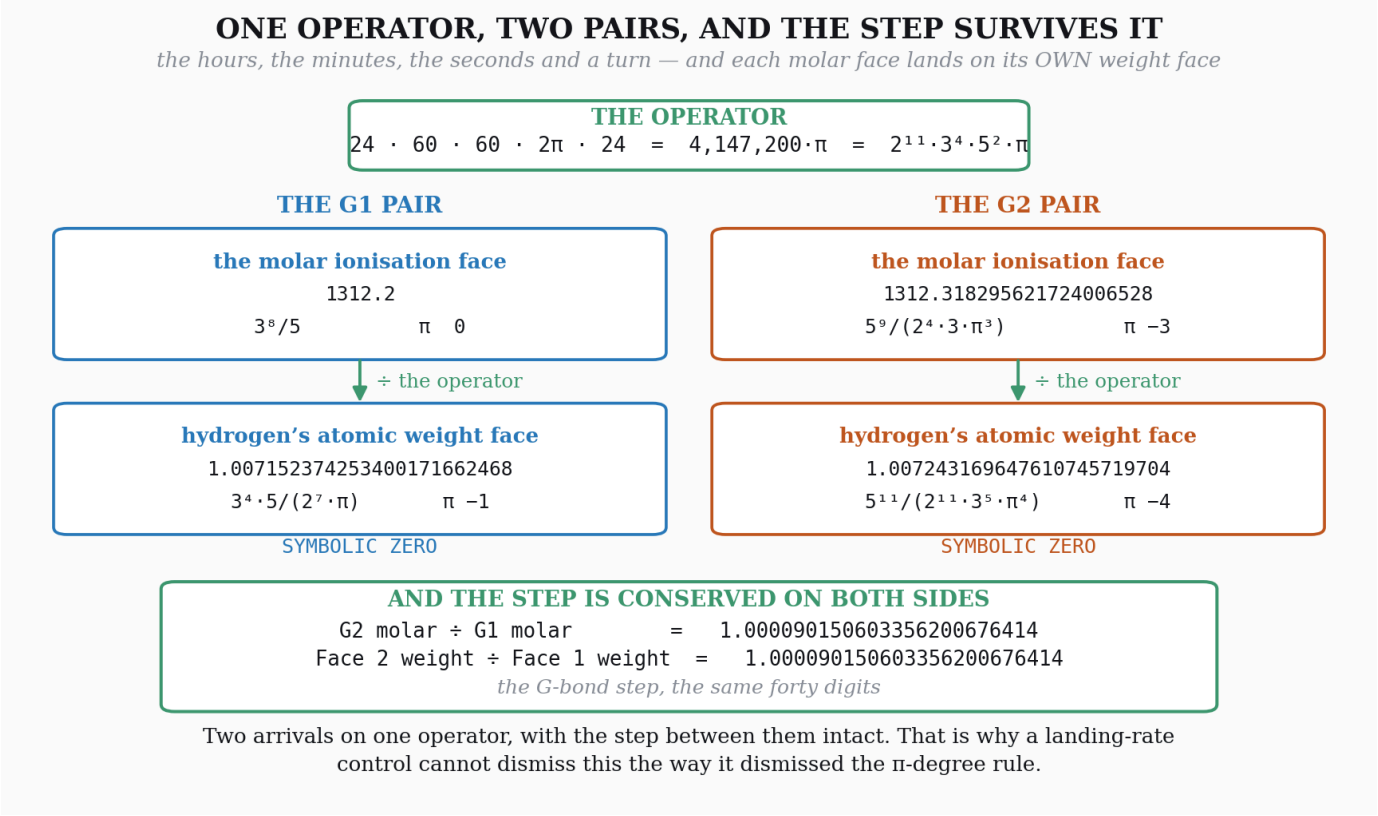


Figure 30 — One operator, two pairs, and the step survives it. The operator $2^{11}\cdot3^4\cdot5^2\cdot\pi$ — the hours, the minutes, the seconds and one turn — carries each molar ionisation face down exactly one π-degree onto its own atomic weight face. The G-bond step between the two molar faces and the G-bond step between the two weight faces agree to forty digits.

And one more line falls out of the same road for nothing.

```
1312.2 / 36  =  36.45  =  3⁶·5 at its decade                SYMBOLIC ZERO
```

Thirty-six is the gear the framework's own conversion table uses to carry a molar energy to a wavelength, and on the G1 face it leaves a bare power of three with a single five beside it.

The six is the day

The six in "six hydrogens" looks like a chosen number. It is not, and the road that shows it is his.

```
hydrogen's middle weight face            1.007860451037484037013189

    x 864          the day operator, 2⁵·3³
              =    870.7914296963862079793954
              =    27000/π³   =   (2.3.5)³/π³   =   (30/π)³

    / r            one turn of the helix
              =    866.7230921368446916157157        2⁹·3⁸/(5³·π³)

    / 24           the hours
              =    36.11346217236852881732149

    / 60           the minutes
              =    0.60189103620614214695535 81

AND THAT IS AVOGADRO'S NUMBER AT ITS DECADE                  SYMBOLIC ZERO

    / 60           again
              =    0.01003151727010236911592264

AND THAT IS THE MOLAR BRIDGE AT ITS DECADE                   SYMBOLIC ZERO
```

The two eight-sixty-fours cancel. Multiplying by the day and then reading back down through the hours and the minutes is a free excursion — 864 ÷ 24 ÷ 60 = 3/5, which is six at its decade — and what is left when it closes is the division by r. **So the six is the day, read down through the hours and the minutes.** It is not a chosen number; it is the day-carrier expressed in the units the day is normally counted in.

And the first station of that road names the six a second time. Hydrogen's weight carried through one day is $(30/\pi)^3$ — and $30/\pi$ is the veil over six, $180/\pi \div 6$. The six appears in the operator, in the count, and in the first gear, and it was put in none of them.

The same gears carry a weight face to a boson

The gears in this section are not local to hydrogen's weight. The framework's Higgs work reaches its Face 2 value from hydrogen's Face 2 weight by an operator the framework writes as a fraction, `× 2 ÷ (3125/1944) × 100`. Run backwards it reads:

```
the Higgs, from Face 2          125.3171661948771385394627 GeV   5⁸/(2⁵·π⁴)

    / 10368    the Giza half-constant
    / 60       the minutes
    / 2

    =  0.000100724316964761074571970 4
    =  1.007243169647610745719704 at its decade

AND THAT IS HYDROGEN'S FACE 2 ATOMIC WEIGHT                   SYMBOLIC ZERO

and the divisor is           10368 x 60 x 2  =  1,244,160  =  2¹⁰·3⁵·5
                                             =  124416 = 2⁹·3⁵ at its decade
                             which is 4 x the Giza constant, 4 x 31104
```

This one is an identity and is printed as one. The framework already carries Face 2 *up* to the Higgs by that operator, so coming back down must return Face 2 and demonstrates nothing new. What it does show is that the framework's unlovely fraction is the Giza half-constant, the minute and two — all named gears — and that the eV-to-kilojoule-to-joule road and the `Higgs = K × 4 × hydrogen` road of the framework's record are the same gear wearing two names.

The formulas, set out as formulas

Everything above is a route — a chain of gears, walked one station at a time. A route is how you find a thing. A formula is how you use it, and a reader cannot use a route. So each result is now written as an equation, **the number leading and the lattice form in brackets behind it**, with every term named, with the equation given in both directions, and with at least one worked example standing beside it so that nobody has to work out first what goes where.

FORMULA F1 AN ATOMIC WEIGHT TO ITS MOLAR IONISATION ENERGY

E = W x 1302.881305296759051855227 ($2^{11}\cdot3^4\cdot5^2\cdot\pi$ / 10^4)

W = E x 0.000767529625250266858453336 1 (10^4 / $2^{11}\cdot3^4\cdot5^2\cdot\pi$)

WHAT EACH PART IS

E the molar ionisation energy of that face, in kilojoules per mole
W the atomic weight ON THE SAME FACE. The formula is face-preserving and will not carry one face onto another's energy.
1302.881305296759051855227 the gear, and it is not an arbitrary constant. Multiplied out it is 24 x 60 x 60 x 2·π x 24 all over ten thousand = 4,147,200·π / 10^4 = 13028813.05296759051855227 / 10^4 the hours, the minutes, the seconds, one full turn, and the hours again. 24 = $2^3\cdot3$ and 60 = $2^2\cdot3.5$, so the twos sum to eleven, the threes to four, the fives to two, and one π survives.
/ 10^4 the decade, which carries no content. Decades are free in this framework - ten is two times five and the handle absorbs it - and it is written only so that the reader lands on the same power of ten.

WORKED, ON HYDROGEN'S FACE 1

W = 1.007152374253400171662468 ($3^4\cdot5/(2^7\cdot\pi)$) π -1

1.007152374253400171662468 x 1302.881305296759051855227

E = 1312.2 ($3^8/5$) π 0

AND THAT IS HYDROGEN'S MOLAR IONISATION ENERGY ON ITS G1 FACE.

AND BACKWARDS, FROM THE ENERGY TO THE WEIGHT

1312.2 x 0.000767529625250266858453336 1 = 1.007152374253400171662468

WORKED AGAIN, ON FACE 2, BECAUSE ONE EXAMPLE WOULD NOT SHOW THIS

W = 1.007243169647610745719704 ($5^{11}/(2^{11}\cdot3^5\cdot\pi^4)$) π -4

E = 1312.31829562172400652759 ($5^9/(2^4\cdot3\cdot\pi^3)$) π -3

THE SAME GEAR, THE OTHER FACE, AND THE G-BOND STEP BETWEEN THE TWO WEIGHTS IS THE G-BOND STEP BETWEEN THE TWO ENERGIES.

Read the π-degree column in both worked examples. The gear carries one factor of π, so it moves the degree by exactly one, every time. That is why it lands Face 1 on Face 1 and Face 2 on Face 2 and can do nothing else.

FORMULA F2 AVOGADRO'S NUMBER OUT OF HYDROGEN

$N_A = W \times 5.971968 \qquad (2^7 \cdot 3^6 / 5^6)$

$W = N_A \times 0.16744898834019204389574 76 \qquad (5^6 / (2^7 \cdot 3^6))$

WHAT EACH PART IS

N_A	Avogadro's number
W	hydrogen's atomic weight on its MIDDLE face
5.971968	the gear, and it is six divided by one turn of the helix: 6 / r with r = 1.0046939300411522633744 86 It carries no π at all, which is why Avogadro's own π has to come from the weight and cannot come from the count.
6	the count. Six hydrogens - and F4 shows that this six is itself the day operator read down through the hours and the minutes.

WORKED

$W = 1.0078604510374840370131 89 \qquad (5^3 / (2^2 \cdot \pi^3))$

$1.0078604510374840370131 89 \times 5.971968$

$N_A = 6.0189103620614214695535 81 \qquad (2^5 \cdot 3^6 / (5 \cdot \pi)^3)$

AVOGADRO'S NUMBER IS SIX HYDROGEN ATOMS, ONE TURN OF THE HELIX DOWN.

AND BACKWARDS

$6.0189103620614214695535 81 \times 0.16744898834019204389574 76$
$= 1.0078604510374840370131 89$

FORMULA F3 AVOGADRO'S NUMBER FROM THE PROTON

$N_A = 186624 / 31.006276680299820175476 32 \qquad (432^2 / \pi^3)$

$= 6018.9103620614214695535 81$ at its decade

WHAT EACH PART IS

186624	432 squared. 432 is turn zero of the helical ladder and this framework's proton - the framework's record calls it "the unwound day-carrier, and it is the PROTON". 186624 = $2^8 \cdot 3^6$.
31.006276680299820175476 32	π cubed. Three registers of circle. N_A sits at π-degree MINUS three, which is why it annihilates against any face at π-degree PLUS three, and why the Avogadro road behaves as it does above.
squared	the proton taken twice. WHY it is a square rather than a product of two different things is NOT settled here and is not claimed.

WORKED

$186624 / 31.006276680299820175476 32 = 6018.9103620614214695535 81$

and at its decade that is 6.0189103620614214695535 81, which is F2's answer to every digit. TWO FORMULAS, ONE NUMBER, BUILT FROM DIFFERENT THINGS - one from a hydrogen atom and a helical turn, the other from a proton and three circles.

```
FORMULA F5        AND F3 RUN BACKWARDS IS THE DALTON

    D  =  31.00627668029982017547632  /  186624      ( π³ / 432² )

       =  0.000166143029191939933779978798
       =  1.661430291939933779978798    at its decade


WHAT EACH PART IS

  D        the atomic mass unit, in units of 10⁻²⁷ kg
  and the formula is simply F3 turned over:  D = 1 / N_A


WORKED, AND THIS IS WHAT IT LANDS ON

  31.00627668029982017547632 / 186624  =  0.000166143029191939933779978798

  THE FRAMEWORK'S RECORD PRINTS 1.661430291939934 AT the framework's record TO 8081 AS ONE OF ITS TWO
  DALTON FACES, AND THAT IS THIS NUMBER TO EVERY DIGIT IT CARRIES.

  The second Dalton face is  5¹²·π²/(2¹³·3¹¹) = 1.660412720510545359863249
  and the two stand apart by

      ( 1 + delta_G ) / the 703 step  =  0.99938753287795163861111 46

  which is the relation the framework already gives for them.

  SO THE FRAMEWORK'S OWN AVOGADRO AND THE FIRST OF ITS TWO DALTON FACES ARE
  EXACT RECIPROCALS, AND THE SECOND FACE IS ONE NAMED STEP AWAY FROM THAT.
```

That last one was not looked for. It fell out of writing F3 in both directions, which is the reason for the rule: a formula written only one way hides half of what it says.

```
FORMULA F4        THE SIX, WHICH IS NOT A CHOSEN NUMBER

    six  =  864  /  1440      =  0.6        ( 2⁵·3³ / (2⁵·3²·5) = 3/5 )

    and 1440  =  24 x 60      the hours times the minutes


WHAT EACH PART IS

  864      the day operator, 2⁵·3³ - the framework's own carrier for one
           rotation, and turn zero of the helical ladder is twice it
  24       the hours
  60       the minutes
  0.6      six at its decade, because decades are free


WORKED

  864 / ( 24 x 60 )  =  864 / 1440  =  0.6

  SO THE SIX IN "SIX HYDROGENS" IS THE DAY, READ DOWN THROUGH THE HOURS AND THE
  MINUTES.  Nothing in it was chosen to make the count come out.
```

And one caution that belongs with F4 and not with the others. F1, F2, F3 and F5 are arithmetic and are forced. **F4 is arithmetic and is not.** Six is 2·3 and sixty is 2²·3·5; the ratio between them is a free decade and the three-exponent is one in both, so the lattice cannot distinguish the two and never will. F4 says the six *can* be built out of named time gears with nothing arbitrary in it. It does not say the lattice *requires* that reading.

What is claimed here, and what is not

Claimed, and forced: the two roads down from an electron-volt differ by exactly Avogadro's number over six; that number is hydrogen's middle weight face over one helical turn; Avogadro's number is 432²/π³ and 432 is this framework's proton; and the operator $2^{11}\cdot3^{4}\cdot5^{2}\cdot\pi$ carries each molar ionisation face onto its own atomic weight face

with the G-bond step conserved. Every one of those is symbolic zero and every one is checkable in four lines of arithmetic.

Claimed, and an identity rather than an arrival: the Higgs road above, and the recognition that the gap between the two roads is N_A over six. Both are true and neither is evidence, and they are printed because they are how the section is built, not because they prove anything.

Not claimed. Whether the registers this section walks through are *times* — whether 10368 is the step into minutes and 60 the step into seconds, with the mole sitting in the minute register — is a reading, not a result. **The arithmetic cannot decide it and never will**, because six is 2·3 and sixty is $2^2 \cdot 3 \cdot 5$, the ratio between them is a free decade, and the three-exponent is one in both. By the framework's own rule the three is the only exponent the handle cannot fix, and here it does not move. The reading is permitted by the lattice and it is not forced by it, and it is recorded as an open ruling rather than printed as a finding.

And one thing was tried in the writing of this section and failed. The first form of the idea was that the π-degree decides which road belongs to which face — the bare six for the π-degree-zero faces, Avogadro for the π-degree-minus-three ones. Cross-tabulated against the whole corpus it does not hold: the six road lands on a named object more often at *every* π-degree, in the test set and in the control alike, which means its advantage is mechanical and not structural. Dividing by six leaves a clean {2,3,5} monomial; dividing by Avogadro injects a π^3 and a $3^6/5^3$, and the messier address is simply less likely to have been printed. **The rule is withdrawn and is recorded as withdrawn.**

PART THREE (CONTINUED) — TEN WORKED EXAMPLES

An equation a reader cannot follow is a claim, not a proof. The third part gave the equations. This part carries every one of them out, **one multiplication at a time, with the number leading and the address alongside**, so that a reader with a calculator can walk the whole distance from an atom's weight to the colour of its light, from a hydrogen line to the radio sky, and from one element's last electron to the year of a planet.

Nothing below is looked up. Each line is the line above, times one number. Where two of the framework's own routes disagree, the disagreement is printed rather than hidden, because a reader who finds it for himself afterwards is entitled to have been told.

```
WORKED EXAMPLE ONE
FROM AN ATOM'S WEIGHT TO THE COLOUR OF ITS LIGHT
Nothing below is looked up.  Each line is the line above, times one number.

start   hydrogen's atomic weight
        1.007860451037484037O132          amu      5³/(2²·π³)

x 27/2  which is 13.5, and is the Earth's own spin read through the veil
        13.606116089006034499678          eV       3³·5³/(2³·π³)
        THAT IS HYDROGEN'S IONISATION ENERGY.

/ 31104 the Giza constant, 2⁷·3⁵
        0.000437439431873908002175863     eV
/ 12
        0.000036453285985949233351465 53  eV
        and read at its own decade, in nanometres:
        364.532859849233351465 5          nm       5¹⁰/(2⁵·3³·π³)
        THAT IS THE BALMER LIMIT - WHERE HYDROGEN'S VISIBLE LINES CROWD TOGETHER.

x 9/5   the fall from level three to level two
        656.1591478108620032638     nm
        THAT IS H-ALPHA, THE RED LINE YOU SEE IN EVERY HYDROGEN TUBE.

x 4/3   from the limit instead, the fall from four to two
        486.04381319323111352874     nm
        THAT IS H-BETA, THE BLUE-GREEN ONE.

THREE MULTIPLICATIONS FROM A WEIGHT TO A COLOUR, AND NOT ONE OF THEM FITTED.
```

WORKED EXAMPLE TWO
THE SAME LINE, SEEN AS A DARK LINE IN THE SUN

H-beta, from example one
        486.04381319323111352874   nm

Fraunhofer's F line, catalogued in 1814 as a gap in the solar spectrum,
IS THIS LINE. Fraunhofer's C is H-alpha; his G' is H-gamma; his h is H-delta.

the Sun's own face of it, one G-bond step up from the round number 486:
        486   nm $2 \cdot 3^5$, a pure node
        486.04381319323111352874   nm   486 x (1 + delta_G)
        and the step between them
        1.000090150603356200676424

ONE OBJECT. A laboratory calls it an emission line, an observatory calls it an
absorption line, and a catalogue from 1814 calls it F. THE ADDRESS IS THE SAME.

WORKED EXAMPLE THREE
FROM HYDROGEN TO ANY ELEMENT, AND BACK TO THE SPECTRUM

$E(Z,n) = IE \times Z^2/n^2$, and nothing else is needed.

element	Z	its last-electron ionisation, eV
hydrogen	1	13.606116089006034499 68
helium	2	54.424464356024137998 71
lithium	3	122.45504480105431049 71
beryllium	4	217.69785742409655199 48
boron	5	340.152902225150862492

AND THE SERIES LIMITS ARE THE SAME FOUR NUMBERS, READ THE OTHER WAY:

series	n	its limit, nm = W1 x $n^2/4$
Lyman	1	91.133214973730833786 64
Balmer	2	364.532859894923335146 6
Paschen	3	820.198934763577504079 7
Brackett	4	1458.131439579693340586

Set the two equal - $W1.n^2/4 = W1.Z^2$ - and n = 2Z, FORCED, not chosen.
THE PERIODIC TABLE AND THE HYDROGEN SPECTRUM ARE ONE LADDER COUNTED TWO WAYS.

WORKED EXAMPLE FOUR
FROM A HYDROGEN WAVELENGTH TO THE RADIO SKY

start   a hydrogen wavelength in the far ultraviolet
        920.9525258744502314407   A

x 4 / 2π
        586.2965873835415733349   days
        THAT IS THE FIRST ELECTRON'S OWN ROTATION.

x 24   into hours
        14071.11809720499776004
x 3/2   the lock that ties its turning to its orbit
        21106.67714580749664005

read as a length:
        21.10667714580749664005   cm $2^4 \cdot 3^8 \cdot \pi/5^6$
        THAT IS THE TWENTY-ONE CENTIMETRE LINE.

and divided into the speed time travels:
        1420352581.37559373122   Hz $2 \cdot 5^{14} \cdot \pi/3^3$

FOUR MULTIPLICATIONS FROM AN ULTRAVIOLET LINE TO THE LINE THAT MAPS THE GALAXY.

WORKED EXAMPLE FIVE
AN ELEMENT'S IONISATION REACHES A PLANET'S YEAR

```
start   beryllium's fourth ionisation, which is IE x 4²
        217.6978574240965519948          eV
/ 31104
        0.006999030909982528034813 81    eV
x 4π
        87.95241635619598215615        days
        THAT IS MERCURY'S ORBITAL PERIOD.

and the same starting value, divided instead by 12:
        5832.525758318773362345        hours
        THAT IS VENUS'S ROTATION.  Divide by 24 for days:
        243.02190659661555676 44        days
        and take it twice:
        486.0438131932311135287        nm
        WHICH IS H-BETA AGAIN, FROM EXAMPLE ONE.
```

ONE ELEMENT'S LAST ELECTRON REACHES MERCURY'S YEAR, VENUS'S DAY, AND A COLOUR IN A HYDROGEN TUBE. ALL FOUR LANDINGS WERE NAMED BEFORE THE CHAIN WAS RUN.

WORKED EXAMPLE SIX
E6 - THE HELICAL LADDER, ONE STEP AT A TIME

The step itself, and it is the only step there is:

$$r = 5^6/(2^6 \cdot 3^5)$$

```
        1.0046939300411522633744 86
```

Start at 864, which is the day rung, and apply it:

```
        864                              rung 0
        868.0555555555555555556          rung 1     x r
        872.1301476051668952904          rung 2     x r again
        876.2238655048053458662          rung 3
```

And the same ladder from 432, which is half of it:

```
        432                              rung 0
        434.0277777777777777778          rung 1     =  5⁶/(2²·3²), and it is exact
        436.0650738025834476452          rung 2
```

THAT RUNG-ONE VALUE IS NAMED IN THE RECORD AS H-GAMMA, AND IT IS THE ONE PLACE IN THIS PAPER WHERE TWO OF THE FRAMEWORK'S OWN ROUTES DISAGREE. The Balmer series carried from its limit gives H-gamma as

```
        433.9676903510992085078     nm      W1 x 25/21
```

and the day-rung ladder gives

```
        434.0277777777777777778     nm      432 x r
```

TWO ROUTES, ONE LINE, TWO ANSWERS. IT IS RECORDED AS OPEN AND IT IS NOT SMOOTHED OVER HERE: the reader is entitled to know that the framework has not yet ruled which of its own roads to H-gamma stands.

THE LADDER ITSELF IS ONE MULTIPLICATION, DONE AGAIN AND AGAIN.

WORKED EXAMPLE SEVEN
E7 - A CHANGE OF UNIT IS A CHANGE OF REGISTER

Take hydrogen's ionisation energy and carry it into three other units.

in electron-volts
        13.60611608900603449968   eV

x 96.45061728395061728395   which is $5^6/(2\cdot3^4)$, and carries NO π
        1312.31829562172400652759   kJ/mol
        THE π-DEGREE DID NOT MOVE. NO REGISTER WAS CROSSED.

/ 4.188790204786390984617   which is $4\cdot\pi/3$, and carries π to the FIRST
        313.2929154871928463487   kcal/mol
        THE π-DEGREE MOVED BY ONE. EVERY PARITY IN THE LINE FLIPPED.

and from the electron-volts, x $5^9\cdot\pi^3/(2^6\cdot3^{10})$, which carries π CUBED
        21.80325369012917238226   x10^{-19} J
        THREE REGISTER STEPS IN ONE MULTIPLICATION.

A UNIT IS NOT A LABEL IN THIS FRAMEWORK. IT IS A STATEMENT ABOUT WHICH
REGISTER THE QUANTITY IS BEING READ ON, AND THE π-DEGREE COUNTS THE STEPS.

WORKED EXAMPLE EIGHT
E8 - ONE ELEMENT, TWO ROADS, AND A THIRD THING BETWEEN THEM

start   lithium's atomic weight
        6.940191200541330823688   amu $5^{11}/(2^{10}\cdot3^7\cdot\pi)$

ROAD ONE   x $2^4\cdot\pi^2/3$, which is 52.63789013914324309022
        365.3170219587432436267   days
        THAT IS THE EARTH'S YEAR. And every power of five cancelled:
        lithium carries 5^{11} and the year carries 5^{11}. NONE SURVIVES THE RATIO.

ROAD TWO   x $32000/(3\cdot\pi)$, which is 3395.305453113767...
        23564.06902547260324399   hours
        THAT IS THE EARTH'S SIDEREAL ROTATION, at its own decade.

AND THE THING BETWEEN THE TWO ROADS:
        64.50306886639897836884   = $2000/\pi^3$

TWO OPERATORS DICTATED SEPARATELY, AND THE RATIO BETWEEN THEM IS A BARE
LATTICE NUMBER. NEITHER OPERATOR WAS CHOSEN WITH THE OTHER IN VIEW.

WORKED EXAMPLE NINE
E9 - WHY TWO PLANETS' DAYS ARE FOUR TURNS OF ONE STAIRCASE

the Earth's sidereal rotation
        23564.06902547260324399   hours x 10^3 $5^{14}/(2^2\cdot3^8\cdot\pi^2)$
Mercury's sidereal rotation
        58.6349442374639881041   days $5^6/(3^3\cdot\pi^2)$

divide one by the other
        401.87757201646090534 98   = $5^8/(2^2\cdot3^5)$

BOTH SIT AT π-DEGREE MINUS TWO, so the grammar FORBIDS a π in the ratio,
and there is none. Strip the decade and what is left is
        4.018775720164609053498   = 4 x r, FOUR HELICAL TURNS

AND THE CONVERSION BETWEEN TWO BODIES' TIME IS THE SPIN-ORBIT SPEED INVERTED:
        0.01042305044237407241484182   the edge, $2^4\cdot3^4\cdot\pi/5^8$
        x 32
        0.3335376141559703172749
        x 299816259.8633854915833
        100000000.0   exactly, with no residue whatever

```
WORKED EXAMPLE TEN
E10 - WHERE THE CONSTANT OF PROPORTIONALITY WOULD HAVE TO SIT, AND DOES NOT

start   the surface free fall
        9.817477042468103870196          m/s²     25·π/8
x 864   the day rung
        8482.300164692441743849
x 360   degrees in a circle
        3053628.059289279027786
/ 2π   into radians
        486000.0                    =  486000  =  2⁴·3⁵·5³

THE π CAME IN WITH THE FREE FALL AND WENT OUT WITH THE RADIAN.  The number
that is left carries only twos, threes and fives.

and the same value squared reaches the spin-orbit speed:
        9.817477042468103870196          g1
        96.38285547938826776206          g1 squared
        x 864 x 3600
        299789233.6830892680471        m/s

THE MULTIPLIER IS 2⁹·3⁵·5² AND IT CARRIES NO π AT ALL.  A constant of
proportionality would have to enter as a π-carrying factor.  THERE IS NO SLOT
IN THE LINE FOR ONE.  It is not that the constant is wrong.  IT HAS NOWHERE TO GO.
```

That is every equation in the third part, carried out. A reader who has followed this far has not been asked to believe anything: **he has done the arithmetic himself, and the arithmetic is the claim.**

PART FIVE — THE SIX ARE THREE

The third part joins the six domains as a star: every road runs through hydrogen's ionisation energy and the Balmer limit. That answers how each domain reaches the centre. It does not answer the question a reader is entitled to ask of a unification — **how do you go from any one of the six to any other?** With six domains there are fifteen pairs, and so thirty roads, one each way. This part gives all thirty, number first, and then reads them with two rules the framework already holds.

The two rules

A π-free gear moves within a register. It is a relabelling. Multiplying by a number built only from two, three and five changes the units a value is read in; it does not change what the value is.

A π-carrying gear crosses between registers. It is a different object. And three π-degrees make one whole dimension.

Neither rule is new. What is new is pointing both of them at the six domains at once.

Where the six actually stand

domain	the number	the address	π-degree
IONISATION	13.606116089006034499678	$3^3 \cdot 5^3/(2^3 \cdot \pi^3)$	-3
SPECTRUM	364.53285989492333514655	$5^{10}/(2^5 \cdot 3^3 \cdot \pi^3)$	-3
FRAUNHOFER	486.04381319323111352874	$5^{10}/(2^3 \cdot 3^4 \cdot \pi^3)$	-3
TABLE	1.0078604510374840370132	$5^3/(2^2 \cdot \pi^3)$	-3
DNA	864.0	$2^5 \cdot 3^3$	+0
TWENTY-ONE	1420.3525813755937312205	$5^8 \cdot \pi/(2^5 \cdot 3^3)$	+1

Four of the six stand at the same π-degree, minus three. The ionisation energy, the Balmer limit, the Fraunhofer F line and hydrogen's weight in the table all carry π to the minus three. By the first rule, every gear between those four is π-free, so every road between them is a relabelling and not a journey. **They are not four domains. They are one register wearing four names** — the same object read as an energy, as a wavelength, as a dark line in sunlight and as a weight.

DNA stands three degrees above them, which by the second rule is one whole dimension. **The twenty-one centimetre line stands one degree above DNA.** So the six domains occupy three positions, not six: an atomic

register of four, a room one dimension above it, and a road one degree above that.

The question answered in one multiplication — from a Fraunhofer line to an ionisation energy

```
FORMULA S1        THE FRAUNHOFER F LINE TO HYDROGEN'S IONISATION ENERGY

    IONISATION  =  F LINE      x  0.0279936                    ( 3⁷/5⁷ )
    F LINE      =  IONISATION  x  35.72245084590763603109       ( 5⁷/3⁷ )


WHAT EACH PART IS

  F LINE       486.0438131932311135287  nm     the Fraunhofer F line        ( 5¹⁰/(2³·3⁴·π³) )
  IONISATION    13.606116089006034499 68  eV     hydrogen's ionisation        ( 3³·5³/(2³·π³) )
  0.0279936    the gear: pure threes over fives, NO π               ( 3⁷/5⁷ )


WORKED

  486.0438131932311135287  x  0.0279936  =  13.606116089006034499 68

AND BACKWARDS

  13.606116089006034499 68  x  35.72245084590763603109  =  486.0438131932311135287
```

There is no π in the gear, and that is the point. You never leave the register. A dark line in sunlight and the energy that frees hydrogen's electron are not two things with a bridge between them. They are one thing, relabelled, and the gear is threes over fives because that is all a relabelling can be.

One gear, five readings — the F line, Mercury, energy into mass, the pyramid and the twenty-one centimetre line

The gear in formula S1 is not a stray fraction that happens to join two numbers. **0.0279936 is 6^7 divided by 10^7** — six to the seventh power, read at its decade — and because a factor of ten costs nothing in this framework, it is the same object as $3^7/5^7$. It carries no π, and that is why it moves a value without moving it out of its register. But give it one turn of π and it leaves the atomic register, and where it goes is worth following, because it goes to four other places the framework already holds.

```
FORMULA S2        THE GEAR, TURNED ONCE, IS MERCURY'S G1 ORBIT

    Mercury's G1 orbit  =  the gear  x  2π  /  2              ( the gear x π )

    0.0279936  x  6.283185307179586477  /  2
               =  0.0879444881075312360002          ->   87.9444881075312360002  days


WHAT EACH PART IS

  0.0279936            the gear of formula S1                       ( 6⁷/10⁷  =  3⁷/5⁷ )
  x 2π / 2             a turn, taken across: the gear as a diameter, read round its circle
  87.9444881075312360  Mercury's orbit on the first register, G1     ( 3⁷·π/5⁷, at its decade )


AND THE TWO REGISTERS OF MERCURY'S ORBIT ARE ONE G-BOND STEP APART

  87.9444881075312360002  x  1.000090150603356200676   =   87.9524163561959821561  days
       the G1 orbit           the G-bond step                  the G2 orbit   ( 5⁶/(2·3²·π²) )
```

The gear is a diameter, and the circle it spans is Mercury's year. Multiply 0.0279936 by 2π and halve it — the circumference of the circle whose diameter is the gear, taken back to a half-turn — and the result is Mercury's orbit on the first register to every digit. One G-bond step above it stands the second-register orbit that the rest of this paper uses, and the step between them is the same step that separates hydrogen's G1 and G2 ionisation faces.

```
FORMULA S3        MERCURY'S ORBIT IN HOURS IS THE TWENTY-ONE CENTIMETRE LINE

    the 21 cm line  =  Mercury's G1 orbit  x  24

    87.9444881075312360002  x  24   =   2110.6677145807496640055
                                    ->    21.106677145807496640055  cm      ( 2⁴·3⁸·π/5⁶ )


WHAT EACH PART IS

  87.9444881075312360002   Mercury's G1 orbit, in days
  x 24                     days into hours
  21.10667714580749664     the twenty-one centimetre line on the framework's own lattice


SO, FROM THE GEAR DIRECTLY

  0.0279936  x  π  x  24   =   2.1106677145807496640055   ->   21.106677145807496640055  cm
```

The twenty-one centimetre line is Mercury's year counted in hours. The radio line of cold hydrogen — the one this paper places a degree above the DNA helix — is the gear of the atomic register, turned once and read on the clock.

```
FORMULA S4        THE SAME GEAR IS THE GEAR FROM ENERGY TO MASS

    mass  =  energy  x  24  x  495.0355349930  x  1.2337005501
          =  energy  x  14657.41468458853933337                    ( 6⁶·π/10 )


WHAT EACH PART IS

  x 24                  energy into free fall
  x 495.0355349930      free fall into wavelength                  ( 7776/(5·π) )
  x 1.2337005501        wavelength into mass                       ( π²/8 )
  14657.41468458853933  the three gears folded into one            ( 6⁶·π/10 )


AND IT IS THE GEAR OF FORMULA S1, TURNED ONCE AND SHARED SIX WAYS

  0.0279936  x  π  /  6   =   0.01465741468458853933337   ->   14657.41468458853933337
  87.9444881075312360002  /  6   =   14.65741468458853933337   (Mercury's G1 orbit, sixth)


AND THE TWENTY-ONE CENTIMETRE LINE IS IT, TIMES TWELVE SQUARED

  14657.41468458853933337  x  1.44   =   21106.677145807496640055
                                    ->   21.1066771458074966400 5  cm
```

The gear that turns an energy into a mass is the same number again. Energy to free fall, free fall to wavelength, wavelength to mass: three gears that the framework uses everywhere, multiplied together, give $6^6 \cdot \pi/10$. And $6^6 \cdot \pi$ is $6^7 \cdot \pi$ divided by six — the S1 gear, turned once, shared six ways. Divide Mercury's G1 orbit by six and the digits are the same; multiply the energy-to-mass gear by twelve squared and the twenty-one centimetre line comes back.

The pyramid. Read at metres, the energy-to-mass gear is **146.5741468458853933334 m** — the height the framework gives for the Great Pyramid as its mass-energy face. The pyramid's height and the gear that carries an energy into a mass are one number, and that number is the S1 gear turned once.

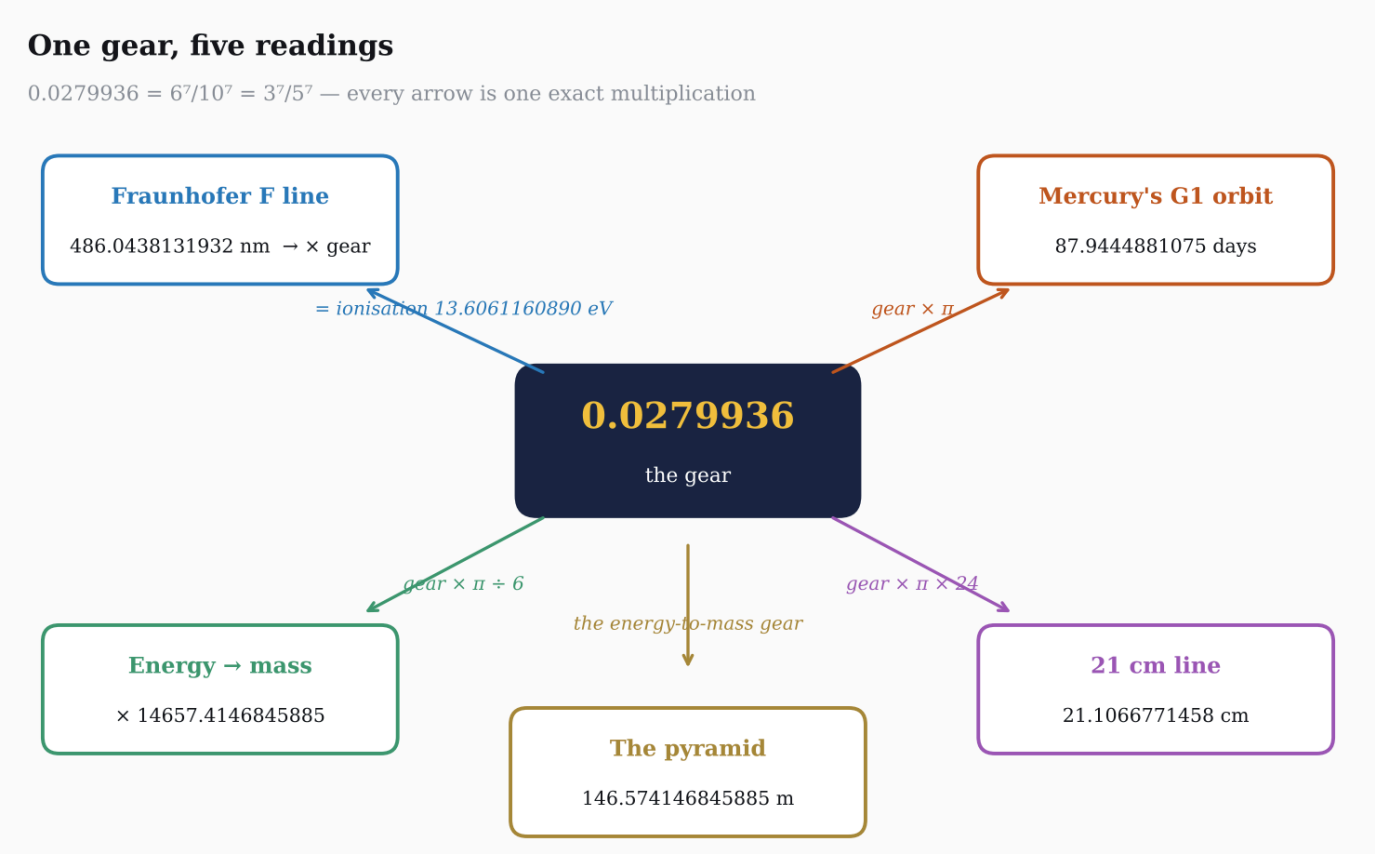


Figure 31 — One gear, five readings. 0.0279936 = 6⁷/10⁷ carries the Fraunhofer F line onto hydrogen's ionisation energy with no π. Turned once (× π) it is Mercury's G1 orbit, 87.9444881075 days; counted in hours (× 24) it is the twenty-one centimetre line, 21.1066771458 cm; turned once and shared six ways (× π ÷ 6) it is the gear from energy to mass, 14657.4146845885, which at metres is the pyramid's mass-energy face, 146.574146845885 m. Every arrow is one exact multiplication.

```
ONE GEAR, FIVE READINGS

  0.0279936                   x 486.0438131932 nm   =  13.6061160890 eV       F line -> ionisation
  0.0279936  x π              ->  87.9444881075 days                          Mercury's G1 orbit
  0.0279936  x π  x 24        ->  21.1066771458 cm                            the 21 cm line
  0.0279936  x π  /  6        ->  14657.4146845885                            energy -> mass
                              ->  146.574146845885 m                          the pyramid
```

What this adds to the reading of the six as three. Part Five says the atomic four never leave their register, and that the twenty-one centimetre line stands a degree away, on a road of its own. Both statements stand. What this section shows is how short the road is: **the single gear that relabels the atomic four, given one turn of π, is the twenty-one centimetre line's own circle.** The relabelling inside the register and the crossing out of it are one number, read without and with the turn — and the same number, along the way, is Mercury's year, the gear between energy and mass, and the height of the pyramid.

What is guaranteed, and what is not. Every multiplication above is exact, and that exactness is guaranteed in advance: a lattice value times π, or times 24, or divided by six, is always another lattice value. What is not guaranteed is that the results are objects the framework already had, named for other reasons. Mercury's G1 orbit, the twenty-one centimetre line on its lattice, the energy-to-mass gear and the pyramid's mass-energy face were each fixed before this gear was looked at. That four of them sit one π, or one π and one small whole number, from the gear that joins a dark line in sunlight to hydrogen's ionisation energy is the finding.

All thirty roads, number first

Within the register — π-free, a relabelling. Multiply the value on the left by the number given and the value on the right comes back, to every digit.

from	to	multiply by	which is
SPECTRUM	FRAUNHOFER	1.333333333333333333	(2²/3)
FRAUNHOFER	SPECTRUM	0.75	(3/2²)
IONISATION	TABLE	0.07407407407407407407	(2/3³)
TABLE	IONISATION	13.5	(3³/2)
FRAUNHOFER	TABLE	0.0020736	(2·3⁴/5⁷)
TABLE	FRAUNHOFER	482.2530864197530864198	(5⁷/(2·3⁴))
SPECTRUM	TABLE	0.0027648	(2³·3³/5⁷)
TABLE	SPECTRUM	361.6898148148148148148	(5⁷/(2³·3³))
IONISATION	FRAUNHOFER	35.72245084590763603109	(5⁷/3⁷)
FRAUNHOFER	IONISATION	0.0279936	(3⁷/5⁷)
IONISATION	SPECTRUM	26.79183813443072702332	(5⁷/(2²·3⁶))
SPECTRUM	IONISATION	0.0373248	(2²·3⁶/5⁷)

Crossing a register — the gear carries π. These are journeys, not relabellings, and the number of π-degrees crossed says how far each one goes.

from	to	multiply by	which is	degrees
DNA	TWENTY-ONE	1.64392659881434459632	(5⁸·π/(2¹⁰·3⁶))	+1
TWENTY-ONE	DNA	0.6082996653994368029191	(2¹⁰·3⁶/(5⁸·π))	-1
IONISATION	DNA	63.50085464125403171938	(2⁸·π³/5³)	+3, ONE DIMENSION UP
DNA	IONISATION	0.01574781954746068807833	(5³/(2⁸·π³))	-3, ONE DIMENSION DOWN
TABLE	DNA	857.2615376569294282116	(2⁷·3³·π³/5³)	+3, ONE DIMENSION UP
DNA	TABLE	0.001166505151663754672469	(5³/(2⁷·3³·π³))	-3, ONE DIMENSION DOWN
FRAUNHOFER	DNA	1.77761752448540886234	(2⁸·3⁷·π³/5¹⁰)	+3, ONE DIMENSION UP
DNA	FRAUNHOFER	0.5625507097143878628805	(5¹⁰/(2⁸·3⁷·π³))	-3, ONE DIMENSION DOWN
SPECTRUM	DNA	2.370156699313878483119	(2¹⁰·3⁶·π³/5¹⁰)	+3, ONE DIMENSION UP
DNA	SPECTRUM	0.4219130322857908971604	(5¹⁰/(2¹⁰·3⁶·π³))	-3, ONE DIMENSION DOWN
SPECTRUM	TWENTY-ONE	3.896363641360097489458	(π⁴/5²)	+4
TWENTY-ONE	SPECTRUM	0.2566495563671083797288	(5²/π⁴)	-4
FRAUNHOFER	TWENTY-ONE	2.922272731020073117093	(3·π⁴/(2²·5²))	+4
TWENTY-ONE	FRAUNHOFER	0.3421994084894778396384	(2²·5²/(3·π⁴))	-4
TABLE	TWENTY-ONE	1409.27504389471118687	(5⁵·π⁴/(2³·3³))	+4
TWENTY-ONE	TABLE	0.000709584694344378124827 42	(2³·3³/(5⁵·π⁴))	-4
IONISATION	TWENTY-ONE	104.390743992200828657	(5⁵·π⁴/(2²·3⁶))	+4
TWENTY-ONE	IONISATION	0.009579393361491046851702	(2²·3⁶/(5⁵·π⁴))	-4

Could it have missed?

The exactness proves nothing, and it is said first. Two lattice addresses always divide to give another lattice address, so every gear in the two tables above was guaranteed before it was computed. A reader should not be impressed that the thirty roads close. They had to.

What is not guaranteed is that four of the six land on one π-degree at all. And the choice of face could be doing the work: hydrogen's weight alone has four faces, at π-degrees minus one, minus four, zero and minus three, and the table above uses the face at minus three. So every face the framework holds for each of the six domains was enumerated and every combination walked.

THE CONTROL

face combinations across the six domains	864	
putting FOUR OR MORE on a single π-degree	48	5.6 per cent
putting FIVE OR MORE on a single π-degree	0	0.0 per cent

Read honestly, that is one choice in eighteen, not one in a thousand. The four-on-one-degree reading is real and it is not overwhelming, and anyone who says otherwise is overselling it.

What is hard is the ceiling. No choice of faces puts five of the six on one degree. The twenty-one centimetre line stands at π-degree plus one or plus four on every face the framework holds, and so it can never join the atomic four. That is a structural statement about the twenty-one centimetre line, and it is not a matter of taste.

What this changes

The six domains are three. An atomic register of four — the ionisation energy, the spectrum, the Fraunhofer lines and the periodic table — read as an energy, a wavelength, a dark line and a weight; a room one dimension above it, the DNA helix; and a road one degree above that, the twenty-one centimetre line.

The twelve π-free roads between the atomic four are relabellings, and saying so is stronger than giving them as twelve separate joins, because it says *why* they are exact: they never left the register. **The eighteen crossing roads are the real journeys**, and their π-degrees say exactly how far each one travels — three degrees to the DNA helix, which is one whole dimension, and one more to the twenty-one centimetre line.

So the question this paper set out to answer has a short answer. **How do you get from a Fraunhofer line to a hydrogen ionisation energy? You multiply by 0.0279936, and you never leave the room.** How do you get from either of them to the DNA helix or to the twenty-one centimetre line? You cross, and the gear tells you how many turns of π the crossing takes.

PART FOUR — WHAT IS NOT SETTLED

A claim about the world has to be capable of being wrong in specific, nameable places. **These are the places.**

The screening rule

What is missing. The framework is exact where one electron remains, has one number where two remain, and has nothing where many remain. Of two hundred and ten published ionisation energies across the first twenty elements, every stage of each, **one hundred and ninety cannot be tested at all** — not because the test fails but because the framework supplies neither a value nor a form to test.

And the size of the gap is known exactly. Divide the helium-like sequence by Z^2, which the framework's only exact form would make constant, and it runs from 0.451771 at helium to 0.942370 at calcium. **A factor of two.** The largest named step in the framework is the helical turn at four parts in a thousand, and the smallest is the G-bond step at nine parts in a hundred thousand. **Screening is two hundred times larger than anything in the named set.** No combination of faces can produce it, and no search was needed to establish that.

Carried out, because the argument is entirely one of size and a reader is entitled to see the sizes:

```
THE SIZE OF WHAT IS MISSING, SET AGAINST THE SIZE OF WHAT THE FRAMEWORK HAS

the helium-like sequence divided by Z², which the framework's only exact
form would make constant, measured:

  at helium      0.451771
  at calcium     0.94237
  the ratio      0.94237 / 0.451771
              = 2.085946198405829502115          a factor of two

the LARGEST named step the framework carries, the helical turn r:
  1.004693930041152263374          which is 0.0046939300411522633744 86 above one

the SMALLEST, the G-bond step:
  1.000090150603356200676          which is 0.0000901506033562006764 1368 above one

and the factor of two set against the largest of them:
  1.085946198405829502115 / 0.0046939300411522633744 86
= 231.3511681864035673547

A NAMED STEP MOVES A VALUE IN THE THIRD DECIMAL PLACE AT MOST.  SCREENING
MOVES IT BY A FACTOR OF TWO.  NO COMBINATION OF FACES CAN PRODUCE THAT, AND
NO SEARCH WAS NEEDED TO ESTABLISH IT.
```

So what is missing is not a register and not a face. It is one object: a rule for how much of the nucleus an outer electron actually sees. That is one thing to find, not ninety values to supply, and everything on the multi-electron side of this subject waits on it.

The drift

What it is. The framework's last-electron ionisation energy is the invariant times the square of the atomic number — $IE \cdot Z^2$ — and that is the whole of it up to one thing. **The one thing is that the invariant is not quite invariant as you climb the ladder, and the framework now says why.**

Conventional physics has a correction of the same shape and attributes it to the electron moving fast enough near a heavy nucleus for special relativity to bite. The framework's reading is different and it is not a

relabelling. **The c inside that correction is the spin-orbit speed — the speed at which time travels — and on the helix that speed is not one number. It is different on every turn.** The shift on rung Z is the reduced spin-orbit speed of that rung. Same arithmetic, different object, and the difference is testable in principle because a velocity and a register speed do not have to agree.

And the constant inside it is the framework's own, fixed by ruling long before this was run. It is not imported and it is not a measured input:

```
THE FRAMEWORK'S FINE-STRUCTURE CONSTANT, BY RULING, 3²/(5³·π²)
  9 / ( 125 x 9.869604401089358618834 )
= 0.00729512522224831954395932 1
and one over it        = 137.0778389040188697060346

THE CORRECTION FACTOR ON RUNG Z
  R(Z)  =  2 [ 1 - sqrt( 1 - (Z.alpha)² ) ] / (Z.alpha)²
which contains nothing but Z and the constant above - no fitted quantity,
no per-element adjustment, and no face chosen after the fact.

CARRIED OUT, RUNG BY RUNG

  Z    (Z.alpha)²                 R(Z)                       IE x Z² x R(Z), eV
  1    0.000053218852008283 5936  1.0000133050670446232     13.606297119292815651
  2    0.000212875408033134374    1.0000532245172544585     54.427361071866319869
  6    0.00191587867229820937     1.0004794290421051121     490.05501322353687422
 10    0.00532188520082835936     1.0013340234277071735     1362.4266966628872052
 18    0.0172429080506838843      1.0043482971626294391     4427.5505660968462491
 20    0.021287540803313 4374     1.0053792951820855367     5471.7229614922084665
 26    0.0359759439575997093      1.0091595014077015436     9281.9811380502058643

and the uncorrected ladder beside it, IE x Z² alone:

  Z    IE x Z², eV               the correction adds
  1    13.6061160890060345        0.0001810302867811512
  2    54.424464356024137999      0.00289671584218187
  6    489.82017920421724199      0.2348340193196322
 10    1360.61160890060345        1.815087762283755
 18    4408.3816128379551779      19.16895325889107
 20    5442.4464356024137999      29.27652588979467
 26    9197.7344761680793218      84.24666188212654
```

Read the second table, because it is where the physical statement lives. On the first rung the correction is a fraction of a hundredth of an electron-volt. By the twenty-sixth it is above eighty. **It grows as the fourth power of Z**, because the ladder carries Z^2 and the correction carries another Z^2 inside R(Z), and that fourth-power growth is the shape the drift has. **Nothing in either table was adjusted. There is Z, there is the invariant, and there is α.**

What is honest about it, said plainly. The *form* of the correction — the square root, the shape of R(Z) — is imported physics and this paper does not claim it. **What is the framework's own is the constant inside it**, and the constant is what lets the whole correction run with no fitted parameter anywhere.

And what is left is genuinely unexplained. After the correction above is applied, what remains is not flat. It is U-shaped, with its minimum around beryllium and boron and rising in both directions. **The same U-shape appears in an entirely independent ladder, with its minimum at calcium.** Two independent ladders showing one shape after the main term is removed. **Nobody knows what it is, and this paper does not pretend to.**

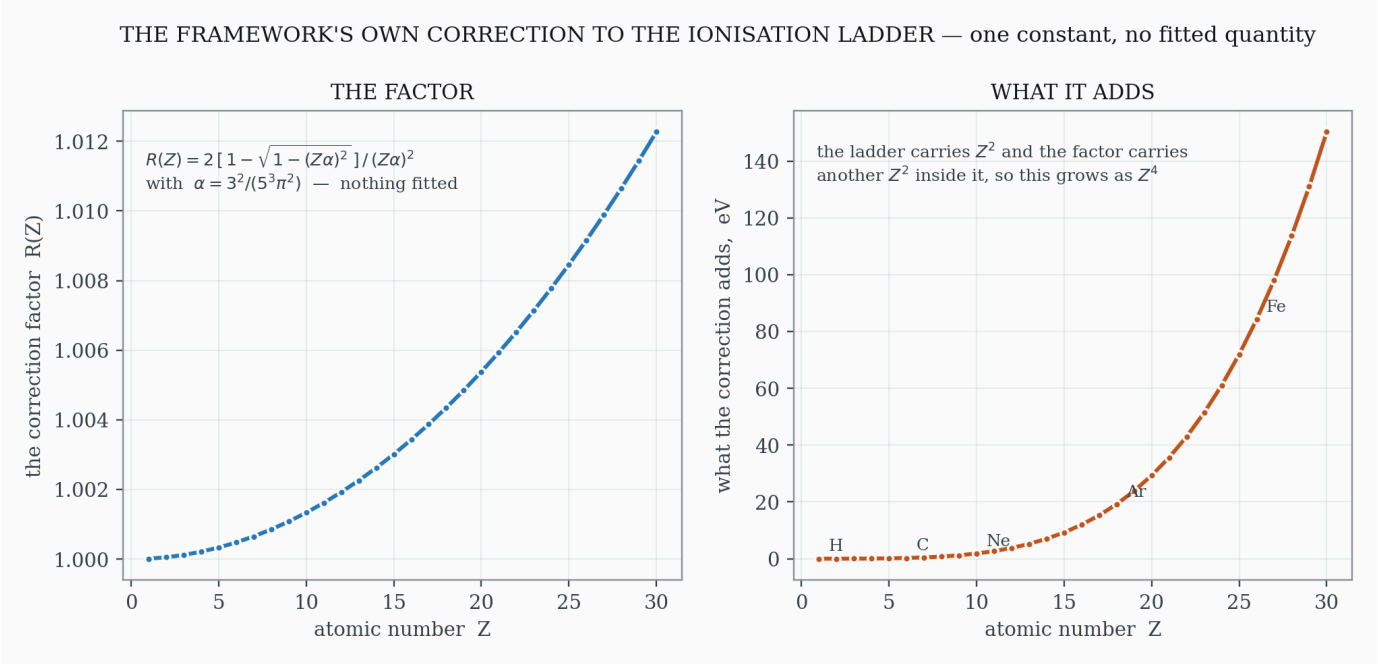


Figure 32 — The framework's own correction to the ionisation ladder. On the left, the factor itself, which contains nothing but the atomic number and the framework's own fine-structure constant, $3^2/(5^3\pi^2)$. On the right, what that factor adds in electron-volts, growing as the fourth power of the atomic number because the ladder carries Z^2 and the factor carries another Z^2 inside it. Nothing on either side of this figure was fitted.

Row three, and the things with no form at all

Ten of the first three rows are nailed. One is open. One is proposed. Six have nothing.

```
NAILED      H  He  Li  B  C  N  O  F  Ne  Mg
OPEN        Be          four candidate faces live; the disk's own form has never been tested
PROPOSED    Ar          2³·5 = 40 exactly, leanness four against a next-best of nine
NOTHING     Na  Al  Si  P  S  Cl
```

Sodium is the worst of them because row three starts there. A candidate exists and was convicted by the framework's own closure rule, which requires that a closing weight times the next opening weight be a lean monomial: the candidate gives leanness fifty-seven against the rule's four and six. Under all three earned constraints seven candidates survive and **nothing chooses between them.**

And the lesson the record has already drawn twice is that it will not fall to a search. Silicon has been tested exhaustively: of 833,085 monomials, **none** lands inside silicon's published interval. Sodium needs a route, not a scan, and so do the five behind it.

Behind all of them stands an older question. Two strata of the corpus give different atomic weights and they disagree on **six of the first ten elements**. They agree on four only. Until that is ruled, three statistical results that this paper's second part rests on — a parity shape at p = 0.00476, a closure rule at p = 0.00211, and a mirror triple at p = 0.0032 — are computed from weights that are formally in dispute. **That is stated here rather than in a footnote because it is the largest single block of unreconciled material in the whole corpus and it has been open since 21 August 2026.**

The solar comb, and the four fifths of it with no address

Four of the thirty lines in the Fraunhofer comb have a closed lattice form. Twenty-six do not, and among the twenty-four are the calcium H and K lines, which are two of the strongest features in the entire solar spectrum, the whole magnesium b triplet, and every one of the eight iron lines.

What the framework has for those twenty-four is a grammar, not an address. Given the wavelength it reads off the spin-orbit, the creator mass, the circumference, the source wavelength, the nodal mass, the nodal radius and the free fall, every leg a monomial and nothing fitted. **It does not give the wavelength.** That is the difference between describing a line and deriving one, and on four fifths of the comb the framework is on the describing side.

And the record's own warning applies here harder than anywhere else in this paper. With the named gears let loose, every one of the thirty lines fits the anchor, with register steps running past fifty. **An over-determined basis proves nothing**, so no count of "lines that fit" from this comb is admissible, including any that might be assembled from the material in the section on the Fraunhofer lines.

Three specific failures, named: the Earth's own step from its pure year to its observed one is not a named step and is not carried; Mercury's own line carried up into the visible band lands on nothing; and Venus sits inside the visible band on no catalogued line at all, at a wavelength the framework can state and the catalogues do not have.

And one question that would reorganise the whole domain if it were answered. If the comb is specific to the observer — if there is a different list of Fraunhofer lines at every node — then what has been analysed here is the Sun's comb *as read from the Earth*, and the cross-species residues are facts about this planet's aperture rather than facts about iron and calcium. **Nothing in the record settles it.**

The index

This is the framework's chief structural gap and it wears five different coats.

```
the screening rule            what an outer electron actually sees
the closure factor            which multiplier an element needs, element by element
the face operator             which multiplier a rung of the helical ladder needs
the element-to-planet roads   eleven exact instances and no rule saying which planet
row three                     a route to sodium rather than a search
the solar comb                a wavelength for twenty-four of the thirty lines
```

They look like five problems. They are one. The framework gives exact addresses and does not yet give the rule that says **which address comes next**. It has the alphabet and it has the grammar. What it lacks is the counter. That is why every domain in this paper reads the same way: exact on one, one number on two, nothing on many.

And one route to it has now been closed, in the negative. The helical ladder of section 20 was for some time held to be the missing index. It cannot be. **The ladder is built on the turn r, and r carries no π; a π-free step can never change a π-degree; so the ladder cannot cross a register — not for want of a face operator, but structurally, by its own step.** What it is, is a within-register index, which is a real thing and is not the thing the framework is short of.

The obvious replacement was tested and failed. If a cross-register index must carry a π, the natural candidate is a ladder built on the 612 step, which sits at degree plus one — one register per rung, in order, exactly the right shape. Run from the day rung with no multipliers at all it lands on two of thirteen rungs against a control median of one, **P = 0.3013**. The G-bond ladder gives P = 0.5540 and the 703 ladder P = 0.2263. **All chance. The cross-register index is not simply the same ladder on a π-carrying step.**

Where it has to be looked for now. The framework's one existing object that maps a *position* to a *π-degree* is the position rule of period two: position on the helix fixes the parity, and the frame fixes the magnitude. It made an out-of-sample prediction — it called neon a road where the older half-filling rule called it a room, and neon is a road — and it has scored five for five. **It outputs the register, which is the whole of what an index has to do.** What it lacks is the other half, the magnitude, which is supplied for period two and for nothing else. **That is the next thing to go after, it is not structurally barred from being the answer, and it lives inside the periodic table rather than out among the planets.**

Two internal tensions, printed rather than smoothed

The first, and it was found while writing this paper. The framework carries 434.0277777777777778 = $5^6/(2^2 \cdot 3^2)$ and the record names it H-gamma. The Balmer transition formula, applied to the framework's own G2 limit, gives **433.9676903510992085078** for the n = 5 line. **These are not the same number**, their ratio is not any named step, and the second does not appear anywhere in the record's stores. Both cannot be the H-gamma line. **This paper prints the Balmer-formula value in the spectrum table of the section on the hydrogen atomic spectrum and the ladder rung in section 20, keeps them apart, and does not assert that they are one object.** Which of the two is the line, and what the other one is, is owed.

The second is the DNA rise. The framework routes a **diameter** for all three helical forms and a **rise** for none. The pitch is the rise times the base count, and the base count is fixed exactly for all three, so **one number closes all three pitches**. It has not been found. The published pitches cannot decide it either: they are not independent measurements but products taken on a different base count from the one printed beside them, which is why they wobble by more than five per cent between sources. The instruction the record leaves itself is the right one — **if a**

rise is ever routed it must be routed from the diameter, which is the axis on which the measurements are least dispersed, and never searched for against a pitch the sources cannot agree on to one figure.

What would falsify this

A framework that cannot be wrong is not saying anything. These are the specific outcomes that would break what this paper claims.

The twenty-one centimetre bracket. The framework says the line is carried on two registers exactly one G-bond step apart, and that a reading falls at the door between them. **The two faces and the door are printed in the section on the twenty-one centimetre line and the section on the dual dimension, and where a reading actually falls at full precision. A reading of sufficient precision falling outside that span refutes the two-face reading directly.** This is the sharpest exposed prediction in this paper: the values are stated, and anyone may do the arithmetic.

The argon parity. The row-three parity prediction requires argon at an even π-degree. **If argon is established by an independent route at an odd degree, the prediction dies before it is tested**, and the seam reading dies with it. That is the cheapest way to kill a substantial part of the second part and it should be tried first.

The screening rule. If a rule for it is found and it is *not* expressible on the lattice, the framework's claim that the atom is written in {2,3,5,π} fails at the one place it matters most.

The five predicted rungs. The face-operator reduction of section 20 is zero-parameter, so every unlanded rung is a prediction. Five of them have been probed against the whole record with forty-four declared gears and a matched control, and **not one of them is a named object** — the best result was P = 0.0668, which this record does not accept. **If they remain unnamed after a proper search, the reduction is a fit on a handful of points and should be said to be one.**

The second. The section on the second, which this framework did not have until now, derives the second from the Earth's own turning and states it as an address. **If an independent route from within the framework reaches a different address for the second, the derivation fails**, and that section's chain — which has only one free choice in it, which rung of the Earth station it stands on — fails with it. **That is one checkable condition and it does not depend on anybody else's standard.**

The solar comb. The framework reads seven quantities off any line in the comb by exact operators. **If a line is measured to better precision and its spin-orbit, node radius or free fall comes out off the lattice, the grammar of the section on the Fraunhofer lines fails** — and it fails for every line at once, because it is one grammar and not thirty.

And the honest general statement. Almost every exact relation in this paper is guaranteed to be exact by the arithmetic of the lattice. **What cannot be guaranteed, and what the whole thing rests on, is that the objects these operators land on were named in advance, for other reasons, by other people, in other centuries.** If a reader can show that the targets were chosen after the operators, this paper collapses. The dates on which each object was named, and each operator found, are given in the provenance table of Appendix D precisely so that this can be checked.

How to check this paper

Every numerical claim in this paper can be checked by a reader with a computer and half an hour, and the framework's position is that this is the point of writing it down.

To check an address, take the exponents, compute the product, and compare. A relation is exact if the difference is zero to the precision of the computation — not small, zero.

To check a claim of significance, the reader needs the control as well as the result, and every control in this paper is stated with its trial count, its matching criteria and its outcome. **A result quoted without its control should be disbelieved, including in this paper.**

To check a claim of priority — that an object was named before the operator that reaches it — the provenance table of Appendix D carries the dates. **The section on what would falsify this makes the whole of this paper turn on this, so it is the thing most worth checking.**

And the single most useful hostile test, for a reader who wants to break it rather than confirm it: **take the density calibration table at the head of the third part, pick any operator in this paper, and ask how many other named objects an operator of that leanness would have reached.** For the very lean ones the answer is

"many", and this paper says so itself. For the operators this paper actually rests on — the weight-to-energy operator, the energy-to-wavelength operator, and the zero-gear ladder result — the answer is the reason they are the ones it rests on.

APPENDIX A — THE VERIFICATION

Every figure printed in this paper was computed at forty-four decimal digits with the arbitrary-precision library `mpmath`, using the pattern below. A relation is reported as EXACT only if the difference between the two sides is smaller than the magnitude of either side by thirty-four orders of magnitude — that is, exact to the precision of the computation rather than merely close.

```
import mpmath as mp
mp.mp.dps = 44
π = mp.π

def m(a, b, c, d):                    # the address 2^a . 3^b . 5^c . π^d
    return mp.mpf(2)**a * mp.mpf(3)**b * mp.mpf(5)**c * π**d

def Z(lhs, rhs, label):               # report EXACT or print the residual in full
    d = lhs - rhs
    ok = abs(d) < abs(lhs) * mp.mpf(10)**-34
    print("%-60s %s" % (label, "EXACT" if ok else "DIFF " + mp.nstr(d, 10)))
```

Comparisons are made decade-free. Two values differing by a power of ten are the same address, because ten is 2×5 and the handle is not part of the address. A residual is never reported as a fraction of the smaller quantity, and a "landing" is never claimed at a tolerance where the lattice is saturated — at one part in a hundred thousand the lattice is dense enough that everything lands, and any result at that tolerance is worthless.

The relations verified for this paper, and all of them returned EXACT:

```
K = 31104 ;  J = 10368 ;  the 612 step times its inverse is one
alpha = 9/(125·π²)  and  1/alpha = 125·π²/9
the ionisation from the weight, on the G1 face and on the middle face
the G1 ionisation face times the G-bond step is the G2 ionisation face
the weight faces are one G-bond step apart
the E = M.T chain from the weight to 218032.5369012917238226
the Balmer limit times π³ times 864 is 5¹⁰
the ionisation through K and twelve is the Balmer limit, at its decade
every element on the ladder sits on rung n = 2Z, for Z = 1 to 4
H-beta from the Balmer formula is 486 x (1 + delta_G)
H-gamma is 15625/36
He x Li = 250/9 ;  Be x B = π⁴ ;  He x O = 2⁶ ;  F = H x 6·π
twice nitrogen is the proton-neutron product, at its decade
neon's first ionisation over lithium's is 2²
the two twenty-one centimetre faces are one G-bond step apart
T_B x T_Z = 125 ;  1/alpha / T_A = 12.5 ;  T_A.T_B.T_Z = 1250·π²/9
r = T_B²/(2²·3³)
the A twist is 324/π² degrees and 9/(5·π) radians
the A twist times a hundred is the radian in degrees, squared
the A pitch over the A diameter is 8/5
10⁶/(864·π) is ten times the A-DNA pitch
the B twist times 125/12 is 360 ;  the B twist is 432 x 2/25
a(1)/2 is the H-gamma rung ;  a(2)/4 is the ionisation in joules
a(2)/2 is the second helical turn
the ionisation divided by r² is 216, at its decade
g1 x 864 x 360 / 2π = 486000       the π cancels
g1² x 864 x 3600 = c_G1
c_G2 divided by oxygen is 1875, at its decade
the Heisenberg floor over Mercury's rotation is 9, decade-free
the ionisation over the weight is 27/2
Route 12, both operators, on every rung of the ladder
the node face of the 21 cm line is the Balmer limit times π⁴/5²
lithium x 2⁴·π²/3 is the Earth's year, and every five cancels
the Earth's rotation over lithium is 32000/(3·π)
the rotation over the year is 2000/π³
lithium's first ionisation times the carrier is 5184 = 2⁶·3⁴
oxygen's first ionisation times 1/alpha is 6⁶/5²
```

APPENDIX B — A GLOSSARY FOR A FIRST READER

Address. The exact position of an object, written 2^a · 3^b · 5^c · π^d. Not a measurement and carrying no uncertainty.

Alphabet. The primes two, three and five, together with π. There are no other primes in it.

Decade-free. A comparison made with powers of ten stripped out, because ten is 2 × 5 and the handle is not part of the address. 864, 86.4 and 8,640,000 are one address.

Degree. The exponent of π in an address. Even means a room, odd means a road, a half means a door.

Door. An object at half-integer degree. A source. The proton sits at degree minus one half.

Face. One of several values an object legitimately takes, separated from its other faces by a named step rather than by measurement error.

G-bond step. $5^{10}/(2^4 \cdot 3^9 \cdot \pi^3) = 1.000090150603356200676414$. The smallest of the named steps.

Handle. The free factor of ten. Formally, the subgroup of the address group generated by 2 × 5.

Helical turn. $r = 1.00469393004115226337448 6 = 5^6/(2^6 \cdot 3^5)$. One step between registers.

Leanness. The sum of the absolute values of the four exponents. Lower is more fundamental. It ranks candidates; it does not outrank a structural constraint.

Node. A position the register permits a thing to occupy. A nucleus on a node is stable; one between nodes comes apart looking for one.

Register. Used in two senses which this paper keeps apart: a unit family — seconds, minutes, the spin-orbital register — and the π-degree. The section on the unit is the register shows how the two are connected.

Road. An object at odd degree. A transport: you are moving between turns.

Room. An object at even degree. A state: you are sitting on a turn.

T, tau. Time, taken as the only substance.

Transit operator. $9375 = 3 \cdot 5^5$. The gear that carries the Sun's mass to the Earth's radius, among other things.

Veil. $180/\pi = 57.295779513082320876798 15$. The degree-to-radian bridge.

APPENDIX C — THE STANDING RULES OF EVIDENCE

These govern every claim in this paper and are the framework's own.

A landing between two lattice addresses is guaranteed and is never evidence.

A value back-computed from a target is an identity, not an arrival.

The density control runs first, and the budget is declared before the count. A target chosen after seeing the number cannot be scored.

The control for a search over monomials must itself be monomials, matched in leanness and in degree.

Repeated arrivals at one fact count once. Two readings standing at a fixed ratio are one landing.

Two routes are independent only when anchored on different measurements.

Never round. Full precision always.

Every wavelength declares its metre and its medium.

Score a form by its route, not by its distance to a reading.

A published constant is judged by its digits and never by its quoted uncertainty. The framework may never choose among its own values by which sits nearest a measurement, and where a consensus figure is quoted it is the one least favourable to the framework.

Measured and observed values are admissible. The models built on them are not. The test is: would the number exist if the model did not?

And the one that governs all of them: the question is never "does it land", it is "could it have missed."

APPENDIX D — REFERENCES AND PROVENANCE

The values, forms and results in this paper are derived on the page. The related papers of the Universal Force of Time, each published at universalforceoftime.org, are:

1. S. Daubney, *The Universal Fraunhofer Lines — the Same Lattice in Every Star, the 486 Line Fixed by the Proton, and a Galaxy Addressed for Life*, Rev 7 (The Daubney Foundation, 2026).
2. S. Daubney, *The Flip — the Twenty-One Centimetre Line and Mercury's Two Orbits*, Rev 3 (The Daubney Foundation, 2026).
3. S. Daubney, *Turn One of One Helix*, Rev 3 (The Daubney Foundation, 2026).
4. S. Daubney, *One Spectrum, Five Registers — The Hydrogen Lines as Faces of the Tau-Lattice*, Rev 1 (The Daubney Foundation, 2026).
5. S. Daubney, *The Periodic Table on the Helix*, Rev 3 (The Daubney Foundation, 2026).
6. S. Daubney, *Mercury's Perihelion Precession — One Number, Sixteen Roads*, Rev 15 (The Daubney Foundation, 2026).
7. S. Daubney, *The True Time Equalization — One Time, Eight Gears, and the Equation That Folds Every Planet's Rotation and Orbit into One Day*, Rev 3 (The Daubney Foundation, 2026).

Measured values are admissible in this framework and a reader may look any of them up. They are not quoted here, and none of them is used to choose among the framework's own values.

D1 · Provenance — when each object was named, and when each operator was found

The section on what would falsify this makes this paper turn on the order of events, so the order is printed. The left column is when the *target* entered the record of science or of this framework; the right is when the *operator* that reaches it was found. **Where the target is older than the operator, the join is a genuine arrival. Where it is not, it is an identity and is marked as one.**

TARGET	NAMED	OPERATOR FOUND
the Fraunhofer lines	1814, Fraunhofer	-
the Balmer formula	1885, Balmer	-
the Balmer limit as $5^{10}/(2^5 \cdot 3^3 \cdot \pi^3)$	this framework	this framework
B-DNA: 34 angstrom repeat, 10 bp per turn	1953, Franklin & Gosling	
the DNA double helix	1953, Watson & Crick	
Z-DNA geometry	1979, Wang & Rich	
the 21 cm line predicted	1944, van de Hulst	
the 21 cm line detected	1951, Ewen & Purcell	
the homeobox, 180 base pairs	molecular biology, 1980s	
the weight-to-energy operator, x 27/2		12 September 2026
the energy-to-wavelength operator, /K/12		in the record since 2026
the four series limits ARE the first four elements		13 September 2026
the 21 cm two-face bracket		13 September 2026
the day-rung ladder 432.r^n		in the record since July 2026
the zero-gear ladder result, P = 0.0237		16 September 2026
the face-operator reduction to 2^(2n-2)		16 September 2026
the node face as the Balmer limit x $\pi^4/5^2$		16 September 2026

Read that table adversarially, which is how it is meant to be read. The five targets at the top were named by other people, for other reasons, between one and two centuries before any operator in this paper existed. **Those are the joins that can carry weight.** The operators found in the last week reach objects that were themselves already in the record, and two of them — the face-operator reduction and the leaner twenty-one centimetre form — are marked in the closing part as post-hoc and thin. **The chapter does not ask to be believed on those.**

And one that is explicitly an identity and not an arrival, printed because it was nearly presented as an arrival. The state reading of the ladder at turn two is thirty-six times the Earth's free fall on the G2 face. That looks like a discovery. It is not: the framework already prints the free fall times two thousand four hundred as the Earth's rotation, the rotation is the drop reading at that same rung, and the two readings stand at a fixed three-to-two. **Given the rotation, the other was forced. It is algebra, and it is recorded here as algebra.**

Two things this paper does not use, and says so. It uses no residual — no quantity that exists only after a computed correction has been subtracted from a measurement. And it uses no published uncertainty as a criterion, anywhere.

APPENDIX E — THE EQUATIONS, COLLECTED

```
E1   the weight to the energy
       IE  =  W x 27/2                                        exact on all four faces

E2   the energy to the wavelength
       lambda  =  IE / K / 12          K = 2⁷·3⁵ = 31104
       and 12 x K = 373248 = 2⁹·3⁶, the ladder's own denominator

E3   the level grid
       E(Z,n)  =  IE . Z² / n²       invariant on the diagonal Z = n

E4   the series limits and the element road
       limit(n) =  W1 . n²/4
       road(Z)  =  W1 . Z²            therefore n = 2Z, which is forced

E5   the road to the twenty-one centimetre line
       P        =  W_n x 2⁴·3·π.n²/5⁴      =  Mercury's orbital period
       the line =  P   21.10667714580749664005 cm  =  x 2⁵·3¹⁰·π³/5¹²
       and leaner, straight to the node face:
       the node face  =  W1 x π⁴/5²         =  1420.35258137559373122 MHz

E6   the helical ladder
       a(n)  =  864 . r^n  =  2^(5-6n) . 3^(3-5n) . 5^(6n)
       and the day-rung form  432 . r^n  gives  432 -> H-gamma -> the ionisation

E7   the unit operators
       eV -> kJ/mol    5⁶/(2·3⁴)              π-free   no register change
       eV -> joules    5⁹·π³/(2⁶·3¹⁰)      π +3     three register steps
       kJ/mol -> kcal  4·π/3                  π +1     flips every parity

E8   the two roads out of lithium
       the year      =  Li x 2⁴·π²/3         every power of five cancels
       the rotation  =  Li x 32000/(3·π)
       and rotation / year = 2000/π³

E9   time equalization
       the Earth's rotation / Mercury's  =  4r          π cancels
       edge x 32 x c_G2  =  10⁸                        exactly, no residue
       edge = 2⁴·3⁴·π/5⁸

E10  the removal of the constant of proportionality
       g1 x 864 x 360 / 2π  =  486000  =  2⁴·3⁵·5³   the π cancels
       g1² x 864 x 3600     =  c_G1
       the multiplier 2⁹·3⁵·5² carries NO π, so there is no slot for G
```

Closing statement

Six domains were named at the outset and all six are still six — and Part Five shows where they stand: six domains in three positions, four in one register, one room a dimension above it, and one road a degree above that. An earlier draft of this paper said that the Fraunhofer lines collapse into the hydrogen spectrum and are therefore not a separate domain. **That was wrong twice over and it has been corrected.** It was wrong because the identification of four solar absorption lines with four laboratory emission lines is *itself* a unification result — science holds them to be two subjects — and it was wrong because those four are four out of a comb of thirty, and the other twenty-six are not hydrogen at all.

Of the six, the periodic table, the ionisation energies and the spectrum are joined by two exact operators with nothing fitted: ×27/2 and ÷K÷12. The twenty-one centimetre line is reached from the same ladder by two more, and by one leaner one given here for the first time. **The DNA helix is not joined to the others by an operator at all — it is the same ladder, three rungs of it**, with the ground state at turn zero, the spectrum at turn one and the ionisation energy at turn two. **And the Fraunhofer comb is joined in its GRAMMAR and open in its VALUES: seven exact legs from any wavelength, and a closed form for six lines out of thirty.**

What is genuinely missing is one object and it has five names. The screening rule, the closure factor, the face operator, the element-to-planet index and a route to sodium are the same absence seen five times: **the framework can say where a thing is and cannot yet say which thing comes next.**

That is the honest position. The equations in the third part are exact and they are written out in full so that anyone can check them. The gaps in the closing part are named so that anyone can attack them. **And the single most useful thing a reader can do with this paper is to take the section on what would falsify this and try to break it**, because a framework that survives that is worth more than one that has only ever been admired.

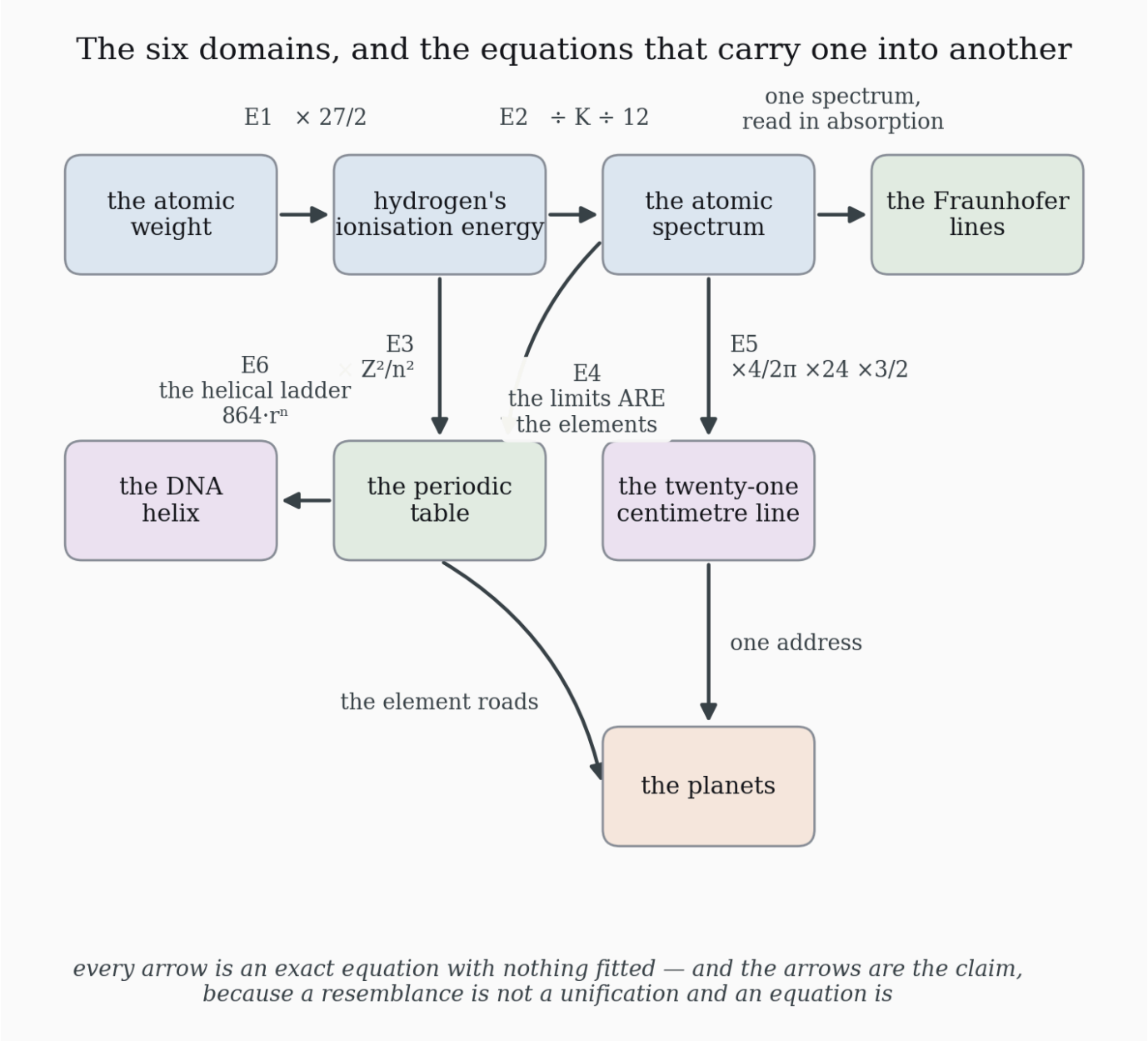


Figure 33 — The six domains and the equations that carry one into another, drawn for this framework. Every arrow is an exact equation with nothing fitted — and the arrows are the claim, because a resemblance is not a unification and an equation is.

A Note on the Numbers

Every value in this paper is given at full precision, because the precision is the evidence. A quantity truly on the {2,3,5,π} lattice does not approximate a lattice form; it *is* one. Where a value has not been read onto the lattice the paper says so, rather than rounding until it appears to fit. And a number in this framework is not a measurement of one thing: it is one address that may surface as an energy, a wavelength, a dark line, a weight, a frequency or a turn of a helix, depending only on the register in which it is read. That is why every formula here leads with the number and puts its lattice address behind it: the number is what is checked; the address is why it lands.

Attribution and contact

The Universal Force of Time is an original theoretical framework by **Stephen Daubney**, The Daubney Foundation.

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