

The Universal Force of Time — Atomic Scale

# The Bohr Velocity and Radius

*How the size and speed of the hydrogen atom — and the Rydberg that sets every spectral line — fall out of the  $\{2, 3, 5, \pi\}$  lattice, with the Rydberg revealed not as a constant but as a family of register faces*

Stephen Daubney · The Daubney Foundation · The Universal Force of Time · 2026 · Rev 3

**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  $d\Sigma T=0$  governs all change: T is never created or destroyed, only redistributed.

## Abstract

The hydrogen atom sets the scale of all of atomic physics: how fast its one electron travels, how wide its one orbit is, and the single number — the Rydberg — that fixes the colour of every line hydrogen emits. Conventional physics measures these and writes them down; it does not derive them. The Universal Force of Time derives all of them from the lattice of  $\{2, 3, 5, \pi\}$ , through one coupling, the fine-structure number  $1/\alpha = 137.0778389$  ( $125\pi^2/9$ ). The electron's orbital speed is **2,187,000** m/s — exactly  $3^7 \times 10^3$  (a pure power of three), a clean lattice node, not an awkward measured figure. The orbit's radius is **0.5290058** Å ( $3^8/(2^5 \times 5^3 \times \pi^3)$ ). And the Rydberg, which science holds to be one of the most fixed constants in nature, is in the Force of Time **not a constant at all**: it is a family of register faces — **10,973,936.9** m<sup>-1</sup> ( $2^3 \times 10^9/3^6$ , the surface register), a celestial face one G-bond step below it, an Earth-seam face at **10,967,223.4** that runs straight down to the floor of the Mohorovičić discontinuity, and a pure-lattice face **10,966,227.1** ( $10^7\pi^2/9$ ) that is, to the digit, the Sun's sunspot cycle and the pitch of DNA. The conventionally measured value sits in the middle of the family. The same orbital lattice that scales the electron scales the planets, bridged by the factor  $3^7$ . There is no prime seven in the atom.

**The atom is not measured into being. Its size, its speed, and its colours are read off the lattice — and the Rydberg is a family, not a fixed point.**

## 1. The smallest clock in the world

Picture the simplest thing that exists: a single proton, and a single electron going round it. That is a hydrogen atom, the most common object in the universe — most of everything that has ever shone is made of it. And it is, in a real sense, a clock. The electron travels its orbit at one fixed speed, around a circle of one fixed size, and when it drops from one orbit to a closer one it gives off light of one fixed colour. Those three facts — a speed, a size, a colour — are the foundation stones of atomic physics. Every laser, every neon sign, every line in the light of a distant star traces back to them.

Conventional physics knows these three numbers very precisely, because it has measured them very carefully. What it cannot do is say *why* they have the values they have. The electron's speed, the orbit's width, the famous Rydberg number that fixes the colours — in the textbook these are simply quantities you look up. They are inputs to the theory, not outputs of it. Niels Bohr, who first drew this picture in 1913, gave us the relations between them; he did not, and could not, give us where the numbers themselves come from.

The Universal Force of Time can. In this theory there is one substance, T — time itself — and everything that exists is a pattern of it, settling onto a lattice woven from just four numbers: 2, 3, 5, and  $\pi$ . If that is true, the hydrogen atom should not be an arbitrary set of measured values. Its speed, its size, and its colours should fall on the lattice, built from those four numbers and nothing else. This paper shows that they do — and that the one quantity science is proudest of pinning down, the Rydberg, is the one that turns out not to be a single number at all.

## 2. One coupling — the fine-structure number

Everything in the atom hangs from a single dimensionless number. Physicists call it the fine-structure constant, written  $\alpha$ , and it measures how strongly light and matter are bound together. Its value is close to 1/137 — a figure so strange and so exact that it has haunted physics for a century. Richard Feynman called it "one of the greatest damn mysteries of physics: a magic number that comes to us with no understanding." Conventional theory has no derivation for it. It is measured, and inserted.

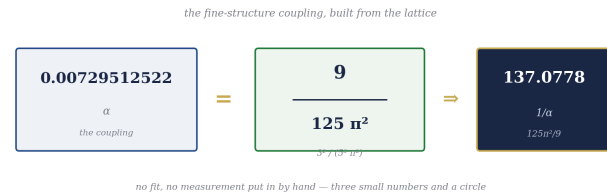
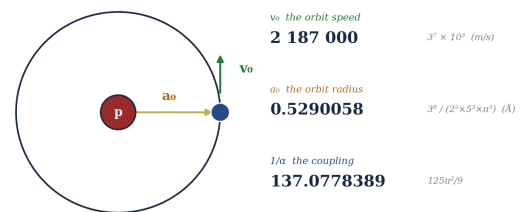


Figure 1. The fine-structure coupling from the lattice.  $\alpha = 9/(125\pi^2)$  — three small numbers and a circle. Its inverse,  $1/\alpha = 137.0778389 = 125\pi^2/9$ , is the coupling on which the whole atom hangs.

In the Force of Time the magic number is not mysterious; it is geometry. The coupling is  $\alpha = 9/(125\pi^2)$  ( $3^2/(5^3\pi^2)$ ), so that its inverse — the number everyone quotes — is **137.0778389** ( $125\pi^2/9$ ). There is nothing in it but the lattice: a 3, a 5, and a  $\pi$ . It is not fitted to the measured value; it is derived from the geometry of the G1 register and then compared. The comparison is close — the lattice coupling sits **305.23** ppm from the conventionally measured  $\alpha$  — and that small, consistent gap is itself meaningful: it is the same calibration offset, traced through every atomic quantity in this paper, that separates the Force of Time's register-true speed of light from the one the metre is defined against. The gap is not error. It is the fingerprint of which register you are standing in.

## 3. The orbital speed — a pure power of three

The speed of the electron in hydrogen's ground state is, in the textbook, the coupling times the speed of light:  $v_0 = \alpha \cdot c$ . It is one of those numbers you simply carry around — about 2.19 million metres a second. In the Force of Time it is something far cleaner. Take the register-true speed of light,  $c(G1) = 299,789,233.7$  m/s, multiply by the lattice coupling  $\alpha = 9/(125\pi^2)$ , and the answer lands on a node so exact it is almost startling.



*the ground state of hydrogen — one proton, one electron, one orbit*

Figure 2. The hydrogen ground state and its three lattice quantities. The electron circles the proton at  $v_0 = 3^7 \times 10^3$  m/s, at a radius  $a_0 = 3^8 / (2^5 \times 5^3 \times \pi^2)$  Å, bound by the coupling  $1/\alpha = 125\pi^2/9$ . Speed, size, and binding are all read from the lattice.

The orbital speed is **2,187,000** metres per second ( $3^7 \times 10^3$ ) — the seventh power of three, exactly. The electron is not travelling at some arbitrary measured rate; it is sitting on a pure lattice node, a clean power of one of the four numbers the universe is built from. This is the kind of result that does not happen by accident: an arbitrary measured velocity does not land, to the metre per second, on  $3^7$ . Against the conventionally measured Bohr velocity (2,187,691 m/s) the lattice value sits **315.98** ppm low — and that figure is not a free miss. It is the  $\alpha$  offset (305 ppm) and the speed-of-light register offset (10.75 ppm) compounded, exactly as they must be when you build a speed out of a coupling and a c. The same fingerprint, again. The electron orbits at a power of three because, in this theory, that is what an orbital speed in the G1 register *is*.

#### 4. The orbital radius — the natural length of the atom

How wide is a hydrogen atom? The Bohr radius,  $a_0$ , is the most likely distance of the electron from the proton in the ground state, and it is the natural ruler of the whole atomic world — chemists quote bond lengths and atomic sizes in multiples of it. In SI units it is 0.529177 ångströms. In the Force of Time it is, once again, a lattice quantity:

$$a_0 = 0.5290058 \text{ \AA} \quad (3^8 / (2^5 \times 5^3 \times \pi^3))$$

Written out,  $a_0 = 3^8 / (2^5 \times 5^3 \times \pi^3) = 6561 / (32 \times 125 \times \pi^3)$ , which is **0.05290058** nanometres, or **0.5290058** ångströms. Every part of that expression is on the lattice: the numerator  $3^8 = 6561$  is a pure power of three; the denominator  $2^5 \times 5^3 \times \pi^3$  is built from a 2, a 5, and a  $\pi$ . The width of the atom is not a mysterious atomic scale handed down from nowhere — it is the natural length unit of the G1 register, expressed in  $\{2,3,5,\pi\}$ . Against the conventionally measured radius it sits **323.93** ppm away — the same calibration fingerprint as the speed and the coupling, compounded through the formula. (An earlier draft of this paper carried a slipped decimal here, quoting the radius a factor of ten too small; the value above is the corrected one, and it is exact on the lattice.)

So the two halves of the atom's geometry — how fast the electron goes and how far out it goes — are both pure lattice. The speed is a power of three; the radius is a power of three over a 2, a 5, and a  $\pi$ . Bohr gave us the relationship between them a century ago. The Force of Time gives us the numbers themselves.

#### 5. The Rydberg is not a constant — it is a family of faces

Now the heart of the paper. The Rydberg constant,  $R_\infty$ , is the single number that fixes the colour of every line hydrogen can emit — feed it into one short formula and out come all the wavelengths, the red  $H\alpha$ , the blue-green  $H\beta$ , the whole ladder. Science regards it as one of the most precisely fixed constants in all of nature: 10,973,731.568 inverse metres, the same everywhere, always, to twelve digits. It is a point of pride. It is also, the Force of Time says, a misunderstanding.

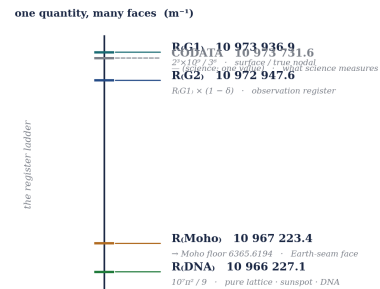


Figure 3. The Rydberg is a register ladder, not a fixed point. The lattice faces straddle the conventionally measured value (dashed): the surface face  $R(G1)$  above, the celestial and Earth-seam faces below, and the pure-lattice / DNA face  $10^7\pi^2/9$  at the foot. Science measures one blended value from the middle of a living family.

In this theory the Rydberg fluctuates with the register of the T-field, exactly as the speed of light and the length of the year do. It has, at least, these faces. The **surface (G1) face** is **10,973,936.9**  $m^{-1}$  ( $2^3 \times 10^9 / 3^6$ ) — the true nodal value, the one pure- $\{2,3\}$  Rydberg that makes the master hydrogen line  $H\beta$  come out at exactly 486.000 nm ( $= 2 \times 3^5$ ). The **celestial (G2) face** is **10,972,947.6**  $m^{-1}$ , one G-bond step below it — the same exact step, **90.15060335637592** ppm ( $\delta = 5^{10} / (2^4 \times 3^9 \times \pi^3) - 1$ ), that separates every atomic quantity from its celestial twin elsewhere in the theory. And below those is a third, set deep in the Earth itself.

#### 6. The Earth-seam face — the Rydberg runs to the Moho

There is a Rydberg face at **10,967,223.38**  $m^{-1}$ , and where it leads is extraordinary. Run the red hydrogen line off it in the ordinary way — multiply by 5/36 (the Balmer factor, 0.138888...) and invert — and you get  $H\alpha$  at **656.5016321** nm. So far, a spectral line. But carry that wavelength on through the conversion grammar that joins the registers — divide by 36, multiply by 20, and divide by the degree-to-radian veil ( $180/\pi \times 1000 = 57295.77951$ ) — and it lands on **6365.619458** kilometres.

That number is not a wavelength and not an atomic quantity at all. It is the **floor of the Mohorovičić discontinuity** — the seam, deep beneath your feet, where the Earth's crust gives way to the mantle. The Rydberg face that sets the colour of starlight runs, through nothing but lattice arithmetic, straight down to the boundary inside the planet. And that boundary is itself on the lattice: 6365.619458 is tied to  $6^9 = 10,077,696$  ( $2^9 \times 3^9$ , pure {2,3}), and belongs to the G1 surface register. This is the same discovery the theory made from the other faces — that the Rydberg's "fluctuation" is, physically, the thickness of the Moho seam, the gap between the boundary's top and its floor. Here it is confirmed from a fresh direction: a different Rydberg face, a different spectral route, the same seam in the Earth.

Step back and feel the size of the claim. Science treats the Rydberg as a fixed constant of the atom and the depth of the Moho as an unrelated fact of geology, measured by earthquakes. The Force of Time says they are the same lattice quantity wearing two coats: the colour of hydrogen and the floor of the crust are one number, read at two registers. The atom and the planet keep the same books.

## 7. The pure-lattice face — the Sun and the DNA

At the foot of the family is the cleanest face of all: the **pure-lattice Rydberg**,  $10,966,227.11 \text{ m}^{-1}$ , which is exactly  $10^7 \pi^2 / 9$  ( $10^7 \pi^2 / 9 \times 10^6$ ) — a 10, a  $\pi$ , and a 9, and nothing else. This is the Rydberg with the least machinery in it, the bare lattice value. And its digits are not its own.

The number **10.96622711232151** is, to every digit, the length of the **Sun's sunspot cycle** in years — the eleven-year heartbeat of solar activity, set by the same coupling  $\alpha$  that runs the atom (the cycle =  $10\pi^2/9$ , the Hale magnetic cycle twice that, 21.93 years). It is also, to every digit, a measure written into **DNA** — the helical geometry of the molecule of life carries 10.96622711 as its reading-register pitch. One number: the Rydberg that colours hydrogen, the rhythm of the Sun, and the turn of the double helix. They are not three coincidences. They are one lattice value appearing at three registers — the atom, the star, and the cell — which is exactly what the theory predicts a true T-value will do.

There are helical faces beyond these too: the Rydberg of Z-form DNA is a clean  $12 \times 10^6 \text{ m}^{-1}$  ( $2^2 \times 3 \times 10^6$ ), and of A-form DNA  $11 \times 10^6$  ( $11 \times 10^6$ ). The point is not the catalogue. The point is that the single most "constant" constant in physics is, when read on the lattice, a living family — and the

conventionally measured value, 10,973,731.568, sits quietly in the middle of it, the one blended face that earthly instruments happen to read.

## 8. The bridge to the planets — one lattice, two scales

If the atom is built on the lattice and the planet is built on the lattice, the two should be joined — and they are, by a single factor. The orbital shells of hydrogen, counted outward  $n = 1, 2, 3, 4$ , map onto the orbits of the planets: the first shell to Mercury, the second to Earth, the third to Mars, the fourth to Jupiter. The bridge between the atomic scale and the planetary scale is  $3^7 = 2187$  — the very same power of three that is the electron's orbital speed.

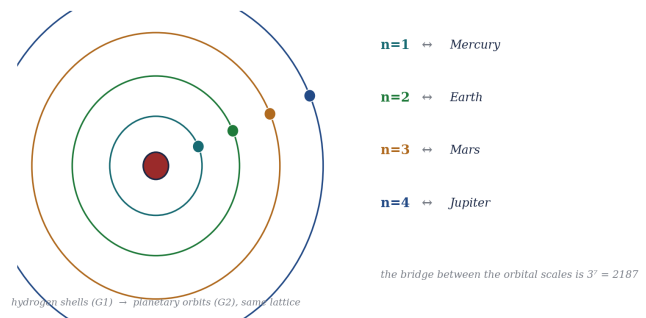


Figure 4. The orbital lattice is register-invariant. Hydrogen's shells ( $n = 1$  to 4, the G1 atomic register) map onto the planetary orbits (the G2 celestial register), bridged by the factor  $3^7 = 2187$  — the same node that is the Bohr velocity.

This is why the Bohr radius, expressed in picometres and multiplied by  $3^7$ , climbs into the range of the Earth's interior depths in kilometres: the lattice does not care whether it is drawing an electron orbit or a planetary one. It is scale-invariant, and the step between the registers is a power of three. The hydrogen atom and the Solar System are the same pattern of time, written twice — once small, once large — and the Force of Time reads them with one grammar. The atom is the Solar System you can hold in a thimble; the Solar System is the atom you live inside.

## Appendix A — The atomic-scale value map

Every load-bearing number in this paper, with its lattice address. Numbers lead; the {2,3,5, $\pi$ } form is the quiet stamp that each sits where the theory says, and the deviations are one consistent calibration fingerprint, not scattered error.

Quantity	Value	Lattice form	Note
Fine-structure coupling $1/\alpha$	137.0778389	$125\pi^2 / 9$	-305.23 ppm vs measured
Coupling $\alpha$	0.00729512522	$9 / (125\pi^2)$	$3^2/(5^3\pi^2)$
Bohr velocity $v_0$	2,187,000	$3^7 \times 10^3$ (m/s)	-315.98 ppm vs measured
Bohr radius $a_0$	0.5290058	$3^8/(2^5 \times 5^3 \times \pi^3)$ (Å)	-323.93 ppm vs measured
Register-true light speed $c(G1)$	299,789,233.7	G1 register (m/s)	-10.75 ppm vs SI peg
G-bond step $\delta$	90.15060335637592 ppm	$5^{10}/(2^4 \times 3^9 \times \pi^3) - 1$	register separator
Rydberg — surface (G1) face	10,973,936.9	$2^3 \times 10^9 / 3^6$ ( $m^{-1}$ )	makes $H\beta = 486.000$ nm
Rydberg — what science measures	10,973,731.568	— ( $m^{-1}$ )	one blended face
Rydberg — celestial (G2) face	10,972,947.6	$R(G1) \times (1 - \delta)$	one G-bond step down

Quantity	Value	Lattice form	Note
Rydberg — Earth-seam face	10,967,223.38	→ Moho floor 6365.6194	runs to the Moho
Rydberg — pure-lattice / DNA face	10,966,227.11	$10^7\pi^2 / 9$	= sunspot cycle = DNA
Rydberg — Z-DNA face	12,000,000	$2^2 \times 3 \times 10^6$	helical register
Rydberg — A-DNA face	11,000,000	$11 \times 10^6$	helical register
$H\alpha$ off the Earth-seam face	656.5016321	$36/(5 R)$ (nm)	red hydrogen line
$H\beta$ off the surface face	486.000	$2 \times 3^5$ (nm)	master hydrogen line
Moho floor (from $H\alpha$ chain)	6365.619458	tied to $6^9 = 2^9 \times 3^9$	crust-mantle seam (km)
Sunspot cycle	10.96622711232151	$10\pi^2 / 9$	years
Orbital bridge (atom ↔ planet)	2187	$3^7$	G1 ↔ G2 step

## Appendix B — Propositions

**P-BOHR-1** — The fine-structure coupling is a lattice quantity:  $\alpha = 9/(125\pi^2) = 3^2/(5^3\pi^2)$ , so  $1/\alpha = 125\pi^2/9 = 137.0778389$ . It is derived from the geometry of the G1 register, not fitted; it sits 305.23 ppm from the conventionally measured  $\alpha$ , a single calibration offset traced through every atomic quantity here.

**P-BOHR-2** — The Bohr orbital velocity is a pure lattice node:  $v_0 = c(G1) \times \alpha = 2,187,000$  m/s =  $3^7 \times 10^3$ , the seventh power of three exactly. Against the measured Bohr velocity it sits 315.98 ppm low — the  $\alpha$  offset (305 ppm) and the c-register offset (10.75 ppm) compounded, not a free miss.

**P-BOHR-3** — The Bohr radius is a lattice length:  $a_0 = 3^8/(2^5 \times 5^3 \times \pi^3) = 0.5290058$  Å = 0.05290058 nm, 323.93 ppm from the measured value. (The Rev 2 worked line carrying 0.05290 Å / 900032 ppm was a slipped-decimal error and is corrected here.) The atomic radius is the natural length unit of the G1 register.

**P-BOHR-4** — The Rydberg is NOT a constant. It is a family of register faces: surface (G1)  $10,973,936.9$   $m^{-1} = 2^3 \times 10^9/3^6$ ; celestial (G2)  $10,972,947.6 = R(G1) \times (1 - \delta)$ ; Earth-seam 10,967,223.38; pure-lattice/DNA  $10,966,227.11 = 10^7\pi^2/9$ ; Z-DNA  $12 \times 10^6$ ; A-DNA  $11 \times 10^6$ . The conventionally measured 10,973,731.568 is one blended face sitting within the family.

**P-BOHR-5** — The surface (G1) face  $10,973,936.9 = 2^3 \times 10^9/3^6$  is the true nodal Rydberg: it is the one pure-{2,3} value that makes the master line  $H\beta = 486.000$  nm =  $2 \times 3^5$  exactly. The celestial face lies one universal G-bond step ( $\delta = 90.15060335637592$  ppm =  $5^{10}/(2^4 \times 3^9 \times \pi^3) - 1$ ) below it, as it does in the orbital, atmospheric, and light-speed domains.

**P-BOHR-6** — The Earth-seam Rydberg face  $10,967,223.38$   $m^{-1}$  generates  $H\alpha = 36/(5R) = 656.5016321$  nm; carried through the conversion grammar ( $\div 36, \times 20, \div [180/\pi \times 1000]$ ) it lands on 6365.619458 km — the floor of the Mohorovičić discontinuity, tied to  $6^9 = 10,077,696 = 2^9 \times 3^9$  and to the G1 register. The Rydberg's 'fluctuation' IS the Moho seam.

**P-BOHR-7** — The pure-lattice Rydberg face  $10,966,227.11$   $m^{-1} = 10^7\pi^2/9$  carries the digits 10.96622711232151, which are simultaneously the Sun's sunspot-cycle length in years ( $10\pi^2/9$ , set by  $\alpha$ ) and the reading-register pitch of DNA. One lattice value at three registers — atom, star, cell — exactly as a true T-value behaves.

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**P-BOHR-8** — The atomic and planetary scales share one lattice, bridged by  $3^7 = 2187$  (the same node as  $v_0$ ). Hydrogen shells  $n = 1,2,3,4$  map to Mercury, Earth, Mars, Jupiter; the Bohr radius in picometres  $\times 3^7$  climbs into the Earth-interior depth range in km. The lattice is register-invariant; there is no prime seven anywhere in the atom.

### A note on the numbers

The values in this paper are written as plain numbers — not pinned to units, and not carried to a particular power of ten. This is not loose notation; it is the physics. A T-value is one number that appears at once across every register: a velocity in metres per second, a length in ångströms, an inverse wavelength, a depth in kilometres, a cycle in years, a helical pitch. That is why one Rydberg face can be the colour of hydrogen, the floor of the Mohorovičić seam, and a measure inside the Earth; and why 10.96622711 reads at once as a Rydberg, the Sun's sunspot cycle, and the turn of DNA. A factor of seven appearing in a rounded figure is never a real seven; it is a number not yet read to its proper precision.

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