The Tests of Relativity, Reread

Mercury, the bending of starlight, the slowing of clocks, the radar echo, the dragged gyroscope, the dying pulsar and the waves — seven confirmations, one field of time, and the arithmetic of each shown on the page

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Tau (T) is the living fabric of time itself — the sole substance of which all physical reality is composed. Time is created in the core of the Sun and flows outward through the solar system, laying down matter at the nodal points we call planets and carrying life as it goes. Every particle, force, wavelength and conscious experience is a configuration of T-flow, and every value it carries is an address written in powers of 2, 3, 5 and π. There is no gravity, no separate electromagnetic force, no separate nuclear force: all are registers of the single T-field. The conservation law dΣT = 0 governs every change — T is never created or destroyed, only redistributed.

Abstract

For a hundred years a short list of measurements has decided what the world believes about falling. Mercury's orbit creeps round; starlight passing the Sun is displaced; a clock lower down runs slower; a radar echo from Mars comes back late; a spinning gyroscope in orbit is turned by the Earth's own spin; a pair of dead stars spirals together; and in 2015 an instrument four kilometres long felt a tremor from a collision more than a billion light-years away. Each of these is offered as proof that mass bends an empty fabric called spacetime.

This paper takes the seven, one at a time, and shows that each is the one field of time — T — seen from a different side. Where a number is ours to derive it is derived on the page: Mercury's full advance, **5599.224727986022** seconds of arc a century [$5^6 \cdot 100/(9\pi^3)$], is the first helical turn of the day carried one whole dimension down and multiplied by two hundred; the bending of light at the Sun's edge, **1.7508300533396** seconds of arc [$17.28/\pi^2$], is the Sun's own hydrogen-beta carrier read once round the circle. Where the number comes from a formula, the formula is run on the framework's own constants — its speed of light, its value of what science calls G, its masses — and every worked example is printed in full: the tower redshift, $2.457821554 \times 10^{-15}$, which the framework writes as the height divided by the day-pivot, the free fall and the speed of light together; the GPS clock budget, +38.452 microseconds a day; the radar delay past the Sun, 247.14 microseconds; the two gyroscope precessions, 6600.6 and 40.75 thousandths of a second of arc a year; and the decay of the Hulse–Taylor pulsar, -2.4002×10^{-12} seconds per second.

Every measured value is left exactly as measured. What changes is the reading: no curvature and no separate force — a real medium and one conservation law. One claim that an earlier revision carried, that Mercury's advance is a register gap piling up orbit by orbit, is withdrawn here with its figures. Two places where this account and the curved-space account must part company are named, and one has already been tested. Propositions P-TGR-1 to P-TGR-10.

Nothing in these seven tests was pulled. Every one is a clock — and a clock is a reading of time.

1. Seven Tests, One Field

In 1859 Urbain Le Verrier found that Mercury does not come back to the same place. Each time the planet swings closest to the Sun, the point of closest approach has moved on a little. Most of the creep could be traced to the pull of the other planets, as Newton's law would have it; a sliver could not. In 1915 Albert Einstein took that sliver as the first evidence for a new account of what falling is — mass bending a fabric of space and time, and bodies running along the bends.

Over the century since, six more tests were added: the bending of starlight past the Sun, photographed during the eclipse of 1919; the slowing of clocks lower down, measured in a Harvard tower in 1959 and now corrected for in every satellite-navigation receiver; the extra delay of a radar echo passing the Sun; the turning of a gyroscope by the spin of the Earth, measured by Gravity Probe B; the slow death-spiral of a pair of neutron stars, timed since 1974; and the waves from colliding black holes, felt by LIGO in 2015. Pass these and an account of falling is taken to be proved. Fail one, Einstein himself said of the redshift, and the structure has to be given up.

The Universal Force of Time passes them, because it does not dispute a single measured number. It disputes what the numbers are numbers *of*. There is no empty fabric to bend and no separate force reaching across it. There is one substance, T, the flow of time from the Sun, and it is not the same everywhere: it is denser near a source and thinner far away, it turns with a turning source, and it carries ripples when a node is shaken. The seven tests are the seven sides of that one field.



Figure 1. The canon, reread. Every test of relativity is one T-field seen from a different side: its register structure (Mercury), its broadcast carrier (deflection), its density setting a clock (redshift, Shapiro delay), its co-rotation with a source (frame-dragging), and its motion (pulsar, waves).

1.1 How this paper is built

Two kinds of result appear below, and they are kept apart on purpose. **Derived** results come out of the lattice by a route the framework owns — Mercury and the deflection. **Formula** results take a formula that science also uses and run it on the framework's own constants; the interest there is in what each term *is*, and in the fact that the framework's constants are one consistent set. A third kind, **reading only**, gives the mechanism where no number of ours is at stake. Every section says which kind it is.

2. The Constants This Paper Uses

Every formula result below uses the same five numbers, all from the framework's published papers, and no others from the framework. Measured inputs — a tower's height, an orbit's radius, a pulsar's masses — are named where they enter and never adjusted.

THE FRAMEWORK'S OWN CONSTANTS	
speed of light, G1	**299,789,233.6830892680** $[2^3 \cdot 3^5 \cdot 5^6 \cdot \pi^2]$ m/s
surface free fall g_1	**9.817477042468104** [25π/8] — the time correction
what science calls G	**$6.666666666667 \times 10^{-11}$** $[20/3 \times 10^{-11}]$ — 1/0.15
the Sun's mass	**$1.989436788648692 \times 10^{30}$ kg** $[25/(4\pi) \times 10^{30}]$
the Earth, G1 rung	**$5.976946968 \times 10^{24}$ kg** $[5\pi^5/2^8 \times 10^{24}]$; radius **6375.410099693 km** $[25\pi^5/12 \times 10]$

Two identities hold these together and will be used below. The first ties the free fall to the speed of light with nothing in between:

$$g_1^2 \times 864 \times 3600 = c_{G1}$$

WHAT EACH PART IS

- g_1 — the surface free fall, 9.817477042468104 [25π/8]: in the Force of Time not a pull but the correction that tops a sub-24-hour rotation up to a full day
- 864 × 3600 = 3,110,400 — the day-pivot times one hour $[2^9 \cdot 3^5 \cdot 5^2]$
- c_{G1} — the speed of light on the Earth's register

WORKED EXAMPLE

$9.817477042468104^2 = 96.38285547938827$; × 3,110,400 = **299,789,233.6830893 m/s** — the speed of light, exactly.

The second ties the framework's G, the Earth's mass and its radius to a round number:

$G \cdot M_E \div R_E = 62{,}500{,}000\ m^2/s^2$

WHAT EACH PART IS

- $G \cdot M_E$ = 398,463,131,230,835.2 m^3/s^2 — the framework's G times the Earth's G1 mass
- R_E = 6,375,410.099693364 m — the G1 radius
- 62,500,000 = $10^9/2^4$ — no π anywhere: the depth of the Earth's T-field at its surface

WORKED EXAMPLE

398,463,131,230,835.2 ÷ 6,375,410.099693364 = **62,500,000 exactly**. Divided by R_E once more it gives the Newton free fall 9.803290929160156 = $3000/\pi^5$, the framework's free fall at the Moho register.

That second number is reached a second way, from the free fall times the Moho times the radius with no G and no mass at all. The framework's G, mass, radius and free fall are therefore not four tuned numbers but one consistent set — which is what lets them be used together below.

3. Mercury's Perihelion

Derived. Mercury's orbit is an ellipse, and its nearest point to the Sun — the perihelion — moves round the Sun a little every orbit. Measured from the Earth, with the slow turning of the Earth's own axis included, the whole advance comes to about 5600 seconds of arc a century. The standard account builds it from pieces: most from the turning of the Earth's reference frame, most of the rest from the tug of the other planets, and the last 43 seconds handed to curved spacetime.

The Universal Force of Time does not build it from pieces. It reaches the whole advance as one lattice number, by sixteen independent roads set out in the Mercury paper [14]. The simplest of them starts from the day.

$P = 864 \times r \div \pi^3 \times 200 = 5^6 \cdot 100 / (9\pi^3)$

WHAT EACH PART IS

- 864 — the day-pivot: 86,400 seconds a day ÷ 100 [$2^5 \cdot 3^3$]
- r = 1.0046939300411523 — the helical turn [$5^6/(2^6 \cdot 3^5)$]; 864 × r = 868.0555555556 is the first helical turn [$5^6/18$]
- ÷ π^3 — one whole dimension down: the framework fixes a dimension at three π-degrees
- × 200 — a century counted in half-centuries of the turn; P comes out in seconds of arc per century

WORKED EXAMPLE

864 × 1.0046939300411523 = 868.0555555555556

÷ π^3 (31.00627668029982) = 27.99612363993011

× 200 = **5599.224727986022 ″ per century**

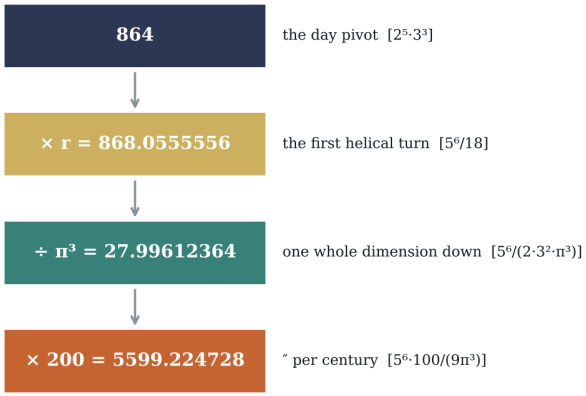


Figure 2. Mercury's advance as one lattice number: the day-pivot, turned once by the helix, carried one dimension down and multiplied by 200.

Read the middle number again: 27.99612363993011. It is not new. The framework prints it as the silicon rung, as the beryllium-7 backbone divided by twelve, as the pitch of A-form DNA — five arrivals from five different parts of the theory at one number. And Mercury's own year is that same node one π-degree up: P × π ÷ 200 = 87.95241635619598 days = $5^6/(18\pi^2)$. **The wobble and the year are one number wearing two faces.**

A second road is Newton's own law, fed the Sun's dimensional masses at two planetary nodes. Mercury × Earth over the node gap gives an energy of 6.48 (π and r cancel); × 24 × $(1 + \delta_G)$ gives the free fall on the g_2 face, 155.534020221834; × 36 returns 5599.224727986 exactly. The matter face, 155.52 × 36 = 5598.72, does not land — the advance lives only on the g_2 face, one G-bond step up. What the older theory calls the relativistic part is, on this road, the G-bond step of Newton's own formula.

3.1 What is withdrawn

An earlier revision of this paper said the advance *is* the gap between two registers — a G2 orbit read with a G1 clock — piling up turn by turn. Run as arithmetic, that reading fails. Accumulated over a century, the helical gap r − 1 gives 2,526,295.00365 seconds of arc, 451 times too much; the G-bond step gives 48,519.474 seconds of arc, 8.7 times too much; the step the reading would need, 10.4035 in the millionths per orbit, is neither. **The cumulative mechanism is withdrawn.** What stands is the identity: the advance is the first helical turn one dimension down, times two hundred. A lattice address does not have to supply a cause, but it is not the same thing as one, and the difference is stated rather than blurred.

3.2 The 43 seconds

The framework has no 43-second sliver to explain, because it never splits the advance into a Newtonian part and a relativistic part. The 43 seconds is a quantity inside the older account — the remainder left when that account's own pieces are subtracted. It is not a separate thing in the sky.

4. The Bending of Starlight

Derived. When the Moon covers the Sun, stars that sit close to the Sun's edge can be photographed, and they appear displaced outward from where they sit at night. Johann von Soldner in 1801, and Einstein himself in 1911, treated light as a falling body and got about 0.87 seconds of arc at the limb. Einstein's 1915 theory doubled it, and the eclipse expeditions of 1919 to Sobral and Príncipe were taken to have found the doubled value. Radio measurements since have pinned it far more tightly.

In the Force of Time, light is not a body falling past the Sun. What carries the starlight to the Earth is the Sun's own broadcast, and the Sun's broadcast carrier is the hydrogen-beta line, the blue-green Balmer line near 486 nanometres. The deflection is that carrier wavelength read once round its circle.

deflection = λ(Hβ) × 360 ÷ 10^5

WHAT EACH PART IS

- λ(Hβ) = 486.3416814832213 nm — the pure-lattice face of the Balmer-β line [4800/π²]
- × 360 — one full spin-orbit circle: × 180/π (the veil) × 2π
- ÷ 10^5 — the decade that carries nanometres into seconds of arc; no content

WORKED EXAMPLE

486.3416814832213 × 360 = 175,083.005333960

÷ 100,000 = **1.7508300533396** ″ = 17.28/π² = 1,728,000/π² ÷ 10^5 (1,728,000 = $2^9 \cdot 3^3 \cdot 5^3$)

The Balmer-β line has three faces in the framework, and all three can be carried round the circle:

face of Hβ	wavelength, nm	deflection, ″
plain	486	1.7496
g_2 (celestial)	486.0438133	1.749757728
pure lattice	486.3416815 = 4800/π²	1.7508300533

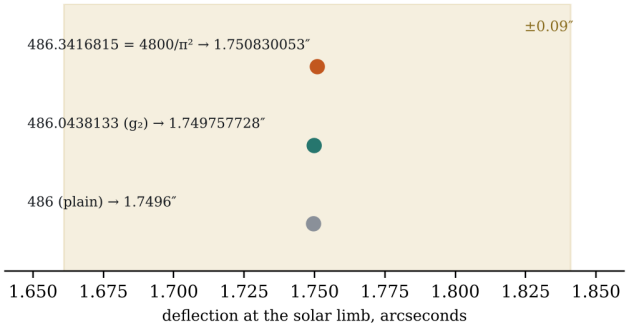


Figure 3. The three faces of the Sun's 486 carrier, each read once round the circle. All three sit inside the ±0.09″ tolerance of 1919; the pure-lattice face lands the value exactly.

The number is reached a second time from the Sun's mass, through the 432/π² family the framework uses for the Sun: the mass road gives 43,200/π², and the same 1.7508300533396 falls out. And a third reading — the familiar formula 4GM/(c²b), run on the framework's G, solar mass and speed of light with the measured solar radius 695,700 km — gives 1.750129. That third figure depends on a measured radius the framework has not yet fixed, and it is printed so the reader can see it, not as the framework's value.

4.1 Why only in eclipse

The reading also says why the effect is seen only when the Sun is covered. The eclipse is not a window that lets faint stars be photographed; it is the experiment. With the Sun's disc blocked, the Earth's feed of T along that line of sight is interrupted, and the apparent place of the star behind shifts with it. If the Sun pulled, the closest body would go first: Mercury would long ago have fallen in. It has not.

5. Clocks Run Slower Lower Down

Formula, with a lattice form. In 1959 Robert Pound and Glen Rebka sent gamma rays of one sharp frequency 22.5 metres down the tower of Harvard's Jefferson Laboratory, and found that at the bottom they arrived shifted toward the blue by a little over two parts in a thousand million million. Sent up, they shifted to the red. Robert Pound and Joseph Snider repeated it in 1964 to about one per cent. The orthodox reading is that light gains energy falling into a well. The Force of Time reading is simpler: **the clock is set by the local density of T**. Lower down, nearer the source of the field, time runs slower; a frequency set at the top is counted at the bottom against a slower clock. No energy is gained or lost. The ruler changed.

The standard formula for the shift is g·h ÷ c². In the framework every part of it is a part of time, and the identity of §2 lets it be written with no c² at all:

$$\Delta f / f = h \div (3{,}110{,}400 \times g_1 \times c_{G1})$$

WHAT EACH PART IS

- h = 22.5 m — the tower's height (measured input)
- 3,110,400 — the day-pivot times an hour, 864 × 3600 [$2^9 \cdot 3^5 \cdot 5^2$]
- g_1 = 9.817477042468104 [25π/8] — the free fall, which is the time correction
- c_{G1} = 299,789,233.6830893 m/s — and because c = 3,110,400 · g_1^2, $g_1 \div c^2 = 1 \div (3{,}110{,}400 \cdot g_1 \cdot c)$

WORKED EXAMPLE

3,110,400 × 9.817477042468104 × 299,789,233.6830893 = 9,154,448,158,475,120

22.5 ÷ 9,154,448,158,475,120 = **$2.457821554 \times 10^{-15}$**

On the Moho face of the free fall, $3000/\pi^5 = 9.803290929$, the same tower gives $2.454270037 \times 10^{-15}$. The Pound–Snider measurement, good to about one per cent, holds both.

Read the box in words. **The shift per metre of height is one divided by the day, the hour, the free fall and the speed of light multiplied together.** The rate a stone falls and the rate a clock slows are the same fact, because in the Force of Time the free fall *is* a correction to the clock.

5.1 Every satellite clock

A clock on a GPS satellite sits higher in the Earth's T-field than a clock on the ground, so it runs faster; it also moves at nearly four kilometres a second, and the speed slows it a little. The two together are large enough that the satellites' clocks are set slow at the factory before launch.

$$\Delta t/t = (G \cdot M_E/c^2)(1/R_E - 1/r) - G \cdot M_E/(2c^2 r)$$

WHAT EACH PART IS

- $G \cdot M_E \div R_E$ = 62,500,000 exactly (§2): the field's depth at the ground
- r = 26,561.75 km — the GPS orbit radius (measured input)
- the first term is height in the field; the second is the satellite's speed, $v^2 = G \cdot M_E/r$

WORKED EXAMPLE

height: **+45.66280570 μs a day**

speed: **−7.21079488 μs a day**

net: **+38.45201083 μs a day**, a fractional rate of $4.45046422 \times 10^{-10}$

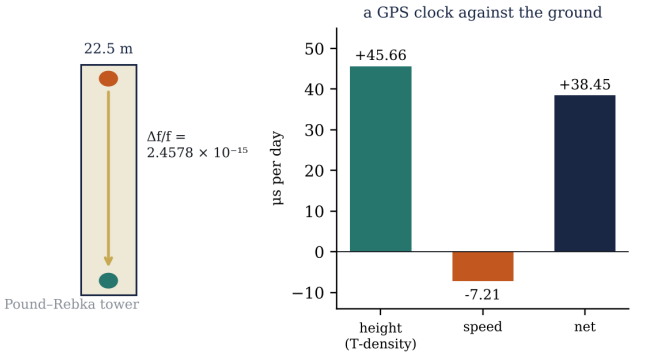


Figure 4. Left: the Pound–Rebka tower, 22.5 m, Δf/f = 2.4578 × 10^{-15} on the framework's constants. Right: a GPS satellite clock against a clock on the ground, per day, on the framework's Earth.

This budget is the framework's leading figure. It leaves out the Earth's own spin and the shape of the ground, both of which the engineers also fold into the factory setting; it is printed as the framework's number, not as a claim to the engineering digit.

The white dwarf Sirius B, with the mass of a sun packed into a ball the size of the Earth, shows the same effect in its starlight, shifted to the red by a velocity of about 80 kilometres a second. It is the same reading — a deep, dense node, a slow clock — and it is a different thing from the redshift of distant galaxies, which the framework reads as light crossing register seams on its way to us, not as a

stretching of space.

6. The Radar Echo That Comes Back Late

Formula. In 1964 Irwin Shapiro pointed out that a radar pulse sent past the Sun to Mercury or Venus and back should return later than the straight distance allows. The Viking landers on Mars measured the delay in 1976–77; the Cassini spacecraft, in 2002, measured it so tightly that the theory's parameter for it, γ, was found equal to one within a few parts in a hundred thousand.

In curved-space language the path is lengthened. In the Force of Time the T-field is denser close to the Sun, the speed at which a signal can match into a register is set by that register's density, and a pulse crossing denser T is clocked accordingly. The same density gradient that slows a clock in a tower delays a pulse past the Sun.

$$\Delta t = (4\,G\,M_{\odot} \div c^3) \times \ln(4\,r_E\,r_M \div b^2)$$

WHAT EACH PART IS

- $4GM_{\odot}/c^3$ = 19.69022963 μs — twice $2GM_{\odot}/c^3$ = 9.845114814 μs on the framework's G, Sun and c
- r_E = 150,000,000 km — the framework's Earth node; r_M = 227,900,000 km — Mars (measured input)
- b = 695,700 km — the pulse grazing the Sun's edge (measured input)
- the factor four (rather than two) is what the parameter γ = 1 means; here it is not a parameter but the structure

WORKED EXAMPLE

$4\,r_E\,r_M \div b^2$ = 282,521.5… ; its natural log = 12.55151

19.69022963 μs × 12.55151 = **247.14 μs** for the round trip, Earth to Mars and back, grazing the Sun

6.1 One gradient, three readings

Put §4, §5 and §6 side by side. The deflection, the redshift and the radar delay are one density gradient of T in the inner solar system, read three ways: it shifts a passing ray, it slows an emitted clock, and it delays a crossing pulse. The curved-space account also says these are one thing; it calls the one thing geometry. The Force of Time calls it a medium.

7. Why Heavy Things Fall Like Light Things

Reading. Under all of the tests sits an older one. Drop a heavy ball and a light ball and they land together; the mass that resists being pushed and the mass that falls agree, in the best modern experiments, to about one part in a thousand million million. Newton noticed it. Einstein made it an axiom, the equivalence principle, and built his theory on it. Neither explained it.

Here there is nothing to explain. A body is a node, a place where the flow of T closes on itself, and it sits at a resonant address in the lattice. Moving it off that address costs T in proportion to how much T is bound there — that is inertia. And the same count of bound T sets how the field thins around it — that is weight. **Inertial mass and gravitational mass are not two masses that happen to agree. They are one number asked two questions.** The equivalence principle is not a postulate in this framework; it cannot even be stated as a separate claim, because nothing in the framework could make the two disagree.

8. The Gyroscope That Was Turned

Formula. Gravity Probe B carried four of the roundest objects ever made — quartz spheres coated in niobium — in a polar orbit 642 kilometres up from 2004 to 2005. A gyroscope in empty space should hold its direction forever. These turned, by two small amounts in two directions. One, in the plane of the orbit, is the geodetic effect: the gyroscope carried round a dense field. The other, at right angles, is frame-dragging: the field turned by the Earth's own spin. In 2011 the results were 6601.8 ± 18.3 and 37.2 ± 7.2 thousandths of a second of arc a year. The LARES and LAGEOS laser-ranged satellites have since measured the dragging to within a few per cent.

The Force of Time expects the dragging for a concrete reason. The Earth is not an inert lump; it is a turning broadcaster of T, and a turning source carries its field round with it, the way a spinning drum carries the air against its wall. There is no vacuum to twist. There is a medium, and it co-rotates.

$$\Omega_{geodetic} = (3/2)(G\,M_E)^{3/2} \div (c^2\,a^{5/2})\ ;\ \Omega_{drag} = G\,I\,\omega \div (2\,c^2\,a^3)$$

WHAT EACH PART IS

- $G\,M_E$, c — the framework's values (§2)
- a = 7027.4 km — the orbit radius, 642 km up (measured input)
- $I = 0.3307\,M_E\,R_E^2$ — the Earth's moment of inertia (measured factor 0.3307 on the framework's mass and radius); ω = 2π ÷ 86,164.0905 s, the measured sidereal day

WORKED EXAMPLE

geodetic: **6600.6 mas a year** (measured 6601.8 ± 18.3)

frame-dragging: **40.75 mas a year** (measured 37.2 ± 7.2)

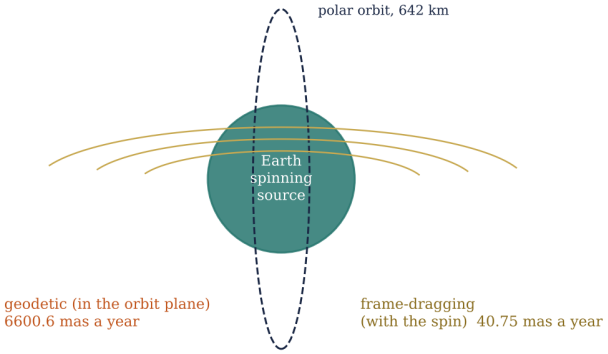


Figure 5. Gravity Probe B. The geodetic turn lies in the plane of the polar orbit; the frame-dragging turn follows the Earth's spin. Both are the gyroscope reading the T-field it sits in.

The frame-dragging figure leans on two measured inputs the framework has not yet derived — the moment-of-inertia factor and the sidereal day in seconds — and both are named. The Earth's sidereal rotation is a lattice value in the framework, 23,564.069025 [$5^{14}/(2^2\cdot3^8\cdot\pi^2)$], but reading it as hours, minutes and seconds is an addition, which the lattice does not allow, so the measured day is used here instead.

9. The Pulsar That Is Dying

Formula. In 1974 Russell Hulse and Joseph Taylor found a pulsar, PSR B1913+16, in an eight-hour orbit round an unseen companion — another neutron star. The pulsar is a clock better than most on Earth, and by timing it they could watch the orbit. It is shrinking. Each orbit is shorter than the last by about two and a half millionths of a second a year, and the time of closest approach has drifted, after fifty years, by more than a minute. The 1993 Nobel Prize in Physics was awarded for it.

In the curved-space account the pair loses energy by radiating gravitational waves. In the Force of Time the orbit is a pattern of T, and dΣT = 0 says T is neither made nor destroyed — so the T the orbit gives up is redistributed outward, carried away as a ripple in the field. The same formula follows, because it is a bookkeeping of the same quantity.

$$\dot{P}_b = -(192\pi\,G^{5/3} \div 5c^5)\,(P_b/2\pi)^{-5/3}\,f(e)\,m_1m_2(m_1+m_2)^{-1/3}$$

WHAT EACH PART IS

- G, c, $M_\odot$ — the framework's values (§2)
- $m_1 = 1.4398\,M_\odot$, $m_2 = 1.3886\,M_\odot$; $P_b = 0.322997448918$ days; e = 0.6171340 — the pulsar's measured masses, period and eccentricity
- $f(e) = (1 + 73e^2/24 + 37e^4/96) \div (1 - e^2)^{7/2}$ — the eccentric orbit radiates harder at its close passes

WORKED EXAMPLE

P_b = 27,906.98 s; f(e) = 11.857

$\dot{P}_b$ = **-2.40019×10^{-12} seconds per second** (measured, after the galaxy's own acceleration is removed: $-2.398 \pm 0.004 \times 10^{-12}$)

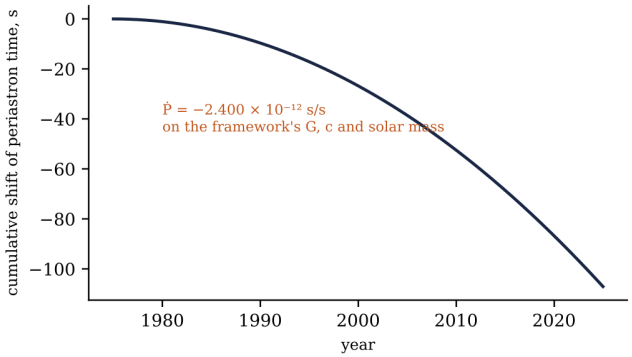


Figure 6. The cumulative drift in the time of the Hulse–Taylor pulsar's closest approach, from 1975, on the framework's constants. The orbit's T is redistributed outward; nothing is lost.

10. The Waves

Reading, with one prediction already tested. On 14 September 2015 the two LIGO detectors, in Washington State and Louisiana, each with two arms four kilometres long at right angles, registered a signal that rose in pitch and strength for a fifth of a second and stopped: GW150914, read as two black holes of about thirty-six and twenty-nine suns merging some 1.3 thousand million light-years away. Hundreds of such events have been recorded since.

The detections are not in dispute here, and nothing in this paper would have predicted a different waveform. What is in dispute is what rippled. In the curved-space account the fabric of spacetime itself

was stretched and squeezed. In the Force of Time there is no fabric to stretch, because there is no spacetime — there is T, and T is what everything is made of, the arms of the instrument and the light in them included. Displace a node hard enough and the gradient around it has to rearrange; the rearrangement travels outward at the speed of the field; an instrument with two long arms at right angles reads it as a brief variation in the rate of fall along each arm, out of step between them. That is the signal LIGO recorded. **The observation stands; the curved-space interpretation is not required by it.**

10.1 The speed of the wave

Here the Force of Time sticks its neck out. The framework carries two faces of the speed of light: 300,000,000 m/s and 299,789,233.6830893 m/s. They stand one step apart, and the step is a named one — the 703 step, 1.000703048 [800/(81π²)]. If the waves rode one face and the light the other, light and wave from the same event would part company by one part in 1,422, and over 130 million light-years one would arrive about 91,000 years after the other.

On 17 August 2017 a pair of neutron stars merged in the galaxy NGC 4993, about 130 million light-years away. The waves were caught as GW170817, and a burst of gamma rays arrived 1.7 seconds later. **Light and wave travel on the same face.** In this framework they must, because both are the one field reconfiguring; a framework in which they were separate things would have had no reason to expect it. The test could have failed, and did not.

11. Where the Two Accounts Must Part

If two accounts return the same numbers for every test, a reader is entitled to ask whether they differ at all. They do, and in a measurable place.

If falling were produced by a mass acting through empty space, the free fall would weaken smoothly with height, because the inverse square is a smooth law and nothing in it can make a ledge. If instead the gradient is the thinning of a nodal field, it must thin the way the lattice allows: in steps, at node crossings. The size of the step is not free. It is the helical turn taken three times:

$r^3 = (5^6 / (2^6 \cdot 3^5))^3 = 1.0141479924824136$

WHAT EACH PART IS

- r = 1.0046939300411523 — the helical turn: the same number that sets the turn of DNA and appears in Mercury's advance
- three turns — one step of the field across a node boundary

WORKED EXAMPLE

1.0046939300411523^3 = **1.014147992482414**: across each atmospheric node boundary the rate of fall should step by this factor, and sit flat between boundaries.

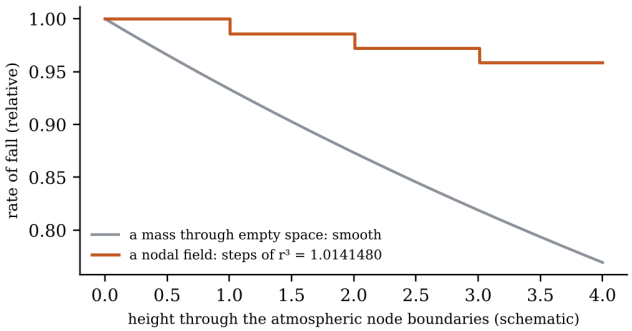


Figure 7. The decisive difference, drawn schematically. A mass through empty space gives a smooth fall-off; a nodal field gives a staircase with steps of r^3 at the node boundaries.

Satellite and airborne gravimetry already has the sensitivity. What it has not had is a reason to look for a staircase, because no account before this one predicted one. **Find a smooth profile at that resolution and this account is wrong.** The speed of the waves (§10.1) is the second such place, and it has already been passed.

12. What This Paper Claims, and What It Does Not

test	kind	the framework's number	reading
Mercury	derived	5599.224727986022 ″/century [$5^6 \cdot 100/(9\pi^3)$]	first helical turn, one dimension down, × 200
deflection	derived	1.7508300533396 ″ [$17.28/\pi^2$]	the Sun's 486 carrier read once round
tower redshift	formula, lattice form	$2.457821554 \times 10^{-15}$	clock set by T-density
GPS	formula	+38.45201083 μs/day	height and speed in the field
Shapiro	formula	247.14 μs (Earth–Mars, grazing)	pulse crosses denser T
equivalence	reading	—	one number, two questions
GP-B	formula	6600.6 and 40.75 mas/yr	gyroscope in a co-rotating field
Hulse–Taylor	formula	-2.40019×10^{-12}	orbital T redistributed, $d\Sigma T = 0$
waves	reading + test	light and wave on one face	the field reconfiguring

It claims that every one of the canonical tests returns a number the framework also returns, and that the disagreement with the curved-space account is of cause, not of value. It claims two numbers as its own derivations. It claims that its constants are one consistent set. It names a place where the two accounts must give different answers.

It does not claim that the formula results are independent derivations: they use formulas science also uses, on the framework's constants, and they inherit the measured inputs named beside them. It does not claim a mechanism for Mercury beyond the lattice identity, the earlier mechanism having been withdrawn. It does not claim to reproduce the GPS engineering setting to its last digit, nor to have derived the Earth's moment of inertia or the Sun's radius.

Propositions

P-TGR-1 — The disagreement is of cause, not value. Every classical and modern test returns a number the framework also returns; there is no curvature and no separate force.

P-TGR-2 — Mercury is one lattice number. $P = 864 \times r \div \pi^3 \times 200 = 5^6 \cdot 100/(9\pi^3) = 5599.224727986022$ ″/century; the year is the same node one π-degree up. Sixteen roads; the cumulative register-gap mechanism is withdrawn.

P-TGR-3 — The deflection is the carrier read once round. $\lambda(H\beta) \times 360 \div 10^5 = 1.7508300533396$ ″ with $\lambda = 4800/\pi^2$; three faces of the line inside ±0.09″; the eclipse is the experiment.

P-TGR-4 — The redshift is a clock. $\Delta f/f = h \div (3{,}110{,}400 \cdot g_1 \cdot c_{G1})$: the shift per metre is one over the day-pivot, the hour, the free fall and the speed of light. Distinct from the cosmological redshift.

P-TGR-5 — The constants are one set. $G \cdot M_E/R_E = 62{,}500{,}000$ exactly, reached also with no G and no mass; the framework's G, masses, radius and free fall are not tuned separately.

P-TGR-6 — One gradient, three readings. Deflection, redshift and the Shapiro delay are one density gradient of T in the inner solar system.

P-TGR-7 — Equivalence is not a postulate. Inertial and gravitational mass are one count of bound T asked two questions; nothing in the framework could make them differ.

P-TGR-8 — A turning source carries its field. The geodetic and frame-dragging precessions are a gyroscope reading a co-rotating medium.

P-TGR-9 — Nothing is lost. The binary pulsar's decay is orbital T redistributed outward under $d\Sigma T = 0$; gravitational waves are the field reconfiguring round a displaced node.

P-TGR-10 — Two places to part company. Light and gravitational waves must travel on one face of the speed of light (passed, GW170817); the free fall must step by $r^3 = 1.0141479924824$ at node boundaries (open).

Open Questions

OQ-1 — The staircase. A vertical gravimetric profile through the atmospheric node boundaries at the resolution needed to see steps of r^3.

OQ-2 — The Sun's radius. The framework carries several solar radii; which one the deflection formula and the Shapiro delay should take is not yet ruled.

OQ-3 — The Earth's moment of inertia. The factor 0.3307 is measured; its lattice form is owed.

OQ-4 — The sidereal day in seconds. The lattice value $5^{14}/(2^2 \cdot 3^8 \cdot \pi^2)$ cannot be read as hours, minutes and seconds without an addition; the right reading is owed.

OQ-5 — A mechanism for Mercury. The advance is a lattice identity; the physical process that makes the orbit carry it is not yet given.

OQ-6 — GW150914 itself. The masses and distance quoted for the first detection are curved-space readings of the waveform; the framework's own reading of that waveform is owed.

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Appendix A — Every Number in One Table

quantity	value	lattice form or input	§
speed of light, G1	299,789,233.6830893 m/s	$2^3 \cdot 3^5 \cdot 5^6 \cdot \pi^2$	2
free fall g_1	9.817477042468104	$25\pi/8$	2
G	$6.666666666667 \times 10^{-11}$	$20/3 \times 10^{-11}$	2
$G \cdot M\odot$	$1.326291192432461 \times 10^{20}$	$125/(3\pi) \times 10^{19}$	2
$G \cdot M_E \div R_E$	62,500,000	$10^9/2^4$	2
Newton free fall	9.803290929160156	$3000/\pi^5$	2
first helical turn	868.0555555555556	$5^6/18$	3
silicon rung	27.99612363993011	$5^6/(2 \cdot 3^2 \cdot \pi^3)$	3
Mercury advance	5599.224727986022 ″/cy	$5^6 \cdot 100/(9\pi^3)$	3
Mercury year	87.95241635619598 d	$5^6/(18\pi^2)$	3
Hβ pure face	486.3416814832213 nm	$4800/\pi^2$	4
deflection	1.7508300533396 ″	$17.28/\pi^2$	4
$3{,}110{,}400 \cdot g_1 \cdot c$	$9.154448158475120 \times 10^{15}$	—	5
tower shift (g_1)	$2.457821554 \times 10^{-15}$	h = 22.5 m	5
tower shift (Moho g)	$2.454270037 \times 10^{-15}$	h = 22.5 m	5
GPS net	+38.45201083 μs/day	r = 26,561.75 km	5
$2GM\odot/c^3$	9.845114814 μs	—	6
Shapiro, Earth–Mars	247.14 μs	b = 695,700 km	6
GP-B geodetic	6600.6 mas/yr	a = 7027.4 km	8
GP-B frame-drag	40.75 mas/yr	$I = 0.3307\ MR^2$	8
Hulse–Taylor $\dot{P}$	-2.40019×10^{-12}	measured masses, P, e	9
703 step	1.000703048	$800/(81\pi^2)$	10
r^3	1.014147992482414	$(5^6/(2^6 \cdot 3^5))^3$	11

A Note on the Numbers

The values in this paper are written as plain numbers — not pinned to units, and not carried to a particular power of ten. This is not loose notation; it is the physics. Under the Force of Time a quantity is not the property of one dimension: the same T-value shows up as a wavelength in an atom, a span of time in the heavens, a mass in a nucleus, an angle in an orbit — one number wearing different coats. That is why a hydrogen line in nanometres can meet the bending of starlight in seconds of arc, and the turn of a day can meet the creep of Mercury's orbit, and land on the same value: they were never separate quantities. We therefore do not solve for a result "to the power of" anything in one register and stop. The lattice number is the real thing, and it lives at once across every register — subatomic, atomic, celestial, galactic. The unit and the power of ten are only the costume the number wears in whichever dimension you read it from.

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