Graviton Pressure Theory

The Unified Framework

Individual Submission

This document is part of a multi-part scientific framework

Part 4 of 30

From Newton to GPT

The Evolution of Gravitational Understanding:
A Century of Advances, and What Still Does Not Fit

This submission is part of the broader Graviton Pressure Theory (GPT) project, a redefinition of gravitational interaction rooted in causal field dynamics and physical force transmission. Each document is designed to stand on its own; its full context emerges as part of the larger framework. For the complete series, see https://peopleoftheworld.net/graviton-pressure-theory/.

Author: Shareef Ali Rashada

shareef@peopleoftheworld.net

Second edition, November 2026 (first edition 12 June 2025)

Contents

About This Paper **2**

4.1 The Promise of Gravity **2**

4.2 Newton: Force Without Contact **3**

4.3 Einstein: Geometry Without Force **3**

4.4 A Century of Advances **4**

4.5 Where the Story Does Not Fit **5**

4.5.1 Matter No One Has Found 6

4.5.2 A Regularity That Unseen Matter Does Not Predict 6

4.5.3 Energy No One Can Explain 6

4.5.4 Measurements That Disagree 6

4.5.5 The Shape of the Pattern 7

4.6 Quantum Gravity, or the Lack of It **7**

4.6.1 Two Theories That Do Not Join 7

4.6.2 Why the Obvious Approach Fails 7

4.6.3 A Carrier That Has Never Been Seen 7

4.6.4 Many Proposals, No Confirmation 7

4.6.5 Problems Built into the Theory 8

4.6.6 What the Graviton Reveals 8

4.7 Separate Domains, Switching Mechanisms **9**

4.7.1 Gravity by Territory 9

4.7.2 Where Is the Border? 9

4.7.3 What a Single Mechanism Would Do 11

4.8 The Gravity We Live With **11**

4.9 The Need for Causality **12**

4.10 What Comes Next: A Gravity You Can Touch **12**

Changes in the Second Edition **13**

About This Paper

This paper tells the story of gravity from Newton to the present. Newton described its effects without a cause. Einstein replaced force with geometry, again without a cause. Much has happened since 1916, and the story is carried forward here to 2026.

It records the great confirmations of the last century, because they are real and must be stated plainly. It records, just as plainly, the places where the story does not fit: the matter that has never been found, the energy that cannot be explained, the measurements that disagree, and above all the failure, after nearly a century of effort, to join gravity to quantum theory.

And it draws out one thing more. Gravity today is not explained by one theory. It is handled by several, each assigned its own territory—Newton for the engineer and the galaxy, Einstein for the clock and the black hole, quantum mechanics for the falling neutron, particle physics for the hypothetical graviton, unseen matter and energy for the rest. The borders between these territories are not features of nature. They are features of our explanations. Gravity does not change what it is when a calculation changes hands.

Claims about Graviton Pressure Theory are marked by their status, as the key shows. The registers of explanation introduced in Part 3—**[N]** Newtonian force, **[GR]** geometry, **[FR]** frame forces, **[C]** contact, **[EN]** energy and potential, **[Q]** particle exchange, **[DS]** the dark sector—are used again here.[1]

How to read the marks. Claims about Graviton Pressure Theory are marked by how far they are established.

Established	No mark. Accepted, measured physics.
Argued	Solid blue underline. A conclusion this framework argues in detail, which readers can check.
Hypothesis	Dashed orange underline. A proposal of GPT, not yet tested.
Open ○	Dotted grey underline and ○. A question not yet answered; work still owed.

A whole passage with one status carries a bar of the same style in the left margin. The marks are drawn in distinct line styles, so they read in black and white.

4.1 The Promise of Gravity

Gravity has always been more than a force; it has been the quiet architect of reality. Before it had a name, it shaped the courses of rivers, the rhythm of bodies, the balance of trees. Long before science wrote its equations, gravity was already teaching. It sculpted mountains and wore them down, held the Moon in its path and drew the tides across the shore like breath. When minds first turned skyward, gravity was already there, waiting to be recognised.

Isaac Newton was the first to describe its effects with precision.[2] He linked the falling apple to the orbit of the Moon. With him, the era of calculable gravity began: through a force law and a universal constant, the invisible hand of nature was named. And yet, though Newton gave us gravity's behaviour, he did not give us its cause. He described the pull, but not the pulling. He measured the acceleration, but not the engine.

Centuries later, Einstein took a radical step. Dissatisfied with action at a distance, he replaced it with geometry. Objects would no longer pull on one another; mass and energy would shape space and time, and other objects would follow the shape.[3] In this view there was no

[1] Rashada, 2026c.
[2] Newton, 1713.
[3] Einstein, 1916; Misner et al., 1973.

force—only paths, only geodesics.[4]

It was an elegant revolution. But elegance is not the same as explanation, and beauty can conceal what it leaves out.[5] In Einstein's theory, as in Newton's, something was missing: a named mechanism. The sensation of being pressed into a chair. The resistance of the ground beneath our feet. The effort of holding up a book. These are described by Newton's force, and redescribed by Einstein's geometry, but in neither theory does anything named do the pressing.

4.2 Newton: Force Without Contact

Newton's contribution cannot be overstated. He unified the heavens and the Earth with a single law. The same influence that made an apple fall governed the Moon and the tides. For the first time, the cosmos became calculable.

But Newton's force was silent. It offered no medium, no transmission, no tether between masses. Bodies acted on one another across the void—but how? What moved between them? Newton himself called action at a distance through empty space an absurdity, and openly declined to guess its cause.[6] Within a few years others proposed that gravity was a push from a universal flux of particles; those proposals, and why they were set aside, are traced in Part 1. Part 2 traces how the question of mechanism itself was gradually set aside.[7]

Still, Newton's equations worked. They let cannonballs fly true and planets be found. They are still the working tool of engineering, navigation and most of astronomy. But they left gravity itself as a black box: a law that describes without illuminating.

4.3 Einstein: Geometry Without Force

Einstein's leap was as philosophical as it was mathematical.[8] He removed the force altogether. Mass and energy shape spacetime; freely falling bodies follow the straightest paths through it. Acceleration and gravity became locally indistinguishable. A person in free fall feels nothing—not because gravity has vanished, but because, in Einstein's account, falling is what an unforced body does.

It was beautiful. It was consistent. And it named no mechanism.

General Relativity does not say how mass tells space how to curve; it states the relationship and solves it. Its field equations are of great power, but they describe; they do not name what acts. Why does mass curve spacetime? How does spacetime "know" that mass is present? These questions are not answered. They are not asked.

And its confirmations, remarkable as they are, are often spliced with Newton. The advance of Mercury's perihelion, GR's first triumph, is a sum: about 532 arcseconds per century computed as the Newtonian pull of the other planets, and 43 attributed to General Relativity.[9] The theory credited with the result denies the forces that produce most of it. This is not dishonest; it is how the calculation is done. But it means that even GR's founding success rests on a combination of two pictures that disagree about what gravity is—the error Part 3 calls the

[4] Wheeler, 1990.
[5] Smolin, 2006.
[6] Newton, 1713.
[7] Rashada, 2026b.
[8] Einstein, 1916.
[9] Clemence, 1947.

Reduction Conflation.[10]

And throughout it all, the ground still pressed against our feet, bodies still tired under their own weight, bridges still strained. Every one of these is calculated with Newton's force, in a world where the more fundamental theory says that force does not exist.

4.4 A Century of Advances

General Relativity has passed every precision test put to it for more than a hundred years. Any honest account of gravity must say so plainly, and must explain these results, not wave them away.

Year	Advance	What it showed
1919	Starlight bent by the Sun, measured at a solar eclipse[11]	The full bending predicted by GR, twice the Newtonian value
1959–60	Pound and Rebka: light's frequency shifts over a 22.5 m tower[12]	Clocks run at different rates at different heights
1964	Shapiro proposes radar delay past the Sun[13]	Later confirmed; Cassini (2002) to two parts in 10^5
1974–93	The Hulse–Taylor binary pulsar[14]	Orbit shrinks exactly as energy is lost to gravitational waves
1975	Colella, Overhauser and Werner: neutrons interfere differently when tilted in Earth's gravity[15]	Gravity acts on quantum waves, described with the Newtonian potential
1998	The expansion of the universe is accelerating[16]	Attributed to dark energy
2002	Neutrons bouncing on a mirror occupy discrete quantum energy levels[17]	Quantum states in Earth's gravity, described with the Newtonian potential
2011	Gravity Probe B[18]	Orbiting gyroscopes precess as predicted, including frame dragging
2015	Gravitational waves detected directly[19]	Ripples from merging black holes
2017	Neutron-star merger seen in gravitational waves and light[20]	Gravity's disturbances travel at the speed of light, to within about one part in 10^{15}
2019	First image of a black hole's shadow[21]	Matches GR's prediction for its size

[10] Rashada, 2026d.
[11] Dyson et al., 1920.
[12] Pound and Rebka, 1960.
[13] Shapiro, 1964.
[14] Weisberg et al., 2010.
[15] Colella et al., 1975.
[16] Riess et al., 1998.
[17] Nesvizhevsky et al., 2002.
[18] Everitt et al., 2011.
[19] LIGO Scientific Collaboration and Virgo Collaboration, 2016.
[20] LIGO, Virgo, Fermi GBM and INTEGRAL Collaborations, 2017.
[21] Event Horizon Telescope Collaboration, 2019.

Year	Advance	What it showed
2020	Newton's inverse-square law tested down to 52 micrometres[22]	No deviation found
2022	MICROSCOPE satellite[23]	All bodies fall alike, to about one part in 10^{15}
2022	Gravitational Aharonov–Bohm effect[24]	Gravity shifts the phase of atom waves that feel no net force
2023	ALPHA-g: antihydrogen falls down[25]	Antimatter is not repelled by gravity
2025	DESI[26]	Hints that dark energy may change over time
2026	LZ[27]	One unexplained event in a dark-matter detector (2.6σ); no detection claimed

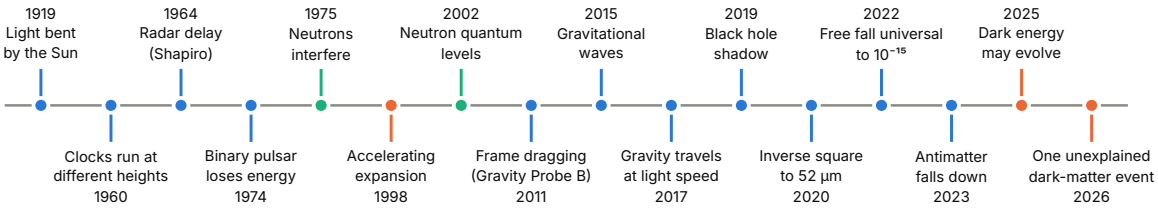

Figure 4.1: A century of advances in gravitational physics. Most confirm General Relativity; the quantum experiments are described with Newton's potential; and the most recent signals point to what remains unexplained.

GPT must account for every confirmed result in this table. Part 1 shows how it obtains two of them—the bending of light and the radar delay—from the medium.[28] The others are taken up in the parts that follow.

4.5 Where the Story Does Not Fit

Beside the confirmations stand the results that do not fit the standard account comfortably. None of them, alone, overturns it. Together, they show that the story is not finished—and several of them sit exactly where a missing mechanism would be expected to show.

[22] Lee et al., 2020.
[23] Touboul et al., 2022.
[24] Overstreet et al., 2022.
[25] Anderson et al., 2023.
[26] DESI Collaboration, 2025.
[27] LZ Collaboration, 2026.
[28] Rashada, 2026a.

4.5.1 Matter No One Has Found

Since Zwicky in 1933 and Rubin in the 1970s, galaxies and clusters have been seen to move as if they contained far more mass than we can see.[29] The standard explanation is dark matter: about five times as much unseen matter as ordinary matter.[30] After four decades of direct searches, no dark-matter particle has been detected. In September 2026 the LZ experiment reported a single event it could not explain, at a significance well short of a discovery, and explicitly did not claim to have seen dark matter.[31]

4.5.2 A Regularity That Unseen Matter Does Not Predict

Galaxies also show a striking regularity. Across 153 galaxies of every size, the acceleration of stars and gas at each radius is predicted, with small scatter, by the visible matter alone, through a single relation with one characteristic acceleration of about $1.2 \times 10^{-10}\,\mathrm{m/s^2}$.[32] Mordehai Milgrom predicted such a relation in 1983 by modifying Newton's law below that acceleration (MOND).[33] In the dark-matter picture, the relation has to emerge from the way galaxies form; in MOND, it is built in, but MOND struggles with galaxy clusters and cosmology. Whether wide binary stars, orbiting each other at such low accelerations, deviate from Newton is currently disputed, with opposing analyses of the same Gaia data. ○[34]

4.5.3 Energy No One Can Explain

The accelerating expansion is attributed to dark energy, about 68% of the universe's energy content.[35] If it is the energy of empty space, quantum field theory predicts a value larger than the observed one by a factor commonly quoted as about 10^{120}—the cosmological constant problem.[36] In 2025, the DESI survey reported evidence, at between about 2.8 and 4.2 standard deviations depending on the data combined, that dark energy may be weakening over time.[37] If confirmed, it would not be a constant at all. ○

4.5.4 Measurements That Disagree

- **The expansion rate.** Measured from the early universe, the Hubble constant is about $67\,\mathrm{km/s/Mpc}$;[38] measured from nearby supernovae calibrated with Cepheid stars, it is about 73.[39] Another nearby method gives about 70.[40] The disagreement, the Hubble tension, is unresolved. ○
- **The strength of gravity itself.** Laboratory measurements of the gravitational constant G disagree with one another by more than their stated uncertainties allow, at the level of a few parts in ten thousand.[41] G remains the least precisely known fundamental constant.

[29] Zwicky, 1933; Rubin et al., 1980.
[30] Planck Collaboration, 2020.
[31] LZ Collaboration, 2026.
[32] McGaugh et al., 2016.
[33] Milgrom, 1983.
[34] Chae, 2023; Banik et al., 2024.
[35] Planck Collaboration, 2020.
[36] Weinberg, 1989.
[37] DESI Collaboration, 2025.
[38] Planck Collaboration, 2020.
[39] Riess et al., 2022.
[40] Freedman et al., 2024.
[41] Li et al., 2018.

4.5.5 The Shape of the Pattern

Each anomaly has proposed resolutions within the standard framework, and some may succeed. But notice where they cluster: at the largest scales, where the dark sector is added; at the lowest accelerations, where galaxies follow a law no one wrote into the theory; and in the strength of gravity itself, which we cannot pin down. These are the places where a theory that describes without a mechanism would be expected to need patching.

4.6 Quantum Gravity, or the Lack of It

The deepest gap in gravitational physics is not an anomaly. It is an absence.

4.6.1 Two Theories That Do Not Join

Every other known interaction—electromagnetism, the weak force, the strong force—is described by quantum field theory, in which forces are carried by quanta exchanged between particles. Gravity alone is not. General Relativity is a classical theory of smooth geometry; quantum theory is a theory of discrete, probabilistic exchange on a fixed stage. Where both must apply at once—at the centre of a black hole, at the beginning of the universe—the theories give no consistent answer.

4.6.2 Why the Obvious Approach Fails

The obvious approach is to treat gravity like the other forces: a field carried by a particle, the graviton, a massless quantum of spin 2. At low energies this works. Treated this way, General Relativity is a perfectly good effective field theory, and it even predicts tiny quantum corrections to Newton's law.[42] But at high energies the calculation breaks down: the infinities that are tamed in the other forces cannot be tamed in gravity. This was shown for gravity with matter in 1974, and for pure gravity at two loops in 1986.[43]

4.6.3 A Carrier That Has Never Been Seen

The graviton has never been detected. Freeman Dyson argued in 2013 that detecting a single graviton may be impossible even in principle with any conceivable detector.[44] The energy at which quantum effects of gravity are expected to become strong, the Planck energy, is about 10^{19} GeV—some fifteen orders of magnitude beyond the most powerful particle collider ever built. No experiment has yet observed a quantum effect of gravity itself: an entanglement created by gravity, a graviton, or a measured granularity of spacetime. Experiments to test whether gravity can entangle two masses have been proposed, but not yet carried out.[45]

4.6.4 Many Proposals, No Confirmation

Many routes to quantum gravity have been developed over half a century:

[42] Donoghue, 1994.
[43] 't Hooft and Veltman, 1974; Goroff and Sagnotti, 1986.
[44] Dyson, 2013.
[45] Bose et al., 2017; Marletto and Vedral, 2017.

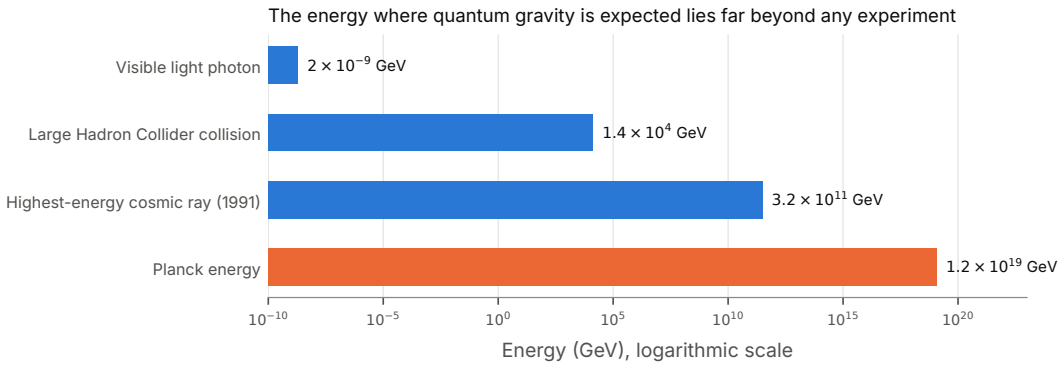

Figure 4.2: The energy at which quantum effects of gravity are expected to become strong, compared with the highest energies observed. The scale is logarithmic: each gridline is a factor of 100,000.

- **String theory**, in which particles are vibrating strings and the graviton appears automatically.[46]
- **Loop quantum gravity**, in which space itself is woven from discrete loops.[47]
- **Asymptotic safety**, in which gravity becomes well-behaved at high energies on its own.[48]
- **Causal sets**, in which spacetime is a discrete collection of events ordered by cause and effect.[49]
- **Emergent gravity**, in which Einstein's equations arise like the equations of a fluid or a gas, from something more basic.[50]

None has made a confirmed prediction that distinguishes it from General Relativity. One related idea—that gravity causes the collapse of quantum superpositions—has been tested: its simplest version was ruled out underground in 2021.[51]

4.6.5 Problems Built into the Theory

General Relativity also predicts its own limits. Under general conditions, collapsing matter must form a singularity, where the theory's quantities become infinite.[52] Black holes should radiate and evaporate, according to a calculation that joins GR to quantum theory, but this radiation has never been observed, and what happens to the information that fell in remains disputed.[53] And when General Relativity is quantised directly, time disappears from the basic equation—the "problem of time."[54]

4.6.6 What the Graviton Reveals

There is one more point, and it bears directly on this framework. The particle picture of gravity and the geometric picture are mathematically related: a spin-2 field on flat space,

[46] Polchinski, 1998.
[47] Rovelli, 2004.
[48] Weinberg, 1979.
[49] Bombelli et al., 1987.
[50] Jacobson, 1995; Verlinde, 2011.
[51] Donadi et al., 2021.
[52] Penrose, 1965.
[53] Hawking, 1974.
[54] DeWitt, 1967.

made consistent with itself, reproduces Einstein's equations, as Feynman and Deser showed.[55] Physicists often treat this as reassurance that the two pictures agree.

But they agree in their numbers, not in what they say exists. In the particle picture, gravity is a field carried by quanta through a fixed, flat background—a force in the full sense, the same kind as electromagnetism. In the geometric picture, there is no force and no fixed background; spacetime itself is the field. Physics lists gravity among "the four fundamental forces" when it speaks of particles, and denies that gravity is a force when it speaks of geometry. This is the Reduction Conflation at the frontier: two incompatible accounts of what gravity is, held together by agreeing mathematics.

4.7 Separate Domains, Switching Mechanisms

4.7.1 Gravity by Territory

Step back from the individual theories, and a pattern appears. Gravity is not explained by one account. It is handled by territory:

Territory	Theory used	What gravity is said to be
Buildings, bodies, machines, spacecraft navigation	Newton **[N]**	A real force
Galaxies and clusters (dynamics)	Newton **[N]** + dark matter **[DS]**	A real force, plus unseen mass
Low-acceleration regime (MOND)	Modified Newton	A force whose law changes below a_0
Clocks, GPS, light bending, black holes, waves	General Relativity **[GR]**	Not a force: geometry
Cosmic expansion	GR **[GR]** + dark energy **[DS]**	Geometry, plus unexplained energy
Neutrons, atoms and quantum interference	Quantum mechanics with the Newtonian potential **[N]**/**[EN]**	A potential energy in the Schrödinger equation
Particle physics at low energy	Effective field theory **[Q]**	A field carried by gravitons on flat space
The Planck scale	Unknown	Unknown

Within each territory, the account works. Across them, they contradict one another about whether gravity is a force, a geometry, a potential energy, a particle exchange, or something modified at a particular acceleration.

4.7.2 Where Is the Border?

These borders are drawn by convenience, and physicists are clear that they are approximations: Newton is what GR looks like when fields are weak and speeds are low; the potential in the Schrödinger equation is the Newtonian limit; the graviton is the low-energy face of a theory

[55] Feynman et al., 1995; Deser, 1970.

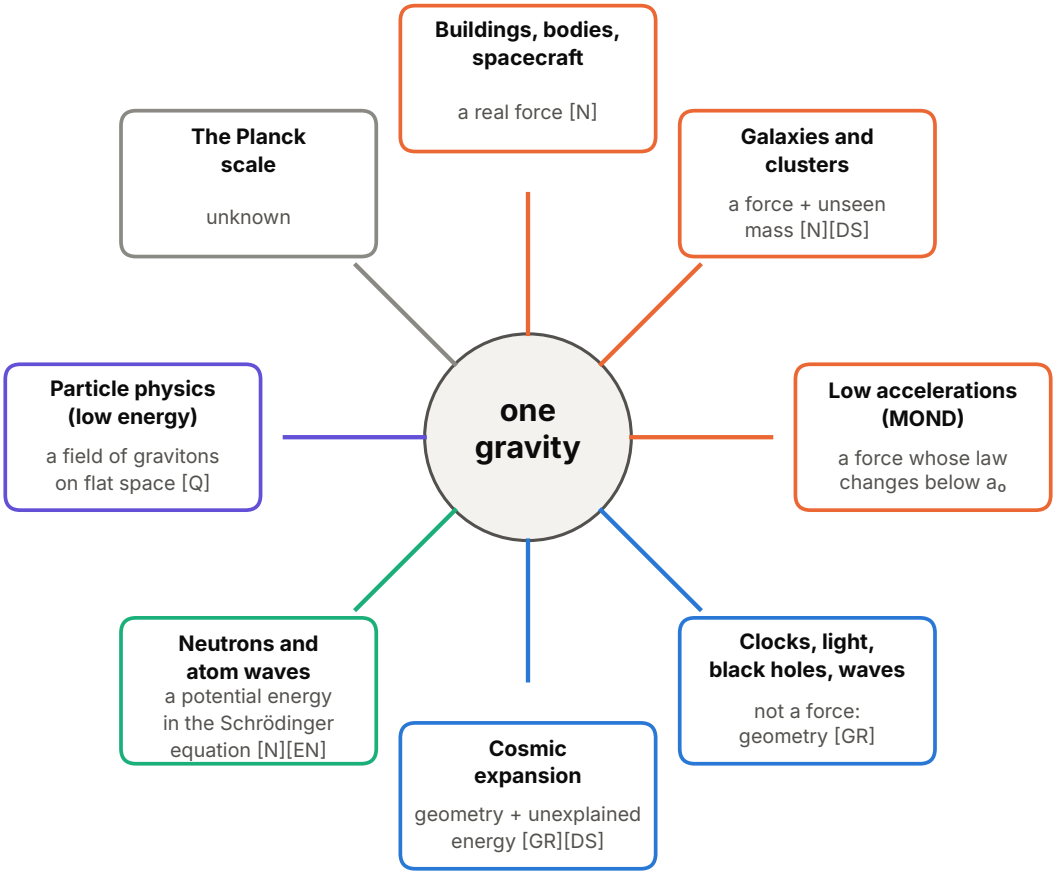

Figure 4.3: One gravity, many accounts. Each territory of gravitational physics is handled by a different theory, and the theories disagree about what gravity is.

not yet known. That is the strongest reply, and it was answered in Part 3: a calculation may change hands, but nature does not.[56]

Consider the falling neutron of 1975. Its quantum interference was predicted and confirmed using Newton's gravitational potential energy, mgh, inserted into the Schrödinger equation.[57] No geometry was involved. Yet the neutron is falling in the same field that, a few metres away, slows the laboratory's clocks according to General Relativity, and that, in a textbook down the corridor, is no force at all. Gravity does not become a potential energy when it meets a neutron, a geometry when it meets a clock, and a force when it meets a bridge. One thing is acting. Our explanations take turns.

Or consider the galaxy. Below an acceleration of about $10^{-10}\,\mathrm{m/s^2}$, the observed motions follow a relation that Newtonian gravity with visible matter does not produce.[58] The standard response adds unseen matter; the alternative changes the law at that acceleration. Either way, something about gravity appears to change character at a particular scale, and neither response says what physical process changes. ○

4.7.3 What a Single Mechanism Would Do

If gravity has a single physical mechanism, then every territory is the same process seen under different conditions. The weak-field and strong-field regimes would differ in degree, not in kind. The quantum experiments would show the mechanism acting on matter waves. The galactic regularity would be a property of the mechanism at low accelerations, not an accident of galaxy formation or an arbitrary change of law. And the frontier between gravity and quantum theory would be a question about the mechanism, not a collision between two incompatible pictures.

Graviton Pressure Theory proposes such a mechanism: one medium, acting on all matter, at every scale. The territories are then one process under different conditions: the engineer's load is the medium's momentum relayed through a structure; the slowing of clocks is their motion through the medium; the falling neutron is a matter wave in an accelerating medium; the black hole is where the inflow reaches the speed of light. The galactic regularity is the hardest test, and Part 9 takes it up.

4.8 The Gravity We Live With

If the reader has followed the Gravity Catalog, they will have seen that gravity is not merely an abstraction. It is lived. It is felt. It resists, pushes, presses. It leaves calluses on builders' hands and strain in dancers' knees. It shapes trees, stones and breath.

The body does not experience geodesics. It experiences load. The builder does not calculate spacetime distortions. She braces against weight. The child does not float. He falls, and he lands, and he cries. Gravity is not a suggestion. It is an imposition.

Yet no current theory names a mechanism for that imposition. Newton gives us an equation. Einstein gives us a geometry. Quantum theory gives us a particle that has never been seen and a theory that fails at high energies. None gives us a cause.

[56] Rashada, 2026c.
[57] Colella et al., 1975.
[58] McGaugh et al., 2016.

4.9 The Need for Causality

A theory that describes without naming a cause may be accurate, but it is not complete.[59] To say that mass curves spacetime is not an explanation; it is a description. To say that objects follow geodesics is not a mechanism; it is a restatement. The mind is not satisfied with circular answers. It asks how.

For the other forces, physics at least names a carrier: the electric force is carried by photons, the strong force by gluons. Whether those exchanges themselves pass the interface test—whether "virtual" exchange names what touches what—is a fair question, and this framework asks it of every theory, including its own. But for gravity, physics names no carrier in its accepted theory at all. The graviton belongs to a theory that fails; the accepted theory says there is nothing to carry.

Graviton Pressure Theory is born from that dissatisfaction, but not from cynicism. It arises not to destroy what came before, but to complete it: to give form to what was abstract, and weight to what was ethereal. GPT does not reject the observations of Newton or Einstein, or the century of confirmations that followed. It proposes a cause behind them.

4.10 What Comes Next: A Gravity You Can Touch

Graviton Pressure Theory begins where the others stop. It asks: what if gravity is not a pull, but a push? What if space is not curved, but filled? What if mass does not attract, but takes in?

HYPOTHESIS

In this model, gravity is the work of a physical medium. Gravitons—real carriers, not abstract quanta—fill space. Mass does not sit idly in a void. It takes the medium in and returns it changed, so the medium flows into every mass, its pressure lowered where it flows fastest. Every body in that flow is carried by it: real, directional and testable.

This, GPT proposes, is why you fall. This is why the chair pushes back: it stops the carrying, and the push is your weight. This is why a pendulum swings. Not illusion, but contact. Not curvature, but flow.

GPT does not ask you to believe. It asks you to look again—at the breath you draw, the ground beneath you, the strain in your legs when you rise—and then to test what it proposes, field by field, particle by particle, law by law.

You have seen what gravity does, and how it has been explained. Now let us propose how it works.

[59] Bunge, 1959.

Changes in the Second Edition

This list records what changed from the first edition (12 June 2025) and why. Changes to the argument alter what the paper claims or how it supports a claim; clarifications improve wording, sources or presentation and leave the argument as it was.

Changes to the argument

- The first edition told the story in two acts, Newton and Einstein, and stopped in 1916. This edition carries it to 2026: A Century of Advances (Section 4.4), Where the Story Does Not Fit (4.5), Quantum Gravity, or the Lack of It (4.6), and Separate Domains, Switching Mechanisms (4.7), which draws out what the first edition only hinted at: that gravity is handled by several theories, each in its own territory.
- "When it came time to verify GR, physicists fell back on Newtonian mechanics… a sleight of hand" overstated the case: the eclipse test used GR's own prediction. The point is now made precisely with the Mercury calculation (532 arcseconds Newtonian plus 43 from GR), as a description of how the calculation is done, not as a charge of dishonesty.
- "GR had no causality" and "Einstein gives us a metaphor" are now "named no mechanism" and "a geometry". GR is a precise description, not a metaphor.
- The comparison with electricity and magnetism no longer implies that the other forces pass the interface test without question. Physics names carriers for them; whether "virtual" exchange names what touches what is a question the framework asks of every theory, its own included.
- The closing claims ("This is why you fall… It is contact") are framed as GPT's proposal, and gravitons as real carriers are marked as a Hypothesis.
- Section 4.10 now follows Part 5: mass takes the medium in and returns it changed, and bodies are carried by the inflow, in place of mass shading the medium and casting shadows. "Swings and slows" becomes "swings": a pendulum slows mainly through air and friction at its pivot.

Clarifications

- New subtitle: *The Evolution of Gravitational Understanding: A Century of Advances, and What Still Does Not Fit*.
- Three new figures: the timeline of advances (4.1), the energy gap to the Planck scale (4.2), and one gravity and its many accounts (4.3).
- "Curvature of rivers" is now "courses of rivers". The closing line now ends "propose how it works".
- Status labels in square brackets are replaced by marks drawn under the text (see the key at the start). The status of each claim is unchanged.

References

E. K. Anderson et al. Observation of the Effect of Gravity on the Motion of Antimatter. *Nature*, 621:716–722, 2023.

Indranil Banik et al. Strong Constraints on the Gravitational Law from Gaia DR3 Wide Binaries. *Monthly Notices of the Royal Astronomical Society*, 527:4573–4615, 2024.

Luca Bombelli, Joohan Lee, David Meyer, and Rafael D. Sorkin. Space-Time as a Causal Set. *Physical Review Letters*, 59:521–524, 1987.

Sougato Bose et al. Spin Entanglement Witness for Quantum Gravity. *Physical Review Letters*, 119:240401, 2017.

Mario Bunge. *Causality: The Place of the Causal Principle in Modern Science*. Harvard University Press, 1959.

Kyu-Hyun Chae. Breakdown of the Newton–Einstein Standard Gravity at Low Acceleration in Internal Dynamics of Wide Binary Stars. *Astrophysical Journal*, 952:128, 2023.

G. M. Clemence. The Relativity Effect in Planetary Motions. *Reviews of Modern Physics*, 19: 361–364, 1947.

R. Colella, A. W. Overhauser, and S. A. Werner. Observation of Gravitationally Induced Quantum Interference. *Physical Review Letters*, 34:1472–1474, 1975.

Stanley Deser. Self-Interaction and Gauge Invariance. *General Relativity and Gravitation*, 1:9–18, 1970.

DESI Collaboration. DESI DR2 Results II: Measurements of Baryon Acoustic Oscillations and Cosmological Constraints. arXiv:2503.14738, 2025.

Bryce S. DeWitt. Quantum Theory of Gravity. I. The Canonical Theory. *Physical Review*, 160: 1113–1148, 1967.

Sandro Donadi et al. Underground Test of Gravity-Related Wave Function Collapse. *Nature Physics*, 17:74–78, 2021.

John F. Donoghue. General Relativity as an Effective Field Theory: The Leading Quantum Corrections. *Physical Review D*, 50:3874–3888, 1994.

F. W. Dyson, A. S. Eddington, and C. Davidson. A Determination of the Deflection of Light by the Sun's Gravitational Field. *Philosophical Transactions of the Royal Society A*, 220:291–333, 1920.

Freeman Dyson. Is a Graviton Detectable? *International Journal of Modern Physics A*, 28:1330041, 2013.

Albert Einstein. *Die Grundlage der allgemeinen Relativitätstheorie*. Annalen der Physik 49, 769–822, 1916.

Event Horizon Telescope Collaboration. First M87 Event Horizon Telescope Results. I. The Shadow of the Supermassive Black Hole. *Astrophysical Journal Letters*, 875:L1, 2019.

C. W. F. Everitt et al. Gravity Probe B: Final Results of a Space Experiment to Test General Relativity. *Physical Review Letters*, 106:221101, 2011.

Richard P. Feynman, Fernando B. Morinigo, and William G. Wagner. *Feynman Lectures on Gravitation*. Addison-Wesley, 1995.

Wendy L. Freedman et al. Status Report on the Chicago–Carnegie Hubble Program (CCHP). arXiv:2408.06153, 2024.

Marc H. Goroff and Augusto Sagnotti. The Ultraviolet Behavior of Einstein Gravity. *Nuclear Physics B*, 266:709–736, 1986.

Stephen W. Hawking. Black Hole Explosions? *Nature*, 248:30–31, 1974.

Ted Jacobson. Thermodynamics of Spacetime: The Einstein Equation of State. *Physical Review Letters*, 75:1260–1263, 1995.

J. G. Lee, E. G. Adelberger, T. S. Cook, S. M. Fleischer, and B. R. Heckel. New Test of the Gravitational $1/r^2$ Law at Separations down to 52 μm. *Physical Review Letters*, 124:101101, 2020.

Qing Li et al. Measurements of the Gravitational Constant Using Two Independent Methods. *Nature*, 560:582–588, 2018.

LIGO Scientific Collaboration and Virgo Collaboration. Observation of Gravitational Waves from a Binary Black Hole Merger. *Physical Review Letters*, 116:061102, 2016.

LIGO, Virgo, Fermi GBM and INTEGRAL Collaborations. Gravitational Waves and Gamma-Rays from a Binary Neutron Star Merger: GW170817 and GRB 170817A. *Astrophysical Journal Letters*, 848:L13, 2017.

LZ Collaboration. LZ Sees Surprising Result in Search for Dark Matter. U.S. Department of Energy announcement, 1 September, 2026.

Chiara Marletto and Vlatko Vedral. Gravitationally Induced Entanglement between Two Massive Particles Is Sufficient Evidence of Quantum Effects in Gravity. *Physical Review Letters*, 119:240402, 2017.

Stacy S. McGaugh, Federico Lelli, and James M. Schombert. Radial Acceleration Relation in Rotationally Supported Galaxies. *Physical Review Letters*, 117:201101, 2016.

Mordehai Milgrom. A Modification of the Newtonian Dynamics as a Possible Alternative to the Hidden Mass Hypothesis. *Astrophysical Journal*, 270:365–370, 1983.

Charles W. Misner, Kip S. Thorne, and John Archibald Wheeler. *Gravitation*. W. H. Freeman, 1973.

V. V. Nesvizhevsky et al. Quantum States of Neutrons in the Earth's Gravitational Field. *Nature*, 415:297–299, 2002.

Isaac Newton. *Philosophiæ Naturalis Principia Mathematica*. Cambridge, 2nd edition, 1713. First edition 1687.

Chris Overstreet et al. Observation of a Gravitational Aharonov–Bohm Effect. *Science*, 375: 226–229, 2022.

Roger Penrose. Gravitational Collapse and Space-Time Singularities. *Physical Review Letters*, 14: 57–59, 1965.

Planck Collaboration. Planck 2018 Results. VI. Cosmological Parameters. *Astronomy & Astrophysics*, 641:A6, 2020.

Joseph Polchinski. *String Theory*. Cambridge University Press, 1998.

R. V. Pound and G. A. Rebka. Apparent Weight of Photons. *Physical Review Letters*, 4:337–341, 1960.

Shareef Ali Rashada. Introduction to the Unified Framework (Part 1, second edition), Appendix 1.A. https://peopleoftheworld.net/graviton-pressure-theory/full-framework/part-01-introduction/, 2026a.

Shareef Ali Rashada. The Removal of Intent, Cause and Mechanism (Part 2, second edition). https://peopleoftheworld.net/graviton-pressure-theory/full-framework/part-02-the-removal-of-intent/, 2026b.

Shareef Ali Rashada. The Gravity Catalog (Part 3, second edition). https://peopleoftheworld.net/graviton-pressure-theory/full-framework/part-03-the-gravity-catalog/, 2026c.

Shareef Ali Rashada. The Reduction Conflation. https://peopleoftheworld.net/graviton-pressure-theory/papers/reduction-conflation/, 2026d.

Adam G. Riess et al. Observational Evidence from Supernovae for an Accelerating Universe and a Cosmological Constant. *Astronomical Journal*, 116:1009–1038, 1998.

Adam G. Riess et al. A Comprehensive Measurement of the Local Value of the Hubble Constant with 1 km/s/Mpc Uncertainty from the Hubble Space Telescope and the SH0ES Team. *Astrophysical Journal Letters*, 934:L7, 2022.

Carlo Rovelli. *Quantum Gravity*. Cambridge University Press, 2004.

Vera C. Rubin, W. Kent Ford, and N. Thonnard. Rotational Properties of 21 SC Galaxies with a Large Range of Luminosities and Radii. *Astrophysical Journal*, 238:471–487, 1980.

Irwin I. Shapiro. Fourth Test of General Relativity. *Physical Review Letters*, 13:789–791, 1964.

Lee Smolin. *The Trouble with Physics*. Houghton Mifflin, 2006.

Gerard 't Hooft and Martinus Veltman. One-Loop Divergencies in the Theory of Gravitation. *Annales de l'Institut Henri Poincaré A*, 20:69–94, 1974.

Pierre Touboul et al. MICROSCOPE Mission: Final Results of the Test of the Equivalence Principle. *Physical Review Letters*, 129:121102, 2022.

Erik Verlinde. On the Origin of Gravity and the Laws of Newton. *Journal of High Energy Physics*, 2011(4):29, 2011.

Steven Weinberg. Ultraviolet Divergences in Quantum Theories of Gravitation. In S. W. Hawking and W. Israel, editors, *General Relativity: An Einstein Centenary Survey*. Cambridge University Press, 1979.

Steven Weinberg. The Cosmological Constant Problem. *Reviews of Modern Physics*, 61:1–23, 1989.

J. M. Weisberg, D. J. Nice, and J. H. Taylor. Timing Measurements of the Relativistic Binary Pulsar PSR B1913+16. *Astrophysical Journal*, 722:1030–1034, 2010.

John Archibald Wheeler. *A Journey into Gravity and Spacetime*. Scientific American Library, 1990.

Fritz Zwicky. Die Rotverschiebung von extragalaktischen Nebeln. *Helvetica Physica Acta*, 6: 110–127, 1933.