Has Physics Already Given Us the Pieces?

The Established Physics That May Help Us Understand Gravity

SpacePressure does not begin by rejecting the achievements of modern physics.

It begins by taking them seriously.

Newton gave us a precise mathematical description of gravitational force.

Einstein showed that gravity is inseparable from the geometry of spacetime.

Modern physics has since revealed that apparently empty space is not simply nothing, that physical fields possess energy, and that spacetime can expand, curve, carry waves, and participate dynamically in the evolution of the universe.

These discoveries are usually considered within their own specialised areas of physics.

But what happens when we look at them together?
Could the physical picture suggested by SpacePressure emerge not from one entirely new discovery, but from a reinterpretation of relationships that science has already uncovered?

Physicists have long expected the final answer to gravity to be profoundly complex.

That expectation is understandable.

Gravity sits at the centre of some of the deepest unresolved questions in modern physics.

General Relativity describes gravity with extraordinary accuracy on large scales. Quantum theory describes matter and energy with extraordinary accuracy on very small scales. Yet bringing these two great pillars of physics together remains one of the unfinished tasks of science.

Because of this, it is natural to assume that a deeper answer must lie within mathematics of extreme complexity — perhaps in a future theory of quantum gravity, a new geometry, a new field, or an entirely new physical framework.

But there is another possibility.

What if science has already done much of the essential work?

What if Newton, Einstein, General Relativity, quantum field theory, and modern cosmology have already given us many of the necessary pieces — but we have not yet settled upon the physical picture that connects them?

Perhaps the missing step is not a replacement for existing physics.
Perhaps it is an additional interpretation of what the existing physics may already be saying.

This is the question at the heart of SpacePressure.

SpacePressure does not propose that General Relativity is wrong.

It does not begin by proposing new equations, new constants, new particles, or a new gravitational force. Instead, it asks whether the curvature of spacetime described by Einstein might also be understood as representing a physically meaningful structured condition of space — a condition that may be interpreted through compression, pressure-like response, and gradients within space itself.

In that sense, SpacePressure is not an attempt to overturn established physics.

It is an attempt to ask whether established physics may already be pointing towards a deeper physical picture.

The Pieces Already on the Table

Several established areas of physics contribute to this wider picture:

- Newtonian gravity provides a successful description of gravitational force and potential.
- General Relativity describes gravity through dynamic spacetime geometry.
- Relativistic physics already includes energy, momentum, stress, and pressure as sources of curvature.
- Gravitational waves demonstrate that measurable spacetime relationships can propagate and change.
- Quantum field theory assigns physical significance to vacuum states.
- Cosmology shows that spacetime evolves on the largest scales.

None of these facts proves SpacePressure. But together they establish that modern space and spacetime are far richer than passive emptiness.

A Recent Development: Spacetime as a Structured Dynamic System

A recent study published in Physical Review Letters, titled “Frozen-In Gravitational Fields,” was written by Felipe A. Asenjo, Maricarmen A. Winkler, and Luca Comisso. [1]

The researchers developed a reformulation of aspects of General Relativity using mathematical ideas related to electromagnetism, conducting fluids, and plasma physics.

The work does not replace Einstein’s field equations.

Instead, it rewrites gravitational relationships in a form that reveals an analogy with the behaviour of magnetic fields in electrically conducting fluids. (Physical Review Journals)

In ideal plasma physics, magnetic field lines can be described as being “frozen into” a conducting fluid.

Under appropriate conditions, those field lines move with the fluid while preserving aspects of their connectivity. They may stretch, twist, and evolve, while certain topological relationships remain intact. Asenjo, Winkler, and Comisso found an analogous mathematical possibility within General Relativity.

Under particular idealised conditions, certain gravitational field structures can remain connected as spacetime evolves. Their framework also identifies conserved quantities and topological invariants, including gravitational flux and gravitational helicity. (Physical Review Journals)

This is conceptually significant because it adds another layer to the way spacetime may be understood.

Spacetime is not merely a passive background. Nor is it only a mathematical stage upon which matter moves. Within General Relativity, spacetime is already dynamic: matter and energy influence its geometry, and that geometry influences the motion of matter, radiation, and light.

What this recent work highlights is that gravitational structures may also possess persistent organisational features — features whose evolution can be constrained by internal mathematical rules.

The Central Idea Behind “Frozen-In” Structure

In conducting fluids, frozen-in magnetic fields preserve certain connections while the fluid moves. The gravitational study asks whether an analogous principle may be applied to geometric structures associated with gravity.

The researchers reformulated Einstein’s equations so that certain gravitational quantities could be treated mathematically in a way resembling field structures within conducting fluids. Under an ideal condition analogous to an idealised form of Ohm’s law, some of these gravitational structures remain linked as spacetime evolves. (phys.org [2])

This does not mean that spacetime is literally a fluid. It does not mean that gravity has been reduced to electromagnetism. And it does not mean that the universe is filled with a mechanical substance resembling the historical aether.

The analogy is mathematical.

Its importance lies in demonstrating that techniques developed to understand persistent and connected structures in other areas of physics can also reveal organised behaviour within gravitational geometry.

Key Findings of the Study

The study suggests that General Relativity can be expressed in a way that reveals structural behaviour analogous to frozen-in field behaviour in plasma physics.

Its broad conceptual findings include the following:

Spacetime geometry can be treated mathematically as a dynamic system possessing organised structures. Under particular idealised conditions, certain gravitational field connections may remain preserved during spacetime evolution.

The framework identifies conserved or invariant quantities, including gravitational flux and gravitational helicity.

These quantities are topological in character.

Topology is concerned not only with distance and shape, but also with connectivity and the properties that can remain unchanged while a system is deformed. This suggests that the evolution of gravitational fields may involve more than continuously changing curvature. It may also involve relationships and structures that remain preserved while the geometry evolves. (Physical Review Journals)

The study therefore points towards a richer mathematical picture.

Spacetime evolution may not be merely a sequence of arbitrary geometric distortions. It may also be governed by deeper organisational conditions that restrict how certain structures can change.

Why This Matters Conceptually

The familiar public summary of General Relativity is often expressed in this way: Matter tells spacetime how to curve, and curved spacetime tells matter how to move.

That remains one of the clearest summaries of Einstein's theory.

But modern research increasingly reveals that spacetime may be richer than the single word curvature suggests. Curvature is the mathematical description. The physical meaning we place beneath that geometry remains a deeper interpretive question.

The frozen-in gravitational-fields study strengthens the view that spacetime can be approached mathematically as a structured and evolving system.

It possesses dynamics.

Its evolution is constrained.

Certain configurations may persist.

Some topological relationships may remain conserved even while spacetime changes.

This does not change General Relativity.

It deepens the range of ways in which General Relativity can be mathematically examined and conceptually understood.

That distinction is important.

A new physical interpretation of gravity does not necessarily need to overthrow Einstein. It may instead ask whether Einstein's geometry can be given a clearer physical picture.

Relation to SpacePressure

This is where the recent study becomes relevant to SpacePressure — not as proof, but as conceptual alignment. SpacePressure proposes that gravity may be interpreted as arising from structured states of space itself. In this interpretation, mass does not merely curve spacetime in an abstract geometric sense. It may also place space into an altered, compressed, or pressure-like condition. Gradients within that structured condition of space would then be associated with the gravitational acceleration experienced by matter.

This does not require spacetime to be a mechanical medium, revive the historical aether, or introduce a preferred frame of reference. It concerns a proposed physical interpretation of the dynamical geometry already present within General Relativity.

This does not alter the equations of General Relativity.

It does not change the predictions of Newtonian gravity within the regimes where Newton's equations apply.

It does not introduce a fifth force.

The proposed "one small change" remains interpretive.

Instead of saying only that mass curves spacetime, SpacePressure asks whether that curvature may also represent a physical compression or structured state of space.

Instead of saying only that objects follow geodesics through curved spacetime, SpacePressure asks whether those paths may also reflect gradients within that structured state.

The recent study contributes to a broader conceptual environment in which this question can reasonably be explored.

It demonstrates that mainstream work in General Relativity is already examining ways in which gravitational geometry may contain persistent structures, conserved relationships, and internally constrained evolution. (Physical Review Journals)

That does not validate SpacePressure directly.

It does, however, place the SpacePressure question within a wider scientific effort to understand the structured and dynamical properties already present in relativistic spacetime..

Spacetime is increasingly being examined not only through curvature, but also through topology, connectivity, conserved structures, quantum information, and other forms of internal organisation.

Three Areas of Conceptual Alignment

1. Medium-Like Mathematical Behaviour

The frozen-in study uses ideas drawn from plasma physics and electromagnetism to describe gravitational structures.

This does not mean that spacetime is a material medium in the traditional mechanical sense. It does suggest that gravitational geometry can sometimes be analysed mathematically as a system with internal organisation and evolution.

SpacePressure begins from a similar, although distinct, conceptual position.

It treats space as more than empty nothingness.

It asks whether space may possess state, structure, and response without being a mechanical substance.

The point of contact is not that spacetime is literally plasma-like.

It is that spacetime may display mathematically structured behaviour that resembles, in limited respects, the behaviour of other dynamic physical systems.

2. Persistence of Structure

The study identifies gravitational field relationships that may remain preserved under specific idealised conditions.

This suggests that gravitational geometry can retain organised configurations while spacetime evolves. SpacePressure likewise proposes that the condition of space surrounding matter may be physically meaningful.

In this interpretation, gravity would not arise from an invisible pull passing mysteriously across empty distance.

It would arise from the organised condition of the surrounding space.

The two ideas are not equivalent.

But both invite us to treat spacetime structure as physically significant rather than merely descriptive.

3. Constraint-Driven Evolution

The study suggests that the evolution of particular gravitational structures may be governed by topological constraints. These constraints act as internal mathematical rules that limit how those structures can change.

SpacePressure is also constraint-based in its conceptual outlook.
It asks whether gravitational behaviour may arise from the way space responds to mass and energy through deformation, compression, gradients, and a possible tendency towards equilibrium.

Again, the frozen-in study does not establish that such a pressure-like mechanism exists. But it reinforces the more general idea that spacetime dynamics may contain internal structure and organising principles.

Boundary Conditions

The limits of this comparison must be stated clearly.

The frozen-in gravitational-fields study does not prove SpacePressure.

It does not claim that space is mechanically compressed.

It does not introduce a new pressure force.

It does not replace Einstein's field equations.

It does not show that gravitational acceleration is caused by a SpacePressure gradient.

And its frozen-in behaviour applies only under particular mathematical and idealised conditions. (Physical Review Journals)

The study uses analogy carefully.

It does not claim that gravitational physics and plasma physics are physically identical.
These boundaries matter.

SpacePressure should not overstate the connection.

The value of the study lies not in proving SpacePressure, but in showing that serious work in General Relativity is already moving towards descriptions of spacetime that are more structured, dynamic, and internally constrained than the simplified public image of “curved spacetime” may suggest.

The Larger Question

For centuries, gravity has been described through different conceptual languages.

Newton described gravity as a force acting between masses.

Einstein described gravity as the geometry of spacetime.

Modern physics increasingly explores spacetime as a dynamic system possessing structure, evolution, constraints, fields, and potentially persistent configurations. SpacePressure asks whether these views might be connected through a simple interpretive bridge. Newton’s force may describe the gravitational effect. Einstein’s curvature describes the mathematical structure associated with that effect.

SpacePressure proposes a possible physical picture of what that structure may represent. In this picture, gravity is not a mysterious pull acting across empty space. Nor is it only an abstract geometric instruction. It may be the observable consequence of space existing in a structured, altered, and pressure-like condition around matter.

This interpretation remains unproven.

But it arises from a question that established physics has made increasingly meaningful: What is spacetime physically doing when gravity occurs?

Closing Summary and Handover

Physics has already shown us a universe in which space is neither passive nor physically irrelevant.

Spacetime curves.

It expands.

It carries gravitational waves.

Vacuum states possess physical significance.

Energy, momentum, stress, and pressure contribute to gravitational behaviour.

Matter and energy influence the geometry through which other matter and light move.

Recent theoretical work also suggests that gravitational geometry may possess persistent structures, conserved topological relationships, and internal constraints governing aspects of its evolution. (Physical Review Journals)

None of this proves that spacetime curvature should be interpreted as spatial compression. It does not prove that gravity arises from pressure-like gradients. That remains a proposal requiring precise formal development, mathematical coherence, and empirical justification.

Nevertheless, taken together, these established results and continuing theoretical developments make the SpacePressure question scientifically meaningful enough to examine carefully. SpacePressure may not require us to discard the existing pieces of gravitational physics. It may ask us to examine whether those pieces can support an additional physical picture beneath the mathematics we already trust. Newton may already describe the effective force. Einstein may already describe the geometry. General Relativity may already contain the necessary dynamical structure. Quantum theory may eventually explain what spacetime is at its deepest level.

Perhaps the challenge is not to invent every piece again. Perhaps it is to determine whether some of the pieces already discovered belong within a physical picture that has not yet been fully considered. This does not mean that the final answer to gravity will be simple.

A complete understanding may still require deep mathematics, new experiments, quantum gravity, and discoveries not yet imagined. But one part of the answer may be closer than we think. It may lie within the interpretation of physics we already possess.

SpacePressure does not claim to complete that task.

It proposes one possible way of connecting the pieces: Mass and energy shape spacetime. That geometry may also represent a structured condition of space. Variations within that condition may be experienced as gravitational behaviour.

If spacetime is not merely geometry, but a structured dynamic system with internal rules, then gravity might one day be understood not only as curvature, but also as the behaviour of space under compression and pressure-like response.

That would not overturn Einstein. It would attempt to give his geometry a more physical voice. Not a change to General Relativity. Not a rejection of Newton. But a new way of seeing what both may already have been telling us.

That leads naturally to one final thought experiment.

Suppose the SpacePressure interpretation were eventually formalised, tested, and validated.

- ❓ How might gravity then be described?
- ❓ What would change in the way it was explained?
- ❓ And what would remain exactly the same?

Continue the Journey: How Gravity Might Be Described If SpacePressure Were Validated

Continue The Journey

The Book That Started the Journey

This journey began with the 2025 book One Small Change to Gravity – One Giant Leap for Science, the original published account of the SpacePressure idea: ***One Small Change to Gravity – One Giant Leap for Science.***

Purchase the Book


One Small Change to Gravity
One Giant Leap for Science
The claim in this book, that
Space does not merely Curve,
it is Compressed into a Curve
- Is not extreme -
What is Extraordinary is not the claim itself
but the implications that follow
- The Unification of Gravity -
There is only one Gravity
from the Cosmic to the Quantum
By Brian C Solomon