

The Flowing Fabric: A Concept for Space Generation and Space-Eating Particles

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Philosophy

The universe is a fabric that is always being made and always being consumed, and everything we observe is the result of that one exchange.

All around us, at countless points, new space quietly comes into being. Elsewhere, at the tiniest points of all, space is taken away. Those points are what we call particles. A particle is not a little ball of stuff sitting in space: it is a place where space ends.

Because particles consume the fabric, the fabric around them is always moving inward to fill the loss. Nothing pulls on anything. Things simply ride the fabric they are in, and the fabric flows toward where it is being consumed. That flow is what we feel as gravity.

There are no large objects. A planet, a person, a grain of sand are all crowds of these points, held apart from one another while space keeps streaming between them and into them.

Every thing therefore has two motions: the motion of the space carrying it, and its own motion through that space. Riding the fabric feels like nothing at all, even while falling. Only being pushed through the fabric can be felt, and that push is what we call a force. Energy is not a thing that exists by itself; it is a way of counting how things move against the fabric. Even time is shaped by the same motion: a clock moving through the fabric ticks more slowly.

On the largest scale, making and consuming are in competition. Near crowds of particles, consumption wins, and structures hold together. Far from them, creation wins, and the universe grows without end, carrying its islands of matter ever further apart.

The picture in detail

The model rests on a small set of statements about the fabric and the particles in it; everything else is derived from them.

The fabric

Space is a fabric. It is not matter, not energy, and not a substance that carries momentum. It can, however, be packed more densely in some places than others: where the fabric is squeezed, it packs tighter.

Generation

New fabric is generated continuously at random points throughout the universe. Over any large region the randomness averages out, so the universe behaves as though every piece of fabric grows at the same steady rate. Because each region grows in proportion to its own size, the universe expands with no centre, and distant regions separate faster than near ones.

Particles

A particle is defined as a point where fabric is destroyed: consumed, reduced to nothing, no longer available. Its only property is its eating rate, the amount of fabric it consumes each second. When two particles meet they merge, and their eating rates add. A particle's eating rate is what we experience as its mass.

Matter as clusters

There are no large objects. Everything we see is a cluster of point particles held apart by forces. The fabric between them exists and streams continuously through the gaps into each particle, like water flowing past and into a row of suction intakes in a river. Each particle inside a planet is pulled inward by its neighbours' inflow and pushes back to keep its place; that constant push is the pressure inside the planet.

The inflow

The fabric flows toward every particle to replace what is consumed, and it speeds up as it approaches, because the same amount must pass through ever smaller spheres. It also packs more densely closer in, because it is squeezed harder there. A piece of fabric falling from far away moves, at every distance, at exactly the speed an object dropped from far away would reach there.

Two motions

Every object has two motions: the motion of the fabric carrying it, and its own motion through the fabric. An object's inertia belongs to the local fabric. A free object rides along with the fabric, accelerating as the fabric accelerates, and feels nothing, even while falling faster and faster. Hovering above a planet means pushing outward through the inflowing fabric at exactly its speed, which feels identical to being pushed by a rocket in empty space.

Forces

A force is anything that changes an object's motion through the fabric. Steady motion through the fabric cannot be felt or detected; only changes can. At the particle level, all forces are expected to converge to a single type, arising from particles' motion against the fabric. Gravity is the first one derived; others may come from other ways particles disturb the fabric.

Energy

Energy is not a stuff. It is a number built from two motions, the fabric's flow and an object's motion through it, which stays constant while the flow pattern is steady. How deep an object sits in a gravity well is simply how fast the fabric flows where it is. When the flow changes, for example as the universe expands, energy is not conserved.

Time

Clocks and rulers are affected by their motion through the fabric. A clock moving through the fabric ticks more slowly, and a ruler moving through it shrinks along its motion, by the same factor. Nothing can move through the fabric faster than a fixed speed limit, the speed of light. Every clock that rides the fabric ticks at the same universal rate, wherever it is.

Light

Light is a ripple travelling through the fabric at the speed limit. Being part of the fabric, it is also carried by the fabric's flow: bent near masses, trapped where the inflow exceeds its speed, and stretched as generation expands the fabric it crosses.

The mathematics

The mathematics is built up one step at a time, starting with the simplest possible situation and adding one ingredient per step. Each step follows a single point of space, or a single object, and asks how it moves.

Symbol	Meaning	Units
g	Generation rate: new fabric per unit of existing fabric per second	1/s
q	A particle's eating rate: amount of fabric destroyed per second	amount/s
r	Distance from a particle	m
u	Velocity of the fabric (the inflow speed when written as a number)	m/s
ρ	Density of the fabric: amount per cubic metre	amount/m ³
κ	A fixed property of the fabric, linking density to squeezing	—
v	An object's actual velocity	m/s
w	An object's velocity through the fabric, $v - u$	m/s
c	The speed limit for motion through the fabric	m/s
G, M	Newton's constant and mass, used for comparison	—

Step 1: Generation alone

Start with no particles at all, only fabric being generated. Pick one point and look at a tiny piece of fabric of volume δV around it.

How a small piece grows. Every bit of fabric generates new fabric at rate g . A piece twice as big generates twice as much, so the growth is proportional to the size:

$$\frac{d(\delta V)}{dt} = g \delta V$$

Anything that grows in proportion to itself grows exponentially, like money earning compound interest:

$$V(t) = V_0 e^{g t}$$

How distances grow. A volume is a length cubed, and generation acts equally in all three directions. So each direction takes a third of the growth:

$$L(t) = L_0 e^{g t/3}$$

How fast two points separate. Differentiating the distance gives:

$$\frac{dL}{dt} = \frac{g}{3} L$$

The separation speed is proportional to the distance. Points twice as far apart move apart twice as fast. Every point sees the same pattern, so there is no centre.

The horizon. Since speed grows with distance, there is always a distance where the separation speed passes any chosen speed v :

$$\frac{g}{3} L > v \quad \text{when} \quad L > \frac{3v}{g}$$

Anything moving at speed v can never cross a gap larger than this, because the gap grows faster than it can travel.

With numbers. Matching the late-time expansion of our universe gives $g \approx 5 \times 10^{-18}$ per second. A volume of fabric then doubles every $\ln 2 / g \approx 1.4 \times 10^{17}$ s, about 4.4 billion years. Setting v to the speed of light, the horizon lies at $3c/g \approx 1.8 \times 10^{26}$ m, roughly 19 billion light-years, close to the cosmic event horizon astronomers estimate for our universe.

Step 2: One particle and one point of space

Now switch generation off. Place a single particle that eats fabric, and a single ordinary point of space at distance r from it. The point has no mass and no motion of its own; it simply rides the fabric. The question is how fast it moves inward, and how that speed changes.

Counting fabric through spheres. Draw imaginary spheres around the particle at different distances. Fabric disappears only at the particle, so every bit the particle eats must first cross every one of these spheres. Each second, the same amount crosses each sphere: exactly what the particle eats. Think of a bathtub drain: every litre that goes down must first pass every circle you could draw around the drain.

Why the speed rises. A sphere close to the particle has a small surface; one far away has a large surface. If the fabric had the same density everywhere, the same amount could only pass through a small surface by moving faster:

$$(\text{surface area}) \times (\text{speed}) = 4\pi r^2, u = \text{constant}$$

Halving the distance makes the surface four times smaller, so the fabric must move four times faster. This is the same crowding that makes liquid race through the narrow neck of a funnel, or traffic speed up when four lanes merge into one.

How acceleration is found. The point's speed depends on where it is, and where it is changes with time. So the rate at which its speed changes each second splits into two parts:

$$a = \frac{du}{dt} = \underbrace{\frac{du}{dr}}_{\text{speed change per metre}} \times \underbrace{\frac{dr}{dt}}_{\text{metres per second}} = u \frac{du}{dr}$$

This rule is used for every acceleration in the rest of the article. A useful shortcut: $u \, du/dr$ is the same as $d(\frac{1}{2}u^2)/dr$.

Why the density cannot be fixed. With fixed density, $u \propto 1/r^2$, so the speed change per metre goes as $1/r^3$, and their product makes the acceleration fall off as $1/r^5$. Doubling the distance would weaken the pull 32 times, compared with 4 times for real gravity. A pull that weakens faster than $1/r^3$ cannot hold stable orbits (Step 6 shows why), and real planets have orbited stably for billions of years. So the fabric's density must vary: it must pack more tightly near the particle. Step 3 works out how.

Step 3: Letting the fabric pack

Keep the same particle and point, but now let the fabric's density vary. The particle eats an amount q of fabric per second.

The counting rule, with density. The amount crossing a sphere each second is density $\times$ area $\times$ speed, and it must equal what the particle eats:

$$\rho(r) \cdot 4\pi r^2 \cdot u(r) = q$$

This is one equation with two unknowns, density and speed. A second rule is needed.

The density rule. The fabric packs more densely where it is being squeezed harder. As fabric flows inward, each small piece is pressed into a smaller space; the squeezing rate C measures how fast. For an inflow of speed u , it is:

$$C = \frac{1}{r^2} \frac{d(r^2 u)}{dr}$$

The rule says density is proportional to squeezing, with κ a fixed property of the fabric:

$$\rho = \kappa C$$

Solving for the speed. Substitute the density rule into the counting rule. To simplify, write $f = r^2 u$, so $u = f/r^2$:

$$\kappa \frac{f'}{r^2} \cdot 4\pi r^2 \cdot \frac{f}{r^2} = q \\ \quad \Rightarrow \quad f', f' = \frac{q}{4\pi\kappa r^2}$$

The left side is the rate of change of $\frac{1}{2}f^2$, so integrating both sides from the particle outward:

$$\frac{1}{2}f^2 = \frac{q}{12\pi\kappa} \quad \Rightarrow \quad f = \sqrt{\frac{q}{6\pi\kappa}}; r^{3/2}$$

Dividing by r^2 gives the inflow speed:

$$u(r) = \sqrt{\frac{q}{6\pi\kappa}} \frac{1}{r}$$

The speed now grows as $1/r$ closer in, more gently than before.

The acceleration. Using the rule from Step 2, $a = d(\frac{1}{2}u^2)/dr$. Here $\frac{1}{2}u^2 = q/(12\pi\kappa r)$, so:

$$a = \frac{q}{12\pi\kappa} \frac{1}{r^2}$$

Doubling the distance now weakens the pull 4 times, exactly as real gravity does.

Eating rate as mass. Newton's law gives $a = GM/r^2$. The two match when:

$$GM = \frac{q}{12\pi\kappa}$$

The eating rate plays the role of mass, and κ sets the strength of gravity. Eating rates add when particles combine, so a cluster of N particles pulls N times as strongly, just as masses add.

The density profile. Putting the speed back into the density rule gives $C = 3u/(2r)$, so:

$$\rho \propto r^{-3/2}$$

The fabric is most tightly packed near the particle and thins out with distance.

Time for the point to arrive. The point moves at the fabric's speed, $dr/dt = -K r^{-1/2}$, where $K = \sqrt{q/6\pi\kappa}$. Rearranging as $r^{1/2} dr = -K dt$ and integrating from the starting distance r_0 to zero:

$$T = \frac{2}{3} \sqrt{\frac{r_0^{3/2}}{K}} = \frac{2}{3} \sqrt{\frac{6\pi\kappa}{q}} r_0^{3/4}$$

Step 4: Objects in the fabric

A point of space can only ride the fabric. A real object, such as a person or a moon, can also move through it. This step describes how.

Two motions. Split the object's velocity v into the fabric's velocity u at its location and its velocity through the fabric, w :

$$v = u + w$$

The inertia rule. An object's inertia belongs to the local fabric: a free object accelerates exactly as the fabric around it accelerates. Following a piece of fabric, its acceleration has two sources, the flow pattern changing over time and the fabric moving to places where it flows differently:

$$\frac{dv}{dt} = \frac{\partial u}{\partial t} + (u \cdot \nabla)u$$

How motion through the fabric changes. The fabric velocity the object sees changes because the object itself moves to new places, at its own velocity v . Subtracting that change from the object's acceleration leaves:

$$\frac{dw}{dt} = (u \cdot \nabla)u - (v \cdot \nabla)u = -(w \cdot \nabla)u$$

So motion through the fabric changes only where the fabric stretches or squeezes around the object. In uniform fabric, w never changes: the object moves in a straight line at constant speed. A force F on an object of mass m adds a push through the fabric:

$$\frac{dw}{dt} = -(w \cdot \nabla)u + \frac{F}{m}$$

Free fall. Drop an object from rest far from a planet, where the fabric is almost still, so $w = 0$. The equation above then keeps $w = 0$ for ever: the object rides the fabric all the way in. Its speed at every distance equals the inflow speed there, and it feels no force while it speeds up. Writing the planet's pull as GM , Step 3 gives $u^2 = 2GM/r$, so:

$$u(r) = \sqrt{\frac{2GM}{r}}$$

This is exactly the speed an object reaches falling from far away in Newton's theory.

Hovering. To stay at a fixed distance, the object must have $v = 0$, so it pushes outward through the fabric at the inflow speed: $w = +u$ outward. The inflow speed falls off as $1/\sqrt{r}$, so its rate of change outward is $u/(2r)$. The stretching term is then:

$$-w\frac{du}{dr} = -u \cdot \frac{u}{2r} = -\frac{u^2}{2r} = -\frac{GM}{r^2}$$

For w to stay constant, the force must exactly cancel this:

$$F = \frac{GMm}{r^2}$$

That is the object's weight. Hovering above a planet and accelerating with a rocket in empty space are the same thing: being pushed through the fabric.

Step 5: Energy

Energy is not added to the model as a new ingredient. It falls out of the inertia rule.

A useful identity. When the flow pattern is steady (not changing with time) and has no swirl, the fabric's acceleration can be written as the slope of one quantity, $\frac{1}{2}u^2$:

$$(u \cdot \nabla)u = \nabla \left(\frac{1}{2}u^2 \right)$$

So a free object, which accelerates with the fabric, obeys:

$$\frac{dv}{dt} = \nabla \left(\frac{1}{2}u^2 \right)$$

Something stays constant. Multiply both sides by v . On the left, $v \cdot dv/dt$ is the rate of change of $\frac{1}{2}v^2$. On the right, $v \cdot \nabla(\frac{1}{2}u^2)$ is the rate at which $\frac{1}{2}u^2$ changes as the object moves to new places. So the two change together, and their difference never changes:

$$\epsilon = \frac{1}{2}v^2 - \frac{1}{2}u^2 = \text{constant}$$

This constant is the energy per unit mass. A force F changes it at the rate $F \cdot v / m$, which is the usual definition of work.

What it means. For a planet, $\frac{1}{2}u^2 = GM/r$, so $\varepsilon = \frac{1}{2}v^2 - GM/r$: ordinary kinetic plus gravitational energy. How deep an object sits in a gravity well is simply how fast the fabric flows where it is. Substituting $v = u + w$ gives a second form:

$$\varepsilon = u \cdot w + \frac{1}{2}w^2$$

Energy depends only on the object's motion through the fabric and on the fabric's flow.

Two checks.

Case	Values	Energy per unit mass
Falling from rest far away	$w = 0$	0
Circular orbit at distance r	$u \cdot w = -2GM/r$, $\frac{1}{2}w^2 = 3GM/2r$	$-GM/2r$

Both agree with ordinary orbital mechanics.

When energy is not conserved. The derivation needed a steady flow. When the flow changes, as when particles merge or generation expands the fabric, energy changes too. In expanding fabric, motion through the fabric fades as $w \propto e^{-(gt/3)}$, so energy of motion is steadily lost. The real universe shows the same thing: energy is not conserved on cosmic scales.

Step 6: Orbits

Now give the object some sideways motion through the fabric and see whether it can circle the particle.

The pull on a free object. From Steps 3 and 4, a free object accelerates with the fabric, which accelerates toward the particle at GM/r^2 . This depends only on distance, not on how the object moves.

The circular orbit. Moving in a circle of radius r at speed v needs an inward acceleration of v^2/r . Setting the two equal:

$$\frac{v^2}{r} = \frac{GM}{r^2} \quad \rightarrow \quad v = \sqrt{\frac{GM}{r}}$$

This is the standard orbital speed. Ellipses and Kepler's laws follow too, because the pull is identical to Newton's.

The orbit seen from the fabric. The object's velocity is sideways; the fabric's is inward. Since $w = v - u$, relative to the fabric the object moves:

$$w_{\text{out}} = \sqrt{\frac{2GM}{r}}, \quad w_{\text{side}} = \sqrt{\frac{GM}{r}}$$

It swims outward against the inflow at exactly the inflow speed while moving sideways. No effort is involved: the inertia rule carries it, and it feels no force.

Why the orbit is stable. With a pull pointing straight at the centre, the object's spin around the centre stays fixed: speed $\times$ distance is constant. For a fixed spin, the inward acceleration needed to stay in a circle grows as $1/r^3$ when the object moves closer. Compare that with the actual pull:

Pull falls off as	Nudged inward	Nudged outward	Orbit
$1/r^2$ (this model, real gravity)	Needed pull grows faster than actual, so it swings back out	Actual pull wins, so it is drawn back	Stable
Faster than $1/r^3$ (fixed-density fabric, $1/r^5$)	Actual pull grows faster than needed, so it spirals in	Actual pull fades faster, so it escapes	Unstable

This is why the fabric had to pack in Step 3: only the packing fabric gives orbits that last for billions of years.

Step 7: Two particles

Now place two particles, A and B, with eating rates q_A and q_B , a distance d apart. Each is a particle, so each rides the flow created by the other; its own inflow is symmetric and pushes it nowhere.

The pull on each. B sits in A's inflow, and A sits in B's. Using Step 3's acceleration for each:

$$a_B = \frac{q_A}{12\pi\kappa} \frac{1}{d^2} \text{ \textit{(toward A)}}, \quad a_A = \frac{q_B}{12\pi\kappa} \frac{1}{d^2} \text{ \textit{(toward B)}}$$

The lighter particle moves more, because it sits in the stronger flow.

A centre that never moves. Multiply each acceleration by the particle's own eating rate: $q_A a_A = q_B a_B$, equal and opposite. So the weighted position below never moves, and both particles fall toward it or circle it:

$$X = \frac{q_A}{q_A + q_B} x_A + \frac{q_B}{q_A + q_B} x_B$$

The still point. On the line between them, the two inflows point in opposite directions. They cancel where $q_A/r_A^2 = q_B/r_B^2$, which is at distance r_A from A:

$$r_A = d \sqrt{\frac{q_A}{q_A + q_B}}$$

Fabric reaches this point from the sides and splits toward each particle, so the gap between them never runs dry.

Falling together. The gap closes with acceleration $(q_A + q_B)/(12\pi\kappa d^2)$, like a single particle of the combined strength. Starting at rest, the straight fall is half of an extremely squashed orbit whose long axis is d_0 , so Kepler's law for its period gives the meeting time:

$$t_{\text{meet}} = \frac{\pi}{\sqrt{6\pi\kappa d^3 (q_A + q_B)}}$$

Given sideways motion instead, they orbit the centre X, with relative speed $v((q_A + q_B)/(12\pi\kappa d))$ for a circular orbit.

Merging. When they meet, they become one particle eating $q_A + q_B$ at X. Just before contact, the flow everywhere except a tiny region already looks like that single particle, so this is the only rule under which nothing changes abruptly elsewhere.

From far away. The pair acts like one particle eating $q_A + q_B$.

These results treat each particle as feeling the other's single-particle flow. Because density depends on the combined flow, the exact two-particle flow differs slightly where the flows overlap; the size of that correction is one of the open questions.

Step 8: Time

Time enters through one rule about motion through the fabric.

The clock rule. A clock moving through the fabric at speed w ticks slower than a clock riding the fabric, and a ruler moving through it shrinks along its motion, both by the same factor. Nothing can move through the fabric faster than c :

$$\frac{d\tau}{dt} = \sqrt{1 - \frac{w^2}{c^2}}$$

Here τ is the time the moving clock shows and t is the time on a clock riding the fabric. Because clocks and rulers change together, any measurement of your own steady speed through the fabric gives zero, so it remains undetectable.

Universal time. A clock riding the fabric has $w = 0$ and is never slowed. Every such clock, anywhere, ticks at the same rate t : falling into a planet, drifting between galaxies, or carried by expansion.

Gravity slows clocks. A clock hovering above a planet moves through the fabric at the inflow speed, $w = u = v(2GM/r)$ (Step 4). Putting this into the clock rule:

$$\frac{d\tau}{dt} = \sqrt{1 - \frac{2GM}{rc^2}}$$

This is exactly the slowing of clocks by gravity that Einstein predicted. Here it is just motion time dilation: a clock on a planet is constantly moving through the inflowing fabric. On Earth's surface, $2GM/(rc^2) \approx 1.4 \times 10^{-9}$, so a ground clock runs slow by about 0.7 parts per billion, roughly $60 \mu\text{s}$ per day, compared with a clock riding the fabric far away.

The GPS check. For small speeds, a clock loses $w^2/(2c^2)$ of each second. A clock on the ground has $w^2 = 2GM/R$, with $R \approx 6,371 \text{ km}$. A GPS satellite at $r \approx 26,560 \text{ km}$ moves outward through the fabric at the inflow speed there and sideways at its orbital speed $v \approx 3.87 \text{ km/s}$, so $w^2 = 2GM/r + v^2$. The satellite clock's daily gain over the ground clock is:

$$\left[\frac{GM}{c^2} \left(\frac{1}{R} - \frac{1}{r} \right) - \frac{v^2}{2c^2} \right] \times 86,400 \text{ s}$$

Part	Per day
Smaller inflow at the satellite's height	+45.7 μs
Satellite's orbital speed	-7.2 μs
Net gain of the satellite clock	+38.5 μs

This matches the correction GPS actually applies.

Black holes. The inflow speed rises closer to the particle. Where it reaches the speed limit, nothing can move outward through the fabric fast enough to escape:

$$\sqrt{\frac{2GM}{r_h}} = c \quad \rightarrow \quad r_h = \frac{2GM}{c^2}$$

For a mass equal to the Sun's, this is about 3 km: the event horizon of a black hole.

Energy with time. Including the clock rule, the energy of a particle of mass m moving through the fabric becomes:

$$E = \frac{mc^2}{\sqrt{1 - w^2/c^2}}$$

At rest in the fabric, it still has energy mc^2 .

Step 9: Generation and particles together

Finally, switch generation back on around a clump of particles, and follow a point of space at distance r from it.

Two flows compete. Generation carries the point outward at $(g/3)r$ (Step 1), faster the farther out it is. The clump's inflow carries it inward at $v(2GM/r)$ (Step 4), slower the farther out it is. Close in, the inflow wins; far out, generation wins.

The balance distance. Estimating the boundary by setting the two speeds equal:

$$\frac{g}{3}, r_b = \sqrt{\frac{2GM}{r_b}} \quad \rightarrow \quad r_b^3 = \frac{18}{g}, GM$$

Inside this distance, fabric flows into the clump and objects can stay bound. Outside it, fabric and everything in it drift away for ever. The boundary grows only as the cube root of the clump's mass.

With numbers. For a group of galaxies like our Local Group, with a mass of about 2×10^{12} Suns, and $g \approx 5 \times 10^{-18}$ per second, this gives $r_b \approx 6 \times 10^{22}$ m, or about 1.9 megaparsecs. Astronomers find a boundary of the same kind around the Local Group, at a radius of around a megaparsec or somewhat more, beyond which galaxies recede.

What follows for the universe. Particles close together merge first. Each merger makes a stronger clump with a larger balance region, capturing more neighbours, while generation pushes everything else apart. Eventually every clump lies beyond the others' balance regions, and the universe ends as isolated, permanent clumps drifting apart in ever-growing fabric.

Inferences and comparison with current physics

For a single non-spinning mass, the model is mathematically identical to Einstein's general relativity, and on cosmic scales it reproduces the main features of an expanding universe with dark energy.

Observation	Current physics	This model
Inverse-square gravity	Newton's law	Inflow with density following squeezing; eating rate acts as mass
All objects fall alike	Equivalence principle, assumed	Follows if all fundamental particles are identical
Hovering feels like accelerating	Equivalence principle	Both are being pushed through the fabric
Stable planetary orbits	Newton and Einstein	Same orbits; the orbiting body swims outward against the inflow
Clocks slow near masses	General relativity	Clocks slow from motion through the inflowing fabric
GPS clocks gain about 38 μ s per day	Two separate effects (height and speed)	One effect: satellite moves through the fabric more slowly
Black hole horizons at $2GM/c^2$	General relativity	Where the inflow reaches the speed limit
Starlight bent by the Sun, Mercury's orbit rotating, radar delays near the Sun	General relativity	Same predictions, because the single-mass model equals Einstein's
Accelerating expansion	Dark energy	Generation of fabric at random points
Galaxy groups stay bound while others recede	Turnaround radius around ~ 1 Mpc	Balance region around each clump
Energy not conserved on cosmic scales	Accepted in general relativity	Energy is only conserved while the flow is steady

Why the agreement with Einstein is exact

Three ingredients make it exact: fabric flowing inward at the escape speed $\sqrt{2GM/r}$, a speed limit c for motion through the fabric, and clocks and rulers changing with that motion. This is Einstein's description of space around a non-spinning mass written in the

flowing-space form found by Gullstrand and Painlevé in 1921–22. Every confirmed prediction for such a mass therefore follows.

The GPS check

A clock on Earth's surface moves through the fabric at the inflow speed. A GPS satellite, at an orbit radius of about 26,560 km, moves outward at the smaller inflow speed there and sideways at orbital speed. Its total motion through the fabric is smaller, so its clock runs faster. Working through the numbers gives +45.7 μs per day from height and $-7.2 \mu\text{s}$ per day from orbital speed: a net +38.5 μs per day, the correction GPS actually uses.

What the model adds

It gives one picture behind several separate rules of current physics. Gravity, the equivalence principle, gravitational time dilation, black hole horizons and cosmic expansion all follow from fabric being created and consumed, and from objects moving with and through it.

Open questions and possible answers

Two further properties of the fabric may answer most of the open questions: a weak internal drag, and the ability to ripple. Both are proposals, not results, and each answer below is offered as a possibility to be tested.

One constraint applies to any drag. Earth has orbited the Sun for about 4.5 billion years without measurably slowing, so drag on objects moving steadily through the fabric must be extremely weak or absent. The drag proposed here acts mainly within the fabric itself, and between particles and the fabric immediately around them.

Why does density follow squeezing?

The fabric may resist being squeezed, much as a thick liquid resists being forced through a narrow gap. If so, fabric being squeezed quickly cannot be consumed as fast as it arrives, and it bunches up. Density would then be a backlog of fabric waiting to be eaten, greatest where the squeezing is fastest. This would turn the density rule from an assumption into a consequence of drag.

Where does the speed limit c come from?

The speed limit may be the speed at which ripples travel through the fabric, set by the fabric's own properties in the way the speed of sound is set by the material it travels through. Clocks and rulers are themselves made of particles that exchange ripples, so motion through the fabric at a large fraction of that speed would slow their internal exchanges. That may be why clocks tick slower and rulers shrink.

What is light?

Light may be a self-sustaining ripple in the fabric, travelling at the ripple speed and carried along by the fabric's flow. Its colour would be the ripple's wavelength, which expanding fabric stretches, producing cosmic redshift.

Spinning masses

A spinning particle or clump may drag the nearby fabric around with it through the fabric's internal drag, adding a swirl to the inflow. Measurements around Earth have detected this kind of dragging of space by rotation, and a swirling inflow is exactly what Einstein's theory describes around spinning masses. The drag would need to act on the fabric close to particles, not on objects coasting through it.

Gravitational waves

When clumps orbit each other or merge, the inflow pattern changes. Those changes may spread outward as ripples in the flow itself, travelling at the ripple speed. Detectors have recorded such waves from merging black holes since 2015, and their speed matches the speed of light, as this picture would require.

The other forces

Other forces may come from particles disturbing the fabric in other ways. A particle whose eating rate pulses rhythmically would send out ripples; two particles pulsing in or out of step might attract or repel, which could be the origin of electric charge. Swirl produced by moving pulsing particles might act as magnetism. The nuclear forces might be very short-range effects of the dense, fast-squeezed fabric right next to particles. All of this is speculative and is the largest piece of work remaining.

Mass and energy

A particle at rest in the fabric still has energy mc^2 . Since its mass is its eating rate, rest energy may measure how much fabric the particle consumes. If true, converting mass to energy, as in nuclear reactions, would mean particles reducing their eating and releasing that difference as ripples in the fabric.

Where does eaten fabric go?

It may simply cease. Alternatively, consumed fabric may re-emerge at the random generation points, making the universe a closed cycle of consumption and creation. A cycle would link the generation rate to the total eating rate, which is a testable relation.

The early expansion

The real universe's expansion slowed for its first ~9 billion years before speeding up. When particles were packed closely, their combined inflow, and drag between converging flows, may have outweighed generation and braked the expansion. As matter thinned out, generation would take over, producing the observed switch from slowing to accelerating.

Density where fabric is generated

Where fabric is created, it spreads rather than squeezes, so the density rule as written breaks down. Freshly generated fabric may arrive at a fixed baseline density, with squeezing adding to that baseline near particles.

Several particles at once

Because density depends on the combined flow, the flows of several particles do not simply add. The corrections may turn out to match the small extra effects Einstein's theory predicts for multiple bodies. Solving the full equations numerically will show whether they do.

The values of q and κ

The strength of gravity fixes only the ratio of the eating rate to the fabric constant κ . If the speed limit comes from ripples, the ripple speed may supply a second relation that pins down both.

Randomness

Generation happens at random points. That built-in randomness at the smallest scales may connect to the randomness of quantum physics, a direction not yet explored.

Related ideas

Parts of this picture echo earlier proposals, though none combines them in this way; this list is from memory and approximate.

- **Riemann (mid-1800s)** speculated that gravity is a space-filling substance flowing into matter and disappearing there. This model differs in treating space as a fabric rather than a substance.
- **Gullstrand and Painlevé (1921–22)** showed that Einstein's description of space around a single mass can be written as space flowing inward at escape speed. Hamilton and Lisle (2008) popularised it as the river model of black holes. This model's inflow and time rule reproduce that description exactly.
- **Lorentz (around 1900–1905)** explained the slowing of moving clocks and shrinking of moving rulers as effects of motion through a medium, in a form that matches the predictions of special relativity.
- **Bjerknes (1870s–1880s)** showed experimentally that bodies pulsing in a fluid attract or repel depending on whether they pulse in step, an analogy to the proposed origin of other forces.
- **Padmanabhan (2012)** proposed that cosmic expansion is the emergence of new space, related to this model's generation.
- **Cahill's Process Physics (from about 2000)** treats space as a flowing medium with matter as a sink. It is not accepted by most physicists.