WORKING PAPER SUPPLEMENT · SEPTEMBER 2026 · CONDITIONAL EXERCISE

The Scaled-Metric Reading

A supplement to Geometry of a Three-Orb Metastructure

What the paper would say if Norbert Schwarzer's scaled-metric formulation and its calculations were true — an exercise, not a finding

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This supplement adopts five postulates from Schwarzer's Fluid Universe for the length of the document and re-derives the main paper under them. It is a conditional exercise. It does not endorse the framework, does not authenticate the footage, and has not been reviewed by Dr. Schwarzer.

Why this exists

Theories of everything usually stop at the equations. There is rarely a worked example, a current technology the theory speaks to, a derivation a peer can check line by line, or an exercise a student can change a number in and watch. A theory nobody can play with is hard to test, and a theory nobody can test can be neither trusted nor ruled out. This supplement is the first of a series that tries to do it differently. The test case is the author's working paper, *Geometry of a Three-Orb Metastructure* (Revision 10.1), a kinematic reconstruction of disputed footage published together with its counter-evidence. The framework applied to it is Dr. Norbert Schwarzer's scaled-metric formulation, developed across his books and most recently in *Fluid Universe: The Way of Structured Water and its Mathematical Foundations* (Jenny Stanford Publishing, 2026) [S1]. Dr. Schwarzer reviewed an earlier revision of the paper, and his comments on dimensionality and scale prompted this exercise; he has not reviewed this supplement, and the reduction of his framework to the five postulates of S1 is the author's. The method is deliberately strict: adopt the postulates as if they were true, re-derive the paper under them, and write down what the framework would buy and what it would cost. The release also includes a plain-language guide, *The Seam*; an interactive console in which every instrument is driven by the formulas shown beside it and marks where it simplifies; and a hardware design study, a bench instrument drawn as it would have to be if the framework were right, published for critique and not as an apparatus that tests the theory. The exercise ends in four measurements on which the framework and the textbook disagree. If you are a physicist, check the mathematics and say where it breaks; if you are a student, open the console and push it until it fails.

Abstract

This supplement is an exercise. It takes the scaled-metric formulation of Norbert Schwarzer, recorded as a possibility in §7.7 of the main paper, and asks what *Geometry of a Three-Orb Metastructure* would say if that formulation and its calculations were true. Five postulates are adopted for the length of the document: a scaled metric within the Einstein–Hilbert action from which the quantum equations follow; explicit dependence of the field equations on the number of dimensions; a scale factor that makes effective quantities scale-dependent; a non-extremal variational principle; and the radiation of bounded coherent domains. Each section of the main paper is then re-derived under them. The exercise supplies the attractive agent §7 said nobody had named, replaces linear stability at an extremum with residence near one, gives the luminosity of a sphere a source that needs no reaction inside it, moves the "portal" from a curvature throat to a domain wall in the scaling field, and turns the seventeen-order energy gap of §11.4 into a single scaling requirement that can be written down and tested. It also finds what the postulates cost: the scale dependence must stay hidden below about ten micrometres, where the Casimir law is measured to a percent; the framework must reconcile the strong scale dependence a throat needs with the high dimension number its weak-gravity argument needs; and nothing in it authenticates the footage. Every measurement proposed in Part I is kept, and the exercise adds four observations that would distinguish this reading from the standard one.

Rules of the exercise. The postulates are adopted, not argued. Where a result follows from them by ordinary mathematics it is derived. Where it needs a quantity the framework leaves free, the quantity is named as a parameter and the result is given as a function of it, so that nothing is claimed that the framework has not fixed. Each conclusion is marked with the postulate it rests on. The kinematics of §§3–6 of the main paper are taken over unchanged, since they are measurements of a path and do not depend on the metric beneath it. Numbering is separate: sections are S1–S9, equations S1–S8, figures S1–S2, and the reference list is its own. The author is not the originator of the framework and has not verified its derivations; the supplement is written from inside it, as an exercise in what it would buy and what it would cost.

In layman's terms

What the main paper did. Some widely shared videos appear to show three glowing spheres circling an airliner before it vanishes in a flash. The main paper did not ask whether the videos are real; it asked what the spheres would have to be doing if they were. Three objects locked in a triangle, spinning around a plane every few seconds, would each be pulling ten to forty times their own weight toward the centre, and something would have to hold them there. The paper worked out what that something would need to be, found that no known force does the job at that size, and found that the "portal" reading needs an amount of negative energy, the rest-mass of twenty Jupiters with a minus sign, that laboratory physics cannot come within a billion billion billion billionth of. It then listed the measurements that would settle the matter.

What Norbert Schwarzer proposes. Physics has two rulebooks that have never been joined: Einstein's, which describes gravity as the shape of space and time, and the quantum rulebook, which describes everything else. Schwarzer's idea is that space and time are less like a fixed stage and more like the surface of water: a medium (an aether, in the old word; a plasma, in the modern one) that can be stretched, compressed and set ringing, and in which what we call matter and fields are patterns of that stretching. The mathematical object that measures distance, the metric, is allowed to stretch and compress from place to place by a factor he calls the scaling field. When that stretching is written into Einstein's equations, the quantum equations fall out of them unasked. Four things follow. The number of dimensions becomes a dial in the equations rather than a fixed fact, and turning it up makes gravity fade, which is his explanation of why gravity is so much weaker than the other forces. Quantities we treat as fixed, such as the energy in empty space, depend on the size of the region you measure them in. Nothing is ever perfectly at rest, because the balance point of the equations itself trembles. And a patch of the field that has organised itself into a coherent, bounded region gives off waves simply because it has an edge, the way a bell rings because it has a rim.

What this supplement does. It takes those ideas as true for the length of the document and reads the main paper again through them. This is a thought experiment, not a claim. The author did not invent the framework and has not checked its mathematics; Dr. Schwarzer has not reviewed this text. The value of the exercise is not in deciding whether he is right. It is in finding the places where his physics and the textbook would give different numbers, so that someone can go and measure.

What changes if he is right. Five things. The force that holds the triangle together, which the main paper could not name, has a name: the three spheres are coherent patches in one shared field, and the field pulls them toward each other the way the surface of a pond pulls two floating needles together. The triangle no longer has to be perfectly balanced to survive, because in his physics things live *near* balance and wobble, so the formation would jitter slightly no matter how well it was controlled, and that jitter would be a signature. The spheres do not need a furnace inside them to glow; they glow because they are coherent and bounded, and such a glow has a sharp edge in its colour rather than the smooth rainbow of a hot object. The portal stops being a tunnel through space held open by exotic negative energy, which his own physics would make harder, not easier, and becomes a boundary between two regions where the ruler is set to different lengths, which needs ordinary positive energy and looks like a window whose contents are the wrong size rather than a mirrored ball. And because nothing is carried anywhere, the relativity puzzles the main paper raised about moving one end of a wormhole simply do not arise.

What a wormhole is, in the first place. Einstein taught that space is not an empty stage but something that can bend, and in 1935 he and Nathan Rosen noticed that his equations allow two far-apart places to be joined by a short passage, so that you could step in at one end and out at the other without crossing the distance between. That is a wormhole. The catch, worked out by Morris and Thorne in 1988, is that the passage collapses on itself unless it is propped open by something with *negative* energy, and negative energy exists in the laboratory only in amounts too small to weigh. The main paper put a size on the prop: for a doorway wide enough for an airliner, the negative energy of twenty Jupiters. That is why wormholes have stayed in the equations and out of the workshop for ninety years.

What a seam is. Picture a map. On the left half every centimetre of paper stands for one metre of ground; on the right half every centimetre stands for ten kilometres. The two halves are glued together along a line. An ant walking across that line takes the same-sized step it always took, but on the right side that step now carries it across a city. Nothing was dug, nothing was folded, nothing was torn. The paper is continuous. Only the *scale* changes at the line, and the line is the seam. Schwarzer's physics says that space itself is like that paper: a medium (an aether, in the old word; a plasma, in the modern one) whose scale, the length of the ruler at each point, is set by a field that can vary from place to place. Ordinarily the ruler is the same everywhere, which is why the world looks like a fixed stage. If the ruler could be made short on one side of a boundary and long on the other, the boundary would be a seam, and a step across it would be a journey. That is the whole idea, and it is why the exercise arrives at a very different doorway from the one in the textbooks. The textbook doorway is a hole that has to be held open against space trying to close it, and the holding costs a planet's worth of a substance nobody can make. A seam is not a hole. It is a change in the setting of the ruler, and a change in a setting costs ordinary energy, in proportion to how much boundary you are re-setting, not to how far you want to go.

Figure S0. Two kinds of doorway, drawn for the general reader

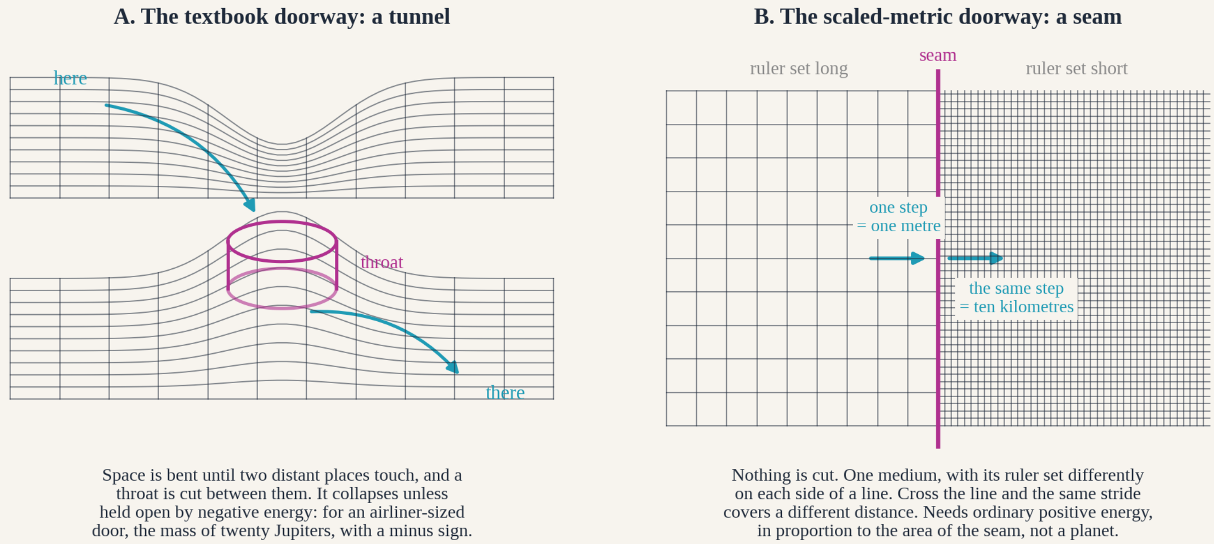

Figure S0. Left, the wormhole of the textbooks: space folded until two places touch, with a throat cut between them that must be held open by negative energy. Right, the doorway this exercise arrives at: nothing is cut; one medium has its ruler set differently on the two sides of a line, so that the same stride covers a different distance on each side.

What a trip would be like. There is no corridor. You would stand in front of a boundary, and through it you would see your destination as if through a window: the same scene you would see on arrival, undistorted, but apparently at the wrong size, and very slightly the wrong colour, because light crossing the seam is re-scaled too. Then you would take one step. On the far side the ruler is set back to normal, and you would be standing at the destination, at the same instant you left, because no distance in the ordinary sense was crossed and no time was spent crossing it. The three spheres in the footage, in this reading, are what the near side of such a seam would look like while it is being formed: three coherent patches of the medium holding a boundary open between them, glowing because coherent patches glow, and spinning because that is how they hold the boundary in the plane. The flash would be the seam closing. None of this is known to be real. It is what the pictures would mean if the physics is right.

Why it would matter to you. Set the footage aside, because the footage may well be an animation, and ask only what follows if Schwarzer's physics is right. The first consequence is the one everyone thinks of, and it is worth saying without embarrassment: distance would stop being the thing that separates people. A seam between two cities is a doorway between them, and a doorway needs no road, no fuel and no time; a family on two continents would be a step apart. The second consequence is quieter and comes sooner. The same physics that makes the seam says that a coherent patch of the medium holds itself together and gives off light without a fire inside it. If that is true even in a small way, it is a new thing to know about energy and matter, and the first place it would show is in a glowing ball of plasma a few centimetres across in a laboratory chamber, which exists today. The third consequence is that the whole subject would move from cosmology, where it is a curiosity, to engineering, where it is a schedule. A problem that needs twenty Jupiters has no first step. A problem that needs a larger coherent patch, held steadier, has an obvious one, and it is the kind of step a university laboratory takes in a year. That is what "practical" means here: not that the doorway is near, but that for the first time there would be a bench to start at and a list of things to try.

Why it matters even if he is wrong. The exercise does not ask anyone to believe. It ends with four measurements, described in plain words at the end of this section, on which his physics and the textbook give different answers. Two can be taken from footage that already exists, one from a plasma ball in a chamber, and one from a laboratory instrument that has been in use since 1997. If the measurements come out the textbook's way, the framework in this form is wrong, and that is worth knowing, because it closes a door that has stood ajar in the equations for ninety years. If they come out his way, the most important experiment of the century will have started in a room the size of a garage. Either way, this is a question that can be settled by looking, and questions of that kind do not stay open forever.

What it would cost. The exercise is as strict about the bill as about the purchase. For the negative-energy gap to close by his scale dependence alone, the energy of empty space would have to *grow* with the size of the region, roughly as the seventh power, between a hundredth of a millimetre and thirty metres, when Casimir predicted a fall as the fourth power and experiments have confirmed that fall to about one percent at the scale of a bacterium. So any such growth would have to switch on above about a hundredth of a millimetre, where measurements are few, and climb steeply from there. His framework also pulls two ways: a large portal wants strong scale dependence, which wants a low dimension number, while his explanation of weak gravity wants a high one. And in place of one unknown, the exotic energy, the exercise leaves four: how strong the field's pull is, how far off balance things sit, how thick the boundary is, and how much the ruler changes across it. None of this touches whether the videos are real. The stock cloud photographs, the effects-library match and the wreckage on Réunion weigh exactly what they weighed before.

What to look for. Four measurements would tell the two readings apart, and none requires believing either. When the triangle tightens in the footage, how fast does it spin up? The textbook says the spin rises as the inverse square of the radius; his physics leaves the exponent free; an animation would most naturally leave the spin constant. Does the light from a glowing sphere fade smoothly into the infrared like a hot coal, or does it stop at an edge? Does the Casimir energy between two plates keep falling as the plates are moved apart past a hundredth of a millimetre, or does it turn? And does a formation that is being held still have a floor of jitter that no control can remove? Two of these can be taken from footage that already exists, one from a glowing plasma ball in a laboratory chamber, and one from a torsion balance. That is where the exercise ends: not with a verdict, but with four places to look.

S1. The postulates

The framework is stated in five parts, each taken from Schwarzer's *Fluid Universe* [S1] and reduced to the form this exercise uses.

$$G_{\alpha\beta} = F[f]\, g_{\alpha\beta}, \qquad F[f] = (C_f + f)^{4/(n-2)}, \qquad \delta\int\sqrt{-G}\, R[G]\, d^n x = H \neq 0$$

Equation S1. The scaled metric, the scale factor in the form Schwarzer works through, and the non-extremal variation with parameter H.

- **P1, scaled metric.** The physical metric is $G_{\alpha\beta} = F[f]\cdot g_{\alpha\beta}$, a background metric multiplied by a function of a scalar field f. Inserted into the Einstein–Hilbert action and varied, it yields both the Einstein equations for g and wave equations of Klein–Gordon, Schrödinger and Dirac type for f. Quantum mechanics is the dynamics of the scaling field.
- **P2, explicit dimension.** The number of dimensions n, including parameter dimensions beyond the four of spacetime, appears as a coefficient in the field equations. The term nonlinear in f grows with n; the curvature terms recede. Gravity is weak because it is the recessive term at large n.
- **P3, scale factor.** $F[f]$ is a choice, of the form $(C_f + f)^{4/(n-2)}$ in the worked cases. Effective quantities, lengths, energies, energy densities and masses, carry a factor of F raised to a power fixed by their dimension, and so depend on the scale at which they are evaluated.
- **P4, non-extremal principle.** The action is not stationary. Its first variation equals a parameter H, the "ever-jittering fulcrum". Equilibria are residences near an extremum, not at it, and the classical stationary principle is recovered only in the limit of large n.
- **P5, radiating domains.** A bounded region in which f is coherent radiates by its nature; the field outside it carries spherical solutions of Klein–Gordon type. Luminosity is a property of coherence, not of a reaction.

Two remarks fix the ground. First, P2's extra dimensions are parameter dimensions, not additional directions in which a force can act. That matters, because in n spatial dimensions a Newtonian force falls as $d^{-(n-1)}$ and circular orbits are stable only for $n = 3$ [S2]; if the framework added spatial directions the triad would be less stable, not more. It does not, and the force laws below keep their three-dimensional form. Second, nothing in P1–P5 says anything about a video. The exercise changes what the objects in the footage would have to be. It does not change whether they are there.

S2. The geometry, unchanged

Equations 1–5 of the main paper survive without alteration: the circle of radius $r = 42$ m, the equilateral triad of side 72.7 m, the torus and its helical winding, and the collapse. They are statements about where three points are in a sequence of frames, and the metric that underlies the frames enters them only through the ratio of the scale factor at the airframe to the scale factor at the camera, which for any F continuous across a hundred metres of air is unity to far better than the pixel. The tests of §8 that are purely geometric, stereo disparity, angular spacing, occlusion order and period, are likewise untouched. The exercise begins where the dynamics begin.

One geometric statement does acquire a second reading. The helical winding of Equation 5, the "donut" of the commentary, was treated in §6 as a weak axial oscillation of unknown cause. Under P5 a coherent domain has a mode structure, and three domains sharing one field have collective modes; a slow axial libration of the triad about its orbit plane is the kind of thing such a structure would show. That is not a prediction, since the framework does not fix Ω/ω, but it is a place the framework could be asked for one.

S3. Dynamics under the postulates

S3.1 The centripetal requirement stands

Equation 6 is kinematics multiplied by mass. The 10.6 g at a four-second period and the 42 g at two seconds are what the circle costs whatever holds the objects on it, and under P3 the only change is that the mass in the expression is an effective mass, $m_{\mathrm{eff}} \sim F(r)^q$, with q set by how mass scales under the conformal factor. For a fixed radius that is a relabelling. Its consequence appears in S3.4.

S3.2 The attractive agent, named

Section 7 of the main paper ended on a sentence: the plasmoid reading needs a second, attractive agent, and the analogy does not survive as mechanics without an addition nobody has yet named. Under P1 and P2 the addition names itself. Three coherent domains sit in one scaling field f, and the gradient energy of that field between them is the term P2 says dominates. For domains small against their separation the field of each falls as $1/d$ outside it, as a massless scalar does, so the pair potential is Coulombic and the pair force inverse-square:

$$U_{ij} = -\frac{\kappa_n f_i f_j}{d_{ij}}, \qquad F_{ij} = \frac{\kappa_n f_i f_j}{d_{ij}^2}, \qquad \kappa_n \propto n \ \ (\text{gradient term}), \quad \kappa_n^{\text{curv}} \to 0$$

Equation S2. Pair potential and force between coherent domains through the scaling field. The coupling κ_n carries the n-dependence of P2; the curvature (gravitational) part is recessive.

Three things follow. The force is attractive between domains of like f, which is the sign §7.1 demanded and the magnetic reading could not supply without exotic fields. It is inverse-square, so Routh's condition, Equation 7, applies exactly as written. And its strength is not bounded by the 106 T surface field of Equation 10, because it is not magnetic; it is bounded by the amplitude of f in the domains and by κ_n, neither of which the main paper's measurements constrain. The binding problem is therefore solved in principle and open in magnitude. The exercise records what the magnitude must be: $\kappa_n f^2 = m_{\mathrm{eff}} r \omega^2 s^2/\sqrt{3}$, which for the placeholder mass of 100 kg and a four-second period is about 32 MN·m². Any domain model derived from the framework must reach that number or the triad flies apart.

S3.3 Stability becomes residence

Routh's condition survives, and equal masses still fail it by a factor of nine. In the standard reading that forced a control loop. Under P4 it forces nothing, because linear stability at an extremum is not the criterion for persistence. The system sits a parameter H off the extremum and moves about it; what the standard analysis calls an unstable mode is, in the non-extremal picture, a direction in which the residence drifts with a rate set by H rather than a direction in which it departs exponentially. This is the single largest change the exercise makes to Part I, and it must be said carefully. The framework does not fix H, so it does not predict how long a triad persists; it removes the theorem that says it cannot. In exchange it predicts something the control-loop reading does not: the residual jitter in the 120° spacing and in the radius has a floor that does not go to zero however good the control, with a spectrum that carries the mode structure of Equation 8 on top of a continuous component. A control loop, by contrast, drives the residual to its sensor noise and leaves a spectrum shaped by its own bandwidth. The measurement is the one §7.2 already proposed. The exercise changes what a non-zero floor would mean.

S3.4 The collapse rule acquires an exponent

Equation 9, $\omega \sim r^{-2}$, was the sharpest falsifier in Part I because it needs no absolute scale. It rests on the constancy of m. Under P3 the effective mass scales with $F(r)$, and if F varies with the size of the structure as a power, $F \sim r^{p}$, then conservation of L_x reads

$$L_x = 3\, m_{\text{eff}}(r)\, r^2 \omega, \quad m_{\text{eff}} \propto F(r)^q \propto r^{\,qp} \;\Rightarrow\; \omega \propto r^{-(2+qp)}$$

Equation S3. The collapse rule with a scale-dependent effective mass. The standard rule is qp = 0.

This is the exercise’s most useful product for the footage, because it converts a framework parameter into a slope on a log–log plot. Track ω and r through the tightening of §5 and fit $\omega \sim r^{-k}$. The standard reading demands $k = 2$. A keyed animation most naturally gives $k = 0$. A value of k that is neither, held consistently through the collapse, is a measurement of qp, the first number the framework would ever have had extracted from a moving object. A value of exactly 2 does not refute the framework; it sets $qp = 0$ at this scale, which the large-n limit of P3 in fact expects, since the exponent $4/(n-2)$ goes to zero as n grows. That expectation is worth carrying to S5.

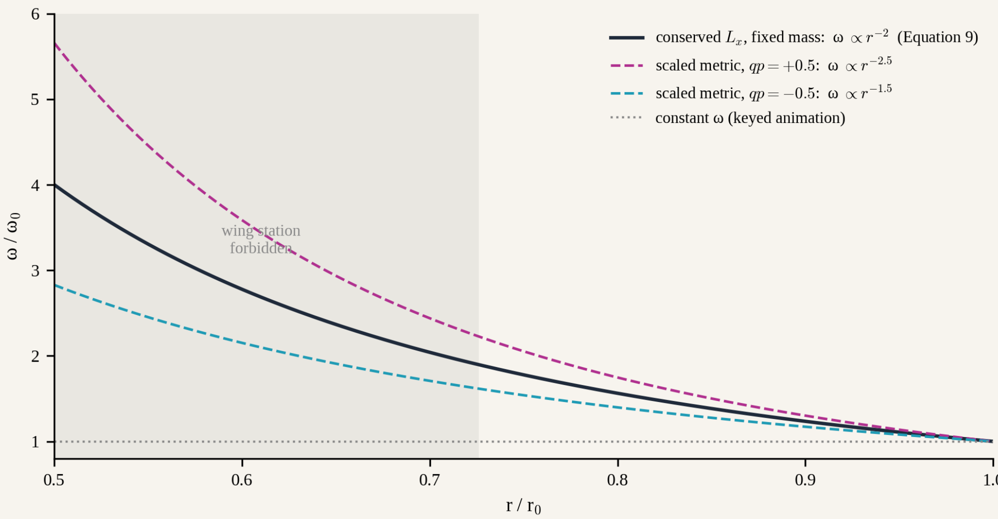

Figure S2. Spin-up during a torque-free collapse: the standard rule of Equation 9 against two values of the scaled-metric exponent qp, and the constant-ω path of a keyed animation. The three physical curves separate by tens of percent by the time the triad reaches the wing station, which is within reach of frame-by-frame tracking.

S3.5 The magnetic bound is retired; the power budget is reinterpreted

Equation 10 bounded a magnetic binding at a surface field of order 100 T. Under S3.2 the binding is not magnetic, and the bound is retired along with the 7 G it implied on the fuselage; the exercise predicts no magnetic signature of the binding at all, which is a difference from the standard reading that a magnetometer log from the aircraft would show. Equation 12 is a different matter. Drag is drag, and an object of metre radius at Mach 0.87 still pays 5 MW per orb to the air whatever it is made of. The radiated power, however, changes character. Under P5 a coherent domain radiates from its boundary with a spectrum set by the domain, not by a temperature:

$$\phi(r,t) = A\, j_0(kr)\, e^{-i\omega t}, \qquad \omega^2 = k^2 c^2 + \left(\frac{\kappa c^2}{\hbar}\right)^2, \qquad P_{\text{rad}} \propto \omega^2 A^2 R^2$$

Equation S6. Spherical Klein–Gordon solution outside a coherent domain, its dispersion relation with the field’s mass parameter κ, and the scaling of the radiated power.

The dispersion relation has a cut-off: nothing propagates below the frequency $\kappa c^2/\hbar$. A domain radiating in this sense is bright above a threshold and dark below it, and its spectrum near threshold is a line, not a Planck curve. The thermal cameras that produced Plate I integrate one band and cannot see the difference. A slit spectrograph on the same object could, and the distinction is sharp: a hot plasma at 1000 to 2000 K peaks in the mid-infrared with a Planck tail into the visible; a radiating domain has an edge. That is the second distinguishing observation, and the cheapest.

S4. Dimensionality, with the dial turned

Section 7.7 of the main paper marked the planar derivations and the three-dimensional modes they omit. Under P2 the dimension is a dial in the equations rather than a choice of the analyst, and the exercise can say what turning it does. The tilt and umbrella modes of the triad remain, because they are geometric; the exercise does not remove the need for a side view. What changes is the balance of terms that governs whether a tilt grows. In the standard reading the tilt of a plasmoid grows because the magnetic configuration has lower energy tilted, an $n = 1$ mode with no restoring term. Under S3.2 the binding is the gradient energy of a scalar field shared by three domains, and that energy is minimised when the domains are coplanar and equidistant, so the gradient coupling supplies a restoring term for tilt that the magnetic picture lacks. Whether it is large enough is a question of κ_n again. The exercise cannot answer it; it can say that the answer improves with n, since κ_n grows with n while the destabilising curvature terms recede, and that in the limit the framework uses to recover classical mechanics the tilt is stiff.

The fluid is the other half of §7.7, and here the framework has a name for what the standard reading calls turbulence. In the fluid-universe picture the atmosphere is itself a domain structure in f at one scale, and the orb another at a larger one; the shear between them is not the shear between a hot sphere and a gas but between two coherent regions, and the framework's anti-diffusion, its tendency for coherent domains to sharpen rather than smear their boundaries, works against the mixing that §7.6 said would recombine an air plasma in microseconds. The exercise notes this without leaning on it, because anti-diffusion in the book is a property of the scaling field, and the Reynolds number of 10^7 belongs to the air, which still obeys Navier–Stokes in three dimensions whatever the orb is. A coherent domain that survives the wake is a domain whose boundary is sharper than the wake can smear it, and the framework has a parameter for that, the wall thickness ℓ_w of S5. It is the same parameter that sets the portal energy. The exercise finds that coincidence worth recording: one number, if the framework has it, does two jobs.

S5. Scale, and the seventeen orders

S5.1 The recomputation §7.7 asked for

Section 11.4 compared the negative energy a 30 m Morris–Thorne throat requires, about 4×10^{45} J, with the Casimir energy density between plates 10 nm apart, 43 kJ/m³, and found the throat hopeless by a stack of cavities 300 astronomical units on a side. Under P3 the two quantities live at scales seventeen orders of magnitude apart, and an energy density carries a factor of the scale factor. The exercise does not have F, so it cannot compute the corrected ratio. It can do the next best thing, which is to compute what F would have to do for the ratio to be one. Spread the throat's energy over its own volume and the required density is about 3×10^{40} J/m³. Measured from the 10 nm figure of §11.4 the rise is about $L^{3.8}$; but nothing may happen below the measured band, so the exercise starts the rise at 10 μm, where the Casimir density is 4×10^{-8} J/m³, and the requirement steepens:

$$\frac{\rho_{\rm req}(30\ \rm m)}{\rho_{\rm Cas}(10\ \mu\rm m)} \approx 7\times 10^{47} \;\Rightarrow\; \rho_{\rm vac} \propto L^{+7.4} \;\;\text{over } 10\ \mu\text{m} \to 30\ \text{m}$$

Equation S4. The ratio the scale factor must supply between the 10 µm onset and 30 m, and the power law in length that would supply it.

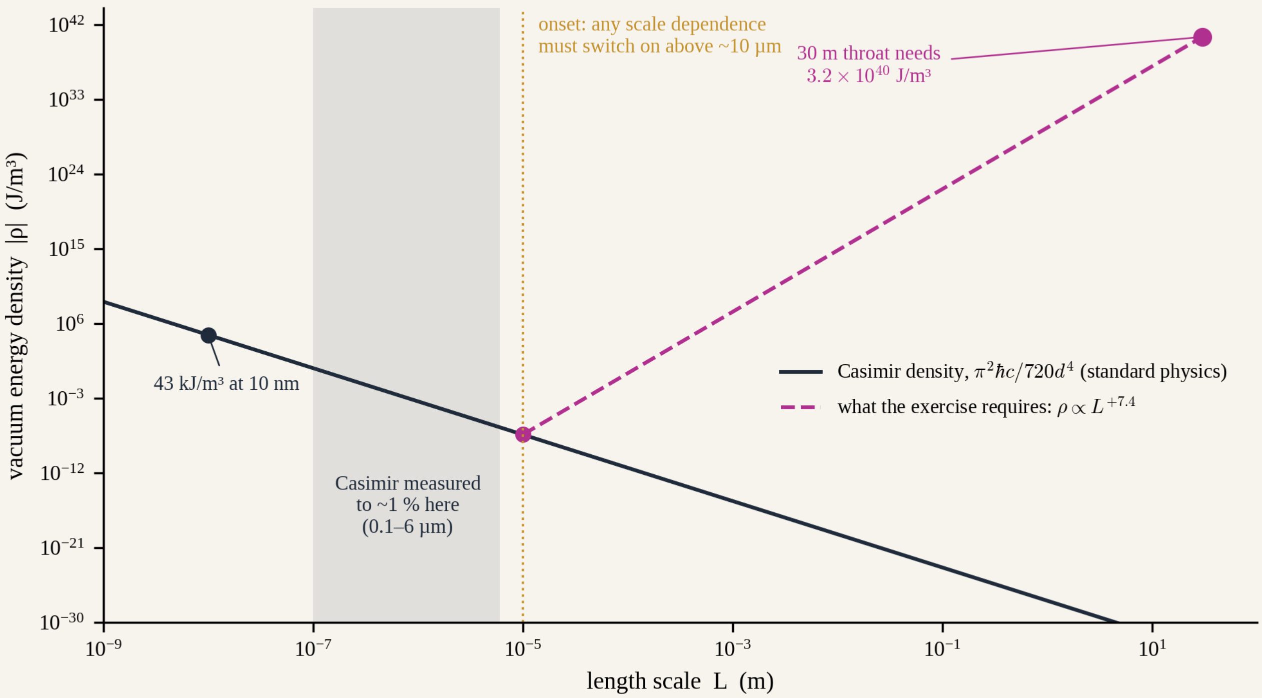

Figure S1. The standard Casimir law falls as the fourth power of the plate spacing and is measured to about a percent between 0.1 and 6 µm. For the exercise to close the gap of §11.4, the effective vacuum energy density must instead rise as roughly the seventh power of scale from a 10 µm onset to 30 m, and must begin above the measured band.

The result is exact within the exercise and it is unforgiving. To close the gap by scale dependence alone, the effective vacuum energy density must *rise* with scale as about $L^{+7.4}$ above the onset, nearly twice as steep as the reverse of the L^{-4} that Casimir derived and that torsion-balance and atomic-force experiments have confirmed to about a percent at separations from 0.1 to 6 µm [S3]. Whatever the scaling field does, it must do nothing there. The exercise therefore places the onset of any such dependence above about 10 µm, and predicts that a precision Casimir measurement at tens to hundreds of micrometres, a regime where thermal corrections already make the standard prediction delicate and where few measurements exist, would be the first place the framework and the standard law part company. That is a laboratory test with a number attached, and it is the third distinguishing observation.

There is a tension here that the exercise must report rather than hide. Under P3 the exponent of the scale factor is $4/(n-2)$, which is large for small n and goes to zero as n grows. Under P2 the weakness of gravity, and the recovery of classical mechanics, require n large. A strong scale dependence of the kind Equation S4 demands therefore wants a low dimension number, and the framework's own explanation of gravity wants a high one. Both may be satisfiable if f itself varies steeply with scale while the exponent stays small, and S3.4 has already noted that the collapse rule measures the product qp rather than either factor. But the exercise cannot make the two demands meet by assertion, and it says so.

S5.2 The portal moves

The deeper change is in what a portal would be. In general relativity a throat is a curvature structure, and P2 makes curvature the recessive term; a framework in which gravity is weak because curvature is suppressed is a framework in which holding a throat open by curvature is harder still, since the same suppression that weakens the pull of a planet weakens the response of spacetime to any stress-energy, negative included. If the exercise stopped at S5.1 it would have made the Morris–Thorne route worse. It does not stop there, because P1 offers a different object. A boundary across which F changes value is a domain wall in the scaling field, and a domain wall is a structure of gradient energy, the dominant term, not of curvature, the recessive one. Its energy is a surface tension times an area:

$$E_{\text{wall}} = \sigma A, \qquad \sigma \simeq \frac{(\Delta f)^2}{\ell_w}\,\chi_n, \qquad \text{versus} \qquad E_{\text{throat}} \sim \frac{r_0 c^4}{G}$$

Equation S5. Energy of a domain wall in the scaling field, against the curvature-throat energy of Equation 14. χ_n collects the n-dependent coefficient; ℓ_w is the wall thickness.

Whether that is small is a question of ℓ_w and Δf, which the framework does not fix and the exercise does not invent. What the exercise can say is structural. The energy of a wall scales with its area, r_0^2, not with r_0c^4/G; it is set by the gradient term the framework calls dominant rather than by the curvature term it calls recessive; and it is positive. That last point is the one to underline. A domain wall needs no negative energy, because it does not hold spacetime open against its own curvature; it separates two regions in which the same metric is scaled differently. The quantum inequalities that §11.4 and the reference document argue over do not apply to it, not because they are wrong, but because nothing on the far side of the wall is exotic. Crossing the wall is not travelling through a tunnel in spacetime. It is stepping from a region with one scale factor into a region with another.

S5.3 What a wall looks like

Section 11.4 said what a Morris–Thorne mouth looks like, a mirrored sphere holding a shrunken image of the far side, and found the flash frames, as described, do not show it. A domain wall predicts something else, and the difference is testable on the same frames. Lengths on the two sides of the wall are in the ratio of the square roots of the scale factors, and frequencies in the inverse ratio:

$$\frac{\ell_{\text{far}}}{\ell_{\text{near}}} = \sqrt{\frac{F_{\text{far}}}{F_{\text{near}}}}, \qquad \frac{\nu_{\text{far}}}{\nu_{\text{near}}} = \sqrt{\frac{F_{\text{near}}}{F_{\text{far}}}}$$

Equation S7. Apparent length and frequency ratios across a wall between regions of scale factor F_far and F_near, for a conformal factor on the metric.

Light from the far side is therefore not lensed into a ring or a shrunken sphere; it is magnified or demagnified uniformly, and shifted in frequency uniformly, by an amount fixed by ΔF. A wall with $\Delta F = 0$ is invisible. A wall with a large ΔF shows the far side as a window whose contents are the wrong size and the wrong colour, without distortion. If the far side is the same sky, the wall is a uniform brightness step and nothing else. The flash frames, as described in §1.1, show a radially symmetric burst over an undisturbed cloud field. Under the exercise that is what the closing of a wall with ΔF near unity would look like, and it is the reading in which the frames and the framework agree best; but it is also the reading in which the frames say least, since a uniform flash is what a rendered effect would most naturally produce. The exercise gains a consistent picture and loses a discriminating one. It records both. The fourth distinguishing observation is the frequency ratio of Equation S7: in a two-band recording, the far-side image is shifted by the same factor in both bands, whereas a hot plasma and a lensed image are not. The clips are single-band.

S6. The fourth source, the pair, and the S-curve

Section 11.4 took up the claim that a fourth source waits at the destination and turned it into a pointing test: the triad plane tilts toward the place it names. That test survives the exercise unchanged. What the exercise adds is a reason the fourth source and the three would belong to one object. Under P1 the domains at both ends share a single scaling field, and the book's S-curves, its sigmoid transitions between states of entangled dimensions, describe how one coherent state hands over to another across a wall. A wall with a domain on each side is, in that language, one structure with two faces, and the triad would be the near face. The exercise does not pretend this makes the fourth source observable in the clips; §11.4's finding that an unobservable body cannot count as support stands. It notes that the framework gives the commentary's picture a grammar it did not have, and that the grammar predicts the tilt.

Section 15 of the main paper reviewed what relativity does to a mouth that is moved: the mass ratio of Equation 17, the time shift between mouths, and the chronology problem. Under the exercise none of that applies, because nothing is moved. A domain wall is not a mouth carried from one place to another; it is a boundary that forms where the scaling field is made to change, and the two faces are wherever the two domains are. The Mouth Separation and Temporal Displacement bridges of §15 are therefore not needed and not available: there is no mouth to accelerate and no clock to desynchronise, and the chronology-protection question does not arise because no closed timelike curve is constructed. The exercise counts that as a simplification the framework buys, and as a loss of one of the more striking predictions the standard reading offered, since a wall gives no time shift to measure.

S7. Steering under the postulates

Section 14 costed steering by radio-frequency fields, by software and by intention, and found the last separated from the first by seventy-eight orders of magnitude in energy, Equation 14 against the Orch OR scale. The exercise changes the geometry of that comparison without, by itself, changing the number. Under P4 an equilibrium is not at an extremum, and the first variation of the action does not vanish:

$$\delta S = H\,\delta\lambda + \tfrac{1}{2}S''\,\delta\lambda^2 + \dots \qquad \text{(at an extremum the first term is absent)}$$

Equation S8. Variation of the action about a non-extremal residence. At an extremum only the second-order term survives; at the fulcrum there is a slope.

At an extremum a small displacement costs energy only at second order, and there is nothing to lean on: any bias is a force, and the force must do the work of Equation 14. At a non-extremal residence there is a slope, H, and a system that sits on a slope can be moved by changing where the slope points rather than by pushing against it. That is the sense in which the framework makes steering a matter of information rather than energy: the energy to reorient the triad is still the centripetal work of §7, but the energy to choose the direction is of order H per decision, and H is a parameter of the field, not of the airframe. The exercise cannot say how small H is. It can say that if H is of the order the framework needs for quantum behaviour to emerge from the metric, which is Planck's constant times a rate, then the decision energy is quantum-scale and the seventy-eight orders of §14.4 close to something like the ten that separate a neuron from a photon. That sentence is the most speculative in the supplement and is marked as such. What would make it more than a sentence is a demonstration, in any system the framework describes, that biasing H steers the residence; the bench experiments of §16.2, a microwave-sustained fireball in a chamber, are the place to look, since a fireball under the exercise is a coherent domain and its drift is a residence about a fulcrum.

The book's own subject, structured water, enters here and only here. In the framework a coherent domain of water is the same kind of object as the orb, at a different scale, and a biological system is a hierarchy of such domains. A pilot steering by intention would, in this reading, be one coherent structure biasing the fulcrum of another through the field they share. The exercise records the reading and declines to cost it, because the coupling between two domains at different scales is exactly the scale-dependent quantity P3 leaves free. It is a place where the framework and the author's wider interests meet, and for that reason it is the place where the discipline of the exercise matters most.

S8. The candidates, revisited

Part II costed three cores against the requirements of Part I. Under the exercise the requirements have changed, and the candidates should be re-read against them. Table S1 does so.

Candidate (main paper)	Standard reading needed	Under the exercise	Standing
Spherical IEC, §11	Megawatts of fusion power; non-Maxwellian core; a binding nobody named	A coherent domain needs no reaction; the IEC becomes a way to make one, not the thing itself	Demoted to a possible source of the domain
Staged Z-pinch, §12	Pulsed gain; 50 MJ shots; flicker and radio bursts	Same; a pulsed core is pulsed in any framework	Unchanged; the flicker test stands, and a steady light curve now counts against it doubly
Buoyant plasmoid, §13	Gigawatts to keep a shell hot in the wind	The domain's boundary is sharp by anti-diffusion, not by heating; the 4 GW is not required	Promoted; the fireball becomes the laboratory domain
Coherent domain (new, S3.5)	—	Binding by gradient energy; luminosity by boundary radiation; persistence by residence; portal as a wall	The exercise's own candidate

Table S1. The candidates of Part II re-read under the postulates. The exercise's own candidate is the coherent domain; the buoyant plasmoid of §13 is the nearest laboratory object to it.

The re-reading has one consequence for the programme of §16. The bench experiment that §16.2 rated most testable, a microwave-sustained fireball in a chamber, becomes under the exercise the experiment that tests the framework itself: a fireball is a coherent domain or it is a hot gas, and the two differ in their spectrum near threshold (S3.5), in whether their boundary sharpens or diffuses when the feed is cut (S4), and in whether their drift about an equilibrium has a floor that the chamber's control cannot remove (S3.3). All three are measurements a university laboratory can make with existing equipment. The exercise recommends them in that order.

S9. What the exercise bought, and what it cost

Read from inside the framework, the main paper changes in five places, and each can be said plainly. First, the glue. The main paper could not name a force strong enough to hold three metre-sized objects in a spinning triangle; the exercise names one. The three spheres are coherent patches in a single shared medium, and the medium pulls them toward each other the way the surface of a pond pulls two floating needles together. That pull weakens with the square of the distance, like gravity, so the old stability rules still apply, but it is not a magnet and so is not limited by how strong a magnet can be built. Second, the balance. The main paper showed that a triangle held by such a pull is unstable and concluded that something must be actively steering it, like a hand on a tiller. In Schwarzer's physics nothing sits exactly at balance; everything lives slightly off it and wobbles. So the triangle need not be perfectly balanced to persist, and a formation held this way would jitter a little no matter how well it was controlled. That jitter, which the tiller reading says should be absent, becomes a fingerprint. Third, the glow. The main paper said a sphere that shines for minutes in open air must be fed megawatts, like a furnace. The exercise says a coherent patch of the medium shines simply because it has an edge, as a bell rings because it has a rim, and such a glow stops sharply at a certain colour instead of fading smoothly like a hot coal. Fourth, the doorway. The main paper found that a tunnel through space needs the negative energy of twenty Jupiters, and the exercise finds that Schwarzer's physics makes that kind of tunnel harder, not easier. But it offers a different doorway: not a tunnel, but a boundary between two regions where the ruler is set to different lengths. That boundary needs ordinary positive energy, in proportion to its area, and would look through like a window whose contents are the wrong size, not like a mirrored ball. Fifth, the clocks. Because nothing is carried from one place to another, the puzzles the main paper raised about moving one end of a wormhole, the fuel to accelerate it and the clocks that fall out of step, do not arise at all.

The cost is stated with the same care. The scale dependence that would let §11.4 close must rise as about the seventh power of length between a 10 μm onset and 30 m while doing nothing at all where the Casimir law is measured, and the exercise has named the measurement that would find it. The strong scale dependence a throat needs and the high dimension number weak gravity needs pull in opposite directions, and the exercise could not make them meet. The wall energy, the binding strength, the jitter parameter and the wall thickness are all free, and until the framework fixes them the exercise has replaced one unknown, the exotic energy, with four. And nothing here touches the provenance of the footage: the cloud-photograph match, the effects-library match and the flaperon on Réunion are exactly as heavy as they were.

What the exercise leaves behind is four observations that the standard reading and this one predict differently, none of which requires accepting either. The collapse exponent k in $\omega \sim r^{-k}$, which the standard reading fixes at 2 and the exercise leaves free. The spectrum of a luminous sphere near its faint edge, Planckian or thresholded. The scaling of the Casimir energy above 10 μm, falling or rising. And the jitter floor of a held formation, zero or finite. Two of these can be taken from footage that already exists, one from a fireball in a chamber, and one from a torsion balance. That is the proper end of an exercise of this kind: not a verdict on the framework, which the author is not placed to give, but a short list of places where the framework and the textbook would give different numbers, and where someone could go and look. The main paper closes by saying that the universe has not said no. The supplement adds that, if Schwarzer is right, it has been saying something more specific all along, and that we now know four places to listen. For the reader who came for the doorway, the plain version is this: in the textbook reading a wormhole needs a planet's worth of a substance nobody can make; in this reading it needs a coherent patch of the medium made large enough and held steady, and the first such patch may already exist, a few centimetres across, in a microwave chamber.

Notes and sources

[S1] Schwarzer, N. *Fluid Universe: The Way of Structured Water and its Mathematical Foundations*. Jenny Stanford Publishing, 2026. ISBN 9789815352153. The five postulates of S1 are this supplement's reduction of that text; the reduction, and any error in it, are the author's. Comments on dimensionality and scale: private communication, September 2026. See also Schwarzer, N. *The Theory of Everything: Quantum and Relativity is Everywhere – A Fermat Universe*. Jenny Stanford Publishing, 2020.

[S2] Ehrenfest, P. "In what way does it become manifest in the fundamental laws of physics that space has three dimensions?" *Proc. Amsterdam Acad.* 20 (1917): 200–209. Stability of orbits and of atoms only in three spatial dimensions. Routh's condition and the Lagrange configuration: main paper, refs. [20]–[21].

[S3] Casimir measurements: Lamoreaux, S. K. *Phys. Rev. Lett.* 78 (1997): 5, torsion pendulum, 0.6–6 μm, ~5 %. Mohideen, U., and Roy, A. *Phys. Rev. Lett.* 81 (1998): 4549, atomic-force microscope, 0.1–0.9 μm, ~1 %. Decca, R. S., et al. *Phys. Rev. D* 75 (2007): 077101, micromechanical torsion oscillator, sub-percent below 0.75 μm. Reviews: Bordag, M., Klimchitskaya, G. L., Mohideen, U., and Mostepanenko, V. M. *Advances in the Casimir Effect*. Oxford, 2009. The thermal (Lifshitz) regime above a few micrometres is where the standard prediction is least certain and least measured.

[S4] Domain walls as gradient-energy structures: Vilenkin, A., and Shellard, E. P. S. *Cosmic Strings and Other Topological Defects*. Cambridge, 1994, ch. 13. Conformal transformations and the scaling of lengths, frequencies and densities: Wald, R. M. *General*

Relativity. Chicago, 1984, Appendix D.

[S5] Klein–Gordon solutions in spherical geometry and the threshold in the dispersion relation: any text on relativistic wave equations, e.g. Greiner, W. *Relativistic Quantum Mechanics: Wave Equations*. Springer, 3rd ed., 2000. The identification of such solutions with the radiation of a coherent domain is Schwarzer's [S1] and is adopted as postulate P5.

[S6] Main paper: Ingram, B. M. *Geometry of a Three-Orb Metastructure*, Working Paper, Revision 10.1, September 2026, bryaningram.com/research. Section, equation, figure and reference numbers cited without an S prefix refer to it; its Equation 14 is the Morris–Thorne energy scale, its §7.7 the subsection this supplement extends.

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