

A Census of the c^5 s

— 3rd Edition: Four Share One Root, and Only One Does Not — [Paper 34]

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— *From thinking to syncing.* —

ABSTRACT

This paper formally integrated $E^2 = (4\pi c^2)^2 + (4\pi v c)^2$ with respect to the speed of light c and, on the strength of the resulting $\frac{16\pi^2}{5}c^5$, claimed a "complete proof" of the Randall–Sundrum model and a "5D geometric leakage theorem". The second edition withdrew both in full, leaving **only an observation about the exponent structure c^5** . The 3rd edition turns that observation into a census. First, the exponent 5 of the quadrupole formula is forced. In $P = \frac{G}{5c^5}\ddot{Q}^2$ we have $[G\ddot{Q}^2]/[P] = L^5T^{-5} = (L/T)^5$ — once one decides to write the radiated power in terms of G and $\ddot{Q}$, no exponent other than 5 is possible. Second, the 5 and the $\frac{1}{5}$ inside that same formula are distinct roots. The exponent 5 comes from dimensional analysis, but the coefficient $\frac{1}{5}$ comes from an angular average over the sphere — verified numerically here as $\langle n_i n_j n_k n_l \rangle = \frac{1}{15}(\delta_{ij}\delta_{kl} + \delta_{ik}\delta_{jl} + \delta_{il}\delta_{jk})$, which is geometry of the same family as 4π . Third, this paper's own 5 and $\frac{1}{5}$ come from one and the same operation. $\int c^4 dc = \frac{c^5}{5}$ — that the exponent rises by one and that a coefficient $\frac{1}{5}$ appears are two faces of the same antiderivative. The quadrupole formula has two roots, this paper one. That the numbers look aligned is precisely because the breakdowns differ. Fourth, four of the c^5 s in this series share one root. The Planck power c^5/G (the only power constructible from G and c alone, and the one Planck quantity that contains no $\hbar$), the quadrupole formula ($\ddot{Q}^2/(5P_{\text{Pl}})$), the Planck time ($t_p = \sqrt{\hbar/P_{\text{Pl}}}$) and the causal-sphere entropy of Paper 65 ($S = \pi(P_{\text{Pl}}/\hbar)t^2$) — all are the same c^5/G . Fifth, exactly one c^5 does not belong to that family — this paper's. $\frac{16\pi^2}{5}c^5$ contains no G , and $[L^5T^{-5}]$ is neither a power nor a time nor an entropy. Four belong to a family of physical quantities; one is an artefact of calculus. Scope: a structural account within established physics (Layer 2). This paper contributes neither to the confirmation nor to the refutation of the RS model, and claims no new physical law or prediction.

Positioning of this paper (discipline): This paper offers a **structural interpretation** of established physical laws. It claims neither the discovery of new physical laws nor the proof of open problems. The relations shown are transformations of known expressions; the aim is to propose a structural reading of them. No claim contradicting established theory is made. **The appearance of the same number in several contexts is not treated as evidence of a common origin** (Papers 48, 86, 100, 115). **$m = 4\pi$ and the like are conventional choices within a system of units, not new facts about nature** (Papers 35, 38, 95). **The speed of light c is a constant, and integration with respect to c is not a physical operation** (withdrawn in the second edition; §1).

1. Introduction: the c^5 this paper manufactured

This paper integrated $E^2 = (4\pi c^2)^2 + (4\pi v c)^2$ formally with respect to c to obtain

$$\int E^2 dc = \frac{16\pi^2}{5} c^5 + \frac{16\pi^2 v^2}{3} c^3 + C.$$

The computation itself is elementary and correct. But as the second edition recorded, **c is a constant and integration with respect to c is not a standard physical operation** (Duff's 2002 criticism: the variation of a dimensionful constant carries no physical meaning on its own; only dimensionless ratios are measurable). **The first edition's justification — "integrating over the building material of spacetime to restore a geometric volume" — has been withdrawn.**

What the second edition left standing was only **"an observation about the exponent structure"**: that it **shares the same c^5** with the quadrupole formula (Paper 42), the Planck time (Paper 40) and the Planck power (Paper 44).

But "shares the same c^5 " is the phrasing this series must be most wary of.

The 3rd edition turns that observation into a census — writing which share a root and which do not.

2. The exponent 5 of the quadrupole formula is forced

Established Fact 2.1 (Dimensional analysis fixes the exponent uniquely)

The quadrupole formula for the power radiated in gravitational waves is

$$P = \frac{G}{5c^5} \ddot{Q}_{ij} \ddot{Q}_{ij}.$$

Counting dimensions (verified here): $[P] = ML^2T^{-3}$, $[Q] = ML^2$ so $[\ddot{Q}] = ML^2T^{-3}$ and $[\ddot{Q}^2] = M^2L^4T^{-6}$, while $[G] = M^{-1}L^3T^{-2}$. Hence

$$\frac{[G \ddot{Q}^2]}{[P]} = \frac{ML^7T^{-8}}{ML^2T^{-3}} = L^5T^{-5} = \left(\frac{L}{T}\right)^5.$$

The moment one decides to write the radiated power in terms of G and $\ddot{Q}$, no exponent other than 5 is possible. There is no room for choice — it is a "forced" number in the classification of the 3rd edition of Paper 38.

3. The 5 and the $\frac{1}{5}$ inside that formula are distinct roots

Established Fact 3.1 (The coefficient $\frac{1}{5}$ comes from an angular average over the sphere)

The coefficient $\frac{1}{5}$ of the quadrupole formula arises from **averaging the radiation over the full solid angle**. The fourth-order angular average of a unit vector $\boldsymbol{n}$ is

$$\langle n_i n_j n_k n_l \rangle = \frac{1}{15} (\delta_{ij} \delta_{kl} + \delta_{ik} \delta_{jl} + \delta_{il} \delta_{jk}),$$

verified here by quadrature over the sphere:

component	numerical	exact
$\langle n_1^4 \rangle$	0.199999	$1/5 = 0.200000$
$\langle n_1^2 n_2^2 \rangle$	0.066666	$1/15 = 0.066667$
$\langle n_1 n_2 n_1 n_2 \rangle$	0.066666	$1/15 = 0.066667$
$\langle n_1^3 n_2 \rangle$	0.000000	0

Contracted through the transverse-traceless projection, this average yields the $\frac{1}{5}$. The $\frac{1}{5}$ therefore comes from an integral over the sphere — geometry of the same family as 4π .

Corollary 3.2 (There are two roots inside $\frac{G}{5c^5}$)

The exponent 5: dimensional analysis (§2, forced).

The coefficient $\frac{1}{5}$: an angular average over the sphere (geometry).

They stand side by side in one expression, but come from different places. This is **the same work** as Paper 48's separation of the three factors of **2** in Gauss–Bonnet, and as the 3rd edition of Paper 17 giving each of three twos an address. **The 5 and the $\frac{1}{5}$ of $\frac{G}{5c^5}$ must not be read as "the same 5".**

4. This paper's 5 and $\frac{1}{5}$, by contrast, are one operation

Observation 4.1 (Two faces of one antiderivative)

The $\frac{16\pi^2}{5}c^5$ this paper produced comes from $\int c^4 dc = \frac{c^5}{5}$.

Here, the rise of the exponent by one and the appearance of the coefficient $\frac{1}{5}$ are two faces of the same antiderivative. One root.

The quadrupole formula has two roots; this paper has one. That the numbers "5 and $\frac{1}{5}$ " look aligned is precisely because the breakdowns differ. Looking aligned is exactly the reason to inspect the breakdown.

5. A census of the c^5 s — four share one root

Established Fact 5.1 (c^5/G is the only power constructible from G and c alone)

We have

$$\left[\frac{c^5}{G}\right] = \frac{(L/T)^5}{M^{-1}L^3T^{-2}} = ML^2T^{-3} = \text{power},$$

with the value $P_{P1} = c^5/G = 3.6283 \times 10^{52}$ W (computed here).

What deserves notice is that this is the one Planck quantity containing no $\hbar$. Length, time and mass all require $\hbar$; power alone closes with G and c .

Observation 5.2 (The four are the same c^5/G)

where it appears	form	root
Planck power (Paper 44)	$P_{\text{Pl}} = c^5/G$	the only power from G and c
Quadrupole formula (Paper 42)	$P = \ddot{Q}^2/(5P_{\text{Pl}})$	the same c^5/G (reciprocal)
Planck time (Paper 40)	$t_p = \sqrt{\hbar G/c^5} = \sqrt{\hbar/P_{\text{Pl}}}$	the same c^5/G (with $\hbar$ on top)
Causal-sphere entropy (Paper 65)	$S = A/4\ell_p^2 = \pi(P_{\text{Pl}}/\hbar)t^2$	the same c^5/G

Numerical check (computed here): $\sqrt{\hbar/P_{\text{Pl}}} = 5.3912 \times 10^{-44}$ s agrees with $t_p = \sqrt{\hbar G/c^5}$ to machine precision. And substituting $A = 4\pi(ct)^2$ and $\ell_p^2 = \hbar G/c^3$ into $S = A/(4\ell_p^2)$ gives $S = \pi c^5 t^2/(\hbar G)$, which with $\hbar = G = t = 1$ yields $S = \pi c^5$ (the form of Paper 65).

These four are therefore not "different quantities sharing a number". They are one quantity. This series usually splits one number into distinct roots; here, conversely, four fold into one.

6. And exactly one c^5 does not belong to this family — this paper's

Corollary 6.1 (No G , and no dimension)

This paper's $\frac{16\pi^2}{5}c^5$ contains no G . Its dimension is $[c^5] = L^5T^{-5}$, which is neither a power, nor a time, nor an entropy.

The four belong to the family of the physical quantity c^5/G ; this paper's is an artefact of calculus. Two different things stand under one notation " c^5 ".

The second edition wrote that it "shares the same exponent structure". The 3rd edition withdraws that — it does not share it. The exponents agree because one was forced by dimensional analysis and the other was raised by one through integration; they did not become 5 for the same reason.

Nor, as the second edition already held, is there any ground for reading the exponents 5 and 3 as the spacetime dimensions 5 and 3 — an exponent and a count of dimensions belong to different categories (the same distinction the

3rd editions of Papers 28 and 06 drew in writing that "an exponent is not a dimension").

7. A concrete weight — gravitational waves really do approach the Planck power

Observation 7.1 (The peak luminosity of GW150914)

The peak power radiated at the merger of GW150914 is reported as $\sim 3.6 \times 10^{49}$ W. Computing the ratio here,

$$\frac{P_{\text{GW}}}{P_{\text{Pl}}} = \frac{3.6 \times 10^{49}}{3.6283 \times 10^{52}} = 9.92 \times 10^{-4} \approx \frac{1}{1000}.$$

An event in the universe reached one thousandth of the Planck power.

And what matters is that this is a dimensionless ratio. It is the same in every system of units (3rd edition of Paper 38: dimensionless ratios are the physics). The c^5 itself changes with the units; this 10^{-3} does not.

That this paper was drawn to c^5 in the first place was not the mistake.

The mistake was trying to manufacture one.

The c^5 was already there, carrying G with it, standing as the scale of power.

 **Personal reflection of the author (Layer 3; labelled non-scientific / no claim of mechanism)**

In the first edition I integrated over c , produced a c^5 , and wrote that it meant five dimensions. In the second I withdrew the justification for the integral and said that "**only an observation about the exponent structure remains**". I thought that had made me honest.

Doing the census for the 3rd edition, I found that **even that observation had been too generous. I had written "it shares the same c^5 ", and it does not.** Their c^5 carries G , has the dimension of power, and four of them fold into a single quantity. **Mine carries no G and has no dimension.** Two different things stood under one symbol.

And while computing, my hand stopped at one place. **The peak luminosity of GW150914 is one thousandth of the Planck power.** The c^5 I had been trying to manufacture by shuffling an equation **was already standing there, in the observations, at that order of magnitude.**

Being drawn to c^5 was, I think, not the mistake. The mistake was trying to make one myself. I should have gone and looked.

8. Scope / Conclusion

What is shown: that the exponent 5 of the quadrupole formula is forced by dimensional analysis (§2) / that the 5 (dimensional analysis) and the $\frac{1}{5}$ (angular average over the sphere) inside that formula are distinct roots (§3, $\langle nnnn \rangle$ verified numerically) / that this paper's 5 and $\frac{1}{5}$ are instead two faces of one operation, $\int c^4 dc$ (§4) / that the Planck power, the quadrupole formula, the Planck time and the causal-sphere entropy of Paper 65 all share the same c^5/G , and that c^5/G is the one Planck quantity containing no $\hbar$ (§5) / that this paper's c^5 alone contains no G , has no dimension, and does not belong to that family (§6, withdrawing the second edition's "shares the same exponent structure") / that the peak luminosity of GW150914 is about 1/1000 of P_{P1} (§7, a dimensionless ratio).

What is not shown (restraint): no proof, confirmation or refutation of the RS model — outside the scope of this paper (the first edition's "complete proof" was withdrawn in the second) / no "5D geometric leakage theorem" (withdrawn in the second edition) / no physical meaning is given to integration with respect to c (withdrawn in the second edition) / the exponents 5 and 3 are not read as the spacetime dimensions 5 and 3 / this paper's c^5 is not treated as sharing a root with the physical c^5 (withdrawn in §6) / no new physical law and no prediction (Layer 2).

What the 3rd edition adds is the census. Not stopping at "the same number occurs", but writing which share a root and which do not — and this time four folded into one, and exactly one was left outside.

The one left outside was the one this paper had made.

Revision Record

3rd edition (August 2026): removed the word "Withdrawal" from the title, which now names **what the paper shows**; the list of withdrawals is collected in this section.

Added in the 3rd edition: a demonstration that the exponent 5 of the quadrupole formula is forced by dimensional analysis (§2). A demonstration, by numerical verification of $\langle n_i n_j n_k n_l \rangle = \frac{1}{15}(\delta\delta + \delta\delta + \delta\delta)$, that the 5 and the $\frac{1}{5}$ in that formula are distinct roots — the $\frac{1}{5}$ being an angular average over the sphere, geometry of the same family as 4π (§3). An explicit statement that this paper's 5 and $\frac{1}{5}$ are instead two faces of the single operation $\int c^4 dc$ (§4). A census of the c^5 s, showing that the Planck power c^5/G , the quadrupole formula, the Planck time and the causal-sphere entropy of Paper 65 all share the same c^5/G , and that c^5/G is the one Planck quantity containing no $\hbar$ (§5, with $\sqrt{\hbar/P_{P1}} = t_p$ confirmed to machine precision). A computation of the peak luminosity of GW150914 as about 1/1000 of P_{P1} (§7). All numbers were computed here (no external tables consulted). The "(in preparation)" notes remaining on the self-citations were removed, all being published.

Withdrawn in the 3rd edition: the second edition retained the observation that "**the exponent 5 and the coefficient $\frac{1}{5}$ share the same exponent structure with the quadrupole formula and the Planck time**". **The 3rd edition withdraws it. They do not share it** — the physical c^5 is a single quantity carrying G (c^5/G), whereas this paper's contains no G and has no dimension, being an artefact of calculus. **The exponents agree because one was forced by dimensional analysis and the other was raised by one through integration; they did not become 5 for the same reason (§6).**

Withdrawn in the 2nd edition (July 2026):

1. **The claim to "completely prove the geometric substantiality" of the Randall–Sundrum model.** The RS model is a specific model defined by the warped metric $ds^2 = e^{-2kr|\phi|}\eta_{\mu\nu}dx^\mu dx^\nu + r^2 d\phi^2$, and **the appearance of c^5 from an integral over c establishes nothing about its validity.**
2. **Treating integration with respect to c as a physical operation. The speed of light is a constant, not a variable.** As Duff (2002) pointed out, **the variation of a dimensionful constant carries no physical meaning on its own; only dimensionless ratios are measurable.** The first edition's justification ("integrating over the building material of spacetime to restore a geometric volume") was withdrawn.
3. **The "Yamagishi 5D geometric leakage theorem".** (1) The integral it presupposed had been withdrawn; (2) the "max" in $\lim_{\Delta E \rightarrow \max}$ was undefined; (3) no equation of motion corresponding to "leakage" existed; and (4) no derivation showed $16\pi^2$ acting as a conversion factor between dimensions. **Reading the exponents 5 and 3 as the spacetime dimensions 5 and 3 confuses a power with a count of dimensions.**

First edition: Zenodo 10.5281/zenodo.21430340.

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