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A No-Go Theorem for Single-Length Dimensional Gradings in Geometric Models of the Radiative Quantum

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Abstract

A recurring strategy in geometric approaches to quantum structure is to represent every physical quantity as a power of a single length, so that force, energy, wave and power appear as successive grades of one geometric parameter. Such a scheme is attractive because it renders the whole of mechanics visualisable. We show here that it carries a precise and unavoidable cost. Assigning to each quantity a rational grade in one length, we convert the requirement that a physical constant be constant into the requirement that its grade vanish and solve the resulting linear system. Three results follow. First, if distance carries grade one and energy grade three — the minimal conditions for a volumetric model in which energy is proportional to the volume of a quantum — then Planck's constant and the speed of light cannot both be of grade zero: the two requirements fix the grade of time at −3 and +1 respectively, and the system is empty. Second, if the volumetric condition is abandoned, there exists a one-parameter family of gradings in which h, c, k and σ are simultaneously constant, but in it the energy grade is the negative of the length grade, so that energy falls as the inverse of the quantum radius. Third, requiring in addition that Newton's constant be of grade zero forces every grade to vanish, collapsing the scheme to triviality. The theorem accounts economically for a family of pathologies reported independently in such models — non-constant h and k, a radius-dependent propagation speed, an ambiguous Stefan–Boltzmann grade, and regions of negative absolute temperature — exhibiting them as five symptoms of one cause. We conclude that a single-length grading may serve as a bookkeeping device but cannot support the universal constants, and we identify the minimal enlargement that would be required.

Keywords: Dimensional Analysis; No-go Theorem; Fundamental Constants; Geometric Models; Quantum Topology

Abbreviations

AI: Artificial Intelligence; E: Energy; GBM: Gamma-ray Burst Monitor.

Introduction

Dimensional analysis is ordinarily conducted over four independent base dimensions — mass M, length L, time T and thermodynamic temperature Θ — together with the ampere, mole and candela. A recurring temptation in geometric reformulations of physics is to reduce this basis to one. If every quantity can be written as a power of a single length r, then force, energy, wave and power become successive grades of one geometric object, and the whole of mechanics acquires a picture. Constructions of this kind have appeared in topological and cosmological models of the radiative quantum bhattacharya, et al. [1-3], where the appeal is evident: an energy is a volume, a force is an area, and the relations among them are relations among shapes.

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The purpose of this note is to determine what such a reduction costs. The question is sharper than it may appear, because it is entirely decidable. A physical constant is a quantity whose value does not depend on the state of the system; in a grading, that is exactly the statement that its grade is zero. The demand that h, c, k, σ and G be constants therefore becomes a system of linear equations in the grades of the base quantities, and one may simply solve it. We do so below. The answer is negative, and the manner of its failure is informative.

Gradings

Let every physical quantity Q be assigned a rational number g(Q), its grade, such that $Q \propto r^{g(Q)}$ for a single length parameter r, and such that grading respects multiplication:

$$g(Q_1Q_2) = g(Q_1) + g(Q_2),\ g(Q^n) = n\,g(Q) \quad (1)$$

Write $\ell = g(L)$, $\tau = g(T)$, $m = g(M)$, $\theta = g(\Theta)$ and $e = g(E)$. Consistency of the mechanical definition of energy, $E = M L^2 T^{-2}$, requires

$$e = m + 2\ell - 2\tau \quad (2)$$

A quantity is a constant of the scheme precisely when its grade vanishes, since only then is it independent of r. The five constants of interest have the standard dimensional forms $h = E\cdot T$, $c = L/T$, $k = E/\Theta$, $\sigma = M T^{-3} \Theta^{-4}$ and $G = M^{-1} L^3 T^{-2}$, and so yield the grade conditions of Table 1.

Constant	Dimensional Form	Grade	Condition
h	$E \cdot T$	$e + \tau$	$e + \tau = 0$
c	L / T	$\ell - \tau$	$\ell = \tau$
k	E / Θ	$e - \theta$	$\theta = e$
σ	$M\,T^{-3}\,\Theta^{-4}$	$m - 3\tau - 4\theta$	$m - 3\tau - 4\theta = 0$
G	$M^{-1}\,L^{3}\,T^{-2}$	$-m + 3\ell - 2\tau$	$-m + 3\ell - 2\tau = 0$

Table 1: The requirement that each constant be genuinely constant, expressed as the vanishing of its grade.

The Volumetric Conditions

Geometric models of the type considered here share two structural commitments. The first is that the length parameter is itself the distance, so that $\ell = 1$. The second is that energy is proportional to the volume of the quantum, whence $e = 3$. We shall call these the volumetric conditions. They are not incidental: the second is what permits an energy to be identified with a region of space, and it is the assumption from which the spectral constructions of bhattacharya [1-3] are built. We now ask whether they are compatible with universal constants.

The Theorem

Theorem 1. In any grading satisfying the volumetric conditions $\ell = 1$ and $e = 3$, the constants h and c cannot both be of grade zero.

Proof. From table 1, the condition that h be constant is $e + \tau = 0$, which with $e = 3$ gives $\tau = -3$. The condition that c be constant is $\ell = \tau$, which with $\ell = 1$ gives $\tau = +1$. Since $-3 \neq +1$, no grading satisfies both. ≈. The two conditions are shown as lines in the (ℓ, τ) plane in figure 1. They are not merely difficult to satisfy jointly; they are parallel to nothing and meet nowhere on the line $\ell = 1$, being separated by exactly four grades. The separation is the same quantity that appears in the discrepancy of the Stefan–Boltzmann grade discussed in Section 6, and for the same reason: it is the gap between the grade a scheme must assign to time if action is to be constant and the grade it must assign if velocity is to be constant.

Corollary 1. Under the volumetric conditions, at most one of the following may hold: that the propagation speed is the same for all quanta, or that the ratio of energy to frequency is the same for all quanta. This is worth stating separately because both are experimentally established to high precision. Vacuum dispersion is constrained by the simultaneous arrival of photons of widely differing energy from distant astrophysical sources, and the constancy of E/ν is established across some fourteen orders of magnitude in frequency, Abdo, et al and Millikan [4,5]. A model obliged to sacrifice one of them is in difficulty regardless of which it chooses.

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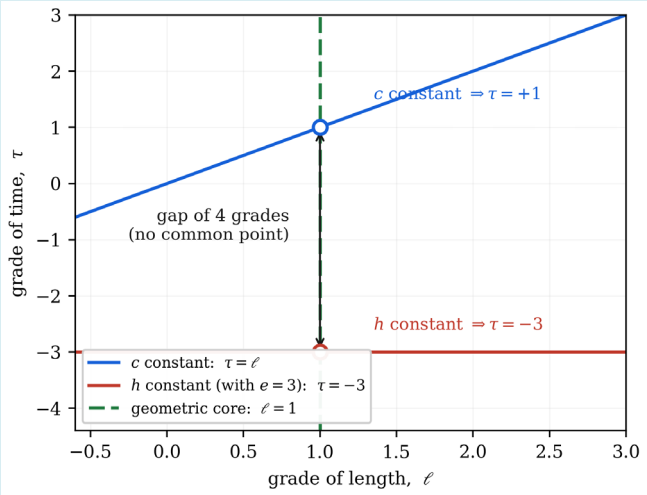


Figure 1: The two constancy conditions in the (ℓ, τ) plane. On the line $\ell = 1$ required by the volumetric conditions, a universal c demands $\tau = +1$ and a universal h demands $\tau = -3$. There is no common point.

Abandoning the Volumetric Conditions

It is natural to ask what happens if the volumetric commitment is relaxed. Solving the four conditions for h, c, k and σ jointly with equation (2), and leaving ℓ free, gives a one-parameter family:

$$\tau = \ell, \; e = \theta = m = -\ell \qquad (3)$$

Two observations follow. The first is favourable: the σ condition is automatically satisfied by any member of the family, so that once h, c and k are made constant, the Stefan–Boltzmann constant is constant as well. This is the grading counterpart of the familiar fact that $\sigma = 2\pi^5 k^4/(15c^2h^3)$ is not an independent constant but a combination of the others, Planck [6].

The second observation is fatal to the geometric programme. In every member of the family the energy grade is $e = -\ell$. If length carries positive grade, energy carries negative grade: energy falls as the quantum grows. The volumetric identification of energy with a region of space — the very assumption that gives such models their content — requires $e = +3$ with $\ell = +1$, which lies off the family. The constants may be recovered, but only by discarding the geometry they were meant to explain.

Gravitation Forces Triviality

Theorem 2. If in addition Newton's constant is required to be of grade zero, then $\ell = \tau = e = \theta = m = 0$.

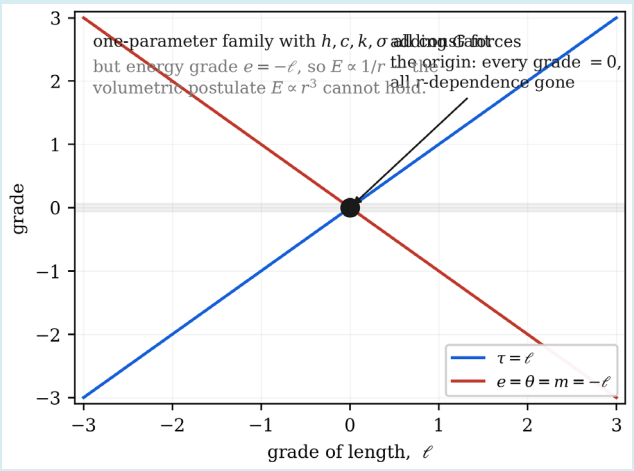


Figure 2: The one-parameter family of gradings admitting constant h, c, k and σ, and the collapse to the trivial grading when G is included.

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Proof. Substituting the family (3) into the G condition of table 1 gives $-(-\ell) + 3\ell - 2\ell = 2\ell = 0$, whence $\ell = 0$, and every remaining grade vanishes with it. ≈. The content of Theorem 2 is that a grading admitting all five constants assigns grade zero to everything, so that no quantity depends on r at all. The scheme survives only by ceasing to be a grading figure 2 displays the family and its collapse.

One Cause, Five Symptoms

The theorem has diagnostic value. A number of pathologies have been reported in single length constructions and have generally been treated as separate difficulties requiring separate remedies. Table 2 shows that they are consequences of the same structural fact, exhibited for the grading $\ell = 1$, e = 3, τ = −2, m = −3, θ = 2 employed in, bhattacharya [1].

Reported Symptom	Grade Condition Violated	Consequence
Action not constant	e + τ = 0 (here 3 − 2 = 1)	E·L spreads by 25.7×
Boltzmann constant not constant	θ = e (here 2 ≠ 3)	k = E/T varies as r
Propagation speed varies	ℓ = τ (here 1 ≠ −2)	$c \propto r^3$, a factor 3.46
σ grade ambiguous	time and temperature differ by 4	+11 by one route, −5 by another
Negative absolute temperature	entropy degenerate with action	$\partial E/\partial \Sigma < 0$ above mid-range

Table 2: Reported pathologies of a single-length grading, with the grade condition each violates. Numerical spreads refer to the seven-quantum construction of bhattacharya [1].

The fourth row deserves comment, since it is the clearest diagnostic. In a single-length grading, time and temperature receive grades τ and θ which are in general unequal. Any expression in which the two appear — and the Stefan–Boltzmann relation is one, carrying temperature to the fourth power against an exitance carrying inverse time cubed — will therefore return different grades according to the route by which it is evaluated, the discrepancy being 4(θ − τ). For the grading of bhattacharya [1] this is 4(2 − (−2)) = 16, exactly the difference observed. The ambiguity is not an arithmetical slip but a structural feature: a scheme with one axis cannot keep two independent dimensions apart figure 3.

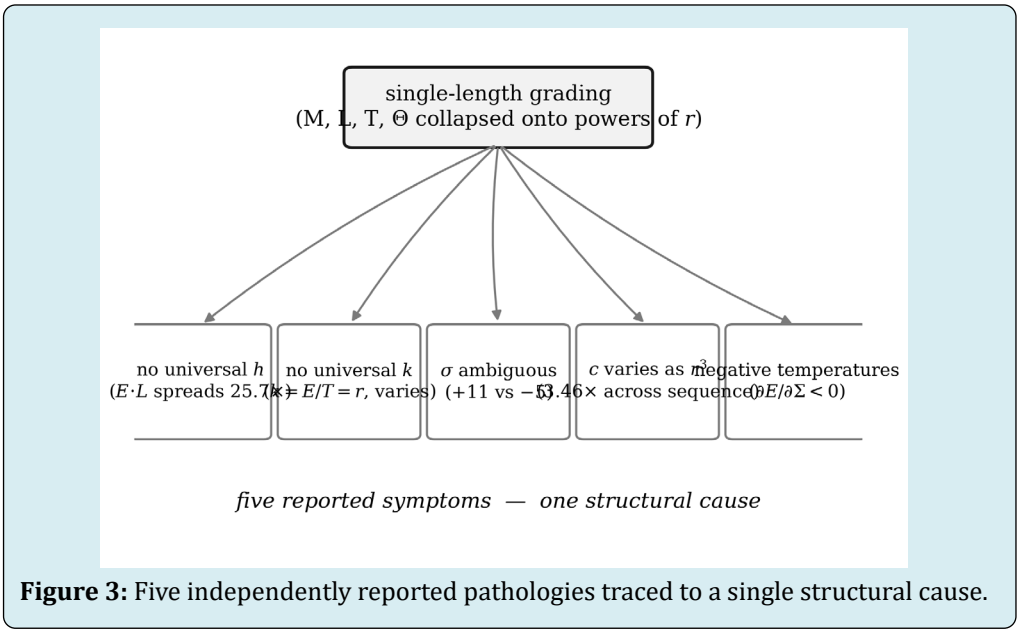


Figure 3: Five independently reported pathologies traced to a single structural cause.

What Would be Required

The theorem indicates its own remedy. What fails is not geometry but the reduction of the dimensional basis to a single axis. A grading over two independent parameters — a length and, say, a mass or an action scale — is not obstructed by the argument above, since the conditions of table 1 then define a solvable system rather than an over-determined one. The minimal enlargement is therefore to admit a second independent scale, at the cost of the visual economy that motivated the reduction in the first place.

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Nothing in the theorem bears on the geometric constructions themselves. Results concerning the shapes, volumes and symmetries of quanta — for instance the closed-form amplitude sequence Ai = hi (12 − hi)/ [4(8 − hi)] obtained for the seven-fold spherical partition in bhattacharya [1] — are statements about spheres and ellipsoids and are unaffected by the grading question. It is only the attempt to read physical constants off the grading that is obstructed Buckingham, et al. [7-10].

Conclusion

Representing all physical quantities as powers of a single length is a natural and appealing device, and within a fixed context it is a consistent bookkeeping. We have shown that it cannot carry the universal constants. Under the volumetric conditions that give such schemes their geometric content, Planck's constant and the speed of light cannot both be constant, their requirements on the grade of time differing by four. Relaxing the volumetric conditions restores h, c, k and σ together but inverts the energy–radius relation; adding gravitation collapses the scheme entirely. The pathologies reported piecemeal in the literature of such models are, we suggest, five aspects of this single obstruction, and no reinterpretation of the individual symptoms can remove it. The obstruction is removed only by enlarging the basis.

Declarations

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Data availability: The paper contains no experimental data. All results follow from the linear systems stated in Sections 2–6 and may be verified directly.

References

1. Bhattacharya C, Sahdev N (2026) A geometric–topological model of the space quantum.
2. Bhattacharya C (2023) Adv Theor Comput Phys 6(1): 1-9.
3. Bhattacharya C (2023) Global J Sci Front Res 23: 13.
4. Abdo AA, Ackermann M, Ajello M, Asano K, Atwood WB, et al (2009) A limit on the variation of the speed of light arising from quantum gravity effects. Nature 462: 331-334.
5. Millikan RA (1916) A Direct Photoelectric Determination of Planck's "h". Phys Rev 7: 355-388.
6. Planck M (1901) Quantum Field Theory. Ann Phys 309: 553-632.
7. (2019) Bureau International des Poids et Mesures. 9th(Edn.), The International System of Units (SI).
8. Buckingham E (1914) On Physically Similar Systems: Illustrations of the Use of Dimensional Equations. Phys Rev 4: 345-376.
9. Maxwell JC (1873) A Treatise on Electricity and Magnetism. Clarendon Press Oxford 1.
10. Carathéodory C (1909) Untersuchungenüber die Grundlagen der Thermodynamik. Math Ann 67: 355-386.

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