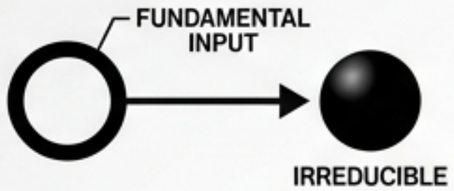
A PHYSICAL ORIGIN OF ELECTRIC CHARGE

MATHEMATICAL DERIVATIONS OF THE P63 FRAMEWORK DERIVED FROM THE BIG FLARE-UP THEORY (BFUT)

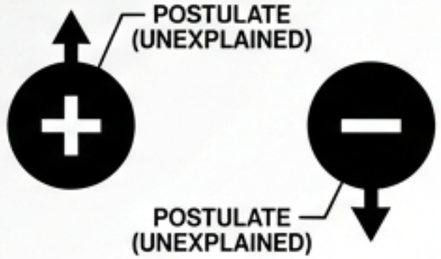
The Axiom Matrix: What is Electric Charge?

Standard Model

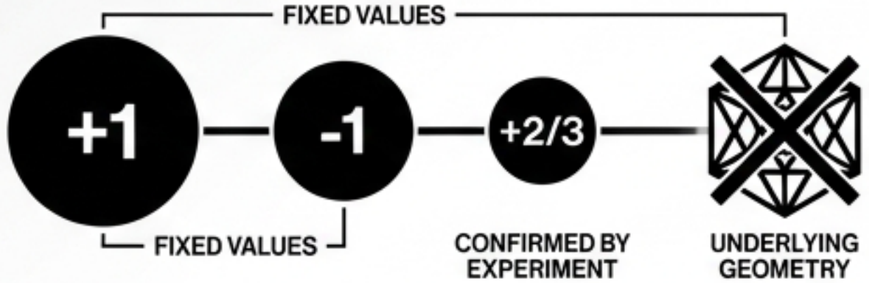
Nature of Charge: Fundamental, irreducible input parameter.



Sign Origin (+/-): Postulate (unexplained).

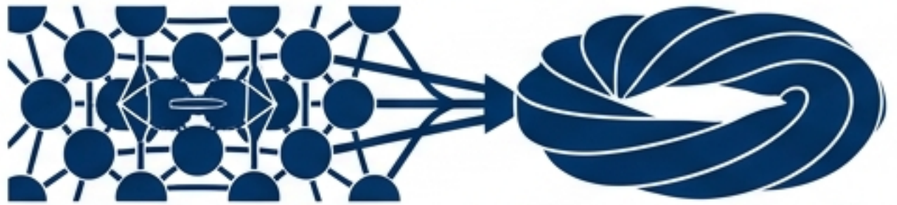


Charge Quantization: Fixed values (e.g., , +1, –1, +2/3) confirmed by experiment, derived from no underlying geometry.

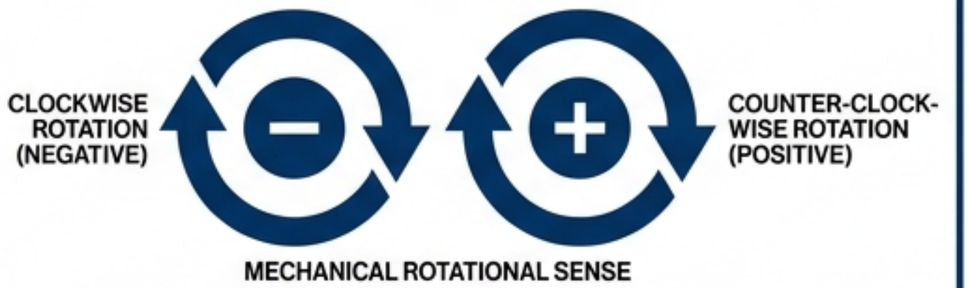


BFUT-P63 Framework

Nature of Charge: Derived topological consequence of substrate condensation.

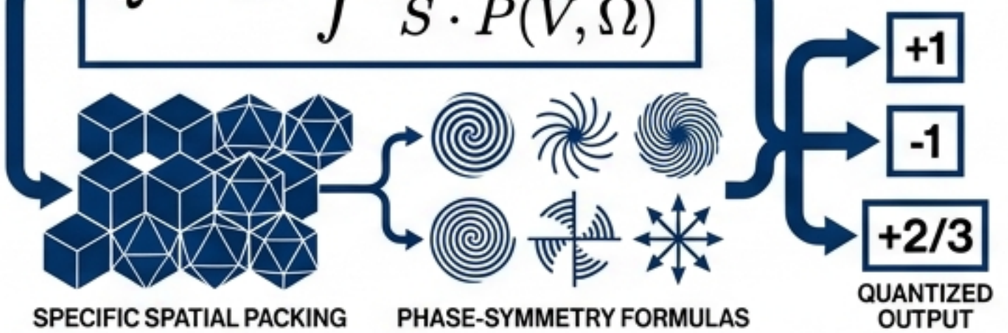


Sign Origin (+/-): Mechanical rotational sense (Clockwise vs. Counter-clockwise).



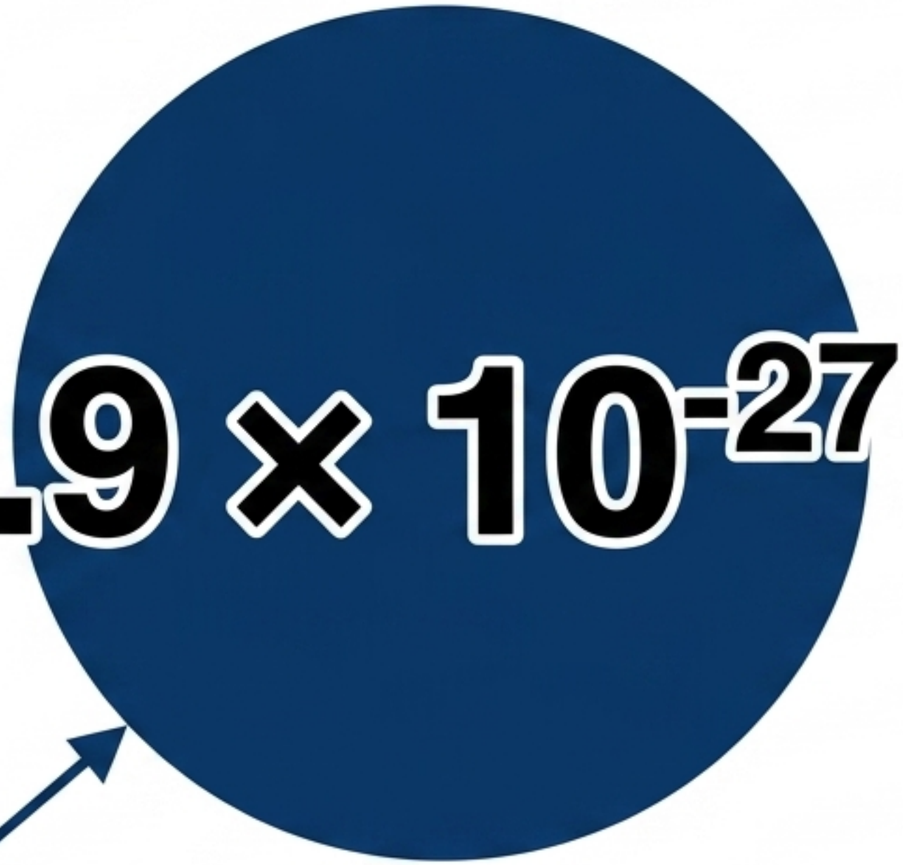
Charge Quantization: Output of specific spatial packing and phase-symmetry formulas.

$$Q = k \cdot \oint \frac{(\partial\varphi + A)dV}{S \cdot P(V,\Omega)}$$



The Foundational Axiom

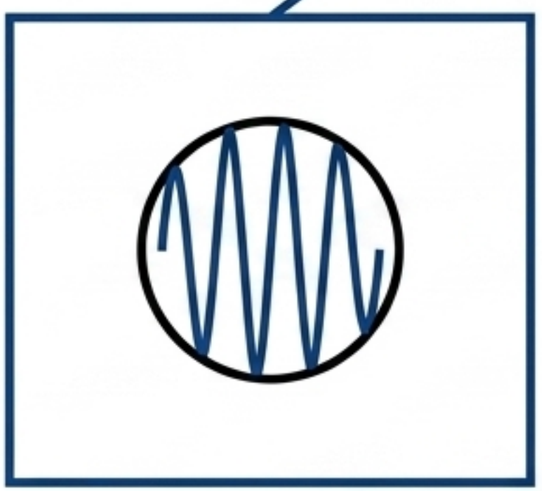
$$\rho_s = 5.9 \times 10^{-27} \text{ kg/m}^3$$



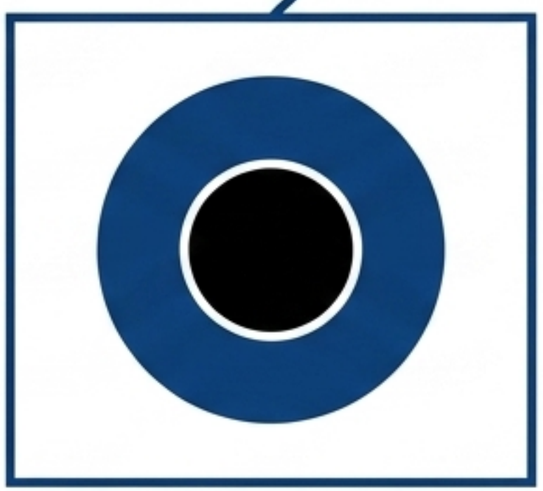
The Intrinsic Equilibrium Density. This is the sole independent substrate parameter from which all subsequent charge geometries, masses, and fractional assignments are mathematically derived. No other inputs are required.

The Condensation Functional (The Stability Engine)

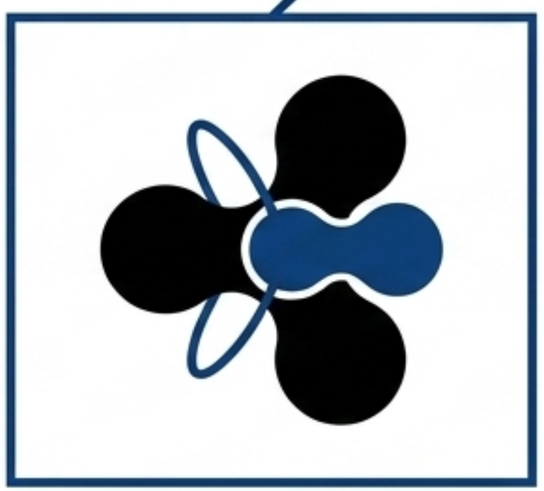
$$E(R) = A/R^2 + B \cdot R^2 + C \cdot R + D/R$$



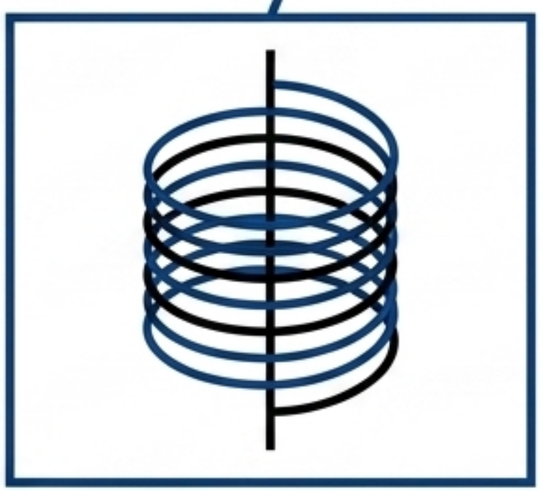
A/R^2: Localisation cost. $A = 1/2$.



$B \cdot R^2$: Bulk elastic cost of compressing the outer void.



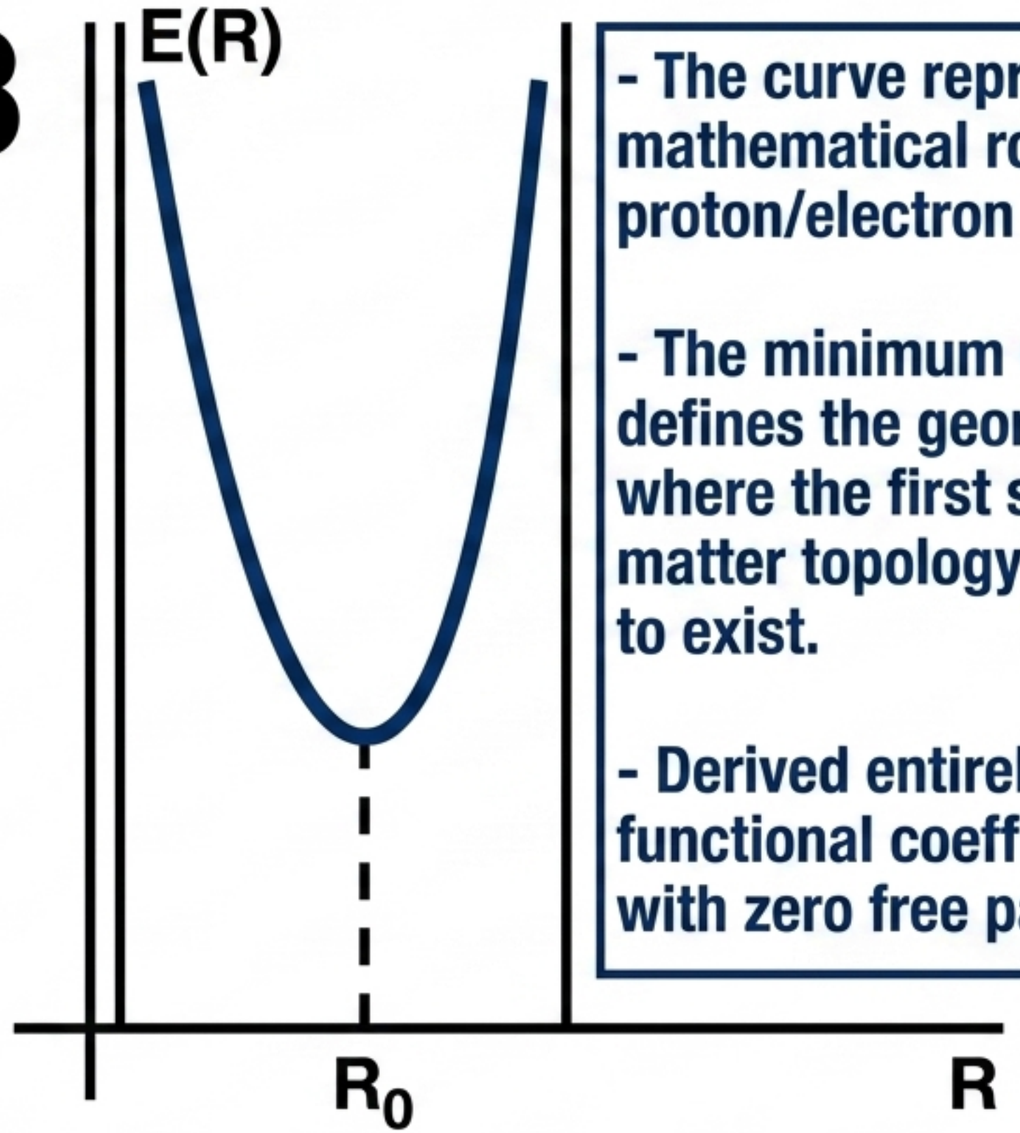
$C \cdot R$: Surface boundary release. $C = -1/3$ (exact derivation).



D/R: Internal circulation topological phase winding. $D = 1$ (exact derivation).

The Condensation Minimum

$$R_0 = 1.27348$$



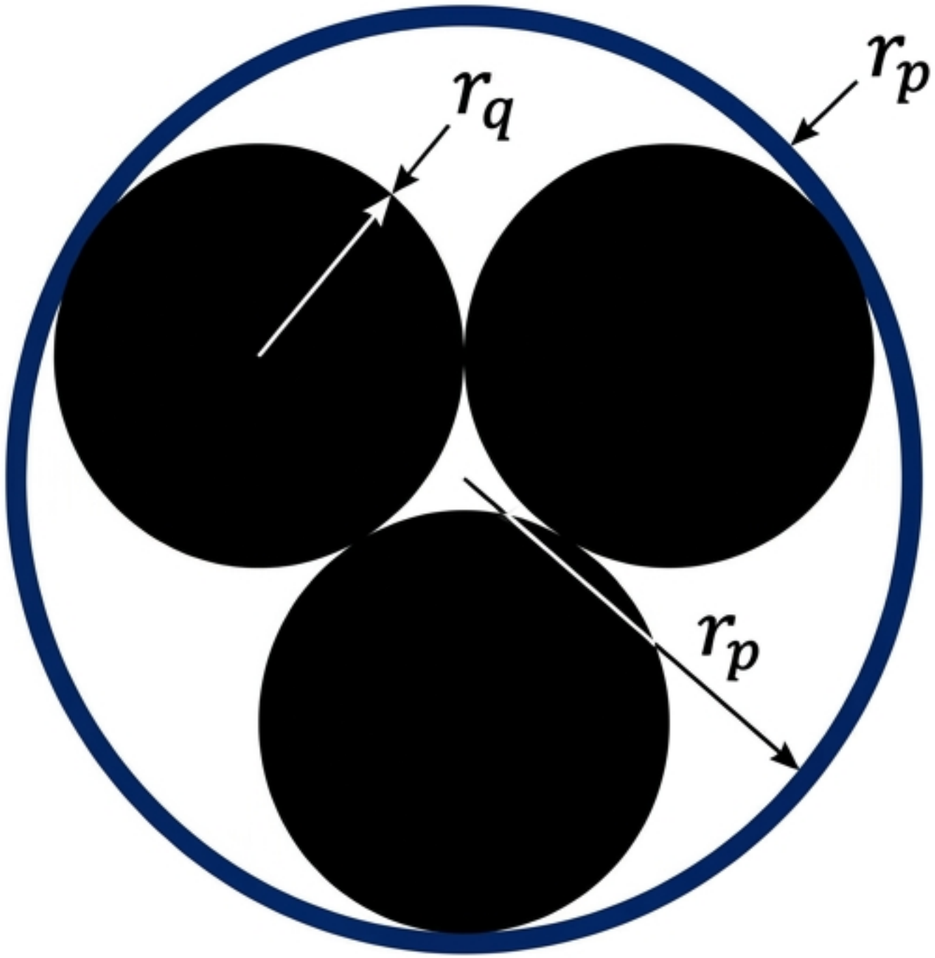
- The curve represents the mathematical root of the proton/electron scale.

- The minimum explicitly defines the geometry where the first stable matter topology is forced to exist.

- Derived entirely from the functional coefficients, with zero free parameters.

The Geometric Packing Formula

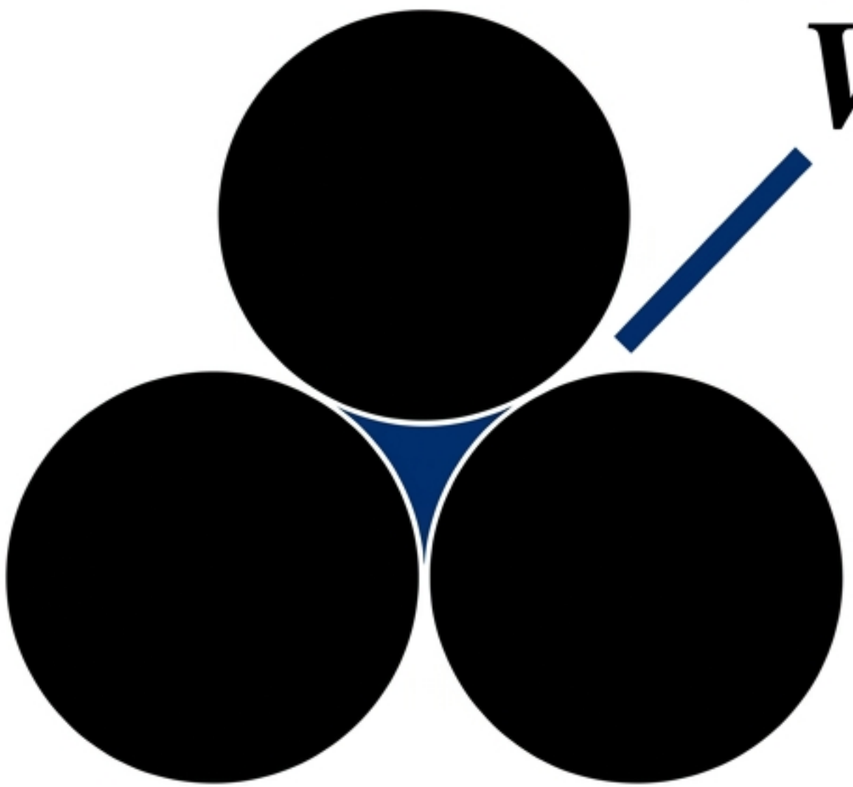
$$r_q = r_p/(1 + 2/\sqrt{3}) = 0.3905 \text{ fm}$$



The spatial constraints of the proton 3-core. Three co-rotating substrate units converge into close-packed contact, proving the exact mathematical size of the internal components (r_q) relative to the measured proton charge radius ($r_p = 0.8414$ fm).

The Interstitial Void Formula

$$\frac{V_{gap}}{V_q} = \frac{2\sqrt{3} - \pi}{4\pi/3} = 0.0770$$

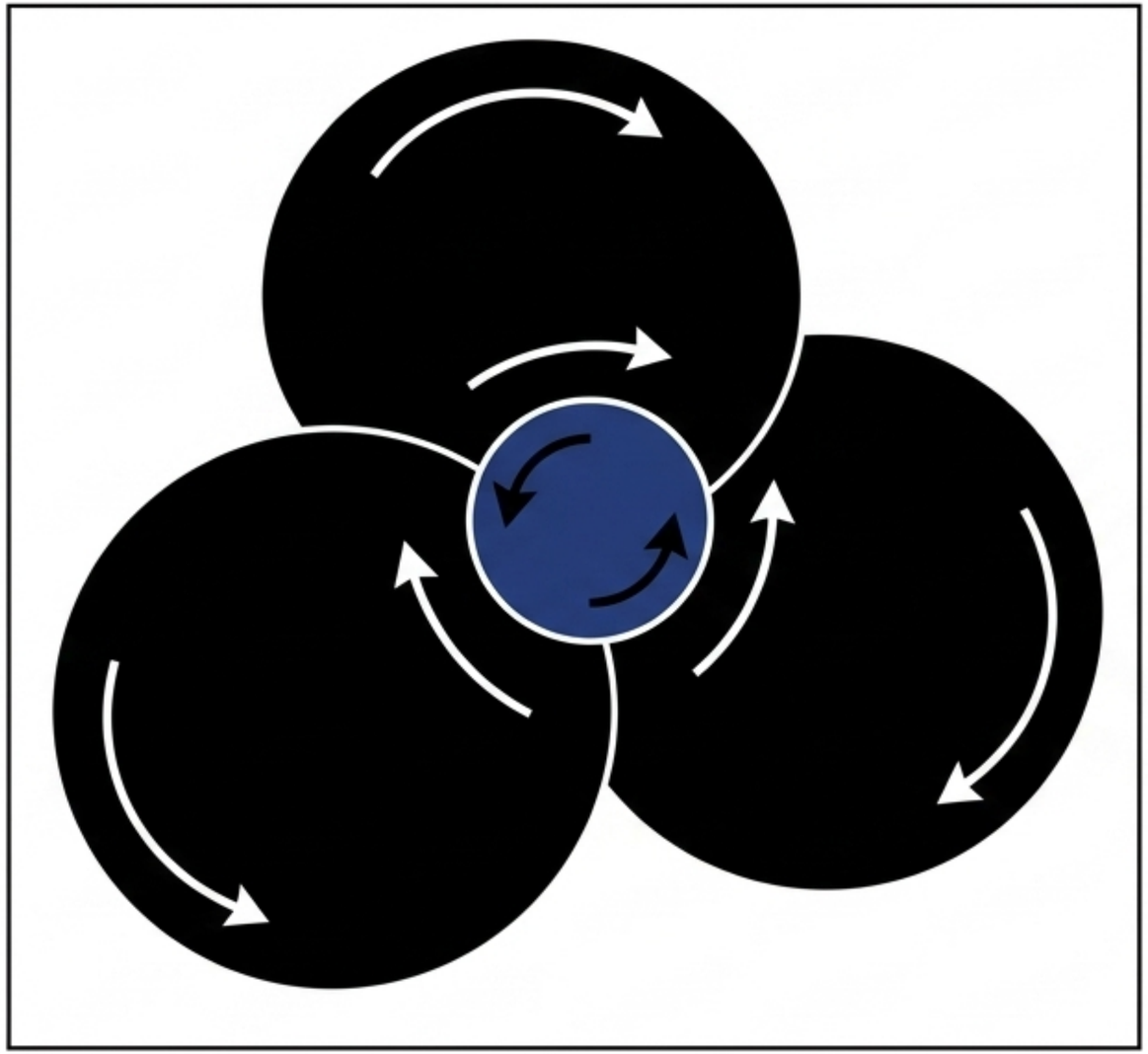


The mathematical necessity of the expelled electron.

This exact geometric volume fraction is left between the three close-packed spheres. As the quarks converge, the substrate is squeezed outward. The fraction 0.0770 is a pure geometric constant with no free parameters.

The Kinematics of Charge (The Gear Mechanism)

Topological Mapping: Co-Rotation = Positive (+) | Counter-Rotation = Negative (-)

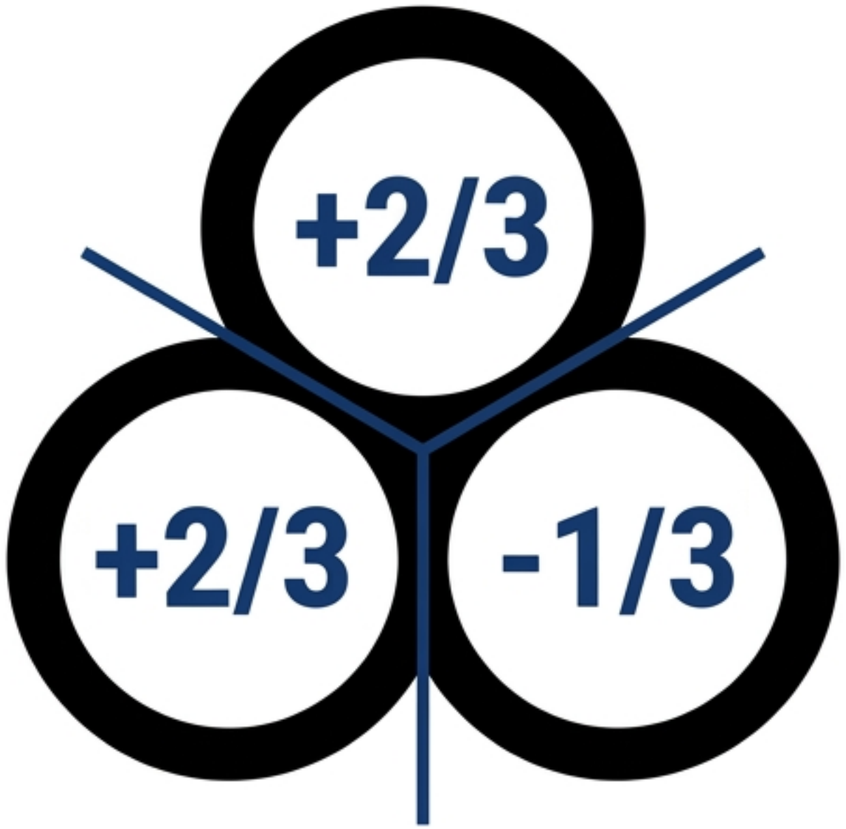


Three co-rotating substrate units converging into close-packed contact mechanically expel a fourth interstitial unit.
Rigid-body mechanics forces the expelled unit to acquire counter-rotation.

Opposite charge is not an assigned postulate; it is a single mechanical consequence of gear-ratio kinematics.

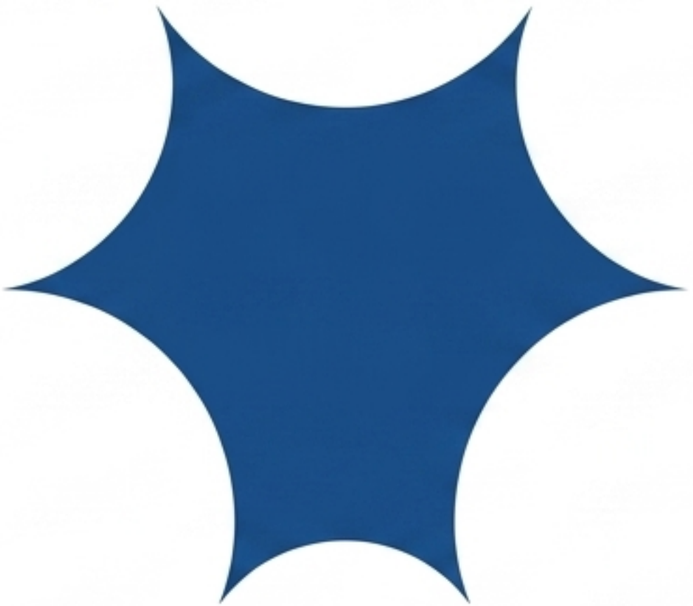
The Origin of Fractional Charges

Retained Core Phase Mapping: +2/3, +2/3, -1/3



The mathematical 3-fold phase symmetry perfectly divides the +1 internal circulation of the retained core. Two phases contribute a positive partial role, and one phase contributes a negative partial role. This produces specific quark fractions in a two-to-one ratio matching the physical symmetry itself.

The Electron Mass Identity



$$\frac{m_e}{m_p} = \frac{1}{(6\pi^5)}$$

The geometric consequence of expulsion.

The geometric consequence of expulsion. Deriving the exact mass ratio (matching the measured 0.511 MeV to extreme precision) strictly from the V_{gap} interstitial geometry. Pure math to pure physical identity.

The Fine Structure Constant

ω_c^2: Internal rotational frequency from the condensation event.

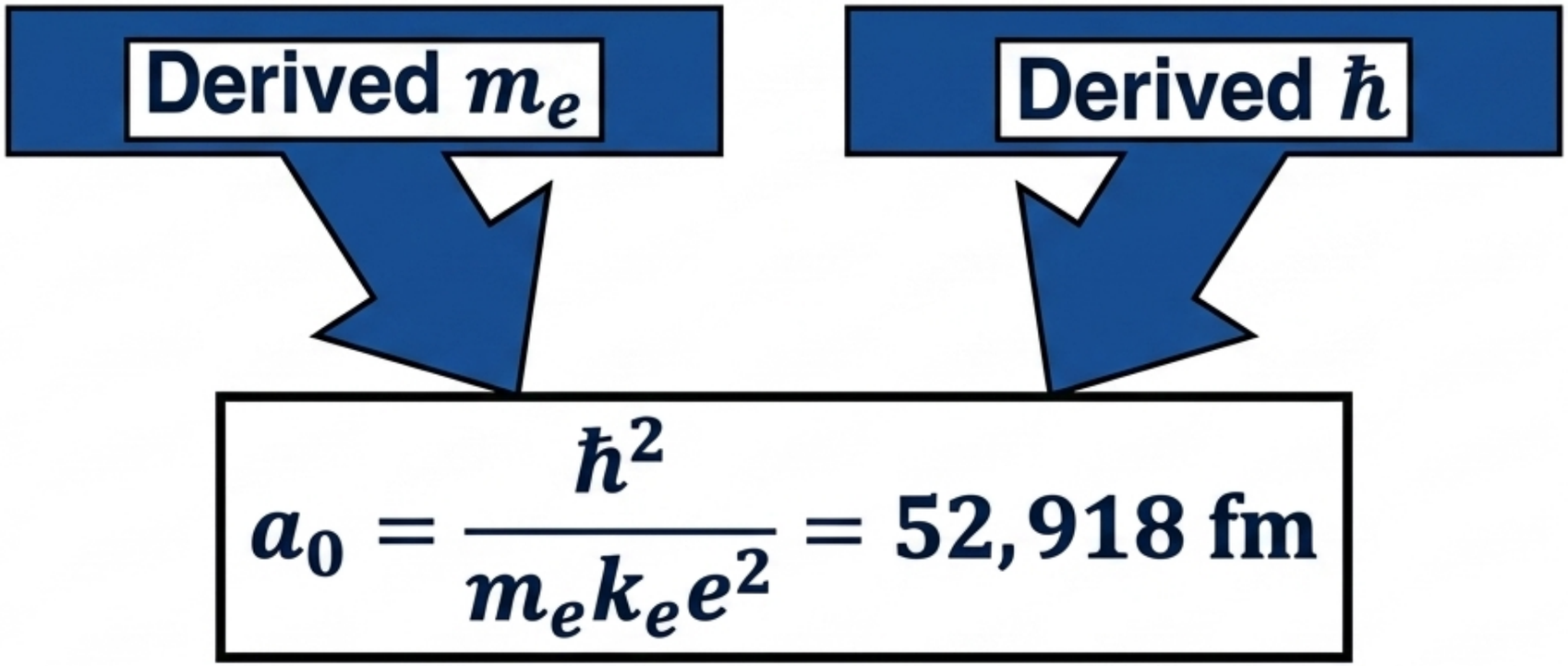
R_0^2: The condensation minimum geometry.

$$\alpha = \frac{\omega_c^2 R_0^2}{c^2} \approx 1/137.1$$

c^2: The total propagation energy limit.

The exact numerical strength of the electromagnetic interaction is defined as the ratio of the rotational energy stored at the condensation's interface to its total propagation energy.

The Bohr Radius: Atomic Scale Derived from Charge Geometry

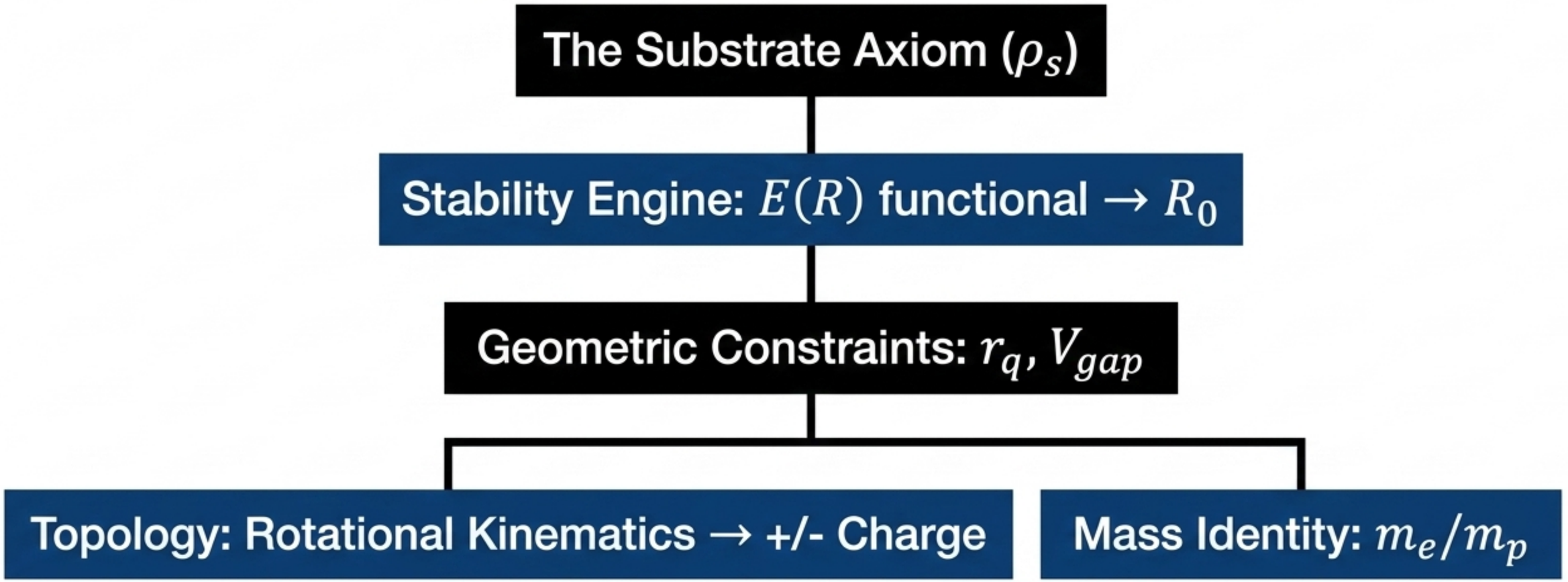


Substituting the geometrically derived m_e and the substrate-derived $\hbar$ yields the hydrogen ground state strictly from the underlying substrate density. The atomic scale is a direct consequence of ρ_s.

Journal Blueprint

Synthesis: The Equation Tree

How a single numeric anchor cascades through pure geometry to forge the sign and magnitude of electric charge.



Falsifiable Prediction: Unbreakable Equality

$$|+q_{\_proton}| \equiv |-q_{\_electron}|$$

The exact equality of positive and negative elementary charge magnitude is an unbreakable mathematical constraint of P63. Both signs are outputs of a single geometric formula (the expulsion event), not two independent variables. Any observed asymmetry would falsify this framework.