

# Addendum 292: Quark Scoping and the Derivation Frontier

The lepton law is lepton-specific; universal first-order  
coupling excluded; the selection rule is the remaining step

TOE Corpus

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**Skill:** gap-closure v1.1 — **Outcome:** Case B (decisive negative scoping + a route exclusion;  
the open core sharpened) — **Addresses:** OI-287-1 (sharpened, kept open) — **Verifier:**  
verify\_P292.py — all PASS

## Abstract

Q2 of the closure program, both halves, both honest. *(i) Quark extension: fails, decisively.* Inverting the A287 law against PDG quark masses: the up-type sector would require coefficients  $c = (-49.1, -81.2)$  (MS-bar top:  $-79.3$ ) and the down-type  $c = (119.5, 58.1)$  — wrong signs (both quark sectors need *rising* exponents where leptons fall), wrong magnitudes, wrong ordering (down-type's would have to *decrease* with level), and no small-integer structure. The verdict is unambiguous: **the correction law is a charged-lepton law**. Plausible reasons are noted without weight (QCD dressing and scheme dependence pollute the bare comparison; color may enter the operator differently), but no rescue is attempted: the corpus scopes the law to the sector where it is parameter-free and  $10^{-4}$ -exact. *(ii) Derivation attempt: the universal route is excluded.* If the law arose from a single perturbation  $gW(x)$  of  $\hat{O}$  at first order, the required relative eigenvalue shifts ( $\varepsilon_2 - \varepsilon_1 = -0.0126$ ,  $\varepsilon_3 - \varepsilon_1 = -0.1084$ , ratio 8.58) would equal  $g \Delta_n[\langle \psi | W | \psi \rangle / \lambda]$ . Computed for eight corpus-natural candidates ( $\rho$  and each layer component,  $x$ ,  $x^2$ ,  $x(1-x)$ ,  $V_{\text{obs}}$ ): every ratio lies in 1.20–1.84 — a factor  $\geq 4.7$  short. **No universal first-order perturbation produces the law.** What survives is the reading the law's own form suggests: *level-selective* coupling — family  $n$  couples to *its* layer component  $\rho_{\ell(n)}$  with one universal strength — which reproduces the form by construction and leaves exactly two things underived: the selection rule  $\ell(n)$  (edge→boundary→bulk with rising mass) and the strength  $\kappa\Omega/\lambda_1$ . OI-287-1 is restated in this final form. The closure program's Q2 ends: extension scoped negative, derivation localized to a named missing mechanism.

## 1 Quark Scoping

**Proposition 1.1** (Required coefficients). *With the A281 spectrum and PDG masses: up-type ( $u, c, t$ ) requires  $\beta_2 = 5.630$ ,  $\beta_3 = 6.198$  (pole top; 6.165 MS-bar) — exponents rising where the lepton law falls — equivalent to  $c_2 = -49.1$ ,  $c_3 = -81.2$ . Down-type ( $d, s, b$ ) requires  $\beta_2 = 2.645$ ,  $\beta_3 = 3.732$ , i.e.  $c_2 = 119.5$ ,  $c_3 = 58.1$  — positive but inverted in order and an order of magnitude beyond the density coefficients. No assignment of (2,3,16), no sign convention, and no anchor choice reconciles either sector. The law does not extend; it is scoped to charged leptons, where it stands at  $10^{-4}$  with zero free parameters (A287).*

## 2 The Derivation Frontier

**Proposition 2.1** (Universal first-order coupling excluded). *A perturbation  $H \rightarrow H + gW$  shifts  $\ln(m_n/m_e)$  by  $\beta(\varepsilon_n - \varepsilon_1)$  with  $\varepsilon_n = g\langle\psi_n|W|\psi_n\rangle/\lambda_n$ . The law requires the level-3-to-level-2 shift ratio 8.58. Numerically (eigenvectors at  $N = 2000$ ):  $W = \rho_{\text{edge}}$  gives 1.29;  $\rho_{\text{bnd}}$  1.43;  $\rho_{\text{blk}}$  1.68; full  $\rho$  1.63;  $x$  1.29;  $x^2$  1.43;  $x(1-x)$  1.20;  $V_{\text{obs}}$  1.84. All excluded by factor  $\geq 4.7$ . The deficit is structural: expectation values of smooth positive weights grow too slowly with level to produce the bulk-coefficient jump.*

**Remark 2.2** (OI-287-1, final form). *The surviving route is the one the law’s algebra already encodes: family  $n$  couples only to its layer component, with the universal strength  $\kappa\Omega/\lambda_1$  and coefficient  $c_{\ell(n)}$  read off  $\rho$ . Two objects remain underived: the selection rule (why generation index maps to layer depth — heaviest to bulk, anchor to edge; consonant with the corpus’s inward-mass intuition and with A289’s chord voicing, derived from neither) and the strength. A derivation must produce both; nothing else is missing. Any future mechanism can be tested in one line against the pinned shifts  $(-0.0126, -0.1084)$ .*

**Verifier.** `verify_P292.py`: quark inversions for both sectors and both top conventions; the eight-candidate exclusion table with the 8.58 target; the pinned shifts; the scoping and sharpening assertions. All PASS.