Roundtable Discussion on Quark Masses and α_s

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Quark Masses

- Is there a “best” definition of quark masses? Or do different applications (e.g., heavy-light vs. quarkonium vs. Higgs BRs) naturally require their own definition(s)?

- A global fit automatically preserves correlations and (perhaps) information about tails of distributions, but can be cumbersome. Are there a ways to capture this information to make such information from the low-energy observables portable while still quoting m_b and m_c? For example, some sort of parametrized pdf?

- The relation

$$\frac{am_{c,\mathrm{lat}}}{am_{b,\mathrm{lat}}} = \frac{m_{c,\overline{\mathrm{MS}}}}{m_{b,\overline{\mathrm{MS}}}}$$

holds for mass-independent schemes. What property of staggered fermions protects its bare mass from power-law effects in a^{-1} and Λ_{QCD} (e.g., from renormalons or small instantons)? How do other bare lattice masses fare in this respect?

- How to does the meson-mass sensitivity to Λ (or m_b) and μ_π^2 complement determinations from semileptonic decays?

α_s and Perturbation Theory

- In published work relying on perturbation theory at scales such that $\alpha_s \approx 0.2–0.3$, what tests persuade you that PT works, i.e., that error estimates are robust?

- Given family of renormalized couplings, $\alpha_\nu(\mu)$, with parameter ν, a decay or scattering amplitude's perturbative series must have expansion coefficients that cancel the ν dependence analogous to the cancellation of μ dependence). It then follows, generically, that choosing ν to make α_ν smaller will, at the same time, increase the coefficients (so the sum stays the same, up to next order in α_ν). How then can a criterion such as $\alpha_\nu(\mu) < 0.1$ serve as a general rule of thumb?

- Is there an unbiased, practical way to diagnose a perturbative series—including choices of scheme and renormalization scale—to infer how reliable the series is?