

Flavour symmetry as the origin of the axion

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Motivated by recent interest in the connection between axions and flavour, we investigate a generic, generation-dependent $U(1)$ quark flavour symmetry, with emphasis on achieving maximal reduction in the number of free Yukawa parameters. We find that there are only two inequivalent Yukawa textures, each one giving rise to six physically distinct models. The $U(1)$ symmetries that generate these textures all have a QCD anomaly, and hence are PQ symmetries. The resultant axion has flavour-violating couplings to quarks, and in some cases the coupling to nucleons can be suppressed, rendering the axion nucleophobic.

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