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A Common Origin for the QCD Axion and Sterile Neutrinos from SU(5) Strong Dynamics

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We identify the QCD axion and right-handed (sterile) neutrinos as bound states of an SU(5) chiral gauge theory with Peccei-Quinn (PQ) symmetry arising as a global symmetry of the strong dynamics. The strong dynamics is assumed to spontaneously break the PQ symmetry, producing a high-quality axion and naturally generating Majorana masses for the right-handed neutrinos at the PQ scale. The composite sterile neutrinos can directly couple to the left-handed (active) neutrinos, realizing a standard see-saw mechanism. Alternatively, the sterile neutrinos can couple to the active neutrinos via a naturally small mass mixing with additional elementary states, leading to light sterile neutrino eigenstates. The SU(5) strong dynamics therefore provides a common origin for a high-quality QCD axion and sterile neutrinos.

Mini Symposia (Invited Talks Only)

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