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The Scale of Dark QCD

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Most of the mass of ordinary matter has its origin from quantum chromodynamics (QCD). A similar strong dynamics, dark QCD, could exist to explain the mass origin of dark matter. Using infrared fixed points of the two gauge couplings, we provide a dynamical mechanism that relates the dark QCD confinement scale to our QCD scale, and hence provides an explanation for comparable dark baryon and proton masses. Together with a mechanism that generates equal amounts of dark baryon and ordinary baryon asymmetries in the early universe, the similarity of dark matter and ordinary matter energy densities can be naturally explained. For a large class of gauge group representations, the particles charged under both QCD and dark QCD, necessary ingredients for generating the infrared fixed points, are found to have masses at one to two TeV, which sets the scale for dark matter direct detection and novel collider signatures involving visible and dark jets.

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