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Axion Quark Nuggets and Matter-Antimatter asymmetry as two sides of the same coin: theory, observations and future searches

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In this talk I want to discuss the (unorthodox) scenario when the baryogenesis is replaced by a charge separation process in which the global baryon number of the Universe remains zero. In this, the so-called axion quark nugget (AQN) dark matter model the unobserved antibaryons come to comprise the dark matter in the form of dense nuggets. In this framework, both types of matter (dark and visible) have the same QCD origin, form at the same QCD epoch, and both proportional to one and the same fundamental dimensional parameter of the system, which explains how the two, naively distinct, problems could be intimately related, and could be solved simultaneously within the same framework. In particular, I discuss several recent papers suggesting that we have been witnessing of such kind DM for years (even centuries). I will also discuss the broadband search strategy of relativistic axions which always accompany AQNs when they interacting with the Earth material. I will explain why a study of the daily modulations could be a powerful tool to discover such kind of relativistic axions.

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