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From Axions to ALPs in the Post-inflationary Scenario

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In the scenario in which the axion is born after inflation, the field develops significant inhomogeneity and evolves in a highly nonlinear fashion. Understanding the eventual abundance and distribution of axionic dark matter in this scenario therefore requires dedicated numerical simulations. Here, we go beyond the QCD axion, and perform a suite of simulations for a range of possible temperature dependencies in the axion mass growth, including the temperature independent axion-like particle case. We study the complex dynamics of the axion field's evolution, including the scaling of the axion cosmic string network, the decay of domain walls, and the lifetime of axitons; eventually leaving us with the seeds of miniclusters. Given the expanding experimental campaign to search for axions and axion-like particles, these simulations have potentially wide implications for present-day direct and indirect searches.

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