

Abstract Submitted  
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**Particle Methods in Numerical Cosmology** HUGH COUCHMAN,  
McMaster University — Particle methods play a central role in numerical simulations of cosmic structure. These methods are particularly important for simulations of two-component universes that include both baryonic and “dark matter.” Particles are used to model both the collisionless dark matter—using a classical inverse square law gravitational attraction—and, with Smoothed Particle Hydrodynamics (SPH), the baryonic component. Although Eulerian methods are also now widely used to model cosmological hydrodynamics, SPH exhibits many useful and important properties for cosmology: it is robust and simple to code, meshes well with the necessary particle representation of the collisionless dark matter and is able to model large density contrasts and irregular geometries easily and reliably. These methods have been used to model purely collisionless cosmic fluids with up to  $10^{10}$  particles and to model both baryonic and dark matter universes with approximately  $10^{8.5}$  particles.

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