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Dark Matter in Galaxies JOHN SCHRECK, State University of New York at Stony Brook, Stony Brook, NY — Swiss astrophysicist Fritz Zwicky was the first to hypothesize dark matter in 1933 by observing radial velocities of stars around the Coma cluster. He concluded that there had to be 'missing mass' in order for stars to be gravitationally bound. Today, dark matter is thought to comprise of approximately 20-25 percent of the mass in the universe but no one is quite sure just what it is. Resolving the dark matter 'problem' is crucial in understanding the structure of galaxies, which includes individual structure (including dark matter halos), clusters of galaxies, and evolution. One particular problem is that we can't see it. We infer its presence from gravitational effects, but what is it? The current theories that attempt to address its substantive qualities are hot dark matter, warm dark matter, cold dark matter, and baryonic dark matter. Cold dark matter seems to be the leading candidate because 1) it assumes stars are non-relativistic (so they stay bound within a galaxy), and 2) it is a description of how the universe went from a smooth initial state at early times, to the lumpy distribution of galaxies we see today. From a high energy point of view, the standard model must somehow also be compatible with dark matter. However, the perspective of some scientists is that dark matter does not exist, its mankind's limited understanding of how gravity works over very large distances.

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