ABSTRACT:

Eight decades of precise astronomical observations have presented physicists and astronomers with a profound cosmic mystery: only a small fraction of the matter in the universe appears to be in the form of familiar subatomic particles like protons, neutrons, and electrons. The remainder, aptly named dark matter, is invisible, and reveals itself only through its gravitational effects on stars, galaxies, and galaxy clusters across the universe. Motivated by these observations, experimental physicists have constructed extremely sensitive ground-based detectors that seek to detect dark matter particles through their interactions with ordinary nuclei. After decades of operation, however, these experiments have failed to return any convincing evidence of detection. Meanwhile, the astronomical evidence for the existence of dark matter has inspired generations of physicists to probe its possible identity at the forefront of theoretical particle physics research. In this talk, I will outline the vast evidence for the existence of dark matter, summarize direct and indirect dark matter detection experiments, and explain the basic structure of the theories particle physicists believe may offer an explanation for our universe’s mysterious dark matter.