



# SONDERKOLLOQUIUM

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## **The Quest for the Nature of Dark Matter: Status and Perspectives of Searches with Liquid Xenon TPCs**

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Dynamics of visible matter in galaxies and galaxy clusters, gravitational lensing, and, in particular, redundant cosmological measurements provide overwhelming evidence for the existence of a particle-like, non-luminous “dark” matter in the universe, which dominates luminous matter by a factor of  $\sim 6$ . Cosmological observations further tell us that Dark Matter is non-baryonic in nature and non-relativistic at the times of structure formation. No particle in the Standard Model matches the characteristics of the observed phenomenon, providing clear evidence for new physics. Many different Dark Matter models have been invented.

Weakly Interacting Massive Particles (WIMPs) comprise a wide and theoretically well-motivated class of hypothetical Dark Matter candidates. A large world-wide effort is ongoing, trying to measure their predicted feeble interactions with regular matter directly, using various techniques. The concept of a liquid xenon time projection chamber (TPC), operated in dual phase mode, has proven particularly successful in this pursuit. In this talk, I will provide an overview of the field and focus on the achievements, current status, and future prospects of the XENON Dark Matter search, as well as a longer term project called DARWIN. Time permitting, we may expand the view to other dark matter candidates and physics channels, such as solar neutrinos and coherent neutrino scattering. We may also glance at other applications of liquid xenon TPCs, such as for indirect Dark Matter searches, for neutrinoless double beta decay, or medical imaging.