

The "Towards the Next Fundamental Scale of Nature: New Approaches in Particle Physics and Cosmology" workshop was a gathering of leading scientists from around the world, held at the MITP in Mainz. The aim of the workshop was to bring together experts from both particle physics and cosmology to discuss new and innovative approaches towards uncovering the next fundamental scale of nature.

The program featured a diverse range of topics, including the latest developments in experimental particle physics and theoretical models of the universe. One of the highlights of the event was the presentation on axion searches, including talks from William DeRocco, who discussed "Hunting for axions in the solar basin", and Mario Reig, who presented on "Axion couplings in grand unified theories". Lorenzo Ubaldi spoke about "False vacuum decay in the thin wall approximation", providing a theoretical perspective on the topic.

In the realm of dark matter and dark sectors, Michael Baker presented on "Probing Dark Sectors with Evaporating Black Holes", while Toby Opferkuch discussed "Reheating with non-minimal couplings". Wei Xue presented on "Condensation and Evaporation of Boson Stars", and Weishuang Linda Xu spoke about "Cosmological Constraints on Light (but Massive) Relics". Ed Hardy's talk on "Gravitational waves from cosmic strings" and Soubhik Kumar's discussion on "Heavy axions as dark matter and baryogenesis candidates" rounded out the discussions on this topic.

Hyungjin Kim presented on "Alternative ways of QCD axion dark matter search with spectroscopy, interferometry, and accelerometry", while Marco Gorghetto discussed "Boson stars and dark matter substructure". Michael Geller provided a unique perspective with his talk on "Crunching Naturalness", and Nemanja Kaloper presented on "Rollercoaster Cosmology". Wolfram Ratzinger rounded out the discussions with his talk on "Spectral distortions from dark turbulence".

Walter Tangarife's discussion on "Sterile neutrino dark matter and neutrino self-interactions" and Dipan Sengupta's presentation on "Deciphering the behaviour of scattering amplitudes of theories of compactified extra dimensions" added to the discussions on particle physics and cosmology. Keisuke Harigaya presented on "Parity symmetry breaking scale and Standard Model parameters", while Gabriele Rigo discussed "a-Anomalous Interactions of the Holographic Dilaton". The event was rounded off with Saereh Najjari's presentation on "Composite Dark Matter and Neutrino Masses from a Light Hidden Sector".

The workshop emphasized interdisciplinary collaboration and provided a unique opportunity for researchers to share their latest findings and exchange ideas on new and innovative ways to tackle some of the most challenging questions in both fields. The event was a highly productive and exciting opportunity for the scientific community to learn about the latest developments in particle physics and cosmology,

network with their peers, and work together towards uncovering the next fundamental scale of nature.