

Plenary Talk

## HIGH ENERGY ASTROPHYSICS – STATUS AND PERSPECTIVES

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High-energy astrophysics explores the physics of astronomical objects that are characterised by high-energy and non-thermal processes. It explores cosmic objects such as supermassive black holes and exploding stars which produce extreme conditions that cannot be created in experiments on Earth. After introducing the basic concepts, I will explain which underlying physics we *can probe* and what fundamental new physics we *hope to learn* by studying the most extreme physics laboratories of the cosmos. I will demonstrate how the propagation of gamma rays probes the structure of space-time, intergalactic magnetic fields, cosmic star formation history, and the thermal history of the universe. I review our understanding of particle acceleration at supernovae and which dynamical effects these cosmic rays have on the interstellar medium and on galaxies. Finally I provide an overview of energetic processes associated with accreting super-massive black holes and explore their dynamical and thermal impact on galaxy formation at the massive end.