

- **Johannes Knapp** (DESY Zeuthen, Germany): *Measuring astroparticles*

In my lectures I will introduce the following topics:

- Astroparticle Physics: the high-energy frontier
- Air showers as a means to record high energy cosmic ray particles
- Interactions of particles and radiation with matter as basis of particle detection detector basics for all
- Detection principles and challenges for cosmic rays from  $10^{14}$  -  $10^{20}$  eV cosmic ray composition and the energy limit, charged particle astronomy
- Detection principles and challenges for gamma rays from  $10^8$  -  $10^{15}$  eV
- Gamma Ray Astronomy, the success story of the past 30 years.
- The era of multi messenger measurements: cosmic rays, photons, neutrinos and gravitational waves are linked.
- Air shower simulations with the CORSIKA program: capabilities and limitations.
- Relativistic kinematics: How to deal with relativistic particles?