ISAPP 2012 lecture:
From particle physics to astroparticle physics.

1) Historical introduction.
Particle physics has actually started in the heavens, with the detection of charged cosmic rays. Because the experimental conditions are not under control in the skies, particles were accelerated in the laboratory and huge machines have been built, allowing to discover how the subnuclear realm is organized.

2) I will rapidly review the standard model -- in particular the Weinberg-Salam electroweak theory -- and present a few possible extensions to the standard lore, which are currently tested at the LHC.

3) In the late 70's and early 80's, the behaviour of heavy neutrino-like species was studied in a cosmological setting. I will discuss the WIMP miracle, i.e., a nice coincidence which makes any weakly interacting and massive particle (WIMP) a potential candidate to the dark matter of the universe, provided it is stable. WIMPs have also been introduced to solve the solar neutrino deficiency, hence a potential relation with stellar evolution.

4) From the mid 80's until now, astroparticle physics has been a growing field of activity, driven in great part by the quest of the nature of the astronomical dark matter. This search has triggered many technical developments and new instruments have been invented, with refined methods. I will discuss the direct and indirect signatures of the dark matter species and review the experiments which track them in outer space, underground and even inside the ice cap of the South Pole.

5) The above-mentioned developments have seen the birth of a high-energy gamma ray and neutrino astronomy. I will present the recent investigations through this new window. Huge arrays of ground detectors allow to probe the cosmic radiation at the highest possible energies.