The 2020 Gordon Godfrey workshop on Astroparticle Physics

30 Nov. to 4 Dec. 2020 https://indico.cern.ch/event/887490

Meeting Purpose:

- Increase awareness of astroparticle physics in Australia

Astroparticle Physics: Intersection of astrophysics and particle physics

Email list - `ozastroparticle.physics@list.adelaide.edu.au`
Sign up - https://list.adelaide.edu.au/mailman/listinfo/ozastroparticle.physics

Coming in 2021: Joint AIP/ASA Group for Astroparticle Physics (GAP)

- Refine discussions of an ARC Centre of Excellence (CoE) bid in astroparticle physics
  Centre for Cosmic Origins and Extremes

Mon-Fri Mornings: Three review talks on relevant topics
Mon-Fri Midday: Discussion of talks

Friday Afternoon 2-4pm: CoE discussion and input from meeting participants

(email: Michael Schmidt m.schmidt@unsw.edu.au for your 5min slot)

Centre for Cosmic Origins and Extremes

[Discussions: U. Adelaide, U. Sydney, UNSW, U.Queensland, Monash, WSU, ANU, Curtin, U. Melb]

Theme 1: Origin of Extreme Particles

Accelerated particles such as cosmic rays and electrons are an indicator of the Universe's extreme processes. Topics and challenges within this theme include: extreme particle acceleration processes in the early and the current Universe; how are these processes set up?; What roles do accelerated particles play in galaxy and stellar formation?; What role do they play in the early Universe's evolution?; Is the Standard Model valid beyond collider energies?; How can we probe beyond-Standard Model physics in astrophysical settings? How do accelerated particles influence the conditions for life?

Theme 2: Origin of Mass and Matter

The origin of particle masses and the origin of matter itself is one of the deepest mysteries of fundamental physics. Solving this problem requires understanding the acquisition of particle mass in the early Universe, and the evolution of baryon, lepton and dark matter abundance over cosmic history. Some of the most important specific questions are: How did particles acquire mass in the early Universe? What is the theoretical mechanism that gives neutrinos mass? Why is there much more visible matter than antimatter in the universe? How were the elements that make up our solar system and us synthesized?

Theme 3: Origin of Expansion and Structure

In its 13.8 billion year history, our observable Universe has grown by a factor of about 10^50. In the course of this enormous expansion, it has experienced temperatures and energies extending far beyond the comfortable realms of physics testable by modern laboratory experiments. The focus of this theme is to investigate the origin of the Universe's expansion, which happens to also be inextricably linked to the origin of the Universe's structure: firstly, because the initial seeds for the formation of cosmic structures were generated during cosmic inflation – a period of exponential expansion in the earliest stages of the Universe's history. And secondly, because our most powerful source of information about the Universe's composition and history are probes of the cosmic structure, such as the anisotropies of the cosmic microwave background (CMB).

Enjoy the meeting!

(Meeting organisers: C. Balasz, R. Crocker, J. Hamann, A. Kobakhidze, G. Rowell, M. Schmidt, P. Scott, Y. Wong)