



Astroparticle Physics European Consortium

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APPEC Town Meeting Concludes

“This is an exciting field, and I am excited to be part of it with all of you,” said APPEC Chair Frank Linde, as two days of discussion and debate to shape the new APPEC Roadmap drew to a close. The Town Meeting, held at the Sorbonne in Paris, had gathered the astroparticle physics community to take a snapshot of the discipline as it stands, and to begin to hone “considerations” for the roadmap into the final recommendations. The first talk of the day looked at the wider applications of research and development related to astroparticle physics.

Jo van den Brand set the scene and presented a case study of the wider reach of gravitational wave research, such as [“nanokicking” of stem cells](#). Fostering greater links between industry and science and working on R&D required by both was expected to be very beneficial. However, responses from the audience warned that short employment contracts for engineers were likely limiting their development in some areas.

Francois Bouchet delivered a presentation on the cosmic microwave background, speaking of the “goldmine” of the Planck space telescope, of which he is a principal investigator, and also the ambition that was required to make the mission a reality. He said that Planck had helped the community develop experience of data analysis challenges, sharing data, and organisation, which would benefit future projects. With no new data from space-borne detectors possible for at least a decade – although proposals are underway - the focus is now on ground-based detectors supported by detectors flown on balloons.



The CMB also featured in Ramon Miquel’s talk about the current state of Dark Energy research. He said there was good complementarity in some of the surveys allowing for some interdisciplinary collaboration. International collaboration will also be vital as large galaxy surveys are needed both for photometric and spectroscopic data. The USA is currently leading the way with DESI and LSST, although there is large French participation in LSST. From a European perspective, dark energy research is focused on Euclid, currently under construction by the European Space Agency. However, Euclid will need international co-operation for the ground-based observations required for photometric redshifts and systematic error control.

In a talk held over from the first day, Andrea Giuliani discussed Lepton number violation and basic neutrino properties. A large number of small experiments are taking place, but some larger ones are needed. For constraining neutrino mass scale, he said that KATRIN is the dominant experiment, and that future improvements to it were possible and would eventually be necessary. For neutrinoless double beta decay, the focus is on future experiments of one ton of isotope mass with zero background. The route to such an experiment requires collaboration, the use of information from the current experiments, and a wait of two to three years, he said.

The enormous amounts of data to be generated by future experiments was addressed by Volker Beckmann in his presentation of APP Computing. He reminded the audience that the [APPEC working group had recently produced a brochure with a model for computing](#). He anticipated a doubling of CPU requirements in the next four years, while disk storage more than quadruples over the same period. A range of solutions including use of grid and cloud facilities was presented, while the related issue of data assimilation and public data release was also raised.



LIGO scientist Patrick Sutton presented on the topic of gravitational waves, and pointed out that he is one of 240 Europeans working on LIGO, accounting for 23% of the collaboration. He looked forward to the addition of Advanced Virgo to the observing network, explaining that the source of the first confirmed direct detection of a gravitational wave, GW150914, was more difficult to pinpoint relying on the two US-based LIGO detectors. In his SWOT analysis of gravitational wave research, Prof Sutton warned that Virgo will need increased support to maintain its role in the global network and urged support for Advanced Virgo, and for R&D activity for beyond Advanced Virgo design. He also looked ahead to KAGRA, LIGO India and the beginning of the next generation of detectors including the Einstein Telescope, and the breadth and depth of international co-operation was emphasised. Sheila Rowan explained the role of the international gravitational

wave committee, GWIC, while some detailed feedback on the draft considerations was also given.

The rest of the afternoon was devoted to the international round table, where the current state of astroparticle physics and future plans were presented. Those present were Fabiola Gianotti of CERN, Roberto Gilmozzi of ESO, Kathy Turner of the US Department of Energy, Jim Whitmore of the National Science Foundation, Colin Vincent from Astronet (also of STFC), and Marcela Carena from Fermilab. The perspective from Japan, China, and Canada was given on a personal level by Takaaki Kajita, Shuang-Nan Zhang, and Nigel Smith respectively. The presentations included a wide range of future plans in astroparticle physics and many invitations to collaborate and develop new ideas.

Frank Linde was the final speaker, reflecting on all of the presentations that had taken place. He pointed out the strengths of astroparticle physics – its excellent science, incredible experiments, and distributed community. He reflected on what APPEC's role should be, saying future common calls were likely, and closer work with CERN would be vital. He added that multimessenger astronomy was certainly a responsibility for APPEC, and considered the possibility of adding a dark energy workshop following the successful organisation of the CMB workshops in Florence. He finished by thanking all the speakers, moderators, scientific secretaries (those recording the presentations), participants and organisers. The APPEC Chair said the next step would be to prepare 15-20 recommendations for this year's roadmap, drawing on the information and exchanges from what had been a vibrant Town Meeting.

See the [Storify report of social media interactions during the meeting here](#).

Reminder: You can [read the draft considerations discussed at the meeting here](#)

This summary is by the [APPEC Communications and Outreach Coordinator, Ruth McAvinia](#). A full record of the Town Meeting is being made to support the writing and editing of the 2016 Roadmap. Please forward [items for inclusion in our regular monthly newsletter by Friday 15 April](#).

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