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XXVII International Conference on Neutrino Physics and Astrophysics (Neutrino2016)

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Preface

The XXVII International Conference on Neutrino Physics and Astrophysics (Neutrino 2016) was organised jointly by Imperial College London and the Institute of Physics. The conference took place at the Royal Geographical Society, South Kensington between the 4th and the 9th of July 2016. A little over 700 delegates attended the conference, a record, confirming the rising trend in attendance at the conference that is indicative of the growing international interest in the field. The 82 invited plenary presentations covered all aspects of neutrino physics, as well as the most important recent developments in astroparticle physics, astronomy and cosmology. Of the 82 plenary speakers, 20% were female, 54% hailed from European institutes, 30% were from the Americas and 15% were from Asia. One speaker was from Africa. Approximately 450 poster abstracts were received of which it was possible to accommodate 400 in four congested but vibrant poster sessions.

The conference was opened by Professors T. Kajita and A. McDonald who had been awarded the Nobel Prize for Physics in 2015 in recognition of their pioneering work in the discovery of neutrino oscillations. New results were presented from all the world's major neutrino experiments. T2K showed new data on the long-baseline oscillation of muon anti-neutrinos. Together with new data from NOvA and reactor experiments a "preference" for the violation of the matter-antimatter symmetry was reported. Observations of extra-galactic neutrinos (ICECUBE) were presented. Together with the ground-breaking evidence for gravitational waves, reviewed at the meeting, these measurements pave the way for multi-messenger astronomy.

Clear evidence for an additional contribution to the neutrino spectrum at ~ 5 MeV was reported by all reactor neutrino experiments. Progress in the study of anomalies that may hint at the existence of sterile neutrinos was reviewed and the status of experiments that aim to determine the absolute mass scale of neutrinos was discussed. New measurements of neutrino-nucleus cross sections, including electron-neutrino-nucleus cross sections were reported. These measurements, together with advances in the theoretical description of neutrino interactions pave the way for the improved understanding necessary for present and future long- and short-baseline experiments to fulfil their potential.

Major new initiatives, DUNE and SBN in the US and Hyper-K in Japan, were discussed. These experiments seek to deliver unparalleled sensitivity to the violation of the matter-antimatter symmetry in neutrino oscillations. Current neutrinoless-double-beta-decay experiments that seek to determine the Majorana or Dirac nature of the neutrino were reviewed. New results were presented by GERDA phase II, KamLAND-Zen, the MAJORANA demonstrator and NEMO-3, and the status of ongoing or upcoming experiments, EXO-200, CUORE, SuperNEMO were reported. The prospects for an exciting future effort were also discussed.

The presentation of neutrino experiments was complemented by discussion related phenomenological aspects; from neutrino oscillations to lepton-number and flavour violation, from neutrinos in astrophysics and cosmology to the connection with dark matter. Progress in theoretical neutrino physics was reported, with emphasis on the origin of neutrino masses, mixing and CP-invariance violation in extensions of the Standard Model and their phenomenological consequences, such as the generation of a matter-antimatter asymmetry in the early Universe via the leptogenesis mechanism.



In parallel to the scientific programme, a number of outreach events were organised to showcase our science, to highlight the opportunities for impact that arise from our research and to reach out to school students and the public. The well-known science communicator Professor Brian Cox gave a public lecture on Wednesday the 6th July 2016. Tickets were free and allocated using a ballot system; the lecture was oversubscribed by roughly a factor of three. On the 5th and 6th of July, groups of students from junior high schools in outer London attended a day of neutrino-themed activities in Imperial's purpose-built Wohl Reach-Out Laboratory. The activities included a planetarium session on supernova neutrinos and the chance for the students to build their own cosmic-ray detectors to detect neutrino-induced muons. Students from across the UK were invited to enter a competition to create a design to be painted on the magnetic shielding walls of the MICE experimental hall at the Rutherford Appleton Laboratory (RAL). The two winners received their prizes from B. Cox and A. McDonald at the start of the public lecture.

All the slides presented at the conference, together with videos of the presentations and the contributions submitted to the proceedings can be found at:

<http://neutrino2016.iopconfs.org/programme>

Neutrino 2016 was an exciting event in which past achievements were celebrated and ground-breaking new results were discussed. We look forward with excitement and anticipation to Neutrino 2018 that will take place in the beautiful city of Heidelberg.

Ken Long, Imperial College London and STFC

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