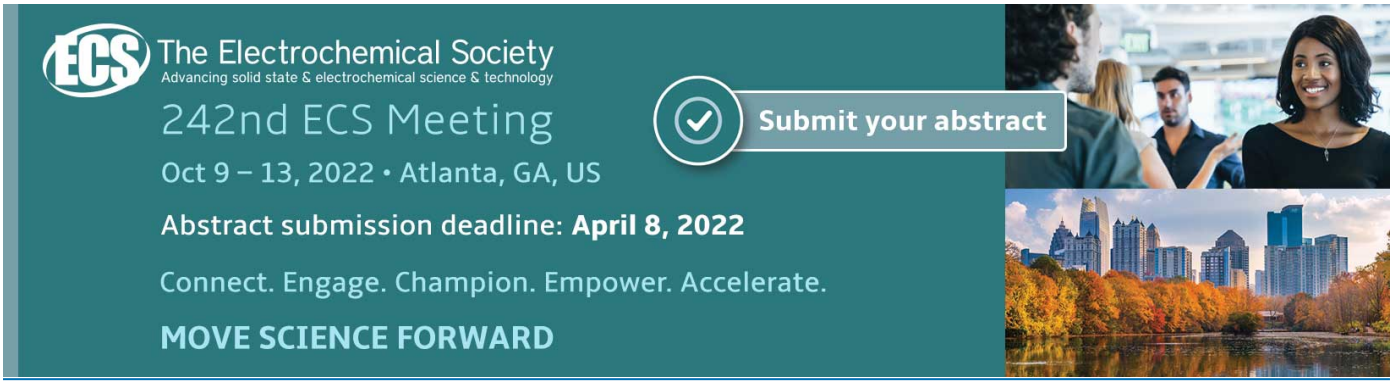
Enrico Bellotti: a leader in underground physics



Journal of Physics: Conference Series **2156** (2022) 012008 doi:10.1088/1742-6596/2156/1/012008

Enrico Bellotti: a leader in underground physics

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On September 11, this year, Enrico Bellotti - "Puccio", for his friends and colleagues - left us. In mourning the loss of Puccio, who was a highly esteemed figure both for his professional stature and his human qualities, personal reminiscences arise in many of us, about the scientific experiences we shared and enjoyed together, during a very long lapse of time. A number of these memories are related to the TAUP Conference.

At the first meeting of this Conference, held in September 1989 in the Castello Cinquecentesco in the town of L'Aquila, Italy, a welcoming address to the participants was delivered by Enrico Bellotti. On that occasion, he synthetically depicted how, in the seventies, emerging common scientific interests among particle physicists, astrophysicists, and cosmologists led to "the need of a new, large, and well equipped underground laboratory", which could provide an experimental setup adequate to pursue investigations previously carried out in "facilities, mines or small caves, not specially designed to that purpose."

Obviously, Puccio knew pretty well all the details - physical motivations and experimental aspects - of that epochal transition from small facilities to a highly structured laboratory, as he was one of the main actors of that extraordinary experimental breakthrough. His involvement in underground physics had started in the early eighties with an experiment designed to study nucleon stability, whose detector, NUSEX, was installed in a *garage area* along the road tunnel under the Mont Blanc. In this same underground location, he also took part in an important search for neutrinoless double beta decay in germanium.

Quite naturally, as the project of the Gran Sasso Laboratory got political approval and its construction plans started, Puccio became progressively more and more involved in its complex realization – eventually becoming the first director of the Laboratori Nazionali del Gran Sasso (LNGS) in 1987, when the laboratory became operative.

His vision as to the role of the lab was wide and far-sighted, not only in terms of the experimental investigations to be carried out in it, but also within a more general perspective. Puccio aimed at creating a top level scientific community living at Gran Sasso, and – in Puccio's own words at TAUP 89 – at promoting "cultural opportunities like this Conference from which we expect suggestions and scientific support." These ideas were perfectly in tune with the scientific motivations at the origin of the foundation of the TAUP Conference.

The remarkable development of the LNGS in the following years witness Puccio's skills in managing the laboratory and in putting the basis for great scientific achievements. The Borexino experiment is a prominent example of a project that he strongly supported.

Puccio had a major personal role in the conduction of important experiments. Needless recalling here the extraordinary success of the investigations carried out on the low-energy part of the neutrino emission by the sun, with two outstanding experiments: the Gallium Experiment (GALLEX), followed by the Gallium Neutrino Observatory (GNO), where Puccio acted as a spokesman. Furthermore, Puccio's involvement in the Germanium Detector Array (GERDA) was the natural outcome of his continuous interest for the intriguing search for neutrinoless double beta decays.

In parallel with this activity, in 1991, Puccio was also involved in a new line of investigation proposed and initiated at the LNGS. The idea was to measure nuclear reactions of astrophysical interest, *i. e.* those involved in fusion processes that took place in the early universe and that are also of relevance in the processes of hydrogen and helium burning occurring in the stars. Their cross sections are so low that their experimental measurements require the installment of an appropriate set-up in an environment with extremely low backgrounds. The LUNA (Laboratory for Underground Nuclear Astrophysics) Experiment was installed at LNGS and progressively went through various steps, with remarkable results. Recent experimental outcomes led to a significant improvement in the theoretical prediction for the amount of deuterium produced during cosmological nucleosynthesis.

Puccio also paid much attention to experimental instrumentations installed outside the underground laboratory. Hence, his strong support, and personal involvement, in the physics of cosmic rays investigated by Extensive Air Shower Array with detectors placed at an altitude of 2005 meters above sea level (EAS-TOP), whose measurements could be correlated with observations performed by detectors located inside the underground laboratory.

Furthermore, in the late eighties, within the physical community, an increasing interest for investigating high-energy neutrinos emitted by astrophysical sources was emerging, but it soon became clear that this kind of investigation required large-area detectors, and therefore that these experimental setups could not be located in an underground laboratory. For this reason, various experimental groups started conceiving large-area installations based on water Cerenkov detectors to be placed outside an underground environment. Puccio was very interested in this field and collaborated very actively in a project led by Milla Baldo Ceolin, that was first discussed during the first edition of the International Workshop on Neutrino Telescope in Venice, in November 1988. On that occasion, Puccio presented a detailed survey about many sites located within a distance of 20 kilometers from the LNGS, that could be considered as possible sites for a neutrino telescope.

The reason for recalling here those circumstances is to stress how open-minded Puccio was in considering new routes within research in physics, with a marked hands-on approach. This initial stage in the conception of a neutrino telescope gave rise to a collaboration which brought together, in the period between the late eighties and the early nineties, a considerable number of experimentalists and theoreticians. The reference point of this activity were the Venice workshops, in an interplay with the TAUP meetings, whose venue, at that time, alternated between the LNGS and the Spanish location of Toledo. Eventually, the Neutrino Telescope (NET) project did not go through, but - I believe - that experience was very exciting and instructive for many of us – and it certainly contributed to convey much attention to that specific field of research.

From then onwards, Puccio's support in the development of the TAUP Conference was invaluable. He was a member of the Steering Committee, a chairman of the organizing committee, a keynote speaker, and a convener of workshop sessions.

We have so far focused on Puccio's activities in underground physics. But this does not mean that he was not involved in other branches of physics. Actually, Puccio's initial professional work was devoted to measurements at particle accelerators. Most remarkably, he participated in the Gargamelle neutrino experiment at CERN, an experiment that in 1973 discovered the existence of weak currents – a milestone in physics, and specifically in the test of the electro-weak unification model.

Our community will deeply miss Puccio, and will certainly remember him as a colleague and a friend always open to new ideas and to new challenges.