# 2014 André Lagarrigue Prize

The international jury[1] of the André Lagarrigue prize, meeting under the chairmanship of Jacques Martino, director of IN2P3, has awarded the 2014 prize to **Michel Della Negra**, physicist emeritus of the CERN Physics Department, presently CMS emeritus at Imperial College, London. The award, established in 2005 under the aegis of the French Physical Society, pays tribute to Professor André Lagarrigue, director of the Laboratory of Linear Accelerator (LAL, Orsay) from 1969 to 1975, who had a major role in the discovery of neutral weak interactions with the Gargamelle bubble chamber at CERN, thus establishing the validity of the electroweak theory. The award, co-funded by the CEA, CERN, Ecole Polytechnique, IN2P3-CNRS, LAL and Université Paris-Sud, is awarded every two years.

Born leader, with deep understanding of physics, in direct André Lagarrigue's lineage, Michel Della Negra has shown outstanding qualities as a builder of experimental devices of great complexity. He is one of the major players in two fundamental discoveries: the W and Z bosons, carriers of the weak interaction with the UA1 SppS, and the Higgs boson with CMS at the LHC.

Born in 1942, a graduate of the Ecole Polytechnique, Paris, he begins his career at the Laboratory of Nuclear Physics of the College de France. He defends his thesis in 1967 on the study of proton-antiproton annihilations at rest, using bubble chamber photographs. He is recruited by the CNRS in 1968. During a postdoctoral stay at SLAC (1970-1972), he joins the first deep inelastic scattering experiment using a 17 GeV muon beam interacting on the protons of a rapid cycling bubble chamber, and he is given the responsibility of the muon system. The experiment confirms the early "scaling" of the cross sections, from $Q^2 \sim 1$ GeV$^2$, as already observed in deep inelastic

[1] J. Martino (IN2P3, président), P. Bloch (CERN), J.C. Brient (Ecole Polytechnique), A. Fontaine (SFP), J. Iliopoulos (ENS - Paris), D. Leith (SLAC), C. Matteuzzi (INFN - Milan), M.N. Minard (LAPP), J. Mnich (DESY), K. Peach (Univ. of Oxford), V. Ruhlmann-Kleider (DAPNIA/CEA), A. Stocchi (LAL) et F. Zomer (Université Paris Sud)

scattering of electrons and neutrinos. It also shows evidence for hadron jets produced by interaction of the virtual photon on the constituent quarks of the proton.

On his return to the College de France in 1973, then at LAPP in 1977, Michel Della Negra turns to the physics program at the CERN ISR, first example of hadron colliders. He convinces the Split Field Magnet collaboration to focus on high $p_t$ physics and to study the events with two coplanar jets, which sign interactions between the parton constituents of the colliding protons. The capabilities of a $4\pi$ multi-purpose detector being demonstrated, he involves himself in the proposed proton-antiproton collider in the SPS and contributes decisively to the design of a $4\pi$ detector, which will be UA1, approved in 1978. After the intense phase of construction of UA1 detector, as soon as the first data are taken in 1983, he is a major contributor to the results of SppS Collider at CERN, the most significant of which is the discovery of the W and Z bosons.

Senior Physicist at CERN from 1985 on, he is among the first physicists with Jim Virdee to support the visionary project of a 16 TeV $10^{34}$ $cm^{-2}$ $s^{-1}$ luminosity hadron collider, in the LEP tunnel that Carlo Rubbia at CERN proposes at the end of 1990, while the LEP $e^+e^-$ collider has been taking data at the Z resonance for a year and has a major physics program for a decade. The unprecedented challenges facing this project, both for the machine and for the detectors, are acknowledged by Michel Della Negra, who starts thinking, back in 1989, of a $4\pi$ detector for the LHC. He focuses on the optimization of the muon and trigger systems, aiming at the discovery of the Higgs boson through its decay into four muons. A very strong magnetic field is mandatory, produced by a large radius solenoid capable of holding an electromagnetic calorimeter inside, so that the $H\rightarrow 2\gamma$ channel is also measured accurately. At the end of 1990, the major features of the CMS detector are designed. Upon the establishment of the CMS collaboration in 1992, Michel Della Negra is elected Spokesman. He remains so until 2006, taking crucial decisions, facing detector construction difficulties, financial problems, managing the integration of thousands of physicists in hundreds of laboratories. When he hands over to Jim Virdee, CMS is ready for LHC data taking and analysis. In July 2012, the discovery of the Higgs boson by both Atlas and CMS experiments is announced. The experimental confirmation of the Standard Model of particles, inaugurated thirty years before by the discovery of Neutral Currents, is complete.

The central role played by Michel Della Negra along his career was praised by several awards. He receives the Joliot-Curie prize in 1977, awarded by the French Society of Physics, and the CNRS Silver Medal in 1984. In recognition of his key role in the discovery of the Higgs boson, he receives in 2012, jointly with Peter Jenni, the Julius Wess Prize from the Karlsruher Institute für Technologie. In 2013, he shares with the LHC pioneers the Fundamental Physics Breakthrough Prize, and with Peter Jenni, Jim Virdee and CMS and Atlas collaborations, the 2013 High Energy and Particle Physics Prize from the European Physical Society.

In recognition of his exemplary career, the jury awards with the greatest pleasure the 2014 André Lagarrigue Prize to Michel Della Negra.