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Colloquia: PRZ Memorial

Roberto Petronzio: INFN President in time of changes

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Summary. — In this contribution I would like to remember Roberto as the President of INFN that has accompanied with vision and skill the institute through a complex period, interpreting the shifting political and scientific landscape. Not forgetting the short but productive scientific path made together.

1. – Introduction

A great theorist. A key member of the team that developed the APE computer. The component of the executive board of the institute driving the involvement in the GRID adventure providing LHC with a viable computing model. The noble attempt to build a large research infrastructure that would have put Italy at the forefront of the world. And above all, in his role of President, the political ability to defend the peculiar nature of the INFN whose most relevant point is the self-governance.

2. – The reform of Italian research institutions

Roberto Petronzio has avoided the homogenisation of INFN to the other Italian research institution. He will be always remembered by the INFN community for this single achievement.

A bit of history. A law passed in September 2007 by the Italian Parliament delegated the Government to reform the research institutions. The idea was to give them a larger autonomy. The context was complex though. Several institutes, from the very large CNR to some made only by a few people. With ways of functioning and governances much different from one another. In this landscape INFN had one peculiarity that made it profoundly different from every other institution. The institute has a federal structure, with more than 20 nodes located inside the physics departments of the main Italian universities complemented by four national laboratories and, at that time, one supercomputer centre. Each structure has a Director, expression of the community, that is a member of the governing body of the institute (Board of Directors). The board elects a President of the institute and an executive board. Every level is elective, a rare form of self-government. This structure, with a tradition that comes from the very first day of life of the institute in the Sixties of the past century, is the key of the successes that INFN has collected during the time of its activity. It appeared soon clear that a process of reform, even guided by the best intentions, could have put at risk the peculiarity of the INFN governance. To complicate things, the Government that received the mandate to intervene on the research institutions from the Parliament was replaced by another of different political flavour. After a long and tiring sequence of stop and go, moments of desperation and anxiety, eventually the law came out on December 31, 2009. The patient, persuasive, tireless work of Roberto Petronzio with the Minister of Research was successful. Subsection 4 of article 9 says explicitly that the Board of Directors retains its functions and, more important, the way of selecting all the components of the governance is maintained. To better measure the achievement one shall read in the premises of the law that the Minister has rejected a suggestion of the Parliament to make INFN governance homogeneous to those of the other institutions, namely cancelling the Board of Directors and replacing it with a five-members, Government-appointed, body.

3. – The Super-B project

The B-physics emerged as a very fruitful field of research thanks to the two B-factories, PEP-II and KEK-B and their experiments, BaBar and Belle [1]. In the quest for New Physics, while waiting for the LHC and its searches at the energy frontier coming on-line, a complementary approach was considered, the one metaforically named *shake the box*. The LHC would have *opened the box* and possibly revealed the treasure, but even shaking the box one can understand something on what is contained inside. Very interesting hints of anomalies were seen here and there although it was clear that it was not in the reach of these experiments to pass the threshold for claiming a discovery of a signal of New Physics. The analysis tools were all developed and sharpened at the existing B-factories but much more luminosities were needed to challenge the predictions of the almighty Standard Model. The lattice calculations, a field where Roberto Petronzio gave a great contribution, were improving fastly, and manifestly effects at a level of 1% were the goal to be achieved. A higher luminosity could however not be attained just by pushing the parameters of the actual machines. Something new was needed. At INFN there was a brilliant accelerator physicist, Pantaleo Raimondi, with a lot of experience, enthusiasm and a great idea [2] to be tested. A radical re-design of the interaction region coupled with very low emittance beams [3] could bring to luminosities much higher than the ones achieved so far without increasing the current and keeping the background under control. The idea was indeed tested [4] with success at the Dafne machine in Frascati-LNF. Coupling the physics call and the technical possibility Roberto Petronzio launched the idea of building a new accelerator in a new campus, close to LNF in the area of the Tor Vergata University. This infrastructure, aptly named Super-B [5], would have inherited the progresses made in the field and pushed the reach of the flavour physics much beyond the state of the art. Again, the power of persuasion of Roberto, his ability to find the right language to interact with politicians, his perseverance and patience obtained an approval from the Government with an initial plan of funding of 280 million euros, about half of the estimated cost of the project. A lot of activity and detailed studies followed, both in the flavor physics community and in the accelerator physicists one. The Japanese, having also an idea of building a follow-up of their KEK-B, soon converted their design to the one suggested by Pantaleo and Frascati people. This research infrastructure, the largest ever to be placed in Italy, would have given the country an enhanced visibility, secured a leading position to INFN in the international scene for a long time and would have been complementary in Europe to CERN, the light sources ESRF and X-FEL, FAIR, the neutron spallation source ESS. The project was a victim of the economical crisis started in 2008, but more probably of the lack of long-term vision of the Italian Governments. Even a downscaled version, a Tau/Charm factory [6], could not proceed. Needless to say that meanwhile another change in the colour of the political landscape did not help! The successes of the LHCb experiment at LHC and the imminent start of data taking of Belle-II at KEK do however justice to the idea of Roberto and to the work done for that project.

4. – A personal recollection

Deep inelastic scattering was a very active field of experimental research after the formulation of the evolution equations of Altarelli-Parisi [7] and in particular the new big neutrino experiments started at CERN at the end of the Seventies (of the past century), CDHS [8] and CHARM [9], were very active in the measurement of the nucleon structure functions and the derivation of the parton densities. I was a member of the CHARM Collaboration and together with my colleagues M. Diemoz and E. Longo worked a lot in this field. We developed a method to extract the structure functions from the abundant mess of data provided by the neutrino interactions in the wide-band beam, a lot of data and a lot of gymnastics to unfold the distributions. We wanted to extract the parton densities, in particular the gluon one. Nice challenge, to extract the distribution of the parton that does not couple directly to the neutrino probe. We needed a model, something to constrain the fit for getting the distributions. A model is however something that you would prefer not to use as it might lead you to a biased result. At that time Roberto was at CERN and he was working on QCD and parton densities [10]. He guided us in the details of the QCD evolution equations and we discovered the power of formulating the analytical solution in the form of a series of Laguerre polynomials. This technique, worked out by Roberto [11], provides indeed a natural framework for extracting from the data the quark and gluon distributions without any prejudices concerning their particular analytic form. So, we did apply the recipe and the results [12] were indeed interesting. The gluon distribution extracted from our data is still perfectly compatible with the most modern extraction and parametrization. The Collaboration was therefore very successful and Roberto, as an editor of the Physics Reports journal, very kindly gave us the task of writing a long report on the subject of the nucleon structure functions from neutrino scattering [13].

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REFERENCES

[1] Bevan A. J. *et al.*, *Eur. Phys. J. C*, **74** (2014) 3026.
[2] Raimondi P., *Towards higher luminosities in B and phi factories*, in *Proceedings of EPAC 2004* (European Physical Society Accelerator Group) 2004, p. 286.
[3] Raimondi P. *et al.*, LNF-07/003 (IR) (2007).
[4] Zobov M. *et al.*, *Phys. Rev. Lett. D*, **104** (2010) 174801.

[5] Baszczyk M. *et al.*, arXiv:1306.5655 [physics.ind-det] (2014).
[6] Biagini M. E. *et al.*, arXiv:1310.6944 [physics.acc-ph] (2013).
[7] Altarelli G. and Parisi G., *Nucl. Phys. B*, **126** (1977) 298.
[8] Holder M. *et al.*, *Nucl. Instrum. Methods*, **148** (1978) 235.
[9] Diddens A. N. *et al.*, *Nucl. Instrum. Methods*, **178** (1980) 27.
[10] Curci G., Furmanski W. and Petronzio R., *Nucl. Phys. B*, **175** (1980) 27; Furmanski W. and Petronzio R., *Phys. Lett. B*, **97** (1980) 437; Furmanski W. and Petronzio R., *Z. Phys. C*, **11** (1982) 293; Ellis R. K., Furmanski W. and Petronzio R., *Nucl. Phys. B*, **207** (1982) 1; Ellis R. K., Furmanski W. and Petronzio R., *Nucl. Phys. B*, **212** (1983) 29.
[11] Furmanski W. and Petronzio R., *Nucl. Phys. B*, **195** (1982) 237.
[12] Bergsma F. *et al.*, *Phys. Lett. B*, **123** (1983) 269.
[13] Diemoz M., Ferroni F. and Longo E., *Phys. Rep.*, **130** (1986) 293.