The spirit of CERN and the new physics

Frédéric Perrier

From 1983 to 1986, I had the privilege of preparing my doctoral thesis at the European Centre for Nuclear Physics (CERN), in the neutrino experiment called CDHSW\(^1\) chaired by Jack Steinberger and my subject was the precise measurement of the famous electroweak parameter \(\sin^2 \theta_W\). It was a great experiment lead by Friedrich Dydak, and a successful adventure whose results Steinberger mentioned in his Nobel speech. When we compared our results with the results from the proton-antiproton collider experiments, we could propose an upper bound on the top quark mass and even a rough upper bound on the Higgs boson mass. Then I was lucky enough to spend two years of post-doctoral research at the Stanford Linear Accelerator Center. Nevertheless, I was never satisfied with these gifts of fate, and was hooked in the selfish pursuit of my own dreams, with my own questioning of what new physics meant. After I was hired, I went back to CERN, dragging my feet, and spent time in a LEP (Large Electron Positron ring) experiment. Large collaborations were growing increasingly large, and my taste for this type of work grew increasingly small.

When I think back, I feel that I did not try really hard to fit in, and I sometimes feel like slapping myself. I sometimes wonder how my colleagues could cope with me without strangling me every day. Day after day, I was taking more and more distance, trying to figure out what it was the science I really wanted to do. Meanwhile, I had drawn a few crazy ideas on paper, and proposed a large experiment for the future Large Hadron Collider (LHC), to be built in the LEP tunnel. It was based on a huge toroidal magnet, with the main idea to propose alternatives to the common ideas.

For me, these ideas were gratuitous dreams and games, and that’s why I had enjoyed them, plus these ideas did seem to irritate the establishment, which made me enjoy these crazy scribbles even more. However, the reactions around me made it clear that it was time for me to stop playing late teenager and come up, at last, with some form of a serious project. Seeing the expectations, I ran. It also happened that, at the same time, an opportunity was offered to start my search for physics in the Himalayas in my own way, whatever it was. Anyway, demonstrating then an incredible talent for forecasting, I was sure LHC would never be done, the air core toroid would never be built, and that, if by accident they would be built, the whole LHC and the whole stuff would anyway never work.

Well, not only the huge LHC was built, the air core toroid was implemented in ATLAS, the largest experiment ever conceived. Not only these things were built, but they actually did work, and the huge army of physicists behind this achievement even found the much hunted Higgs boson, last key pillar of our Standard Model of forces.

In March 2014, I was kindly invited at CERN, a shaking invitation for me. I had followed the whole LHC story from far away, much buried in my own struggles and actually having no time for anything. It was my luck that this invitation came at a time I needed to get out of my university. A call from fate, maybe. Dreaming and longing for my own physics was one thing, bringing it to reality was a much more difficult task, and I was having my moments of exhaustion, when not despair. Then, suddenly, I realized that for ten

\(^1\) CERN Dortmund Heidelberg Saclay Warsaw
years, during my arrogant youth, I had been cherished and pushed by the High Energy Physics community, these people I had dropped suddenly without a word of gratitude. Then, for the next twenty years, till now, I had been struggling and had worked like a horse, or, rather like a donkey, doing my research and my classes, doing the dirty work and checking the horrendous student test papers, and treated like a handicapped donkey with no sign of appreciation. Maybe I did deserve the situation, as a kind of reverse fortune and kind of punishment, but, on the other hand, overwhelming evidence tells me justice is not in this world.

These very same I had thrown like a dirty handkerchief, not only still remembered about me, but took the trouble to give me a VIP tour. Those, whose ideas I had never bothered to listen to or care about when I was young, had listened to me, and turned the naive dilettante proposal into a jewel of civilisation. It was a very emotional moment when I saw in real ATLAS, the crazy irrelevant scribble turned into reality, into a real cathedral, thanks to the incredible amount of work and the steady dedication of so many talented people. Friedrich Dydak, my former mentor now retired, and Fabiola Gianotti, now famous, themselves, gave me each one tour. There are special moments in life, and these were. Yes, I had to admit I was wrong. If the result was so successful and the erected monument so beautiful, then it had been, from the beginning, the right thing to do. I was happy for a change to be simply a humble and impressed guest.

Many months afterwards, I am still frozen in front of the huge detector, the largest and most sophisticated instrument ever built by men (and women), and still struggling with my thoughts. Still frozen and still meditating the matter when, last December, just arrived in Kathmandu, jet-lagged and half asleep, I found myself unexpectedly the chief guest on stage next to Suyog Shrestha, probably the first Nepali to have carried out his doctoral degree at CERN. It was a show on LHC, ATLAS and the discovery of the Higgs boson.

It was a cold room in the cold winter of Nepal, but the room was full with young kids, young teachers, students, older professors, journalists, all overexcited, with so many who could not even make it inside. In Nepal, in the middle of winter, such a crowd. I could not believe my eyes. Then came the memories of my busy years during my youth at CERN. Then I realized what it was actually all about at CERN. Whatever the purpose, new physics or not new physics, Higgs or not Higgs, supersymmetry or not, the main miracle has happened. If the thrill could be felt so deeply so far away from the tunnels of CERN, there in the middle of the Himalayas where so many other burning problems are present, then there was the real message, the real spirit of CERN, the real purpose of CERN, achieved. The dream of the founders of CERN, incarnated and real, even more brilliantly than ever conceived. Young physicists from all over the world, not just Europe, not just America, but, now, from all over the world, meet and work together in one place, struggle together, suffer together, succeed together, becoming more than just friends. Becoming the new generation of physicists tied together by ties stronger than any ideology, by the feeling, the daily experience of pure shining science. I was watching the crowd and I was watching the young CERN scientists present in the room and sharing their adventure with others eager to listen to them. It was simple incredible. That is the new physics of CERN, the real purpose of science as the dream of the Ancients for a united mankind. The founders of CERN who suffered so much during World War II would be proud.

Now that I am back in the middle of my own fights for my own physics, at least I am pleased that I have seen all this. Do I regret the fact that I had chosen to leave the boat? What would think the sailor who would have left, just before departure, the ship of Columbus, to go somewhere dreaming?

Actually, I don't regret my decision, and under no circumstances would I go back. Because in that very room in Kathmandu listening to the CERN presentation, were my own kids, and all the reasons why I had made the choice I had made. The main thing, however, is that, now, I have rejuvenated my memories from CERN, and I do cherish them again. Now I have seen that those, who worked so hard, were right because they were not just struggling for one physics subject or one physics community. They should now be confident for the future. The real spirit of CERN is the construction of this united world science dedicated to peace, and that has always been the most important reason for the existence of CERN. That is the new physics that CERN cannot search in its experiments and its data, because it has found it already. CERN itself is the new physics.

With thanks to Suyog, Abha, Traudl and Witold.