



Remembering Raymond Stora

André Martin

CERN, PH-TH Division, 1211 Geneva 23, Switzerland

Received 10 August 2016; accepted 10 August 2016

Available online 30 August 2016

Editor: Hubert Saleur

I shall not speak on BRS (I omitted T deliberately after some conversations with Raymond). I am not an expert on non-abelian gauge theories. I believe that, among living physicists, I am the person who has known Raymond for the longest time.

During the summer of 1952, at Les Houches, Loup Verlet and I accepted to be members of the new theoretical physics group at École Normale started by Maurice Lévy (now 93 years old), at the invitation of Yves Rocard. At the same time we met Louis Michel who was then at École Polytechnique in the laboratory of Louis Leprince Ringuet. We were very much interested by the selection rules he proposed. During the autumn of 1952, Loup Verlet and I went every week to the seminar held in the Leprince Ringuet laboratory. One day, we met Louis Michel in a corridor accompanied by a young man in khaki uniform (not with the “bicorné”). Louis presented us his collaborator, Raymond Stora. They were calculating the decay spectrum of a lepton sufficiently heavy to decay into a muon. Then the standard calculation of the muon decay by Louis Michel, depending only on the “Michel parameter” must be modified, and this what they were doing. The motivation was that there seemed to exist such a heavy lepton, but soon this candidate for a heavy lepton disappeared. However, 23 years later, Martin Pearl discovered the Tau lepton (about 1800 MeV) and so, the ratio of the mass of the muon to the mass of the tau was not negligible and the calculation of Michel and Stora applied. I attracted the attention of Sau Lan Wu who was measuring the decay spectrum of the Tau at LEP on this calculation.

Now, I open a parenthesis about the seminars given by Louis Michel on weak interactions even though it does not concern Raymond. Louis Michel spoke about left–right symmetry. He said that of course there is no left–right symmetry in biology. The asymmetry propagates through genetics and the only problem is (symbolically: I am not a creationist) why Adam and Eve had their hearts to the left. In particle physics everybody believed there is a complete left–right symmetry, technically called parity conservation. Louis Michel pointed out that there was absolutely no

E-mail address: andre.martin@cern.ch.

indication that parity was conserved in weak interactions. This was in 1952, 3 years before Lee and Yang, and others, raised the question and proposed tests of parity violation! Though Verlet forgot that, my testimony is confirmed by what Thérèse Michel remembers. I should have asked Raymond but it did not come to my mind.

My next meeting with Raymond was at MIT, in 1956, where I visited my new friends, Martin Blume and Shelley Glashow, met during the first Latin American summer school in Mexico City. I met him during a seminar given by Francis Low on dispersion relations. Raymond was doing his PhD under S. Olbert on the evolution of the hadronic component of cosmic rays in the atmosphere. Back to Saclay, Raymond wrote a very important paper with Marcel Froissart (also recently deceased) on the depolarization of particle beams in accelerators. This paper is used by machine engineers world wide. He also participated in a new proof of dispersion relations with J. Bros, M. Froissart, A. Messiah, and R. Omnès never published. My contacts with Raymond became intense through his short and long visits to CERN where he collaborated with J. Bros, H. Epstein and V. Glaser in the domain of Axiomatic field theory.

Later, when he moved from Saclay to Marseilles we met quite often since I was member and later chairman of the scientific committee of the Centre for Theoretical Physics. Part of the time he was director of this centre, where his diplomatic qualities were essential to remove the tensions between the members. Of course, when Raymond moved to Annecy, after spending a year at CERN our contacts became more intense. This continued, of course when Raymond retired and spent most of his time at CERN, till the end, because Raymond even sick continued to work.

Raymond's culture was immense, not only scientific but literary, historical, musical, and he loved old books. I happen to receive wonderful catalogues of old books about once every 3 months. I gave these catalogues to Raymond who found the photographs wonderful and the commentaries extremely interesting. Now, I don't know what to do with them.

In Mathematics, he knew old maths and new maths. I can give an example. Almost every evening I listen to a program on the French TV called "Questions pour un champion". Once a question was "who is the mathematician who found a way to construct a regular polygon with 17 sides?". The answer, that nobody found, was "Gauss". The next day, I go to the office of Raymond and he, immediately, gave me the proof, indicating that this can be generalized to other polygons with more sides. Raymond's merit was that he made others benefit from his immense knowledge. He always welcomed anyone who needed help, and, most of the time he effectively helped. I know at least two cases, one indirect and one direct. The indirect one comes because, in 1967–1968 Gilbert Mahoux and I decided to extend the proof of the Froissart bound to particles of arbitrary spin. We used helicity amplitudes. Kinematical singularities of these amplitudes must be eliminated. This is done in a work by Gilles Cohen-Tannoudji, André Morel (deceased) and Henri Navelet. They make it very clear that they had considerable help from Raymond. The other example is that, K. Chadani, N.N. Khuri, T.T. Wu and I studied scattering in 2 space dimensions (in fact Jacques Bros and Daniel Iagolnitzer had already worked on that). Again we needed the right kinematical factor and it took 5 minutes to Raymond to get it.

The merits of Raymond were recognized by several prestigious prizes: the prize Joannidès from the French Academy of Sciences, the prize Ricard from the French Physical Society, the Medal Max Planck from the German Physical Society and finally the Dannie Heinemann Prize, from the American Physical Society in 2009, as I learnt only 3 months before he died. Raymond was so modest that he told nobody that he got the prize and did not even go to the United States to receive it. I learnt about it because Alain Rouet wrote an article about the problem of climatic change and, to give more weight to his intervention signed "Alain Rouet, recipient of the

Heinemann Prize”. Normally I would have thought that this a bit ridiculous because inventing BRS does not guarantee that you are an expert on the climate, but, thanks to that, I had the pleasure to warmly congratulate Raymond. Raymond also received the Légion d’Honneur and was elected corresponding member of the French Academy of Sciences. Why “corresponding” and not full member? That’s an absurdity. Even if among us we have 3 Nobel Prize winners, it is a fact that Raymond was better than some of the full members.

I remember that I called Marie-Françoise because I wanted to visit Raymond and bring him again one of these catalogues of ancient books that I mentioned before, but she said that he was in the hospital and was going to get out the next day. I promised to visit him, but, as we know, something very tragic happened.