

In memory of Decio Levi

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I will start these notes by remembering when and where we (Decio and I) knew each other and started to work together. This happened in the early seventies of the last century, the same years when our friendship was born. We were sharing one of the small offices located in the so-called “theoretical corridor” on the second floor of the building hosting the “Istituto di Fisica”. In the Italian Universities there were no “Departments” at the time, just “Facoltà” (which do not mean exactly Faculties, but rather Schools) and “Istituti”. Neither Roma II (Tor Vergata) nor Roma Tre existed, and it did not even exist the “new building” of the “Istituto di Fisica”, later on named Marconi (the old one) and Fermi (the new one). Incidentally, the Departments were established by a national law at the beginning of the eighties.

At that time, according to a widespread opinion, the Italian “Laurea in Physics” had to be compared to a Master of Science degree, and even to a Ph.D. degree rather than to a Bachelor degree. Whatever it is, I was just graduated and Decio was deeply involved in his Laurea thesis, having to do with the study of a class of two-body potentials ruling the nucleon-nucleon interaction: the main question was to ascertain whether those potentials were satisfying an important property called “saturation”, crucial to ensure the stability of nuclear matter. On the other hand, in the Laurea thesis that I had just finished I had carried out a rather extended review of the existing models of (nonrelativistic) nucleon-nucleon interaction, and our common advisor Francesco Calogero thought that I could be the right person to cooperate with Decio in his delicate, and sometimes boring, checking analysis. Decio took his degree “cum laude”, and soon after left Italy to perform his civil service in Mexico City. While being there he had the opportunity to get in touch with Marcos Moshinsky, then a top level theoretical nuclear physicist, and with Pavel Winternitz, a great expert in group theory and its applications to Physics, who had left his native country, Czechoslovakia, and moved to Montreal after the Russian invasion in August 1968: with Pavel, Decio started a fruitful collaboration that went on for their entire life (Pavel Winternitz passed away in October 2021).

I met Decio back when he returned to Rome, in 1975. Thanks to a number of lucky and quite exceptional circumstances, in Italy the situation for young fellows improved considerably in the late seventies and early eighties of last century. So, Decio and another young researcher, Mario Bruschi, who had recently joined our group, got a renewable two year “assegno di ricerca”, and I got a permanent position as Assistant Professor. Later on, another young theoretical physicist, Paolo Santini, joined our group: he had won a scholarship in Mathematical Physics, a very rare event for people with a graduation in Physics. From the very beginning, Paolo showed outstanding qualities of autonomy

and originality. He moved immediately to United States, got there a Ph.D. in Applied Mathematics and started a collaboration with Mark Ablowitz and Thanassis Fokas which lasted for many years. In the same time, the triad Bruschi-Levi-Ragnisco produced several good papers in the area of exactly solvable models and soliton theory, taking also advantage of the existing international collaboration agreement between INFN and GKAE, as well as between the "Istituto (after 1983 Dipartimento) di Fisica" and the Landau Institute for Theoretical Physics based near Moscow, and with the Warsaw Institute of Theoretical Physics. The decades 70-90 were a very favorable period for our international scientific exchanges, even well before the fall of the Berlin Wall, and we must acknowledge that Italian government and our scientific institutions played a pioneering role in the East-West scientific collaboration. Quite naturally (I would say physiologically) over the years the scientific interests inside our group diversified; in my opinion the core of Decio's activity has been well represented by the acronymous SIDE (Symmetry ad Integrability of Difference Equations), a thematic project of International collaboration, which had Decio as a co-founder, promoter and animator, taking part in all the meetings held all over the world every two years from 1994 till today.

Decio retired in 2016, aged 68, and mostly devoted his last years to the completion of a monumental monographs on "Continuous Symmetries and Integrability of Discrete Equations", coauthored with Ramil Yamilov (Ufa) and Pavel Winternitz (Montreal), and published at the end of 2022 by the American Mathematical Society. Unfortunately, neither of his coauthors could see the final version of the monographs, as both died before its publication. As a matter of fact, Decio's retirement was much a bureaucratic passage and did not imply any dramatic discontinuity in his scientific or training activity: he went on giving PhD courses and supervising theses of his PhD students, till the end.

Let me close this recollection with some personal considerations, related to the last months of our friendship (and alas of his life, but that we didn't know). There are occasions where a real friend reveals himself. Whatever happens, you understand he will be on your side. So was for Decio. I cannot forget that he hosted my wife and me in his apartment in Rome when he was abroad, and, just married, we were desperately looking for a roof to shelter under. After our retirement in 2016, he came to visit me regularly, roughly once a week, never with empty hands. One time he carried a book, another a box of candies or chocolates, or a nice pack of herbal teas. The official reason was his monographs "Continuous Symmetries and Integrability of Discrete Equations" that he was about to finish. He was asking for suggestions he did not need: usually, we started talking about the book, but then we passed to talk about common friends or events we had experienced together, some of them being joyful and some others very sad, as the unexpected death of Mario Bruschi and his wife. We remembered all such events in those quiet afternoons where the life looked as it was slowly fading out. His last visit was around Christmas 2022: he knew about my walking troubles (that seemed more serious than his !). Finally I went to visit him at home, I think at the beginning of January 2023, less than a month before his death. I had the clear perception that he was gradually distancing himself from life.

Good Bye Decio, my beloved friend!