

**My experience with Pino** starts in 1968, when I was still a Physics student. Pino taught a course in Potential Scattering, along De Alfaro-Regge book on the subject. I must say, to be fully honest, that his lectures were a little bit obscure for me, but this left no harm. Pino was a pleasant and enthusiast young theoretician and somewhat the message percolated to us. Then we met for good in the middle '70s when I was back from the Princeton experience and was ready to consider new ideas beyond Geometric Quantization... Pino told me about the recent “Large N” rush following Veneziano and 't Hooft papers. We learnt a technique from “Planar diagrams” by *Parisi et al* and extended one of their result to non-singlet states - *J. Math. Phys.* **21** 1103 (1980). In the years 1981-82 we were at CERN together, and worked at a formulation of confinement criteria (Wilson and Polyakov) which looked quite intuitive to us and hopefully to others (*Nuovo Cimento A* 65 298 (1981)). Back to the University of Parma, we kept on collaborating and here I learnt quite a lot by Pino: I was literally level 0 as what regards computer programming and Pino with great patience introduced me to Fortran and card punching to dialog to a CDC7600 in the computer center in Bologna (CINECA). Nowadays this kind of programming would discourage many, but since there was no alternative I got interested in the potentialities of computing. We started from a problem of “Loop equations at large N” (*N.Phys.B* 249, 225 (1985)) which had no follow up, but it was a good training for me. Then I got a position of full professor in Trento (1986) but kept on collaborating with Pino - I realized that he had always a good view of relevant research and even at a distance it was easy to collaborate with him. A problem with the  $O(\infty)$  Heisenberg model gave me the opportunity to deepen my knowledge of Matlab and the results were rather impressive - thousands of complex singularities in the partition function could be revealed in a few minutes on the Vax750 - now it would take just seconds on my Mac... (*Nucl. Phys. B* 326, 758 (1989) with P. Butera and M. Comi). And then it came the season of Lattice Gauge Theory. With a brilliant post grad (*Francesco Di Renzo*, now professor in Parma U.) and a group of young collaborators (*Marenzoni, Burgio, Pepe, Scorzato*) we adopted an innovative technique stemming from Parisi-Wu stochastic quantization. We realized that the idea could be exploited without actually computing lattice diagrams, which are even harder then in perturbative QFT, but we could leave to the computer the whole task by developing the Langevin stochastic equation in the coupling constant. We soon had the perturbative coefficients of the “plaquette” for  $SU(3)$  well beyond had been obtained by diagrammatic analytic methods (*N. Phys. B* 426, 675 (1994), *Phys.Letters B* 422, 219(1998)) and the method, dubbed “Numerical Stochastic Perturbation Theory” was then adopted by other groups, pushing the perturbative order for lattice observables to unprecedented levels (16 loops or so). The technique was soon extended by DiRenzo and collaborators to fermion fields, well beyond what originally we had foreseen and providing an unvaluable tool for phenomenolgy (see e.g. *JHEP*10 (2004) 073). For me it's nice to think that it was an idea of Pino which proved to be a very good seed, just try “Numerical Stochastic Perturbation Theory” on google scholar - you are about to get some 300000 records! Since computing facilities were essential in this research, Pino and I got in touch with the group INFN in Rome who developed very successful parallel computers named APE (Array Processor Emulator). Nicola Cabibbo, at the time President of INFN, and Giorgio Parisi agreed to share their technology with us, and so an

intense and fruitful season of supercomputing started for our group, extended to Milano Bicocca when Pino left Parma to fund the new University. This endeavor was pushed with great decision, also in a collaboration INFN-Eurotech, thanks to our collaboration with G.P. Tecchioli, a young Physicist from Trento who emerged as a talented computer scientist both in software and in hardware development. Pino had a great design in mind, he talked about “ la Bottega”, that is a workshop where we should develop new tools for supercomputing and make them available outside Academia. Eventually the idea was surpassed by the market where the big industry turned out to be unbeatable - zillions of dollars of investment - still we had a continuous interaction with Pino. He apparently could not rest a minute - INFN “Commissione Quarta” (theory) was directed by him and I collaborated to spread computing facilities in the form of PC-clusters in the main INFN labs (except Parma, I’m afraid), we collaborated in the launch and permanent organization of the Summer School in Parma (SNFT), well financed by INFN. Even when he suffered by a serious disease and he was at the hospital in Milan he could not stop pushing on research. The revision of our last paper (*JHEP 0806, 104 (2008)*) was performed in his hospital bed. In 2012 we tributed to him a meeting in Cortona for his 70th birthday, and you may find some records in this blog. I would like to cite one of the latest successes of Pino, the creation of the Galileo Galilei Institute in Firenze. You can find some details in the words of Roberto Casalbuoni on this same site.

Thank you, Pino!

Parma, July 5th 2020,

*Enrico Onofri*