PROCEEDINGS OF SCIENCE

Remembering MILLA and Those Times – 1950's

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We recall events, beginning in 1953, which led to a young American physicist (the author) spending the year 1958-59 in Padova with the particle physics research group led by Milla Baldo Ceolin.

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1. Introduction : 1952-56

I arrived in Padova on September 1, 1958. Now why would a young U.S. physicist (two years from the Ph.D.) go to Padova? To understand this we have to travel back 7500 km. and a few years, from Padova to Madison, Wisconsin. In 1952 W.F. (Jack) Fry arrived at the University of Wisconsin to start an experimental program in particle physics using nuclear emulsions. In 1953 he received a grant from the Atomic Energy Commission and I became his first student, shortly after joined by M.S. Swami from India, and a year later by postdoc George Snow. The exciting things at the time were the "strange" particles: K-mesons, the θ-τ puzzle, the Λ, Σ, and Ξ hyperons, associated production and Gell-Mann's new strangeness quantum number. We flew stacks of emulsion plates in balloons to get high energy cosmic ray events, and exposed stacks to pion and kaon beams at the new proton accelerators, the 2-3 GeV Cosmotron at Brookhaven and the 6.3 GeV Bevatron at Berkeley. The K^- beams from the Bevatron were prolific producers of strange particles. We produced about 5 papers per year – a paper typically had 3-4 authors and 1- 1001 events. Here are two (Figures 1 and 2) that I especially remember [1,2].

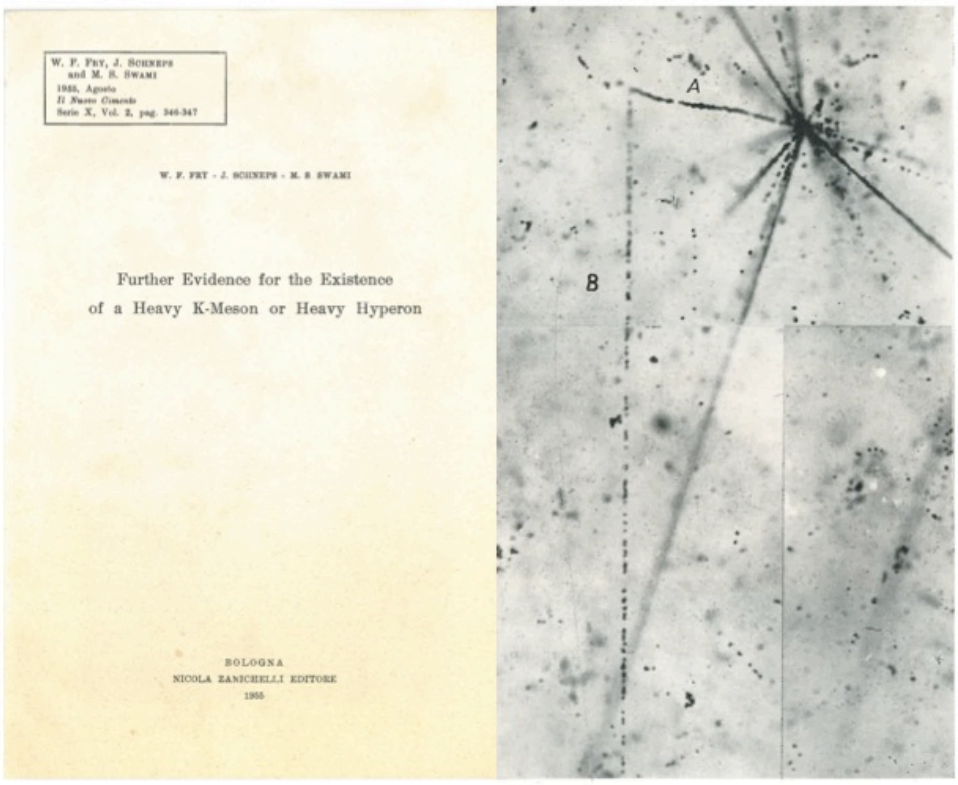
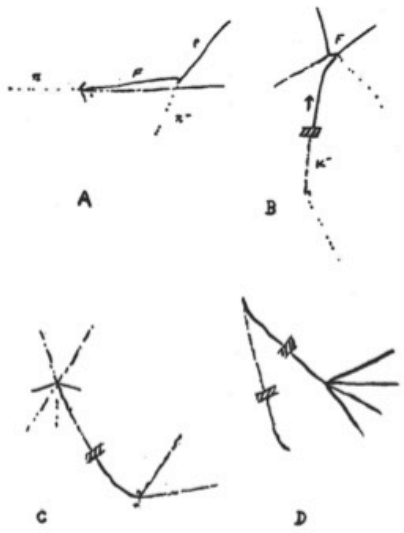


Figure 1. An Ω^- -event 6 years before the Ω^- was predicted, 8 years before it was found at Brookhaven. The event was recognized as Ω^- by L.W. Alvarez in 1973 [3], and gives a mass, M=1672.1±1.0 MeV .

First Evidence of K^0-$\overline{K}^0$ mixing

Evidence for a Long-Lived Neutral Unstable Particle*

W. F. Fry, J. Schneps, and M. S. Swami
Department of Physics, University of Wisconsin, Madison, Wisconsin
(Received July 19, 1956)



These events can be explained by assuming that long-lived neutral K mesons were produced at the target with about the same frequency as the K^+ mesons. A small fraction of these neutral K mesons could have penetrated the shielding (about two feet of brass) between the plates and the target and then interacted in the pellicle stack. The lifetime of these particles must have been at least 10^{-8} sec. The existence of a long-lived neutral K meson was predicted by Gell-Mann and Pais.[2]

Figure 2. This paper was published simultaneously with Lande et.al [4] in Phys. Rev., September 1956.

Sometime in the spring of 1956 Jack Fry took me aside – he had good news to tell me.

1. He has been promoted. He will be Associate Professor with tenure.
2. He has a Guggenheim Fellowship and in August will go to the University of Padova in Italy for a year.

I have the choice of staying in Wisconsin as a postdoc or finding another position. I choose to go to Tufts University in Boston as Assistant Professor. It would be my job to finish up the papers we were working on. Jack was excited about long-lived neutral K-mesons, so before leaving for Padova he exposed a stack of emulsion to a neutral beam at the Bevatron to take with him.

2. 1956-58

In September 1956 I arrived at Tufts University. My main activity at first, besides teaching, was to finish the papers we were working on in Wisconsin and to start an emulsion research project at Tufts, for which we obtained a modest grant from the A.E.C. in January. I would write to Fry with physics questions about our papers, and he would answer with a three page letter – one or two sentences about the physics questions – and three pages about how wonderful it was to be in Italy; Padova, Venezia, the Istituto di Fisica, and especially the people he was working with: Above all, there was this bundle of enthusiasm, Milla Baldo Ceolin, Then there was Carlo (Milla's husband), and Professor Dallaporta, Professor Rostagni, student Sergio

Natali and Researcher Humi Huzita, and all the scanners of the emulsion group. 'Jack', he wrote to me, 'you ought to come here', and after several such letters I was convinced. In 1957 I applied for a National Science Foundation Fellowship, and in August 1958 I was on my way to Padova.

Figure 3. W.F. "Jack" Fry –His other passion, violins [5]

Milla enrolled in the University of Padova shortly after the end of World War II. In 1952 she completed her thesis with Professor Dallaporta and joined the newly forming emulsion group. How she advanced from this no salary position to becoming the first woman to be appointed Professor in the University of Padova since its founding in 1222 is beautifully described in her 2002 article "The Discreet Charm of the Nuclear Emulsion Era" [6]. At that time in Europe the only way to study the new strange particles was with high energy cosmic ray events – cloud chambers on mountain tops; emulsion stacks carried to high altitudes by balloons. In the United States the large accelerators were arriving; the 3 GeV Cosmotron at Brookhaven followed by the 6.3 GeV Bevatron at Berkeley. As mentioned earlier, in 1956 we were so excited by finding the long-lived K^0 that Jack Fry quickly arranged a new exposure of an emulsion stack to a neutral beam at the Bevatron, and when he arrived in Padova he was carrying it with him. This began the change from cosmic rays to accelerator research in Padova (CERN was on the way). In 1956-57 Fry and Milla concentrated on kaon mixing and found clear evidence of long-lived neutral K-mesons [7].

3. Padova – 1958-59

In August 1958 I sailed from New York to England on a small ship called Le Flandre, sharing a cabin with Sheldon Glashow who was on his way to Bohr's institute in Copenhagen. In Plymouth I picked up a little Morris Minor I had reserved in advance, and we drove to London where we visited Professors Matthews and Salam at Imperial College, and then to Paris where we visited the laboratory of Professor Le Prince Ringuet at Ecole Polytechnique. There we separated and I drove to Padova. At the beginning of September I entered the door of the Istituto di Fisica where I met the porter, Mario, and we could not understand each other (I speaking English and 'pidgin' Italian and he speaking the Padovano dialect), so he called the only English-speaking secretary and she brought me to Professor Dallaporta , who shortly after brought me to Milla (Fig. 4). And so I joined Milla's emulsion group and here it is in Fig. 5.

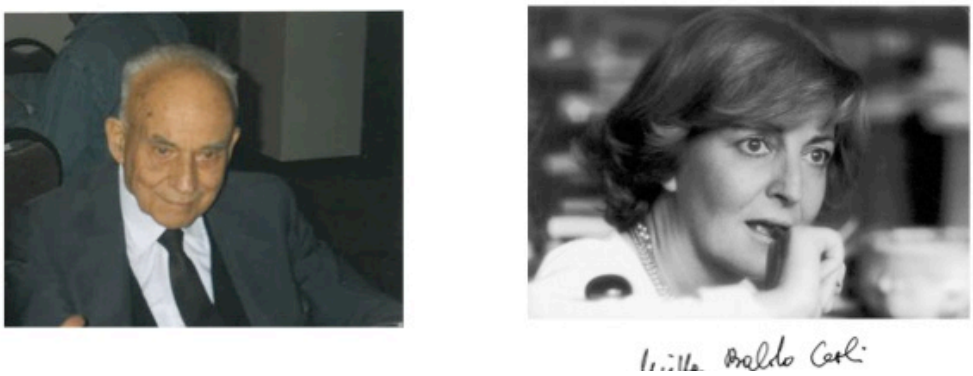


Figure 4. Professor Nicola Dallaporta in 1995 and Milla, as she always was.

Figure 5. *Milla's Group 1958-59 -- Milla, Sergio Natali, Franca Farini, Gabriela Miari, Oscar Fabbri, Sergio Ciampolillo, J. Schneps and scanners*

Soon I met everyone in the particle physics section. Marcello Cresti and Silvia Limentani had returned from working with the Alvarez group in Berkeley to set up a bubble chamber facility in Padova, Luciano Guerriero , who also worked with emulsions, and of course there was Carlo Ceolin, who insisted on only speaking Italian to me, as did all the scanners. Eventually, I learned.

In Milla's group we worked on studying the properties of Ξ hyperons (called "cascade") produced by high energy K^- beams at Berkeley [8]. (Remember -- quarks, standard model, charm, and multiple neutrino flavors did not yet exist.) I would sit down with Milla in her office almost every day and we would talk about the experiment, what else was going on in particle physics, what new experiments to be considering, and politics, food, music, etc. With Milla you couldn't help but absorb her enthusiasm, everybody was infected by it. Eventually, in the early 1970's, we both had turned to neutrino physics, she at CERN and me at Fermilab. The great thing about it was that it gave us more opportunities to see each other.

For me, the year with Milla's group in Padova was UNFORGETTABLE! I always called Milla "my old boss". In 1988 when I organized NEUTRINO'88 in Boston, she was there, and in that same year when she started "Neutrino Telescopes", and later NOVE, she told me I must come, and I have never missed one yet. Here, Figures 6 and 7, are a few pictures of us from earlier Neutrino Telescopes conferences.

Figure 6. Nicola Dallaporta, Jack Schneps and Jack Fry – circa 2000

Figure 7. 2001 -- Left: Jack, Jack, Milla & Nino Costa. Right: Jack, Jack, Milla & Dieter Haidt.

4. p.s

The English-speaking secretary who met me when I arrived at the Istituto in 1958 was called Lucia. Her grandfather had been a professor of geophysics in Padova, 1902-32. She came in 1957 to help Prof. Rostagni with the Padova-Venice Conference. She's still with me, and we have 3 daughters and 6 grandchildren. Yes, Padova was quite a year.

5. Thanks

Special thanks are due to Mauro Mezzetto and the Local Organizing Committee from Padova for continuing the tradition of this wonderful Workshop in the spirit initiated and carried on by Milla for so many years. Thanks also to the secretariat, to Pina Salente; and it was so nice to see Leopolda Benazzato back again, and to remember all those years she took care of us. Although this was not a physics report I would like to say that my work in neutrino physics is and has been supported by the U.S. Department of Energy, for which I am grateful.

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