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Memorie della

A long friendship

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Abstract. To open this meeting dedicated to the memory of Francesco Palla, I give a brief account of our long personal and professional relationship.

During the summer of 1980, I was surprised to receive a postcard from Italy. Someone named Francesco Palla had heard that I would be headed to Cornell University that fall to pursue research in star formation theory. He himself had recently entered that field, and was eager to meet up. The prospect of a like-minded person at Cornell was intriguing, and eased the transition from Berkeley, where I had spent a happy period as a graduate student, and where I had just received my PhD in physics. Soon after my arrival at Cornell, Francesco and I did meet, and began a conversation that was to last for over 35 years.

Fig. 1. Francesco and I in the 1980s, somewhere in the Masachusetts countryside.

The field of star formation was relatively young in 1980, as were we. It was known that stars form out of molecular clouds, but dense cores were just over the horizon. Protostellar disks were objects of pure theory, which had no explanation at all for, among other things, massive stars. So Francesco and I had plenty to talk about. We also began actively collaborating in research. Francesco was able to spend long periods in Ithaca, up to 6 months as I recall, interspersed by trips back to Italy. He later told me that he was insecure about his English during that period, but I only noticed a pleasant Italian accent, which stayed remarkably constant over the years. What I also noticed quickly was his ability to fit into, or at least appear comfortable in, almost any social situation.

After two years in Ithaca, I moved to Cambridge for a second postdoctoral appointment at the Harvard-Smithsonian Center for Astrophysics. Francesco kept up his extended, regular visits, and was clearly energized being in the Boston area. His circle of friends expanded, as did mine. I had become involved with a music and comedy troupe that performed in rural Vermont, and occasionally in Cambridge. Francesco attended at least one Vermont show with me; a poster from that event adorned his Arcetri office for many years. Eventually he and I starred in a skit that was performed in a Cambridge church. The auditorium rang with laughter, and Francesco was thrilled. I also had been making short, comic films since graduate school. Soon, I persuaded Francesco to play a part in one of these. In fact, he jumped at the chance. Humor was a major ingredient in our friendship, and a key element of Francesco's personality. (Joe Silk, after first meeting Francesco in Berkeley, said to me, "Now there's a jolly fellow!") It was during the Cambridge years that we began producing our long series of papers on early stellar evolution. Back at Cornell, we had talked about many things, but the only joint project was with Ed Salpeter. A decade earlier, Ed and Dave Hollenbach had shown that molecular hydrogen could efficiently form out of atomic gas on the surfaces of interstellar grains. The question naturally arose as to how the molecule could form in the early Universe, before the production of metals. Francesco and I joined Ed in working out the gas-phase production of molecular hydrogen and applying the mechanism to a first theory of primordial star formation.

In Cambridge, we returned to protostellar and pre-main-sequence evolution in the present-day Universe. One of our early triumphs, around 1990, was to show that the stellar birthline, when extended to the intermediate-mass regime, successfully accounted for the distribution of Herbig Ae and Be stars in the HR diagram. After we published this result, Francesco showed me a three-word message from Franco Pacini: "We are impressed." That was on *my* office wall for quite some time. Later, we moved on to study binaries, before writing another series of papers on cluster formation.

We always worked hard together, but clearly also found time to relax. Two other significant changes occured during the Cambridge period. First, I began to hear about someone named Sylvie. Many a long-distance conversation from my apartment, all conducted in Italian, of course, ended with the increasingly familiar "baci" (kisses). In fact, I began to understand a lot more of what Francesco was saying, as I had started going to Florence myself. These month-long visits represented a major shift for me, as I had not previously traveled widely outside the US. Arcetri provided a welcome environment, and having a friend so comfortable in both cultures was of enormous benefit. As I became acclimated to Arcetri, I noticed how Francesco's own status at the Observatory began to rise.

Fig. 2. Francesco in my office at the Center for Astrophysics. At this time, we were heavily involved in stellar evolution studies

The early 1990s witnessed two other transitions. I decided it was time to leave my faculty job at MIT. While many people warned me against taking such a risky and unorthodox step, Francesco was not one of them. We knew each other well enough to respect such momentous decisions. In addition to leaving MIT, I generally felt the need for a break from American academia. I asked Francesco if I could obtain a visiting position at Arcetri, and soon the director created one. About this time, I also began to entertain the possibility of writing a book on star formation. When I asked Francesco if he would be my co-author, his only response was slight irritation that I had not asked him earlier.

So began our ten-year project. Visits followed visits, and thousands of messages were exchanged. We were essentially working in the dark, as it was far from clear how to synthesize an entire field that had, as yet, no serious text.

Fig. 3. A portion of Francesco's notes for our textbook. Searching for papers was a laborious process in the 1990s.

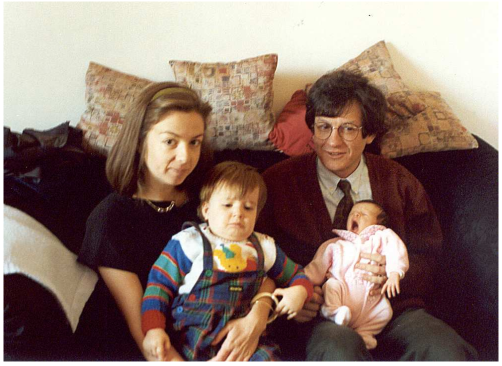

Fig. 4. The new family, in February of 1993. Barbara is on the left, and newborn Arianne on the right. Photo courtesy of Sylvie Duvernoy

Neither of us had the opportunity to teach the subject, so we could not follow the traditional route to writing a book. In addition, tracking down references in those pre-Internet days was difficult and tedious. I won't deny that we were both exasperated at times. Nevertheless, it was critical that Francesco was able to stay remarkably even-tempered. When we finished writing, in late 2003, we were exhausted and elated. Our personal circumstances had also changed in the meantime. I had finally returned to California, while Francesco and Sylvie had a new family. In fact, Barbara and Arianne were born close in time to the book's own inception.

While Francesco and I were writing the book, we delved into so many areas that fresh ideas came to us regularly. Of course, we could only select a few issues to pursue, or the main task would have taken even longer. Looking back, however, I see that Francesco's remarkable diversity of research interests – from masers to primordial chemistry to stellar oscillations – emerged during that decade. Every scientist knows that truly good ideas are rare. For my part, most of those I've had also date from that time.

With the book finished, our visits and also our research collaborations fell off. I watched from afar as Francesco assumed the directorship of Arcetri. I heard about the formidable trials faced by Italian astronomy. Our discussions of everything from world affairs to the arts to science also never flagged, and we remained as close as ever. We began working on a second edition of the book. Up until the end, there were plans to visit.

As I finish this piece, I reflect that it has been a year and a half since Francesco's sudden and untimely passing. Even in that brief period, significant new findings have rippled through our field, which is far from what it was in 1980. I am fortunate to have had a companion with whom I could witness this transformation, and even contribute a part to the ongoing story.

Fig. 5. The last photo of me and Francesco, at Arcetri in May of 2013.