

Pierre-Gilles de Gennes

1932-2007

Preface

Pierre-Gilles de Gennes passed away on May 18, 2007 after a long battle with cancer. He was one of the great physicists of our time, and made important contributions to diverse areas such as superconductivity, magnetism, liquid crystals, polymers, colloidal and interfacial science and, more recently, to memory in the brain and bio-adhesion. He was a true scientific leader who influenced many generations of scientists and students, initiated research in the physics of many topics and disciplines that were later pursued by others. His work was recognized by many awards and prizes including the Wolf Prize in 1990 and the Nobel Prize in 1991. The three of us had the good fortune to work closely with him. It is worth noting that we span his long scientific career of over 45 years; Guy Deutscher was one of his first student and research associate in the 60s, David Andelman his post-doctoral fellow in the 80s, and Yoav Tsori was his last post-doc (2003-04). Instead of writing an ordinary obituary, we felt that our short personal recollections could offer a glimpse into the extraordinary style and character of Pierre-Gilles de Gennes.

The Early Years (Guy Deutscher)

Pierre-Gilles de Gennes was a great friend of Israel. When I told him in 1971 of my decision to leave University of Paris (Orsay) and take up a position at Tel Aviv University, he smiled broadly and said: "*C'est tres bien, vas-y*" [That's great! Go ahead!]. I was surprised by this encouragement. I understood only years later that he already had some very good friends in Israel, in particular, the late, Shlomo Alexander, and that he liked to visit our country and supported it in many ways. He did not consider me a "deserter", but rather a pioneer. My decision did not break the link between us. On the contrary; in the long term it even reinforced it.

This reaction of de Gennes was, in fact, typical of him. He empowered you to make your own decisions. This is why I always felt completely at ease with him. He liked to work with experimentalists, revealing to them the range of possibilities based on some calculation ("*un petit calcul*", as he would say) he had just done. This was a deliberate choice: he had accepted the position that was offered to him at University

of Paris (Orsay) under the condition that he would have the freedom to hire experimentalists (mostly PhD students) and that there would be lab space and a budget. We, experimentalists, did receive the support of those theorists that did their PhD with de Gennes, but the emphasis was clearly on the experimental side. This model of a research team composed of about 4 or 5 experimentalists, with a "half theorist", was reproduced throughout his career.

Experiments were discussed informally amongst us (a group of four, "*the 4 mousquetaires*" as he used to call us later) to such an extent that papers were sometimes published under the non-personal authorship of "*The Orsay group on superconductivity*", and when the time came to write down our respective theses, the attribution of different parts of the research was not always obvious. We all came from different backgrounds, and I believe had been pre-selected by him as such. Etienne Guyon had done a diploma thesis on transport at low temperatures, Alexis Martinet was an extraordinarily gifted designer and constructor of lab instruments, Jean-Paul Burger had done a thesis on the properties of hydrogenated palladium, and my own background was in metallurgy. Out of this mixture came papers on thin films, tunneling, proximity effect, etc. The idea of a team composed of people from different backgrounds, but educated in such a way that they can communicate with each other, is another innovation in the structure of a research group as de Gennes saw it.

This model worked well under his extraordinary leadership. Whether it is a recipe that can be adopted successfully by others remains to be seen. He was the magical "glue" that held all the pieces together.

Middle of the Road (David Andelman)

The year I spent at *Collège de France* (1984-85) as a post-doctoral fellow had a remarkable effect on me and to a large extent changed my approach to science. At that time de Gennes was already a very well known scientist with substantial contributions to superconductivity, liquid crystals and polymers. He was just on his way to explore other new phenomena including wetting and spreading of liquids on solids, adhesion and lubrication.

His lab at *Collège de France* consisted of several experimental groups (about 30-40 people), de Gennes' PhD student at the time (J.F. Joanny) and one or two

theoreticians. This mixture of a few theoreticians embedded in an experimental lab was completely different from my experience as a graduate student at MIT. During that year I learned how synergistic that blend was. De Gennes' presence was felt mainly by "*diffusion*". We knew when he was around (as he was often absent traveling) and when he was, the whole lab was in an excited state. My interaction with him was very intense but divided into short intervals. Working with him as a young post-doc was frustrating and rewarding at the same time. One had to be extremely quick in order to stay in tune with him, but then the benefits were so great! It was remarkable to see him reasoning while facing the blackboard, as he decomposed a complex problem into some simple sub-problems and then reassembled it back like a game of LEGO.

He had a unique way of convincing people to enter new and risky fields or to setup completely new experiments. I watched him do this in amazement and concluded that others could not possibly mimic him. At the time experimentalists at *Collège de France* were happily producing neat results on polymer physics, and de Gennes tried to convince them to move on to yet another unexplored topic: wetting and spreading of liquids. There was some initial resistance but eventually he succeeded and within a year or two, beautiful research on the wetting phenomenon emanated out from the lab. This situation was not unique, but quite typical. He had the charisma to convince people and they followed. He was a natural leader.

Another unforgettable memory is how he treated famous scientists and novice students alike even though his time was precious and limited. He had many obligations, but he always gave first priority to scientific research. When someone would approach him, he would give him - for a limited amount of time - his undivided attention. It was also wonderful to see how he could convey his opinion, even when it was critical, without the need to use his authority or stature. He was a true gentleman of science.

the Later Years (Yoav Tsori)

Ambush. This is what gave me the privilege to work with de Gennes. While still a post-doc at *École de Physique et Chimie* in Paris (ESPCI), where de Gennes was the director for many years, I was waiting patiently with a colleague of mine, Francois Tournilhac, near a room where de Gennes was attending a management

meeting. When he came out of the meeting, we approached him to tell him of a new phenomenon we had found. He was very curious and immediately wanted to come and see its complete experimental demonstration. This encounter was typical of him – he would never dismiss any new scientific idea and would often “jump” on them head-on and with all his enthusiasm and capability.

Cigar. A weak cigar smell in the corridors of the Lab at *Collège de France* was an indication that I came to work too late. De Gennes had already been there earlier and I probably missed something. A strong scent would mean that he was still around, and that I should expect him any minute. In this case I would prepare what I wanted to ask him, in order to save precious time.

Ping-Pong. Working with him was like a game of ping-pong (table tennis). Typically he would tell me something, and I was supposed to respond quickly, within a matter of days. Then he would either reject or develop these ideas, and the process continued. For him, this was an exchange that could last for several days. I remember one time, during one of these short “debates”, how he ended the conversation by clapping his hands and saying “*bravo*” to indicate that he was convinced, and left the room. This was, however, a rare occasion... Usually I simply listened because I had no counter-arguments. If you did not work in his style, you were in danger of him losing interest in you.

Curiosity. De Gennes liked unexpected answers and unorthodox thinking. It impressed me a lot that even with all his fame and glory and despite his age, he would pay attention to any good scientific idea, whether from a mature scientist or a student. He never assumed he knew everything. On the contrary, he appreciated that on such occasions he could find novel and different views on both old and new problems. I recall that a year ago, in one of his last meetings at Trieste, he clearly explained how curiosity had propelled him in his career. And, indeed, his curiosity never diminished. I would be completely satisfied if, from all his immense intellect, I could borrow just a fraction of his enthusiasm and curiosity.

De Gennes and Israel

De Gennes was a close friend of the Israeli scientific community and constantly supported Israeli science. He had many friends here and came often to

lecture. One of his closest friends was the late Professor Shlomo Alexander and they maintained close ties over many years. Something that is very relevant today, is that he was vigorously opposed to any type of academic boycott, in general, and, in particular, against boycotting Israel and Israeli science. He also refused to take part in any scientific meeting where he feared the organizers would use his presence to advance their proper political agenda against his own will.

De Gennes' first visit to Israel took place in early 1966 when he participated in a Batsheva Winter School on Solid State Physics. The workshop took place at the Weizmann Institute in Rehovot and was organized by the late Shlomo Alexander. The wonderful advanced courses which he and other eminent physicists from all over the world taught at that workshop, introduced Israeli graduate students to modern aspects of Condensed Matter Physics. Some of those former young students are today among the leading figures of the Israeli scientific community. After that first seminal visit, de Gennes continued to visit Israel and interacted with a large number of Israeli scientists. Over the years, the scientific community in Israel benefited tremendously from these multi-faceted contacts and interactions.

His last visit to Israel was just over a year ago, in April 2006. It was quite evident that he was fighting an unforgiving illness. He had been invited by the French Embassy to deliver a lecture for the general public entitled: "*Inventors and their suffering*". The lecture was delivered at the Rabin Medical center in Petah Tikva and was attended by many people. During the same week, and in spite his fragile health condition, he gave lectures at Tel Aviv University, Ben Gurion University and the Weizmann Institute. On that occasion he was interviewed on Guysen Israel News (a Francophone online news agency), <http://www.guysen.tv/transition.php?vida=320>). In that 12 minute interview, he expressed his views on science and his long-term warm relationship with the Israeli scientific community. As always, he was vivid and full of charm. His answers were enlightening and elegant. He gave the impression that this small interview was the most important thing for him at *that* particular moment. And this was again something very typical of him. Back in France and despite his illness he worked until his very last day. We think that this is how he would have wanted us to remember him. And we will!

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