

Manuel Cardona, The Person

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Because others will treat Manuel's scientific accomplishments in detail, I am writing this from a more personal perspective. In a field filled with outstandingly intelligent people, Manuel was arguably the brightest individual I ever met. His language skills were legendary, and his scientific skills no less. Much of what I have accomplished in my career, and certainly much of the recognition that has come my way, I owe to Manuel. Probably most graduate students and postdoctoral research associates who have had the opportunity to work with Manuel will say the same thing, which gives some idea of his impact.

I first saw Manuel as a graduate student at the University of Illinois Urbana/Champaign, when he arrived to give a solid-state-physics seminar on modulation spectroscopy. Not only did he speak maybe 50 % faster than anyone else I had ever seen lecture, in 5 min he had filled the blackboard, which stretched across the lecture room, from one end to the other. Yet the talk was quite understandable, highlighting the physics and what we had learned from the work, rather than concentrating on formalism and experimental techniques. I don't recall meeting Manuel personally on that visit, but my Ph.D. advisor, who was a physical chemist, recognized that one of the best things that could happen to me at this stage of my career would be to land a postdoctoral research associate position in Manuel's group.

Somehow it happened. That fall, my wife, small son, and I rolled into Providence with everything that we owned in 5' × 8' U-haul trailer. In their typical generous fashion Manuel and Inge insisted that we stay in their house while we found accommodations, since they were out of town. This made finding a place to stay enormously easier.

At this time modulation spectroscopy was reaching its peak, and Manuel was making an impact in the field from both experimental and theoretical perspectives. At the time Manuel's laboratory and many of his methods could be described more or less accurately as "early casual": students were doing electroreflectance by applying fields to semiconductors using electrolytes, light shielding on spectrometers was done courtesy of cardboard boxes taped together, and band-structure calculations were done using the $k \cdot p$ method. Nevertheless, the overall goal was results, and the physics being done there was world-class. This period set the stage

for the rest of my career. Jack Rowe and Fred Pollak were only two members of the group who become lifetime collaborators and friends.

My next significant professional overlap with Manuel came in the mid-1970s, when he made arrangements for a 6-month stay in his department at the Max-Planck-Institute für Festkörperforschung. Getting a 6-month sabbatical from Bell Laboratories was unusual, but my management there decided that it would be good to make some connections with the world-class effort going on in Stuttgart. This was the time of when spectroscopic ellipsometry was beginning to make an impact, and synchrotron radiation spectroscopy was also starting to be a factor. Manuel's laboratory was now much more polished, suggestive (correctly) of much better financial support. The group was also much more international, which was not surprising as by that time Manuel's reputation was worldwide. However, Manuel's office was the same as it was at Brown: papers stacked everywhere, particularly on his desk. Nevertheless, despite the apparent disorganization, Manuel always seemed to find what he needed when he needed it.

In later years we had fewer interactions, but in the late 90s, Manuel and Wolfgang Richter (another Manuel product) arranged a short stay for me at the Max-Planck-Institute, although this was more a visit to renew old acquaintances and review successes than to make further scientific progress.

Of the many aspects of Manuel that I found exemplary, one of the best is that none of the well-deserved acclaim that he earned ever went to his head. He was invariably considerate, approachable, and (as usual) knew more than you did about any topic that you cared to discuss.

To Manuel, friend, scientist, and person extraordinaire: It was a privilege to know you, let alone to be able to work with you. We miss your presence, but your contributions, influence, and impact remain alive and well.