

TIPP 2011 – Technology and Instrumentation in Particle Physics 2011

Remembering Georges Charpak, Friend, Advisor and Great Physicist

Dr. Nickolas Solomey¹, Professor and Chairman of Physics
Wichita State University, 1845 Fairmount St., Wichita KS, United States

© 2012 Published by Elsevier B.V. Selection and/or peer review under responsibility of the organizing committee for TIPP 11. Open access under [CC BY-NC-ND license](https://creativecommons.org/licenses/by-nc-nd/4.0/).

In 1961, before I was born, Georges Charpak was working on particle detectors for applications in Nuclear Science. This led him to the 1968 invention of the multiwire proportional chamber that eventually led to the discovery of the drift chamber. He was very proud of these achievements but, unlike the Geiger Counter or the Winston Cone, none carry his name which he thought was a good thing. However, for me the story with George starts with my first meeting him on his visit to Argonne National Lab in 1983. There I was participating in what today we call the REU (Research Experience for Undergraduate) program for students. His inspiring talk and subsequent discussions led me to start a written communication with him, not a snappy e-mail like today's communications, but a real exchange of letters with some ideas. The next summer, while a graduate student working on my MS degree at Ohio State University as part of a 3-2 program with a liberal arts college called Mount Union College, Georges invited me to CERN as his summer student. Little did I know that his newest detector idea, which was being tested in a Proton Synchrotron beam line in the East Hall, would become the hardware development topic for my Ph.D. thesis with George as Co-advisor. Only one month after I defended my Ph.D. thesis, studying heavy ion interactions in the WA93 experiment at the CERN's SPS using a set of these devices, Georges got the exciting call announcing his winning of the 1992 Nobel Prize in Physics. The stories and

memories of George did not stop there but continued for many years afterwards. Our last face to face meeting was in 1999 on my visit to Paris and we had a few e-mail exchanges a year up until his death in 2010. Many of the stories are personal, others are scientifically insightful, while others will remain between us.

I arrived at CERN in June of 1985 and went to the main Experimental Physics (EP) Division secretary's office. Georges came down to pick me up and help me settle in. The group at that time consisted of Fabio Sauli (of whom I had heard but never met) and a young post-doc named Masayo Suzuki. The device they were working on was named the "light chamber" and was only $10 \times 10 \text{ cm}^2$. The concept was to have an avalanche wire chamber and read it out with an image intensifier CCD camera so that higher multiplicity events could be recorded. By the end of my Ph.D. thesis we would build four of these $2 \times 1 \text{ m}^2$ detectors imaged by eight special CCD cameras. This device would later find application in bio-medical imaging. As with all new ideas, we were groping in the dark to try and find a way to make it work. There were technical challenges to achieve the needed resolution for the intended applications of high density tracking in heavy ion collisions being planned for CERN's Super Proton Synchrotron (SPS) program. The detector was already built and ideas were being tested to improve it, or at least make it work more reliably. A beam line in the East Hall off the Proton Synchrotron (PS) was set up with a dark box and imaged intensifier camera. I recall that Georges was there at all hours to help and see if it could work. As can be seen in the few photos I have found of that time, he seemed tired, but always encouraging to all working to help. My role changed from just a helper to something more significant when Masayo was hospitalized after an auto accident. In the end we obtained lots of nice images and showed the basic idea could work. However, since the CCD readout was not randomly triggerable, but had a TV synchronized readout, the background levels changed from event to event. This problem would eventually be solved, but it would take the combined efforts of the University of Geneva electronics group and a supportive company interested in the idea of a triggerable CCD, namely EEV (English Electric Valve). During that summer a few other ideas were tried out on other detectors but it was this project that was intriguing, and the application of searching for new physics of the Quark Gluon Plasma was exciting. I remember during that summer that I mentioned to Georges that it was exciting studying these ideas of particle detectors, but Georges took off his glasses, as he always did before getting ready to make some far insightful comment, and replied that he thought I would only be truly satisfied if I was aiming to do physics with a detector. In the end he was very correct.

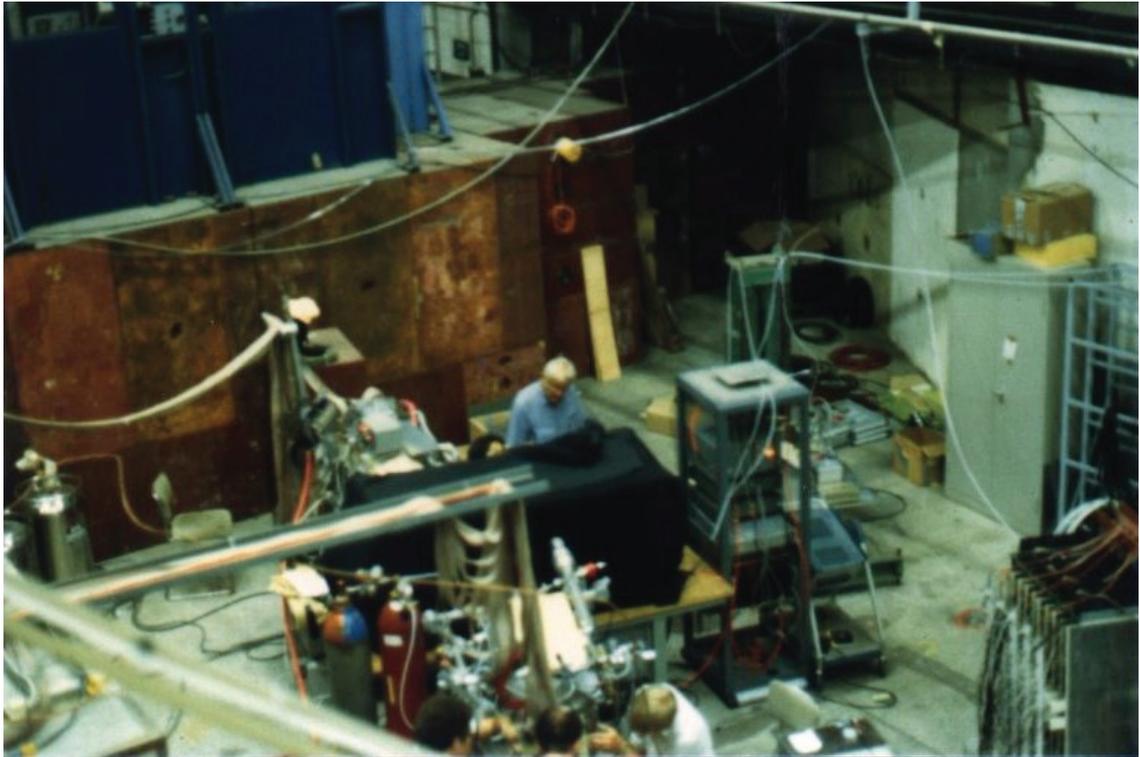


Figure 1: Georges Charpak working in the PS test beam of the West Hall at CERN with the imaging detector prototype in the summer of 1983.

I returned the next summer and participated again on several new ideas and improvements to the light chamber. This time Georges insisted I take the desk in his office across from him, which resulted in many chat sessions about politics, life, troubles and fun ideas. The opportunity came to stay at CERN and work on my Ph.D. partially with him and Professor M. Martin as a student at the University of Geneva. Eventually the phase of the project turned away from a small new idea development to expanded size and faster readout. We eventually built a full size detector and tested it, and then went into mass production for the four readout planes in one arm. The results of these efforts became the charged particle tracking system of the WA93 experiment. During the technical developments, as the detector became bigger and real life limitations were being encountered that would stop us from doing physics with the device, Georges seemed to become less and less interested. We eventually overcame them and when needed, Georges was present to help talk us through ideas towards a solution. However, when data from the experiment with lovely images started coming out George was thrilled to be present, and take some of the images away with him to show to friends. The WA93 data set with these tracking chambers was taken in 1990-1991 and the data analysis of first physics results for my Ph.D. thesis defense occurred in

September of 1992, just a month before he got the phone call about him receiving the Nobel Prize in physics.

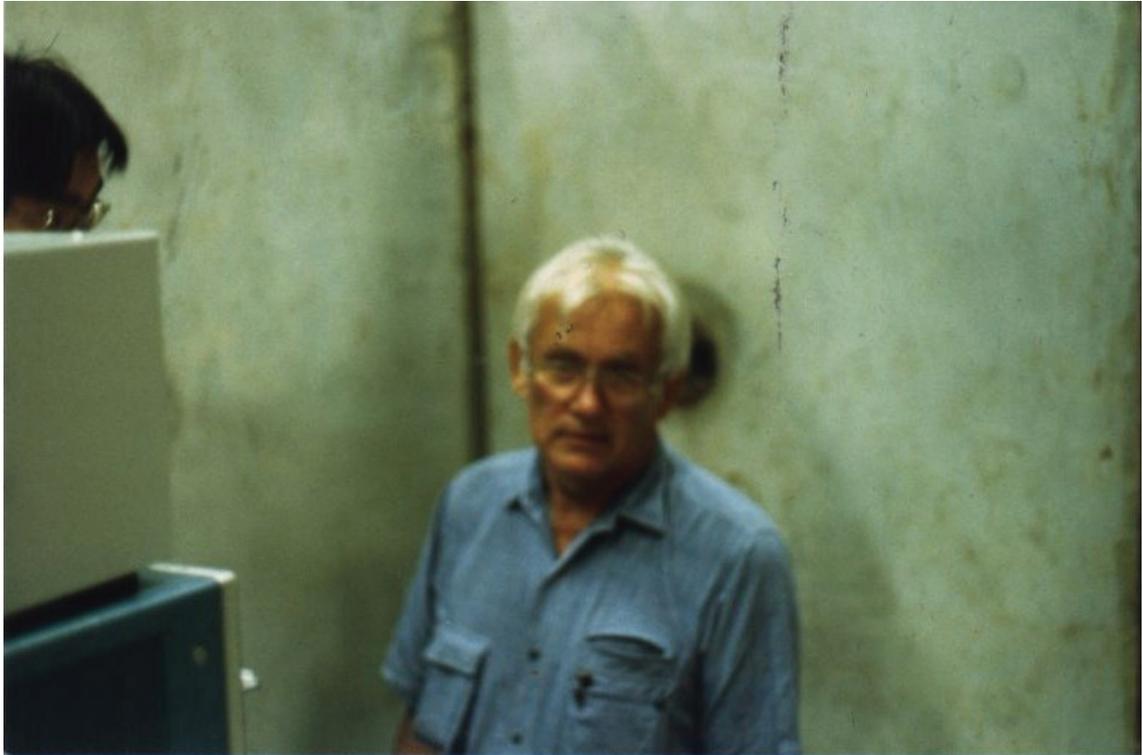


Figure 2: Georges Charpak in the early morning after an all night test beam run at the CERN PS T7 beam line of the West Hall at CERN, July 1983.

During this long time many other events occurred, including wine shopping in Bourgogne with Georges. One year we waited in his office by the phone in October, but the Nobel Prize committee did not call him, so we went off to get a drink at the CERN bar. A phone call once came from a New York reporter who accidentally phoned the wrong number instead of the Director General's private number, which differed by one digit. This reporter expected to get the CERN director general, Carlo Rubbia, and Georges tried to pretend to be Carlo! I have many other good memories. Georges also wanted to educate me about how Americans see the world wrongly, so he arranged that I would go to the Soviet Union and give a physics seminar at three cities about the experiment being developed and the tracking chamber system. In his mind, if more Americans became aware of the people within the Soviet Union, there would be less chance for nuclear war. We had constant visitors who needed help with their multiwire proportional chambers or drift chambers that would not work. In the end, the answer was always that the wire chamber had so many leaks that air was getting in. One especially nice memory for me was when

Georges arranged that we would have lunch at the CERN main cafeteria with John Bell and discuss some theoretical physics. It was the shortest 2.5 hour lunch I ever had! The time flew by. Through Georges I met Tom Ypsilantis, Philippe Mine, David Anderson, Yanis Giomataris, Wojtek Dominik, Dominique Savage, Don Lamb, Carlo Rubbia, Abdus Salam, Amos Breskin, Paulo Fonte, Vladmir Peskov, Leon Lederman and many more.

Upon finishing my Ph.D. degree, Georges and I kept in touch, always communicating at least twice a year by e-mail. I went off to the University of Chicago to work on the gaseous Transition Radiation Detectors for KTeV, but also helped with the CsI calorimeter and debugging the tracking chambers. However, I am most proud of the hyperon system that I put together for KTeV of which even N. Cabibbo took note. I was the post-doc of Roland Winston of the Winston cone fame and this helped me feel comfortable at the University of Chicago because Roland Winston was of an identical character and brilliance as Georges. I even got to contribute to five papers on solar energy research with Roland's other non-high energy physics efforts. Georges' career touched a wide variety of experiments including the CERN g-2 experiment. He used his new wire chamber and drift chamber to participate in experiments of rare K^0 decays and the study of CP violation which resulted in a CERN yellow report in the 1960s about physics results from this experiment. When I first arrived at CERN, Georges was always interested in what experiments needed, finding a way to help, and always being excited about the physics itself. I remember when the cold fusion talk came to CERN, the room was full and all members of Georges' group showed up. Right after the talk, we all met in the hallway and discussed how the physics seemed wrong by utilizing what physics they had presented during their seminar.

I went on to write a popular book that came out of my public lectures when I was Compton Lecturer of Physics at the University of Chicago. Many people helped me during the research for this book and Georges went out of his way when I needed to contact someone about certain material. Georges willingly wrote a contribution for the back cover along with John Bahcall about how great the book "The Elusive Neutrino" was. Likewise when Georges was writing books in his retirement, we often had discussions on some points he wanted to bounce off of someone. He arranged that I give the summary talk at the 2001 Vienna wire chamber conference, which was an honor for me to deliver, since I knew Georges thought that conference was the best one that reflected what he perceived to be his field of research expertise.

Naturally, we had a few disagreements. One that comes to mind was when I was the Physics Section Chair for arXiv.org and insisted that articles on detectors belonged in the Instrumentation and Detector

section and not the hep-ex category. This was not a statement against him but solely a statement that library science states that an article should be in the category to which it belongs for organizational purposes. Also, Georges was a strong advocate for nuclear energy and I was not because of my own history growing up in Western Pennsylvania in the shadow of Three Mile Island. The crisis there unfolded when I was in high-school. However, I do have a suggestion that I think Georges would like if anyone from DOE is listening: In the 1940s, President Roosevelt and Einstein proposed at the prodding of Leo Szilard and Eugene Wigner to start a crazy almost impossible project to build the nuclear bomb, In May of 1961, 50 years ago, President Kennedy made a similar challenge (that everyone thought impossible) to put a man on the moon by the end of the decade. I suggest to DOE to take a city of half-million people and by the end of the decade make it completely powered by renewable energy sources, capable of surviving without grid electricity, no natural gas service and most cars running on renewable fuels. A lot of components to do this for electricity and heating exist but a lot would have to be invented to make it work, while other components for energy storage would have to be developed with intense R&D. Once we can demonstrate a city like this, mankind would be ready to face the real challenge of saving the planet, and this would be a dramatic step forward that we need to do, and that I feel is possible to do by 2020!

Georges and I last met face to face in 1999 when I was in Paris. I came to his condo near Notre Dame on the river Seine. We had a pleasant afternoon discussion and remembered the past. At that time, he was well and still enjoying life. I will always remember him as a kind and good man, a great scientist and a true physicist.