The Glashow–Iliopoulos–Maiani mechanism: some personal reminiscences

A. Zee
University of California, Santa Barbara, CA, USA
Shanghai Jiao Tong, October 29, 2019
Tempus fugit: 50 years have passed!!!

I was at Harvard from 1966 to 1970, receiving my Ph.D. a few months after the GIM paper was conceived. John Wheeler sent me there to work for Weinberg, but (fortunately for me) he left for MIT not long after I arrived, for reasons unknown to me. (At that time, I heard rumors but Gross told me recently that they were not true. Weinberg had also told me the same.) So I worked for Coleman, talked to Glashow, and took Schwinger’s quantum field theory every year for four years (and learned Mandarin in the process!)
Personal reminiscences: “My memory, your memory, and what actually happened.”

First, my apology to Professor Maiani
(I collected stamps as a boy; San Marino!)

My life has been, and was, more intertwined with that of Glashow’s and that of Iliopoulos’s, partly because I live in the US and like to hang around Paris.

1969 was an important year, NOT only because that was when I first heard of the charm quark, but because……..
Widener Library near sunrise on April 10, 1969

Ladies and gentlemen, I don’t think that you fully realize how large a horse is until you have been charged by the mounted police waving batons. And then teargassed.

Fortunately, the university had declared that Harvard Yard was a sanctuary, off limits to the police.

So actually, the whole thing was a bit of fun and games (not like at UCSB, where the students burned the Bank of America, or in Paris in 1968.)
So, classes were often cancelled, partly because the students did not show up, and partly because the professors were also out protesting and rioting.

Net result: Huge gaps in my education discovered later at Princeton.

Glashow was a young and perhaps the most fun professor at Harvard! Sometimes Shelley would show up wearing sunglasses* and then ask the students what we would like him to tell us.

I remember many thought provoking conversations with him. For example, he told me not to learn to play wei-qi (=go); he had a board, and also a dart board, in his office.
*Shelly liked to wear dark glasses

Photo from 1962: Glashow had already done his Nobel winning work (I was still in high school in Brasil)

Physics convention: famous people in front, for example, Wigner. But Shelly likes to flout tradition. (Or perhaps the young guy sitting in front of Wigner thought that he was more famous?)
Shelly was a veritable volcano of ideas!
Often, I would run into him in the corridors. “Hi Tony, I just thought of ten great ideas. Let me tell you about them, but most of them are probably nonsense!”

Typical: “How do you know that there is only one kind of photon?”

Years later, I wrote a paper about this when fractional charges and magnetic monopoles were both discovered at Stanford.

A hugely refreshing change from Schwinger, Coleman, and Weinberg, who never talked (or talk) nonsense!
More than 40 years later, in Santa Barbara
1981: Where is Iliopoulos? How many physicists can you identify?

I asked Jean to cook a dinner for the group. It took several days! Many stories: “You do not understand, we are taking the ferry….” “Those who are under 30 raise your hands….”
By far the most famous chef in the theoretical physics community and the ONLY Chevalier du Tastevin I know!

(Going to a Greek restaurant in NYC with Iliopoulos was a scary experience for me, around 1976 I think. I was young and sensitive to the threat of physical violence after my Harvard education.)

Jean in uniform (minus his chef’s hat) with my wife Janice, dining in his Paris home
A famous chef lecturing about food and wine and looking upset by a stupid question
Over the decades Jean has taught me many things. (I spent two of my year-long sabbaticals at the Ecole Normale Superieure, most recently two years ago, so that my three sons could have a taste of the French educational system.)

For example, he explained to me, in the late 1980s I think, that the word “friend” has different meanings in the USA and in Europe.
Iliopoulos was very friendly to me, even though I was merely a student. (Graduate students were treated extremely badly at that time at Harvard, not even given a desk, let alone an office to meet in, but separate bathrooms.)

Just to show the young people how the world has changed: at that time, preprints sent to the professors were locked in a glass cabinet and Jean had a key. He would show me some interesting papers from time to time and tell me about them.

One day, he was unusually excited ……
No need for me to explain the GIM mechanism here, extremely well known and treated in all textbooks

For those of you who don’t know it, here it is explained by Iliopoulos in Chinese

撰文 John Iliopoulos（巴黎高等师范学校荣誉教授、狄拉克奖获得者、粲夸克的发现者之一）
翻译 高莘（哈佛大学物理系）
编辑 丁家琦

物理学家的行话中，若是提到“charm”（中文意为“魅力”）这个英文单词，首先让人想到的并非某位窈窕淑女的迷人风采，而是一种晦涩难懂的粒子——夸克（quark）。夸克是我们发现的最“基本”的粒子，一切物质都由质子和中子构成，而夸克就是质子和中子的组成成分。如何追寻最小的粒子的过程，是另一个充满激情的故事，我们暂且按下不表。

我们的故事始于上世纪60年代。当时我正在欧洲核子中心（CERN）做博士后，那是一段美好的记忆。我和其他博士后和访问学者共同组成了一个快乐的年轻人小团体，不仅在一起愉快地讨论物理，也一块儿滑雪、登山、吃喝玩乐。我们并没有在物理方面做很多事，但是正如小团体的一员David Sutherland所言，我们正在搞一些大事情。那时我们知道有三种夸克存在，分别叫做u、d和s（译者注：u即up，称为
The charm quark (of course not as such) was announced on November 11, 1974. (The subsequent, rapid changes in high-energy physics at the time have become collectively known as the "November Revolution"). Callan, Kingsley, Treiman, Wilczek, & Zee was received December 9, 1974.

Again, to show the young people how the world has changed, I remember Frank Wilczek staying up all night typing this paper and showing me early in the morning a copy covered with white-out (invented in 1956), which we sent to the journal by snail mail.
One exciting episode in the golden age of particle physics …………
Thank you!