International Conference on History of the Neutrino

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I'm very glad to be here, and I would like to thank the organizing committee for having invited me, especially Mr. Vignaud and Mr. Cribier.

I have to say, to introduce my series of short talks, that I am not a specialist in particle physics. So, what could a generalist historian of science bring to a conference full of experts in neutrino physics? Maybe a way to shift the focus a bit. I will consider it as my job, during these three short talks, to convince you that the history of the neutrino, is not only a history of great intellectual discoveries and wonderful new techniques, but also from end to end a history of the twentieth century. A history of nations, politics and war. A history of institutions and social changes, all deeply intertwined.

This history starts during the interwar period, as several speakers have reminded us of this morning. It is precisely at this time that the way of doing science, and physics especially, started to resemble something we know nowadays. Actually, the interwar period was a period of major changes for science that we cannot understand without calling back to the beginning of the century and particularly the First World War.

Let us remind ourselves briefly what physics looked like at the turn of the century. An overwhelming majority of physicists were working in Western Europe. American universities were still small and distant institutions, in a quickly developing but isolated country. Most scholars, who were not yet named *researchers*, were still amateurs, living off of personal resources, teaching or business activities, or patronage and various grants. Work was essentially individual or organized between small groups of people, and what we could call “laboratory work” was often led at private residences and not in universities. Leading papers were written in German or

French. And science was mainly seen among society as an enjoyable inquiry with moral involvement more than a material or economic one.

Finally, the existence of atoms had just been completely accepted, and the physics of radiation was bursting into an explosion of new observations the likes of which fundamental physics had not known for a while. The experiments stemming from this whole new continent became the building blocks of quantum theory.

In this landscape, the First World War was probably the event having the most profound consequences on twentieth-century science, on par with or maybe even having more impact than the Second World War.

Scientists played a very important role throughout the war. Aviation was used for the first time in a conflict. Submarine use became significant. Chemists developed poisonous gases. Heavy artillery demanded more and more ballistic computations. And meanwhile, the twice nobelized Marie Curie developed medical radiology to help the Red Cross treating the countless injured soldiers. At the same time, the total war, produced by the clash of the imperialisms among the european States, involved the entire societies, resting upon nationalist ideologies. All of this led ruling elites and each nation's society to think of their scientists as a highly useful tool for power. And even if we usually date the end of the First World War in 1918, this schema actually persisted more or less until the Second World War.

What have been the consequences for physics? Firstly, the professionalization of scientists. The importance of science for national power, and the new prominence taken by the States in each nation's society together made science a political and national aim. At the same time, the terrible social conditions of the war aftermath had broken the fragile equilibrium between personal resources and private fundings that once had permitted some scientists to live and work. The time had come to construct national public scientific organizations with staff researchers. In France, it was the

CNRS, *Centre national de la recherche scientifique*, planned by the government of the Popular Front and the first undersecretary for scientific research, Irène Joliot-Curie, daughter of Marie Curie and recipient of the 1935 Nobel Prize in Physics for the discovery of artificial radioactivity. So, scientific research became a professional *career* during this interwar period, something it had never really been before in European history.

Secondly, another direct outcome of this new social place for science — and especially physics — was its incredible penetration into society as a whole, hand in hand with the rise of advertisement (or propaganda) and the birth of consumerism. Modern physics became synonymous with the power of a nation and with a radiant future. Institutions dedicated to popularization of science were built, like the *Palais de la Découverte* designed by Jean Perrin in Paris. In France, the discovery of radium by Marie Curie inspired in just a few years a *now absurd* trend of radium consumption. Advertisements were praising radioactive water, or face cream; very good for the complexion, guaranteed! Or even radium talc for babies!

Finally, the war had been the accelerator that propelled the American economy to a worldwide leading position. The center of gravity for physics was still in Germany, but the rapid development of scientific institutions in the United States made the physics community experience a first kind of “globalization” across the Atlantic Ocean. The most famous example of this internationalization of physics was the organization in Brussels, by the Belgian industrial Ernest Solvay of a series of conferences, known as the “Solvay conferences”, more or less every three years starting from 1911. A large part of the animated debates about the nature of the quantum world and the correct theories to understand it took place there. In a way, these meetings were the first international conferences of theoretical physics. Except that at the time, basically, all theoretical physicists in the world could fit in a single room.

Thank you for your attention, and see you tomorrow for the next historical interlude!