

# A portrait of Stueckelberg as a young man

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E. C. G. Stueckelberg was a Swiss physicist of the twentieth century, famous for his contributions to the theory of elementary particles. The early part of his career, which ended dramatically in 1932, is not well known, but the facts below help to shed some light on Stueckelberg during this period.

E. C. G. Stueckelberg was born in Basel in 1905. His full name was Johann Melchior Ernst Karl Gerlach Stueckelberg, Freiherr von Breidenbach zu Breidenstein und Melsbach. He inherited his German aristocratic title from his mother's side. His father was a lawyer and his paternal grandfather a Swiss painter renowned for his frescoes of the 'Tellskapelle' on the 'Vierwaldst ttersee'.

Stueckelberg started to study physics at the University of Basel in 1923 and became President of the Students' Union within his first year. In this capacity, he invited Arnold Sommerfeld, a renowned leader in theoretical physics, to give a lecture in Basel. Surprisingly, this invitation was accepted. Impressed by Stueckelberg's intelligence and good manners, Sommerfeld invited him to spend the academic year 1924-25 in his institute in Munich.

This episode was the making of the young Stueckelberg, a brilliant freshman who was already aware of what was happening at the forefront of theoretical physics and knew that Sommerfeld was a master in this field. Instead of travelling to Munich in an attempt to be introduced to the master, he took the initiative, as President of the Students' Union, to invite him, and succeeded. Stueckelberg gave a brilliant introduction to Sommerfeld's lecture, which took place in the Bernoullianum in Basel. His reward was a one-year stay in Munich. Stueckelberg is thus portrayed as a smart, self-confident and determined young man.

The Munich experience was a critical period in Stueckelberg's education in theoretical physics. He was given the opportunity to learn quantum mechanics in a fundamental research environment. He was able to meet Werner Heisenberg and could attend Sommerfeld's famous lectures, which became a model for his own teaching. Back at Basel University, he undertook a Ph.D. thesis on cathode temperatures and got his degree in 1927, at the age of 22. He also became an officer in the Swiss Army.

Stueckelberg's father offered his son a trip to the United States of America as a reward for his Ph.D. Stueckelberg did not actually travel in the USA as a tourist, his goal being to find a job. This is another striking episode in Stueckelberg's life. He obviously wanted to start his career in the USA right away, without first looking for an opportunity in Europe. What is amazing is that he was very quickly successful and was offered a post in one of the most prestigious universities in the USA, Princeton University. At the end of 1927, he became Research Associate at the Palmer Physical Laboratory, a highly renowned research institution. Stueckelberg thus proved that the USA is a country where everything is possible. Sommerfeld's recommendation clearly played a role in Stueckelberg's appointment. It would be interesting to know if there were other Swiss scientists holding postdoctoral posts in the USA in 1927 or if Stueckelberg was the only one in his field.

As the quantum theory of atoms was already well understood when Stueckelberg arrived in Princeton, the next challenge was the quantum theory of molecules. It was one of the main topics of research at the Palmer Physical Laboratory. New tools had to be devised for the computation of the spectra of molecules and for the description of their interactions. This required new reliable approximation methods for the solution of quantum mechanical problems.

Dealing with applications of quantum mechanics could still be quite an adventure in the late 1920s (Dirac's Quantum Mechanics appeared in 1930). Various approaches coexisted and were vividly argued and discussed. A funny story occurred while Stueckelberg was attending the 1928 Michigan summer physics programme where H. A. Kramers, a prominent theoretician was giving lectures. Stueckelberg asked Kramers to give him his view of quantum mechanics, but Kramers did not have time for that, as he was leaving and had to pack. Stueckelberg insisted and offered to pack Kramers's bags himself; as a Swiss army officer, he was expert in packing. This suggests a picturesque scene: Stueckelberg packing bags while carefully listening to Kramers, his senior by eleven years, explaining quantum mechanics.

The Princeton stay was quite a productive period. Stueckelberg was in close contact with colleagues at the Palmer Physical Laboratory, P. M. Morse among others. He was working on molecular spectra, explaining for instance the

continuous spectrum of the hydrogen molecule with J. G. Winans. His main efforts were focused on the description of collisions (ion-molecule, atom-molecule, molecule-molecule, electron-molecule), and this was done in part with P. M. Morse. Stueckelberg developed a theory of non-adiabatic effects in the collisions of two atomic systems. Nowadays, this theory is known as the Landau-Zener-Stueckelberg formalism, actually produced separately and simultaneously by the three authors.

Stueckelberg published eighteen papers between 1928 and 1932, and was promoted to Assistant Professor in 1930, at the age of 25. He was affected by the 1929 financial crash. His salary was reduced and he improved his income by giving occasional riding instruction.

His life changed suddenly in January 1932, when Stueckelberg was afflicted by the first attack of a terrible mental disease, manic-depressive psychosis. His illness cast a dark shadow on the rest of his life. He decided that his mental state would not allow him to pursue his career in the USA. He resigned from his position at the Palmer Physical Laboratory and came back to Basel.

The University of Basel did not really welcome Stueckelberg on his return. His Princeton experience was not recognised and all he was offered was a junior assistant's post. He could not apply for an academic position in the German-speaking part of Switzerland because he had no *Habilitationsschrift*. He therefore produced such a thesis, with a detailed account of his version of the Landau-Zener-Stueckelberg formalism, but it was not accepted. At that time, the only positive event was his nomination as Privatdozent at the University of Zürich in 1933. His financial and scientific situation became stable in 1934 when he was appointed Professor of Theoretical Physics at the University of Geneva.

Stueckelberg completely abandoned molecular physics after writing his *Habilitationsschrift* and became a pioneer of elementary particle physics, but that is another story.



E. C. G. Stueckelberg, third from left, with colleagues in Princeton.