# Hermann Weyl in Zurich 1950–1955

*Beno Eckmann*

Hermann Weyl (1885–1955), a German mathematician of the Göttingen school, spent much of his mathematical career at the Swiss Federal Institute of Technology (Eidgenössische Technische Hochschule, ETH) in Zurich, and later at the Institute for Advanced Study in Princeton. Excellent expositions of his well known work in representation theory, harmonic analysis, foundations, and theoretical physics are in the literature, including ones by Weyl himself. In what follows, I give some personal recollections of Hermann Weyl.

## Zurich 1913–1930

Hermann Weyl and Zurich: All biographies include the well-known fact that he was professor of mathematics at the ETH in Zurich from 1913 to 1930. The majority of his world-famous papers were written during that period, as well as his books which became best-sellers like *Space, Time, Matter* and *The Group Theoretic Method in Quantum Physics*. People from all over the world came to Zurich to see him and to discuss important problems. Zurich and the ETH were one of the centers of mathematical research.

In 1930 Weyl left Zurich to succeed David Hilbert in Göttingen. But in 1933, when the Nazis came to power in Germany, he accepted an invitation from the Institute for Advanced Study in Princeton. We should realize that, while not Jewish, Weyl was a strong opponent of the Nazi spirit and his (first) wife from Göttingen was Jewish.

He left Europe quite reluctantly; the spirit, the language, the history, everything seemed quite strange. But Princeton turned out to be a very good place for him to work and to maintain his international contacts. He made various trips, including visits to the mathematicians of the ETH in Zurich where he found a small but very interested group.

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## 1950–1955

What is less known is the importance of his activity during his time in Zurich in 1950–55. In 1950, approaching the age of 65, he decided to retire from the Institute and move back to Zurich. The official retirement year seems to be 1951. But from April 1950 on until his death in 1955 he spent most of his time in Zurich—interrupted by shorter stays in Princeton and, of course, lecturing trips. He was remarried in 1950 to Ellen Bär, the widow of a physics professor at Zurich University who had died at a rather young age. The families Bär and Weyl had known each other well during the earlier time in Zurich. Hermann Weyl's first wife had died in Princeton in 1948. In 1947 when we, my wife Doris and I, were at the Institute she was already ill and in hospital.

Ellen Weyl-Bär (also Jewish) was a very cultivated person, active in the arts as a gifted sculptor and, in earlier times, a violinist. She knew personally many artists, painters, sculptors, musicians, and writers. She created for Weyl a most fascinating atmosphere of culture and science. From his writings we know how deeply he was interested in all cultural activities.

During 1950–55 Hermann Weyl, whenever he was in Zurich, maintained close contacts with the mathematicians of the department. He had no official status but simply came to the main building of the ETH to discuss the many aspects of mathematics he was interested in. He attended

lectures and student seminars and, of course, gave, himself, beautiful colloquium talks. It was a very happy time for me. Since we knew each other well from the Princeton time he would often come to my office and ask questions. My answers would eventually always result in some new things I could learn from him and from his magnificent classical mathematical background. His questions centered around the de Rham theorem on differential forms on a compact manifold and generalizations; or around fixed point theorems, vector fields, Hodge and Kähler structures, and many similar things.

## ICM Amsterdam 1954

A particularly interesting period was spring and early summer 1954. This was the year of the International Congress of Mathematicians in Amsterdam. Weyl, as president of the Fields Medal committee, had to report on the work of the two Fields Medal winners, Kunihiko Kodaira and Jean-Pierre Serre. He clearly was well aware of the merits of their prize-winning work, harmonic analysis on manifolds (Kodaira) and homotopy groups of spheres (Serre). He felt, however, that he should know more about the "modern" techniques in these fields. He wanted to learn for example, in connection with Kodaira's work, the details of the proof of the de Rham theorem, and of the Hodge-de Rham decomposition of the vector space of differential forms on a compact Riemannian manifold. Or, concerning Serre, the concept and importance of homotopy groups and their relation to homology, or the Hopf algebra structure of the cohomology of loop spaces, or the technique of spectral sequences, etc. So there were for me the interesting and clearly most gratifying tasks of teaching topics from a "modern" viewpoint. What an unusually gifted student!

The lecture in Amsterdam was a brilliant account not only of the work of the medalists but also of the role of algebraic topology throughout many fields of mathematics. Weyl himself knew very well that in earlier times, almost until the beginning of World War II, algebraic topology had not been fully recognized by the mathematical community—and now it appeared in a glorious way in the work of the two winners, in quite different contexts.

## A Student Course in Zurich

An extraordinary story, typical of Hermann Weyl, happened in 1950 soon after his return to Zurich from Princeton. I was a young professor at ETH, nominated in 1948. In the summer of 1950 there was the first post-war International Congress of Mathematicians, at Harvard University. I was invited to deliver a lecture in the topology session. There were no funds available for the very high travel and living costs; so it was arranged by the American Mathematical Society that I give a short course at a midwestern university. This meant that I had to leave Zurich three weeks before the end of the semester and had to find replacements for my ETH lecture courses. This was not easy for one of them, my course on number theory. When Weyl, during one of his frequent visits to our department, heard about this he immediately offered to do it in place of an assistant. I hesitated, but he said "No red tape, don't inform the administration. Just give me your notes." We proceeded in that way. He entered the classroom, gave his name, and said that he would replace me for the last three weeks of the semester. The students were happy about his lecturing. To what extent they realized what a world-famous substitute I had is not clear. When I returned after the Congress, the dean and rector and president were rather angry at me—not having known about that activity of Weyl at the ETH. Our arrangement had of course been illegal but could not be changed. What seemed important was Weyl's feeling to still be part of the mathematics life at the ETH Zurich.

## 70th Birthday

In the fall of 1955 the ETH and the mathematics–physics group organized a wonderful 70th birthday celebration for Hermann Weyl. Let me just mention the remarkable talk by Wolfgang Pauli on the overall importance of Weyl's work, and the dinner party at one of the Zurich guildhouses. One month later Weyl brought to a neighorhood post office all the letters he had written to thank people for the congratulations. They were handwritten on a small white card which had, at the top, a Goethe verse as imprint: "Willst Du ins Unendliche schreiten, geh nur im Endlichen nach allen Seiten (you want to go to infinity, just go in the finite domain in all directions)." These simple words from (complex) projective geometry were an adequate description of Weyl's lifetime work and thinking. On the way back from the post office he was struck down by a heart attack. He fell to the street and died on the spot.

A volume *Selecta Hermann Weyl* was published, with the help of the ETH, the Institute for Advanced Study, and Birkhäuser Verlag Basel, in honor of the 70th birthday. Weyl himself had selected, from the huge number of his publications, those papers which should be included—and those which should not! He was enthusiastic about the project and had very strong opinions concerning his own work. We, that is Heinz Hopf, Michel Plancherel, and myself, had long discussions with him about that choice but could not always follow his arguments. Of course we accepted his decisions. The volume appeared early in 1956. It was sad that Weyl could not see it and hold the final copy in his hands.