

Interlude in Denmark

In my early student days -- as I have mentioned in chapter 3 -- my friend Christiansen-Weniger and I won an election as German student representatives on the ticket by striking a mathematical funny bone: Christiansen-Weniger - von Hippel [Christiansen minus von Hippel]. In the meantime, "Krischan" had become a professor of agriculture and had been called to Ankara in that capacity. He was an "unblemished Aryan," still a German citizen, and his lovely wife, Luise, alias "Körnchen," also a youth-movement friend, came to visit us. She intended to fly to Warsaw, and I wanted to fly to Copenhagen via Danzig, in order to visit Olga, who was directing a training school for agricultural helpers in that neighborhood. We therefore decided to fly together from Istanbul.

In those early years of aviation, this was a major undertaking. Istanbul did not yet have a real airport and our six-passenger plane, with semi-open cockpit, took off from a meadow at night with the headlights of carefully stationed cars outlining a runway. Before our departure, we received the reassuring news that the plane flying the reverse route had crashed in the Albanian mountains.

Our flight proved glorious, however. We passed over the Balkans in semi-darkness. No light shone from the ground there because practically all of its settlements had then been wiped out in the Balkan Wars and World War I. At sunrise we reached the Carpathian mountains and flew along that stunning semi-circle separating Hungary from Poland. The air became turbulent and we had to throw up "*par la fenêtre* [out the window]." At noon we landed in Warsaw, where Luise left me. Later in the afternoon we reached Danzig, where a flight attendant informed me, "Your wife has just arrived."¹ And there stood Olga with a happy face who then took me along to her headquarters in Pomerania (part of Prussia): an old farm house filled with young people.

Big farms had been subdivided to form new settlements.* Girls with all kinds of backgrounds served as helpers -- some remaining with the farmers during the week and returning to headquarters for the weekend. Any happy or calamitous event and any problem in agriculture or human relations landed on Olga's doorstep and she grew with her responsibilities. Obviously, here was still hope for Germany.**

A few days later in Copenhagen, I was very warmly greeted by Niels Bohr and his co-workers and also by his colleagues at the Technical University. My lecture was well received and led to an invitation to come to Copenhagen as a guest-professor. Opa Franck was visiting Baltimore at the time, where Professor R.W. Wood -- a wonderfully original man, full of wit and surprises -- wanted to lure him to Johns Hopkins University.

On my return trip to Istanbul via Venice and Athens, I met a German artist who longed to see Turkey but had not enough money for the purpose. Impressed by his ability, I took him along, since we had a spare room in our apartment -- not knowing that Daggie had in the meantime come down with jaundice and asthma. Alone with the children and Ditzi, the messy situation had proved too much for her. The asthma, which she had first contracted in childhood, when Opa was away in World War I, unfortunately returned from now on at times of serious strain and ultimately proved fatal. My new artist friend therefore could not stay in our place for more than a few days, but he made portraits of Peter, Arndt and myself, which are still a lovely reminder.

While I was away, the 18 instrument boxes had finally been released by customs. We left some of them to friends and colleagues, shipped the remainder to Copenhagen, and departed in the early days of December via the Orient Express for a last Christmas in Göttingen. It was an interesting experience to pass through the ascending cultures of Europe, spiced with an amusing oriental episode. An Arab in our compartment threw admiring glances at Daggie and at last said, she looked so beautiful that he would like to see how a gold chain would enhance her beauty. Daggie obliged him by wearing it for awhile but we assured him that we would not buy the chain. After we crossed the boundary to Austria and the customs inspector

* During the late 1920's and early 1930's a number of the big East Prussian landowners (Junkers) had gone bankrupt and their properties had been taken over by the state. The land holdings were subsequently broken up and redistributed to many who were inexperienced as farmers.

** Olga was working as an officer-leader of the RAD (Reichsarbeitsdienst), a para-militarily organized work-service organization that operated throughout the Third Reich. The hope mentioned here refers to the fact that the predecessor organization of this type were not Nazi organizations during the twenties and had helped to provide similar types of work for the unemployed: reclaiming land, helping with harvest, etc. Many idealistic people such as Olga joined for this reason.

had passed, the Arab took the chain back. Only then did it dawn on us that we had been partners in a smuggling operation.

Ditzi had acquired a boyfriend and remained in Istanbul. We were lovingly taken in by my father and, his second wife, Tante [Aunt] Bezi, on our arrival in Göttingen, but the atmosphere was terribly depressing. Most people had become Nazi-followers. Professor Goldschmidt, the great Norwegian geochemist, cheered me up with the statement: "I had expected that 95% of all the people would be skunks, but there are only 92%." I tried to convince him to return to his native Norway, but he wanted to stick it out for a while longer. Later, after the Nazi takeover, he was loaded with many other Jews on a ship to be drowned in the Baltic. A nurse who had taken care of him got him off at the last moment and he -- the confirmed bachelor -- married her and returned to Oslo. Unfortunately, he died before we could meet again.

That last Christmas in Göttingen was a sad affair. Daggie had asthma and, instead of asking our old Dr. Kaufmann for help, I consulted a specialist. Only too late did I realize that Kaufmann believed that we too had deserted him. We were alone with father and Tante Bezi for the holidays and saw some old friends including Professor Nohl, Opperman and Joerden. Then we went to Hamburg, where we had a short reunion with Curt and were charmingly taken in by one of his uncles, who later perished in a concentration camp. On December 31, 1934, we crossed the Danish border and were received with open arms in Copenhagen by Opa and Oma Franck. Firecrackers and church bells at midnight on New Year's Eve² told us that we had arrived in a still-free country.

Guest Professor in Copenhagen (January 1935 - August 1936)

I had originally been scheduled to join the Staff of the Physics Department at the Technical University but my fundamental research on the electrical breakdown phenomena in gases, liquids and solids did not fit into that classical engineering surrounding. I therefore switched over to the Niels Bohr Institute at Blegdamsvej; got a basement room next to my future friend, Ebbe Rasmussen; and had the privilege of becoming a friend of the Bohrs and seeing Niels and his co-workers in action for one and a half years.

Our family settled down in a ground-floor apartment in a new housing development about 10 miles out of town in Bleedaparken (see Figures 55 and 56).

Bohr's assistant, Ebbe Rasmussen, lived nearby with his family and, in the morning, we bicycled together to the Institute. Niels Bohr came by bike from Carlsberg, in the opposite direction. He lived there because the founder and director of the Gamle Carlsberg Brewery had become an admirer of science after professors had helped him with advice about the fermentation process. Therefore, at his death, the brewer bequeathed his brewery for the support of science and his stately mansion, with its beautiful garden and pond, as an honorary abode for the foremost scientist in Denmark. Niels and Margrethe Bohr lived there with their sons offering heartwarming hospitality.

I will never be able to thank the Bohrs enough for the nineteen months of this Danish interlude, sheltered in a wonderful atmosphere of scientific discovery and human warmth. Daggie became a very close friend of Margrethe Bohr and of Grete, the daughter of P.O. Pederson, Director of the Technical University. I was privileged to speak to Niels Bohr on a first-name basis and to enjoy seeing him and his family in action. In lectures, Bohr never quite knew in which language he spoke -- Danish, German or English. Sometimes he switched in the midst of a thought. And sometimes he suddenly stopped altogether for awhile -- his face going blank. Then came a beatific smile and a new idea had been born.

It was also a wonderful privilege to be with Opa Franck in the same Institute again (see Figure 57). Opa,, along with Professor von Hevesy and the rest of the Institute, had been pulled by Bohr into the study of radioactive decay processes. A strong radium source was located in a deep well under the basement for the irradiation of all kinds of materials; and all day long Opa and the other scientists galloped past my door from the well to the Geiger counter room to measure decay times. Ebbe Rasmussen and I in our adjacent basement laboratories were practically the only experimentalists engaged in other pursuits. In the wonderful atmosphere of Bohr's Institute, I was able to continue my studies of the electric phenomena at high field strength in gases, liquids, and solids.^{3*}

On Sundays, Opa and I sometimes went on long walks with Niels Bohr. I still remember with embarrassed amusement how Opa once bragged about my ability at stone-throwing. I was therefore invited to demonstrate this ability one day while we were walking along the beach and threw relatively far. But Niels threw twice as far. He and his brother, Harold, were very strong and athletic. In fact, Harold was not only an excellent mathematician, but also the best football [soccer] player in Denmark. This led to a funny incident in a streetcar. Niels had found a seat and

* There is an article on this period in the Bohr Institute in the special Niels Bohr centennial issue of *Physics Today*, "Niels Bohr as Fund Raiser," by Fin Aaserud, October 1985, pp. 38-46. This article and another article, "Bohr's First Theories of the Atom," by John L. Heilbron (pp. 28-36), both contain pictures of Bohr with James Franck.

Harold was standing because the car was overcrowded. Suddenly a man standing next to Niels spoke up disapprovingly, "You should get up and give your seat to the great soccer player, Harold Bohr, over there." Niels smiled and did.

Harold Bohr lived with his family not far from us in Bleedaparken, and he and his wife, Ulla, were very kind to us. That no close friendship developed was due to my mathematical ignorance. On the other hand, I had a certain ability to handle three languages since I had spoken English in America and French in Turkey. Therefore, when the famous French physicist, Perrin, was expected, I was asked to prepare Niels Bohr's welcoming speech. Everything seemed to be under control when Perrin arrived: Niels came down the stairs to greet him but suddenly his face went blank. Shaking Perrin's hand, he said "aujourd'hui" ["today"], turned and went up again. Today I can deeply sympathize with such blackouts of memory.

My Scientific Problems and Their Ramifications

Since the early work on cathodic sputtering⁴ I had become deeply interested in the molecular events underlying macroscopic properties. The customary approach for studying the electric and magnetic responses of materials was still a macroscopic one. To determine the electrical breakdown strength of air, for example, one made multiple measurements of the breakdown voltage of a spark gap and then averaged the results. I believed that, if one understood the breakdown mechanism and the experiment were properly conducted, one measurement should suffice to give the correct answer. I had therefore studied the various stages of electrical breakdown in gases, liquids and solids while still in Göttingen.⁵

When we moved to Turkey, it was obvious that real laboratory research would be impossible for awhile. Therefore, I opted for thunderstorm studies as a possible alternative and had a new type of wide-angle lens developed by my friend, Ehringhaus, at the Zeiss-Winkel factory in Göttingen. It could provide a picture of the sky over an 180-degree angle and thus record a sequence of events. Our rapid departure from Turkey squelched that program but, at the Bohr Institute, with its excellent shop, I was able to return to my molecular interests.

In contrast to the present mode of experimentation, where most of the essential equipment is commercially available, we had to build just about everything -- including the spectrograph required for our special investigations. The shop, supervised by my friend, Ebbe Rasmussen, helped me in every possible way and I was able to clarify the detailed steps of electrical breakdown in gases and in

alkali-halide crystals. I gave a lecture with demonstration experiments at the Danish Academy of Sciences that won Niels Bohr's applause. My education in quantum mechanics, entrusted by Niels to Vicki Weisskopf, however, proved much less successful. Like Opa Franck, I enjoyed the contact with the brilliant young group of theoretical physicists but lived in a different world of challenges. I began to visualize how the properties of materials could be made to order through molecular insight.

A Trip to Norway and Sweden

My glowing memories of Norway and Daggie's about her Swedish relatives and their helpfulness during the World War I period made us decide to visit both countries together. Opa and Oma Franck and our lovely maid, Fröken [Miss] Hilde, volunteered to take care of the children -- and we were off to the Hardanger Fjord and the mountains beyond. It was just as beautiful as I remembered it. We slept at the shore in our sleeping bags, looking over the sparkling clear waters to the snow-covered mountains beyond and, the next morning, climbed over the glacier of the Hardanger Jokulen. Again fog descended and we had to blow the foghorn on the glacier to be rescued by a maiden coming down from the shelter. In the hut was a larger party with a guide.

Following these tourists the next morning towards Finse, the top-station of the Bergensbahnen [the railway from Oslo to Bergen], we were slightly amused that one should need a guide for such a trip. Then disaster struck! A rock broke loose under my feet and I fell head-over-heels down the precipice. The sensation was a strange one: flying through the air I believed I would die but felt no fear -- only sorrow for Daggie. Memories raced through my mind -- then I saw Daggie turn and cry out in horror. I crashed into a boulder and blacked out. Fortunately I had landed on my back, which was protected by the steel frame of a Swedish Army rucksack.

Coming to, I looked into Daggie's lovely anxious face and at the guide next to her and assured both of them that I was still quite alive. Only my right arm was slightly demolished. We made a sling, soon I could walk again, and we reached the mountain hotel of Finse without further mishap.

Recovering at the hotel for a few days, we saw in the dining room, to our surprise, a number of pictures by the well-known German painter, Hellberger. His daughter, Kaete, had been one of the children educated by the sister of my mother, Tante Mariechen, and had become a good friend of my brother, Ernst, and myself.

Inquiry revealed that Hellberger had a cabin on a mountain stream about half-an-hour away and that he was there at present with his daughter and her two children. We therefore soon had a happy reunion.

Happy? Not really! Forebodings of calamity were in the air. Mr. Hellberger had a Jewish wife and was subject to Nazi persecution. I tried to convince him not to return to Germany but to come to Denmark and emigrate to America. It was in vain. I therefore bought a picture from him because he had run out of funds -- and fate took its course. He returned to Germany, was forbidden to paint and died during the war. I met Kaete and her children once more in Berlin. Later they were forced to hide but survived. The painting, depicting the rushing mountain stream with its beautiful surroundings near their cabin, provides a fond memory.

After I was somewhat repaired, we took the train to Stockholm and Göteborg, met the Swedish relatives and became good friends. Simultaneously, I began to understand Oma Franck's difficulties. Extremely musical, she was trained as a concert pianist. But also extremely shy, she felt forlorn in Opa's lively academic surroundings. She was sick for most of the years I knew her.* Unfortunately, I was not yet experienced enough to be of real help.

A Last Visit to Nazi-Germany

Niels Bohr, without having any good reason, believed in my engineering abilities and therefore pulled me into the planning effort for a "High-voltage Laboratory" that was to be built partly underground at Blegdamsvej to make possible nuclear excitation and disintegration experiments. What was desired was a 1-2 million Volt facility. The van de Graff and Cockcroft-Walton machines were just on the horizon and quite untried. Nernst's thunderstorm generator on Monte Generoso had reached such voltages but was obviously not a feasible prototype. I therefore suggested looking at a cascaded transformer arrangement for 2 million volts just then being developed by a reputable manufacturer in Dresden. Taking a train and ferry via Rügen, I transacted our business and then took a last look at Hitler's Germany.

It was a sorry goodbye. I felt like a stranger in Jena, where I went for a last visit to Marianne's grave. My old friend, Gerd Lüers, in his trusting naiveté, had become a convinced Nazi; and even my Zeiss-colleague, Gerhard Hansen, had

* Lisa Lisco commented that Oma Franck had an "Alzheimer-like condition."

joined the Nazi motorcorps.^{**} The beloved Director of Zeiss, Straubel, was being persecuted on account of his Jewish wife. Max Wien -- always a gentleman -- held out steadfastly against the vile Nazi Professor Esau next door but had trouble with his children, who were influenced by the Nazi movement. My old friends, the Maurers, were also estranged from me. The old Geheimrat⁶ was dead and his wife and children Nazi-affected. In Göttingen too I found the Nazis triumphant and my father on the defensive. Returning via Berlin, I saw Hitler driving to the Sportspalast, where Helen Riefenstahl glorified him in her films. Finally, I visited to Olga and her wonderful youth-movement camp in Pomerania.

Olga had to wear a uniform with a swastika badge but her activities were in old youth-movement spirit. Her concern for the newly settled peasants and their various troubles and her education of the young girl-counselors was a joy to watch. That period has now been vividly described by herself and a number of colleagues in a book, *My heart was in Pomerania*.⁷

I was about to leave via Stralsund when a message from Daggie arrived, asking me to meet our friend Grete Kröncke there. Puzzled, I did so and heard an ominous story. Shortly after I had left Copenhagen, someone in the German embassy had called Daggie and warned her that the Nazis intended to arrest me -- presumably in order to put me to work for the Third Reich. She herself would be endangered if she tried to warn me, so she should instead send a Danish friend. Thus Grete arrived and we decided to fly out together via Hamburg because the Nazis expected me on the train via Rügen. After a final day with Olga in Lübeck, we succeeded in escaping.

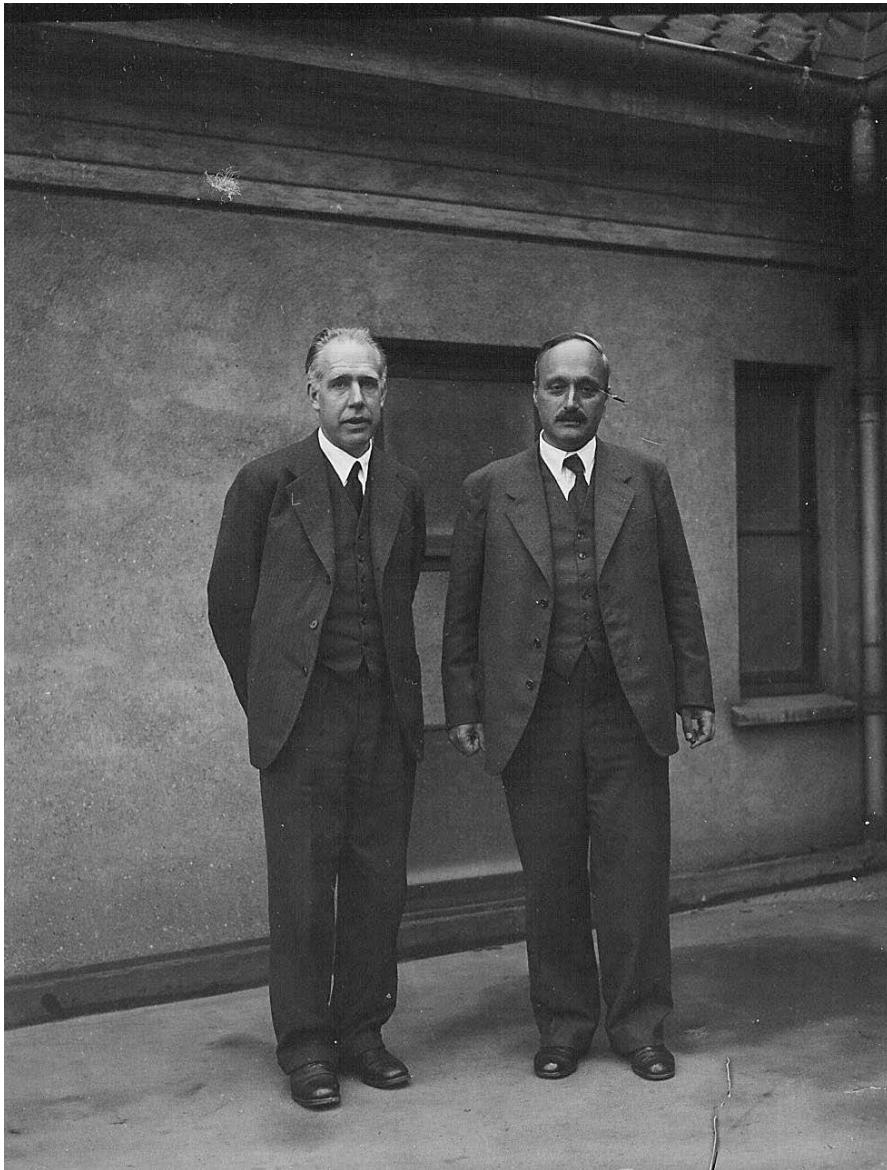
^{**} This was a Nazi paramilitary group that drove around in private cars and on motorcycles.



55. Peter in Denmark



56. Arndt on phone in
Denmark



57. Niels Bohr and
Opa Franck