

Study at Last! But for What Profession?

Before I joined the Army in 1916, my father -- at that time "Rector" of the University of Göttingen -- had sworn me in as a "student of law." In contrast to my brothers, however, I had not the slightest intention of following in father's footsteps.

In early 1916, an adopted uncle, director of a big coal mining concern, tried to enlist me as a prospective mining engineer. I took a trip into one of the deepest mines, creeping on my stomach through dripping galleries, a leather helmet on my head as protection against falling stones and overhead high voltage lines. Returning to daylight, I felt somewhat challenged but in urgent need of a drink. I changed my mind definitely to the negative after returning from the war. We had slept more or less outdoors for years and fresh air had become a necessity of life.

I considered medicine and went to the Anatomical Institute, where the German medical student begins. But the dead babies in pickle jars did not appeal to me. Toying with the idea of "science" I went to my old high school teacher, Götting, a lovely old man who had lost both of his sons in World War I. They had been admired older friends of mine in the Youth Movement. He encouraged me to become a physicist and so I enlisted in the famous School of Natural Sciences¹ of the "Georgia Augusta" University at Göttingen.

All our more sophisticated high school mathematics and physics had been erased by the war. I was therefore assigned with five other "old officers" -- we still wore uniforms, because we had no civilian clothing -- to a charming young lady, Hertha Sponer, who with much laughter and wonderful freshness tried to teach us. I could not imagine at that time that, many years later, she would become my step-mother-in-law.

Subsequently I attended a lecture course on classical mechanics by the famous mathematician, Hilbert,² who already had aroused my admiration as a not-too-distant neighbor. I had seen him dash out of his yard to sweep up fresh horse droppings for his garden. I had heard him talk with my father (they were both East Prussians) on the way to the university, and when father angrily exclaimed, "But

Herr Hilbert, yesterday you said just the opposite!" -- had heard Hilbert coolly reply, "Can one not change one's mind?" I had seen him in the autumn standing under an apple tree, below his bulky assistant -- Miss Noether -- picking in the branches. He exclaimed in beautiful East-Prussian "dass sie nur nicht fallen [that you (or they) don't fall]!" "I am quite safe, Herr Geheimrat," Dr. Noether assured him. "But I meant the apples" was his answer.

Hilbert's lectures -- like his pronouncements -- were delivered in pure East Prussian, pulled out of his sleeves with irresistible originality. When explaining, for example, the principle of "*actio equal reactio*," he introduced an example "from daily life." He said, "think of two equal avalanches connected by an invisible string; as the one avalanche rolls down the mountain, the other avalanche is pulled up the mountain." This one kept in mind.

In the next term, his assistant, Courant, took over and believed he could -- like the great man -- improvise without preparation. It did not work and we were ready to beat him up. In physics, Pohl made spellbinding experiments and Debye taught theoretical physics in masterly fashion. Everything seemed crystal-clear while you sat in front of him. Afterwards, however, when you went downstairs, you stared into the unknown.

The "Academische Gilde" and the "Church Tower"

Traditionally, the old student-fraternities, with their inherited ideas that a free student life consisted of singing and drinking, friendship and duelling, had given the universities a streak of medieval "Faustian" heritage. Now the "Youth Movement" created a counterimage of joyful exuberance without drinking and fighting; of friendship without sexual overtones; and of skiing, mountain climbing and evenings without alcohol, full of songs and debating.

The old student fraternities had their houses, maintained by the money of their predecessors ("Alte Herren"). The youth movement had some prewar fraternities, the "Freischaren," but they could serve only a limited number of newcomers. Therefore my brothers and I, along with some newly acquired friends, founded the "Akademische Gilde."

Initially we met in an abandoned garden house, but one day -- as I passed the "Johannis Kirche" behind the town hall on my way to the Physics Institute -- I witnessed an extraordinary sight. Swaying down from the top gallery of one church tower came the coffin of its last guardian, received in awed silence by a waiting multitude. The thought flashed through my mind that the top of this tower with its guardian abode would be the perfect home for our fraternity. So I asked the town authorities to give me a hearing. Our family was well known in Göttingen and

my fresh impudence and officer's uniform impressed them. When I answered their final question: "What would you do if the tower burned down?" by answering: "We would build it up again!" the town officials laughingly consented; and I remained the responsible tenant until we emigrated in 1933.*

Now the "Gilde" became a really flourishing and joyful enterprise, acquiring selectively new members and some older friends like Professor Nohl and Curt Bondy. Girl friends were invited for special occasions, including Liesel Engelhard and my sister, Olga; and carol singing from the tower at Christmas and New Year's Eves attracted a multitude of listeners below. At one of these occasions an exuberant ex-soldier opened his roof window and began to fire his army gun, accidentally using live ammunition. We prudently took cover until he had exhausted his ecstasy.

Like the old professional guardian, we had a large megaphone to warn of fires and indicate their location. In addition, we had a telephone and installed some bunk beds on the floor below so that some of us could live there and keep the tower open for visitors during the noon hour. It was lovely to sleep there, hear the church bells strike the time and see the town go to sleep until, at midnight, the Ratskeller** closed and the last drunks searched their way homeward (see Figure 27).

Hunger and Inflation

Contrary to the "peace and brotherhood" promised by President Wilson, Clemenceau and Lloyd George kept Germany blockaded and we lived on starvation diets. Also we could heat only two rooms in wintertime: one as a study for father and us three sons and the other for mother and sister Olga -- which also served as the family dining room. In addition a galloping inflation devastated our money. Soon our father and the other professors got their salary paid in cash every day at 10:00 AM, standing in line at the bursar's office with their children lined up behind them. Immediately after the money was received, we spread out through the town to purchase whatever food and necessities could be had, before the value of the German mark dropped at noon another notch towards the abyss.

Over the original designation of the German currency were printed in red more and more outrageous numbers, until we reached the designation "milliards" -- corresponding in American to "billions." I still have a 10 Reichsmark bill

* In the summer of 1985, AvH climbed the church tower again with son Frank and grandson Paul. They found that he was a legendary figure to the current student occupants who he entertained with stories of the olden days.

** A restaurant in the basement of the town hall where the burghers liked to meet.

overprinted "10 billion Reichsmark" (see Figure 28). Finally, the inflation was stopped in 1923.

However, the havoc caused to the social structure of Germany by this inflationary nightmare was nearly indescribable. Anyone who had relied on savings, mortgages or other investments based on currency values was wiped out. My grandfather, for example, had the first mortgage on a large house owned by a wealthy Professor of Mathematics. Our family was paid off with a piece of paper money that bought a pound of cheese. Grandfather had given us grandchildren every birthday 20 gold marks; since they had been deposited in a bank, the accumulated savings allowed me to buy only a tablecloth before they completely disappeared.

The German Forestry Service sold its wood on a credit basis of one year. A group of speculators bought up the wood supply, paid with a penny after a year and joined the new class of war profiteers.³ Industrialists who caught on early built industrial empires. The most conspicuous of them, Mr. Stinnes, offered to buy the German railroads. Fortunately for him, a ruptured appendix took him to the eternal hunting grounds in 1924 before the indignation the public boiled over.

Revolts -- We Become Soldiers Again

The breakdown of the economy inevitably inflamed the revolutionary climate: Communist governments formed in various regions of Germany and Nationalist counterforces mobilized to overthrow them. Political murderers found their victims.

One of these victims was Walther Rathenau, a former member of the youth movement, from a Jewish family and a wonderfully gifted industrialist and political reformer. Rathenau's father had founded the Allgemeine Electricitäts Gesellschaft, the counterpart of the American G.E.; Walther had been in charge of the German Supply System in the first part of the War. After the war, he headed the German Foreign Office and tried through his international connections to create a climate of reason. He was machine-gunned by young right-wing radicals (later to become Nazis) firing from a car as he drove to his office in Berlin. His mother, a heroic woman, wrote a letter of deep sympathy to the parents of the murderers, who she assumed would be deeply distressed -- only to be rejected.

The Communists occupied several towns not far from Göttingen, and they formed a state government in Braunschweig with a former washerwoman as Minister of Education. Our friend Gert Lüers had studied architecture at the Technical University there and needed a permit for his final examination. The Minister obviously liked his looks and asked kindly, "What do you want to

become, my Son?" When he said: "an architect," she promoted him on the spot:, "You are, my son, you are!"⁴ Unfortunately her government fell a week later and Gert had to start all over again.

In Göttingen, in 1919, father and we three brothers acquired guns and ammunition and organized a house-defense team. Positions were allocated to each one for firing from certain windows and from the balcony. Then a student battalion formed to drive the Communists from the neighborhood and we brothers enlisted.

This was an adventure full of bizarre happenings. The Communists in town had called a big citizen's rally, to be held -- appropriately -- at night in the big circus building. Brother Fritz went to their headquarters the morning before, trying to argue them out of their intentions. In the meeting we got the answer to his efforts: "Even the 'vons' have crawled to the cross [have humbled themselves]," the speaker assured the audience. Fritz and some others were therefore detached to arrest the leaders and guard them in the barracks. The prisoners climbed up to the windows and spat on his head.

Ernst and I had more ambitious plans. It was clear that the battalion would need artillery support. My experience in Münster had shown that the higher-up active officers were afraid of us and would give us what we wanted. Therefore, we took some of our "Gilde" friends on a train to Hannover. I presented to the General Staff officer a written request for a howitzer with the proper ammunition, draft-horses and a riding horse for Ernst, whom we had made our commander. I acted as the chief gunner and the others formed the remaining crew. We got everything, loaded our artillery onto a freight train and departed for Göttingen.

When we arrived and rattled over the cobblestones (to the great astonishment of our professors) we found unfortunately that the student battalion had already left for the Harz mountains, where a major Communist insurrection by the miners was in progress. We therefore loaded our unit onto another freight train and took off for our old skiing area at Andreasberg. Trotting along through the landscape after unloading, we saw a village photographer's shop. The thought occurred to us that we might be killed and that our parents should at least have a last picture of their heroic sons. Therefore we stopped. The photographer had come out with his big camera and started to focus on us from behind his black cloth, when suddenly an orderly on a motorcycle appeared (see Figure 29).

The message was from the major, Count von Hanstein: "Battalion is being attacked by superior forces; urgent help required." I still see with pleasure brother Ernst turning on his horse and telling the orderly: "Tell the major, the artillery cannot come immediately; battery is being photographed." But, after the picture had been taken, we began to roll in earnest to the "Scene of the Battle."

The setting was typical: the battalion was spread out in a wide arc along the rim of a mountain firing toward an invisible enemy and an old woman still hoed potatoes at the right. Our dramatic appearance changed the tempo of the war,

however. We drew smartly into position and I aimed two grenades in a very flat angle toward the mountaintop, making them ricochet and explode spectacularly in the air. The peasant woman fell down in fright, our troops shouted "Hurrah!" the enemy -- disgruntled miners -- fled, and the battle was over.

Our troops then distributed printed pamphlets ordering the rebels to hand over their weapons or they would be shot. Actually we dreaded shooting anybody in our country and it fortunately proved unnecessary: soon after the placards had been displayed, small boys appeared carrying rifles and the message, "Greetings from papa and here is his gun." But that night, as we "artillery" camped in the yard of an inn, the same boys climbed onto the roof of the guest house and spat down upon us.

The next day, driving farther into the Harz mountains, we found no resistance and the battalion made quarters in a small village. Here, to our disgust, the old Corps [right-wing (dueling) fraternity] students, took after the young women, quite contrary to our youth movement ideas. I therefore went back to my quarters in a bad mood, said "hello" to the landlady, and went up to my chamber to go to bed. Unslinging the carbine from my shoulder, which I believed was unloaded, I triggered the weapon accidentally, and with a crash the bullet went through the floor. First there was a deep silence and I was deadly afraid that I had killed the landlady. Then I heard her voice: "Oh, the poor young man; he looked so downcast and now he has killed himself!" I went downstairs and we celebrated our resurrection.

The next morning, ready to move, we were participants in a strange spectacle. Major von Hanstein, the commander, approached us twice at full gallop but -- before reaching us -- turned his horse around and disappeared. Riding up a third time, he passed us rapidly shouting, "Ohhhh!" Dutifully but puzzled we shouted back:, "Ohhh!" Afterwards, his adjutant -- an old friend from school -- explained: the major wanted to greet us with "Good morning, cannoneers!" but suddenly realized that we had been officers. Therefore he decided to greet us with: "Good morning, gentlemen" but in approaching again he realized that we were currently serving as cannoneers. Therefore, on his final approach, his desperate cry of "Ohhh!" saved the day.

That evening, we took up quarters in an abandoned T.B. sanatorium and stayed for a few days, straightening out our military department while scouts localized the enemy. Then, on a foggy morning, still in semi-darkness, we started to advance for the decisive battle. We were about 600 students; the enemy was supposed to number 5000. Thus the odds were in favor of the old German song: "Morgenrot, Morgenrot, leuchtest mir zum frühen Tod" [Dawn's light, you are lighting my way to an early death] and our mood was slightly depressed. Suddenly a motorcycle messenger rushed up with a dispatch for our commander. Major von Hanstein, tearing it open, turned purple in his face and in consternation read aloud its contents:

"I, the President of the Province of Kassel, hear with deep indignation, that troops of the Province of Hannover have invaded my territory. Will you please retreat immediately to your home-base!"

The Major was flabbergasted, ordered us back to quarters, and a furious paper war arose between Hannover and Kassel. The upshot was that, a few days later, we were loaded onto a train and arrived in Göttingen again late that afternoon. At the station the major gave a last rousing speech, praising our valor and called on us now to follow him into the civil war in the Ruhr valley. But, when he ordered, "Volunteers, step forward!" nobody stepped forward. We disbanded and went home.

Shortly thereafter, however, the "Kapp" Putsch [uprising, March 1920] against the Government moved Fritz and me to volunteer once more -- this time as officers joining the territorial army.⁵ This proved to be a similarly abortive enterprise. The only remarkable event was our last Gilde-meeting on the church tower where we found the sympathies of our friends divided between the Nationalists and the Communists. Some of us therefore went to the former and some to the latter. We hoped for a happy reunion afterwards.

The "Corps"* was forming near my old garrison town, Münster, at the Senne-Lager, a town of barracks in a sand desert. At the railroad station of Münster we had our first surprise. An officer from another Corps approached us and offered us more money if we would join his unit. Obviously, the breakdown of public order had created a class of mercenaries as in medieval times. The only amusing incident was a theater play at the "Lager" by a traveling actors' group, where the hero -- shot down -- exclaimed: "I am dying, is there no doctor near?" "Yes, he is" came a voice from the background and our surgeon stepped forward, bringing the house down.

Well, the "Kapp Putsch" ended in defeat, we had seen no action, and the Government under the socialist President Ebert became strong enough to disarm the civilian population. We went home; but not trusting the situation I fastened our guns on strings and let them slide under the tiles of the roof. Checking up some time later I found that mice had gnawed the strings through, the guns had slid out of reach into the gutter -- and there they may be found on Doomsday.

* "Freikorps" -- para-military armies of former soldiers and officers formed in upper Silesia right after the war. Later, similar units were set up to fight revolutionary uprisings all over the country, from Bavaria to Prussia.

Detour Through Social Work and the Arts

Returning to my studies, I was not yet at all convinced that I was cut out to be a scientist. We had formed a firm friendship with two outstanding social leaders, Professor Nohl⁶ and Curt Bondy. Nohl came as a young professor of pedagogics from Jena to Göttingen, full of fire and spellbinding in his lectures. Curt Bondy, the son of a rich Hamburger banker, was deeply committed to social work. He had been a medic during the war and afterwards for a year a prison guard in the youth prison "Hannover-Sand" on an island in the Elbe River. He studied with Nohl and both were frequent visitors to our church tower. We broke all the taboos of the University for Nohl with a rousing demonstration and singing concert in his lecture. This moved him so deeply that he declined a call to another university and stayed in Göttingen for life.

Obviously, we also wanted to be socially engaged and came to the idea that laborers and peasants should have access to good and inspiring books. We therefore got hold of a horse and buggy and created a bookmobile and, in addition, set up a display and sales stand, the "Bargain Bookman"⁷ at the Christmas market in Göttingen. It was a roaring success but had repercussions. A delegation of the legitimate bookstores went to the Bürgermeister [mayor] complaining about "unfair competition." Also, a peasant with his farm wagon drove through the electric line I had strung from the cellar inn of the town hall to our display stand. With a spectacular short circuit, the lights of the Ratskeller went out of commission. I slaved a whole day to repair the damage under the eyes of the scolding proprietor.

I also ran with a Freischar-friend,* Christiansen-Weniger, for the office of "National Representatives" in an All-German student election. The ticket, "Christiansen-Weniger -- von Hippel," won -- possibly because its *a* minus *b* appearance struck funny bones,* and I found myself suddenly the "cultural representative" of the German students. What a nightmare! Surrounded by sophisticated politicians I felt utterly lost and -- scraping together my last military savings -- escaped for the summer term 1921 to Munich, to live free in a climate of theater, music, and artistic life, before becoming a "professional."

Searching in Munich for lodging in 1921, I found a room in the house of an old Counselor of Commerce,⁸ Herr Steinmetz. The rent was low but carried with it the obligation to visit the old gentleman to cheer him up every morning before leaving. This proved to be possible with a standard procedure: I went in and assured him with conviction: "Herr Geheimrat, Münchener Hofbräu beer is still the best!" His day was made!

* The "Deutsche Akademische Freischar" was another Youth Movement group to which the "Gilde" was closely connected.

* Literal translation is "Christiansen less von Hippel" or "Christiansen minus von Hippel."

One of my first actions was to visit Geheimrat Roentgen,⁹ our grandfather's best friend and companion on many Alpine tours. He received me with open arms and even paid me an official return visit dressed with top hat.¹⁰ The landlady was duly impressed. He still lectured despite his 76 years and was charming at home; a great man of utter modesty.

A famous active physicist of that period was Professor Sommerfeld, a theoretician of deep insight who attracted a group of gifted students, including Heisenberg, to his seminars and Alpine hut. I listened to his excellent lectures for a short time but became enchanted by the lectures and seminars of Professor Wölflin on the "Renaissance." The famous Art Galleries of Munich, the "Alte" and "Neue" Pinakothek and the "Glyptothek," provided an inexhaustible supply of original works; and a new friend, Hans Klockow, a law student and brother of my brother Ernst's future wife, shared this enthusiasm. Therefore I signed up as an art student.

Munich was also at that time an outstanding center of theater and music. Inspired conductors like Bruno Walter and Furtwängler produced an amazing variety of operas and concerts. Every week, we lined up at the ticket office at 9 PM to obtain standing-room tickets at 9 AM for three performances. A roll call every three hours allowed us some intermittent sleep; and a spoonful of artificial honey made from turnips kept our hungry stomachs quiet.**

My brothers' old Latin-teacher, Dr. Dittmann, had departed Göttingen to become director of an organization in Munich devoted to the preservation of the Latin language.¹¹ He left behind such glowing memories of friendship that I wrote him a letter asking to be accepted. We met at his suggestion at the "Chinese Pavilion in the English Garden," charmed each other and became friends for life.

"Schorse" (George) Dittmann had two "allergies:" he did not allow any woman into his home, and -- in spite of living in Munich for years -- he had never been in the Alps. I succeeded in licking both aversions.

Paula Reuter, a lovely companion from my Wandervogel days and the future wife of my friend Herbert Beyer, joined me in Munich, earning her living as a seamstress. We visited Dittmann's flat together, found it immaculate -- and Schorse wanted to celebrate his liberation from preconceived notions with a rare bottle of wine. Placing it on his balcony for cooling, he unfortunately missed the railing and the bottle disappeared three stories downwards to its doom. Fearing that an unintentional murder might have resulted, we looked after it and celebrated its safe arrival later with Bavarian beer.

Now Dittmann joined with gusto in our expeditions to Lake Chiem and a climb of the "Great Venediger" in the Dolomites. His only difficulty was that he brought a spare for every piece of equipment: two packsacks, two ice axes, etc. Roped

** In 1985, AvH went to a Rudolph Serkin concert in Boston with son Frank and grandson Paul and remarked, "this is the first time I've heard Serkin since 1921 in Munich."

between the guide and me he fell into a glacier crevasse but was extracted without harm. He had a new lease on life.*

After the term, I hiked with Hans Klockow, Ernst's future brother-in-law, from Munich to Vienna through the Alps. I left my belongings in Innsbruck, where I intended to study the next winter and perfect my skiing in the Alpenjäger-Corps. In Vienna with its wonderful art museums we could still survive for a few days because the Austrian inflation was ahead of the German one, but then we were completely broke. In a desperate night march we crossed the "Steinerne Meer," and the Quakers with their soup kitchen took mercy on us. Returning to Innsbruck, I found a laconic message from my father: "Out of money; complete studies in science or starve." The wonderful interlude had ended.

On the Way Toward Science

Göttingen in the early 20th century was a center of the scientific revolution from classical physics to quantum mechanics. Max Born had succeeded Debye and attracted a brilliant group of young theoretical physicists. He also recruited his friend, James Franck, to Göttingen from Fritz Haber's Kaiser Wilhelm Institute of Physical Chemistry in Berlin. Franck became the director of a new Second Physics Institute. With Gustaf Hertz, he had done the famous Franck-Hertz experiment, demonstrating that electrons colliding with the atoms of mercury vapor lose kinetic energy in discrete quanta and that the excited mercury atoms re-emit that energy as discrete photons.

I sat in on the lectures of both Born and Franck and began to know them quite well. Born was the son-in-law of a Law Professor Ehrenberg, a colleague of my father, to whose house I was once invited for a student party. When the old gentleman became tired and we made no move to go, he went to his canary bird and covered the cage saying: "Hänschen, you can go to sleep, but I have beloved guests." This broke the party up with a roar of laughter. Franck once came to his lecture unprepared and was stuck after about 10 minutes. Going up and down behind the lecture table in awkward silence, he looked at us and said at last: "it will come in a moment." But nothing came and, after a short while, we left, highly amused.

Franck was one of the warmest and most inspiring personalities one could hope to meet. He did not calculate but dreamed about science with wonderful intuition

* AvH had a similar experience after Christmas 1975 when his skis broke through the ice covering the Swift River in Passaconaway. Fortunately, he was right next to the bank and he managed, during the short interval that his son, Frank, could hold him up, to free himself from his skis. He had been very depressed over the death of his wife, Dagmar, a few months before, but this successful fight to survive cheered him up and gave him too "a new lease on life."

and provided, with decisive spectroscopic studies, the experimental basis for the quantum theory of atoms and molecules. His Institute, full of happy life, with its many students and foreign visitors, was counter-balanced by the Theoretical Physics Institute of Max Born, where men of genius like Pauli and Heisenberg and many other theorists of outstanding ability grew up. The First Physics Institute of Professor Pohl, an excellent experimenter and popularizer of science; the Mathematical Institute of Hilbert and Courant; the Geophysical Institute of Professor Goldschmidt; the Chemical Institute of Professor Windaus; and the Physical Chemistry Institute of Professor Tammann and his successor, Professor Eucken -- all located near each other in close spiritual contact -- made Göttingen a capitol of science.

Somehow Franck took a liking to me. He had lived in a house near Professor Nohl before moving into an apartment in the tower of the Levin-Villa at the Hainberg with its dominating view over Göttingen,* and I had seen his two daughters playing with the Nohl children. One day he asked me after his lecture, could I teach his wife bicycle-riding? I said I would try, and succeeded in getting her to a point where she could ride freely; but when I said, running behind, "You have done it alone!" she dropped from the bike and never touched it again. Without being aware of it, she needed protection.

The Born and Franck scientific groups were housed as the "Institute for Theoretical Physics" and as the "Second Physical Institute" respectively in the same building on Bunsen Strasse as Professor Pohl's "First Physical Institute." This constellation formed the most exciting scientific center for the development of the new quantum physics. It was therefore no accident that Niels Bohr came there in June 1922 to present his new theory of the Periodic System in a series of lectures. This "Bohr Festival"¹² proved a decisive event in my life.

We sat spellbound as Professor Bohr, with inspired face, absent-mindedly walked to and fro before the blackboard in the biggest lecture room, hitting the ceiling lamp with his pointer on every pass. The lamp began swaying in resonance with increasing amplitude, threatening to come down with a resounding crash. Finally Hilbert arose and -- gently exclaiming "Great Master!" -- pried the pointer from Bohr's hand. We had just begun to breathe again, when a voice broke in from the back, "I have a student who does not believe this!" and Sommerfeld strode forward like a colonel of hussars with young Heisenberg in tow. A five-minute discussion arose. Then, as Bohr turned back to the blackboard, Born spoke up, "I also have a student who does not believe this!" and young Pauli arose, chewing his fingernails. When the lecture had ended, we normal students tramped out, in love

* Now the "Nansen House," a residence for students from abroad. The house bears a plaque indicating that James Franck lived there.

with Bohr but convinced that theoretical physics was a calling reserved for geniuses. I enlisted as a Ph.D. student in the "Institute for Applied Electricity."

Student of Applied Electricity

The founder of the Institute and its first director, Professor Simon, had been an outstanding leader and a pioneer who saw the need for linking science to industry. I had known and admired him, and his son was a friend in the youth movement, who had died in the war. Another Wandervogel friend, Rudi Berthold, a next-door neighbor full of unquenchable cheerfulness, had just become his assistant and had stimulated my interest in electrical phenomena. Rudi now introduced me to his new boss and, since the broadcasting age was just dawning, I selected as my thesis problem the development of a new and better microphone.

The normal telephone microphone with its permanent magnet and vibrating iron membrane had proved unequal to the task of true frequency response. High signal amplification had been achieved during the War by the introduction of triodes and pentodes, pioneered by Schottky. I had become quite familiar with these techniques while serving for a short while as the communication officer of our Division. Therefore, as a preliminary task, I built a very high gain amplifier that allowed us to pick up radio signals without an outside antenna. We celebrated the event with coffee and cake, but the high-frequency response of the voice transmission was atrocious.

During World War I some efforts had been made in England to develop a "hot-wire microphone" named "thermophone" which would respond selectively to the propeller noise of submarines. My task was to develop the theory and experimental design for a "thermo-microphone" which would allow the transmission of radio broadcasts as free of frequency distortion as possible.

The living conditions in Germany became ever more precarious. Hunger was endemic. I therefore made a maximum effort to complete the thesis project in record time in order to become self supporting. Every night at about 3 AM I pedaled my bike to the Institute. A candle in a paper bag served as illumination, since bicycle lamps were not available.

My thesis problem was the invention and theoretical description of a new, more inertia-free microphone for the beginning broadcast age. The Institute had lots of odds and ends from the War and a very good machine shop with excellent mechanics. I built a frequency sensor of a nearly invisible meshwork of thin Wollaston wires, measured and analyzed its frequency response, developed its theory and even obtained a patent on the contraption.¹³ Finishing the thesis in early spring of 1924, I appeared on June 13th in swallowtails and top hat for the oral

exam, and was grilled by three professors for 2 hours. Fortunately, the ordeal ended with the mark "*summa cum laude*" -- my impudent friends had appeared noisily outside carrying an enormous paper hat with that designation. I therefore did not need to sneak out the back door. We marched past the Goose-girl¹⁴ fountain on the market place to our church tower and sang a "goodbye" to my student days.

Italian Interlude

What next? The exciting glimpse of the Italian Renaissance during my art studies in Munich enticed me to visit Italy before any final professional decision was taken. With two friends from the Gilde and very little cash, I took a train to Tessino and we climbed the Monte Telegrapho on our way to Gardone. On top of the mountain, we met some Italian tourists who had been officers on the enemy side during World War I. Exchanging stories in broken phrases, we celebrated a newly-found brotherhood. A good omen for a sequence of happy experiences.

Descending through a beautiful landscape dotted with olive trees to Lake Garda, we found quarters at a fisherman's house in Gardone. At the shore, we met a painter who had rented a sailboat. He invited us to come along, we became friends and, when he had to leave a few days later, we took over the boat with its fisherman Ettore ["Hector"].

Ettore told us a sad tale about his singing club: their piano -- probably played with too much exuberance -- had broken down and their activities were greatly impaired. One of us was a good pianist so we offered to help repair the instrument. Taking it apart we refreshed its insides by cut and try, put it together again -- and it worked! To our astonishment we had become heroes and honorary members of the singing club. Now every morning one or another lady club member appeared with a basket of fruit before we set sail; and in the evening we sang and listened in the club and began to understand some of the uproarious implications of its songs.

Sailing along one day we came to the beautiful Renaissance estate, "San Vigilio." Its wonderful gardens intrigued me and, with some misgivings, I climbed out to walk about. Suddenly the Count appeared like a thundercloud to chase me out. Waiting for his onslaught I introduced myself -- and found myself suddenly embraced instead of beaten. The Count had been a patient of my grandfather, who had saved his sight with a cataract operation.

Thus, welcomed by nobility and fishermen we lived a fairy tale. But this time drew to a close. After stealthily planting some cacti at night on the town wall as a parting compliment, we left for Florence. The city was empty of travellers and a fairy tale of Renaissance beauty. Embedded in an unspoiled landscape with its wonderful buildings and bridges, palaces and paintings, one felt the city was still

the home of the Medici and that one might meet Leonardo, Michelangelo and their contemporaries in its streets.

After five days we had to leave for home. I knew that I could enjoy art deeply but not produce it. I therefore returned to become a scientist.

Endnotes: 3. STUDY AT LAST! BUT FOR WHAT PROFESSION?

¹ Naturwissenschaftliche Fakultät.

² David Hilbert (1862-1943).

³ Kriegsgewinnler.

⁴ “Bist du, mein sohn, bist du!”

⁵ “Landesjäger-corps.”

⁶ Herman Nohl (1879-1960).

⁷ “Billige Büchermann.”

⁸ “Kommerzienrat:” an honorary German title for someone who has made a contribution to industry.

⁹ Wilhelm Konrad Roentgen (1845-1923), discoverer of X-rays, received the Nobel Prize in Physics in 1901. Geheimrat is an honorary title for an older professor.

¹⁰ High silk hat, “Cylinder” in German.

¹¹ “Thesaurus Linguae Latinae.”

¹² Festspiele - a take-off on the “Händelfestspeile,” which in came into existence in Göttingen at this time (literally, “festival performance”).

¹³ A. von Hippel, *Ann. Phys. [4]* 75, 521-548 (1924); *Ann. Phys. [4]* 76, 590-618 (1925).

¹⁴ Gänseliesel



27. Celebration for my grammar-school teacher-friend, Herr Engelke, on the church tower (April, 1922)



28. One-thousand-Mark note overprinted as one billion (eine milliard) marks



29. “ von Hippel Artillery” on the Harz Mountain expedition (March 1920)