

24 To Europe as a Guggenheim Fellow with My Bride

For the last few years, the meetings between Margaret and me had been a bit too intermittent to suit us. Her teaching and her continued obligations to her own family kept her fully occupied. For my part, my position was not yet sufficiently secure for me to take on the obligations of a married man. Yet the recognition I was receiving from Germany, together with an improved economic status at M.I.T. consequent upon it, now for the first time made it possible for me to look the responsibilities of marriage in the face. Margaret came down to see me at Christmas. I proposed again and was accepted, and we decided to get married and to take the European trip together as our honeymoon.

However, there were difficulties of detail. It was planned that I should arrive in Göttingen in April for the summer semester, at which time Margaret would still be teaching modern languages at Juniata College, in Pennsylvania. She did not wish to resign from the job two months before the end of the school year. For a while we thought of getting married in Europe, but we found that the red tape attendant upon this made it practically impossible. We played with the idea of an embassy marriage or of a marriage at sea by the captain of an American ship. These courses of action also ran into serious difficulties. Finally, we had to admit that the practical and sensible thing was to get married in the United States just before my trip, for Margaret to go back to her teaching work, and for her to join me in Europe during the summer.

Margaret left Boston again for her work at Juniata. In the meantime I found myself very busy and hardly able to think of the new problems of marriage and of the trip. I had an active social life at the time, and on one occasion soon after Christmas the Borns invited a group of us to their apartment to show off a new electric train they had bought for their children in Germany. There was quite a group of scientists and electrical engineers present to witness this occasion—Vannevar Bush, now head of the Carnegie

Institution of Washington; Manuel Sandoval Vallarta—the young man who had helped me to translate my article into French—at present vice-minister of education in Mexico, formerly professor of physics at M.I.T., and many others whose names have become household words among those dealing with electricity. When the train was assembled for display and the switch was thrown, the transformer flashed and burned out. It was a considerable time before our combined engineering talents were able to diagnose the trouble. That part of Boston was on direct current, on which no transformer could function.

I was closely associated with Vannevar Bush in my work during this time. Bush was already developing some of the various forms of electrical computing machines which were later to make him famous. From time to time he would call on me for advice, and I tried to do what I could in designing computational apparatus on my own account.

I have already spoken of my work on harmonic analysis, which even at that time seemed to me to be pointed directly toward important practical realizations. Since then these applied realizations have been made; and, as I shall show later, generalized harmonic analysis is an important part of my work even to the present day.

One time when I was visiting the show at the old Copley Theater, an idea came into my mind which simply distracted all my attention from the performance. It was the notion of an optical computing machine for harmonic analysis. I had already learned not to disregard these stray ideas, no matter when they came to my attention, and I promptly left the theater to work out some of the details of my new plan. The next day I consulted Bush.

The idea was valid, and we made a couple of attempts to put it into working form. In these, my contribution was wholly intellectual, for I am among the clumsiest of men and it is utterly beyond me even to put two wires together so they will make a satisfactory contact. Bush is, among other things, one of the greatest apparatus men that America has ever seen, and he thinks with his hands as well as with his brain. Thus, our attempts in a new sort of harmonic analyzer were quite reasonably successful, and since then they have led to work even more successful.

Ultimately the spring came, and I was about to leave for Germany. I was in a very exulted mood at what I conceived to be the first wholehearted recognition that had come my way, and I am afraid that I talked more of it to the newspapers than was strictly becoming. I felt that I had now got from under the pressure and the indifference of Birkhoff and Veblen. I was more eager to begin the duties of my new position, and I must have been an insufferable young man in my boasting and gloating.

Margaret and I were married in the parish house of a Lutheran Church in Philadelphia. We left at once for a few days' advance honeymoon in Atlantic City, to separate again for the months until Margaret should have discharged her duties at Juniata. She saw me off at the boat in New York. The hotel to which I took her in New York was the old Murray Hill Hotel, which had been for many years the special headquarters of the meetings of the American Mathematical Society, and which was a gloomy old-fashioned marble and porphyry mausoleum inhabited almost exclusively by elderly ladies, around whom flitted the spirits of the not-so-gay nineties.

After this depressing incident I took Margaret to the theater. As luck would have it, we went to see Ibsen's *Ghosts*, the gloomiest of all plays by that most gloomy playwright. These things would not have mattered much if they had only been incidents in a prolonged honeymoon, but as a prelude to a separation of many months they must have been devastating to Margaret's peace of mind.

I arrived in England to see the Devonshire spring already established and the primroses in full bloom. After visiting Hardy at Oxford, where he had now become professor, I went to Göttingen and took up quarters with the landlady of my student days.

I have already mentioned Richard Courant, the young mathematician on whom the administrative mantle of Felix Klein had fallen, as the pope of Göttingen. Courant, who had been amiable on my last Göttingen visit, now turned out to be somewhat hostile. The list of Guggenheim fellows had appeared in the American newspapers, and, as I have said, I had been a bit loquacious concerning my prospective trip. I gave an interview which came to the attention of the all-seeing eye of the Amerika-Institut in Berlin, which went on to dig up the fact of my father's bitter opposition to Germany in the First World War.

While Nazism did not become official in Germany until 1932, there was a strong and bitter nationalist element which had already assumed great power, and which had begun to terrify the more liberal elements in the universities. These universities were of course government institutions, and thus subject to nationalistic pressure. This was also the precise moment at which Courant wanted very much to gain the good will of the United States. The Rockefeller Foundation was deeply interested in European reconstruction. As far as mathematics was concerned, it had picked out the University of Göttingen as the first object of its benefactions. This was entirely natural and right, because Göttingen at that time held an unquestioned first rank as the great center of world mathematics. Later on that year, as I then

learned, Birkhoff was to visit Göttingen and to make a detailed report on the project for an improved and enlarged mathematical institute.

I do not envy Courant his difficult position between the upper and the nether millstones. However, it was myself rather than Courant who felt them grind the hardest. Courant's attitude to me became quite cold, and the favors which had been promised me were either denied or granted in such a grudging way that they were not acceptable.

Courant scolded me for my newspaper publicity and was disposed to deny me the assistant and the complete official recognition which he had promised me. Nevertheless, he allowed me to continue in Göttingen in an unofficial way, and after some persuasion found an able young mathematician to aid in the preparation of my lectures, provided I should pay him out of my own pocket.

I was left at Göttingen with a position that belonged neither to flesh, to fowl, nor to good red herring. The humiliation brought me to the edge of a nervous breakdown. Partly as a consequence of this, my lectures were less successful than I could have wished, both as examples of mathematical research and as lectures in the German language. I have no doubt that I would have broken down if it had not been for the loyalty of a few American and English friends, who cheered me up in my blues, went for long walks with me, and attended my classes at a time at which almost all the German students and docents had given them up as a bad job.

Chief among the Americans was J. R. Kline, a Pennsylvania German who was many years later to become the secretary of the American Mathematical Society and the head of the mathematics department at the University of Pennsylvania. He was there with his wife and little boy, and they took me in almost as a member of the family until Margaret came over and lightened their burden for them.

Of my English friends the chief was A. E. Ingham, then a don at the University of Leeds and later a fellow of King's College, Cambridge. Ingham was a shy, almost timid man who had already begun to do distinguished work in the theory of numbers. It is to Ingham that I owe a scientific lead which has carried me to much of my best work.

There were places in my theory of generalized harmonic analysis which I was nearly but not quite able to bring to a definite close. I needed certain theorems, and I found myself proving similar but not identical ones. Ingham pointed out that many similar problems had been solved by Hardy and Littlewood by what they called the method of Tauberian theorems. The study of these is a job belonging to the technique of the mathematician

rather than to his repertory of ideas, and I do not intend to try to expound it to the layman. It is enough to say that I made a new attack on this field which was thoroughly successful, and that I not only closed the gap in my earlier work but was able to go on to the simplification of large areas in the theory of whole numbers.

With Ingham and Kline as my friends, I turned my attention to a premature idea of reviving the two old Göttingen clubs, the American and the British Colony which had been the center of my life there in my student days. Kline and I had hoped to improve German-American relations by re-establishing the American colony. Accordingly, we turned for aid to one of the subadministrators of the university.

This subadministrator, who turned out to be a very questionable character, backed us to the limit. He introduced us to a group of young German students, whom I later found to have all the marks of the Nazi about them. Our administrator friend saw to it that our plans got a certain publicity in a local newspaper.

This came to Courant's attention, and he was furious. He squelched the subadministrator with all the fund of contempt which the German professor has for the underlings of the university office. We ourselves got the backlash of his anger, and my very weak position at Göttingen became even weaker.

I had expected that my Göttingen recognition would be a way of getting out from under the continued hostile pressure of Birkhoff in the United States, but now Birkhoff had himself come to Göttingen. He represented the American whose support Courant most wanted.

Courant approached me as an avenue through which he might win Birkhoff's good will. I told him that I had no influence whatever with Birkhoff and that Birkhoff's entire reaction to me was hostile. I kept away from Birkhoff on his visit. I felt that the relations between Birkhoff and Courant were their own business.

Soon after school had closed in the United States, Margaret came over to join me in Göttingen. I fetched her from the boat at Le Havre, and after a few days together in Paris and a short trip to Holland we arrived in Göttingen. It was a pretty sorry and confused state of things into which I introduced her, and it must have been a great shock for a newly wedded wife as yet imperfectly acquainted with her husband. Besides consoling me, she had serious work to do in bringing my landlady to a proper sense of her responsibilities and to a halfway fair treatment of our business relations. The difficult situation in which I found myself as far as my relations with

Courant were concerned had gone too far for any repair, but Margaret did her best to help me mend my fences.

Soon after our arrival we threw a belated wedding party for our friends at a well-known Göttingen wine restaurant, where the wine steward did everything in his power to see that the wines we ordered were adequate without being overly expensive. He pointed out that after the first bottle our guests would no longer be interested in the superlative excellence of the wines we ordered and suggested that we order a cheaper wine for the succeeding bottles. Our guests brought us as a wedding present a beautiful tablecloth and set of napkins.

It was not long after that that my parents decided to visit Europe, partly to share in my supposed success and partly to keep a supervising eye over the newly-married couple. This more than doubled my already unsolvable problems. Was I to tell my parents of the rebuff I had received and of the reason for it? As I have said, this lay partly in my father's opinions and in a confusion which the Germans had made of the two of us. It has always been harder for me to be safely wise than to blurt things out, and I told my father what had happened. Naturally, he was much more interested in his personal rebuff than in extricating me from my impossible situation. It was not a very happy week that we spent together in Göttingen, nor was it possible to keep my father and mother from going over my head and attempting to deal directly with the Göttingen people and the German educational authorities.

Margaret and I decided to spend our summer vacation in Switzerland. We went to Bönigen, a suburb of Interlaken, to a little hotel which my sister Bertha and I had already visited on an earlier trip to Europe. Later on the Klines came down from Göttingen to join us at the same hotel. Part of the time we wandered over the foothills of the Alps and some of the time I would play chess with the proprietor, a friendly wine merchant with whom we were on the best of terms. But, suddenly, our stay in Bönigen was terminated by a peremptory summons from my parents, who were passing their holidays in Innsbruck, in Tyrol.

Margaret and I needed this time for those adjustments in marriage which consist primarily in getting acquainted with one another, and which are rendered infinitely more difficult by any attempt at surveillance. On the other hand, through the course of the years, I had become too emotionally dependent on my parents to ignore their summons.

We found Innsbruck delightful, with its walks, its little theater, and its scenery, but my parents were in an irreconcilable mood. Father insisted on my writing an immediate and unconditional protest to the Prussian

minister of education. This I knew to be futile, for it was perfectly clear that the minister of education was the real source of all my difficulties. It was foolish and weak of me to submit, but the habits of years are not easily overcome. It took a long time, even after that, for Margaret to build up in me a certain degree of independence from my parents as an individual and as the head of a family in my own right.

Finally we went to Italy for three weeks of a real honeymoon. We first spent a little time in Bolzano, which had but recently been Italianized from its previous South Tyrolean status as Bozen, and which was not happy under the change. Then came a brief stay among the dust-covered olive groves of the Lago di Garda.

There followed a visit to the magic city of Venice, with its fabulous watery streets, its treasures of architecture, and the delightful Lido. This Venetian visit would have been pure fairyland if it had not been for the black depression caused by my Göttingen experience.

It was no pleasant experience for Margaret to become involved with the problems of a neurotic husband at his very lowest emotional level. I had become even more of a problem, because my parents had made a policy of glossing over my emotional difficulties, instead of confronting Margaret with the real task she had undertaken in marrying me.

From Venice we went on to Florence and to Rome. Florence in particular seemed to us a city of unbelievable beauty and distinction, which we could appreciate even through the veil of our emotional confusion.

However, the time came when we had to decide what to do with my remaining half-year abroad. For the immediate future, the meeting of the German Association for the Advancement of Science, in Düsseldorf, awaited us. After that, we felt that we had had our fill of Göttingen, and we decided to spend our remaining time in Europe, until January 1927, in the more genial atmosphere of Copenhagen. I had received Harald Bohr's permission to work with him, and I was determined to make up for the blight of my Göttingen visit.

We made a hurried and fatiguing journey to Düsseldorf by way of Switzerland and the Rhine. In Düsseldorf I gave a paper, and I made many new and agreeable contacts with German scientists. In particular, I met a young mathematician named Robert Schmidt, who was an instructor at the University of Kiel. Schmidt had done some important work on Tauberian theorems which, as I saw, was closely related to my own new ideas. We decided to pool our efforts. He pointed out to me in particular that a Tauberian theorem of the comprehensive character, the kind that I had some hope of proving, would be most valuable in number theory, and in particular in the

problem of the distribution of prime numbers: such numbers as 2, 3, 5, 7, 11, which have no other factor besides one and themselves.

In the late nineties, two great mathematicians, Hadamard and De La Vallée Poussin, of Louvain, succeeded in proving that the number of primes less than a larger number n was approximately $\frac{n}{\log n}$. Their proofs were thoroughly rigorous and satisfying, but somewhat complicated. Their theorem had been on the point of being proved for many years before they had succeeded in demonstrating it, and the great German mathematician Riemann had come near to establishing it in the third quarter of the nineteenth century. Riemann had made a certain conjecture which he had not been able to establish, but which, if it was true, would lead to a much finer estimate of the distribution of the primes.

To make a long story short, I found my way clear to using my methods to give a much simpler proof of the prime-number theorem and ultimately several much simpler proofs. It was Schmidt who directed my efforts toward this problem, and Schmidt also suggested to me that I might be able to establish or refute the Riemann hypothesis. In this more difficult problem, however, I have always found my efforts completely inadequate.

During my later stay in Copenhagen I made a couple of visits to Schmidt at Kiel. At first he was enthusiastic about my new method, but he gradually began to lose confidence in what I was doing. He threw the work entirely back on my own hands. There were, in fact, some gaps in my proof at that early stage; but they were the sort of gaps which were easily filled up. The repudiation of my work by Schmidt proved a blessing in disguise, for it gave back to me the full control of a piece of research which, if it was not the best that I was ever to do, was certainly close to my best, and which gave me a reputation incomparably greater than that which any of my earlier work had given me.

Courant was at the Düsseldorf meeting, and he tried to get me back again for another term in Göttingen. I told him that a further visit to him would have no point. Margaret and I made a brief trip to nearby Belgium, from which we took an unbelievably fatiguing train voyage to Copenhagen.

To go to Copenhagen by train one had then to take the ferry from Warnemünde to Gjedser. We traveled third class and spent an unhappy night in the red-painted, roughly-beamed, third-class dining saloon on the train ferry. It is a place to make one contemplate all one's past sins and all one's wasted opportunities. The passengers were huddled against one another in an uneasy sleep, and the swinging lanterns cast their oscillating

shadows on the floor to the tune of the rocking of the boat and the creaking of the timbers.

When we got to Copenhagen we were nearly dead, and we slept for a whole day. Then I looked up Harald Bohr and prepared for some months of research. We saw a good deal of the brothers Bohr. I remember that at the apartment of one of them, I believe it was Niels, there was a plaque of the two as children which gave them an undeniable peasantlike appearance, which they had lost in the course of the years. One of the other guests, a lady who was professor of classics at the University of Copenhagen, and who smoked big black cigars incessantly, told us that some friend had commiserated with their mother for having two such dull boys for children. In view of the fact that Niels Bohr has become the national hero of Denmark because of his scientific work and lives in a palace donated by one of the great Copenhagen breweries and that Harald was certainly the greatest mathematician ever to live in Denmark, this story now seems more than a little ridiculous.

Copenhagen was a delightful city which combined the intellectual amenities of a world capital with the hominess of a small town. In the intellectual world everyone knew everyone else, and there was an atmosphere of friendliness pervading the whole of life.

The Bohrs were charming to us, as was their colleague, Professor Nørlund, whom I had already met in Strasbourg. Nørlund was a tall, handsome, bearded man, who had gone from pure mathematical work to the headship of the Geodetic Survey of Greenland, and whose house was frequented by bluff Arctic sea captains. Mrs. Nørlund retained the beauty which had so impressed me at Strasbourg. She was most cordial to us. We had already decided to learn Danish, and were taking Danish lessons with a high-school teacher who had spent some time in the United States. Mrs. Nørlund supplemented our Danish instruction by reading with us Andersen's *Fairy Tales* in the original. The beauty of these fairy tales in the sweet, intimate Danish language was brought out to the full by the charming way in which she read them.

Besides my work on Tauberian theorems and number theory, I made one or two new starts in Copenhagen on important points in harmonic analysis. Copenhagen was a rest and a refuge after the turmoil of Göttingen.

I have said that we left Copenhagen for a brief trip to Germany, where my wife visited her relatives and I worked with Robert Schmidt. After that we returned to the extended festivities of the Danish Christmas and New Year season. Two weeks are devoted to nothing but parties, and the

crowds take delight in milling up and down the narrow business street of Strøget.

The time had now come to go back to the States. We returned by way of England. Margaret and I took over the room of some American friends of hers who had been studying in London. I found the mild winter a fine occasion to talk over my work with Hardy and take advantage of his criticisms. Then we returned to the States after a calm winter voyage and spent a day or two with my sister Constance before we started house hunting.

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Norbert Wiener—A Life in Cybernetics

Ex-Prodigy: My Childhood and Youth and I Am a Mathematician: The Later Life of a Prodigy

By: Norbert Wiener

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