HOW I BECAME A MATHEMATICIAN

K. MAHLER

As I am now slightly over 70, my memory is not particularly good, and some of the dates may be slightly wrong; but the facts will be essentially correct.

My twin sister and I were the 7th and 8th children of my parents; four of my brothers and sisters had died before we two were born on July 26, 1903. My parents were middle class Jews, and, with all my four grandparents, came from the lower Rheinland, Prussia, Germany. My birthplace, Krefeld, not far from the Dutch border and on the western side of the river Rhein, was then a rather pretty town of about 100,000 inhabitants. The main industry in those days had to do with silk and its uses.

My father and several of my uncles worked in printing and bookbinding. We had a small printing firm dealing mainly with commercial work, and my father had started at the bottom since none in our family was well to do. The printing firm lasted till the coming of the Nazis in 1933, and my only surviving brother was due to take over the firm when this happened.

There was no academic tradition in our family or in those of my relatives, and it is doubtful whether I should have ended at a university if I had been in good health. We all were great readers, and we read anything we could get, without much discrimination. In those days (but not after the First World War), our home was still run on strictly orthodox Jewish lines, and we were also all good German patriots. Krefeld belonged to Prussia, was in a mainly Catholic district, and there was even then a certain amount of anti-Semitism, although more as a reminder of the past.

My twin sister was very healthy, good at languages, and later an excellent business woman, but mathematics was not in her line. She had one child, but died early in the Nazi period; her husband is still alive. My brother was less intellectually inclined. He served in the First World War in France until he was very badly wounded and therefore released from the army with the Iron Cross and a promotion. He and his wife, and many more of my relatives, were put to death in German concentration camps during the Second World War. My elder sister, now over 80, is still alive. She, her husband (recently deceased), and her only daughter have been living for many years in the Netherlands. Both she and her husband were mainly interested in music. In contrast, although I can somewhat appreciate the great composers from Bach to Beethoven, I find most of the earlier and the later music mainly noise and nuisance! I have always preferred things I can see to things I can hear.

My health never was good. At about 5, I became a victim of tuberculosis in my right knee. There was no good treatment in those days, and after an operation when I was about 8, the knee became stiff, the leg bent at the knee, and there was for many years an open wound. I was thus very much hindered in walking. This remained so

until 1937 when the doctors finally could remove the infection, straighten the leg, and once and for all get rid of the disease.

Between my 7th and my 11th year I was at school only for short periods, but had some private tuition at home in the three R's. Then, until I was not quite 14, I went to the *Volksschule* (elementary school), a Jewish one, where in spite of the small staff, the teaching in the true Prussian spirit was surprisingly good. It involved only elementary subjects and did not include mathematics, apart from arithmetic. My worst subject was *Schönschreiben* (calligraphy), but in later years I was to acquire a very satisfactory way of writing.

When I left the *Volksschule* some three months before my 14th birthday, my parents thought I should try to become a *Fein-Mechaniker* (precision mechanic) because this would allow me to work sitting. To prepare for this, I went for the next two years to elementary technical schools in Krefeld. It was there that I made my first contacts with elementary algebra and geometry, and I think that this was the moment when I decided to become a mathematician. In the summer vacation of 1917, on my 14th birthday, I bought a logarithm table and spent the vacation most pleasantly by doing all kinds of calculations with it. Soon afterwards, I obtained books on trigonometry and analytic geometry, and a little later, books on calculus. By about 1919 I began the study of books of university standard[1], learning about groups, invariants, sets, and a little later, about analytic functions, elliptic functions, modular functions, number theory, non-Euclidean geometry, etc. I had no teachers to help me, and I therefore tried to teach a couple of my fellow scholars at the technical school some of the pretty things I was attempting to understand!

About this time, in 1919, I entered a machine factory in Krefeld as an apprentice. The reason for this was that, if I could conclude the apprenticeship, I might be allowed to enter a *Technische Hochschule* (technical college), without first passing the very difficult *Abiturienten-Examen* (university entrance examination). At such a *Technische Hochschule* I should then be able to study mathematics.

The machine factory made machines for producing screws and bolts, some of them quite large, but all rather simple mechanically. I spent one year at their drawing office and not quite two in the factory itself, learning to handle simple instruments and machines. The technical drawing proved later very useful in my own work and also enabled me to help colleagues with such drawings, e.g., L. J. Mordell[2].

I was in the factory not quite three years. Then a happy accident happened. The director of the local *Realschule* (i.e., headmaster of a middle school), a very good mathematican and former student of Christoffel, learned of my studies and sent some of my attempts to Felix Klein in Göttingen[3]. Klein, who was already old and in bad health, gave these to C. L. Siegel who was then doing research in Göttingen, for a report. Siegel found a number of errors, but recommended that I should be helped to pass the *Abiturienten-Examen* so that I could proceed to a university.

As a consequence, several teachers at the *Realschule* helped me in the next years

with languages (French and English) and other subjects, and at last, in the summer of 1923, I was admitted as an outsider to the *Abiturienten-Examen*.

At this time, under the Weimar Republic, Prussia had a very liberal government, and they allowed me, against the usual rules, to take the examination at the *Ober-Realschule* in my home town, rather than elsewhere. This was of great importance, for it was the time of the great inflation in Germany, of the French occupation of the Ruhr, and of the pro-French separatist movement in the Rheinland; there was even some shooting in Krefeld between the separatists and the police.

The subjects of my examination were German, French, English, Mathematics, Physics, Chemistry, History, Geography, and possibly some more which I have forgotten. For five successive days I was given written tests in the different subjects, and then I had to endure an oral examination. I just passed in most of these subjects, and I obtained good marks only in mathematics, physics, and history. But I was successful, and hence a couple of months later I was able to enter the University of Frankfurt am Main as a full student, shortly after I had reached the age of 20.

I stayed in Frankfurt for three semesters until early 1925, and from then until the coming of Hitler in 1933 studied and did research at the University of Göttingen[4]. Then came the exodus, and, except for two years at the University of Groningen in the Netherlands, I stayed for more than a quarter of a century at the University of Manchester, England. But by this time it had of course become clear that I had become a mathematician!

Notes

1 My main advanced books before I went to the University were as follows: Pascal, *Repertorium der Mathematik*, Vol. 1, Section 1; Cesáro-Kowalewski, *Algebraische Analysis;* Clebsch-Lindemann, *Geometrie;* Klein, and Klein and Fricke, *Das Ikosaeder; Modul-Funktionen; Automorphe Funktionen;* Hilbert, *Grundlagen der Geometrie;* Bachmann, *Zahlentheorie* (several volumes); Landau, *Primzahlen;* Knopp, *Analytische Funktionen.*

2 See Mordell's papers on geometry of numbers, mainly J. London Math. Soc., between 1941 and 1945.

3 My notes dealt with irrationality of certain series; the solution of a quartic equation by means of Klein's Oktaeder equation; and with three-dimensional hyperbolic geometry. They were sent to Klein at different dates.

4 My teachers in Frankfurt were Dehn, Epstein, Hellinger, Szász, and in particular Siegel, who taught me a lot privately. In Göttingen, I was particularly influenced by Courant and Emmy Noether, and more indirectly by Landau. Although then at Göttingen, I submitted my Ph. D. thesis *Über die Nullstellen der unvollständigen Gammafunktionen* in Frankfurt where Szász acted as the examiner. This was in 1927.

DEPARTMENT OF MATHEMATICS, THE AUSTRALIAN NATIONAL UNIVERSITY, P. O. BOX 4, CANBERRA, ACT. 2600, AUSTRALIA.