

HANNA CAEMMERER NEUMANN

German group theorist **Hanna Caemmerer Neumann** (February 12, 1914 – November 14, 1971) was born in Berlin, the youngest of three children of Hermann and Katharina von Caemmerer. Her father held a doctorate and was well on his way of establishing himself as an academic historian when he was killed early during WWI, forcing the family to live on a small military pension. From the age of thirteen Hanna (she much preferred being called by her first name) helped with the family finances by tutoring younger children. After graduating from the Augusta-Victoria-Schule, a girls' grammar school, she entered the University of Berlin in 1932, where in her first year she studied with Ludwig Bieberbach, Erhard Schmidt and Issai Schur. It was while at Berlin that she met her future husband Bernhard H. Neumann, also a mathematician.



Bernhard, a Jew, could see that Germany was no place for him. In 1933, he left for Cambridge in England. Hanna visited him in 1934, and they became secretly engaged. Back in Berlin, Hanna was an active member of a group of students who tried to protect Jewish lecturers, all of whom would soon lose their positions with the University, from the Nazis. Realizing that her political views would make it impossible for her to pass the oral exam on “political knowledge,” required for a doctorate, Hanna instead took the *Staatsexamen* final, which consisted of an oral examination and a written essay. It was a prerequisite for entry into public service including teaching. She chose to be examined in Mathematics, Physics and Philosophy. As her essay topic she chose the epistemological basis of numbers in Plato’s later dialogues. She graduated with distinctions in both mathematics and physics.

Realizing the impossibility of receiving a doctorate in Germany and wishing to marry Bernard, Hanna left for England. To protect his parents still living in Germany, the couple was secretly married in 1939. Because they were German aliens, after Dunkirk, they were not allowed to live near the coast and so moved from Cardiff, where Bernhard had been teaching, to Oxford. Soon thereafter Bernhard was interned and released into the British army. Already the mother of one child and expecting another, Hanna made arrangements to complete her doctorate at Oxford, concentrating in group theory. She was able to pursue her studies through the efforts of the Society of Oxford Home Students and a waiver of fees that Oxford University granted to all refugee students whose course of studies had been interrupted by the war. Soon after, restrictions were lifted and the Neumann family that now included a third child (it would eventually grow to five children) was allowed to return to Cardiff. Hanna was awarded a D.Phil. in 1944, for a thesis on the problem of determining the sub-group structure of free products of groups with an amalgamated subgroup. Olga Taussky (later Olga Taussky-Todd), at the time a lecturer at Westfield College, which had been evacuated from London to Oxford, directed Hanna's dissertation.

After the war Hanna taught for twelve years at the University College in Hull. Her own research and her joint research with her husband were submitted in 1955 to Oxford, which awarded her a doctorate of science. Meanwhile Bernhard was lecturing at Manchester. In 1958 Hanna joined him on the faculty at Manchester. She took an active interest in her students and seemed always eager to share her joy in mathematics with them. She was determined to see her students make the most of their potential, and organized courses that would show them something of mathematics as she saw it. All the time she had the responsibilities of raising and caring for her family, which became even more demanding in 1958, when Bernhard took a study leave of nine months, visiting India and Australia. Still she found time to hold regular coffee sessions with students where they would discuss problems of mutual interest.

Hanna Neumann's first paper "On the elimination rule," was a problem suggested by Bernhard. She described the problem in the opening paragraph. "Chess matches are often decided according to the following elimination rule. The team with the higher score wins, of course. If both teams score the same number of points, the one that won at the last board at which the game was not drawn wins the match. The problem is to find an arithmetical equivalent of this rule, i.e. to attribute to the single boards positive integral weights (which then have to be chosen as small as possible) such that the result is in accordance with this rule."

During 1961-62, the Neumanns were at the Courant Institute of Mathematical Sciences in New York. Then Bernhard was asked to set up a research department of mathematics at the Australian National University in Canberra and Hanna was offered a position as Reader (now called Professorial Fellow) in the same department. Hanna left Britain in 1963, after finishing her obligations to her students at Manchester, to join her husband in Australia. She was invited to take the newly created chair of Pure Mathematics in the National University's School of General Studies. With the chair came the position as head of the department. She accepted, assuming the post in 1964.

Hanna went about assembling an excellent department of pure mathematics and was actively involved in a radical curriculum restructuring in her adopted country, which required the creation of new secondary school mathematical syllabi, reflecting the changes that were taking place in the teaching of mathematics in other parts of the world. Whether working with secondary school teachers, undergraduates who might make a career of mathematics or students with limited background, Hanna was intent in getting across the notion that doing and thinking about mathematics could be a joyous activity, sharing with one and all her delight with the subject and her willingness to work hard.

In 1965, Hanna helped organize a very successful international conference on group theory at Canberra. In 1966 she reported on her recent work about varieties of groups at the International Congress of Mathematics held in Moscow. The next year she published a classic monograph *Varieties of Groups*, which listed some of the unsolved problems on varieties, many of her own formulation. In 1970 Hannah spent five months at Vanderbilt University in Nashville, Tennessee, as a National Science Foundation Senior Foreign Scientist Fellow. While at Vanderbilt she traveled to other parts of the United States to give a series of lectures on her research. At the end of October 1971, Hanna set off on a Canadian lecture tour. While at Carleton University, Ottawa she felt ill, checked into a hospital, quickly fell into a coma and died two days later without regaining consciousness. The Australian Research Council set up the “Hanna Neumann Postdoctoral Fellowship” in 1996 to “provide a role model for female mathematical scientists.” Hanna Neumann was survived by her husband, who lived another 31 years, and their five children.

Quotation of the Day: “Many women in our present culture value mathematical ignorance as if it was a social grace, and they perceive mathematics as a series of meaningless technical procedures. They discount the role mathematics has played in determining the direction of philosophic thought, and they ignore its powerful satisfactions and its aesthetic values, which are equal to those offered by any other branch of knowledge.” – Lynne M. Osen