

Emil - Artin - Lecture

Ladies and Gentlemen,

on behalf of the Mathematics Center Heidelberg, MATCH, and on behalf of the faculty of mathematics and computer science I would like to welcome all of you to the *Emil-Artin-Lecture*.

The **idea** of this lecture series, which is organised once a year by MATCH, is to appreciate significant developments and ground breaking contributions in mathematics and to present it to a broader public interested in mathematics.

Why do we call it in honour of Emil Artin? Let me say it straight away: Artin does not seem to have any special, close relationship to Heidelberg at all, it is not clear to me, whether he has ever been here! Apart from his fundamental contributions to number theory it is his way of doing and thinking about mathematics, which is a source of inspiration to us and which we consider as a impressive example. Therefore we would like to bear in remembrance Emil Artin and his work.

Let me say a few words about Artin before going over to todays lecture: Emil Artin was born in 1898 in Vienna where he grew up before moving to Reichenberg (now Liberec in the Czech Republic) in 1907 where he attended the Realschule. His academic performance then was barely satisfactory and rather irregular. About his mathematical inclination at that early period he later wrote: “My own predilection for mathematics manifested itself only in my sixteenth year, whereas earlier there was absolutely no question of any particular aptitude for it.” But after spending a school year in France his marking improved considerably. In October 1916 he matriculated at the University of Vienna where he studied mathematics with Phillip Furtwängler. In June 1919 – after spending a year in the Austrian army on the Italian front during the first world war – he moved to Leipzig, where he was awarded the Doctor of Philosophy degree based on his dissertation “Quadratische Körper im Gebiete der höheren Kongruenzen” (“On the Arithmetic of Quadratic Function fields over Finite Fields”), his advisor was Gustav Herglotz. In 1921 Emil moved to Göttingen, the Mecca of mathematics at that time, as a post-doc with Richard Courant and David Hilbert. During that time he worked closely with Emmy Noether and Helmut Hasse. In 1923 he completed his Habilitation thesis “Über eine neue Art von L -Reihen” in Hamburg, in 1924 he advanced to Privatdozent before being promoted to Associate Professor (außerordentlicher Prof) in 1925, the year in which Emil applied for and was granted German citizenship. When the University of Münster offered Emil a professorship in 1926, Hamburg matched the offer and promoted him to full professor, making him (along with his young colleague Helmut Hasse) one of the two youngest professors of mathematics

in Germany.

Meanwhile also his **private life** developed: in 1929 he married Natalie (also called Natascha) Jasny, a young Russian immigrant who had been a student in several of his classes. In 1933 their first child Karin, in 1934 their son Michael and finally in 1938 their second son, Thomas, were born.

Due to the tragic and darksome takeover by the Nazis Emil's situation became increasingly precarious, not only because Natascha's father was Jewish, but also because he made no secret of his distaste for the Hitler regime. In the end, in 1937, Emil was removed/dismissed from office and forced into emigration to the United States, where through the efforts of Courant and Lefschetz a position was found for him at the University of South Bend, Indiana. In 1945 he was granted the U.S.-American citizenship. In 1946 Emil was appointed Professor at Princeton where he stayed until 1958 when he returned to the University of Hamburg until the end of his life. After getting again the German citizenship Emil Artin died on December 20, 1962, of a heart attack at the age of 64.

He had been **awarded** with honorary doctorates by the University of Freiburg (1957) and the University of Clermont-Ferrand (1962), in 1957 he had been elected Fellow of the American Academy of Arts and Sciences, in 2005 the University of Hamburg honoured his memory by creating "The Emil Artin Lecture Hall."

Emil had during his whole life a *broad asthetic and intellectual* focus, in particular he was very much interested in chemistry, biology and over all astronomy. Music played a central role in his life, inspired by chamber music sessions hosted by Courant in Göttingen the Artin living room was later a regular venue for chamber music performances with his children.

Concerning his **mathematical work** – mainly in number theory and algebra – Emil Artin is famous for his contributions to class field theory – the *Artin reciprocity law* - and the introduction of cohomological methods into Galois theory. He contributed a new construction of *L*-functions attached to linear representations of the absolute Galois group on finite-dimensional vector spaces, the *Artin-L-Functions*. Artin's conjecture on *L*-functions saying that is still open. He solved Hilbert's 17th problem in his work "Über die Zerlegung definiter Funktionen in Quadrate."

Furthermore he developed the theory of braids as a branch of algebraic topology, which has applications in theoretical physics in the mean time.

Among his famous **students** are Bernard Dwork, Serge Lang, John Tate, Bartel van der Waerden,

Hans Zassenhaus and Max Zorn.

Whenever Artin was asked whether mathematics was a science, he would reply unhesitatingly, “No, it is an art.” Here is his elegant elaboration of this idea: “We all believe that **mathematics is an art**. The author of a book, the lecturer in a classroom tries to convey the structural beauty of mathematics to his readers, to his listeners. In this attempt, he must always fail. Mathematics is logical to be sure, each conclusion is drawn from previously derived statements. Yet the whole of it, the real piece of art, is not linear; worse than that, its perception should be instantaneous. We have all experienced on some rare occasion the feeling of elation in realizing that we have enabled our listeners to see at a glance the whole architecture and all its ramifications.”

In *Emil Artin and Helmut Hasse: Their Correspondence 1923–1934*, Frei and Roquette write that Artin’s “main medium of communication was teaching and conversation: in groups, seminars and in smaller circles. We have many statements of people near to him describing his unpretentious way of communicating with everybody, demanding quick grasp of the essentials but never tired of explaining the necessary. He was open to all kinds of suggestions, and distributed joyfully what he knew. He liked to teach, also to young students, and his excellent lectures, always well prepared but without written notes, were hailed for their clarity and beauty.”

This is the spirit of Emil Artin I referred to at the beginning and which we hope will inspire us. Finally I would like to mention here that our colleague Emeritus Roquette is very much engaged in keeping the remembrance of Emil Artin alive.