Professor Helmut Lenzing

(* 16 April 1939, † 13 October 2022)

(Photo by Lutz Hille, 2012 at Bielefeld)

As a mathematician, Helmut Lenzing is best known for his work on weighted projective lines, but his mathematical interests were much wider. From the very beginning he studied homological properties of rings and modules in a categorical context. For instance, he introduced in his thesis from 1964 the notion of an hereditary abelian category, generalising the module categories of hereditary rings. Another early contribution is his 1969 paper *Nilpotente Elemente in Ringen von endlicher globaler Dimension*, which provides the key argument for proving the no loops conjecture, as Igusa pointed out 20 years later in his work on the conjecture.

Lenzing belongs to the first generation of representation theorists studying representations of diagrams and quivers. In 1979 he attended the Second International Conference on Representations of Algebras (ICRA) held at Carleton University, Ottawa. At that time his contributions were devoted to model-theoretic aspects and part of a fruitful collaboration with C. U. Jensen. In 1989 they published their book *Model-theoretic algebra with particular emphasis on fields, rings, modules*. It contains for example a thorough treatment of pure-injective modules.

A continuous interest in geometric aspects eventually led to the work *A class of weighted projective curves arising in representation theory of finite-dimensional algebras*, published in 1987 together with his student Werner Geigle. A crucial observation was the

fact that the category of coherent sheaves on a weighted projective line is an hereditary and noetherian abelian category with a canonical tilting object; passing to its endomorphism algebra provides a canonical algebra in the sense of Ringel, and in fact a bijective correspondence between weighted projective lines and canonical algebras. Another seminal joint paper with Geigle from that time was devoted to the study of perpendicular categories. Many categorical properties of representations and sheaves can actually be derived from this work, now known as *perpendicular calculus*.

Lenzing was a pioneer when it comes to the fruitful interplay between (non)commutative geometry and representation theory. Very early, he stressed the relevance of derived categories, and often he advertised the work of Atiyah, Serre, or the Moscow school of vector bundles. His lectures were always crystal clear and he enjoyed creating panoramas, by combining classical geometric objects with advanced homological and K-theoretic technology. Advanced technology also meant for Lenzing the use of modern computer algebra, for instance when analysing the spectral properties of Coxeter polynomials in joint work with de la Peña. In fact he strongly supported the development and use of computer algebra systems. Experts remember his advocacy of the system MuPAD which was developed by colleagues from his department at Paderborn University.

For Lenzing, a continuous source of inspiration was personal interaction at all levels. He actively supported the international academic exchange, for instance by taking the lead in organising two highly successful schools at the International Centre for Theoretical Physics (ICTP) at Trieste in 2006 and 2010. He enjoyed travelling and developed strong ties to communities in China, Iran, Mexico, and Poland, to name just a few. Visitors to Paderborn remember his hospitality, including free German lessons when he challenged them to speak German. The last international meeting he attended was in 2019 at one of his favourite places, the Casa Matemática Oaxaca.

A picture of Helmut Lenzing is not complete without mentioning his talent for university administration. He started very early. Only few years after completing his PhD in 1964 under the direction of Professor Grotemeyer at FU Berlin, Lenzing got involved in the development of a new university at Bielefeld. Grotemeyer and Hirzebruch were the two mathematicians on the founding committee, but their assistants played a decisive role as members of the first hiring committee for the mathematical faculty. When Bielefeld University was eventually founded in 1969, almost all members of the second mathematical institute at FU Berlin moved to Bielefeld, including Lenzing of course. One of the early challenges was creating a new building, and Lenzing was much involved in its planning, discussing with architects and convincing them to include generous blackboard space. Only a few years later, a new university at Paderborn was founded. So in 1972 he moved to Paderborn and became the first head of the department of mathematics and computer science. He took the lead for many years, and at all levels of the new university, until his retirement in 2006. He remained active, for instance as a regular member of the

Bielefeld representation theory seminar, meeting on Friday afternoons. Every Thursday he met with friends for running, throughout the whole year.

Lenzing had a number of excellent students, among them Dagmar Baer, Werner Geigle, and Dirk Kussin. His generous support for many more young mathematicians will always be remembered. He influenced several generations of representation theorists through a unique style of conceptual thinking combined with a broad mathematical knowledge. The representation theory community will miss his advice, losing a great teacher, a colleague and friend, and last but not least, a true gentleman.

Henning Krause