

MicroscopyPioneers

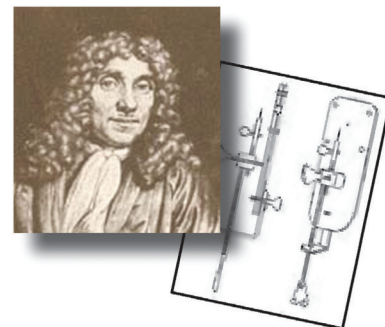
Elmar Zeitler: A Rigorous and Jovial Physicist

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Dr. Elmar Zeitler's early life was marked by when and where he was born—Germany during the rise of Adolf Hitler. His parents moved the family deep into the forested areas of Bavaria to protect their children, but, ultimately, as a boy Zeitler was conscripted into the German Luftwaffe and was sent to the Russian front. Here his friend and colleague, Dr. Michael Isaacson, remarks how his luck changed. Zeitler was captured by American forces and taken as a prisoner of war. It is shocking to hear this described as a change of luck, but Isaacson remarked that Zeitler's life as an American POW was less dangerous than the frontline, and more tolerable than being a Russian POW. This view was held by his late friend as well. The memory was something that he literally carried with him in the form of a small handmade cigar box. Isaacson remarked that it sat atop Zeitler's desk as his career unfolded. Why this cigar box? During his time as a POW, his jovial nature, boyish curiosity, and affinity for basic woodworking earned him a warm relationship with his American captors. During this time, he learned American English and put his carpentry skills to work to help make basic furniture and, apparently, a small cigar box.



After the war ended, Zeitler returned to his hometown, Würzburg, and studied physics. He progressed to the doctoral level and completed his dissertation, *Investigation about the Hard Component of Cosmic Rays*, under the guidance of Dr. Helmuth Kulenkampff. Beginning in 1954, he worked at Bayer for four years on the knowledge-based perfection of scientific photography. In 1958, he visited the Department for Cell Research and Genetics at the Karolinska Institute in Stockholm to work on the quantitative aspects of electron microscopy (EM). During this stay, his interest in using EM on biological specimens was ignited. This interest would be the driving force of his career. He and Günter Bahr were the first to publish about the determination of molecular weight by using EM. Home seemed to once again be calling, and he returned to the University of Würzburg. Here in 1960, he achieved habilitation. For our non-European readers, this is the qualification required to obtain a professorship. Scientifically, he developed a method for determining the local mass of a biological object by means of quantitative contrast analysis. This was an experimental feat for which Zeitler created the precise analytical basis.

Then, Zeitler (and his cigar box) crossed the Atlantic to begin what he called his “American phase.” He first landed at the Biophysical Department of the Walter Reed Army Medical Center in Washington, DC, where he continued his efforts on quantitative EM. Importantly, he was also introduced to his future wife, Leigh Bahr, Günter's daughter. Leigh, an artist, was living in San Jose at the time. Here, I will note that this was his second wife. His first wife tragically passed away at an early age, leaving Zeitler as a heartbroken father to their young daughter. Upon marrying Leigh, the family blended into a very international family and happily welcomed the addition of a son. Isaacson noted the international flair of the family would make for delightful visits, with conversation switching from German to English to Swedish. Apparently, Christmas was an utterly magical experience in the Zeitler house, with the blending of three sets of traditions. From written profiles and in Isaacson's own words, Zeitler was a born storyteller. His stories humanized him and brought lightness to conversations. Upon hearing this, I must admit how sorry I am not to have had the opportunity to speak with the man himself.

In the spring of 1964, Zeitler and Bahr organized a five-day symposium about Quantitative EM. This event is considered as the “the establishment of that research field.” In the summer of 1966, Zeitler taught at a workshop on high-voltage EM held at Argonne National Laboratory; this is where he and Isaacson first met. Isaacson was a doctoral student at the University of Chicago working on the STEM project for Dr. Albert Crewe, who was then Director of the Argonne National Laboratory. It was an impactful meeting for Isaacson, who holds fast to the lessons and wisdom given by Zeitler beginning that summer. He changed his course selection to include additional mathematics because Zeitler pressed upon him, “you can never take too much math.” Zeitler would meet with students in small groups and begin long hours of conversation and instruction with the fundamental principles then progressing to application. He spoke to the students as equal learners rather than the arrogant approach of many other instructors. Zeitler warned the students to not give too much weight to the opinions of those who think too highly of themselves. In 1968, he moved to the University of Chicago to take a faculty position within both the Department of Physics and Department of Biophysics. His accomplishments and impact during his Chicago years are thoroughly documented in an article by Isaacson published in 1993 in *Ultramicroscopy*.

Zeitler's "American phase" concluded in 1977, when was appointed Director at Fritz Haber Institute in succession of Ernst Ruska, and where he remained until his retirement in 1995. Here, his own work and his role as director was centered on his core research passion—the use of high-energy electrons to image biological matter. Zeitler rigorously tested his ideas on the fundamental solution to the beam damage problem. The answers to this challenge were cryo-EM and electron energy loss spectroscopy (EELS), and so these were two of the greatest areas of emphasis at the institute during his tenure as director. The obituary published by the Fritz Haber Institute gives immense detail on Zeitler's leadership, research, and impact (<https://www.fhi.mpg.de/news-institute/obituary-for-elmar-zeitler?c=68418>).

Zeitler's accolades are numerous and include: Honorary Professor at the Technical University of Berlin (1975–1995), Distinguished Scientist from the (Electron) Microscopy Society of America (1989), and Honorary Member in numerous international organizations about EM. He served as President of the International Federation of Societies for Electron Microscopy (IFSEM) from 1982 to 1984, a role he performed well given his natural diplomatic disposition. He was the driving force behind the formation of the journal *Ultramicroscopy* with North-Holland Publishing Company (Elsevier) and served as its Founding Editor. It is perhaps impossible to overstate his impact on the field of microscopy. His life story had a dramatic beginning and progressed into one of great accomplishments.

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