

Herbert Kroemer: Biography

Herbert Kroemer was born in 1928 in Weimar, Germany. He received a Doctorate in Theoretical Solid-State Physics in 1952 from the University of Göttingen, Germany, with a dissertation on high-field electron transport in the collector junction of the then-new transistor. One of the Göttingen professors, Fritz Sauter, had organized a seminar sequence, where the students had to give in-depth reports on selected key papers in the emerging semiconductor field. Kroemer was assigned the 1949 paper by Bardeen and Brattain on *Physical Principles Involved in Transistor Action*. The paper mentioned a few as-yet unexplained observations, and during his presentation, Kroemer suggested that the drift velocity of the charge carriers might decrease again with increasing field at sufficiently high fields. Sauter was intrigued and suggested that this might be a good topic for a dissertation.

Ultimately, the observations in question had a different explanation. But the dissertation led to a career in the physics and technology of semiconductors and semiconductor devices, in a number of research laboratories in Germany and the U.S. Since 1976, he has been with the University of California at Santa Barbara.

Dr. Kroemer is the originator of several device concepts, including the heterostructure bipolar transistor, and the double-heterostructure laser. During the '60s, he also worked on microwave device problems, and in 1964 he was the first to publish an explanation for the Gunn Effect. With the emergence of molecular beam epitaxy in the mid-'70s, he returned to heterostructure devices, and he was one of the first to apply the emerging new technology to new and unconventional materials combinations, such as GaP-on-Si and InAs/(Al,Ga)Sb structures, making several contributions to the development of MBE itself.

Dr. Kroemer is a Fellow of the IEEE and of the APS, and a Member of both the National Academy of Engineering and the National Academy of Sciences. He holds several honorary doctorates from universities in Germany, Sweden, and the USA. He has received numerous awards, including the 2000 *Nobel Prize in Physics*, “for developing semiconductor heterostructures used in high-speed and opto-electronics,” and the 2002 *IEEE Medal of Honor*.

His main research interests continue to be in the physics and technology of semiconductor heterostructures.

His work as a scientist has benefitted greatly from a happy 60-year marriage to his wife Marie Louise, from Berlin, Germany. Their private lives are centered around raising their 12-year old grandson, Ryan, whom they adopted a few years ago.