

# Arthur von Hippel: The Man Behind the Von Hippel Award

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The Von Hippel Award, the most prestigious award of the Materials Research Society was first presented to its namesake, Arthur von Hippel, in 1976. On November 19, 1988, Prof. von Hippel celebrated his 90th birthday, an appropriate occasion to look back on a lifetime of achievement. Through the many testimonials that were heard at his 90th birthday celebration from family, friends, former students and colleagues, emerged a picture of materials science that reflects much that we treasure as the fabric of the Materials Research Society, namely the interdisciplinary approach to materials research.

It has become an annual tradition of MRS to celebrate the achievement of the Von Hippel Award winner, and each year the celebrants begin the ceremony with an affirmation of the efficacy of the interdisciplinary approach. In the early years of the Von Hippel Award, our young students often heard greetings from Prof. von Hippel himself during the opening ceremony. But as the size of the meetings has grown, it has become increasingly difficult for "The Professor" to offer personal greetings. Many young people today yearn for contact with their intellectual heritage. Inspired by this need, the leadership of MRS recommended that a brief article be written for the *MRS BULLETIN* on reminiscences about Prof. Arthur von Hippel and his legacy of the interdisciplinary approach to materials research.

Because of the turmoil in Europe during the 1930s, Arthur von Hippel and his Jewish wife were forced to leave Nazi Germany. After several years of wandering in Turkey and then Denmark, the von Hippels arrived in the United States, a land of opportunity that had opened its doors to war refugees. The von Hippels were looking for a safe harbor where they could start a new life. The opportunity came to von Hippel in 1936 through Karl Compton, president of Massachusetts Institute of

Technology and a Nobel laureate in physics himself, who had a vision of building an education and research program at MIT in materials research. When President Compton made the first major MIT appointment in materials research to a physicist in an Electrical Engineering Department, the concept of the interdisciplinary approach to materials research was introduced. It was, however, Prof. von Hippel who implemented the concept, and this implementation was done over a period of time lasting at least a decade, with much criticism from his colleagues at MIT.

Prof. von Hippel's main interest and expertise was in insulators. Coming from a physics background, it was natural for him to emphasize a more fundamental approach to materials research. This meant working with systems that could be well characterized and carefully controlled.



M.S. Dresselhaus with "The Professor,"  
Arthur von Hippel.

Since the best examples of such materials are single crystals, it was natural for Prof. von Hippel to develop a materials synthesis laboratory. Shortly thereafter he developed a materials characterization laboratory, making use of MIT's great strength in x-ray crystallography. However, the main focus of the von Hippel research program was to gain a basic understanding of the structure and properties of materials at the molecular level and then to modify these materials in clever ways to achieve desired properties and ultimately device applications.

Although Prof. von Hippel was a scientist by training and preference, he had great interest in applications. His interaction with industry and government laboratories was widespread and intense, very much in resonance with the generation that bred the early Route 128 entrepreneurs in the suburbs of Boston.

To carry out all these diverse functions, the von Hippel laboratory required a wide range of expertise, with a sizable group of people working together with a common goal. The structure of the laboratory eventually evolved into an interdisciplinary entity—the Laboratory for Insulation Research. As the United States was drawn into World War II, more focused programs for the defense effort were undertaken. Undoubtedly, the structure of von Hippel's laboratory was significantly influenced by the much larger effort of the MIT Radiation Laboratory, which was established for the development and implementation of radar technology for the United States and its Allies. Though much cooperation and collaboration between the laboratories occurred, each maintained its separate identity and independence during the war years.

When World War II was over, the MIT Radiation Laboratory was adiabatically transformed into the Research Laboratory of Electronics, while the Laboratory for Insulation Research formed the underpinnings for the national interdisciplinary Materials Research Laboratory program which was eventually established in 1960 through the aegis of post-Sputnik initiatives. By the time of Sputnik, Prof. von Hippel's personal interests had also shifted from crystalline dielectrics to water and ice, and from these basic materials to biological functions related to H<sub>2</sub>O. Though the concept of the Materials Research Laboratory program can readily be traced to the von Hippel heritage, he did not himself participate actively in this program, largely because his retirement came in 1962, very close in time to the initiation of this program.

Just as MRS constantly avows its dedication to interdisciplinary research, it also de-

clares its commitment to students through the MRS Student Awards Program and the support of MRS University Chapters at many American universities. Regarding academe, Prof. von Hippel himself came from a strongly academic family, with role models from both his father and grandfather who were famous professors at Göttingen and also from his father-in-law James Franck, a Nobel laureate in physics, best known for the Franck-Hertz experiment. But the commitment of the von Hippel family to academic pursuits did not stop there, since all four of the von Hippel sons became famous professors in their own rights, not to mention the more than 60 PhD's that Prof. von Hippel trained. These PhD's in turn trained many others, leaving a worldwide web of materials researchers committed to interdisciplinary approach.

Prof. von Hippel's reputation as a teacher was legendary; he had a great interest in teaching introductory courses where he could spark the minds of the youngest MIT students. He also gave much attention to graduate education and was the author of a series of books that were widely used for education and also as reference works. Thus the strong educational focus of MRS follows very much in the von Hippel tradition.

Prof. von Hippel was nontraditional in

many ways. One of the endearing features of "The Professor," was his genuine concern for the people who worked in his laboratory. Because his wife is an amateur violinist and he himself had a deep love for music, a musical camaraderie developed around his laboratory, in part related to a number of highly talented amateur musicians who worked in his laboratory. It was, in fact, through chamber music sessions involving several members of his laboratory, that I myself first got to know Prof. von Hippel. These musical contacts later helped me gain his support when I was being considered for a faculty appointment at MIT. Prof. von Hippel was also an ardent skier, outdoors person and nature lover. In this connection, students and members of his laboratory were often invited to spend the weekend at his country home in New Hampshire, enjoying the snow or sunshine in the lovely countryside.

A second nontraditional aspect about Prof. von Hippel was his willingness to accept women colleagues as serious co-workers in an era when few senior male professors were willing to do so; this was also helpful to my career. The very high percentage of women graduate students in materials research at MIT may perhaps be traced to the early support structure provided by "The Professor." Later when I became the director of the MIT Center for

Material Science and Engineering, Prof. von Hippel could not have been more supportive of my appointment. I also learned a lot from him about directing a laboratory. According to his model, a successful laboratory director should be decisive, yet open to suggestions and concerned about the welfare of the students and staff.

As we look ahead into the next decade, we are starting to plan the celebration of his 100th birthday. In the next decade, we envisage the continuation of the golden age of materials research, building on the possibility of creating new materials with novel properties and structures by molecular engineering, a term introduced many years ago by Prof. Arthur von Hippel. It seems most appropriate that the most prestigious award of the Materials Research Society should honor the first recipient of that award.

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**Editor's Note:** Nominations are being accepted for the 1989 Von Hippel Award until July 1, 1989. A nomination form appears elsewhere in this issue. For more information see the article on p. 56 of the February MRS BULLETIN. □

"Many foresee that science and industry are building a Tower of Babel and that this undertaking will be halted as in Biblical times: the laborers, more and more specialized, will finally cease to understand each other. The editor, for one, does not share this gloomy conviction. On the contrary, as our knowledge grows, old boundaries vanish and the view expands to broader horizons... . We have tried to bring together (the) physicist, chemist and electrical engineer... (and) establish alliances between research worker, development engineer, manufacturer, field engineer and actual user... ."

<sup>1</sup>From Arthur R. von Hippel, editor, *Dielectric Materials and Applications* (Technology Press of MIT, Boston, 1954).