

## Herbert C. Freyhardt ICMC Award 2015: Short Vita

Professor Freyhardt, 2015 recipient of the ICMC Cryogenic Materials Award, completed his PhD in 1970 at the University of Göttingen on the Hardening of Superconductors by Dislocations and Precipitates. He took a short Associate Professorship at the University of Göttingen after receiving his PhD, before spending a year as a Visiting Scientist at Argonne National Laboratory in 1973. He returned subsequently to Göttingen to lead the Crystal Growth Facility and the Superconductivity Group at the Institut für Metallphysik, and was appointed “Außerplanmäßiger Professor” in 1980 and to a full Professorship in 1984. In 1990 he established and co-founded The Zentrum für Funktionswerkstoffe (“Center for Applied Materials Research”), a non-profit organisation in collaboration with the University of Göttingen, and has been managing this enterprise ever since.

Freyhardt retired from the Institut für Materialphysik, University of Göttingen in 2006 to take up a part-time Research Professorship in the Cullen College of Engineering’s Department of Mechanical Engineering and the Texas Center for Superconductivity at the University of Houston.



Prof. Freyhardt at the Award ceremony with Prof. Michael Sumption of Ohio State University

Prof. Freyhardt has had a remarkable, successful and innovative research career, resulting in more than 200 publications in scientific journals and several patents. He has investigated a diverse number of topics, primarily within solid state physics, ranging from flux pinning and critical currents to composite superconductors, metastable and amorphous superconductors, A15 and Chevrel phases, bulk high temperature superconductors, coated conductors and thin films, as well as many materials aspects of superconductors and applied superconductivity.

Of Freyhardt’s many research interests and achievements, two, in particular, have had an enormous impact on their respective fields. The first concerns studies of the interaction between individual flux lines in type-II superconductors and individual metallurgical defects, which was an extremely hot and rather controversial topic in the 1970’s. As an early indicator of Freyhardt’s modus operandi, he convened a small group of scientists from all around the world to discuss this issue during the “International Discussion Meeting on Flux Pinning in Superconductors”, near Göttingen, in 1974, effectively stimulating further dedicated research on this topic worldwide.

The second contribution of particular significance came with the advent of high temperature superconductivity in the late 1980’s. Freyhardt was amongst the first to realize that the most promising material, YBCO, required highly specialized fabrication techniques to achieve its potential as a conductor for practical applications. As a consequence, he was one of the pioneers to introduce and develop IBAD techniques for the preparation of YBCO tapes and coated conductors

and was able to set up an impressive laboratory at the then newly founded “Zentrum für Funktionswerkstoffe”. This activity led to another trademark characteristic of his attitude and approach towards scientific research, which was to target, and subsequently foster, very close cooperation with industry and to support focused, well managed knowledge transfer from academia to industry.

Professor Freyhardt has an extremely high and well-respected profile internationally and his research has received worldwide recognition. He realized very early on that bringing scientists together in informal “discussion meetings” is a very efficient way of promoting progress in topics of actual interest and a way of getting to the heart of a particular issue. He instigated a series of biannual international workshops on “Flux Pinning and Critical Currents in Superconductors,” with the first held in 1974, that were then rotating between Europe, Japan and the U.S. At the time, these workshops were renowned for attracting the most eminent researchers in the field. During his research visit at Argonne in 1973, he made close personal contacts with leading scientists in the U.S. As a consequence, he was invited to join the ICMC Board in 1981, subsequently to become elected President from 2000 to 2005, Chairman of the Anchorage Conference in 2005 and Co-Chairman of the 2001 off-year conference. He also became a Board Member of the Applied Superconductivity Conference and, more importantly, founded the European Conference on Applied Superconductivity (EUCAS), which was held for the first time in Göttingen in 1993 and which has continued to be an increasingly successful biennial meeting. There could be no better legacy of Professor Freyhardt’s contribution to the field of applied superconductivity than the continuing success and importance of the EUCAS conference within the scientific community.

Having established what was to become a subject-defining conference in EUCAS, and since the format of these meetings exhibited few of the trademark characteristics of Freyhardt’s favorites, discussion meetings or workshops, he founded yet another series on a hot topic in 2000 - the “International Workshops on Coated Conductors for Applications” (CCA), with the inaugural meeting in Göttingen, fostering particularly close contacts between academia and industry. He was instrumental in bringing the CCA and PASREG conference series to Houston.

From Freyhardt’s broad and impressive range of activities aimed at serving the community and promoting the field of superconductivity, it is not surprising to note that numerous institutions worldwide have been eager to welcome him as a Visiting Scientist, which he has always been ready to accept, underlining further his worldwide reputation. Significantly, Herbert received the IEEE Award for Continuing Significant Contributions to the Field of Applied Superconductivity in 2006, which is further evidence of the esteem within which his peers hold him.