

# Bernd T. Matthias Prize Committee

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## About BERND T. MATTHIAS

Bernd Teo Matthias (1918-1980) was born in Frankfurt am Main, Germany, on June 8, 1918. He completed his Ph.D. in physics in 1943 at the Eidgenossische Technische Hochschule Zurich and continued his research there for four more years. He immigrated to the United States in 1947. Matthias was elected to the National Academy of Sciences in 1965 and is most noted for his discovery of nearly 1,000 superconducting materials.

Superconductivity is a phenomenon that occurs in metals at very low temperatures. When a metal is superconductive, it loses all electrical resistance. This means that electric currents can flow through a ring of superconducting material indefinitely, without losing any energy, as long as the material is kept at the very low temperature at which it becomes superconducting. Matthias's career focused on the search for materials with ever-higher transition temperatures.

In 1947, Matthias accepted an appointment at the Massachusetts Institute of Technology. The following year he began an affiliation with the Bell Laboratories in Murray Hill, New Jersey. On leave from Bell Labs in 1949-51, Matthias was an assistant professor at the University of Chicago, where he developed a career-long collaborative relationship with Willy Zachariasen, a crystallographer and the head of Chicago's Physics Department at that time. While at the University of Chicago, Matthias turned to superconductivity and ferromagnetism in collaboration with John K. Hulm. His interest in the relationship between these two phenomena continued throughout his career.

In 1951, Matthias returned to Bell Labs where he discovered many more superconducting materials and developed the concept of "electron counting." This was an empirical guide that related the transition temperature of superconducting materials with their number of valence electrons per atom, a tool he used to discover many superconducting materials. Matthias was invited to Los Alamos National Laboratory (LANL) as a consultant in the Theoretical Division in 1956 or 1957. In 1961 he joined the physics faculty at the University of California, San Diego, and maintained a part-time presence in the labs at Murray Hill. He also maintained a presence at LANL as well, collaborating there with some of his former UCSD students, thus participating in and conducting research in three labs simultaneously.

A year after joining the Physics Department at UCSD, Matthias founded the Institute for the Study of Matter, funded first by the Air Force and later by the National Science Foundation. In 1966, the Institute merged with the Physics Department's Institute for Pure and Applied Physical Sciences under the direction of Keith Brueckner. Matthias became associate director. Matthias explored the boundaries of science and metaphysics in his courses for undergraduates titled "Frontiers of Science." He was still actively researching and teaching when he died of a heart attack on October 27, 1980.

## BERND T. MATTHIAS PRIZE FOR SUPERCONDUCTING MATERIALS

The **BERND T. MATTHIAS PRIZE**, created in 1989 by friends and colleagues and originally sponsored by AT&T Bell Labs, is awarded in recognition of innovative contributions to the material aspects of superconductivity. Since 2000, the Prize has been sponsored by the Texas Center for Superconductivity at the University of Houston, whose founding director, Paul C. W. Chu, was Matthias' former student. The Prize consists of \$6,000. USD and a special framed certificate designed by the Kamerlingh Onnes Laboratory in Leiden, The Netherlands.

### Prize Recipients 2000 - 2015:

The **Bernd T. Matthias Prize for 2015** is awarded to co-recipients **PROFESSOR XIANHUI CHEN** of the University of Science and Technology of China for his discovery of  $(\text{Li,Fe})\text{OHFe}(\text{Se,S})$ ,  $\text{Yb}_x(\text{Me})_y\text{HfNCl}$  ( $\text{Me} = \text{NH}_3$  and THF), and doped phenanthrene, broadening the material base for superconducting studies, to **PROFESSOR ZACHARY FISK** of the University of California Irvine for the discovery of  $\text{UBe}_{13}$ ,  $\text{UPt}_3$ ,  $\text{ThCoC}_2$  and  $\text{LaRhSi}_3$ , for unraveling the roles of heavy fermions and non-centrosymmetry in superconductivity, and to **PROFESSOR ZHONGXIAN ZHAO** of the Institute of Physics, Chinese Academy of Sciences, Beijing, for the discovery of  $\text{RE}(\text{O,F})$  and  $(\text{RE})\text{O}_{1-x}\text{FeAs}$  ( $\text{RE} = \text{rare earth}$ ) with a  $T_c$  up to 55 K, demonstrating the limit of  $T_c$  in bulk Fe-based superconductors. The awards will be presented at the  $\text{M}^2\text{S-HTSC}$  Conference in Geneva, Switzerland.

The **Bernd T. Matthias Prize for 2012** is awarded to co-recipients **PROFESSOR DIRK JOHRENDT** of Ludwig-Maximilians-Universität München, for his role in the 2008 discovery of the  $\text{BaFe}_2\text{As}_2$  and related materials that have helped further the research and unravel the physics of the novel Fe-based superconductors, and to **DR. IVAN BOZOVIC** of Brookhaven National Laboratory and **PROFESSOR JAMES ECKSTEIN** of the University of Illinois at Urbana-Champaign for their pioneering and sustained contributions to novel synthesis and engineering of superconducting materials. The awards were presented at the  $\text{M}^2\text{S-HTSC}$  Conference in Washington, D.C.

The **Bernd T. Matthias Prize for 2009** is awarded to co-recipients **PROFESSOR YOSHITERU MAENO** of Kyoto University, for his 1994 discovery and subsequent purification of  $\text{Sr}_2\text{RuO}_4$  that creates a unique platform for revealing decisively some unusual features of superconductivity, and **PROFESSOR HIDEO HOSONO** of the Tokyo Institute of Technology, for his 2008 discovery of  $\text{LaO}_{1-x}\text{F}_x\text{FeAs}$  that has heralded in the era of Fe-pnictides for the search for and the unraveling of high temperature superconductivity. The awardees delivered remarks following the Prize Ceremony on September 9, 2009 at the  $\text{M}^2\text{S-HTSC-IX}$  Conference in Tokyo, Japan.

The **Bernd T. Matthias Prize for 2006** was awarded to **PROFESSOR DR. FRANK STEGLICH** of Max-Planck-Institute for Chemical Physics of Solids, for his 1979 discovery of  $\text{CeCu}_2\text{Si}_2$  and the associated novel electronic state that has inaugurated an exciting field of heavy fermion physics. Dr. Steglich delivered the Bernd T. Matthias Prize Lecture entitled "Superconductivity and Magnetism: From Antagonism to Mutual Interplay," on Tuesday, July 11, 2006 at the  $\text{M}^2\text{S-HTSC-VIII}$  Conference, held in Dresden, Germany.

The **Bernd T. Matthias Prize for 2003** was awarded to **PROFESSOR JUN AKIMITSU** of Aoyama Gakuin University for his discoveries of novel superconducting compounds  $\text{MgB}_2$  and  $\text{Bi-Sr-Cu-O}$ ; and of superconductivity  $\text{Nd-Ce-Sr-Cu-O}$  and compressed  $(\text{Sr,CA})_{14}\text{Cu}_{24}\text{O}_{41}$ , that have led to the advancement in  $T_c$ , opened up new subfields of research and offered new avenues to practical superconducting wire fabrications. Prof. Akimitsu delivered the Bernd T. Matthias Prize Lecture on Monday, May 26, 2003 at the  $\text{M}^2\text{S-HTSC-VII}$  Conference, held in Rio de Janeiro, Brazil.

The **Bernd T. Matthias Prize for 2000** was awarded to **PROFESSOR M. BRIAN MAPLE** of The University of California at San Diego, for his pioneering contribution to the understanding of superconducting materials in general, and interplay between magnetism and superconductivity in particular. Prof. Maple delivered the Bernd T. Matthias Prize Lecture, "Three Decades of Progress on Superconductivity and Magnetism in Novel Materials," Wednesday, February 23, 2000 at the  $\text{M}^2\text{S-HTSC-VI}$  Conference, held in Houston, Texas USA.

### Previous Bernd T. Matthias Prize Recipients:

**1997: Beijing, China:** **BERTRAM BATLOGG** and **ROBERT J. CAVA** for their leading work on a variety of superconductors through the successful combination of creative materials chemistry and physics.

**1994: Grenoble, France:** **PAUL C. W. CHU**, **BERNARD RAVEAU** and **M. K. WU** for their outstanding discoveries of mixed valence copper oxides which set the stage for, and expanded the horizons of, high- $T_c$  superconductivity.

**1991: Kanazawa, Japan:** **HIROSHI MAEDA** and **YOSHINORI TOKURA** for their discoveries of materials which have led to the delineation of essential structural elements in the high temperature superconducting cuprates.

**1989: Palo Alto, CA, USA:** **T. H. GEBALLE** (Inaugural Prize].