

Georg Bednorz

IBM Fellow Emeritus

40 years of High-Temperature
Superconductivity:
Chronicle of a discovery and the road
towards an energy efficient
technology

Materials and Mechanisms of
Superconductivity 2026

Date and Time: 22.07.2026, 16:00 - 16:45

<https://m2s-2026.org/program/schedule-kopie/event-abstracts/abstract-540>



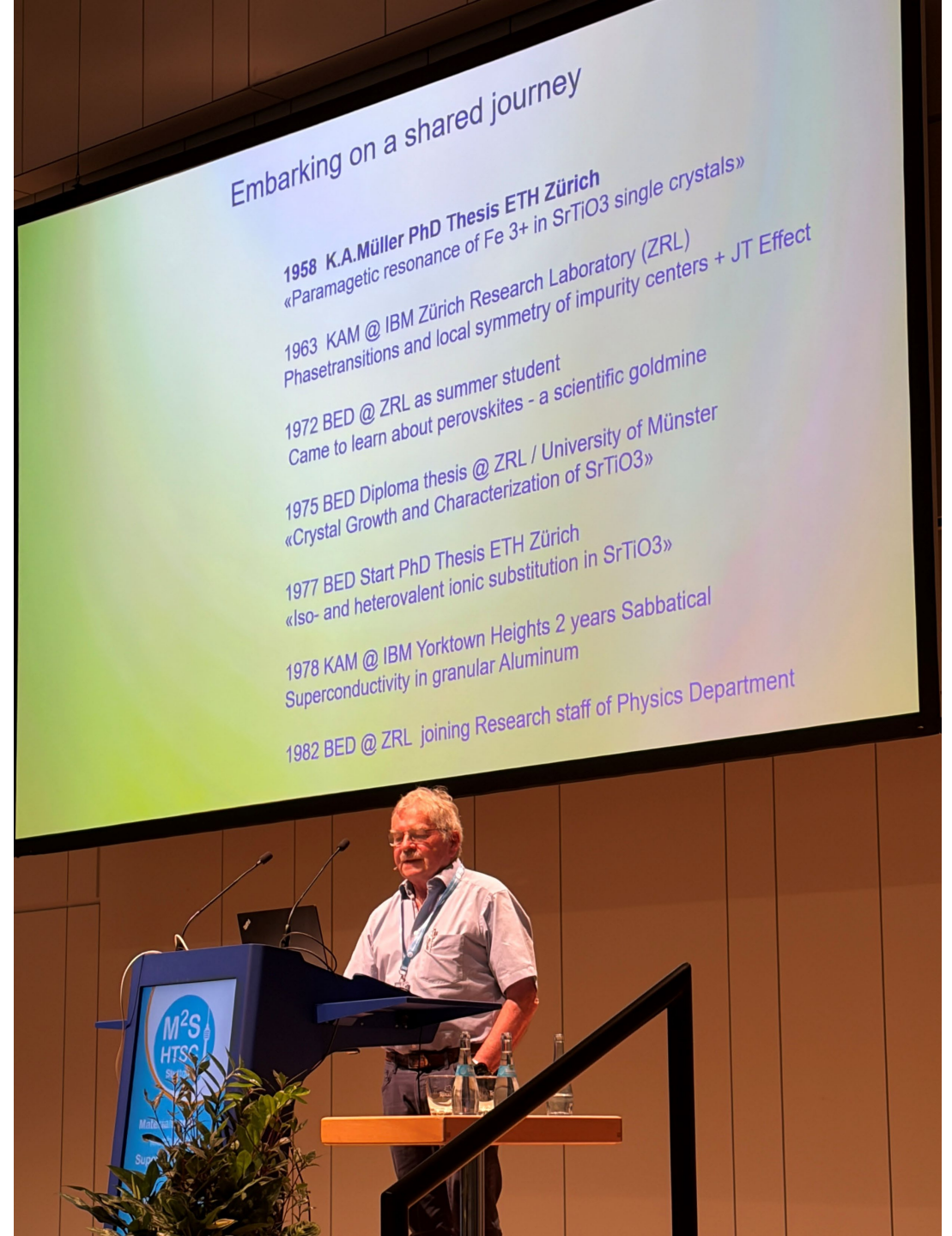
J. Georg
IBM Fellow Emeritus



Bednorz and Müller @ IBM Rüschlikon, Switzerland

Their early work on oxide superconductivity was on SrTiO_3 , with a T_c of 0.3 K

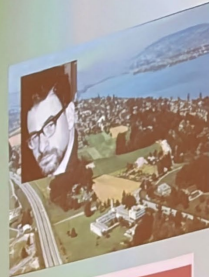
They were interested in the interplay between anti-ferromagnetism and superconductivity. The first material they looked at was LaNiO_3 . This proved to be frustrating for them.



Embarking on a shared journey

- 1958 K.A. Müller PhD Thesis ETH Zürich
«Paramagnetic resonance of Fe^{3+} in SrTiO_3 single crystals»
- 1963 KAM @ IBM Zürich Research Laboratory (ZRL)
Phasetransitions and local symmetry of impurity centers + JT Effect
- 1972 BED @ ZRL as summer student
Came to learn about perovskites - a scientific goldmine
- 1975 BED Diploma thesis @ ZRL / University of Münster
«Crystal Growth and Characterization of SrTiO_3 »
- 1977 BED Start PhD Thesis ETH Zürich
«Iso- and heterovalent ionic substitution in SrTiO_3 »
- 1978 KAM @ IBM Yorktown Heights 2 years Sabbatical
Superconductivity in granular Aluminum
- 1982 BED @ ZRL joining Research staff of Physics Department

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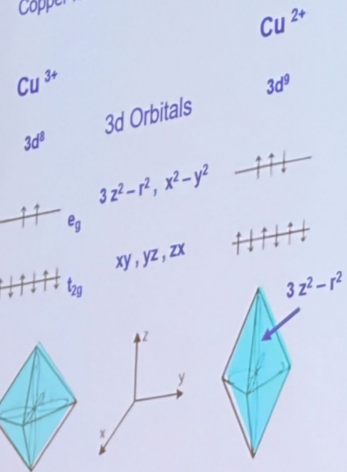
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Theorie of Jahn-Teller Polarons in Intermetallic Compounds

Hoeck, Nickisch & Thomas Helv. Phys. Acta (1983)

Copper Ions in the Oxide Octahedron



Jahn-Teller Effect Elongation of Octahedron

Can this create a Polaron ?

This was the Trigger



...from the discoverer of Vitamin C

Discovery consists of looking at
the same thing as everyone else
and thinking something different.

Albert Szent-Györgyi

A DISCOVERY IS SAID
TO BE AN ACCIDENT
MEETING A PREPARED
MIND.

Albert Szent-Györgyi
Hungarian Scientist

QUOTEHD.COM



This was the paper that he discovered in the library that got them going on La-Ba-Cu-O.

It was written by chemists who were looking at the catalytic properties of Ba-La-Cu-O. The plot shows resistivity vs. temperature from -100 to +300 C.

A Report meets a Prepared Mind

BaLa₂Cu₃O_{13.4}

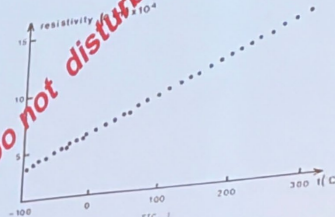
THE OXYGEN DEFECT PEROVSKITE BaLa₂Cu₃O_{13.4} as a METALLIC CONDUCTOR

C. Michel, L. Er-Rachid and B. Raveau
Laboratoire de Cristallographie, Chimie et Physique des Solides, I.A. 373
11800-Université de Caen, 14032 Caen Cedex, France
(Received March 14, 1985; Referred)

ABSTRACT
A new oxygen defect perovskite BaLa₂Cu₃O_{13.4} has been synthesized. The tetragonal structure of the compound has been established. The parameter $a = 3.861(2)$ Å and $c = 12.867(3)$ Å. The X-ray diffraction study shows that the atoms are displaced from their ideal positions. The study of conductivity, magnetic susceptibility and thermoelectric power versus temperature shows that this oxide is a good metallic conductor.

FIG. 1
Resistivity plotted as a function of temperature

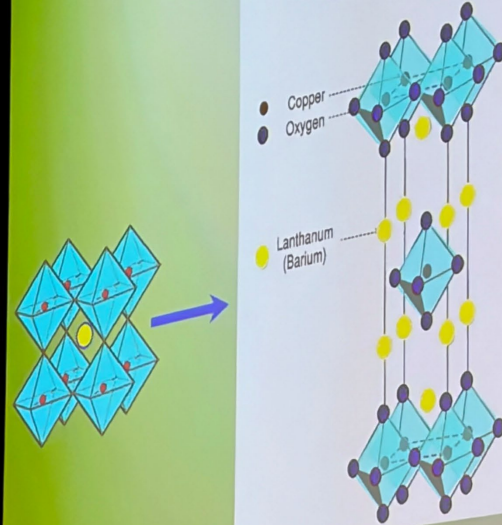
Do not disturb the center of the Octahedron



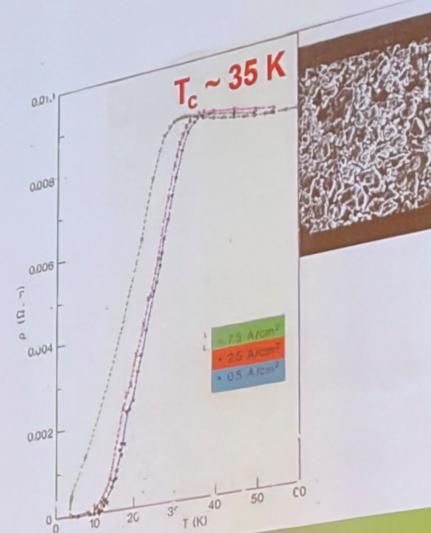
The image shows a man standing at a podium during a presentation. The podium has a sign that reads 'M²S HTSC' and 'Materials Superconductivity'. The background is a large screen displaying a scientific paper titled 'A Report meets a Prepared Mind' about the compound BaLa₂Cu₃O_{13.4}. The paper includes an abstract, a figure showing resistivity vs. temperature, and a red diagonal text overlay that reads 'Do not disturb the center of the Octahedron'. A green four-leaf clover graphic is also visible on the right side of the screen.

.....after 3 Years 1986
Just in time at the 75th anniversary of the discovery of Superconductivity

Structure of the "Zürch Oxides"



La – Ba – Cu – O



April 86

May 86

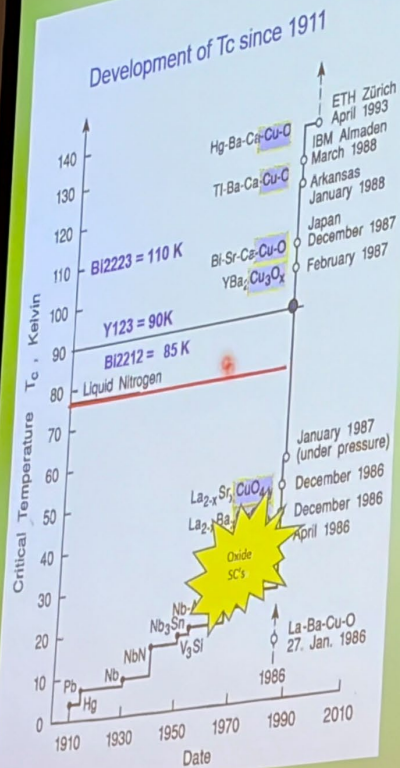
June 86

July 86

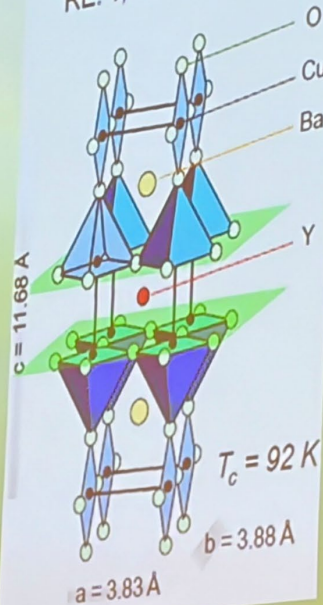
August 86



Series of new 2-D layered
Structures with strong anisotropy
CuO₂-Planes important for Superconductivity



REBCO
 $\text{REBa}_2\text{Cu}_3\text{O}_{7-x}$
RE: Y, Nd, Er, Gd, Eu...



Bi(Pb)-2212
 $2212 \approx (\text{Bi,Pb})_2\text{Sr}_2\text{CaCu}_2\text{O}_x$ ($x \approx 8$)
 $2223 \approx (\text{Bi,Pb})_2\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_x$ ($x \approx 10$)
 $T_c = 85 \text{ K}$

