

Over Half a Century of Research in Oxides

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Received: 10 January 2015 / Accepted: 12 January 2015 / Published online: 31 January 2015
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An attempt will be made to recall some of the highlights of the research in oxides achieved by the author and various collaborators over a period of 58 years. These were: the observation of the paramagnetic resonance of transition metal ions of high valency like Fe^{3+} , Fe^{4+} , Fe^{5+} and Co^{4+} and their photochromic behaviour; the detection of Mn^{4+} in BaTiO_3 and the proof for the presence of order–disorder character in these ferroelectric transitions, and then the temperature dependence of the rotational order parameter of the structural phase transitions in LaAlO_3 and SrTiO_3 . Near the transition, the observation of critical behaviour compatible with renormalisation group theory and the presence of

a Potts transition line, a critical end point and a Lifshitz point under uniaxial stress in SrTiO_3 and CaGdF_3 . This will be followed by the determination of the stabilisation energy of the Jahn–Teller effect with octahedral oxygen neighbours to various ions; leading over to the concept of Jahn–Teller polarons as quasi particles for the generation of superconductivity, and the experimental observation of Jahn–Teller bipolarons and their stabilisation energy determined in one of the HTS copper oxides.

A comprehensive collection of relevant papers appeared in the book “Properties of Perovskites and Other Oxides” by K.A. Müller and T.W. Kool (World Scientific, 2010).

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