Research Platform MMM „Mathematics-Magnetism-Materials“,
Fak. Mathematik, Fak. Physik **@ Univ. Wien.**
CD Laboratory „Magnetic design trough physics informed Machine learning @ Univ. Krems.
Wolfgang Pauli Institut.

IEEE Distinguished Lecture 2023, jointly with

Colloquium of the research platform MMM

The **research platform MMM @ U.Wien,** jointly with **the Christian Doppler Lab. @ U.Krems,** together with the **Wolfgang Pauli Institut**

kindly invite you to the talk of **Ping Liu** (Fellow IEEE)

Time: Wednesday, 13. Sep 2023, 15:15 – 16:15

Place: Hörsaal 13, 2nd floor, Oskar-Morgenstern-Platz 1, 1090 Wien

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1) 14h55 – 15h15 : **Coffee & Cake**

2) 15h15 – 15h20 : **Introduction :** Thomas **Schrefl** (DUKrems)

3) 15.20 – 16.10 Uhr :

J. Ping Liu (IEEE Fellow,
Univ. Texas at Arlington, USA)

“Magnetic Hardening in Low-Dimensional Ferromagnets"

4) 16h10 – 17h00 : **Drink & Sandwich**

Norbert J Mauser
(head MMM & director WPI)

Thomas Schrefl
(Head CDLab)

Abstract:
How "hard" (coercive) a ferromagnet can be, has been a puzzle for a century. Seven decades ago, William Fuller Brown offered his famous theorem to correlate coercivity with the magnetocrystalline anisotropy fields in ferromagnetic materials. However, the experimental coercivity values have been far below the calculated levels given by the theorem, which is called Brown's Coercivity Paradox. Researchers have attempted to solve the paradox with sustained efforts; however, the paradox remains unsolved, and coercivity still cannot be predicted and calculated quantitatively by modeling.
Progress has been made in the past 20 years in understanding coercivity mechanisms in nanoscale low-dimensional ferromagnets. In fact, ferromagnetism is a size-dependent physical phenomenon, as revealed by theoretical studies. However, nanoscale ferromagnetic samples with controllable size and shape have been available only in recent times. By adopting newly developed salt-matrix annealing, surfactant-assisted milling, and improved hydrothermal and chemical solution techniques, we used a bottom-up approach to produce nanostructured magnets and have successfully synthesized monodisperse ferromagnetic Fe-Pt, Fe-Co and Sm-Co nanoparticles and Co nanowires with extraordinary properties, which are strongly size- and shape-dependent. A study on size-dependent Curie temperature of the L10 ferromagnetic nanoparticles with sizes down to 2 nm has experimentally proved a finite-size effect. A systematic study of nanowires with extremely high coercivity above their magnetocrystalline anisotropy fields has opened a door to the solution of Brown's Paradox.

Short Biography:

J. Ping Liu received his Ph.D. degree in physics from the Univ. of Amsterdam, in 1994.
For the past four decades, he has worked in research and development of permanent magnets and related magnetic materials in China, Europe, and USA. He is currently a Distinguished University Professor with The University of Texas at Arlington, USA, and a fellow oft he IEEE.
His current research has been focused on hard magnetic nanoparticles, thin films, and bulk nanocomposites, as reported in his more than 320 peer-reviewed journal articles, review articles, and books, including Nanoscale Magnetic Materials and Applications (Springer, 2009), Skyrmions: Topological Structures, Properties, and Applications (CRC Press, 2016), and Permanent Magnets: The History and Future (Science Press, 2020).
He has supervised more than 50 graduate students and post-doctoral researchers.
Dr. Liu is an elected fellow of the American Physical Society. He received the Outstanding Achievement Award at the 25th International Workshop on Rare-Earth and Future Permanent Magnets and Their Applications in 2018.