

ACADEMY LECTURES

RICHARD ZSIGMONDY LECTURE

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EXPLORING MATTER AT THE NANOSCALE WITH THE ELECTRON MICROSCOPE

ONDREJ L. KRIVANEK

Nion R&D and Arizona State University

WELCOME

ULRIKE DIEBOLD

Vice-President of the Austrian Academy of Sciences

JENS SCHNEIDER

Rector of TU Wien – Vienna University of Technology

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START: 6:00 PM

**AUSTRIAN ACADEMY OF SCIENCES, THEATER HALL
SONNENFELSGASSE 19, 1. STOCK, 1010 VIENNA**

The latest electron microscopes (EMs) are able to resolve and analyze individual atoms, matter's basic constituents. Unlike scanning tunneling microscopes, they are able to look inside materials, and to determine the atomic composition and other properties by spectroscopic means. Without EMs, we would not know what viruses look like, that an atom of silicon can be bonded in a graphene sheet in two fundamentally different ways, and that silica glass can be as thin as three atoms. And we would not have devices such as smartphones, which have powerful chips that need tiny transistors, whose manufacture is only possible because we can see with an EM how well we managed to make them.

The last two decades brought two developments that made electron microscopes especially powerful: working aberration correctors allowed the spatial resolution to be improved by about 3x, and newly developed monochromators allowed the energy resolution of spectroscopic analysis carried out in an EM to improve by around 100x. These developments have made it possible to image individual atoms in a wide variety of materials with ease, and their chemical and vibrational properties to be determined on the atomic scale. Examples include monolayer materials such as graphene and BN, in which every atom can be resolved and single atom impurities identified, 3D reconstruction of unknown materials, at atomic resolution, and the vibrational properties of a single impurity atom.

The talk "Exploring Matter at the Nanoscale with the Electron Microscope" will review how the two developments came about, and illustrate them with practical examples.

Ondrej L. Krivanek is one of the major experts in electron microscopy and electron energy loss spectroscopy. He is co-founder and current President of Nion Co. and Affiliate Professor at Arizona State University. He has received numerous awards, including the Duddell Medal, the Prize of the British Institute of Physics, the Cosslett Medal from the International Federation of Microscopy Societies, and the Kavli Prize for Nanoscience. He is a fellow of the Royal Society, the Institute of Physics, the Microscopy Society of America, and of the American Physical Society, an honorary fellow of the Royal Microscopical Society, and holds an Honorary Doctorate of the Masaryk University, Brno in Czechia, and the University of Leeds in the UK.

The **Richard Zsigmondy Lecture** series is organised by ÖAW and TU Wien and are dedicated to current issues at the interface of chemistry and microscopy. They commemorate the Austro-Hungarian chemist Richard Zsigmondy, who was a professor in Göttingen from 1908 and was awarded the Nobel Prize for Chemistry in 1925.

Please register at: www.oeaw.ac.at/anmeldung/akademievorlesungen

CONTACT: Christoph Benda, Austrian Academy of Sciences,
T: +43 1 51581-1207, christoph.benda@oeaw.ac.at