

PRESS INFORMATION

A New Method of Brno Scientists Allows the Non-destructive Study of Living Organisms with Electron Beams

(Brno, 3 September) **The prestigious American journal *Microscopy and Microanalysis* uveřejnil studii by Brno scientists from the Institute of Scientific Instruments of the ASCR v.v.i. Thanks to their new method, it is possible to observe living organisms in a special environmental scanning electron microscope, without it costing their lives. The method moves the frontiers of electron microscopy towards a more considerate way of studying living nature and can be beneficial in biology and pharmacy as well as for instance in food processing.**

To study surviving organisms in a classic electron microscope is impossible because of the low pressure of the gases around the sample. So far, science was able to study living organisms in the long term only with a light or optical microscope, which however often lacks a sufficient depth of sharpness and resolution. A team of scientists from the Application Laboratory of Advanced Microtechnologies and Nanotechnologies of the Institute of Scientific Instruments of the ASCR (ÚPT) in cooperation with Professor Makoto Shiojiri of Japan have discovered a new method, which **has been published by the prestigious American journal *Microscopy and Microanalysis*** and as a part of their new results **will be published next year also in the Japanese journal *Kenbikyo***. The Brno team was able with an electron beam to observe repeatedly living mites, which survive the experiment with no apparent consequences.

The new method for the study of living samples in a special environmental scanning electron microscope was published by a group of authors of the scientists Ing. Eva Tihlaříková and Ing. Vilém Neděla, Ph.D. from the team Environmental Electron Microscopy of the ÚPT of the ASCR in Brno. Also the world-renowned expert on electron microscopy, Professor Makoto Shiojiri, professor emeritus of Kyoto Institute of Technology cooperated in the research thanks to the support of the OP Education for Competitiveness project with the registration No. CZ.1.07/2.3.00/20.0103.

It is commonly necessary to prepare samples for observation in an electron microscope using special methods - chemically fixate them, dry them, possibly apply an electrically conductive coat to them or observe them in a deep frozen state. These methods, however, often lead to the creation of artefacts and directly eliminate the observation of living organisms. Thanks to the new method, scientists can using the ÚPT, ASCR's originally rebuilt and specially equipped environmental scanning electron microscope study living, biological samples that have not been prepared in any way, as they are effectively protected from the activity of the electron beam in the microscope. "Based on mathematical-physical simulations, we have proposed a method where we created a protective water layer on the surface of the mite or any living tissue. We vaporize this at a specific moment, conduct the observation and then cover the mite with a layer of water again," explained Ing. Eva Tihlaříková from the Institute of Scientific Instruments of the ASCR concerning the principle of the new method.

Optimally, this method could create a bridge between optical and electron microscopy. It would be possible to study samples in their live state, but at greater magnification, a distinctly better depth of sharpness and with the possibility of acquiring new information through both types of microscopy separately or their combination in so-called correlative microscopy.

That offers a wider range of applications, e.g. in the study of the reaction of mites and other parasites to various environments to exterminating substances or specially developed textiles.



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