

Electron Microscopy: Methods and Protocols, by J. Kuo, ed. Humana Press 2007. 608 pp. ISSN 1064-3745

Professor John Kuo is an expert in the field of biological microscopy working at the Centre for Microscopy and Microanalysis at the University of Western Australia. Preparing the revised and expanded second edition of the book entitled "Electron Microscopy: Methods and Protocols" he invited 48, specialists in different topics of electron microscopy from all over the world to contribute to this volume.

Thanks to the work of this professional group the readers have in their hands an excellent handbook providing description of the newest technologies in electron transmission microscopy (TEM) and scanning electron microscopy (SEM) with mass spectrometry (MS), as well as the precise preparative procedures. The book is divided into 28 chapters describing particularly subjects, each with own Notes and References, and is very well illustrated with numerous photographs, line drawings and tables.

The first part of the book guides through the TEM techniques, from conventional to the most recent and complicated ones. The readers can learn the preparation methods, from isolation, fixation and ultramicrotomy sectioning to staining of culture cells, animal and plant tissues and bacteria. One can find descriptions of cryospecimen preparation and cryoultramicrotomy, negative-staining and immunogold labeling procedures.

Freezing can be applied to single cells, tissues and even to the whole organisms. Temperature down to -90°C is shown to better protect the biological material from distortions observed sometimes in samples fixed conventionally. Cryoultramicrotomy procedure allows sectioning of thus vitrified biological samples which preserve their real structure at the moment of freezing.

The negative staining technique is shown to be applicable to almost all isolated biochemical and biological samples and to solutions of synthetic polymers, while immunogold labeling, based on application of antibodies conjugated with gold particles,

permits to detect, localize and quantify defined antigens in the cells.

Especially interesting are chapters describing TEM crystallography and cryo-TEM tomography techniques useful for examination of membrane proteins, macromolecules, organelles and cells. Electron crystallography allows examination of the structure of two-dimensional crystals of membrane proteins. The results of such investigations are especially important for cellular biology and for the development of new drugs.

The three-dimensional reconstruction of biological structures becomes possible thanks to immuno-electron and cryo-TEM tomography. The first uses immunogold-labeled structures to locate immunogold particles in the depth direction. The second one is useful for studying the three-dimensional ultrastructure of the cells and inside organelles.

The second part of the book gives information about SEM techniques. It starts from the description of conventional methods for biological specimens preparation. Then the variable pressure (VPSEM) and the environmental scanning electron microscopy (ESEM) techniques are presented. They allow to examine biological material without any preparation.

Successively described technique is cryoscanning electron microscopy (cryo-SEM) allowing observations of the frozen hydrated plant tissues without fixation and dehydration. It is also useful for visualization of water distribution in these tissues.

The scanning as well as cryoscanning electron microscopy also enable determination of chemical elements in samples by the precisely described X-Ray microanalysis method.

The book comes to an end with a wide discussion of the secondary ion mass spectrometry (SIMS) technique allowing for atomic and molecular characterization of the surface chemistry of biological and biomedical materials.

The book leads the readers through the subjects in an attractive and easy to understand way.

All methods and protocols are precisely and clearly written giving the way to pursue.

The excellent idea was to conclude each chapter with Notes bringing the attention to possible troubles and intricacies the user may meet, planning a course of action how to solve a particular problem.

Electron Microscopy: Methods and Protocols edited by J. Kuo can be recommended as an excellent, clearly written and broadly informative handbook addressed to researchers and students.

Anna Wasik