

Mailvaganam Memorial Oration – 2009

2009 lecture was delivered by

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Electron Microcopy in the Study of Materials.

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Summary:

This presentation describes the types of information which can be obtained from electron microscopy. The physical basis of the techniques used to obtain this information is also described. Unlike optical microscopy, electron microscopy allows us to observe matter with atomic resolution.

There are two general types of electron microscopes: the Transmission Electron Microscope (TEM) and the Scanning Electron Microscope (SEM). For crystallographers, metallurgists or semiconductor research scientists, modern high resolution electron microscopes have permitted the routine imaging of atomic structures, allowing materials researchers to monitor and design materials with required properties particularly in nano-technology research. In addition electron microscopy has been used in all areas of biological and biomedical investigations because of its ability to view the finest cell structures. Furthermore, the possibility of electron diffraction, X-ray microanalysis and energy loss spectrometry (EELS) in the TEM has made this an indispensable tool in the study of materials. Unlike in the TEM, the SEM produces images by scanning the electron beam across the surface of the sample in a raster pattern, with detectors building up an image by mapping the detected signals with beam position.

Nowadays, electron microscopes are used for identifying samples such as gunshot residues in forensic investigations and as a branch of a production line in the field of fault diagnosis and quality control.