Advances in Optical and Electron Microscopy

Volume 11

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Volume 11

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Preface

This preface appears over the names of the new editors. Our first task is to thank the previous editors, Robert Barer and Ellis Cosslett, for their tireless work over the past 21 years in presenting, through the multitudinous review papers that have appeared in these pages, the broad sweep of important developments in optical and electron microscopy at a time of unprecendented expansion and innovation in both the research laboratory and on the shop floors of microscope manufacturers. This development continues apace and shows no obvious sign of levelling out. One of the reasons for this upsurge is that microscopy in all its forms, optical, electron, ion and acoustic, is playing an increasing role in industry, in hospitals and in the life of society in general.

Many of the recent advances have been made possible by relevant developments in computers. Computers allow the operator of a high resolution electron microscope to keep the instrument in good alignment, and free from defects such as astigmatism. They can also acquire and process enormous quantities of data well beyond the capability of an unaided human being. In turn, the design and testing of microcomputers themselves would not be possible without the aid of today's scanning electron microscopes. The impressive performance of contemporary high resolution transmission microscopes owes much to our ability to simulate the detailed performance of a proposed, but as yet unbuilt, electron microscope. This can save both expense and time compared with past methods; the perfection of the optics of modern optical microscopes also owes much to computer-aided design. Electron beam holography at atomic resolution has now been achieved in commercially available electron microscopes, after more than 30 years of exhausting effort on the part of the researchers. Scanning electron microscopes, once considered as amusing toys, can now be fitted with field emission electron guns, giving them a better resolution than many conventional transmission electron microscopes. In addition, such instruments open up the possibility of low voltage microscopy of unstained specimens, which could be of great benefit in biological microscopy and in the low-dose examination of very large scale integrated circuits. These applications, too, are served by the latest developments in optical microscopy which offer improvements in resolution and contrast, whilst retaining the non-invasive properties of optical examination.

The range of available microscopical methods has been greatly expanded to include not just illumination by light or electron beams, or even other forms of radiation, but also of detection and imaging using some resultant property or effect in the specimen under observation. It is our intention to follow broadly the policy evolved by the previous editors and to include all forms of microscopy, old and new, within our terms of reference.

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