

nature REVIEWS

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Since the early studies of the 17th century, microscopy has played a vital role in biological discovery — it enabled Robert Hooke to describe cells and Antonie van Leeuwenhoek to discover bacteria. Four centuries later, microscopy techniques remain at the centre of cell-biological research. So, fittingly, the third instalment in the Nature Reviews collection series features microscopy.

This collection provides a snapshot of the many recent advances in microscopy, among which is *in vivo* imaging — the topic of the first Review. On page 11, John Condeelis and Jeffrey E. Segall discuss the recent advances in intravital-imaging techniques for the study of metastasis. In the past, the initial escape of metastatic cells from tumours has been difficult to study *in vivo*. However, developments in intravital multiphoton microscopy — in combination with animal models of cancer in which green fluorescent protein (GFP) is stably expressed from tissue-specific promoters — now allow the direct imaging of intravasation (the entry of tumour cells into the vasculature) at the single-cell level.

Traditional electron microscopy (EM) technology has been instrumental in our current understanding of microbial surfaces. On page 21, Yves F. Dufrêne explains why further explorations of microbial surfaces are likely to involve atomic force microscopy. This technique enables microbial surfaces to be viewed and manipulated in their native environments. This is not to say that EM is being replaced by other techniques — on the contrary. On page 31, Abraham J. Koster and Judith Klumperman provide an overview of upcoming EM techniques, such as electron tomography and correlative microscopy.

The Perspectives article by Rüdiger Rudolf, Marco Mongillo, Rosario Rizzuto and Tullio Pozzan on page 36 brings us back to GFP and other fluorescent proteins, which have dominated imaging studies in cell biology over the past decade. These authors describe the various probes that are used in Ca^{2+} -imaging studies.

In addition, pages 6–9 feature selected Research Highlights of the recent primary literature on microscopy techniques and some of their applications. In the accompanying web focus (www.nature.com/reviews/focus/microscopy), we have brought together other relevant articles — Research Highlights, News and Views, Reviews, Perspectives and Commentaries, Research — from across the Nature Publishing Group.

This leaves us to thank Richardson Technologies for their financial support, which has enabled us to produce this collection and to make the featured articles available free online for six months. We hope you enjoy!