INTRODUCTION

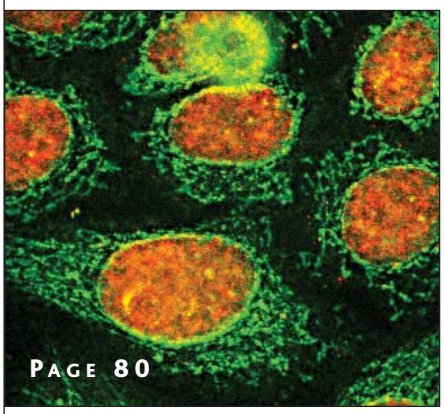
The Future Looks Bright ...

The light microscope has transformed our understanding of biology. In recent times, quantum changes in imaging technologies and labeling techniques revealed a kaleidoscope of events within living cells in real time. Confocal microscopes, green fluorescent protein and its derivatives, image-analysis software, and ever more sophisticated optical technologies promise even more in the months and years to come. Here we have chosen to focus on imaging techniques and technologies at the light-microscopic level for live cell imaging.

Four reviews describe a variety of practical aspects of light microscopy, from Stephens and Allan's advice (p. 82) on the basics of choosing your 'scope, through Lippincott-Schwartz and Patterson's piece (p. 87) on advances in fluorescent protein markers, to Rieder and Khodjakov's overview (p. 91) of imaging mitosis and Weijer's piece (p. 96) on imaging cellular signal transduction. A Viewpoint by Swedlow *et al.* (p. 100) describes the Open Microscopy Environment, an informatics tool to enable cross-correlation of imaging analyses.

Two Reports in this issue illustrate the power of expression of fluorescent protein markers and live cell imaging. Zicha *et al.* (p. 142) express two fluorescent actins to monitor actin dynamics at the leading edge of motile cells. Hutson *et al.* (p. 145; see related Perspective by Martin and Parkhurst, p. 63) look at the movements of whole cell layers during dorsal closure in developing *Drosophila*.

In the News section, two stories illustrate the power of using moving images to capture cellular behavior. Such techniques are overthrowing conventional wisdom about how embryos develop (see Beckman's piece on p. 76) and intensifying the debate over how adult neurons learn new tricks (see story by Miller on p. 78). Another approach is borrowed from basic physics: using quantum dots to watch a rainbow of labeled molecules as they mingle (see Seydel's piece on p. 80). Researchers working at the macro- and microscales face some of the same data-management challenges (see related News Focus story by Barinaga, p. 43).



Science's STKE (www.stke.org) also has numerous resources related to imaging of cell signaling processes. New in this week's Focus Issue are Perspectives by Bers on highly localized changes in Ca^{2+} that control contraction of cardiac myocytes and by Ramm and Thomas on the use of image-based approaches for high-throughput screening in drug discovery. A Protocol by Bunnell zooms in on techniques for monitoring dynamic changes in signaling complexes in living T cells.

On *Science* Online, links to related resources have been gathered to illustrate further the state of the art in biological imaging.

With the advances in labeling and imaging technologies, we have already witnessed remarkable improvements in our ability to monitor and interpret processes in real life and in real time. As advances continue, it is a truism to say "Things can only get better. …"

–STELLA M. HURTLEY AND LAURA HELMUTH

CONTENTS

Related News Focus on p. 43, Perspective on p. 63, Reports on pp. 142 and 145, and Science's STKE on p. 11.

Science

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