

**PHASE  
MICROSCOPY  
MALARIA**

### Imaging Membranes of Red Blood Cells Offers New Insights into Malaria

Cell membranes provide barriers between living cells and their external environments.<sup>1</sup> Biomembrane receptors, channels, signals, and scaffolding maintain cellular growth, metabolism, and homeostasis.<sup>2</sup> The role of membranes encompasses findings important in the broader array of human disease, including infection and neoplasm. For example, abnormal cell-cell adhesion participates in tumor progression.<sup>3</sup> In addition, membrane proteins can be exploited as targets in drug development.<sup>2</sup> A recent, eloquent study from the Massachusetts Institute of Technology reported noninvasive optical techniques to assess membranes of cells infected with malaria.<sup>4</sup> The authors used tomographic phase microscopy and diffraction phase microscopy to image red-blood-cell membranes. Malaria leads to structural, biochemical and mechanical changes in host red blood cells and, as reported in *Proceedings of the National Academy of Sciences*, the techniques created three-dimensional refractive index maps showing nanoscale cell-membrane fluctuations. **Conclusion: Recent imaging of red-blood-cell membranes shows their fluctuations in malaria, and promises a potentially powerful means to identify the cell-membrane dynamics occurring in disease.**

**MRI  
SCHIZOPHRENIA**

### Functional MRI Findings in Unaffected Relatives of People with Schizophrenia

Schizophrenia affects approximately 1.1 percent of U.S. adults, usually presenting in the late teens or early twenties in men, and in the twenties and thirties in women. Rarely, children are afflicted. Hallucinations, delusions, cognitive deficits, and disordered thinking characterize the disease.<sup>5</sup> Since, when performing tasks, patients exhibit dysfunction in the anterior cingulate cortex (ACC) and dorsolateral prefrontal cortex (DLPFC) and their unaffected relatives can display poor cognitive control, researchers used functional MRI to study patients' relatives.<sup>6</sup> As reported in *Neuropsychopharmacology*, researchers led by the University of Missouri - Columbia evaluated 17 unaffected relatives of schizophrenic patients and 17 healthy controls. The functional MRI of the relatives demonstrated decreased activity in the DLPFC when performing a color-naming task (the "Stroop task"), but showed normal activity in the ACC. The Stroop task measures selective attention and is widely used to study attention deficits in schizophrenic people.<sup>7</sup> The study concluded that the genetic risk for schizophrenia may be associated with DLPFC dysfunction, while the ACC dysfunction in schizophrenic patients may be related to abnormalities intrinsic to the disease. **Conclusion: Unaffected relatives of schizophrenia patients can show functional brain MRI changes in the prefrontal cortex.**

**MRI  
EYES**

### High-Resolution MR Improves Eye Imaging

A number of MRI scanners currently use microscopy coils for imaging fingers and toes. To image the orbit and eye, most MRI scanners utilize standard head coils. As reported in the journal *Eye*, researchers headed by the



University of Leeds (UK) employed a microscopy surface coil in a commercially available MRI scanner to obtain high-resolution images of the eye and orbit.<sup>8</sup> The researchers stated that the images depicted structures not previously observed and clearly showed the pathology present. **Conclusion: High-resolution MRI coils could revolutionize orbital imaging.**



High-resolution MRI of the human eye.

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