IMAGE PROCESSING OF BIOLOGICAL SPECIMENS
CAPTURED BY RAMAN LASER MICROSCOPY

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ABSTRACT: Laser Raman microscopy has become a vital tool for probing live cell dynamics. This technology allows a specimen to be viewed in an unmodified state (e.g. without staining). However, although the technology is very powerful, state-of-the-art image processing techniques are required for extracting the proper signals representing the cell from background noise. Of particular interest are algorithms for noise reduction and identification of cellular organelles. The identification of cellular organelles in macrophages has important practical applications in the study of the immune response. We present image analysis techniques that have produced proper lipid separation in macrophage specimens. For example, the application of singular value decomposition (SVD) to a single noisy image of a mouse macrophage, depicted in the figures below, resulted in a significantly improved image. However, SVD alone is insufficient to extract more complex components of cells and a new approach is necessary. This presentation will compare SVD with alternatives for optimal signal extraction in Raman microscopy.