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Spectrally-Resolved Fluorescence Lifetime Imaging JOSHUA WEBER, KEVIN ELICEIRI, University of Wisconsin - Madison — Fluorescence lifetime imaging microscopy (FLIM) reveals variations in the cellular microenvironment based on how they influence the time delay between fluorophore excitation and fluorescent decay. Local metabolic activity, bonding to adjacent molecules, and oxygen concentration are examples of the many environmental factors that influence fluorescence lifetime and thus can be investigated with this technique. The addition of spectral information only adds to the utility of FLIM. Current methods of spectrally-resolved FLIM are technically complicated, expensive, and limited to a small number of spectral components. We propose an alternative method of acquiring spectrally-resolved fluorescence lifetime images. The dispersive properties of an optical fiber create a wavelength-dependent time delay that permits the characterization of the fluorescence lifetime of multiple fluorophores with a single detector. The temporal separation of fluorophore emission should allow for spectral deconvolution, and thus a relatively simple addition to an existing fluorescence lifetime imaging system could add spectral capabilities without adding much complexity or cost. With a few modifications, the technique could also be used to perform polarization-dependent lifetime measurements.

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