A grand goal in brain research is to understand how the interplay of structural, chemical and electrical signals in and between neurons, glia and the vasculature give rise to normal and abnormal functioning of nervous systems. New technologies are hastening progress as biologists make use of an increasingly powerful arsenal of tools and technologies for obtaining data, from the level of molecules to whole organs. This talk will highlight projects in which development and application of new contrasting methods and imaging tools have allowed us to observe otherwise complex or hidden relationships between cellular, subcellular and molecular constituents of cells, particularly those comprising the brain. Prospects for enhancing our understanding of the complex physiology of multiscale systems by facilitating the application of multimodal imaging methods as well as the fusion of data obtained using multiple methods, will also be discussed.