Combined Multimodal Imaging at Micro- and Nanoscale Using Complementary Contrast Mechanisms

Stefan G. Stanciu, Catalin Stoichita, Radu Hristu, Denis E. Tranca and George A. Stanciu
Center for Microscopy-Microanalysis and Information Processing, University Politehnica of Bucharest, Splaiul Independentei 313, 060042, Bucharest, Romania
e-mail: stefan.stanciu@cmmip-upb.org

The need for optical imaging at higher resolution in multiple fields of science has led to the advent of a series of super-resolution imaging techniques in the past couple of decades. The importance of such advancements was recently highlighted by the 2014 Nobel Prize in Chemistry that was awarded "for the development of super-resolved fluorescence microscopy". Although super-resolution imaging techniques have already enabled major scientific breakthroughs in multiple scientific domains, the potential of optical imaging at nanoscale is still not completely comprehended. Among the main reasons for this is the current disconnect between research teams developing and using different nanoscopy techniques, which often times results in contradictory interpretations of the collected data. Additionally, observations at nanoscopic scales many times reveal things that initially make little sense, which accentuates interpretation discrepancies between independent experiments. We present a potential solution to this problem, consisting in a multimodal imaging system that we developed, which enables optical data collection in both micro and nanoscale, in far- and near-field, by several techniques. The contrast mechanisms of the embedded imaging techniques provide complementary information, which plays a key role in facilitating nanoscale data understanding and interpretation. Correlating micro- and nanoscale data by using such a combined approach holds great potential for enabling new perspectives and opening new research avenues in many fields of science such as biology, medicine or materials science.

Acknowledgment: The LANIR research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2012-2015) under grant agreement n°280804. This communication reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.