The intelligent microscope at the nanoscale: multimodal microscopy from fluorescence to label-free

A. Diaspro[1,2,3]
[1]*DIFILAB, Dipartimento di Fisica, Università di Genova, Italia*
[2]*Nanoscopy, Istituto Italiano di Tecnologia, CHT, Erzelli, Genova, Italia*
[3]*Istituto di Biofisica, CNR, Genova, Italia*
e-mail: diaspro@fisica.unige.it

Advanced optical microscopes, form super resolved methods to quantum optical microscopy, are analytical instruments able to produce images that are rich sources of quantitative information towards an unprecedented insight into the molecular mechanisms that govern and determine the fate of living cells. Their developments are positioned at the interface between biology and physics, and today in. More specifically, multimodal optical microscopy is a growing attitude boosted by artificial intelligence that makes intelligent the microscope. In the era of super-resolved fluorescence microscopy, fluorescence plays a significant role, including its photochemical parameters, from brightness to lifetime, and non-linear approaches, like those associated with multi-photon excitation able to exploit intrinsic fluorescence and SHG/THG. In this framework, polarization methods like Mueller matrix microscopy expand those contrast mechanisms available for imaging towards label-free. The intelligent microscope is AI-guided through a computational core based on independent component analysis (ICA) un-supervised machine learning towards supervised deep learning with the ambitious target to create a robust virtual environment "to see what we could not perceive before". An interesting case study is related to understanding the visualization of chromatin organization [1-3].

REFERENCES

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