Correlative Brillouin and Raman microscopy for the characterization of cells and tissues.

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Oral contribution

The innovative Raman-Brillouin Microscope (BRMS) we developed [1,2] integrates the complementary capabilities of Brillouin and Raman scattering into a single, unified platform. This advanced system enables the simultaneous acquisition of mechanical and chemical information, providing a powerful tool for the comprehensive characterization of cells and tissues.

Brillouin scattering measures the interaction between light and thermally excited acoustic waves, offering real-time insights into mechanical properties with subcellular spatial resolution [3]. The mechanical profiling is effectively complemented by Raman spectroscopy, which probes vibrational modes to capture molecular composition. The seamless integration of these techniques allows for detailed, correlative mapping of mechanical and biochemical signatures within biological systems.

BRMS has been successfully applied across diverse research contexts, including cancer biology [1], morpho-mechanical characterization of tissues [4,5], and fundamental studies on tissue phantoms [6]. Its ability to perform high-resolution, non-contact analyses under physiological conditions highlights its versatility and potential to advance both fundamental research and clinical diagnostics.

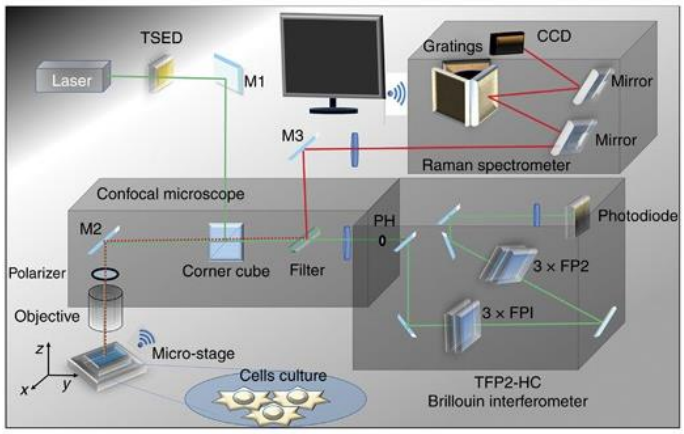

Fig. 1 Layout of the Brillouin and Raman microscope (BRMS). Figure adapted from ref. [1]

References

[1] S.Mattana et al. Light: Science & Applications **7**, 17139 (2018)
[2] F.Scarponi et al. Phys.Rev. X **7**, 031015 (2017)
[3] I Kabakova, J Zhang, Y Xiang, S Caponi, A Bilenca, J Guck, G Scarcelli Nature Reviews Methods Primers 4 (1), 8 (2024)
[4] R. Mecatelli et al. Communications Biology **2** (1), 117 (2019)
[5] M. Alunni Cardinali et al. Journal of the Royal Society Interface **19** (187), 20210642 (2022)
[6] M Bailey et al. Science Advances **6** (44), eabc1937 (2020)