

## Manipulation of optical nanoantennas for nanospectroscopy (SERS) and nanoscale imaging (TERS)

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In this talk I will show the advantages brought by optical nanoantennas to Raman spectroscopy and imaging, highlighting the extreme sensitivity (down to single molecules) of SERS Surface Enhanced Raman Spectroscopy and the nanometric scale spatial resolution achievable with Tip Enhanced Raman Spectroscopy (capable of imaging down to the sub-atomic scale). After a brief review of the basic principles, I will focus on the possibility to do SERS of biomolecules in liquid [1-4] by exploiting optical forces to manipulate metal nanorods (SERS Tweezers) and on the fabrication of high efficiency tips and their applications in TERS for imaging and protein conformation analysis [5,6].

### References:

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- [4] Foti, et al. "Optically induced aggregation by radiation pressure of gold nanorods on graphene for SERS detection of biomolecules." *The European Physical Journal Plus* 136 (2021): 1-20.
- [5] Foti, al. "Low cost tips for tip-enhanced Raman spectroscopy fabricated by two-step electrochemical etching of 125  $\mu\text{m}$  diameter gold wires." *Beilstein J. Nanotechnol.* 9 (2018): 2718-2729.
- [6] D'Andrea et al. "Nanoscale Discrimination between Toxic and Nontoxic Protein Misfolded Oligomers with Tip-Enhanced Raman Spectroscopy." *Small* 14 (2018): 1800890.