ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

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SEMINAR OF NUMERICAL ANALYSIS

- **WEDNESDAY 6 MAI 2015 - ROOM INF 119 - 16h15**

Prof. Olivier MARTIN (EPFL, Nanophotonics and Metrology Laboratory) will present a seminar entitled :

"Modelling realistic plasmonic nanostructures: A surface integral equation approach"

Abstract:
Plasmonic nanostructures are metallic structures with dimensions in the sub-100 nm range, which exhibit a very strong interaction with visible light. This interaction leads to extremely strong near-field enhancements, which can be used to drive a variety of mechanisms at the nanoscale, including surface enhanced Raman scattering, fluorescence and optical forces.

Over the last decade, we have developed a series of simulation tools to compute the field scattered by plasmonic nanostructures, with emphasis on modelling realistic structures to guide and interpret on-going experiments. This approach is based on the integral form of Maxwell's equations and relies on the discretization of only the surface of the scatterers using finite elements. The radiating boundary conditions in the far-field (Sommerfeld conditions) and also complex backgrounds such as a periodic background or a stratified background are handled analytically with this formalism. On the other hand, it leads to nonHermitian dense matrices that are often badly conditioned.

In this presentation, I will review the underlying formalism and present specific results for individual and periodic structures, discussing both the field enhancement near the structure and secondary observables deduced from that field, such as optical forces on plasmonic structures and fluorescence. To stimulate further discussions, I will also highlight some of the difficulties and pitfalls associated with this approach.

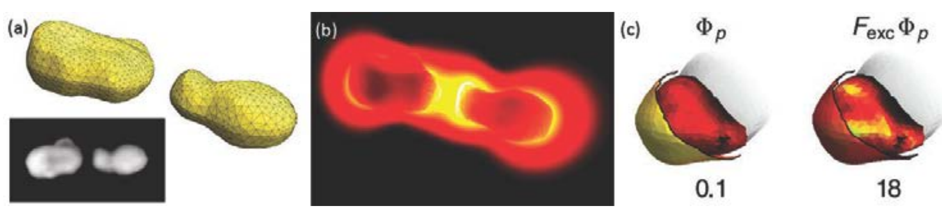

Fig. 1. (a) Model for a realistic plasmonic antenna obtained from the SEM image. (b) Near-field distribution at the vicinity of such the realistic antenna shown in panel (a). (c) Enhancement parameters for the fluorescence of molecules located 1nm from the surface of a realistic plasmonic nanostructure.

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References

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