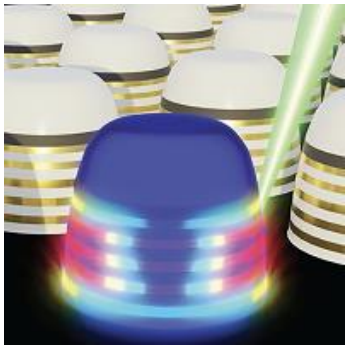
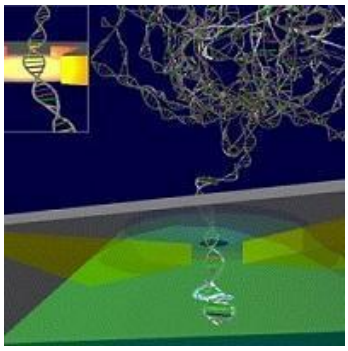
Master thesis project opportunities in the 'Ultrafast Nanophotonics and Advanced Functional Materials' Group

A new lab will open soon at the Department of Physics! In our group we study both the **fundamental and applied aspects of light-matter interactions** in **advanced multifunctional nano- and meta-materials for opto-electronics, photo-chemistry and bio-technology**. We use frequency- and time-resolved spectroscopy, finite-element computational methods and bottom-up/top-down nanofabrication techniques. We focus mainly on two research areas:

Ultrafast dynamics in (magneto)plasmonic nanomaterials: here we focus on the generation and investigation of plasmons, collective oscillations of free electrons, from visible to mid-infrared frequencies, to achieve **nanoscale and active control of charge and spin dynamics in metals, layered semiconductors and strongly correlated materials**. The idea behind this research line is to exploit light-matter interactions to overcome the fundamental limits of electronics, since light is simultaneously much faster and less dissipative. More in detail, we aim to disclose new magnetic phenomena with a potential disruptive impact on forthcoming light-driven nanotechnologies based on energy-efficient data processing and storage functionalities.



Multi-functional metamaterials for bio-nanophotonics: here we aim to study i) the **fundamental physical properties of nanostructured multi-functional metamaterials** (e.g. photo-thermal control of chemical reactions), **which combine different functions** (e.g. optical, magnetic, and thermal), and ii) their **coupling with** other materials, such as **quantum emitters and molecules for light-driven chemistry**. The nanodevices studied here can be used as well for enhanced single-molecule spectroscopy and novel approaches and methodologies applied to personalized medicine challenges (e.g. hyperthermia and controlled drug delivery).



During **the autumn semester of 2022**, we will recruit master-thesis students to work in our group. **The thesis work will mostly relate to theoretical aspects of the two research lines mentioned** above, where the student will develop novel models by using finite-element computational methods. Further discussion on a more detailed outline of the intended project will be necessary before any work can begin. The project is planned as a full-time master thesis project (30 ECTS). Applicants should have adequate education (physics, chemistry, or materials science) and good English skills. Depending on the project, the candidate must be able to work independently and reliably, following advice.

More information can be found on our homepage: https://www.umu.se/en/research/groups/nicolo-maccaferri-lab/, or by contacting Dr. Nicolò Maccaferri (nicolo.maccaferri@umu.se).