



# PHOTONICS LECTURE

WEDNESDAY, FEBRUARY 7TH 2024 | 16:00 H

## DR. CRISTIAN MANZONI

### LECTURE HALL A.1

## Generation and application of ultrashort light pulses

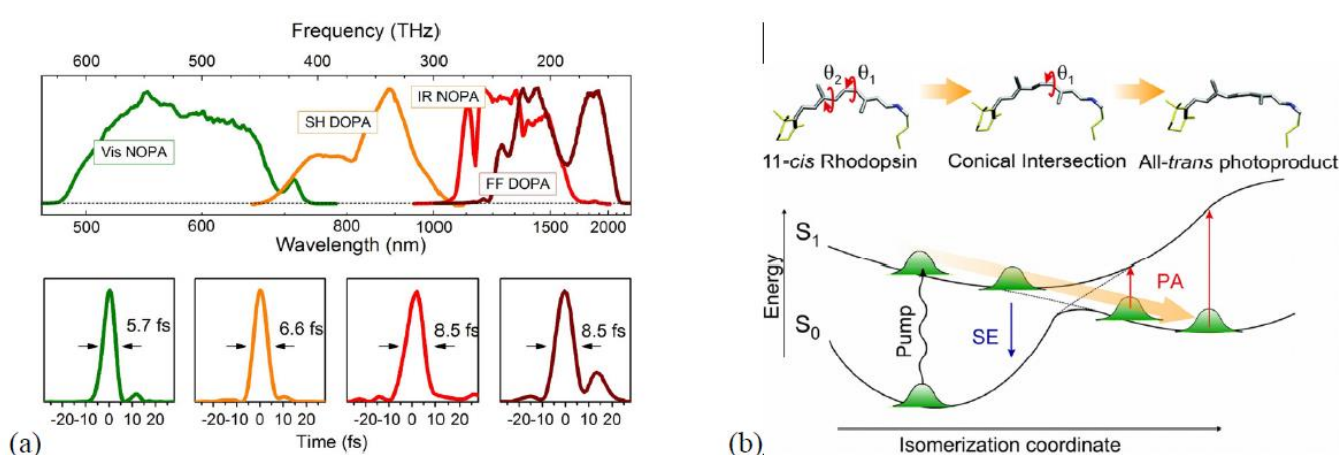
Many processes in nature, such as the primary events in vision and light harvesting in plant kingdom, occur at timescales of the order of tens of femtoseconds. A successful way to resolve and manipulate such mechanisms is by the interaction with light, through ultrafast optical spectroscopy. This technique, which can be performed in a variety of methods, basically employs ultrashort light pulses; these are used both for exciting and for probing the ultrafast processes.

In this talk, we will review the most common and versatile techniques to generate and characterize ultrashort pulses tunable from the ultraviolet to the infrared (Fig. 1(a)): in particular, we will focus on second-order optical processes in nonlinear crystals. We will then discuss pump-probe and two-dimensional



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spectroscopy, among the most important optical techniques for time-resolved spectroscopy of molecules and solids. We will conclude our contribution showing some relevant experimental results obtained with time-resolved spectroscopy (Fig. 1(b)).



**Figure 1:** (a) The spectroscopist's palette: a collection of ultrashort pulses which are used for ultrafast pump-probe spectroscopy; (b) Cis-trans isomerization of rhodopsin, the primary event of vision, and one of the fastest biological processes found in Nature.