Placing a chromophore in close proximity to the metal surface modifies its fluorescence lifetime, which is known as the Purcell effect. The phenomenon is based on the energy transfer from the excited emitter into plasmons of the metal. We employ the Purcell effect for novel applications in nanoscopy.

Our new nanocavity-based method of measuring the fluorescence quantum yield (QY), which requires only few microliters of low-concentrated chromophore solution [1], and is applicable even to single emitters [2]. It allows for measuring the QY of the fluorophores placed inside complex systems, such as a mixture of several types of emitters with strongly overlapping absorption spectra [3] or even with complete overlap of both emission and absorption spectra, which is impossible to do by any other existing technique.

We introduce a new technique for axial localization of fluorophores with nanometer accuracy, using a metal-induced energy transfer [4]. We demonstrate the power of this method by profiling the basal lipid membrane of living cells. The simplicity and high accuracy of the presented techniques allow for using them in a big variety of studies.