

## ÚSTAVNÍ SEMINÁŘ

**proběhne ve středu dne 12. 12. 2018 v 16:00  
v přednáškovém sále Fyzikálního ústavu AV ČR Na Slovance**

Program:

**Ortwin Hess**

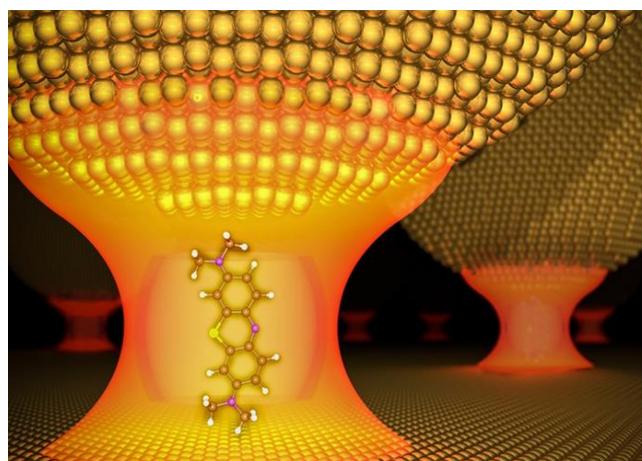
Imperial College London

### Active Quantum Nano-Photonics

Nanoplasmonics and Metamaterials have in the last 15 years inspired scientists to think about photonics beyond traditional constraints imposed by natural materials in which light propagates to conceive functionalities such as subwavelength imaging and broadband ultraslow light. While most concepts have initially been demonstrated at longer wavelengths and for microwaves, they have continuously moved to optical frequencies and beyond. Embracing nonlinearity and (quantum) gain [1], exciting phenomena such as 'dark-light' [2] and cavity-free [3] nano-lasing and room temperature single molecule strong coupling [4] have been unveiled.

In the talk I shall illuminate new horizons for active nanophotonics and topological metamaterials with quantum gain on the nanoscale, discussing recently demonstrated room-temperature strong coupling of single molecules in a plasmonic nano-cavity [4] and near-field strong coupling of single quantum dots [5]. I will further discuss how the 'trapped-rainbow' principle [6] has been a trail-blazer for ultra-slow waves on the nanoscale [7] with innovative applications such as cavity-free stopped-light nanolasing [3]. Finally, I will offer an outlook on how quantum nanophotonics, topological (quantum-) metamaterials and quantum chaos [8] are enabling ultrafast nano-lasers, semiconductor metamaterials, controlled nano-chemistry and phonon lasing with applications in quantum science and nano-technology, semiconductor optoelectronics, photonic energy and photovoltaics as well as for bio-sensing and materials chemistry on the nanoscale.

- [1] O. Hess et al. Nature Materials 11, 573 (2012).
- [2] O. Hess et al., Science 339, 654 (2013).
- [3] T. Pickering, et al., Nature Communications 5, 4971 (2014).
- [4] R. Chikkaraddy, et al., Nature 535, 127 (2016).
- [5] H. Groß, J.M. Hamm, T. Tuffarelli, O. Hess and B. Hecht, Science Advances 4, eaar4906 (2018).
- [6] K. L. Tsakmakidis, A. D. Boardman and O. Hess, Nature 450, 397 (2007).
- [7] K. L. Tsakmakidis, O. Hess, R. Boyd and X. Zhang, Science 358, eaan5196 (2017).
- [8] S. Bittner, S. Guazzotti, X. Hu, H. Yilmaz, K. Kim, Y. Zeng, S.S. Oh, Q.J. Wang, O. Hess, and H. Cao, Science 361, 1225 (2018)



*Seminář proběhne v anglickém jazyce.*

# Colloquium of the Institute of Physics of the Czech Academy of Sciences

on Wednesday December 12<sup>th</sup>, 2018 at 4 p.m.

in the lecture hall of the Institute of Physics Na Slovance

Programme:

**Ortwin Hess**

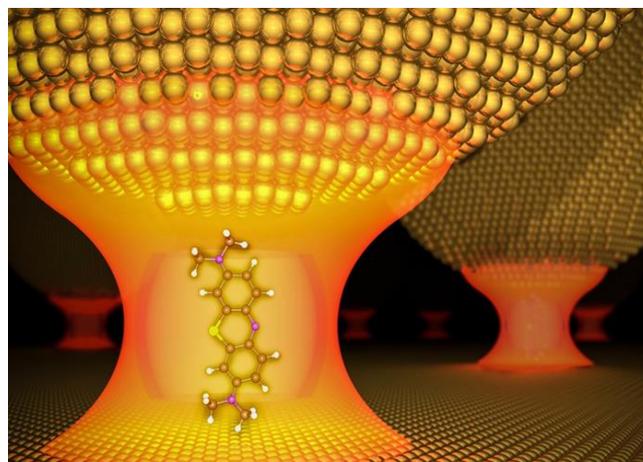
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*The colloquium will be held in English.*