

**19<sup>th</sup> July 2016 - 13:00 h**

**CFEL – Building 99, seminar room III (ground floor)**

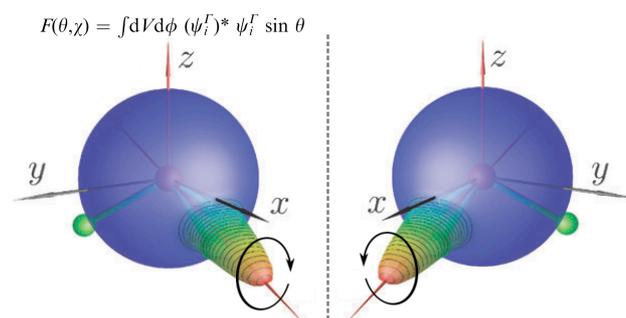
**Andrey Yachmenev**

University College London, UK

## Dynamic chirality and optical activity induced by rotations

Chiral molecules have identical physical properties unless they interact with another chiral entity such as light. There is currently significant interest in laser-governed manipulation of internal and external degrees of freedom of chiral molecules, ultimately aimed at resolving and controlling chiral dynamics on very short time scales. The ability to precisely modulate and monitor the weights of different parity components in the enantiomeric state will lead to significant breakthroughs in the engineering of optical devices, stereochemistry and fundamental physics.

In statically chiral molecules (in the conventional sense) the tunnelling rates can be modulated by applying external electric fields that lower the potential energy barrier separating two chiral enantiomers. Remarkably, a statically non-chiral molecule can exhibit chirality when excited to a stable localized unidirectional rotations that are separated by high kinetic energy barriers. Such systems with induced chirality offer new interesting ways to control the chiral dynamics.



In this talk, I will present the first theoretical study of the dynamic chirality induced in some small symmetric polyatomic molecules by high rotational excitations into the so-called rotational cluster states. In such states, molecules steadily rotate about a localization axis that is approximately parallel to one of the molecular bonds. The clockwise and anticlockwise rotating molecules are indistinguishable from each other and are separated by high kinetic energy barriers, thus behaving in the same way as left-hand and right-hand enantiomers with static chirality. I will present theoretical results for PH<sub>3</sub> molecule as well as propose new experimental schemes for enantiomer differentiation of chiral molecules.