

# Physikalisches Kolloquium

Thursday, 22.05.14, 17:15, HS 100  
Reception with coffee & cookies 16:45



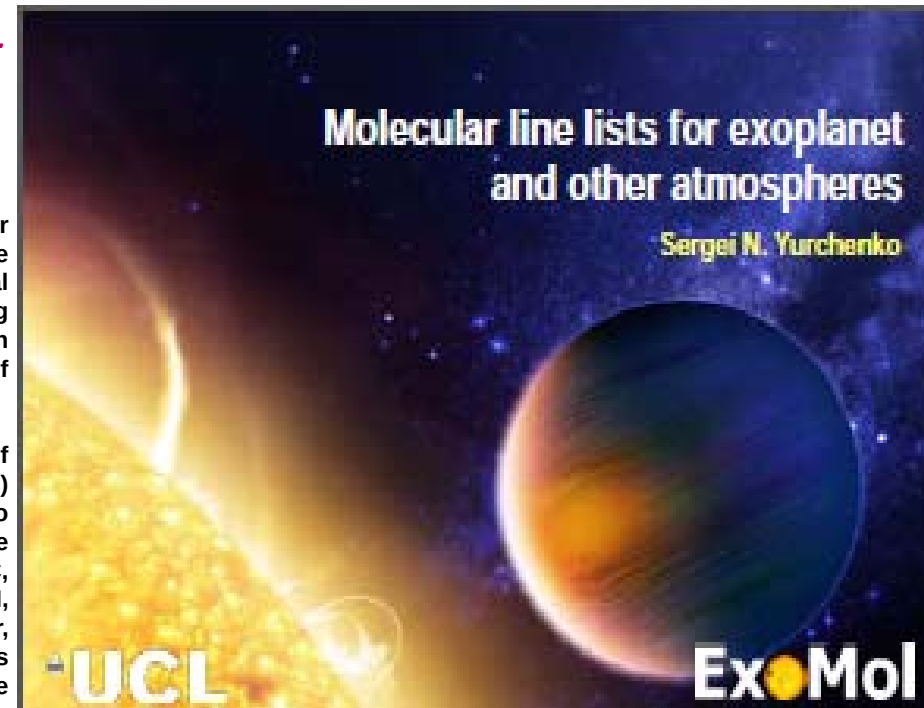
Dr. Sergey Yurchenko, University College London

*ExoMol: Molecular line lists for exoplanet  
and other atmospheres*

## Abstract

Spectral characterization of astrophysical objects cool enough to form molecules in their atmospheres (cool stars, extrasolar planets and planetary discs) requires considerable amounts of fundamental molecular data. In my talk I will demonstrate that experimental molecular line lists are not sufficiently complete. The ExoMol project aims at providing comprehensive line lists for all molecules likely to be observable in exoplanet atmospheres in the foreseeable future. This is a huge undertaking which will mean providing in excess of tens of billions of spectral lines for a large variety of molecular species .

The physics of molecular absorptions is complex and varies between different classes of absorbers, which are therefore divided into following topics (a) diatomic, (b) triatomics, (c) tetratomics, (d) methane and (e) larger molecules. Special techniques are being developed to treat each case. The line lists for a number of key atmospheric species currently available from ExoMol ([www.exomol.com](http://www.exomol.com)): ammonia, methane, CaH, MgH, BeH, SiO, HCN/HNC, phosphine, SO<sub>3</sub>, KCl, NaCl, CH<sub>4</sub>. The line lists in progress are for AlO, PN, SH, SiH, SO, Sch, TiH, C<sub>2</sub>, AlH, H<sub>2</sub>S, HNO<sub>3</sub>, H<sub>2</sub>CO, and C<sub>2</sub>H<sub>4</sub>. As an example I will present our main result so far, a new methane line list generated using high level of theory, called 10to10, which contains just under 10 billion transitions. This 10to10 line list has the potential to revolutionise the accuracy of T-dwarf models.



All of you interested in physics are cordially invited!