Department of Physics
Condensed Matter Physics
Clarendon Laboratory, Parks Road, Oxford OX1 3PU

UNIVERSITY OF OXFORD

CONDENSED MATTER SPECIAL SEMINAR

Thursday 3 October at 2.15pm

"Finding new solid-state materials – from the top to the bottom of the periodic table"

Eteri Svanidze
Max Planck Institute for Chemical Physics of Solids

The importance of solid-state materials and the impact they have on our everyday life cannot be contested. However, further technological advances are impeded by the fact that many fundamental questions regarding underlying mechanisms of magnetism and superconductivity remain unanswered. In addition to the theoretical efforts, which have certainly contributed to the overall progress in the field, significant breakthroughs are often driven by experimental discoveries of new strongly correlated systems. Unfortunately, the majority of these discoveries have so far been "accidental" and only rarely a result of a tailored exploration. To address this pressing issue, I will present several systematic ways in which new unconventional materials can be designed and synthesized1-4. I will show that a gradual evolution from an exact to an empirical chemical bonding analysis is necessary, as we move down the periodic table from lighter to heavier constituent elements. I will show that this approach works for drastically different materials, yielding new solid-state systems that will not only provide deeper insights into the fundamental origin of magnetism and superconductivity but will also push us one step closer to unlocking their full application potential.

[1] A. Amon et al., "Tracking aluminium impurities in single crystals of the heavy-fermion superconductor UBe13," Sci. Rep. 8, 10654 (2018).
[2] E. Svanidze et al., "Intermetallic Compounds with Thorium and Uranium," MPI CPfS Status Rep. (2018).
[3] E. Svanidze et al., "Empirical way for finding new uranium-based heavy-fermion materials," Phys. Rev. B 99, 220403 (2019).
[4] A. Amon et al., "Interplay of atomic interactions in the intermetallic semiconductor Be5Pt," Angew. Chemie Int. Ed., accepted (2019).

Host: Prof Amalia Coldea

Audrey Wood Room, Clarendon Laboratory