

## **Theory of Complex Magnetism at the Atomic Scale**

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In this contribution I discuss with respect to magnetism at the spatial limit the three fundamental questions of magnetism: (i) the size of the magnetic moments or which material will be magnetic, (ii) the magnetic structure and the (iii) the magnetization direction. An overview is presented on the recent progress of ab-initio theory in combination with model theory in determining complex magnetic structures on the atomic scale. It will be discussed (i) how these magnetic structures may be revealed using a spin-polarized scanning tunneling microscope and (ii) how the spin-orbit dependent tunneling cross section can be used to detect magnetism with a conventional STM. The present ab-initio results on the orbital moments and the magnetic anisotropy of transition-metal are presented and critically discussed in the light of recent experimental data.