Light scattering in correlated *d*- and *f*-electron systems

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d- and *f*-electron systems host a variety of instabilities that manifest themselves in new phases such as magnetism, nematicity, density waves or superconductivity. In many cases, competition or intertwining of the different types of order results in rich phase diagrams and opens possible routes to unconventional superconductivity. Inelastic light (Raman) scattering provides access to many of the relevant excitations hence being among the widely used experimental tools for research into many of the material classes such tritellurides, heavy fermion systems, cuprates or ferro-pnictides and -chalcogenides

I will give a brief overview of selected experiments in the tritellurides, where *f*-electrons play a role, but will place the main focus on our recent results on fluctuations and superconductivity in $BaFe_2As_2$ based *d*-electron systems. In the ferro-pnictides we performed polarized electronic Raman scattering experiments on K- and Co-substituted $BaFe_2As_2$ and find the response of fluctuation above the magnetically ordered phase and pair breaking below the superconducting transition. The data are interpreted as signatures of spin-driven structural transformations (nematicity) in the parent compound and the underdoped range [1] and a hierarchy of possible pairing channels in superconducting samples [2,3]. The competition between the *s*-wave-type ground state and the $d_{x^2-y^2}$ subleading instability is a case for superconductivity on the basis of spin fluctuations.

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