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Competition between high T_c superconductivity and ferromagnetism in oxide multilayers

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Artificial multilayers offer unique opportunities for combining materials with antagonistic orders such as superconductivity and ferromagnetism. It was previously shown for multilayers of classical superconductors and ferromagnets that fascinating new quantum states can be realized by tuning the layer thicknesses or the interface properties. In my talk, I will show that multilayers of cuprate high T_c superconductors (HTSC) and oxide-based ferromagnets provide an equally fascinating playground for studying the competition between the superconducting and ferromagnetic orders under the condition that both opponents are of comparable strength. I will present experimental results from neutron reflectometry and low energy muon spin rotation (μ SR) measurements on thin film superlattices that were grown by pulsed laser deposition (PLD). These measurements establish that the interaction between superconductivity and ferromagnetism is surprisingly strong and gives rise to a number of unexpected and very unusual phenomena. In particular, our data provide evidence that a giant superconductivity-induced modulation of the vertical profile of the ferromagnetic magnetization takes place in some of these superlattices.