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Pressure Tuning of Strongly Correlated Electron Systems near Magnetic Instabilities

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In some strongly interacting electron systems if the conditions are correct, new ordered states are formed which can not be explained by the traditional low temperature theories of matter (e.g. Fermi-liquid theory). In addition, in some cases unconventional forms of superconductivity are produced which can not be explained by the phonon mediated models of conventional superconductors (BCS theory). A rich discovery arena for such new ordered states has been in systems which are on the border of long range magnetic order. It is possible to see the evolution in to these new states in suitable high purity samples by the precise tuning of the lattice density by the application of hydrostatic pressure. Resistivity measurements allow the clear observation of the onset of superconductivity and importantly also allow the non-superconducting state to be probed. Resistivity measurements at low temperatures in high pressure diamond anvil cells will be presented on heavy-fermion materials which are on the border of magnetic long range order to further understand these systems and novel states. In addition improvements to transport measurements at high pressure and low temperature will be shown.