Phase transitions are ubiquitous in daily life, physical sciences, as well as technology. Classically, they are driven by changes of temperature, e.g. when evaporating water. We consider quantum phase transitions, which are controlled by a non-thermal parameter like pressure or magnetic field. They are fascinating for experiment and theory, as they promote the formation of novel states of matter, whose description is challenging due to inherent quantum effects. We will focus mainly on low-temperature thermodynamic and transport experiments on metals close to magnetic instabilities, which reveal the breakdown of our "standard model", i.e. Fermi liquid theory, as well as the formation of novel quantum phases such as unconventional superconductivity, electronic nematic order or spin-liquid behavior.