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Local increase of symmetry on cooling in KNi_2Se_2 JAMES NEILSON, Colorado State University, NATALIA DRICHKO, Johns Hopkins University, ANNA LLOBET, Los Alamos National Laboratory, MAHALINGHAM BALASUBRAMANIAN, MATTHEW SUCHOMEL, Argonne National Laboratory, TYREL MCQUEEN, Johns Hopkins University — Materials with the $ThCr_2Si_2$-type structure host myriad examples of many-body physics, including high-temperature superconductivity and heavy fermion behavior. In these compounds, the emergence of the collective electronic state frequently occurs near a magnetic instability, suggesting that magnetic fluctuations underlie the electronic phenomena. I will provide evidence for similar many-body physics in the structurally related, but non-magnetic compound, KNi2Se2. KNi_2Se_2 exhibits an increase of symmetry on cooling below $T \leq 50$ K, as observed by Raman spectroscopy and high-resolution synchrotron x-ray diffraction. X-ray absorption spectroscopy confirms that the symmetry increase is due to changes in nickel-nickel interactions and suppression of charge density wave fluctuations. Density functional theory calculations reveal a zone-boundary lattice instability that provides a model of the room-temperature x-ray pair distribution function data, but fails to describe the higher local symmetry observed for $T \leq 50$ K. Together, these results support many-body correlation effects as drivers for the unusual heavy fermion electronic ground state in KNi_2Se_2.

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