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Spin-orbit driven Peierls transition and possible Agterberg-Barzykin-Gorkov superconductivity in CsW2O6 IGOR MAZIN, Naval Research Lab, SERGEY STRELTSOV, M.N. Miheev Institute of Metal Physics Ekaterinburg, Russia, ROLF HEID, KLAUS-PETER BOHNEN, Karlsruhe Institute of Technology, Germany — We study *ab initio* a pyrochlore compound, CsW_2O_6, which exhibits a yet unexplained metal-insulator transition. We find that (1) the reported low-T structure is likely inaccurate and the correct structure has a twice larger cell; (2) the insulating phase is not of a Mott or dimer-singlet nature, but a rare example of a 3D Peierls transition, with a simultaneous condensation of three charge density waves; (3) spin-orbit interaction plays a crucial role, forming well-nested bands. The high-T (HT) phase, if stabilized, could harbor a unique $e_g + ie_g$ superconducting state that breaks the time reversal symmetry, but is not chiral. This state was predicted in 1999 by Agterberg et al, but never observed. We speculate about possible ways to stabilize the HT phase while keeping the conditions for superconductivity.

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