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Superconductivity and Excitonic Charge Order JASPER VAN WEZEL, PAUL NAHAI-WILLIAMSON, SIDDARTH SAXENA, University of Cambridge — It was suggested four decades ago that excitons as well as phonons could mediate superconductivity and that the temperature limits usually imposed by phonons could thus be avoided. In practice this form of excitonic pairing turned out to be elusive, because phonon softening typically causes a structural instability to occur before excitonic superconductivity has a chance to arise. Upon suppression of this CDW order however, superconductivity once again has an opportunity to materialise, as has recently been observed in for example pure $TiSe_2$ under pressure. It is unclear what role is played by the excitons in such an environment of critical structural fluctuations, and whether they can have any effect on the pairing or indeed T_C. Here we introduce a theoretical model to study the ways in which SC, CDW and excitonic order compete, coexist and even cooperate. Applying the model to $TiSe_2$, we show that the hitherto elusive mechanism driving its CDW transition is a combination of excitonic and Jahn-Teller effects, and that under pressure it is likely to display an unusual type of superconductivity mediated by combinations of excitons and phonons.

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