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Nematic order by disorder in spin-2 BECs RYAN BARNETT, Caltech, ARI TURNER, EUGENE DEMLER, Harvard, ASHVIN VISHWANATH, Berkeley — The effect of quantum and thermal fluctuations on the phase diagram of spin-2 BECs is examined. They are found to play an important role in the nematic part of the phase diagram, where a mean-field treatment of two-body interactions is unable to lift the accidental degeneracy between nematic states. Quantum and thermal fluctuations resolve this degeneracy, selecting the uniaxial nematic state, for scattering lengths a_4 greater than a_2, and the square biaxial nematic state for a_4 less than a_2. Paradoxically, the fluctuation induced order is stronger at higher temperatures, for a range of temperatures below T_c. For the experimentally relevant cases of spin-2 ^{87}Rb and ^{23}Na, we argue that such fluctuations could successfully compete against other effects like the quadratic Zeeman field, and stabilize the uniaxial phase for experimentally realistic conditions. A continuous transition of the Ising type from uniaxial to square biaxial order is predicted on raising the magnetic field. These systems present a promising experimental opportunity to realize the 'order by disorder' phenomenon.

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