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SU(3) gauge symmetry for collective rotational states in deformed nuclei GEORGE ROSENSTEEL, NICK SPARKS, Tulane Univ — How do deformed nuclei rotate? The qualitative answer is that a velocity-dependent interaction causes a strong coupling between the angular momentum and the vortex momentum (or Kelvin circulation). To achieve a quantitative explanation, we propose a significant extension of the Bohr-Mottelson legacy model in which collective wave functions are vector-valued in an irreducible representation of SU(3). This SU(3) is not the usual Elliott choice, but rather describes internal vorticity in the rotating frame. The circulation values C of an SU(3) irreducible representation, say the (8,0) for ^{20}Ne, are C = 0, 2, 4, 6, 8, which is the same as the angular momentum spectrum in the Elliott model; the reason is a reciprocity theorem in the symplectic model. The differential geometry of Yang-Mills theory provides a natural mathematical framework to solve the angular-vortex coupling riddle. The requisite strong coupling is a "magnetic-like" interaction arising from the covariant derivative and the bundle connection. The model builds on prior work about the Yang-Mills SO(3) gauge group model (J. Phys. A 48 (2015) 445203).

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