Towards More Accurate Double-Beta Matrix Elements

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All the methods currently used to calculate the nuclear matrix elements governing neutrinoless double beta decay omit potentially important correlations. I discuss steps — mostly underway — to improve the most prominent methods: the shell model, the generator coordinate method, the quasiparticle random phase approximation, and the interacting boson model. I focus particularly on the first two. The shell model is beginning to include effective interactions and operators, constructed non-perturbatively from ab initio calculations, that compensate for the parts of Hilbert space it omits. The generator coordinate method is starting to incorporate important non-shape degrees of freedom as coordinates. Both approaches face computational challenges, but stochastic methods will help us to meet them.