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Microscopic description of single-particle levels with modern NN interactions SHINICHIRO FUJII, CNS, University of Tokyo, RYOJI OKAMOTO, Kyushu Inst. of Tech., KENJI SUZUKI, Kyushu Inst. of Tech — Recently, ab initio nuclear structure calculations starting with realistic NN interactions have been possible beyond few-nucleon systems. The coupled-cluster method (CCM) will be one of the promising ones for this kind of study, and actually the application of the CCM to nuclear structure calculations has been increasing. We have developed a many-body theory, the unitary-model-operator approach (UMOA), to perform *ab initio* structure calculations for a wide range of the mass numbers of nuclei. The UMOA can be regarded as one of the CCM, and leads to an energy independent and Hermitian effective interaction through a unitary transformation of the original Hamiltonian. The unitary transformation employed in the UMOA has also been used to derive the effective interaction in the *ab initio* no-core shell model (NCSM). In the UMOA, the energies of ground states and single-particle (- hole) levels can be calculated taking into account a sufficiently large model space. I will show some recent results for nuclei around <sup>14</sup>C, <sup>16</sup>O, <sup>24</sup>O, and <sup>40</sup>Ca using modern NN interactions.

> Shinichiro Fujii CNS, University of Tokyo

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