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Nonlinear Features of Nuclear Collective Vibrations[1] SARAH BUCHHORN[2], H.H. Dow High School, Midland, Michigan, VLADIMIR ZELEVINSKY, Michigan State University — Atomic nuclei reveal rich diversity of collective modes of vibrational and rotational type. We analyze the experimental data for low-lying collective excitations in many medium-mass even-even nuclei and find convincing manifestations of systematic nonlinear effects that cannot be reduced to weak anharmonicity. Here we discuss two empirical trends. (i) The assumption that the main part of the restoring potential for the most collective quadrupole vibrations of spherical nuclei is quartic, $\propto \beta^4$, where β is the quadrupole deformation coordinate, leads to the spin dependence of the yrast vibrational states $E \propto J^{4/3}$, in agreement with data for many isotopes of Cr, Ni, Zn, Ge, Se, Kr, Sr, Mo, Ru, Pd, Cd. (ii) The second effect is the systematic coupling between quadrupole (2^+) and octupole (3^-) modes that leads to the correlation of their energies, E(3)=A-B/E(2) in agreement with many isotopic chains; this is important for the search of (PT)-violating electric dipole moments. We present theoretic arguments explaining these trends.

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