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Spin-flavor composition of excited baryons[1] ISHARA FERNANDO, JOSE GOITY, Hampton University and Jefferson Lab — The excited baryon masses are analyzed in the framework of the $1/N_c$ expansion using the available physical masses and also the masses obtained in lattice QCD for different quark masses. The baryon states are organized into irreducible representations of $SU(6) \times O(3)$, where the $[\mathbf{56}, \ell^P = 0^+]$ ground state and excited baryons, and the $[\mathbf{56}, 2^+]$ and $[\mathbf{70}, 1^-]$ excited states are analyzed. The analyses are carried out to $O1/N_c$ and first order in the quark masses. The issue of state identifications is discussed. Numerous parameter independent mass relations result at those orders, among them the well known Gell-Mann-Okubo and Equal Spacing relations, as well as additional relations involving baryons with different spins. It is observed that such relations are satisfied at the expected level of precision. Predictions for physically unknown states for each multiplet are obtained. From the quark-mass dependence of the coefficients in the baryon mass formulas an increasingly simpler picture of the spin-flavor composition of the baryons is observed with increasing pion mass (equivalently, increasing $m_{u,d}$ masses), as measured by the number of significant mass operators.

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