Rotational states

\[ E = \frac{k^2 l^2 (l+1)}{2I} \]
\[ l = 9/2, 11/2, 13/2 \]

Collective motion \rightarrow nucleus is deformed
Large quadrupole moments

Vibrational states

\[ R = R_0 \left( 1 + \sum \sum m = -l \right. \]
\[ \left. \frac{e_m}{l_m} \left( Q, q \right) \right) \]
\[ l = \frac{3}{2} \sum \frac{e_m}{l_m} \left( Q, q \right) \]
\[ R = \frac{3}{2} \sum \frac{e_m}{l_m} \left( Q, q \right) \]

Giant resonance: \[ E_{resonance} \approx 15 \text{ MeV} \]
Strong \( E1 \) transition

Today by Brown - Bolsteri:
16) Derivation
17) Dipole transition amplitude