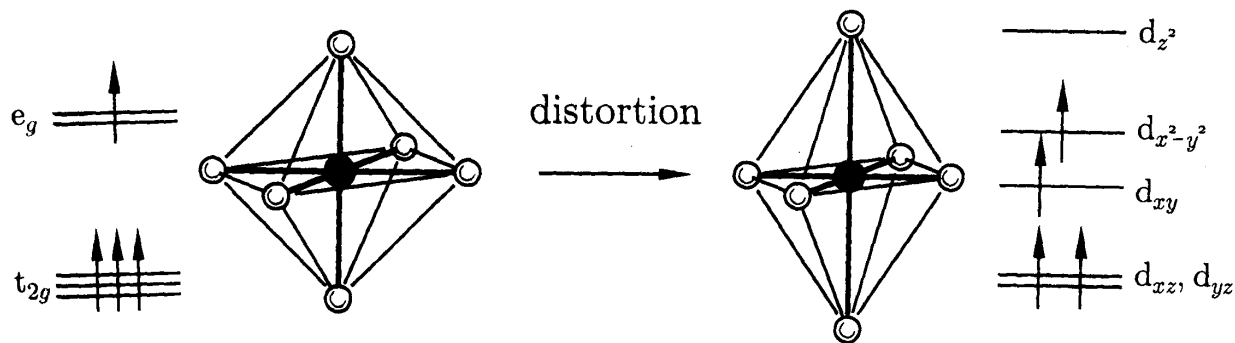


## Jahn-Teller effect ( $\text{La}_{1-x}\text{Ca}_x\text{MnO}_3$ )

If orbital ground state is degenerate, then lowering of energy by crystal distortion occurs

Example of  $\text{Mn}^{2+}$ :  $e_g$  electron in a distorted cubic crystal field (



Tetragonal distortion removes the degeneracy of  $e_g$  electron

Distortion:  $\epsilon \Rightarrow$  elastic energy  $E_{el} = A\epsilon^2$

$\Rightarrow$  variation of crystal field energy  $\delta = B\epsilon$

Minimum of energy:  $\epsilon = -A/2B$

spontaneous distortion; no orbital degeneracy in the ground state