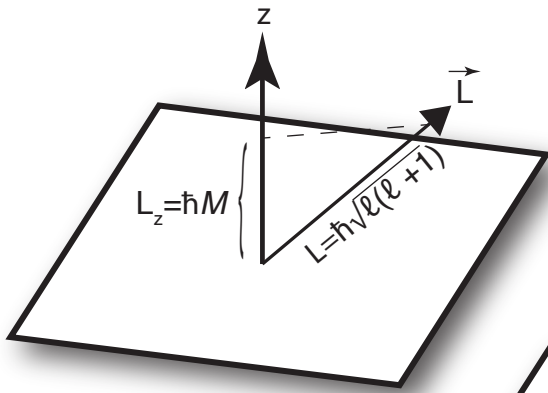
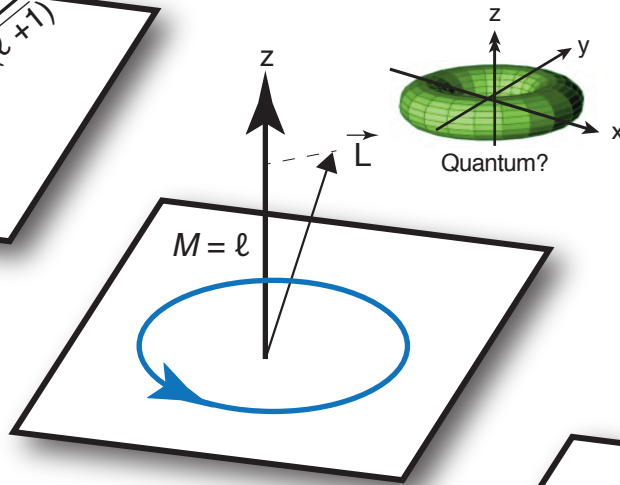


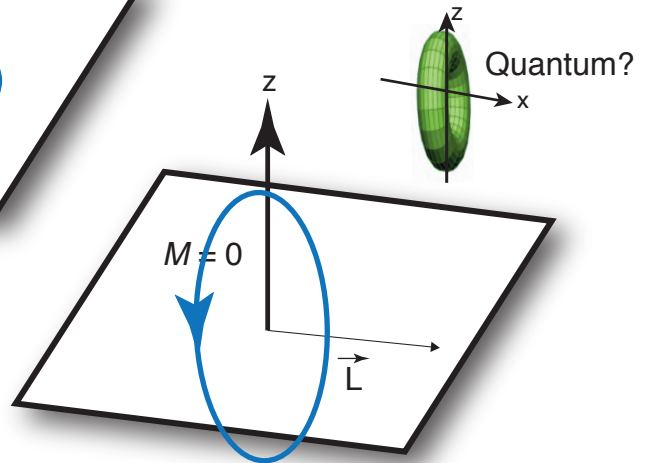
Classical orbits and quantum orbitals (= wavefunctions) for 3D rotation:



Classical view of the quantum mechanical angular momentum  
 Note that  $L > L_z$  always, the angular momentum cannot point along a specific axis without violating the Heisenberg Principle.




Classical view of rotation "almost about the z-axis"



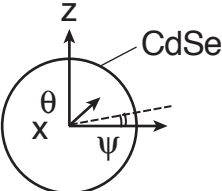
Classical view of rotation about unspecified axis perpendicular to the z-axis.

Quantum dots: particles in a spherical box:



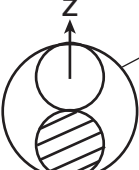
CdSe

classical



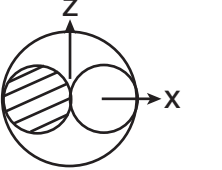
CdSe

quantum:  $\psi(\rho, \theta, \phi, \rho) = R(r)Y_{\ell m}(\theta, \phi)$



CdSe

$Y_{10}$ :  $p_{z^-}$  electron



CdSe

$Y_{11+}$   $Y_{1-1}$   $p_x$  - electron