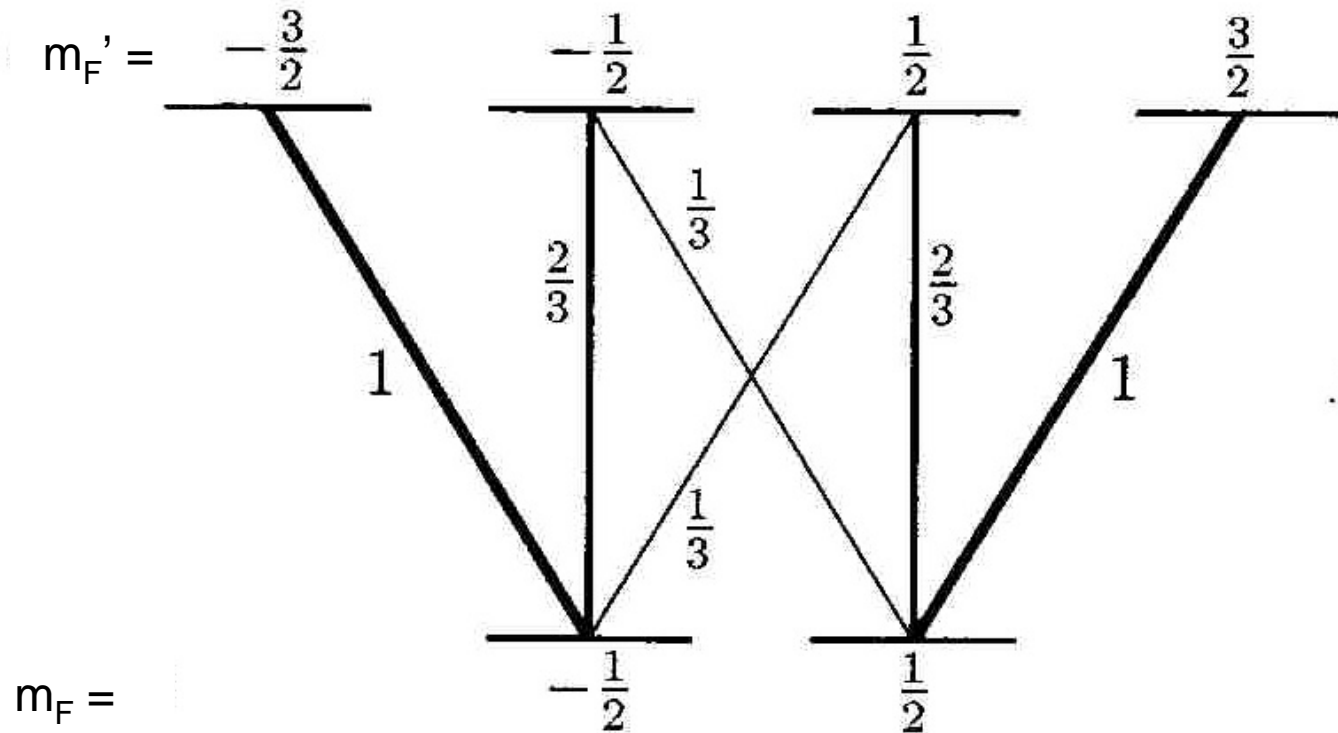


Multi-level atom

- Consider an atom with:
- $F=1/2$ in ground level.
 - $F'=3/2$ in excited level.

Excited state: $F' = 3/2$

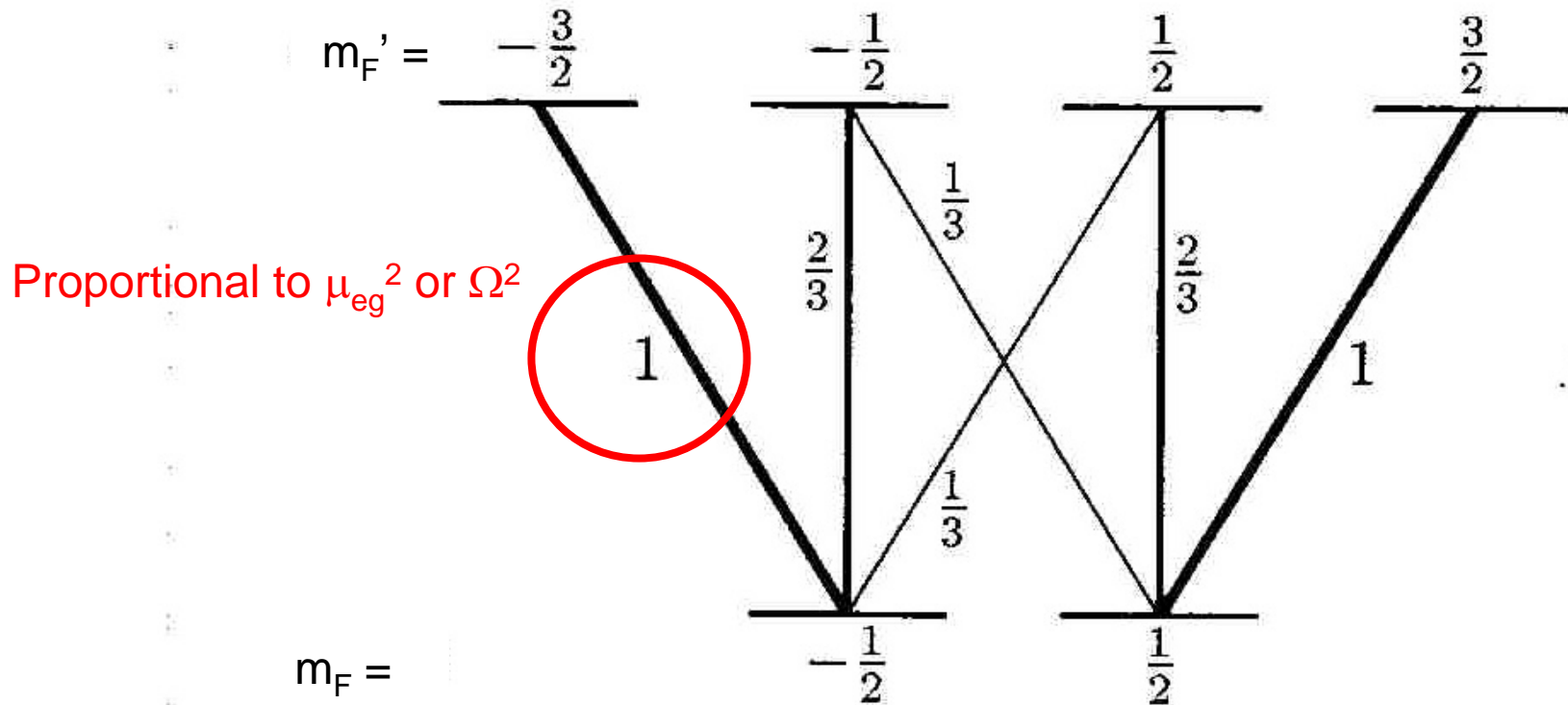


Ground state: $F = 1/2$

Multi-level atom

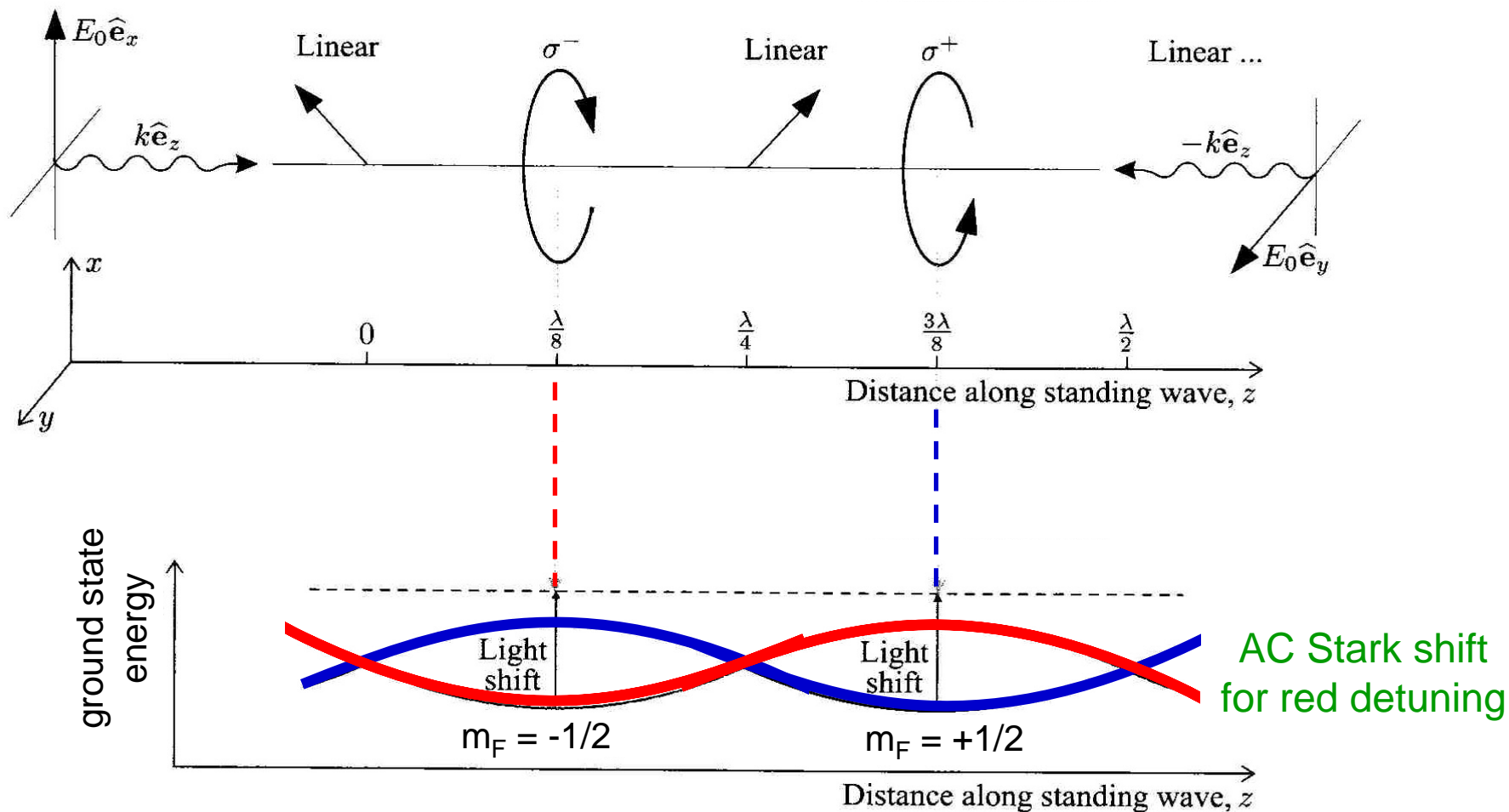
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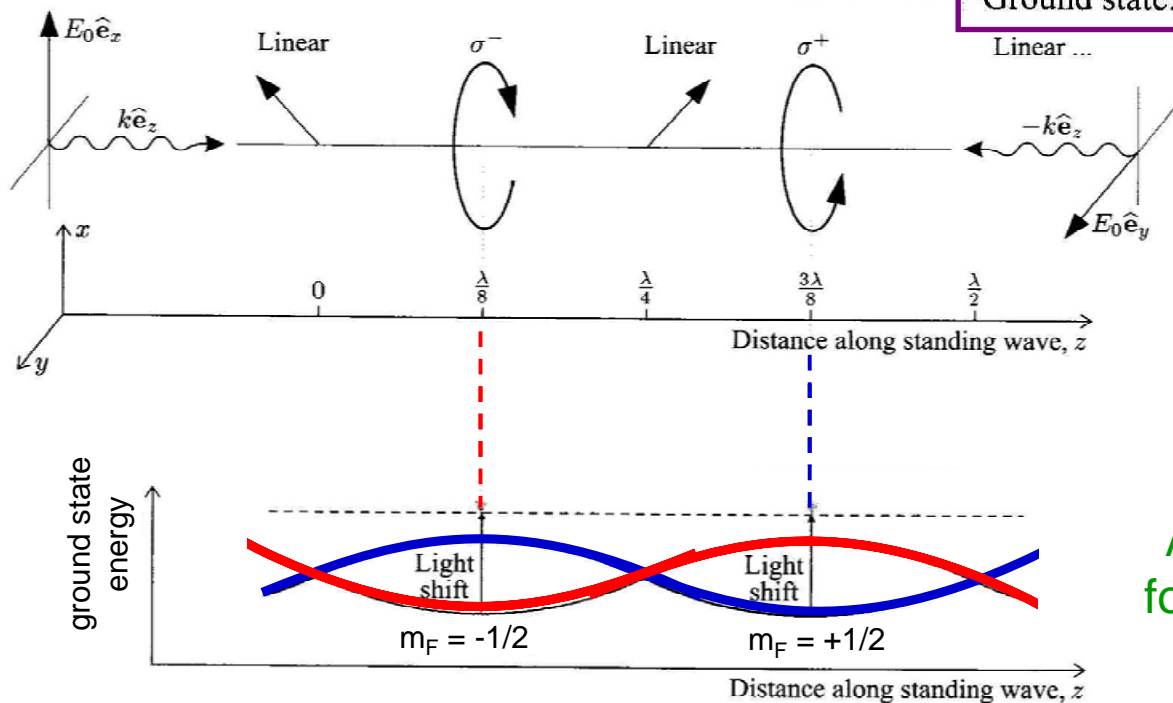
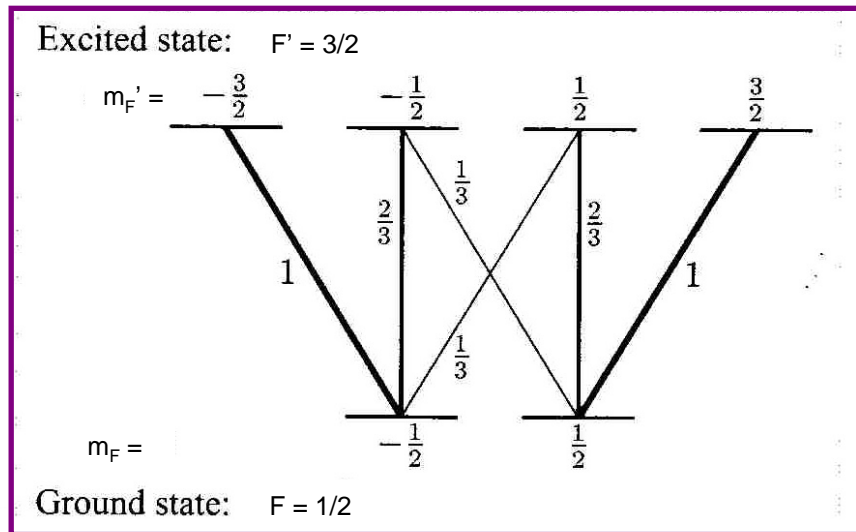


Ground state: $F = 1/2$

AC Stark Shift in Polarization Gradient Lattice

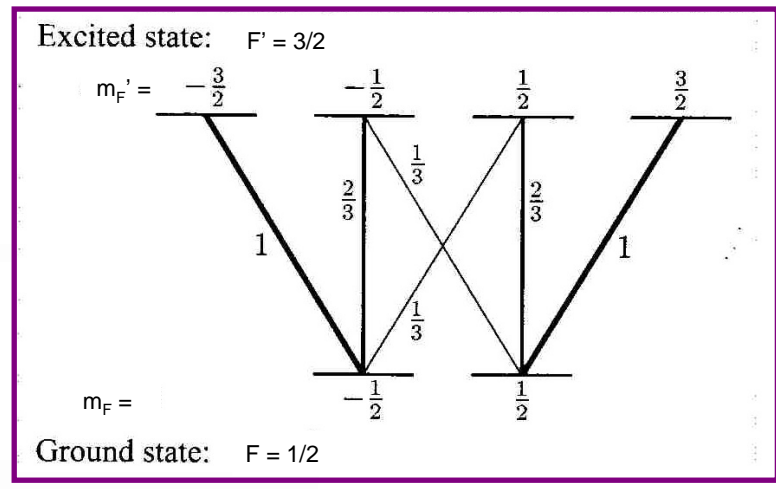
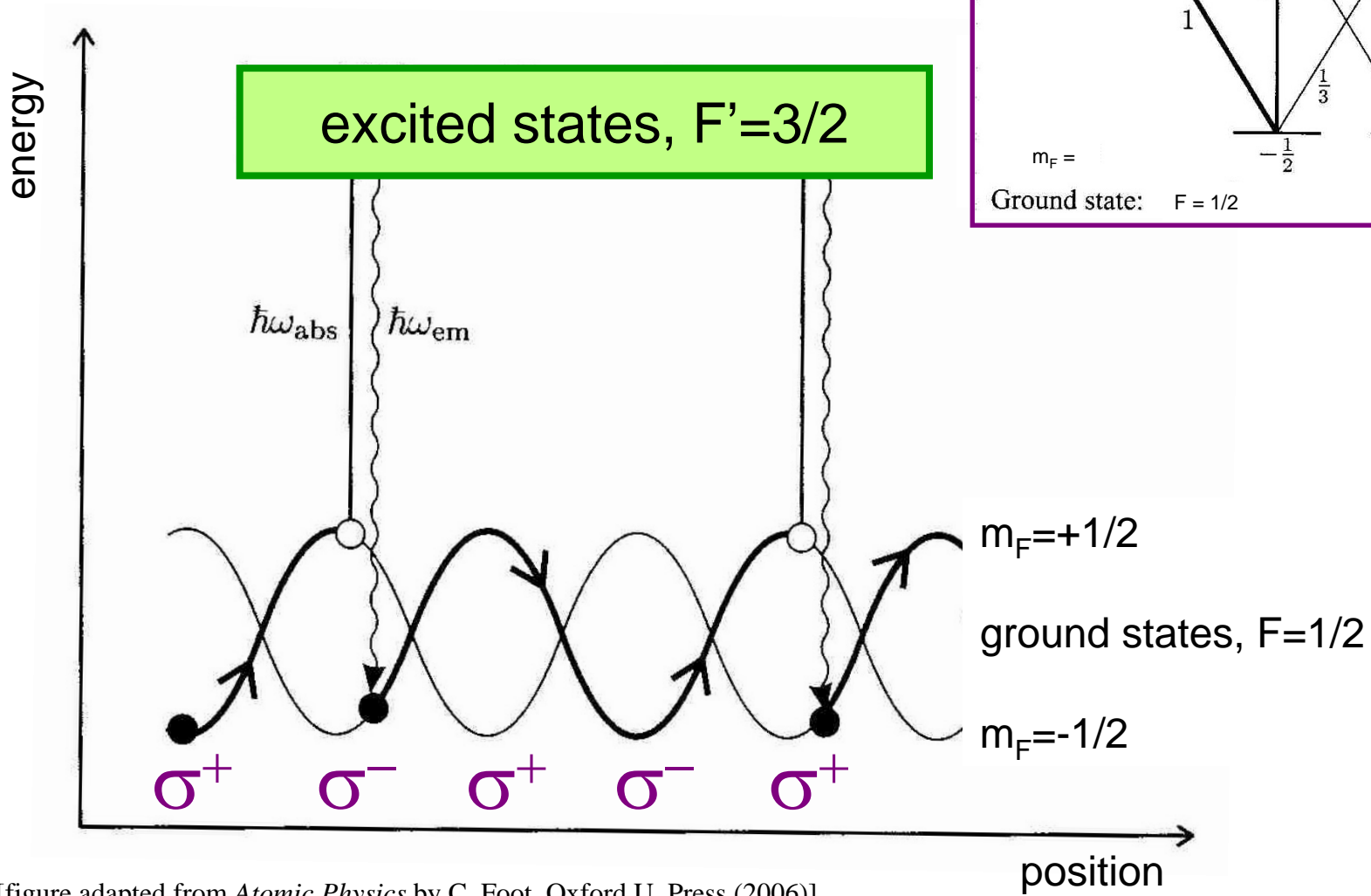


AC Stark Shift in Polarization Gradient Lattice



AC Stark shift
for red detuning

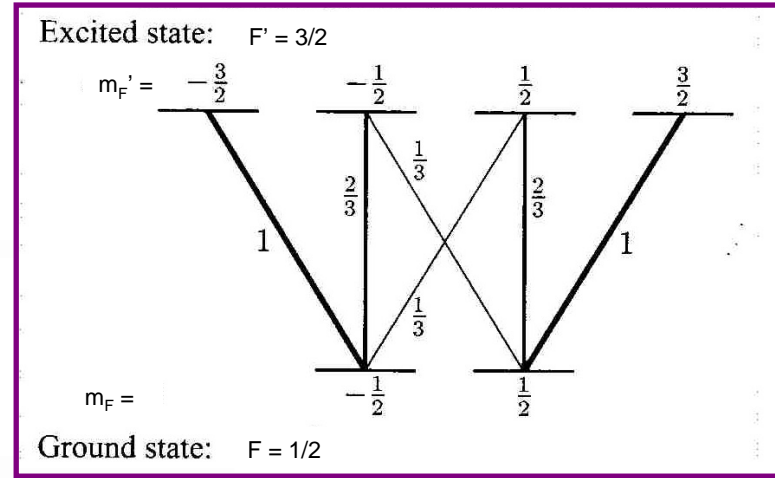
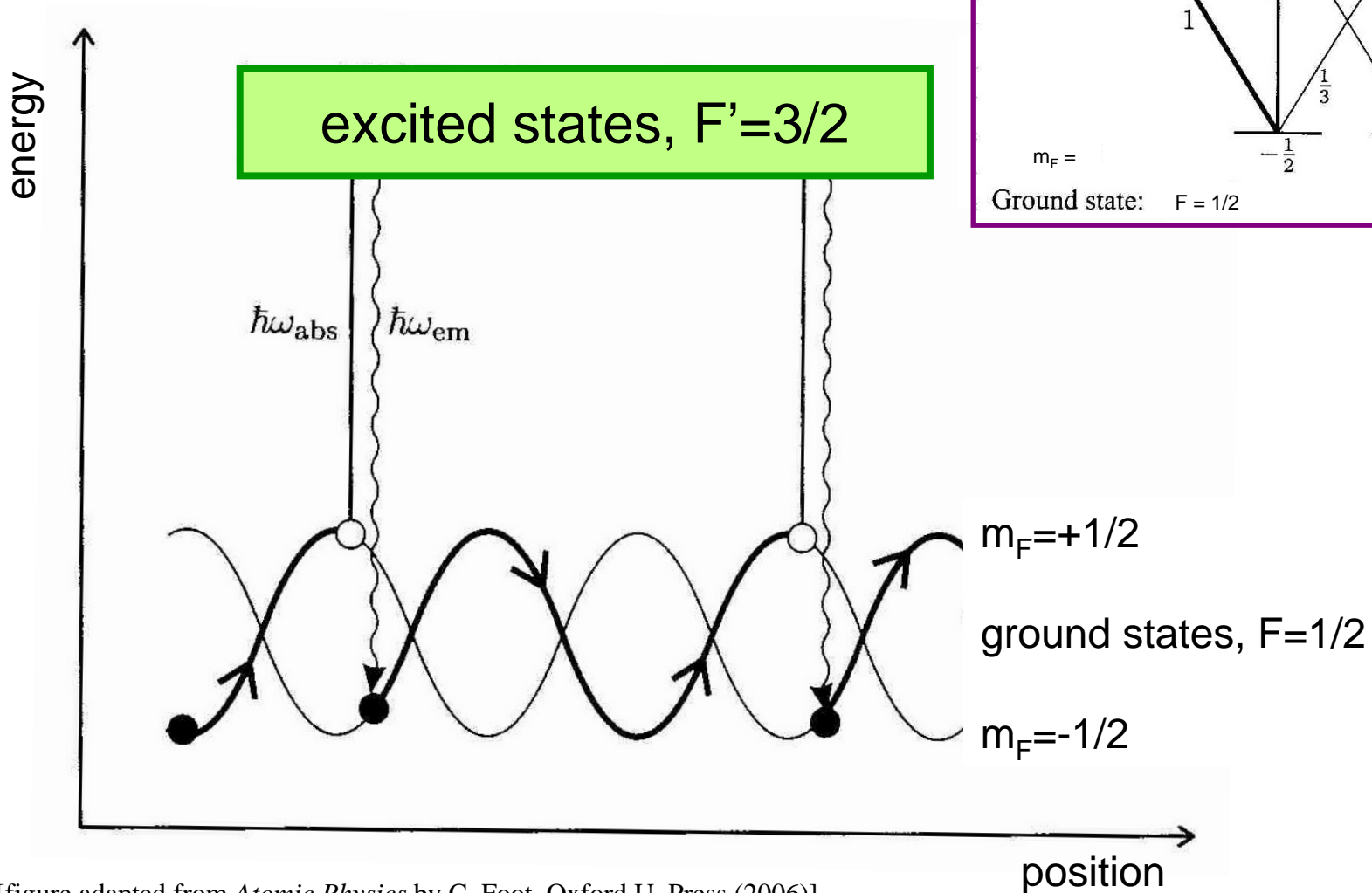
Sisyphus Cooling



[figure adapted from *Atomic Physics* by C. Foot, Oxford U. Press (2006)]

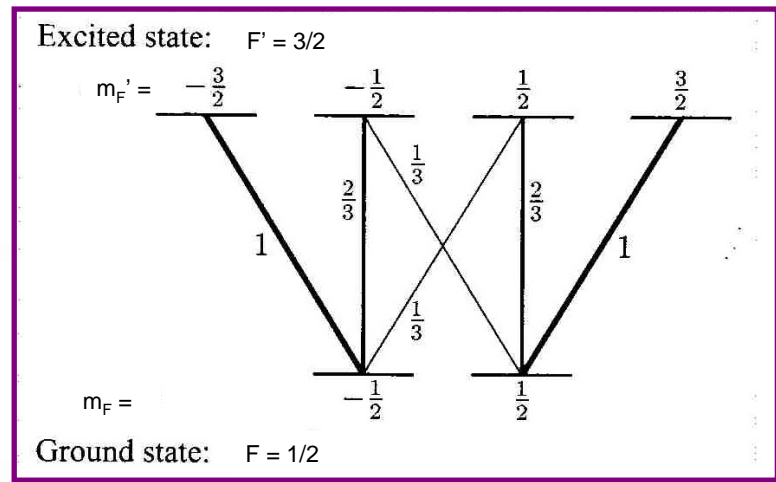
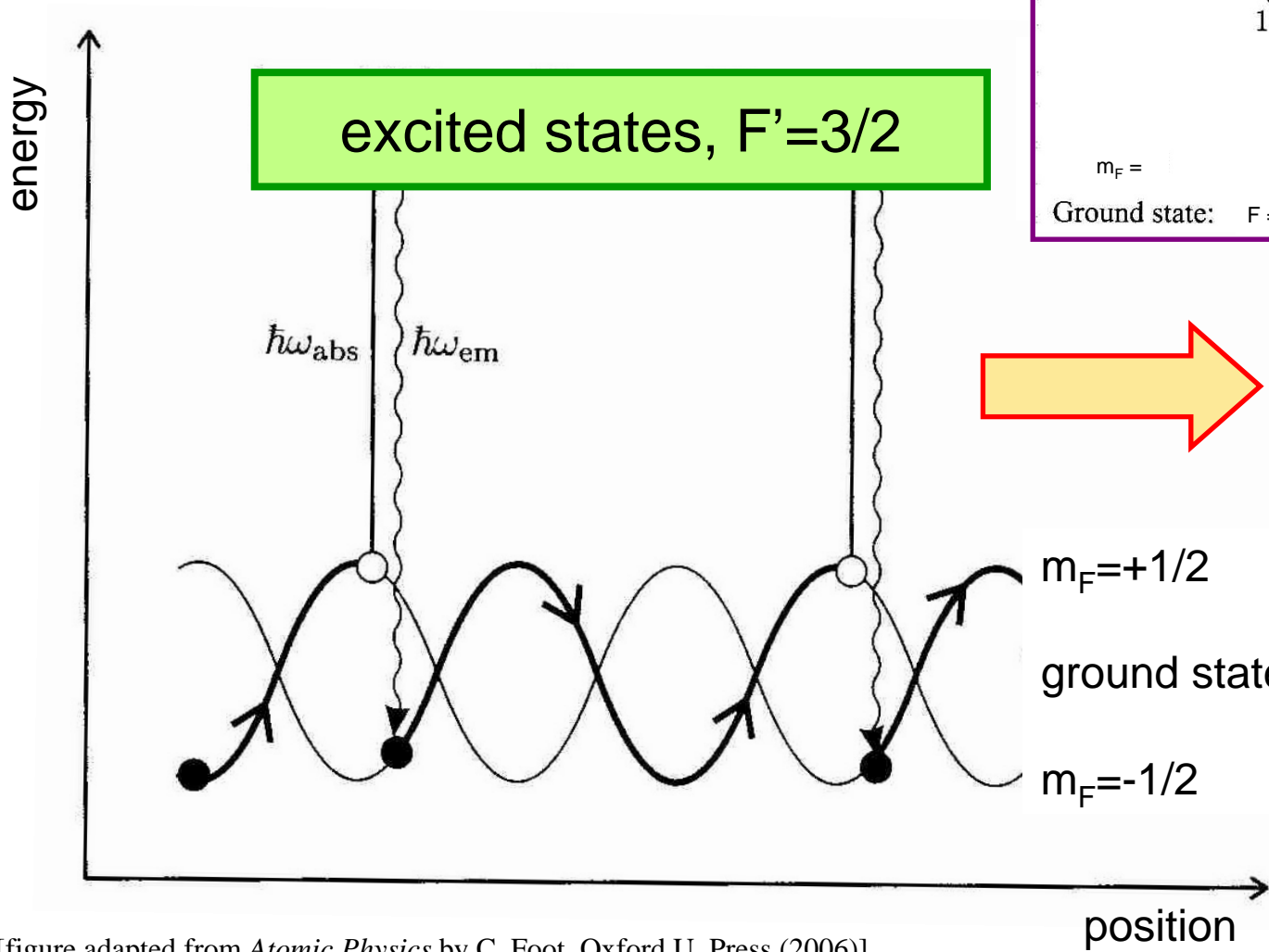
Sisyphus Cooling

Atoms that are excited at the top of a **hill** are most likely to decay to **valley**.



Sisyphus Cooling

Atoms that are excited at the top of a **hill** are most likely to decay to **valley**.



Atoms travel **uphill** most of the time
 \rightarrow cooling

[figure adapted from *Atomic Physics* by C. Foot, Oxford U. Press (2006)]

Cooling Force (Doppler + Sisyphus)

