

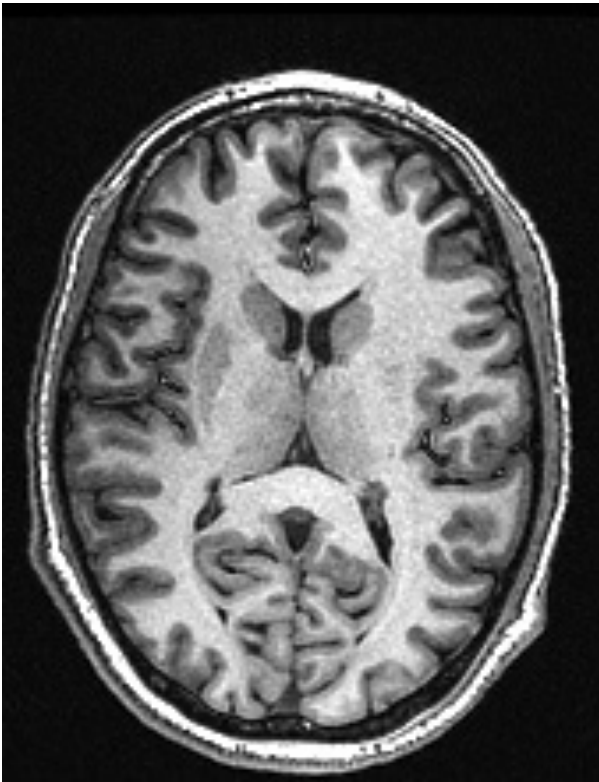


MRI pulse sequences for neuroimaging research

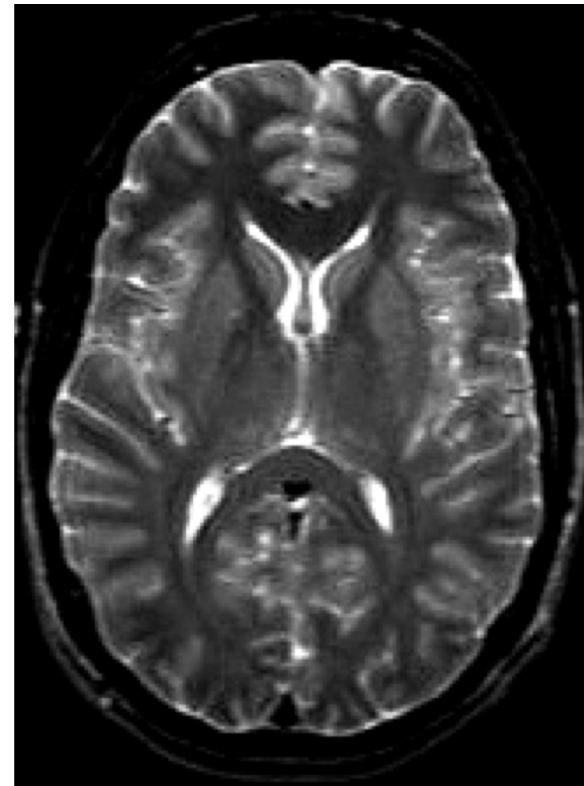
spin-echo



MRI Contrast



T1-weighted

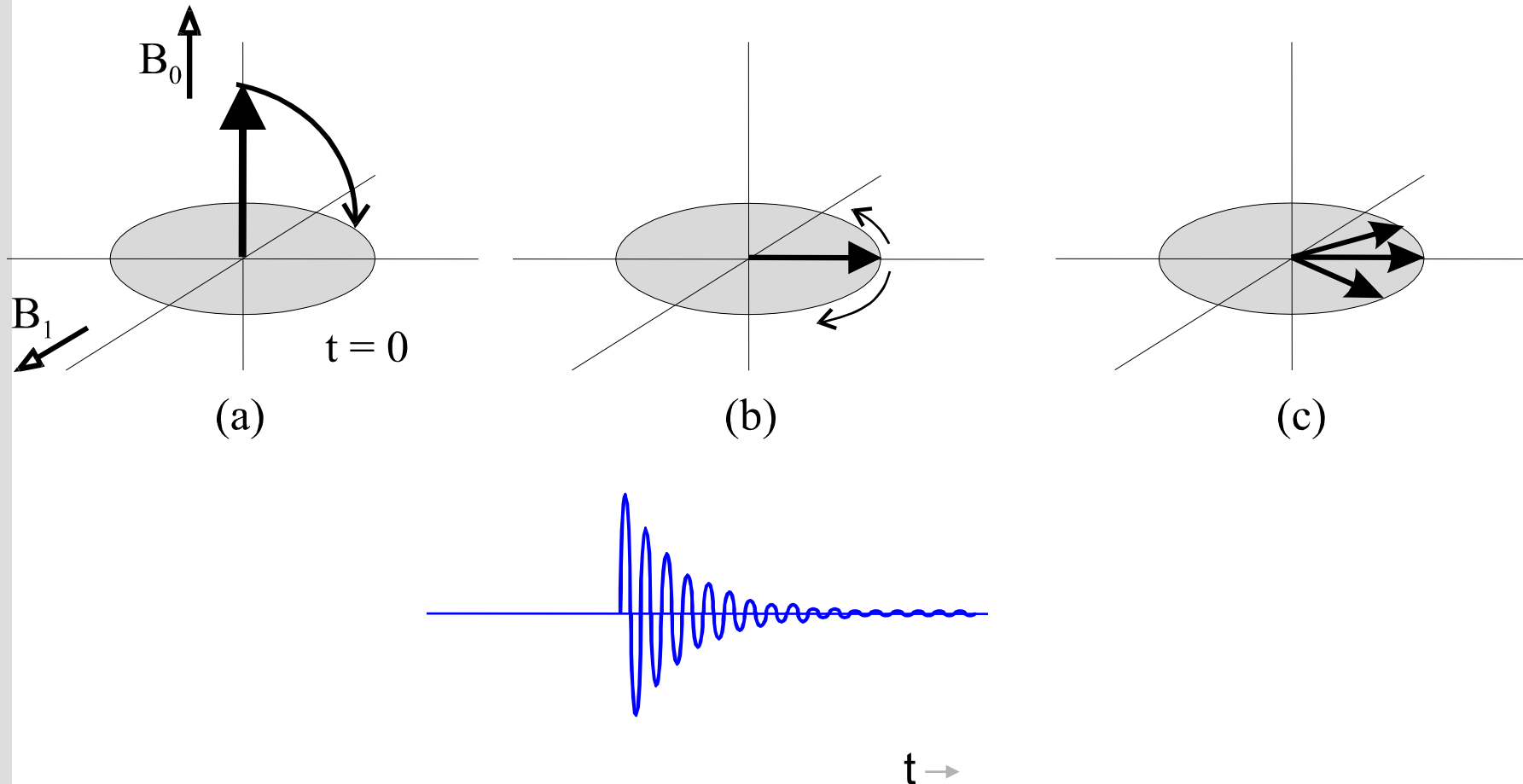


T2-weighted



Relaxation – T2

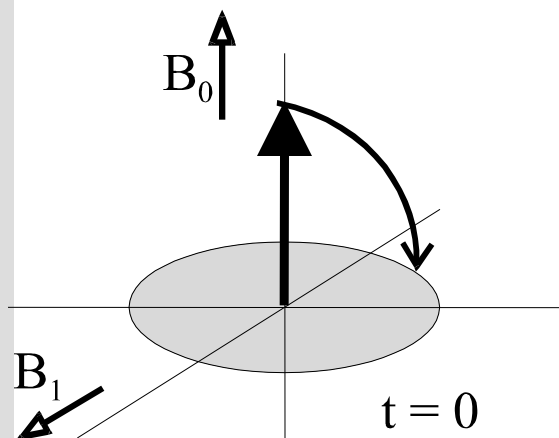
Spins get out of phase with one another (“dephase”)



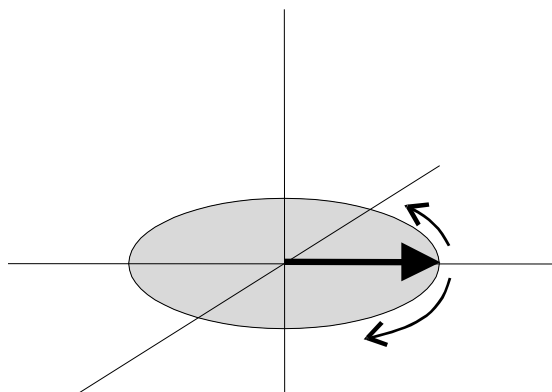


Relaxation – T_2^*

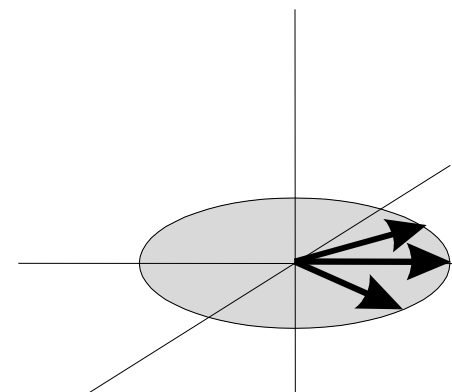
Spins get out of phase with one another (“dephase”)



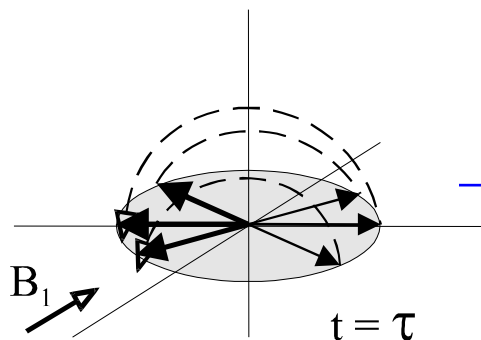
(a)



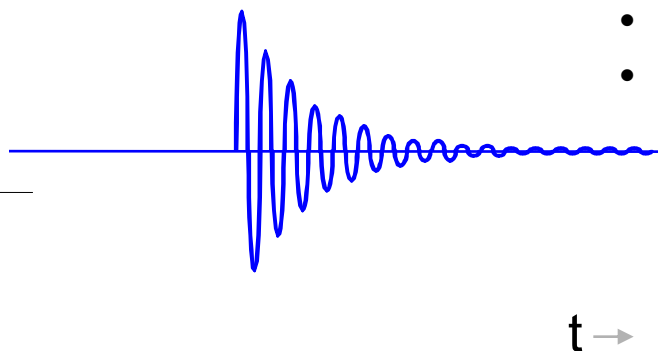
(b)



(c)



(d)

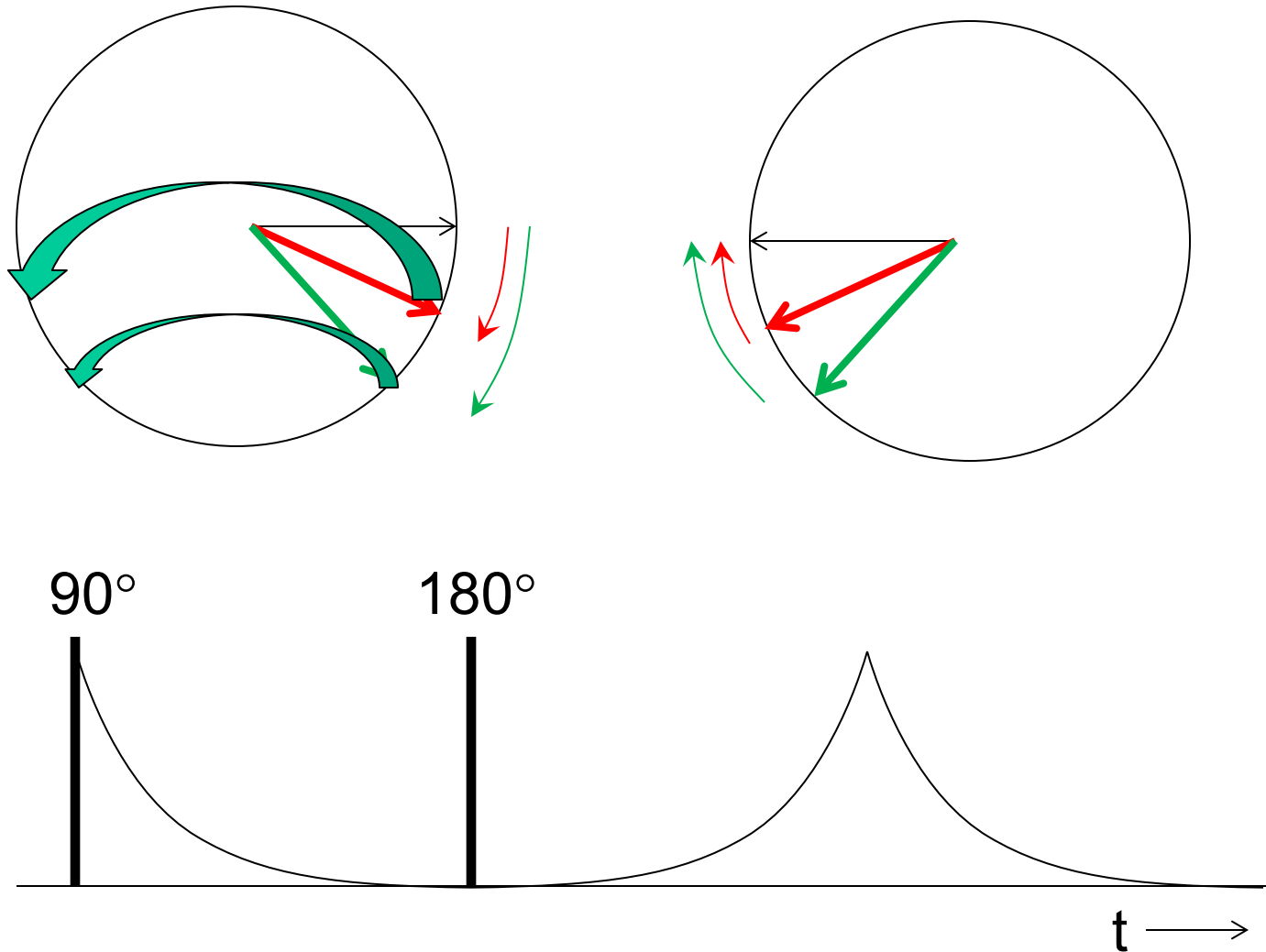


- Spin-spin interactions (T_2)
- B_0 -field non-uniformity (T_2')

$$\frac{1}{T_2^*} = \frac{1}{T_2} + \frac{1}{T_2'}$$

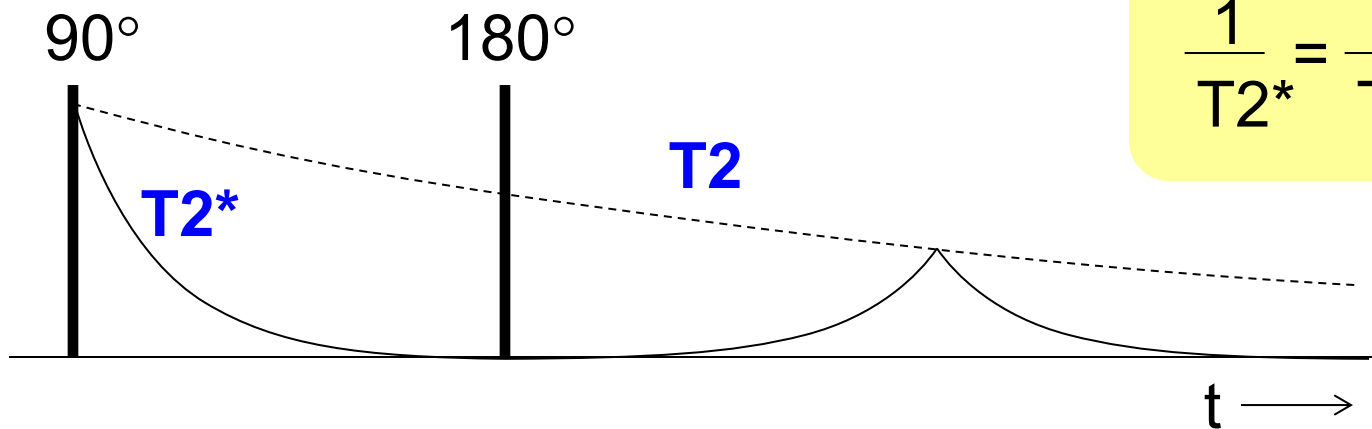
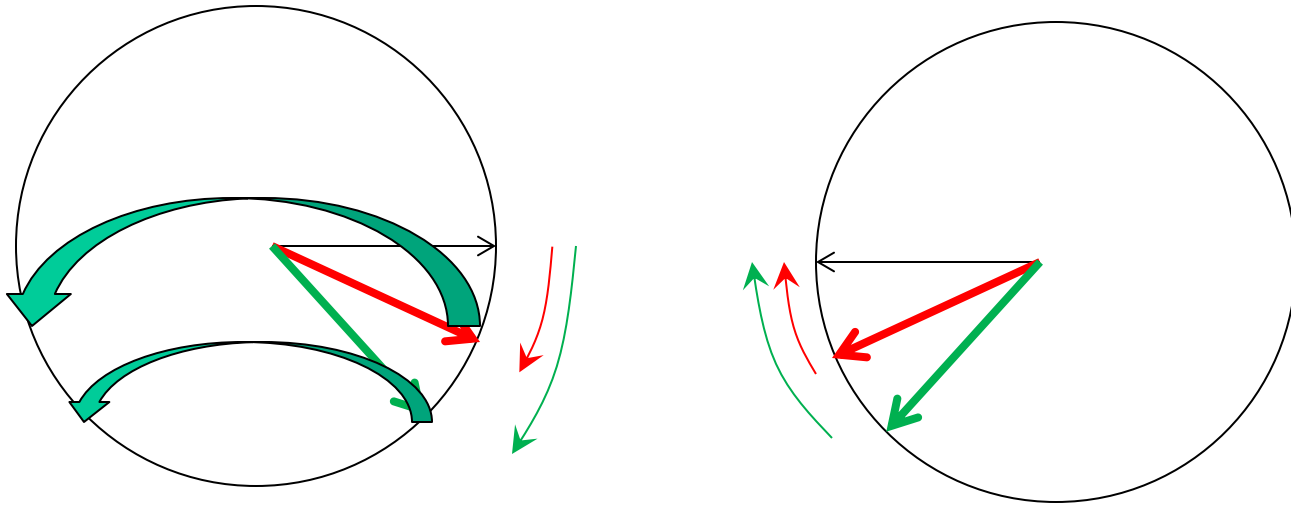


Spin Echo

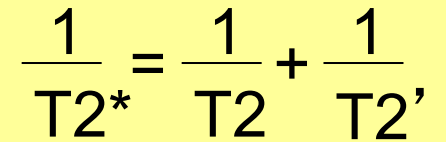




180 degree pulse

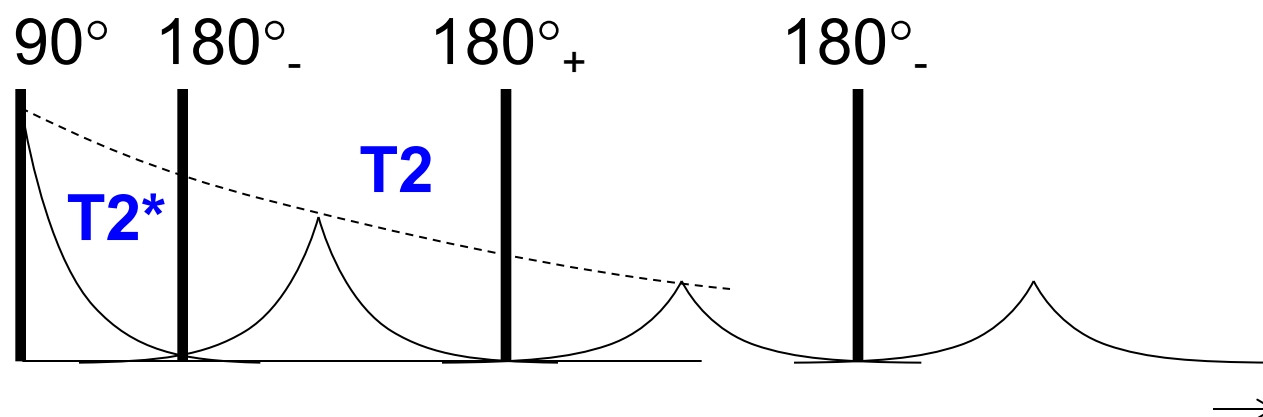


$$\frac{1}{T2^*} = \frac{1}{T2} + \frac{1}{T2'}$$





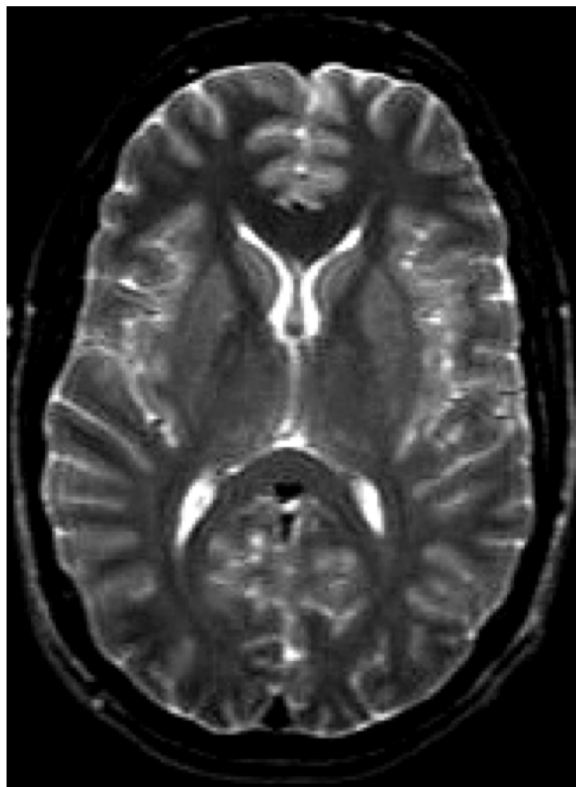
Multiple 180



CPMG = Carr, Purcell, Meiboom, Gill



Spin-echo (T2-weighted) image



T2-weighted