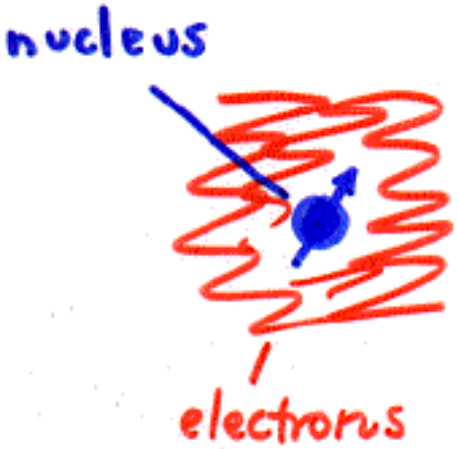
Origin of the Chemical Shift

$\omega = \gamma B$ resonant frequency is proportional to magnetic field



Electrons tend to rotate in plane perpendicular to field

Rotating electrons produce a tiny magnetic field which opposes the external field

$$B_{eff} = B_o (1 - \sigma)$$
$$= B_o - \sigma B_o$$

"chemical shift"

The electron cloud "shields" the nucleus from the applied (B_o) field, giving it a lower effective field and a lower resonant frequency. Electron-withdrawing substituents reduce electron density around the nucleus.

"De-shielding" → higher ω