

## **Pulsed-Field Gradients (PFG)**

- Technology from MRI (Medical Imaging)  
Introduced to NMR Spectroscopy in 1980's
- Hardware: Gradient Controller Board, Gradient Amplifier, Gradient Coil(s) in Probe
- Advantages:
  - Eliminates Artifacts (Artifact can be 100 X Desired Signal or More)
  - Allows Rapid Automatic Shimming
  - Greatly Reduces Time for 2D Experiments
- Briefly (~ 1 ms duration) Introduces Inhomogeneity in Magnetic Field: a Linear Gradient
- Gradient is Typically along Vertical (z) Axis
- Molecules at Top of Sample Experience Slightly Higher Field Than Molecules at Bottom
- During the Gradient Pulse, Field Varies in Smooth Linear Fashion from Top to Bottom of Sample
- This "Twists" the NMR Signal Into a Helix of Many Turns Up and Down the NMR Tube: Average is Zero
- The Gradient Can Destroy NMR Signals in this Manner, But They Can be Brought Back with Another Gradient