

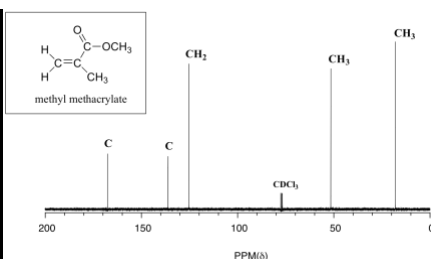
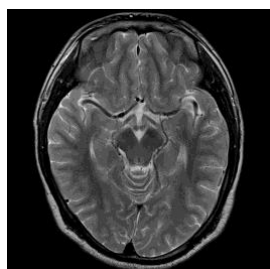


# Principles of Magnetic Resonance

## Spring 2020

### Course Description:

This course will introduce students to the fundamental principles and concepts involved in magnetic resonance with an emphasis on its seminal utility for molecular structure and molecular dynamics elucidation. The course is aimed at upper division undergraduates and graduate students in the molecular sciences (i.e., physics, chemistry, biochemistry, molecular biology and engineering). The course is intended to introduce fundamental principles and reinforce these principles with 'hands-on' Magnetic Resonance experimental and/or computational projects.



ASU-Tempe BCH/CHM 494/598

1/13-5/01, Wed, 3:05-5:50 pm

Tempe-PSH-132 & ISTB1 L2-63

Prof. Jeff Yarger – ISTB1 412

BioPchem.Education & Canvas

### Contents:

#### Part I: Modern Nuclear Magnetic Resonance (NMR)

- ❖ *Basics of NMR Spectroscopy and Spectrometer*
- ❖ *Basics of NMR Data & Interpretation*
- ❖ *Multi-nuclear and Multi-Dimensional NMR Spectroscopy*
- ❖ *MR Relaxation and Molecular Motion*
- ❖ *Small Molecule, BioMolecular & Molecular Materials NMR*

#### Part II: Introduction to Spin & Nuclear Magnetism

- ❖ *Basics of Nuclear Spin Interactions and Hamiltonians*
- ❖ *Density Matrix and Product Operator Formalisms*
- ❖ *Simulations and Computational Analysis*

#### Part III: Magnetic Resonance Imaging

- ❖ *Elements of the NMR Microscopy and MR Imaging Instrument*
- ❖ *Magnetic Field Gradients (usage in NMR vs. MRI)*
- ❖ *High-Resolution k-Space Imaging*

#### Part IV: Emerging Magnetic Resonance Techniques

- ❖ *Combining Nuclear and Electron Spin Resonance*
- ❖ *Hyperpolarization & Non-Boltzmann Spin Dynamics*
- ❖ *Neutron Spin Echoes and Diffraction*

Contact Prof. Yarger for more information. ((480) 727-3590, [Jeff.Yarger@asu.edu](mailto:Jeff.Yarger@asu.edu))