

28. Advanced Contrast Mechanisms in MRI
1 unit, Kayvan R. Keshari, November 5, 2025

Outline:

- Revisiting Relaxation contrast (T_1 , T_2 and T_2^*)
 - BOLD and ASL
- Diffusion-weighted MRI
- Contrast Mechanisms for MRI
 - Relaxation based (small and large molecules)
 - Chemical Exchange Saturation Transfer
 - Magnetic Resonance Spectroscopy/Spectroscopic Imaging
 - Multi-nuclear MRS/MRI
 - Isotope tracing
 - Hyperpolarization

Break

2 Discussion Papers:

Day, S. E. *et al.* Detecting tumor response to treatment using hyperpolarized ^{13}C magnetic resonance imaging and spectroscopy. *Nat Med* **13**, 1382–1387 (2007).

Choi, C. *et al.* 2-hydroxyglutarate detection by magnetic resonance spectroscopy in IDH-mutated patients with gliomas. *Nat Med* **18**, 624–629 (2012).

Background paper:

James, M. L. & Gambhir, S. S. A molecular imaging primer: modalities, imaging agents, and applications. *Physiological reviews* **92**, 897-965 (2012). <https://doi.org/10.1152/physrev.00049.2010>