

Physics of Magnetic Resonance Spectroscopy in Vivo, ENAS 825

Course Directors

Graeme Mason, Robin de Graaf, Henk de Feyter

Location

MRRC Conference Room (TAC-N135)

Textbook

None

Time

Mondays and Wednesdays, 11:35am-1:00pm

Objectives

At the end of the course, attendees should

- 1) understand basic NMR theory.
- 2) grasp enough of pulse sequence requirements and pitfalls to provide some critique of presentations, grants, and manuscripts.
- 3) be able to discuss MR aspects of their projects before an audience of peers or grant reviewers.
- 4) be able to perform some experimental design, including proposals of MR techniques to select.
- 5) grasp enough MRS and MRI theory to design and critique studies of their own and of others.

Topic	Lecturer	Date
<i>Basics of NMR</i> <ul style="list-style-type: none">- Nuclear Magnetization- Nuclear Induction- T₁ and T₂ relaxation- Chemical Shift	de Graaf	Sep 3
<i>MR Hardware</i> <ul style="list-style-type: none">- Magnet- Magnetic field gradients	de Graaf	Sep 8
<i>Basic MR methods</i> <ul style="list-style-type: none">- Pulse-acquire- Rotating Frame- Bloch Equations- Spin-echo and T₂* relaxation	Mason	Sep 10
<i>Basic MR processing</i> <ul style="list-style-type: none">- Fourier transformation- Phasing- Chemical shift referencing	Mason	Sep 15 Sep 17
<i>MR Hardware</i> <ul style="list-style-type: none">- Tx and Rx chains	de Graaf	Sep 22
Prescan Adjustments <ul style="list-style-type: none">- Tx power adjustment- Rx phase and gain adjustment	de Graaf	Sep 24 Sep 29

Topic	Lecturer	Date
- Shimming		
<i>Basics of MRI – 1</i> - Magnetic field gradients - K-space + FT reconstruction - GE and SE methods	Mason	Oct 1
<i>RF Pulses</i> - Conventional (sinc, Gauss) - Frequency-selective - Adiabatic	de Graaf	Oct 6
<i>Basics of MRI – 2</i> - K-space and fast MRI - MR image contrast (T ₁ , T ₂ , DTI, MTC)	de Graaf	Oct 8
<i>MR Coils</i> - Coil types - Tuning and matching - Sensitivity	Mason	Oct 13
<i>No Class: October Recess</i>		Oct 15
<i>Functional MRI</i> - BOLD - CBF/CBV	de Graaf	Oct 20
<i>Basic MRS Methods</i> - Single-Volume MRS: STEAM, PRESS, (s)LASER - Water suppression	Mason	Oct 22
<i>Question/Answer Session</i> *For questions on the problems in the notes, Drs. Mason and de Graaf are available to schedule meetings	de Graaf/ Mason	Oct 27
<i>Midterm Exam</i>	Mason	Oct 29
<i>MR Spectroscopic Imaging</i> - Outer Volume Suppression - MRSI acquisition - MRS processing and display	de Graaf	Nov 3
<i>Spectral Editing</i> - Scalar coupling - J-difference editing GABA, GSH, 2HG	de Graaf	Nov 5
<i>Advanced MR Processing</i> - Preprocessing - Integration - Spectral fitting (LCModel)	de Graaf	Nov 10
<i>X-nucleus (other than ¹H)</i>	De Feyter	Nov 12
<i>Applications of MRS: Diabetes</i>	De Feyter	Nov 17
<i>MR Safety</i>	Johnson	Nov 19
<i>No Class: November recess</i>		Nov 24
<i>No Class: November recess</i>		Nov 26
<i>Applications of MRS: Cancer</i>	De Feyter	Dec 1

Topic	Lecturer	Date
<i>Applications of MRS: Neurological disease</i>	De Feyter	Dec 3
<i>Question/Answer Sessions</i> *For questions on the problems in the notes, Drs. Mason, de Graaf, and de Feyter are available to schedule meetings	de Graaf/ Mason/de Feyter	by appt
<i>No Class: Reading Period</i>		Dec 8
<i>No Class: Reading Period</i>		Dec 10
<i>Final Exam</i>	Mason	Dec 15