

GS02 1083 - Biological and Biophysical Principles of Molecular Imaging

Lecture Days / Time / Location: T, Th, 9:00-10:30 A.M.

Recommended Textbook: "Molecular Imaging: Principles and Practice" by Ralph Weissleder, Brian D. Ross, Alnawaz Rehemtulla, and Sam Gambhir

GSBS Holidays: Martin Luther King Jr. Day (1/21), President's Day (2/18), Spring Break (3/18-3/22)

Grading: Midterm (25%), Final (25%), Student Presentation (50%)

Lecture Contact: Steven Millward (smillward@mdanderson.org)

Section	Topic	Instructor	Room	Date
	Course Introduction/Thermodynamics and Bioenergetics	S. Millward/J. Stafford	3SCR4.3202b	1/15
I.	Biological and Biophysical Principles of Molecular Imaging			
	Chemical Equilibria and Ligand Binding	S. Millward	3SCR4.3202b	1/17
	Enzyme Kinetics	S. Millward	3SCR3.3202b	1/22
	Physiochemical properties of cells, including diffusion	R. J. Stafford	3SCR4.3202b	1/24
	Metabolism: glycolysis, gluconeogenesis, Fatty Acid oxidation, anaplerosis	S. Millward	3SCR4.3202a	1/29
	Metabolism: pyruvate oxidation, TCA cycle, OxPhos	N. Millward	3SCR4.3202b	1/31
	Image-based Biological Analysis – Western Blots, IHC, Flow Cytometry, Microscopy	D. Frigo	3SCR4.3202b	2/5
II.	Nuclear Imaging			
	PET/SPECT Imaging – Theory, Instrumentation, and image reconstruction	S. Gammon	3SCR3.3202b	2/7
	CT Imaging – Reconstruction and dual energy CT	D. Cody	3SCR4.3202b	2/12
	Introduction to Radiochemistry	F. Pisaneschi	3SCR4.3202b	2/14
	Survey of PET Radiotracers	F. Pisaneschi	3SCR3.3202b	2/19
	PET imaging – Kinetic Modeling of Radiotracers	S. Gammon	3SCR6.3202a	2/21
III.	Optical and Bioluminescence Imaging			
	Genetically Encoded Reporter Strategies	D. Piwnica-Worms	3SCR6.3202a	2/26
	<i>In vivo</i> Optical Imaging	S. Gammon	3SCR4.3202b	2/28
	Intravital Microscopy	T. Liu	3SCR4.3202a	3/5
	MIDTERM EXAM		3SCR4.3202a	3/7
IV.	Magnetic Resonance Imaging and Spectroscopy			
	Nuclear Magnetic Resonance Spectroscopy and MRI	M. Pagel	3SCR4.3202b	3/12
	MRI with Endogenous contrast: T1, T2, and diffusion imaging	M. Pagel	3SCR6.3202a	3/14
	MRI with Exogenous contrast: Contrast Agents, CEST, pH Imaging, PK Modeling	M. Pagel	3SCR4.3202b	3/26
	Hyperpolarized Magnetic Resonance Spectroscopy	P. Bhattacharya	3SCR6.3202a	3/28
V.	Ultrasound, Photoacoustic Imaging, and Other Imaging Concepts			
	Ultrasound imaging – 2D, 3D, Doppler, and Photoacoustic imaging	R. Bouchard	3SCR4.3202b	4/2
	Principles of Nanoparticle Imaging	C. Li	3SCR4.3202a	4/4
	Radiomics	R. Colen	3SCR4.3202b	4/9
	Dosimetry	B. Erwin	3SCR6.3202a	4/11
	Mass Spec Imaging	E. Cressman	3SCR4.3202b	4/16
	Multimodality Imaging and Translational Imaging	M. Pagel	3SCR4.3202b	4/18
	Introduction to Interventional Radiology	E. Cressman	3SCR3.3202b	4/23
	Clinical Imaging	D. Schellingerhout	3SCR4.3202b	4/25
	Critical Analysis of Biomedical Imaging Literature	S. Millward	3SCR6.3202a	4/30
	Student Presentations	S. Millward	3SCR3.3202b	5/2
	Student Presentations	S. Millward	3SCR4.3202b	5/7
	FINAL EXAM		3SCR6.3202a	5/9

Faculty

Steve Millward, Ph.D. Assistant Professor, Cancer Systems Imaging - **Course Coordinator**

R. Jason Stafford, Ph.D. Associate Professor, Imaging Physics

Richard Bouchard, Ph.D., Assistant Professor, Imaging Physics

Niki Millward, Ph.D. Assistant Professor, Urology

Mark "Marty" Pagel, Ph.D. Professor, Cancer Systems Imaging

Seth Gammon, Ph.D. Assistant Professor, Cancer Systems Imaging

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Dianna Cody, Ph.D. Professor, Imaging Physics

Bill Erwin, M.S. Senior Medical Physicist, Imaging Physics

Dawid Schellingerhout Ph.D. Associate Professor, Diagnostic Radiology – Neuro Imaging

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