Biochemistry 801 **1/17/2011**
Biochemical Application of NMR
Spring 2011

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Tuesdays and Thursdays, 11:00 am – 11:50 am; 171B Biochemistry

Week	Lecture	Date	Lecturer	Topic
1	1	1/18	Markley	Course organization and overview
	2	1/20	Markley	Principles of NMR data collection and analysis
2	3	1/25	Markley	Chemical shifts and J-couplings
	4	1/27	Markley	NMR relaxation and molecular dynamics
3	5	2/1	Markley	NOE and exchange spectroscopy
	6	2/3	Markley	Protein thermodynamics from NMR
4	7	2/8	Markley	Protein kinetics from NMR
	8	2/10*	Westler	Hydrogen bonding
5	9	2/15	Markley	Sample preparation and isotope labeling
	10	2/17	Tonelli	Data collection strategies
6	11	2/22	Tonelli	Fast data collection strategies I
	12	2/24	Tonelli	Fast data collection strategies II
7	13	3/1	Bahrami	Automated assignment and secondary structure determination
	14	3/3*	Singarapu	Protein structure determination
8	15	3/8	Cornilescu	Residual dipolar couplings
	16	3/10	Markley	Methods for larger proteins
9		3/15	No class	SPRING BREAK
		3/17	No class	SPRING BREAK
10	17	3/22	Markley	NMR structure validation
	18	3/24	Ulrich	BioMagResBank and the Protein Data Bank
11	19	3/29*	Westler	Electron-nuclear interactions (paramagnetic effects)
	20	3/31*	Westler	Calculation of NMR observables
12	21	4/5	Markley	Hydrogen exchange
	22	4/7	Markley	Protein folding
13	23	4/12*,#	Butcher	RNA structure determination
	24	4/14*,#	Butcher	RNA dynamics
14	25	4/19	Butcher	Small angle X-ray scattering and its use in structure refinement
	26	4/21	Markley	Protein-ligand interactions and enzyme mechanisms
15	27	4/26	Markley	Membrane proteins
	28	4/28	Markley	Metabolomics
16	29	5/03	Ralph	NMR spectroscopy of plant cell walls
	30	5/05	Markley	MRI and MRS [term papers due]
The instructional team is drawn from the National Magnetic Resonance Facility at Madison and the BioMagResBank: Arash Bahrami, Sam Butcher, Gabriel Cornilescu, John Markley, John Ralph, Kiran Singarapu, Marco Tonelli, Eldon Ulrich, W. Milo Westler				
* JLM away, # ENC				

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Course format / grading:

This course consists of informal presentations by members of the instructional team and discussions. Students are encouraged to ask questions about concepts or material covered in the readings or lectures.

Grading will be on the basis of attendance, class participation, and a term paper to be turned in on the last class day.

Text / readings:

We will not use a text, although students may wish to purchase one of the recommended ones. Readings will be from the literature.

Term paper:

The term paper should be 10-20 pages and cite 10-20 recent journal articles or reviews. The topic of the paper should be chosen by 3/10/2011 and cleared in advance with John Markley so that all students taking Biochem 801 have different topics.

The topic can be chosen from the list below or can be devised by the student (with approval of John Markley). A critical analysis of the literature is what is expected.
It is suggested that the term paper topic not be too closely related to your PhD research.

Suggested term paper topics:

- Direct ^{13}C and ^{15}N spectral observation: applications to proteins
- Non uniform sampling approaches for biomolecular NMR
- Membrane proteins: NMR approaches
- Fast and ultrafast data collection strategies
- NMR investigations of intrinsically disordered proteins
- NMR fluxomics: following metabolic pathways by NMR and the use of stable isotopes