Chemistry 474: Neurochemistry CRN: 39000

Instructor:	Dr. Kelly Drew			
Office/office hrs:	104 Irving I, MWF 10-12:00			
Telephone:	474-7190			
e-mail:	kdrew@alaska.edu			
fax:	474-6967			
Lecture:	MWF 3:30-4:30, Reichardt Room 165			
Homework:	Assignments posted on course schedule are due at the beginning of the next class unless otherwise indicated. Homework turned in after the deadline will not be accepted unless arrangements are made before the homework is late. See schedule for when homework is due. Permission to hand-in HW via e-mail may be arranged in advance and will not be accepted without prior arrangements. Homework and reading assignments (other than from the text book) will be posted on blackboard			
Home-work make-up:	Attend neuroscience seminars. A write-up about a seminar will substitute for one HW assignment (peer-reviews of selected articles). Up to 3 HW assignments can be substituted by a seminar write-up.			
Course Description:	Course will cover basic and applied aspects of interneuronal signaling of specific neurotransmitter systems. Lectures will be based on chapters from assigned text as well as recent and historical literature relevant to these topics. Basic concepts introduced in lectures will be applied through guided discussion of original research papers. Students will learn to prepare "peer reviews" of selected papers. Prerequisite: BIOL F115 and CHEM F322; and PSY F335, or BIOL B417 or CHEM F470			
Course Goals:	Students should gain fundamental understanding of inter-neuronal communication and be able to apply this understanding to critical analysis of peer-reviewed literature in neurochemistry.			
Student Learning Outcomes:	 Knowledge of the following student learning outcomes will be assessed for each neurotransmitter/neuromodulator discussed using in class quizzes and exams. Ability to apply these concepts to interpretation and critical analysis of peer-reviewed research will be evaluated through homework assignments and group presentations. Homework assignments will ask students to prepare comments to authors and editors regarding strengths and weaknesses of original research manuscripts. For these assignments published papers are treated as manuscripts submitted for review. Group presentations are designed to model a laboratory research team. Each group member takes a turn playing the role of PI, graduate student or technician using a high-impact, peer-reviewed paper as the imaginary product of the research effort. Know functions and diseases associated with neurotransmitter/neuromodulator Recognize structure activity relationships and structural similarities between endogenous neurotransmitter, agonists and antagonists. Be able to address detailed mechanisms of neurochemical transmission Synthesis Storage Regulated release Receptor subtypes and effectors Termination of effect Know how to decipher a scientific paper Know how to decipher a scientific paper Know how to critically evaluate presented in formats typical of scientific papers Know how to prepare a peer-review of a submitted manuscript when invited by a journal's editor. 			
	 (Thinking like a neurochemist group project assignment) Students will be guided through oral presentations of original research towards the following objectives: Become familiar with data bases and original literature related to a topic of interest in neurochemistry 			

	 Know effective techniques for oral presentation of original research Know effective techniques for optimizing positive group dynamics and productivity as a team
	player and as a group leader.
Instructional Methods	Instructional methods will consist of about 60% traditional lecture on material from the text book and 40% discussion and interpretation of peer-reviewed literature.
Text:	Basic Neurochemistry: Molecular, Cellular and Medical Aspects by George J. Siegel (Editor), 8 th edition (if you can get it). Otherwise 7 th edition should suffice.
Other Required Reading:	Original research and review articles to be assigned
Exams and Grading:	Exams and quizzes will typically consist of a subset of review questions provided in class. There will be no make-up exams or quizzes except under extreme circumstances. If such circumstances arise notify Dr. Drew (474-7190) before the scheduled time of the exam. If a make-up exam is approved it must be completed within 1 week of the original exam. Any student suspected by the instructor of cheating on a quiz or exam may be assigned a course grade of F; course drop forms will not be signed in these cases. The letter grades assigned will be based on the overall performance of the class but will usually be in the range 90-100=A, 80-90=B, 70-79=C, 60-69=D, and below 60 is failing.
Add a book; drop a quiz option	You may choose to read one of the following books OR, journal your impressions of 3, online seminars at http://neuroseries.info.nih.gov/ and drop one quiz grade. You will be asked to hand in a book report to verify that you read the book, or turn in your journal kept while watching the seminars. <i>Molecules Of Emotion</i> : The Science Behind Mind-Body Medicine (Paperback) by Candace B. Pert; ISBN: 9780684846347 <i>Apprentice to Genius</i> : The Making of a Scientific Dynasty by Robert Kanigel; ISBN: 9780801847578
	Books by Oliver Sacks, MD (professor of neurology and psychiatry at Columbia University): <u>Awakenings The Man Who Mistook His Wife for a Hat: And Other Clinical Tales</u> , <u>Musicophilia: Tales</u> <u>of Music and the Brain</u> , <u>The Mind's Eye</u> .
Disabilities:	Students with a physical or learning disability are required to identify themselves to Mary Matthews (474-5655) in the Disability Services office, located in the Center for Health and Counseling. The student must provide documentation of the disability. Disability Services will then notify Prof. Drew of special arrangements for taking tests, working homework assignments, and doing lab work.

Assignments for Chemistry 474, Spring 2010

2 Exams (100 pts ea.)	200 pts
3 Quizzes or 2 quizzes + optional (25 pts ea.)	75 pts
Presentations of original research papers	75 pts
Comprehensive final exam	100 pts
Homework (10 pts ea.) + 10peer review	~150 pts

Course Schedule

Last Updated: 2/6/2013 5:55 PM

Date		Lecture #		Topic and Reading Assignments (Reading assignments will usually be discussed in the next class)	Hand-outs and Homework (HW is due at the beginning of the next class period after it is assigned and listed below)
Jan	20	F	1	Introduction to chemistry and the brain http://www.youtube.com/watch?v=bqkUbiUkR5k&featur e=relmfu Read http://www.nature.com/nature/journal/v467/n7319/full/nature09 510.html Review Chapter "Synaptic transmission and cellular signaling"	 HW: Write a review of <u>http://www.nature.com/nature/journal/v467/n73</u> <u>19/full/nature09510.html</u> 1.Briefly summarize the findings 2.Note what aspect of the report makes you trust the results or conclusions. 3. Note what aspect of the report makes you doubt the results or conclusions.
	23	М	2	Techniques Optogenetics <u>http://www.youtube.com/watch?v=I64X7vHSHOE</u>	HW:1. Explore professional access to topics in neuroscience and neurochemistry (Handout)2. Short essay: Is science truth?
				Immunohistochemistry http://en.wikipedia.org/wiki/Immunohistochemistry	Recommended: Lies, Damned Lies, and Medical Science http://m.theatlantic.com/magazine/archive/2010/ 11/lies-damned-lies-and-medical-science/8269/
	25	W	3	Serotonin Article 1: <u>http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3071248/?</u> <u>tool=pubmed</u>	HW: Description of Article 1 (take home message from each figure and 3 questions to address when reading the text)
	27	F	4	Discussion of Article 1 How to write a critical review of an original research paper	Form for Peer-Review of Manuscript HW: Critical review of Article 1
Jan	30	М	5	Serotonin continued Article 2: <u>http://www.sciencemag.org/content/333/6042/637.full</u> FYI: <u>http://www.sciencemag.org/content/suppl/2011/07/27/333.6042</u> .637.DC1/Ray.SOM.pdf	HW: Description of Article 2 (take home message from each figure and 3 questions to address when reading the text)
Feb	1	W	6	Discussion of Article 2 Serotonin continued Read: <u>http://en.wikipedia.org/wiki/Receptor_theory</u>	HW: Critical review of Article 2
	3	F	7	Basic Pharmacology Review: <u>http://pdsp.med.unc.edu/kidb.php</u>	HW : Hand-in 3 original research papers to consider for group presentation. Indicate impact factor of journal for each paper.
	6	М	8	Basic Pharmacology continued Read: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2784146/pdf/ni hms146111.pdf http://onlinelibrary.wiley.com/doi/10.1111/j.1749- 6632.1990.tb16915.x/pdf	

	8	W	0	Quiz 1 (take home) and meet with groups to select a paper for projects and prepare a timeline for preparing for presentation on 2/17 Read: <u>http://www.nature.com/nature/journal/v447/n7143/full/44</u> <u>7368a.html</u>	Group meeting/select paper. Title, time line and copy of paper due by end of class. Take home quiz due Friday
	10	Г	9	Read chapter on catecholamines	
	13	М	10	No class	
	15	W	11	No class	
	17	F	12	Group Presentations (1)	
	20	М	13	Using PET to image neurochemistry of the brain <u>http://www.dnalc.org/view/1152-Positron-Emission-</u> <u>Tomography-PEThtml</u> Catecholamines continued	
				Article 3: <u>http://jpet.aspetjournals.org/content/early/2012/01/03/jpet</u> <u>.111.189076.long</u> or Salimpoor et al., 2011 <u>http://www.nature.com/neuro/journal/v14/n2/full/nn.2726.</u> <u>html</u>	HW: Description of Article 3 (take home message from each figure and 3 questions to address when reading the text)
	22	W	14	Discussion of Article 3	HW: Critical review of Article 3
	24	F	15	CA continued or Small group discussion of review questions to review for Exam I ; Group meeting and select paper	HW : Hand-in 3 original research papers to consider for group presentation. Indicate impact factor of journal for each paper.
	27	М		Exam I (lectures 1-15)	
	29	W	16	Histamine Read chapter on Histamine Article 4: Espana and Scammel, 2011 <u>http://www.ncbi.nlm.nih.gov/pubmed/21731134</u>	HW : Description of Article 4 (take home message from each figure and 3 questions to address when reading the text)
Mar	2	F	17	Discuss Article 4	HW: Critical Review of Article 4
	5	М	18	Glutamate Read chapter on Glutamate	
	7	W	19	Glutamate continued Article 5: Dash et al., 2009 <u>http://www.jneurosci.org/content/29/3/620.full</u> or <u>http://www.pnas.org/content/99/22/14488.full.pdf+html?with- ds=yes</u> or State-dependent changes in astrocyte regulation of extrasynaptic NMDA receptor signalling in neurosecretory neurons <i>J Physiol August 15, 2011 589 (16) 3929-3941 (see</i> <i>link in course documents on black board)</i>	

	9	F		Glutamate finale Article 5 Scannevin and Huganir, 2000 <u>http://www.nature.com/nrn/journal/v1/n2/full/nrn1100_13</u> <u>3a.html</u> or MacGillavry et al., 2011 <u>http://www.sciencedirect.com/science/article/pii/S104474</u> <u>3111001965</u>	HW : Description of Article 5 (take home message from each figure and 3 questions to address when reading the text) NOTE that these are review papers
	<mark>12</mark>	М		Spring Break	
	<mark>14</mark>	W		Spring Break	
	<mark>16</mark>	F		Spring Break	
	19	М	20	Group Presentations (3)	
	21	W	21	Discussion of Article 5	HW: Critical Review of Article 5
	23	F	22	Glutamate finale (make up)	
	26	M	24	GABA and Glycine (Read Chapter)	
	30	F		Quiz 2	HW : Description of Article 6 (take home message from each figure and 3 questions to
				Article 6 http://ajpregu.physiology.org/content/300/2/R272.full.pdf +html	address when reading the text)
April	2	М	25	Discussion of Article 6	HW: Critical Review of Article 6
	4	W	26	Purinergic Systems (read chapter)	
	6	F	27	Purinergic Systems	
	9	M W	28 29	Exam II Read Magistretti 2009 low cost travel in neurons <u>http://www.sciencemag.org/content/325/5946/1349.full</u> Energy Metabolism in the Brain (Read chapter)	
	13	F		Hypoxic-Ischemic Brain Injury (read chapter) The Treasure Hunt Submitted by Shiree Heath, BS http://www.sfn.org/index.aspx?pagename=bavideo_winne TS How it feels to have a stroke (Jill Bolte Taylor) http://www.youtube.com/watch?v=UyyjU8fzEYU Campos et al., 2011 http://www.sciencedirect.com/science/article/pii/S135727 2511003013	
	16	М	30	Hypoxic-Ischemic Brain Injury continued	HW : Hand-in 3 original research papers to consider for group presentation. Indicate impact factor of journal for each paper.
	18	W	31	Peptides (Read chapter)	
	20	F	32	Peptides continued Read Harwood 2011 <u>http://www.sciencedirect.com/science/article/pii/S002839</u> 0811005144	Group meeting/select paper. Title, time line and copy of paper due by end of class.

	23	М	33	Endocannabinoids	
	25	W	34	Endocannabinoids and energy regulation Gamage and Lichtman, 2012 <u>http://onlinelibrary.wiley.com/doi/10.1002/pbc.23367/pdf</u>	
	27	F	35	Gaseous neurotransmitters (NO, CO, H ₂ S) Kilduff et al., 2011 <u>http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3014438/?</u> tool=pubmed	
	30	М	36	Group Presentations (3)	
		W	37	Quiz 3	
		F	38	Review	
May	7 3:15		5:15	Comprehensive Final Exam	
					All make up assignments are due, 10:00 am Grades must be posted by May 16, 12:00pm