NSCI 400: Neuroscience Seminar: Mind, Brain, Eyes, and Ears

Instructor: Prof. Leslie Kwakye
Wednesdays 1:30-4:20pm, Science Center A247

Contact Information:

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Office Hours: T 11-12:30pm, Th 2-3:30pm, or by appointment

General helpful reading material (on reserve at the Science Library):

- Sensation and Perception (8th Edition) by E. Bruce Goldstein
- Neuroscience (5th Edition) by Purves et al.
- Scientific Integrity (3rd Edition) by Francis L. Macrina
- Successful Scientific Writing (2nd Edition) by Janice R. Matthews et al.
- The Elements of Style (4th Edition) by William Strunk Jr. and E.B. White
- A manual for Writers of Research, Papers (7th Edition) by Kate L. Turabian
- Career Advice for Life Scientists by Elizabeth Marincola
- Grant Writing for Dummies (2nd Edition) by Bev Browning
- Perfect Personal Statements (3rd Edition) by Mark Alan Stewart
- Glossary of Misused Words & Phrases by Frank Grazian

Course Description and Objectives:

Our perception and understanding of the world around us is inextricably tied to the information arriving through our senses. This seminar will focus on how sensory perceptions are formed in the brain and how these perceptions interact with our daily living. Topics will include how the neural processing of sensory information contributes to our appreciation of art and music, how our perceptions are shaped throughout development and by experience, how information from different senses are combined, and how disruptions in sensory perception can impact and contribute to neurological and psychiatric disorders.

The senior seminar course is designed to challenge students in their final semester at Oberlin. The course will focus on the implications of the neural processing of sensory input to daily living; yet will draw on the information and skills that you have developed in the neuroscience courses that you have taken so far. The principle aim of this course is to help you develop your skills in several different forms of scientific communication, namely oral and written presentation skills.

A secondary goal is for the students to obtain an understanding of the current state of research in the field. Thus, students will be required to read and critique the primary scientific literature.

Finally, neuroscience is a growing discipline; this advancement of knowledge has several implications for society in general. We will discuss several ethical dilemmas that are facing neuroscientists.

We will also discuss skills relevant to pursuing a career in the field of neuroscience. It is hoped that these discussions will complement the assigned work in preparing you for what lies ahead – and your participation and candor are critical to achieving that goal.

Assignments and Grades Breakdown:

Presenting: 35%

- Group Presentation: 15%
- Career Building Presentation: 5%
- Outline & Presentation: 5%
- Poster Presentation: 10%

Journal Club: 20%

- I-IV (5% each)

Writing: 35%

- Annotated Bibliography: 3%
- Hypothesis: 1%
- Section Drafts: 6% (2% each)
- Final NRSA: 25%

Participation: 10%

- Attendance (10% off participation grade for every unexcused absence; more than one unexcused absence = failure)
- DQ's (4%)
- Participation (6%)

Group Presentation (15%):

Groups of three students will present on a chosen topic area in sensory neuroscience for approximately 1 hour. The presenters will then lead a discussion of the topic for the remaining 20 minutes. Suggested reading has been provided above for different topic areas. All three students must agree on one presentation topic/theme and are encouraged to choose a topic of interest and importance that may or may not be listed in the above-suggested readings. Presenters are encouraged to look over the suggested reading and to find additional reading. Presenters must identify one to two review articles/chapters of particular interest or importance to assign to the remaining classmates by the Friday before their presentation. The content of each presentation will vary by topic and by presenter's interests; however, the presentation much have a strong and consistent focus on sensory neuroscience. Presenters will have to email Prof. Kwakye their chosen topic for approval at least one week before their presentation. Additionally, presenters will be required to discuss the methodological approaches specific to their topic area and maintain a balance between animal and human studies where appropriate. You will be graded individually on the clarity, appropriateness of the content, interest generated for your presentation, and ability to facilitate and stimulate a lively discussion.

Journal club written assignment (10%):

Prof. Kwakye and the students will decide on 4 key and exciting peer reviewed articles that encompass the central theme of sensory neuroscience. Both animal and human studies will be represented in the articles where appropriate. These scientific articles will be investigations by different groups of researchers that use different approaches to investigate research questions in the interest area of the seminar class. Every member of the class will be expected to read the article prior to class and prepare discussion points/ideas for that class. Following completion of reading the article, students will be required to provide answers to the following questions pertaining to the assigned article:

Journal Club Written Assignment Questions

i) Identify key reasons why the authors investigated the scientific questions.
ii) Examine the hypothesis being tested.
iii) Suggest other alternative hypotheses that could possibly refute and/or modify the authors' hypothesis based on what you know in (i).
iv) What are the strengths and weaknesses of the methodology used to test the hypothesis?
v) Critically evaluate the results in the context of the hypothesis.
vi) Identify the implications of the experimental findings in the field of neuroscience and especially sensory neuroscience.
(vii) Propose new future directions/ experiments not mentioned in the authors' discussion section of the article.
(viii) Based on your understanding of the assigned article and answers to the questions above, creatively compose a discussion question that will stimulate an insightful, respectful, and lively discussion amongst your colleagues in the seminar.

All written assignments are due on Blackboard in the journal club assignment folder by noon on Wednesday (the day of the journal club). Your written assignment should be no more than one page in length, single-spaced, half-inch margins, 11 pt font. Written assignments submitted after noon will receive a grade of zero.

Journal club presentation and discussion (10%):

Students must come to the seminar prepared to discuss any aspect of the assigned article including provision of a detailed background of the research study, proper understanding and critiquing of the methodology, results, conclusions, future directions, and contribution of the scientific findings to our knowledge of sensory neuroscience. Depending on the nature of the article, students will split into PROS vs CONS groups and participate in an informal, lively, and exciting debate moderated by Prof. Kwakye.

Career building presentation (5%)

As rising seniors in the neuroscience department, hopefully most of you may have already seen the light at the end of the tunnel. While it is exciting to envision graduation in just a few short months, there is also the sense of curiosity and nervousness of career opportunities available in the "real world" with a degree in Neuroscience that might loom around your thoughts. The aim of the career building presentations is to allow students to do a literature search and present their findings on diverse career backgrounds and avenues that their impending Neuroscience bachelor's degree would allow them to seek. Due to the seminar and discussion nature of the class, students will be responsible for educating the class and interacting with the class during their Powerpoint presentations. At the first day of class, Prof. Kwakye will pass around a sign-up sheet with a list of possible career paths available for undergraduate students with a solid foundation in Neuroscience to choose from and present to the class. It is important to note that NO TWO STUDENTS can present on the same career topic. For each career building presentation day highlighted in the syllabus, three students will present on different career paths in Neuroscience to the class in a Powerpoint format for 13-15 minutes followed by 5-7 minutes brief discussion sections for EACH student.

Students are highly encouraged to show enthusiasm during their presentations and educate the class on their chosen career paths, while highlighting the systematic academic requirements. Students are allowed to discuss any other ideas or new findings that they come across during their literature search pertaining to the chosen career.

National Research Service Award (NRSA) Grant Application (25%):

Scientific writing and grantmanship is tremendously important to the life of a scientist. Like most writing, scientific writing is about being able to communicate effectively and clearly express your ideas. We will develop your scientific writing skills throughout the semester through a series of workshops (each tailored to a specific component of the NRSA), a draft of each component due throughout the semester, and evaluations from me and your classmates of the component drafts. Your drafts will receive a grade based upon the effort that you put into writing them (counts toward your final grade) and a grade which reflects what your final NRSA would receive if no edits were made (does not count toward your final grade). This grade will almost certainly be lower than you'd like since you will be receiving so much feedback and guidance before your final submission. You MUST turn your drafts in by the due date and put in as much effort and thought as you would for a graded final paper. Drafts handed in late will result in a zero on the draft assignment and a 2-points per day late deduction in your final grade for the NRSA. Additionally, any draft that clearly demonstrates a lack of effort or thought will a lower grade for the draft assignment and may result in a maximum deduction of 5 points from your final NRSA grade. Greater thought and effort put in for your drafts will result in more precise and helpful feedback from me, so it's to your advantage to write the drafts to the best of your ability.

Maximum 7 pages (single spacing, half inch margins, 11 pt font), plus the title page and citations.

Outline presentation (5%)

Students will be required to give a 10-12 minutes Powerpoint presentation followed by 5 minutes questions/discussion on the outline or "skeleton" of their chosen NRSA topic area. The goal of this exercise is to help students present the original ideas of their grant to the class and seek feedback from their colleagues and Prof. Kwakye. The presentation should be a maximum of seven Powerpoint slides and include the following:

- Background of research topic
- Importance of the coined novel research idea(s)
- Overarching Hypothesis
- Specific Aims
- Methods that will be used to test your overarching hypothesis
- Expected Results
- How will your proposed research idea(s) better contribute to our understanding of sensory neuroscience?

Poster Presentation (10%):

Each student will create a poster using his or her hypothesized results based on their grant application (see above). For your poster, you will be allowed to do the following:

i. Use a maximum of two published data (figures, images, etc) from an article most relevant/influential to your NRSA
ii. Create two to three figures of your expected data
iii. Have methods, results, conclusions, future directions, references, and acknowledgement sections on your poster just as you would in a "real" poster session.

We will have a "poster session" in class during which you will present your poster and discuss it with your classmates.

You are to hand in a copy of your poster on 8 ½ X 11 paper to Prof. Kwakye by noon of May 8th, 2013.

Prof. Kwakye will upload a poster template on blackboard that can be used to create your poster.

Evaluations (NRSA components and all presentations):

The evaluation of fellow scientist's research ideas and writing as well as general presentation skills is a critical component to every scientist and academician's career. Similarly, the ability to incorporate constructive feedback to improve scientific writing and presenting is a necessary skill; therefore, you will evaluate your classmates for their group, career building, outline, and poster presentation through surveys filled out and dropped off in the provided "evaluation box" immediately at the end of class. The specific questions for the evaluation will be provided to you well in advance. Additionally, you will evaluate your classmates' NRSA component drafts in teams during the allotted workshop times in class. Your insightful and helpful evaluations to the student whom you are evaluating will be appreciated; however, student evaluations will not factor into the grade of the student being evaluated. In addition, Prof. Kwakye will meet with each student presenter either immediately after the seminar if their schedule permits or schedule an appropriate time to meet for 5-10 minutes to provide constructive and helpful feedback on their presentations. A summary of the evaluations will be sent to

the student presenter along with his/her grade. You are strongly encouraged to consider incorporating your classmates' suggestions into future presentations and your final NRSA.

Participation and discussion questions (10%):

Because this is a discussion-based class, attendance is mandatory. Any unexcused absence will result in deductions from your final grade. Please inform me at the beginning of the semester if you know that you will miss a class during the semester. Participation credit from a missed class can be made up by submitting a one page summary/discussion of an assigned article by Prof. Kwakye or by attending one of the neuroscience seminars this Spring 2013 semester and submitting a one page summary/discussion report of the background, methodology, findings, conclusions, and your proposed future studies in that area of neuroscience based on what you learned from the seminar. If the missed class was due to a graduate school, medical school, job, etc. interview, giving a fifteen minutes presentation on any relevant research (neurodevelopmental and neurological disorders) that was discussed during the interview can make up the participation.

Active class participation is also vital for the class and for your development as a neuroscientist; therefore, you are expected to consistently, meaningfully, and enthusiastically participate in class discussions and debates. Additionally you will be required to thoroughly read all required material prior to class and submit one discussion question per session based on your reading via the discussion board on blackboard by noon on the day of the class meeting

The discussion questions will be graded on a 0, -✓, ✓, +✓ system with the following grading scheme:

- Submitted questions showing a lack of understanding of the reading:

-✓ worth 1 point on blackboard grading center

- Submitted questions showing an understanding of the reading:

✓ worth 2 points on blackboard grading center

-Submitted questions showing an understanding of the reading and a thoughtful examination of the implications of the reading:

+✓ worth 3 points on blackboard grading center

Discussion questions submitted after the deadline will receive a grade of zero.

In order to receive credit for this course, all students must complete all written assignments, oral presentations, and class discussions

Late Policy:

Late submissions will not be accepted or will be heavily penalized. Everyone will receive two automatic extensions of three days on the written assignments of their choosing . You should notify Prof. Kwakye in advance (and at least 24 hours before the assignment due date) when you wish to use one of your extensions. No additional extensions will be granted. The due date and time for the final NRSA is set by the Dean's office and cannot be turned in late without prior approval.

Guidelines for Class participation

1. Respect others' rights to hold opinions and beliefs that differ from your own. Challenge or criticize the idea, not the person.
2. Listen carefully to what others are saying even when you disagree with what is being said. Comments that you make (asking for clarification, sharing critiques, expanding on a point, etc.) should reflect that you have paid attention to the speaker's comments.
3. Be courteous. Don't interrupt or engage in private conversations while others are speaking.
4. Support your statements. Use evidence and provide rationale for your points.
5. Allow everyone the chance to talk. If you have much to say, try to hold back a bit; if you are hesitant to speak, look for opportunities to contribute to the discussion.
6. If you are offended by something or think someone else might be, speak up and don't leave it for someone else to respond to it.
   http://www.crlt.umich.edu/gsis/P4_1.php

The Oberlin College Honor Code

The Oberlin College Honor Code applies to written assignments and presentations for this course.

- You are expected to reference all sourced material.
- You must write your assignments in your own words and your NRSA must contain novel ideas (i.e., experiments that have not yet been conducted in other laboratories).
- You may not look at other students posted discussion questions prior to submitting your own; however, you are encouraged to discuss the readings with classmates prior to class and to review other submitted discussion questions after submitting your own.

You can access the complete Honor Code via Blackboard (go to the tab Lookup/Directories > Honor Code). Before turning in each of your assignments you will be obliged to write the honor pledge and sign it. The honor pledge is: "I affirm that I have adhered to the Honor Code in this assignment."

Students with Disabilities

The college will make reasonable accommodations for persons with documented disabilities. Students should notify the Office of Disability Services located in Peters G-27/G-28 (440)-775-5588 and their instructor of any disability related needs during the first week of classes so that your learning needs can be appropriately met. You will need to provide documentation from the Office of Disability Services.

A few comments on course etiquette

Policy on tardiness*:* Please arrive to class on time. In the event that you are late, please enter as quietly as possible.

Technology etiquette: Please refrain from using laptops, tablets, etc while in the classroom. Also, please ensure that your cell phones, pagers, etc. are turned off during class time. If there is a compelling reason why you need to have these devices on, please talk to me about it in advance.

Email etiquette**:** You are encouraged to contact me via email for questions that do not require expansive answers. If questions require more than a few lines I will direct you to visit me during office hours or to schedule an appointment.

Suggested Readings by topics:

Multisensory integration

- The Merging of the Senses by Stein and Meredith: Chapters 1, 8-11
- Shimojo, S, Scheier, C, Nijhawan, R, Shams, L, Kamitani, Y, Watanabe, K (2001) Beyond perceptual modality: Auditory effects on visual perception. Acoust. Sci. & Tech. 22(2): 61-67
- Calvert, GA, Thesen, T (2004) Multisensory Integration: methodological approaches and emerging principles in the human brain. Journal of Physiology-Paris 98 (3): 191-205
- Talsma, D, Senkowski, D, Soto-Faraco, S, Woldorff, MG (2010) The multifaceted interplay between attention and multisensory integration. Trends in Cognitive Sciences 14 (9): 400-410
- Alais, D, Newell, FN, Mamassian, P (2010) Multisensory Processing in Review: from Physiology to Behaviour. Seeing and Perceiving 23: 3-38
- Ghazanfar, AA, Schroeder, CE (2006) Is neocortex essentially multisensory? Trends in Cognitive Sciences 10(6): 278-285

Development and plasticity

- Principles of Neuroscience (4th edition) by Kandel, Swartz, and Jessell: Chapter 56
- Neuroscience (4th edition) by Purves et al: Chapter 23 and 9 (plasticity section)
- Sensation and Perception (8th edition) by Goldstein: Chapter 16
- The Cognitive Neurosciences (4th edition) by Gazzaniga: Chapters 6, 8, and 24
- Keuroghlian, AS and Knudsen, EI (2007) Adaptive auditory plasticity in developing and adult animals. Progress in Neurobiology 82: 109-121

Speech and Language

- The Student's Guide to Cognitive Neuroscience by Jamie Ward: Chapters 10,11
- Neuroscience (4th edition) by Purves et al: Chapter 27
- Neuroscience: Exploring the Brain (2nd Edition) by Bear, Connors, and Paradiso: Chapter 20
- Principles of Neuroscience (4th edition) by Kandel, Swartz, and Jessell: Chapter 59
- The Cognitive Neurosciences (4th edition) by Gazzaniga: Chapter 52
- Rauscheckler, JP, Scott, SK (2009) Maps and streams in the auditory cortex: nonhuman primates illuminate human speech processing. Nature Neuroscience 12: 718-724
- Scott, SK, Wise, RJS (2003) PET and fMRI studies of the neural basis of speech perception. Speech Communication 41: 23-34
- Scott, SK, Johnsrude, IS (2003) The neuroanatomical and functional organization of speech perception. TRENDS in Neurosciences 26(2): 100-107
- Peelle, JE, Johnsrude, IS, Davis, MH (2010) Hierarchical processing for speech in human auditory cortex and beyond. Frontiers in Human Neuroscience 4: 1-3

Neurological disorders

- Marco, EJ, Hinkley, LBN, Hill, SS, Nagarajan, SS (2011) Sensory Processing in Autism: A Review of Neurophysiologic Findings. Pediatric Research 69 (5): 48R- 54R
- Zeffiro, T, Eden, G (2000) The neural basis of developmental dyslexia. Ann Dyslexia 50 (1): 1-30
- Zarachi, O, Attias, J, Gothelf, D (2010) Auditory and Visual Processing in Williams Syndrome. Isr J Psychiatry Relat Sci 47(2): 125- 131
- Javitt, DC (2009) When Doors of Perception Close: Bottom-up Models of Disrupted Cognition in Schizophrenia. Annu. Rev. Clin. Psychol. 5: 249-275
- Hubbard, EM (2007) Neurophysiology of Synesthesia. Curr Psychiatry Rep. 9(3): 193-199
- Whitton, JP, Polley, DB (2011) Evaluating the Perceptual and Pathophysiological Consequences of Auditory Deprivation in Early Postnatal Life: A Comparison of Basic and Clinical Studies. Journal of the Association for Research in Otolaryngology 12: 535-546
- Merabet, LB, Pascual-Leone, A (2010) Neural reorganization following sensory loss: the opportunity of change. Nature Reviews Neuroscience 11: 44-52
- Moore, DR, Shannon, RV (2009) Beyond cochlear implants: awakening the deafened brain. Nature Neuroscience 12: 686-691

Music and art

- Peretz, I, Zatorre, RJ (2005) Brain Organization for Music Processing. Annu. Rev. Psychol. 56: 89-114
- Baeck, E (2002) The neural networks of music. European Journal of Neurology 9: 449-456
- Rauschecker, JP (2001) Cortical Plasticity and Music. Annals of the New York Academy of Sciences 930: 330-336
- Zatorre, RJ (2003) Music and the Brain. Annals of the New York Academy of Sciences 999: 4-14
- Zeki, S (1999) Art and the brain. Journal of Consciousness Studies 6(6-7): 76-96
- Jacobsen, T (2010) Beauty and the brain: culture, history and individual differences in aesthetic appreciation. J. Anat. 216: 184-191
- Brown, S, Gao, X, Tisdelle, L, Eickhoff, SB, Liotti, M (2011) Naturalizing aesthetics: Brain areas for aesthetic appraisal across sensory modalities. NeuroImage 58: 250-258
- Nieminen, S, Istok, E, Brattico, E, Tervaniemi, M, Huotilainen, M (2011) The development of aesthetic responses to music and their underlying neural and psychological mechanisms. Cortex 47 (9): 1138-1146

Date	**Class number**	**1st section**	**2nd section**	**Assignment Due**
Feb 6th	1	General Intro/Icebreaker	Library Search	**None**
Feb 13th	2	Presenting Workshop	Ethics Discussion I	**Grant Topic** **DQ**
Feb 20th	3	Journal Club I	Career Building I	**JC**
Feb 27th	4	Career Building II	Scientific Writing Workshop	**Ann. Bib.** **DQ**
Mar 6th	5	Group Presentation I	Hypothesis Workshop	**Hypothesis**
Mar 13th	6	Outline Presentations	Outline Presentations	**Outline**
Mar 20th	7	Group Presentation II	S.A. Workshop	**S.A.** **DQ**
Mar 27th	Spring Break	Spring Break	Spring Break	**Spring Break**
Apr 3rd	8	Journal Club II	Ethics Discussion II	**JC** **DQ**
Apr 10th	9	Career Building III	B&S Workshop	**B&S**
Apr 17th	10	Journal Club III	Posters Workshop	**JC**
Apr 24th	11	Group Presentation III	Methods Workshop	**Methods** **DQ**
May 1st	12	Journal Club IV	Ethics Discussion III	**JC** **DQ**
May 8th	13	Posters	Posters	**Posters**
May 18th			*Due by 9pm	**Final Grant**