Table of Contents

Departmental Directory ........................................ 2-4
Neurosciences at CWRU ....................................... 5-8
Program Requirements ......................................... 8-10
Courses .......................................................... 11-13
Examinations ..................................................... 13-14
Change of State Notification ................................. 14
Research Integrity ............................................... 14-15
Guidelines for Thesis Research ............................... 15-18
Master of Neuroscience Degree ............................... 18
Current students ................................................ 18-19

*please send any corrections for the handbook to Katie Wervey (kar18@case.edu)*
Last updated: 9/2015
PRIMARY FACULTY

Dr. Heather Broihier
School of Medicine E714
Office Phone # 368-4326
Lab Phone # 368-0657
Kendall Hoover (kmh125)
Nan Liu (nxl23)
Colleen McLaughlin (cnm37)
James Sears (jcs141)

Dr. Evan Deneris (esd)
Interim-Chair
School of Medicine E648
Office Phone # 368-8725
Lab Phone # 368-8724
E640, E638, E636
Lauren Donovan (lxd156)
Katherine Lobur (kjl16)
Meredith Sorenson (mas87)
Dr. (William) Clay Spencer (wcs53)
Steven Wyler (scw58)

Dr. David Friel (ddf2)
School of Medicine E647
Office Phone # 368-4930
Lab Phone # 368-1915

Dr. Roberto Galan (rgf8)
School of Medicine E725
Office Phone # 368-0811
Yenan Zhu (yxz107)

Dr. David Katz (dmk4)
School of Medicine E712
Office Phone # 368-6116
Lab Phone # 368-6179
Ian Adams (ita)
Cody (James) Howell (cjh33)
Erica Kimmick (exk257)
Min Lang (mxl609)
Michael Sceniak (mps43)

Dr. Lynn T. Landmesser (lt)
Emeritus
(E643A) E627-Lab
School of Medicine E653
Office Phone # 368-3996
Lab Phone # 368-4896
Katherine Lobur (kjl16)
Yuka Maeno Hikichi (yxm29)

Dr. Gary Landreth (gel2)
School of Medicine E649
Office Phone # 368-6101
Lab Phone # 368-3453; E651
Brad Casali (btc8)
Dr. Angela Corona (awc25)
Taylor Jay (trj29)
Colleen Karlo (jck2) E640
Donna Kirsch (djk15)
Dr. Monica Marrianna (mxm534)
Caitlin Quigley (cqk)
Rebecca Skerrett (rsc96)

Dr. Robert Miller
(rhm3@gwu.edu)
Adjunct
School of Medicine E721
Lab Phone # 368-6170
Alex Sargent (ags60)

Dr. Jerry Silver (jsx10)
School of Medicine E661
Office Phone # 368-2150
Lab Phone # 368-5574(E658)
Jared Cregg (jmc205)
Marc DePaul (mxd359)
Amanda Tran (apt26)
Jingqiang (Bruce) You (jxy268)

Dr. Ben Strowbridge (bxs48)
School of Medicine E659
Office Phone # 368-6974
Lab Phone # 368-1041
Dr. Richard (Todd) Pressler (rtp)
Dr. Hannah Armon
Edward Qui

Dr. Bruce Trapp
(trappb@ccf.org)
Cleveland Clinic Foundation
Building NC30
9500 Euclid Avenue
Cleveland Ohio 44195
Office Phone # 216-444-7177
Lab Phone # 216-444-8712

Dr. Daniel Wesson (dww53)
School of Medicine E643D
Office Phone # 368-6100
Lab Phone # 368-3499 E643
Kaitlin Carlson (ksc46)
Dr. Marie Gadziola (mag188)
Katie Tyler (kat85)

Dr. Richard Zigmond (rez)
School of Medicine E701
Office Phone # 368-4614
Lab Phone # 368-4615
Dr. Angela Filous (arn29)
Jane Lindborg (jal89)
Alicia Lisowitz (aal39)
Jon Niemi (jpn34)
SECONDARY FACULTY

Kumar Alagramam (kna3)
Otolaryngology
Lakeside 7123
Office Phone # 216-844-7261.

Susann Brady-Kalnay (smb4)
Molecular & Microbiology
School of Medicine W214b
Office Phone # 368-0330
Kelsey Herrmann (kah136)

Matthias Buck (mxb150)
Physiology & Biophysics
School of Medicine E646
Office Phone # 368-8651

Sudha Chakrapani (sxc584)
Physiology & Biophysics
School of Medicine E621
Office Phone #368-8732
Nicolaus Schmandt (nts21)

Hillel Chiel (hjc)
Biology 301
Office Phone # 368-3846

Thomas Dick (ted3)
Pulmonary/Critical Care, UH
BRB 319
Office Phone # 368-8637

Dominique Durand (dxd6)
Biomedical Engineering
Wickenden 112
Office Phone # 368-3974

Paul Ernsberger (pre)
Nutrition, Dental School 201
Office Phone # 368-4738

Pingfu Feng (pxf25)
Pulmonary/Critical Care, UH
VA Medical Center
Office Phone(VA)
791-3800x5620

Christopher Ford (cpf21)
Physiology & Biophysics
SOM E619
Office Phone # 368-5519
Aphrodit (Didi) Mamaligas (aam45)

Anthony Jack (aij2)
Cognitive Science
Crawford 609
Office Phone # 368-6996

Joseph LaManna (jcl4)
Neurology
BRB 525
Office Phone # 368-1112

Bruce Lamb (btl) (Adjunct)
Genetics
BRB 7th Floor
Office Phone # 368-2979

Brian McDermott, Jr. (bmm30)
Otolaryngology
Wean Bldg., Room 452
Office Phone # 216-844-6036

Maureen McEnery (mwm4)
General Medical Sciences
School of Medicine W-G 11
Office Phone # 368-3377

Elizabeth Pehek (eap6)
Psychiatry
VA Medical Center-Brecksville
Office Phone # 440-526-3030

Robert Petersen (rpb)
Pathology
Institute of Pathology 204
Office Phone # 368-6709

Roy Ritzmann (rer3)
Biology
Biology Building 207
Office Phone # 368-3554

Corey Smith (cbs16)
Genetics & Genome Sciences
BRB 721
Office Phone # 368-6225

Man-Sun Sy (mns92)
Pathology
BRB 9th Floor
Office Phone # 368-1268

Ruth Siegel (res7)
Pharmacology
School of Medicine W319
Office Telephone # 368-5554
Lab Phone # 368-6024

Nicolaus Schmandt (nts21)
Biology
Biology Building 207
Office Phone # 368-3554

Paul Tesar (pjt5)
Pathology
BRB 9th Floor
Office Phone # 368-1268

Erik van Lunteren (evx4)
Pulmonary/Critical Care, UH
VA Medical Center
Office Phone # 791-3800

Nicole Ward (nwl4)
Dermatology
BRB 526
Office Phone # 368-1111

Shasta Sabo (sls79)
Pharmacology
School of Medicine W305C
Office Phone # 368-5683
ADMINISTRATIVE OFFICE
School of Medicine E653

Narlene Brown (nrb)
Administrative Manager
Office Phone # 368-6253

Katie Wervey (kar18)
Graduate Student Coordinator/Assistant to Chair
Office Phone # 368-6252

Pam Capasso (pam7)
Grants Management Specialist
Office Phone # 368-6251
**Neurosciences at CWRU**

The Department of Neurosciences, located in the East Wing of the CWRU Medical School, offers graduate education and postdoctoral training in a wide range of disciplines in modern neuroscience. Training is provided through a combination of research, course work and seminars. The department hosts weekly seminars, journal clubs, a social hour, and invites talented undergraduates to participate in research over the summer. Thesis research opportunities are available with more than 20 faculty members working in areas such as development of motor and sensory systems, regeneration, pathfinding by axons, neurogenetics, regulation of neurotransmitter expression, neuron-glial interactions, synaptic physiology and plasticity, ion channel biophysics and information processing. In the last decade, our department has consistently ranked in the top fifteen percent of Neuroscience programs nationwide in NIH funding (2005 Case ranked 14th in NIH funding). One feature of the Department that makes it particularly attractive is the highly interactive atmosphere, characterized by extensive collaborations among laboratories and with other investigators.

Neurosciences Department Office: SOM E653  
Phone: 216-368-6251  FAX: 216-368-4650  
Web site: [http://neurosciences.case.edu/](http://neurosciences.case.edu/)

**Training Philosophy**

Graduate education in Neurosciences at CWRU addresses many aspects of the science profession, and involves both formal coursework and informal interactions. Both faculty and students prosper when students are considered as promising junior colleagues, deserving dedicated guidance from the scientific community.

"The Doctor of Philosophy degree is the highest academic degree granted by North American universities. It is a research degree and is to be distinguished from other doctorates such as the M.D., J.D. or Ed.D. degrees, which are designed for professional training or which focus on applied rather than basic research.... The Doctor of Philosophy degree is designed to prepare a student to become a scholar, that is, to discover, integrate and apply knowledge, as well as communicate and disseminate it...The program emphasizes the development of the student's capacity to make significant original contribution to knowledge in a context of freedom of inquiry and expression." -Council of Graduate Studies

Neuroscientists today require many skills to succeed in a competitive environment. Our Neuroscience students can expect training in 1) scientific excellence, with close interactions with faculty advisors leading to an understanding of problem-solving, critical analysis of data and modern technical approaches, 2) communication skills, including practice and advice in the analysis of contemporary literature, grantsmanship, and oral presentations and 3) Ethics, to make complex decisions on authorship, data handling, and intellectual property.

**Student Activities.** Graduate students are expected to initiate and participate in a variety of activities having to do with professional growth:

**Departmental Representatives to Case programs.** All departments contribute to the CWRU Graduate Student Senate (http://gss.case.edu/) that discusses issues that affect graduate students. The current listing of Neuroscience representatives to the GSS can be obtained by contacting Katie Wervey.
Journal Clubs and Seminars. Journal clubs and seminars offer an opportunity to learn about broad areas of Neuroscience, and form an important part of graduate training. All students, postdoctoral fellows and faculty are expected to attend both the Journal Club Mondays at noon (SOM E646) and the Neurosciences Seminar Thursdays at noon (BRB105 unless otherwise specified). Students are strongly encouraged to actively participate by asking questions at seminars and journal clubs. Dr. Richard Zigmond (rez) organizes the seminar schedule and Dr. Gary Landreth (gel2) organizes the journal club calendar.

To gain oral presentation skills, students should make formal presentations to the Neuroscience community at least once a year, after practice with their faculty advisors. Students in the first 3 years may elect to present a current research article. Students in the third year or later can select alternatively (with consultation of their faculty advisor) to give a presentation on their research. Faculty offer constructive criticism to the student directly following the presentation.

Two students will be selected each year, by vote of the Graduate Education Committee, to be honored for either "Best Presentation by a Pre-candidacy Graduate Student" or "Best Presentation by a Doctoral Candidate". Awards for these achievements, in the form of a certificate, will be presented upon the first journal club of the following academic year.

Meeting outside speakers for lunch. Students and postdoctoral fellows are encouraged to meet with visiting speakers at lunch following the noon seminar. This is a good opportunity to practice talking about science in a concise, interesting way. Further, it offers a means to get to know the speaker, his/her institution and to discuss scientific strategies or collaborations. To meet with a speaker, contact the student lunch coordinator to reserve a free lunch. A student should seek to meet with at least 4 speakers a year.

Student-sponsored departmental speaker. One speaker a year is selected and sponsored by the graduate students in the Department. Visiting faculty are honored by this distinction and are very accessible to students during the visit. Faculty input about candidates is encouraged to ensure that "student-friendly" speakers are selected. Students create the schedule for the speaker, arrange lunch with students and postdocs, introduce the speaker at the seminar, create a department-wide dinner with the speaker, are responsible for transit to and from the airport and hotel reservations.

Graduate Student Symposium. The graduate students in the biomedical sciences organize a symposium once a year that includes student posters and a keynote speaker invited by students. The faculty advisor for this program is David MacDonald. Many student issues are represented by the National Association of Graduate and Professional Students (http://www.nagps.org/).

Attending national meetings. Students are encouraged to present their work at national meetings once a year. The most appropriate meetings may be the Society for Neurosciences Annual Meeting or a Gordon Conference. Students should compete for individual travel grants as well as funds from training grants. MSTP students often can get partial reimbursement for meeting costs if they present a poster or talk at a scientific meeting.
Recruitment of prospective graduate students. Often the most candid view of our program comes from current students, and that viewpoint is very valuable to prospective students. Students host prospective students from other institutions during the Spring recruitment weekend, and serve as ambassadors of the institution and program.

Individual Predoctoral Support. Once accepted, graduate students who train with Neurosciences Department P.I.s are guaranteed stipend support by the Department for five years if they remain in good standing. Support for additional years may be provided but requires an individual petition. Students who choose to train with P.I.s outside the Department of Neurosciences should note that tuition and stipend support will be the responsibility of the training P.I. and his/her department. A letter of support is required from the training P.I. and chair of department stating that tuition and stipend will be guaranteed for at least five years. This letter must be received by the Department of Neurosciences before a student begins training with the chosen P.I. Stipend support may derive from NIH training grants, NIH individual research grants, federal and private research grants and university resources. Tuition is generally paid by the training faculty member’s primary department. It is highly advantageous for students to successfully compete for individual grant support from extramural sources, and the department strongly encourages such applications. Neuroscience students have been successful in obtaining National Research Scholar Fellowships from the NIH (please see http://grants.nih.gov/grants/guide/notice-files/NOT-OD-07-052.html) and the American Heart Association (please see http://www.americanheart.org/presenter.jhtml?identifier=2457#Predoc). Note that several agencies require applications early in graduate training. The Office of Graduate Education maintains a list of graduate funding opportunities http://casemed.case.edu/gradprog/grantsources.html.

Graduate Stipend and Benefits
Full time registered Neuroscience students are eligible for tuition and stipend support (see above). The stipend level is currently $27,500 for twelve months for the 2015-2016 academic school year. Stipends are funded by NIH training grants, NIH individual research grants, federal and private research grants and university resources. In August, 2000, the Dean of Graduate Studies informed students that "... income tax will be withheld only on the stipend portion of compensation (stipend plus tuition) charged to federal research grants." Note that students may also be required to pay local taxes if they live outside the city of Cleveland. Information can be obtained from each municipality. The Department pays for student health services. A copy of the CWRU Medical Plan for Students can be obtained at the University Health Services, 2145 Adelbert Road.

Program Policy for Trainees whose faculty advisor moves to another institution
In the event that a PhD trainee’s advisor moves to another institution the program policy concerning continuation of training of a trainee in the program at CWRU is as follows. PhD trainees who have completed less than three years of training will not be permitted to continue training in the Neuroscience’s PhD program. Trainees who have completed at least three years of training will be permitted to continue training pending review and written approval of the trainee’s thesis research progress by the trainee’s thesis committee and the training program’s Graduate Program Advisor. If a trainee is granted approval to continue in the program, the Department of Neurosciences will discontinue responsibility for the trainee’s stipend and tuition support after the departure of the
trainer. To continue as a Neurosciences trainee at CWRU while at another institution, the trainee’s advisor must provide, prior to his/her departure, an official written contract from the advisor’s new institution stating that it will assume full financial responsibility for the trainee’s stipend and tuition. The trainee must arrange to meet regularly with his/her thesis committee to present progress according to the guidelines described in the handbook for all PhD trainees. The advisor must return to physically meet with the trainee and the thesis committee every 6 months. Any deviations from this policy must be approved by the departmental Chair.

University Health Service 216-368-2450
Appointments:
  General Clinic 216-368-4539
  Women’s Clinic 216-368-2453
  Mental Health 216-368-2510
  University Counseling Service 216-368-2510

Neurosciences Program Requirements
It is the responsibility of the student to become familiar with the general rules and regulations of the University (available in the General Bulletin, http://www.case.edu/bulletin/) as well as the specific rules which apply for the course of study in Neuroscience (this document).

The Neurosciences Graduate Student Advisor (GSA) is
Dr. Gary Landreth
E649 (SOM)
368-6101; gel2@case.edu

The GSA oversees graduate training in the Neurosciences Program. The GSA is available to discuss progress and provide advice on course selection. The GSA also coordinates student activities and serves as a student advocate should difficulties arise.

All students must submit a Planned Program of Study (PPOS) by the end of their 2nd semester through the Student Information System (SIS) by using the "Course Planner" and "My Program" tabs (the basic curriculum will be given to new students at their initial meeting with the GSA when they first arrive to the department. Credit hours should never exceed 9 hours in any semester since aid is not available for anything above 9 credit hours). If a student fails to submit a PPOS during the required time frame, a registration hold will be placed on the student's account. A revised program of study must also be submitted via the SIS when any change in the original plan occurs. Questions about the PPOS can be directed to the Graduate Studies Office at gradadmit@case.edu, (216) 368-4390.

Registration for classes is also done on-line in SIS.

Most students arrive July 1 and immediately begin a lab rotation. Because the summer session is not encumbered by coursework, often this rotation is an excellent laboratory experience. In the fall, students generally enroll in the correlated curriculum in cell biology (CBIO453) and molecular biology (CBIO455) and pursue lab rotations.
Students are required by the University to take 36 semester hours of graduate courses before advancing to candidacy; this includes required courses, advanced electives and 601 research. **At least 24 hours must be graded.**

**Neurosciences Ph.D. Program Requirements:**
- CBIO 453 Cell Biology I
- CBIO 455 Molecular Biology I
- IBMS 500 Being a Professional Scientist (Ethical issues in science research seminar)
- NEUR 402 Principles of Neural Sciences
- NEUR 415 Neurosciences Seminar Series
- NEUR 419 Critical Thinking in Neuroscience (beginning spring 2014)
- NEUR 540 Advanced Topics in Neuroscience Ethics
- Elective graduate courses
- Neurosciences Journal Club
- A minimum of 18 hours of NEUR 701 thesis research

**Suggested Course of Ph.D. Study**

**Year 1 Fall**
- CBIO 453 Cell Biology 1 (4 credits)
- CBIO 455 Molecular Biology 1 (4 credits)
- NEUR 601 Research in Neuroscience (1 credit)

**Year 1 Spring**
- NEUR 402 Principles of Neuroscience (3 credits)
- Elective graduate course (3 credits)
- NEUR 415 Neuroscience Seminars (1 credit)
- NEUR 601 Research in Neuroscience (1 credit)
- IBMS 500 On being a professional scientist (1 credit)

Summer
- Complete preliminary exam by July 31
- Begin thesis research

**Year 2 Fall**
- Elective courses (6 credits)
- NEUR 601 Research in Neuroscience (3 credits)

**Year 2 Spring**
- NEUR 419 Critical Thinking in Neuroscience (3 credits)
- Elective Courses (3 credits)
- NEUR 601 Research in Neuroscience (3 credits)

Complete Qualifier Exam by July 31
- Form thesis committee
- Research
- Prepare individual fellowship application

**Year 3 Fall**
- NEUR 701 Research in Neuroscience (3 credits)
- Thesis Committee Committee Meetings every 6 months
Year 3 Spring
NEUR 540 Advanced Topics in Neuroscience Ethics (0 credits)
NEUR 701 Research in Neuroscience (3 credits)
Thesis Committee Meetings every 6 months

Year 4+
NEUR 701 Research in Neuroscience (3 credits each Fall and Spring Semester until 18 credits are reached. Once a student has 18 credits, they are required to register for 1 credit hour each fall and spring semester until graduation)
Thesis committee meetings every 6 months

Summer Sessions: Students must register for (0) credit hours of RSCH 750 (Summer Research) every summer using Denise Douglas as the instructor, unless you are going to defend in the summer; in this case, please see Katie.

Medical Science Training Program (MSTP)
MSTP students in the neuroscience program are expected to complete the requirements for MSTP students as outlined in the MSTP guidelines. The general guidelines and performance expectations for MSTP students in the neuroscience program are identical to those for graduate students. MSTP students are required to take NEUR 402 Principles of Neuroscience, NEUR 419 Critical Thinking in Neuroscience, and 3 other elective courses, at least one of which is in Neurosciences. Students are encouraged to take Neuroscience graduate courses during the first two years of medical school. In particular, in light of medical school curriculum changes, it is advised that MSTP students complete NEUR 402 during year 1 of medical school. In general, students are encouraged to take a graduate school elective course in year 2 of medical school, while also preparing for the USMLE step 1. In keeping with MSTP, each student must have a member of the MSTP steering committee and one MD or MD/PhD. on the thesis committee. The MSTP steering committee member for Neurosciences is Dr. Jerry Silver (jxs10).

Laboratory Rotations and Selection
One of the most important decisions a student makes is the choice of a faculty advisor. To obtain experience in different laboratories, students must complete a minimum of three rotations, each lasting at least 6 weeks, during the Fall semester. Students are encouraged to start rotations July 1 to allow sufficient time to complete three rotations by the end of the Fall semester. Additional rotations are permitted during the early spring term if the student has not matched with an advisor and laboratory. These rotations give students a diverse introduction to approaches for studying neural function and serve as the basis for choosing a laboratory for the Ph.D. thesis. A student should realize that 20-25 hours per week of laboratory work are expected during the semester. A 3 page rotation report describing the project and a rotation evaluation form must be prepared at the conclusion of each rotation. After the form is completed, the student and faculty advisor meet to discuss comments. Copies of the rotation report and signed evaluation form are submitted to the graduate program advisor, the Neurosciences Office (give to Katie), and the BSTP Office (for BSTP students). This is the student's responsibility. All three rotation reports must be completed and evaluation reports signed before the preliminary examination can be scheduled.

By the end of the second semester, but as soon as the first semester, students commit to a specific laboratory and faculty advisor for doctoral studies. The date of this
commitment is generally around December 15. Any faculty advisor who agrees to take a rotation student must do so only with confirmed financial support should the student decide to work in that laboratory.

Courses
Potential elective courses may be listed in Neurosciences, Cell Biology, Genetics, Pharmacology or other departments. This is a partial list of available courses:

**NEUR 402: PRINCIPLES OF NEURAL SCIENCE** Credit Hours: 3.0
Offered every spring semester (required).
FRIEL, D.
Description: Lecture/discussion course covering concepts in cell and molecular neuroscience, principles of systems neuroscience as demonstrated in the somatosensory system, and fundamentals of the development of the nervous system. This course will prepare students for upper level Neuroscience courses and is also suitable for students in other programs who desire an understanding of neurosciences. Prereq: CBIO 453. Cross-listed as BIOL 402.

**NEUR 405: CELL & MOLECULAR NEUROBIOLOGY** Credit Hours: 3.0
Offered every fall semester.
DENERIS, E. and FRIEL, D.
Description: Cell biology of nerve cells, including aspects of synaptic structure physiology and chemistry. The application of molecular biological tools to questions of synaptic function will be addressed. Prereq: BIOL 473.

**NEUR 415: NEUROSCIENCE SEMINARS** Credit Hours: 1.0
Offered every fall and spring semesters. (required - only register for this one time).
Description: Current topics of interest in neurosciences. Students attend weekly seminars. From this series, students prepare critiques. No credit is given for less than 75% attendance.

**NEUR 419: CRITICAL THINKING IN NEUROSCIENCE** Credit Hours 3.0
Offered every spring semester to 2nd year students (required).
FRIEL, D.
Description: The goal of this course is to develop the student’s critical reasoning skills through reading and discussing primary research papers. Each year, the course will focus on 3-4 different topics selected by participating Neurosciences faculty members. Students will receive a letter grade based on their contributions to discussions, and at the discretion of the faculty, performance on exams and/or term paper. Prereq: NEUR 402.

**NEUR 424: SENSORY NEUROSCIENCE** Credit Hours 3.0
Offered alternating years, fall semester (odd years – beginning fall 2013).
WESSON, D.
Description: How do our brains and those of other animals allow for the acquisition and processing of unique sensory percepts? In what manners might sensory systems interact to enhance perception? Further, what happens to sensory system function in cases of neurological disorders? This course is a topic introduction to sensory neuroscience, a major area of modern neuroscience with connections to neurology, psychology, ethology, and related topics. Topics include visual, auditory, somatosensory, gustatory, and olfactory neuroscience. We will also examine the mechanisms and uses of magnetoreception, electroreception, echolocation, and other ‘special’ senses. All of the above topics will be covered under the theme of how animals actively sample their sensory environments for information.

**NEUR 466: CELL SIGNALING** Credit Hours 3.0
Offered every spring semester.
DUBYAK, G.
Description: This is an advanced lecture/journal/discussion format course that covers cell signaling mechanisms. Included are discussions of neurotransmitter-gated ion channels, growth factor receptor kinases, cytokine receptors, G protein-coupled receptors, steroid receptors, heterotrimeric G proteins, ras family GTPases, second messenger cascades, protein kinase cascades, second messenger regulation of transcription factors, microtubule-based motility, actin/myosin-based motility, signals for regulation of cell
cycle, signals for regulation of apoptosis. Cross-listed as CLBY 466 and PHOL 466 and PHRM 466.

NEUR 473: INTRODUCTION TO NEUROBIOLOGY Credit Hours: 3.0
Offered every fall semester.
CHIEL, H.
Description: How nervous systems control behavior. Biophysical, biochemical, and molecular biological properties of nerve cells, their organization into circuitry, and their function within networks. Emphasis on quantitative methods for modeling neurons and networks, and on critical analysis of the contemporary technical literature in the neurosciences. Term paper required. Two lectures per week. Prereq: Consent of department. Cross-listed as BIOL 473

NEUR 474: NEUROBIOLOGY OF BEHAVIOR Credit Hours: 3.0
Offered every fall semester.
RITZMANN, R.
(See BIOL 374). Cross-listed as BIOL 474.

NEUR 475: PROTEIN BIOPHYSICS Credit Hours: 3.0
Offered every spring semester.
BUCK, M.
Description: This course focuses on in-depth understanding of the molecular biophysics of proteins. Structural, thermodynamic and kinetic aspects of protein function and structure-function relationships will be considered at the advanced conceptual level. The application of these theoretical frameworks will be illustrated with examples from the literature and integration of biophysical knowledge with description at the cellular and systems level. The format consists of lectures, problem sets, and student presentations. A special emphasis will be placed on discussion of original publications. Offered as BIOC 475, CHEM 475, PHOL 475, PHRM 475, and NEUR 475.

NEUR 477: CELLULAR BIOPHYSICS Credit Hours: 4.0
Offered every spring semester.
JONES, S.
Description: This course focuses on a quantitative understanding of cellular processes. It is designed for students who feel comfortable with and are interested in analytical and quantitative approaches to cell biology and cell physiology. Selected topics in cellular biophysics will be covered in depth. Topics include theory of electrical and optical signal processing used in cell physiology, thermodynamics and kinetics of enzyme and transport reactions, single ion channel kinetics and excitability, mechanotransduction, and transport across polarized cell layers. The format consists of lectures, problem sets, computer simulations, and discussion of original publications. The relevant biological background of topics will be provided appropriate for non-biology science majors. Offered as BIOC 476, NEUR 477, PHOL 476, PHRM 476.

NEUR 478: COMPUTATIONAL NEUROSCIENCE Credit Hours: 3.0
Offered alternating years, spring semester (last offered in spring 2006)
THOMAS, Peter (MATHEMATICS)
Description: Computer simulation of neurons and neural circuits, and the computational properties of nervous systems. Students are taught a range of models for neurons and neural circuits, and are asked to implement and explore the computational and dynamic properties of these models. The course introduces students to dynamical systems theory for the analysis of neurons and neural circuits, as well as to cable theory, passive and active compartmental modeling, numerical integration methods, models of plasticity and learning, models of brain systems, and their relationship to artificial neural networks. Term project required. Two lectures per week. Cross-listed with EECS 478 & BIOL 478.

NEUR 540: ADVANCED TOPICS IN NEUROSCIENCE ETHICS Credit hours: 0.
Offered every other spring semester (even years - beginning 2008) (required in 3rd or 4th year of program)
STAFF
Description: This course offers continuing education in responsible conduct of research for advanced graduate students. The course will cover the nine defined areas of research ethics through a combination of lectures, on-line course material and small group discussions. Six 2-hr meetings per semester. Maximum of 15 students with preference given to graduate students in the Neurosciences program. All Neurosciences graduate students matriculating in 2004 and later must complete this course (typically during their 3rd or 4th year in the program.)
NEUR 590: INDEPENDENT RESEARCH IN NEUROSCIENCES Credit Hours: 3.0
Offered every semester (start date contingent upon SIS posting – either Fall 2015 or Spring 2016)

STAFF

Description: Independent, self-directed research is a vital component of the scientific process. Graduate students especially may benefit tremendously by delving into literary research which fills gaps in existing coursework and allows the students to explore novel frontiers which have yet to become integrated into courses. In this course, students will engage in a semester-long self-directed research project, of their creation, under the advising of Neurosciences department primary faculty member. Regular meetings between the student and faculty member(s) and/or student-led presentations and/or written reports will provide mechanisms for consolidating the independent research themes and also, receiving feedback upon the self-directed research. Graduate students, while encouraged to engage in as much formal coursework as possible, may take up to 6 credit hours of NEUR590. Registration in NEUR590 is by permit only (available in the Department office), which includes synthesis of the research project title, abstract, and signature of the chosen course advisor.

NEUR 601: RESEARCH IN NEUROSCIENCE Credit Hours: 1.0 - 18.0

NEUR 651: THESIS M.S. Credit Hours: 1.0 - 6.0
(Credit as arranged). Prereq: M.S. candidates only.

NEUR 701: DISSERTATION PH.D. Credit Hours: 1.0 - 18.0

Responsible Conduct in Research. All students are required to complete 2 courses to satisfy the responsible conduct in research requirement. IBMS 500: ON BEING A PROFESSIONAL SCIENTIST (1) credit hour, must be taken in spring of the first year of study. This course outlines fundamental information and some case studies. It can be counted in the 36 total credit hours required to advance to candidacy but it cannot be used as graded course work. A second responsible conduct course, NEUR 540: ADVANCED TOPICS IN NEUROSCIENCE ETHICS (0) credit hours, will be completed in the third or fourth year of graduate study (spring semesters) and engages more detailed discussion. Students, postdocs and faculty are encouraged to participate in monthly workshops presented by the Office of Research Compliance (http://ora.ra.cwru.edu/research/orc/rcr/index.cfm; workshop calendar at http://ora.ra.cwru.edu/research/orc/education/onlinecalendar.cfm).

Examinations

Progress toward the PhD is marked by grades in coursework, laboratory research and successful completion of exams. University regulations regarding quality point average and academic probation form the minimum expectations of our students. Any student with a grade point average below 3.0 at the end of the 2nd or 4th semesters of graduate study may be separated from the University by a majority vote of the primary faculty in the Department of Neurosciences.

Preliminary Exam—end of first year, following identification of faculty advisor. The goal of this exam is to identify students who exhibit significant gaps in basic knowledge and critical thinking ability. The student will be assigned a paper published in either the Cellular/Molecular or Systems/Circuits sections of the Journal of Neuroscience. This paper will be randomly selected from a suitable pool of papers chosen by the Graduate Education Committee. The advisor and two additional primary Neuroscience training faculty who are selected by rotation from a list of all training faculty (see Narlene Brown to determine the composition of your committee) form an examination committee. The chair of the committee must be a primary faculty member in the Neurosciences Department. One week later the student will make a 45 min.
presentation of the paper including relevant background, methods used, and a critique of its experimental design and findings. The student will be broadly questioned in an exam that typically takes 1.5 hours. Students should practice their presentations to ensure that the time limit is met. The student must be prepared to discuss all facets of the paper but should emphasize its important strengths and weaknesses. Successful completion of the exam is required for progression to the second year of graduate school. A personalized course of study may be recommended if significant deficiencies are identified. The exam committee chair will submit a written report within one week to the Graduate Program Advisor. The exam must be completed by July 31 of the first year of study.

**Qualifying Exam--end of second year, following completion of required coursework.** This exam tests the ability of a student to propose creative and feasible experiments to test hypotheses and advance knowledge. A **four member committee** will be determined by the faculty advisor and student and must include at least three primary Neurosciences training faculty. If the advisor is not a primary Neurosciences faculty member, the other 3 committee members must be primary faculty members. The chair of the exam committee must be a primary faculty member in the Neurosciences Department. A grant topic will be selected by the faculty committee and given to the student. At the advisor's discretion, this topic may be (1) directly related to the student's research project, (2) more loosely based on the advisor's research interests, or (3) entirely off topic.

One week after receiving the topic, the student will submit specific aims for the proposal that must be approved by the committee. Three weeks later (4 weeks total), the student will submit to the committee an approximately 10 page single spaced research proposal (including a specific aims page, background & significance, and experimental design with necessary methods). Cited references are outside the ten page limit. The proposal should describe 2 or more experimental aims that are feasible within a 3 year time interval. Questions about the topic should be directed to members of the student's examination committee and not to other faculty. One week after submitting the proposal the student will give an oral presentation to the committee and defend the proposal. If the student fails, the committee may give the student a second attempt to pass the exam. The chair will submit a report to the Graduate Program Advisor within one week. This exam should be completed by July 31 of the second year of study. Satisfactory performance on this exam will admit the student to Candidacy for the Ph.D. in accordance with University guidelines. Copies of successful past proposals are available for students to view (see Katie Wervey).

**Change of State Notification.** The graduate school requires written notification of every advancement in a graduate student's progress to mark each of the following events 1) selection of research advisor 2) selection of thesis committee members 3) successful completion of qualifying exam 4) successful completion of Ph.D. program. Students should email Katie Wervey (kar18) to let her know these advancements have been achieved.

**Research Integrity.** Students should carefully attribute material generated by others. “As a general working definition, the Office of Research Integrity considers plagiarism to include both the theft or misappropriation of intellectual property and the substantial unattributed textual copying of another’s work. It does not include authorship or credit disputes. Substantial unattributed textual copying of another’s work means the
unattributed verbatim or nearly verbatim copying of sentences and paragraphs which materially mislead the ordinary reader regarding the contributions of the author. ORI generally does not pursue the limited use of identical or nearly identical phrases which describe a commonly used methodology or previous research because ORI does not consider such use as substantially misleading to the reader or of great significance.” For more information on this issue, see http://ori.dhhs.gov/policies/plagiarism.shtml

GUIDELINES FOR THESIS RESEARCH

Goals for the Training Faculty:

Training faculty of Ph.D. students must be active participants in the Neurosciences Program and contribute to courses, collaborative research projects and/or journal clubs. The program periodically reviews faculty for training status, and faculty who have been inactive will be declined.

The thesis advisor must provide the student with intensive training in the scientific method, including the ability formulate clear research questions, develop feasible research approaches to answering such questions, evaluate data from the student’s own research and that of others, and discuss the broad context and significance of the student’s work.

The thesis advisor, in conjunction with the Thesis Committee, is responsible for developing and implementing a training plan with the student, including the elaboration of an independent research project.

The thesis advisor is responsible for providing physical, financial, and intellectual resources necessary for accomplishing the research plan.

The thesis advisor should work regularly with the student to develop good communication skills, in both speaking and writing.

The thesis advisor should encourage the student to think broadly about the research project and not necessarily be limited to approaches/techniques currently used in the advisor's laboratory.

The Thesis Committee

Graduate training has as its goal the extension of knowledge and the development of scholarship. This requires input from faculty advisors who work together with the student and faculty advisor to guide the scope of the research, and help the student develop into an authority in his/her field. Thesis committee members should have expertise that corresponds with the proposed work and an acknowledged interest in contributing constructively to the student's progress.

Upon successful completion of the qualifying exam, each student will notify the Graduate Student Coordinator (Katie Wervey) so the Advancement to Candidacy form can be filled out and sent to Graduate Studies. Students have 6 months from their qualifier to form their thesis committees and must notify Katie with the names of the committee members, who will be the chair of the committee, and when the first meeting will take place.

The thesis committee shall have a minimum of four members, three of which must be primary Neurosciences faculty (the thesis advisor serves as the fourth member), and the University requires that one member of the committee has a
primary appointment outside this department. A primary appointee in the Department of Neurosciences chairs the meetings. The committee is to serve as the student's advocate in advancing toward the doctorate. The student should feel free to consult individual members at any time. The presence of one half plus one of the members of the committee constitutes a quorum. The membership of the thesis committee can change during the course of work, and is recommended if the direction of work shifts substantially. When the committee agrees that the body of work accomplished is adequate to earn a doctoral degree, the purpose of the committee takes on the additional role of ensuring the completion of a scholarly thesis.

At the first committee meeting, the trainer must bring the student file and rotation reports, and preliminary exam and qualifying exam reports should be reviewed at this time. The first meeting need accomplish no more than a discussion of the general topics for thesis research. A frank discussion of the strengths and weaknesses of the work should be encouraged. The meeting should end with the development of a consensus plan for the next 6 months. Subsequent meetings should put new work in the context of the entire project, and outline advances and proposed areas for work. The committee chair must send a short synopsis of the meeting to the Graduate Program Advisor and Neuroscience Departmental Assistant within one week.

The Thesis Committee must meet at least once a semester to monitor student progress. It is the responsibility of both the Chair of the Committee and the student that these meetings take place. Students will not be allowed to register for a semester if there has not been a Committee meeting during the previous half-year period.

At least two weekdays prior to each meeting, a brief written summary of the student's progress since the last meeting should be given to each committee member. It is the responsibility of committee members to read the report prior to the committee meeting.

After every meeting, a date for the next meeting will be set for 6 months later (unless directed by the committee to meet sooner), so that the student and committee members can enter it into their calendars. It is a requirement that students and their committees meet every 6 months, even if the student does not feel he or she has enough data to report, so that the committee can be kept up-to-date on his or her progress and can advise the student.

The Thesis Committee evaluates the strengths and deficiencies in the training plan or in its implementation and discusses these with the mentor and student. The Committee should serve as a sounding board if the student encounters problems in the graduate program and should create a relationship with the student where it is clear that such interchanges are encouraged.

The Committee is responsible for seeing that the standards and the requirements of the program are fulfilled. It is ultimately the responsibility of the Chair of the Committee to bring any unresolved problems to the attention of the Director of Graduate Studies and/or the Departmental Graduate Education Committee.

Progress Reports must be completed within one week of the committee meeting and sent to the members of the committee and to the Departmental Assistant for placement in the student’s confidential folder. The report must contain a clear assessment of whether or not “satisfactory progress” is being made towards a Ph.D. degree. This
assessment is one of the key responsibilities of the Advisory Committee. If the student receives two unsatisfactory grades in NEUR 701, the student is separated from the University.

If the student, mentor and committee cannot come to an agreement about the training plan, they should bring their differences to the Departmental Graduate Education Committee (* see under “Student Advocates” – next section), the Graduate Program Advisor, or the Chair of the Department.

The Thesis Committee is responsible for approving the shift in the student’s priorities from doing experiments to writing the thesis. Before doing this, the student must present to the Committee a brief outline of the proposed written thesis.

The Dissertation
All candidates for the PhD degree must submit a written dissertation as evidence of their ability to conduct independent research at an advanced level. The dissertation must represent a significant and original contribution to existing knowledge in the student's field. At least six months before the student anticipates PhD completion, a thesis committee meeting should be held to discuss whether the student's progress toward the degree is sufficient. By the time of the thesis examination, the student should have accepted for publication (or accepted pending minor revisions) at least one peer reviewed manuscript, excluding reviews, chapters, or commentaries, on which he/she is the first author. Co-first author papers can be counted towards this criterion, at the discretion of the thesis committee. The first draft of all manuscripts should be entirely written by the student. The committee should agree at that time to the format of the thesis. It is in a student’s interest to submit any manuscripts before leaving the University, because once a postdoctoral position is begun, other concerns arise. Because many students have published manuscripts on their studies, the thesis often reflects that work as chapters, placed in context with a general Introduction, and a Discussion that considers the relevance of the studies. Examples of Neuroscience graduate theses are in the Neuroscience library. Detailed regulations concerning format, quality, time of submission and oral defense are established by the Dean of Graduate Studies and Research, and instructions are available from the Office of Graduate Studies.

Student Advocates. In the event that difficulties arise during graduate training, a student is advised to seek advice from one or more sources including the student's faculty advisor, the graduate program advisor, the Graduate Education Committee, the departmental chairperson or if relevant, the MSTP director. The Graduate Education Committee within the Dept of Neurosciences will meet on an ad hoc basis to discuss policy issues in Graduate Education. A graduate student, thesis advisor, Committee member, or Graduate Student Advisor can bring to the Committee at any time cases where serious breakdowns in communication have occurred with respect to the students' graduate studies and ask the Committee to intervene. Members of the Graduate Education Committee include Drs. Heather Broihier, Ben Strowbridge, Dan Wesson, and Evan Deneris (Committee Chair). Students are also encouraged to seek advice from the Director of Graduate Education. If necessary, students may express a grievance against actions of students or faculty and staff through procedures handled by Graduate Studies (for academic problems) or the University Office of Student Affairs (for non-academic problems). Members of the University community who believe they have been sexually harassed are entitled to an investigation; officials in the Provost's
Office, Office of Student Affairs and/or the Office of Affirmative Action/Equal Employment Opportunity will provide options for resolution.

**Master of Neuroscience Degree.** The Neuroscience program is a Doctoral degree granting program and does not offer a Master's of Science curriculum. No student will be admitted to the Program for the sole purpose of earning a M.S. degree, and under no circumstances will a Master's degree be awarded as part of a Doctoral curriculum. On rare occasions, however, an individual may leave the Doctoral program after completing a significant body of course work and independent research. Under these conditions, a Master of Neuroscience degree (Type B) may be awarded under the recommendation of the student's thesis or qualifying committee. To complete the requirements for a Master of Neuroscience, a student must maintain continuity of registration and a minimum cumulative grade point average of 2.75 (see Graduate Student Handbook, under “Academic Policies” then “Maintenance of Quality Point Average”). The student must successfully pass the preliminary exam as well as a special Masters qualifying exam, and have completed a total of 27 semester hours of course work. At least 18 hours of graded course work must be at the 400 level or higher. Any requirements not specifically addressed below such as those pertaining to grade point average, residency and fees conform to the regulations for the Master's degree specified in the general University Bulletin. This program is aimed at students who have taken most or all of the courses required for the Ph.D. and who have pursued a research program. To earn this Master's degree one of two examinations must be passed: Passage of the Neuroscience qualifier exam or successful oral defense of a research report. The Neuroscience qualifier examination consists of an “NIH style” research proposal that has both written and oral components. The research report is based on the student’s original research and will be tested in an oral examination by the student’s advisory committee. Upon successfully passing one of the two examinations and fulfilling the above requirements, these students will earn a Master of Science in Neurosciences.

**Foreign students.** The University Attorney’s office, Office of Foreign Faculty and Scholars (x4289, FAX x1881) is a resource for foreign students.

Additional information regarding graduate training at CWRU can be found through the Office of Graduate Studies (gradstudies.case.edu).

**Current Students in the Neurosciences Graduate Program (2015-2016)**

<table>
<thead>
<tr>
<th>Name</th>
<th>Year entered into program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kaitlin Carlson</td>
<td>2013</td>
</tr>
<tr>
<td>Brad Casali</td>
<td>2015</td>
</tr>
<tr>
<td>Paul Cheng</td>
<td>2015</td>
</tr>
<tr>
<td>Jared Cregg</td>
<td>2010</td>
</tr>
<tr>
<td>Edward Cui</td>
<td>2015</td>
</tr>
<tr>
<td>Marc DePaul</td>
<td>2009</td>
</tr>
<tr>
<td>Lauren Donovan</td>
<td>2014</td>
</tr>
<tr>
<td>Kelsey Herrmann</td>
<td>2013</td>
</tr>
<tr>
<td>Kendall Hoover</td>
<td>2014</td>
</tr>
<tr>
<td>Cody James Howell</td>
<td>2013</td>
</tr>
<tr>
<td>Taylor Jay</td>
<td>2012</td>
</tr>
<tr>
<td>Meagan Kitt</td>
<td>2015</td>
</tr>
<tr>
<td>Jane Lindborg</td>
<td>2013</td>
</tr>
<tr>
<td>Aphroditi Mamaligas</td>
<td>2013</td>
</tr>
<tr>
<td>Colleen McLaughlin</td>
<td>2012</td>
</tr>
</tbody>
</table>
Jon Niemi    2010
Caitlin Quigley    2015
Alex Sargent    2012
Nicolaus Schmandt    2011
James Sears    2011
Rebecca Skerrett    2010
Amanda Tran    2013
Meredith Sorenson Whitney    2010
Steven Wyler    2009