

# **Neuroscience Curriculum**

The University of North Carolina at Chapel Hill Student and Faculty

Policies and Procedures

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## TABLE OF CONTENTS

I.	INTRODUCTION.....	3
II.	OVERVIEW AND TIMELINE OF THE CURRICULUM.....	3
III.	COURSEWORK AND COURSE PERFORMANCE.....	3
	A. COURSEWORK OVERVIEW AND PHILOSOPHY.....	3
	B. REQUIRED COURSES.....	4
	C. ELECTIVE COURSES.....	5
IV.	EXAMINATIONS AND DISSERTATION GUIDANCE COMMITTEES.....	7
	A. QUALIFYING EXAMINATION (WRITTEN EXAM).....	7
	B. THE DISSERTATION GUIDANCE COMMITTEE.....	7
	C. FORMAT OF THE PH.D. DISSERTATION PROPOSAL.....	8
	D. DISSERTATION PROPOSAL DEFENSE (ORAL EXAM).....	8
	E. THE DEFENSE OF THE PH.D. DISSERTATION.....	9
	F. GRADUATION CHECKLIST.....	10
V.	FACULTY POLICIES .....	11
	A. FACULTY ADMISSIONS .....	11
	B. SUPPORT GUIDELINES.....	11
	C. TRAINING GRANT REQUIREMENTS.....	11
	D. STUDENT PROGRESS AND THE STUDENT TRAINING COMMITTEE.....	12
	E. TEACHING.....	12
	F. MENTORING.....	12
	G. EXPECTATIONS FOR NBIO THESIS ADVISORS .....	13
	H. EXPECTATIONS FOR NBIO STUDENTS.....	14
	I. NBIO RESOURCES FOR DEALING WITH STUDENT/PI CONFLICT.....	16
VI.	GLOSSARY.....	17
VII.	ON-LINE RESOURCES.....	17

## **I. Introduction**

Welcome to the Neuroscience Curriculum at the University of North Carolina at Chapel Hill. The Curriculum offers a course of interdisciplinary training and research in Neuroscience leading to the Ph.D. degree. The Curriculum was established in 1966, making it one of the oldest training programs in the country, and has a long history of training outstanding neuroscientists who go on to make significant contributions in research, industry, teaching, and other areas.

Since the Curriculum is an interdepartmental, interdisciplinary program, it differs in some respects from other graduate programs. This document outlines the pathway through the training program that eventually leads to the award of the Ph.D. degree. It is also a faculty manual, which describes the obligations of faculty, both to the Curriculum and to the students that they train, and describes the funding scheme currently in use for the Curriculum.

The Curriculum's former name was Neurobiology Curriculum and was changed to the Neuroscience Curriculum in 2016. This change was to reflect the changing nature of the field of Neuroscience. Neuroscience includes researchers and students interested in computational aspects of Neuroscience as well as those who are not typically performing research in a wet-lab environment, such as human neuroimaging and human genetics related to Neuroscience. In addition, most top programs around the country have Neuroscience as their program and degree title and new students who are looking to matriculate into a Ph.D. program are commonly searching for and evaluating Neuroscience programs.

## **II. Overview and Timeline of the Training Program**

The first requirement for the Ph.D. in Neuroscience is the completion/attendance of several core courses and seminars as administered by the Biological and Biomedical Sciences Program (BBSP). At the end of their first year in the BBSP Program (after they select their lab), students must pass the written part of the Neuroscience Qualifying Examination. At the end of the first year in the Curriculum, students present written and oral critique of a research paper, which is designed to test their knowledge related to experimental design and core knowledge of neuroscience (the material taught in the first year course). The second part of qualifying exam consists of a thesis proposal and its successful defense. This is presented to the student's thesis committee, and written document is formatted after a pre-doctoral NRSA proposal. This is designed to test the student's knowledge directly related to their line of research. Finally, the dissertation resulting from the student's original research must be presented and defended. It is expected that the entire process does not take more than five to six years.

## **III. Coursework and Course Performance**

### *A. Coursework Overview and Philosophy*

Below is a listing the current courses required of students matriculating in the Neuroscience Curriculum. Neurobiology 722 and 723 (Cellular and Molecular Neurosciences and Systems and Translational Neurobiology) form the core course series in for the Neuroscience Ph.D. Each semester consists of a series of three blocks each directed by different faculty coordinators. Neuroscience students are required to take all 6 blocks, while MD/PhD students are required Blocks 1-4.

The main purpose of this course is to acquaint the student with the experimental basis for current concepts of the central nervous system function. The goals of the course are to provide the students with mental tools to evaluate current and future hypotheses; not so much to provide answers to questions as to attempt to define the unanswered questions.

Blocks 1 through 6 each end in a take-home exam. A student may take the blocks separately but most students take all six blocks. The student earns two credits per block and receives a separate grade for each block based primarily on the exam. Typically, sessions are organized as part interactive lecture and part discussion of original papers led by the students. Lectures, while presenting major concepts, are expected to be interactive rather than didactic. Student participation during 'lectures' and discussion sessions is essential in order that this course be effective. In order to create a climate for discussion, the class is limited to 20 students.

### *B. Required Courses*

#### [NBIO 722A/722B/722C-Cellular and Molecular Neuroscience \(6 cr\)](#)

**BLOCK 1-INTRODUCTION / ELECTRICAL SIGNALING (18 sessions) (NBIO 722A)** This first half of this block introduces such topics as brain cell biology, molecular biology applied to neurons, membrane potentials and imaging methods. The second half of this block introduces such topics as resistance, capacitance, passive membranes, ion channels, and action potential initiation. Fall. various NBIO faculty

**BLOCK 2- SYNAPTIC MECHANISMS (10 sessions) (NBIO 722C)** This block introduces calcium signaling, electrophysiological analysis and molecular mechanisms of neurotransmitter release, synaptic plasticity and expression and maintenance of LTP and LTD. Fall. various NBIO faculty

**BLOCK 3- RECEPTORS (10 sessions) (NBIO 722B)** This block covers such topics as cell and G Protein signaling, ligand binding, GABA-gated ion channels, neurotransmitter receptor trafficking and dopamine release and receptors. Fall. various NBIO faculty

#### [NBIO 723A/723B/723C-Systems and Translational Neuroscience \(6 cr\)](#)

**BLOCK 4-DEVELOPMENT OF THE NERVOUS SYSTEM (11 sessions) (NBIO 723A)** This block covers neural induction, neural stem cells, glial development, neural cell death and neurotrophin during development and synaptic adhesion molecules. Spring. various NBIO faculty

**BLOCK 5-CNS: ANATOMY AND FUNCTION OF SENSORY AND MOTOR SYSTEMS (17 sessions) (NBIO 723B)** This block introduces the sensory pathways of vision, audition, taste, olfaction, pain, and touch, as well as the motor pathways of the spinal cord, basal ganglia, cerebellum, and motor cortex. Mechanisms of sensory information processing and motor execution are discussed. The section includes peripheral and central mechanisms of pain. Spring. various NBIO faculty

**BLOCK 6-CNS: IMAGING AND DISEASE(12 sessions) (NBIO 723C)** This block covers CNS imaging, regeneration, and such diseases as Alzheimer's, ALS, Parkinson's, epilepsy, addiction, autism and schizophrenia. Spring. various NBIO faculty

#### [NBIO 850-Communication of Scientific Results \(3 cr\)](#)

NBIO 850 -This class employs faculty coaching and peer critiquing to develop students' skills in speaking and writing about science with ease, clarity, and precision. The class aims to build self-confidence and the ability to take criticism without defensiveness. It meets once a week for 1.25 hours for both semesters. Students take this course for two semesters; second-year students are paired with first-year students as mentors, as rehearsal partners, and as editing partners for written assignments. The class size is approximately 16 students. Each session is coached by two faculty members, course director and an invited faculty member. Thus, the class also provides a mechanism for expanded student-faculty bonding, reinforced by a social event at the end of each semester. Fall. Smith

#### [BBSP 610-Statistics for Lab Scientists \(2 cr\)](#)

BBSP 610 introduces the basic concepts and methods of statistics with emphasis on applications in the experimental biological sciences. Students should have a basic understanding of algebra and arithmetic. No

previous background in probability or statistics is required, nor is experience with statistical computing. The objectives of this course are to provide graduate students in biomedical research programs familiarity with basic experimental design and elementary statistical methods. By the end of the course, students should understand the principles of experimental design, be familiar with basic statistical methods (and how they are implemented in R), and know which methods are appropriate in a given circumstance. Fall. Bair

#### NBIO 893-Neuroscience Seminar Series (1 cr)

NBIO 893-Students in the Curriculum are expected to attend and participate in the 75 % of the Neuroscience Seminar series on Thursdays at 12:30PM. Students will be enrolled in NBIO 893 each semester, for which their attendance and participation in seminars and dissertation defenses is graded on an H/P/L/F scale. Fall and spring.

#### C. Elective Courses

NBIO students may also consider elective courses relevant to their research specialty or need to supplement their background. An incomplete list of courses from a more extensive selection are shown below. Note that courses change yearly, so many additional courses are available or courses may cease to be available. Two elective course-Some representative choices are listed below. 2 elective courses are required.

#### NBIO 890.001-Special Topics in Neurobiology: Microscopy and Imaging in Neurobiology (2 cr)

This graduate course aims to provide the knowledge one may need to understand the reach of microscopy imaging techniques, to choose the right imaging modality, use fluorescence labels, acquire the images, analyze data and troubleshoot any pitfalls that may occur. We will start from the principles of microscopy, proceed to the description of conventional and advanced modern techniques, and evaluate advantages and disadvantages of each method. You will understand what studies can be addressed with each technique level of details that can be expected. Applications of microscopy will be illustrated with the review of recent research with the focus on Neuroscience. Spring. Ghukasyan.

#### NBIO 890.003- Special Topics in Neurobiology: Network Neuroscience (2 cr)

This graduate-level course combines lectures and paper presentations on cutting-edge interdisciplinary research of dynamics and function of brain networks. The course is designed to be informal and highly interactive and requires active participation. The course will consist of a unique and interdisciplinary blend of cellular and network electrophysiology in animal models and humans, computational neuroscience, network science, and dynamic systems theory. We will focus on achieving an in-depth understanding of (1) physiological and pathological network dynamics in neocortex and (2) cutting-edge brain stimulation approaches. Spring. Frohlich.

#### NBIO 724-Developmental Neurobiology (2 cr)

The theme of this course will be "what are the basic principles guiding the emergence of the mammalian nervous system?" The intent of this course is to present current topics in developmental neuroscience in the context of this theme. Topics will stress the biochemical, molecular, cellular, and genetic processes involved in the development and function of the mammalian nervous system. Fall. Anton.

#### NBIO 727- Translational Seminar in Cognitive and Clinical Neuroscience (2 cr)

The aim of this course is to present new neuroimaging techniques, and their application to the study of the neural correlates of cognitive and behavioral impairments in a number of brain disorders. We will begin with a brief review of the theories and research methodologies that investigate how brain functions support and give rise to mental operations such as attention, emotions, social cognition in the healthy brain. These lectures will also encompass a review of basic functional neuroanatomy. This review of the theories pertaining to the organization of normal

cognitive operations within each domain will be followed by presentations by expert researchers and clinicians using and developing the various neuroimaging techniques to study neurodevelopmental disorders in clinical populations. Alt Yr Spring. Belger

#### NBIO 729-Neural Information Processing (2 cr)

Fundamentals of nervous system information processing and integration, with an emphasis on sensory systems. The course will focus on concepts and computational methods for understanding integrative operations in single cells and small networks. Permission of instructor required. Alt Yr Fall. Manis.

#### NBIO 801-Clinical Syndromes and Neurodevelopmental Disorders (3 cr)

This seminar will review the epidemiology, pathogenesis, diagnosis and treatment of neurodevelopmental syndromes and disorders. Topics will range from single gene (e.g. fragile X syndrome and tuberous sclerosis) to complex genetic (e.g., autism, schizophrenia), to environmental disorders with varied phenotypes, pathogenetic mechanisms, and treatments. Spring. Dichter, Philpot, Piven.

#### NBIO 800-Gene-Brain-Behavior Interactions in Neurodevelopmental Disorders: Towards an Integration of Perspectives on Disease Mechanisms (3 cr)

This seminar examines the topics of genetics, neuroanatomy, physiology, and behavioral development to provide a broad-based and integrated background to understand the etiology and potential mechanism underlying neurodevelopmental disorders. Fall. Dichter, Philpot, Piven.

#### PSYC 701-Biological Bases of Behavior (3 cr)

Graduate standing required. A survey of psychological and biological approaches to the study of sensory and perceptual information processing, with an emphasis on touch and pain. Fall. Boettiger

#### PSYC 702 Biological Bases of Behavior II (3 cr)

A survey of psychological and biological approaches to the study of basic learning and higher integrative processing. Spring. Reissner

#### PHCO 728-Neuropharmacology of Alcohol and Substance Abuse (3 cr)

This course will survey key concepts and recent literature related to the neuropharmacology of alcohol and other drugs of abuse. The first half of the semester will address a variety of topics such as alcohol pharmacology, alcohol actions on signaling pathways, mechanisms of alcohol drinking/reinforcement processes, alcohol dependence and withdrawal, fetal alcohol spectrum disorders and pharmacotherapy for alcoholism. Each student will give a presentation based on the assigned drug of abuse. This course is intended to provide students with a broad understanding of the neuropharmacology of abused drugs and to help with the development of critical thinking skills in evaluation of the scientific literature. The format of this course is designed to be highly interactive and will require active student participation. Alt. Yr. Besheer.

#### BIOS 600-Principles of Statistics (3 cr)

BIOS600 is an introductory course in probability theory and statistical inference with strong emphasis on applications in public health and medical research. The course is motivated by applications in global public health, which appear frequently throughout the lectures, home- works, and laboratory sessions. Topics include descriptive statistics, construction of confidence intervals, hypothesis testing, power and sample size calculations, analysis of contingency tables, diagnostic tests and their properties, and an introduction to more advanced topics (linear and logistic regression, nonparametric methods, survival analysis, and sampling theory). Students will use statistical

software to conduct analysis. Reading for understanding and translation of statistical results into language accessible to other health science researchers will be stressed. Herring

#### GRAD 721-Research Ethics (1 cr)

This course meets two hours each week for seven weeks. The course has two aims. First, students are introduced to concepts, rule, and issues that are central to research ethics. Second, we aim through readings and discussion to develop skills in critical thinking and ethical analysis. Class preparation: Students are expected to spend approximately one hour each week preparing for the seminar. All the readings are online, and students post comments on the reading. No other exams or written work is required. Class participation: Students are expected to attend each meeting and to participate in discussions of all the topics. Fall and Spring. MacLean

#### PSYC 708- Seminar in the Biological Foundations of Psychology (3 cr)

Permission of the instructor. Limited to graduate students in psychology and neuroscience. Lectures and seminar presentations on a wide range of topics in the area of physiological psychology. Spring. Thiele

#### PSYC 830- Statistical Methods in Psychology I (4 cr)

Required preparation, a course in introductory statistics. Data analysis, sampling, applied probability, elementary distribution theory, principles of statistical inference. Fall. Castro-Schilo

### **IV. Examinations and Dissertation Guidance Committees**

#### *A. Qualifying Examination (Written Exam)*

At the end of the first year, an examining committee will be formed for each student. The chair of the committee will assign a paper in one of three areas of neuroscience: development, cellular and molecular, behavior. The student will have 10 days to write up to six pages of comments and critique of the assigned paper. These will include technical and conceptual aspects of the paper, its broad impact in the field, the strengths and limits of the experiments, the validity of the conclusions and the further questions the work leads up to. About seven days after submitting the text, the student will undergo an oral follow-up in which the members of the examining committee will test, in detail, the understanding by the student of all components of the assigned paper. It should be clear that this portion of the qualifying exam should lead to questions by the examining committee that go beyond the narrow scopes of the assigned paper and are meant to test the student's understanding of the broader content of the assigned paper.

#### *B. The Dissertation Guidance Committee*

Soon after passing the Qualifying Examination, a student should form a Dissertation Guidance Committee (DGC). This should occur no later than January of the second year. The chair of this committee must be a member of the Neuroscience Curriculum faculty and, except in special circumstances, must NOT be the director of the laboratory in which the student's training takes place. The chair of the committee is chosen by consensus of the committee in consultation with the Director of the Curriculum in Neuroscience; most often it will be the most senior faculty member on the committee that is not the student's advisor.

The members of the committee should be carefully chosen by the student in consultation with the student's mentor, the Director and/or members of the Neuroscience Progress Committee, with regard to the expertise they can provide in the general area of the dissertation topic. Furthermore, DGC members must understand their responsibilities and time commitment to this function and be willing to participate at an appropriate level rather than serve "figurehead" roles.

Each DGC will consist of five or six members, of which at least three must be members of the Neuroscience Curriculum. It is usually advised that four of the members have this affiliation. One or two (in the case of six-member committees) members may be from institutions other than the University of North Carolina. The composition of the committee must be approved by the Graduate School, the Director of the Neuroscience Curriculum and the Student Mentoring and Oversight Committee. Forms for committee composition are available online (UNC Grad School) <http://gradschool.unc.edu/pdf/wdcomm.pdf>

All committee members must be appointed to the Graduate Faculty. At UNC, tenure-track and tenured faculty are automatically members of the Graduate Faculty. Faculty with fixed-term appointments (Research Assistant/Associate Professors and Clinical Instructors) do not usually have an automatic appointment to the Graduate Faculty, but the Curriculum Director can make these appointments for the term of the fixed-term appointment. External members also must be appointed to the Graduate Faculty and must be able to serve as dissertation advisors at their home institution; since research-track faculty (non-tenure track) at other institutions may not have this privilege, this may limit the selection of outside members.

The principal functions and responsibilities of each student's DGC will include:

1. Evaluating and approving of the dissertation research proposal.
2. Giving advice, counsel, and guidance during all phases of the dissertation research.
3. Administering the "Final Doctoral Oral Examination" which constitutes the oral defense of the written Ph.D. dissertation.
4. Providing a 1-2 page written report following each meeting of the DGC that is signed by the members of the Committee and filed with the Curriculum office. This report may not be required but can be very helpful in case of dissenting opinions.

Shortly following formation, the DGC should have an informal meeting with the student to make decisions and reach agreement on:

1. The student's area of specialization within neuroscience and the role each DGC member contributes to area.
2. The nature of and schedule for the Ph.D. dissertation proposal and defense.
3. The scope of the formal dissertation proposal within the context of the student's preliminary research results.

The Graduate School requires a minimum of one committee meeting per year. Special meetings of the committee should be scheduled as the need arises. For instance, changes in the original proposed dissertation research necessitated as work progresses should be discussed and approved by the DGC.

### *C. Format of the Ph.D. Dissertation Proposal*

The dissertation proposal is a written document that should be submitted to the DGC at least two weeks in advance of the meeting at which the student will be orally examined on the proposal. This should occur no later than one (1) year following completion of the Qualifying Examination.

The proposal is to take the form of an NRSA fellowship and be divided into (Sections A-D are limited to 10 pages total):

- A. Specific Aims
- B. Background/Significance
- C. Preliminary Studies
- D. Research Design

A projected timetable for completion of the research should also be included. Appropriate and complete references must be included, following NIH guidelines. Budget, personnel, funding, and resources information are NOT required, although any unusual resource requirements should be identified and their availability for the dissertation research indicated. It is the responsibility of the DGC to evaluate this proposal and approve it if warranted. The student will orally present and defend this proposal at a meeting with the DGC, which can be viewed as a "site visit" of the dissertation proposal.

It is the obligation of the student and the mentor to notify members of the DGC and the Director of significant changes in the scope or direction of the research project in a timely manner. Major changes must be approved by the DGC. This requirement is in place to provide security for the student, so that the mentor (or the committee) cannot change requirements or add more experiments after they have approved a specific set of experiments, unless it is well justified and agreed to by all involved.

#### *D. Dissertation Proposal Defense (Oral Exam)*

The specialty examination is administered by the student's DGC and consists of an oral presentation and defense of the formal dissertation research proposal. It is expected at that time that the student will demonstrate:

1. Mastery of the relevant literature pertaining to the research area and specific project. This may include general knowledge in any area of Neuroscience that is relevant to the student's research area.
2. Facility with the technical approaches to be employed in the research including the limitations.
3. An appropriate sense of scope for the project (grasp that does not exceed reach).
4. Ability to think of the project in the broader context of Neuroscience and relate possible observations to other research areas.

#### *E. The Defense of the Ph.D. Dissertation*

Following completion of the dissertation research, the student will write a dissertation that documents the entire project as a scholarly work. The format of the dissertation is to be determined by the DGC. There is some flexibility in the exact structure, but it will usually fall into one of two categories. The document may be a "standard" dissertation which consists of introduction, methods, results, discussion, and references sections and is a somewhat lengthy unitary entity. An alternative format is the submission of several manuscripts (or published papers) developed during the course of the research with an overall Introduction section and a General Conclusions section bounding them. The formal defense of the dissertation is usually a two stage event. The first stage is a closed oral examination of the student by the DGC. The committee can at its discretion invite a few additional persons with particular interest or expertise in the subject to observe the formal defense. The dissertation will be submitted to the committee at least two weeks prior to this examination. At the time of the defense the student will present only a brief (15-20 minute) overview of the project to begin the examination. The committee members will then challenge the dissertation document and the student will defend it orally. The purpose of this structure is to focus the efforts of the committee members on the research and the resulting document rather than on the oral presentation itself. Each committee member has a responsibility to have thoroughly read the dissertation and have prepared any pertinent questions prior to the defense. Furthermore, the committee should make suggestions for revisions and additions to the written document at this time. Approval of the dissertation constitutes passing the Final Doctoral Oral Examination of the Graduate School. Forms certifying this will not, however, be signed by the committee until the completion of the second stage of the defense.

Following the closed oral examination, the student will schedule a public presentation of the dissertation research to which the entire academic community is invited. During the intervening period the student makes all corrections in the dissertation document as agreed upon by the committee, process all necessary paperwork associated with receiving the Ph.D. degree from the Graduate School as well as documents required by the Neuroscience Curriculum. Evidence that these conditions have been met are sufficient to warrant signature of the appropriate documents by all members of the student's DGC except the chairman. The chair of the committee will provide the final signature following the private defense.

Private and public defenses must be held at the same time and consist of one presentation open to the public followed by a private meeting of the students and his/her DGC for the purpose of fine-tuning eventual proposed changes to the written dissertation.

The Curriculum exists for the students, but it cannot exist without the energy and participation of the faculty. Like other curricula at UNC, we are a multidisciplinary, physically dispersed, faculty. We provide a diverse set of training opportunities and training styles. It is only through faculty participation and faculty awareness that the Curriculum can succeed in its training mission and make the informed changes in the training program that will endow our students with the tools for the future.

#### *F. Graduation Checklist*

These are the important things to keep in mind while planning exiting/graduating the Curriculum:

1. Consult the deadlines page on the UNC Graduate School website:  
<http://gradschool.unc.edu/academics/resources/graddeadlines.html>  
Pay special attention to the due date for submission of electronic doctoral dissertations as this is a hard-deadline.  
If you do not think that you will be able to submit your final thesis in-time for the deadline, you will have to apply for the next semester graduation (and pay special attention to the next semester thesis submission deadline).
2. Apply to graduation in Connect Carolina, consult the same deadlines page above for the last day to apply.
3. Schedule your public/private defense date (date, time, room)
4. Have 3 Grad School forms filled-out and signed completely:
  - Exam form <http://gradschool.unc.edu/pdf/wdexam.pdf>
  - Committee form <http://gradschool.unc.edu/pdf/wdcomm.pdf>
  - Program degree form <http://gradschool.unc.edu/pdf/ProgramCertificationofDegreeRequirements.pdf>

The Grad School will not clear the student for graduation unless they have all three forms above completed and signed.

5. Other things student needs to be aware of for final graduation clearance from Grad School are
  - Completing the mandatory Grad School exit survey <http://gradschool.unc.edu/about/data/exit/>
  - Making sure PI submits final grade for the defending semester in a timely fashion. Special note- NBIO students are only required to be registered in the fall and spring semesters, however if a student defends in the summer, they are required by the Grad School to be registered in the semester that they defend <http://handbook.unc.edu/registration.html>

## **V. Faculty Policies**

### *A. Faculty Admissions*

Faculty are admitted to the Curriculum as potential mentors through a Membership committee. The Committee reviews the CV of the applicant, and suggests the level of appropriate appointment to the Curriculum. The Membership Committee consists of 3 Primary or Associate faculty appointed by the Director. Faculty who participate as mentors and committee members must be able to be appointed to the UNC Graduate Faculty. Primary members of the Neuroscience Curriculum have access to Neuroscience graduate students to engage in thesis research in their laboratory. Primary members may be asked to serve on dissertation committees of Neuroscience students, to possibly serve on one of a variety of standing and ad hoc committees involved with the normal operation of the Curriculum (admissions, training, curriculum, executive), and to contribute to the teaching and other intellectual activities as may be appropriate and mutually agreeable. The Curriculum will expect that Primary members will provide NIH biosketches, lists of trainees, and current Other Support pages in NIH format for use with the NIH Training Grant that supports the students for the first 1-2 years.

### *B. Support Guidelines*

Students are supported by the BBSP for their first year in graduate school. Support after the first year has to come from fellowship to the student, or from funds made available by the principal investigator whose lab the student has chosen to join for a thesis defense. Support includes a stipend (the level is set by the Basic Science Department Chairs in the School of Medicine and is usually slightly above the standard NIH stipend level), health insurance, tuition, and fees.

The graduate school does not offer tuition remission once the students are past their 6th full semester. It is therefore helpful if the students can obtain in-state residency status in order to reduce the tuition costs, since the mentor is responsible for these costs. Furthermore, the graduate school has an 8-year limit from matriculation to completion of the degree. If a trainee takes longer than this, they must receive a special waiver of this requirement. Neuroscience Curriculum graduate students are currently averaging 5.3 years to completion.

### *C. Training/Research Grant Requirements*

The students should meet the training requirements set forth in the supportive grant and as generally required by NIH. While the Curriculum provides opportunities, forwards announcements, and tries to make sure that these requirements are met by all students, it is also the responsibility of the faculty mentors to be sure that the students are afforded the opportunity and time necessary to allow the trainees to meet these obligations.

1. Support by an NIH grant requires that students obtain instruction in the responsible conduct of research. Thus, it is required that all first year students (regardless of their source of support) take the University-sponsored course that is offered, either in the fall or in the summer. The required attendance information is maintained on file in the Curriculum Offices.
2. All students must obtain training in laboratory safety as provided by EHS, for a level appropriate to the type of work they are doing; this includes radiation safety training if any work with radiation is involved. This latter training must occur PRIOR to the student working with radiation. The Curriculum has begun arranging a session with EHS for the incoming students in late August to obtain the basic training.
3. All students working with vertebrate animals must take the IACUC training course and be certified prior to working with animals in any laboratory (including rotations!). They must be added to the principal investigator protocols that are relevant for the work they are doing. In addition, they must provide evidence of the training and

appropriate laboratory protocols upon request of the Curriculum offices. The Curriculum makes this requirement known to the incoming students, and encourages them to obtain their training in the first few weeks after they arrive, so that they can work with vertebrate animals in laboratory apprenticeships. All students working with Human Subjects must receive IRB certification, and have a current IRB protocol on file with the University IRB. All students working with Human Subjects must have certification that they have passed the

4. NIH Human Subjects (online) training course, as well as all relevant HIPAA courses, prior to working with human subjects. The certification must be supplied to the Curriculum offices upon request.

#### *D. Student Progress and the Student Training Committee*

The Neuroscience Student Mentoring & Oversight Committee, serves as an advisory board to oversee (1) the students' progress in coursework, (2) the selection of and progress in laboratory apprenticeships, (3) participation in journal clubs and seminars. The Committee also offers mentorship to students by summoning to the bi-annual meeting students who have been repeatedly flagged and to students who, whether or not in good status, would like to contact someone else besides their advisory committee.

#### *E. Teaching*

An important part of the Curriculum is that it organizes and teaches courses in Neuroscience. The overall philosophy of the core course series is described above.

For courses given under the Curriculum designation, exams should consist of 3-5 essay-style problem-oriented questions, given as a take home, open book, open library exam, and should usually be given over a weekend. Multiple choice in-class exams are highly discouraged, as they emphasize recitation over measuring the student's ability to think about a problem. The Curriculum has a standard face page and honor code description that the student must sign that should serve as the cover sheet for all exams; this must be signed and returned with the exam or the exam will not be graded. All courses should also collect a faculty evaluation at the end of the course.

The Curriculum offices provide services for collating and copying exams, collecting the exams from the students, for distributing the exams to the faculty for grading, for making and collating faculty and course evaluations, and for collecting and collating those grades. These services are available only to courses that are given under the Curriculum, and not to courses in other departments. It is up to the course directors (and block heads) to review the grading and to be sure that their faculty return the grades and exams in a timely fashion, and that the grades are entered on the University grade sheets, which are available in the Curriculum office.

The Center for Teaching and Learning at UNC (<http://ctl.unc.edu/>) runs teaching workshops that can be invaluable for new and seasoned faculty alike. These are usually 1-3 days in length and are well worth attending. If you are going to teach in the Curriculum, we strongly encourage you to participate in at least one of these workshops.

#### *F. Mentoring*

Faculty mentors are expected to provide a welcoming and supportive mentoring environment for students in the program, to provide adequate research resources for the trainees to accomplish their research goals, and to provide opportunities for exposure of their students to visiting faculty, the opportunity to attend various seminar series (especially those seminars related to Neuroscience, such as the UNC Neuroscience Center seminar series), opportunities to go to meetings and present their work, and the time and opportunities to meet other requirements of the program.

Mentoring is a complex process and is often difficult to accomplish with all of the other demands that are placed on faculty time. However, good mentoring requires constant and frequent communication with the trainee, including going over their experimental design and data with a collaborative atmosphere, as well as understanding the individual and personal requirements of the trainee. Mentoring also includes involving the trainee in all aspects of the work, including paper and grant writing, oral presentation, review, and the discussion of creative ideas and the intellectual property issues, as they are exercised in the mentors laboratory and in other laboratories. Mentoring includes doing experiments at the bench or on the rig with the trainees – this is probably the richest part of a trainees experience and is provides the greatest teaching opportunities. Remember also that the graduate students are professional trainees, not laboratory technicians. They should be fostered to pursue creative ideas with appropriate guidance, and should be encouraged to be scholarly in their approach. They should be encouraged to observe their data carefully and not accept results blindly. They must be steeped in the ethics of research and in the appropriate public and written presentation of their results.

An important part of the mentoring process that is often overlooked is the use of the DGC. This committee is described in detail above, but faculty mentors should look to the committee for other insights and viewpoints into problems and help with direction of the trainees. The DGC also provides a kind of mentoring for the trainee, and the proposal and selection of committee members should be considered in this light.

Our trainees are the “stewards of the discipline”<sup>1</sup> for the future, and should know their literature, the history and development of their chosen field, while at the same time should be instilled with the ability to recognize opportunities and to know how to take advantage of them. Our training in the core courses is focused not on recitation, but on critical evaluation of the literature and an attempt to instill the ability to read any paper in almost any area of neuroscience and to be able to understand the problem, the assumptions, and the approach, and to be able to critically evaluate the conclusions. Our students will soon be dealing with aspects of neuroscience and concepts that we, as faculty, are not even aware of at present, and will probably make several changes in research directions through their career. They must be intellectually nimble, and unafraid to tackle any problem. At the same time, they must know how concepts and ideas in the field have evolved. Your role as mentor is to help foster these traits.

The Office of Postdoctoral Services in the School of Medicine provides resources that are applicable to both pre and postdoctoral trainees, and holds workshops on mentoring that are worth attending and participating in. The Neuroscience faculty is strongly encouraged to take advantage of these opportunities as they arise, in order to improve awareness of the issues that surround mentoring.

#### *G. Expectations for NBIO Thesis Advisors*

Prior to accepting a graduate student mentee: Faculty are expected to meet with a potential graduate mentee and outline expectations related to thesis work. Such a conversation would include hours worked per week for typical lab members and journals towards which the lab is targeting papers. The faculty should encourage potential graduate mentees to meet privately with current lab members. This will allow the graduate student to better understand expectations prior to committing to a thesis laboratory.

Research: Faculty are expected to provide strong intellectual guidance for the thesis research. This includes scheduling regular meetings with graduate mentees. Faculty are also expected to provide or approve expected timelines for completion of thesis research and ensure that the mentees thesis committee meets regularly. Faculty mentors are expected to provide extra support and guidance when the student is working diligently and the thesis project is stalled due to technical difficulties or other issues.

**Scientific Integrity:** Faculty mentors are expected to provide guidance in the ethical conduct of research and to make every effort to ensure that all work in the laboratory adheres to the highest ethical standards. Faculty must not put students in positions that create a conflict of interest.

**Professionalism:** Faculty mentors are expected to provide a workplace free of discrimination and harassment, including sexual harassment. Faculty will familiarize themselves with UNC guidelines on harassment established by the University: <http://policy.sites.unc.edu/files/2013/04/PPHISMD.pdf> Faculty are expected to treat students respectfully at all times and are expected to promote workplace collegiality. It is understood by everyone that the quality of future references that a faculty member will provide will be based on the student's performance in the lab. However, faculty members may not threaten to withhold a reference due to a disagreement with the student.

**Professional development:** Faculty mentors are expected to encourage trainees to think about future plans with plenty of lead time. Faculty should encourage students to attend seminars and special events sponsored by NBIO as well as other seminars where students might be exposed to potential future scientific mentors. For students who may plan a future in non-academic careers, faculty are expected to support this choice, and to make graduate students aware of two websites which are resources for University professional development: the Training Initiatives in Biomedical and Biological Sciences (TIBBS <http://tibbs.unc.edu/>) and Professional Development through the Graduate School (<http://gradprofdev.web.unc.edu/>).

**Work schedule:** BBSP has no official stance for graduate students related to number of hours worked per week. NBIO expects that once course work is completed students will put in a minimum of 40 hours a week working on their thesis research. Faculty can expect students to understand that a 40-hour work week may not be compatible with students graduating in a timely manner and completing a high quality, publishable thesis. However faculty may not impose arbitrary and unrealistic work schedules on students. Faculty should refrain from "micromanaging" students' time.

**Student vacation time:** Faculty mentors will honor reasonable requests for vacation time. While there is no official stance regarding BBSP graduate student hours worked per week or vacation time, as a potential guideline, we suggest the following which applies for postdocs: "Unless otherwise stated, a Postdoc shall receive: (a) twelve (12) days of paid vacation leave per appointment year (in addition to recognized University holidays) and (b) twelve (12) days of paid sick leave per appointment year. Twelve days of vacation and twelve days of sick leave is a required minimum; a greater number of vacation days can be negotiated between the Postdoc and the Mentor." NBIO faculty will abide by this policy. Each faculty member is expected to discuss with students lab policies related to how much notice should be given and how any general lab responsibilities will be handled during vacation time. Faculty are also expected to allow students to observe University holidays and it is hoped that faculty will be flexible about additional time off that might be requested around the holidays.

**Granting of parental leave:** Faculty mentors will follow the University policy of parental leave, which states that a "full-time stipend-supported graduate student is eligible for six weeks of leave from his/her graduate program. In the event that both parents are full-time graduate students at UNC-Chapel Hill, only one may take Parental Leave." The full policy can be found here: [http://gradschool.unc.edu/pdf/parental\\_leave.pdf](http://gradschool.unc.edu/pdf/parental_leave.pdf)

**Guidance to health resources:** Faculty mentors should be alert to depression and other problems that might arise during the stress of graduate training and faculty are expected to be able to guide graduate students to mental and other health resources if needed: <http://campushealth.unc.edu/caps> However, faculty are not mental health providers, nor should they be expected to have that role. Faculty are expected to understand that students may

sometimes need to be out of the lab for appointments with health professionals. NBIO Community activities: It is expected that faculty mentors will attend and support student attendance at NBIO community activities.

#### *H. Expectations for NBIO Students*

Acquiring a Ph.D. through the Neuroscience Curriculum first and foremost requires that the Ph.D. candidate produce a piece of primary research published in a peer-reviewed journal. Therefore NBIO graduate training emphasizes 1) learning to do independent research and 2) acquiring skills in oral and written communication of research. Classes are meant to provide a backbone of knowledge, whereas qualifying exams and participation in seminar series, conferences, etc...help to train students in communication and professional development.

**Prior to joining a laboratory:** NBIO students are expected to meet with the potential mentor, get a sense of what a thesis project might look like, hours worked per week for typical lab members, and journals towards which the lab is targeting papers. Students are expected to familiarize themselves with the publication record of the potential mentor and meet with lab personnel and upper level NBIO students to get a sense of whether the lab seems like a good “match”.

**Research:** Graduate school requires self-motivation and initiative. It is the student's responsibility to familiarize him/her self with primary literature. NBIO students will gather the appropriate background information, perform experiments, analyze data, interpret findings, and learn how to effectively communicate this knowledge in both written and oral formats. NBIO requires students to publish their thesis research in peer-reviewed journals. At least one publication is required. Students should understand that targeting high profile journals and publishing multiple papers will enhance their career prospects.

**Scientific Integrity:** NBIO students are expected to have mastered principles of ethical conduct of research as offered through BBSP, to be familiar with university resources related to the ethical conduct of research, and to conduct research that adheres to the highest ethical standards.

**Professionalism:** NBIO students are expected to treat fellow students, lab mates, and faculty mentors respectfully at all times and are expected to promote workplace collegiality. All types of harassment including sexual harassment are prohibited. Students should be aware of procedures established by NBIO to deal with student/PI conflict and with university procedures for reporting work place harassment.

Professional development:

- Graduate school is a first step in a professional career. It is beneficial for students to become involved with the appropriate professional organizations, such as SfN.
- Even in well-funded laboratories, the student should strive to obtain independent funding through writing fellowships to NSF, NIH, or other relevant funding agencies. Acquisition of independent funding may provide opportunities for students to pursue independent interests consistent with Aims of their fellowship proposal.
- It is the responsibility of the student to be aware of the multiple resources on campus that can assist in professional career development, both for academic and nonacademic routes: The Training Initiatives in Biomedical and Biological Sciences (TIBBS: <http://tibbs.unc.edu/>). TIBBS offers opportunities to develop non- bench skills (e.g. scientific writing, teaching, etc.) as well as provides opportunities to learn about and prepare for non-academic career paths. TIBBS has a staff of PhD-level scientists available to meet one-on-one with graduate students seeking

career advice and options. Additional opportunities for Professional Development are offered through the Graduate School (<http://gradprofdev.web.unc.edu/>), including a number of professional development events.

- Students should understand the existing structure of funding for student stipends in years 03 -05. In the absence of an individual fellowship, 100% of the stipend most often comes from an R01 or similar research grant to the PI. This structure makes it difficult for students to perform internships or significant teaching outside of their research responsibilities. Obtaining independent funding via an NRSA or other fellowship, depending on the Aims of the proposal, might facilitate the acquisition of experiences outside the PI's laboratory.

**Work schedule:** BBSP has no official stance for graduate students related to number of hours worked per week. NBIO expects that once course work is completed, students will put in a minimum of 40 hours a week working on their thesis research. Students are expected to understand that a 40-hour work week may not be compatible with students completing a high quality, publishable thesis and graduating in a timely manner. Most PIs will expect students to be in the lab during the work day, although some PIs may be amenable to students working their own schedule if sufficient progress is made toward project goals. Students should have a clear understanding of their PI's expectations before joining the lab.

**Vacation:** Students are entitled to take vacation and University holidays. Students are expected to provide notice in advance for vacations and other absences (eg around university holidays) and arrangements must be made for important project related activities (eg care of mice). While there is no official vacation policy for graduate students, faculty will consider the policies governing postdoctoral researches as a guideline:

<http://research.unc.edu/offices/postdoctoral-affairs/policies/> Briefly this states: " Unless otherwise stated, a Postdoc shall receive: (a) twelve (12) days of paid vacation leave per appointment year (in addition to recognized University holidays) and (b) twelve (12) days of paid sick leave per appointment year. Twelve days of vacation and twelve days of sick leave is a required minimum; a greater number of vacation days can be negotiated between the Postdoc and the Mentor. Use of vacation leave is subject to the Mentor's prior approval. Leave is available in total on the first day of the appointment."

**Parental leave:** According to the UNC Graduate Student handbook, a "full-time stipend-supported graduate student is eligible for six weeks of leave from his/her graduate program. In the event that both parents are full-time graduate students at UNC-Chapel Hill, only one may take Parental Leave." The full policy can be found here:

[http://gradschool.unc.edu/pdf/parental\\_leave.pdf](http://gradschool.unc.edu/pdf/parental_leave.pdf)

**Health Resources:** Funds covering full health benefits are provided by BBSP, training grants, individual fellowships or by the PIs R01. There are ample medical resources on the campus to deal with all types of illness including depression and other mental health issues. It is the student's responsibility to take advantage of these resources as needed. An entry point to the UNC health system is <http://campushealth.unc.edu/>. Faculty will understand that students may need to be out of the lab for appointments with health professionals

**NBIO Community activities:** It is expected that students will attend and support student attendance at NBIO community activities particularly the Tues. Mini-Series, Student-Invited Seminars, PMRD and student thesis defenses.

#### *1. NBIO Resources for Dealing with Student/PI Conflict*

1. \*NBIO Director or Associate Director (open door policy)
2. Thesis Committee Chair (or other committee member or any NBIO faculty member)
3. Student Mentoring and Progress Committee (Stuber, Gupton, Crews, Reissner)

4. Department Chair
5. BBSP Director (Jean Cook)
6. University Ombudsperson <http://www.ombuds.unc.edu/>

\* It is anticipated that these resources may be accessed in the order shown, but students are encouraged to meet with the NBIO Director at any stage during the process.

## VI. Glossary

DGC – Dissertation Guidance Committee

DGS – Director of Graduate Studies

SMO- Student Mentoring Committee

## VII. On-line resources

UNC home page: <http://www.unc.edu/>

UNC Libraries <http://www.lib.unc.edu/>

Graduate School Resource guide: <http://gradschool.unc.edu/student/>

Graduate School Forms (PDF format): <http://gradschool.unc.edu/forms/>

Graduate School Information for Faculty: <http://gradschool.unc.edu/faculty-and-staff.html> Neuroscience

Curriculum: <http://www.med.unc.edu/neurobiology>

UNC Neuroscience Center: <http://www.med.unc.edu/neuroscience>

Neurobiology Facebook: <https://www.facebook.com/#!/UNCNeurobiologyCurriculum>

UNC Campus Recreation, visit: <http://campusrec.unc.edu/index.html>

The Odum Institute offers statistical, computing, data analysis and grant services to graduate students.

<http://www.irss.unc.edu/odum/jsp/home.jsp>

The UNC Graduate and Professional Student Federation (GPSF) The Graduate and Professional Student Federation is the arm of student government that represents all UNC-Chapel Hill graduate and professional students and advocates for improved campus and community resources to campus administrators and state and federal legislatures. <http://gpsf.unc.edu/> Connect Carolina- to register, check grades and billing info:

<https://sso.unc.edu/idp/Authn/UserPassword>

Sakai provides a listing of all the courses students are enrolled in and provides access to course materials provided by the professors. <https://www.unc.edu/sakai/>