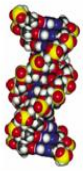

Medical Neuroscience Graduate Program
Indiana University School of Medicine

From Molecules to the Mind

Student and Faculty Handbook

Program, Policies and Procedures

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I. Introduction

Welcome to the Medical Neuroscience Graduate Program at the Indiana University School of Medicine in Indianapolis! The program offers a course of interdisciplinary training and research leading to the Ph.D. degree in Medical Neuroscience. The history of the program in Medical Neuroscience can be traced back to 1956, when, through a special separate appropriation from the State of Indiana, the Institute of Psychiatric Research (IPR) was established on the Indiana University School of Medicine campus. The IPR celebrated its 50th anniversary in December 2006 and boasts notable contributions to neuroscience from its faculty and staff such as the demonstration that glycine is a neurotransmitter, the development of the serotonin hypothesis of depression, the establishment of genetic and biochemical substrates of alcoholism, assembling the largest sample of bipolar families for genetic studies, and the development of an animal model of anxiety. The IPR served as the home of the Medical Neuroscience graduate program until 2003. In that year through a generous gift establishing a $15 million endowment, the Paul and Carole Stark Neurosciences Research Institute (SNRI) was created to expand neuroscience research and training at the medical school. The SNRI became the administrative home to the Ph.D. training program and seeks to continue the proud tradition of quality training in the neurosciences that has led to outstanding careers of our alumni in research, industry, teaching, and other areas.

Since the Medical Neuroscience program is an interdepartmental, interdisciplinary entity, it differs in some respects from graduate programs at other schools that are based in departments of neuroscience, and indeed from departmental-based graduate programs in the IUSM. This affords a broader range of research opportunities than is typically available in department-centric graduate programs.

This document outlines in some detail the pathway through the training program that eventually leads to the awarding of the Ph.D. degree. In that regard it is intended primarily as a guide for current students and faculty to assist each in their respective opportunities and responsibilities to the program. Prospective trainees are also encouraged to review the document as a resource describing both program philosophy and policies toward training the most outstanding neuroscientists possible. It should be noted that although this document describes a variety of “policies” and “procedures”, there is some flexibility in programmatic decisions. Reasonable accommodation for the needs and opportunities of our students has been, and continues to be, an important part of the program.

The document consists of two parts. The first part describes the requirements and obligations of the training program with respect to the students, including the milestones that students must meet, and an approximate time scale for the overall program. Many of the steps to the degree are established by, and reported to the Graduate School. While there is a limited amount of flexibility in some of the time lines, students and faculty alike should be aware of these and plan accordingly so as to meet them in a timely fashion.

The second part of this document is a faculty manual, which describes the opportunities and obligations of faculty participating in the training program, both to the Medical Neuroscience Graduate Program and to the students that they train. It also describes the funding scheme and policies currently in use for the program.

This document is a work in progress, and we welcome input on any part. If you feel that something is not clear, is ambiguous, is untenable, or if there are other topics that should be covered, please let us know and the matter will be brought before the Training & Advisory Committee for consideration.

II. Overview and Timeline of the Training Program

The table below outlines the timeline of requirements and milestones in graduate training in Medical Neuroscience. The first requirement for the Ph.D. in Medical Neuroscience is the completion of several core courses and seminars. Students must pass a Qualifying Examination covering the concepts and research skills presented in the core curriculum. After entering a specific laboratory to engage in a formal research project, a Dissertation Proposal in NIH grant format is evaluated in written form and defended orally in front of the Research Committee. Finally, the dissertation resulting from the student's original research must be presented and defended in a formal seminar.

This timeline represents the average transition of students through the program. Obviously, some (rarely) may complete the requirements in less time, while others may take a little longer to finish.

Year	Timing	Student Progress
1	Entire	Courses, Electives, Research Rotations (3)
2	Entire	Courses, Electives; Selection of Research Mentor, Research
2	June-July	Qualifying Examination (written component)
2	August	Qualifying Examination (oral component)
3	Fall	Selection and 1st Formal Meeting of Research Committee
3	January	Dissertation Proposal to Research Committee
3	Spring	Dissertation Research and Research Committee Meetings
4	Fall	Dissertation Research and Research Committee Meetings
4	Spring	Dissertation Research and Research Committee Meetings
5	Fall	Dissertation Research and Research Committee Meetings
5	Spring	Dissertation Defense and Public Seminar

III. Coursework and Course Performance

A. Coursework Overview and Philosophy

Historically, the Medical Neuroscience curriculum relied heavily upon a series of courses offered by contributing departments (e.g. Neuroanatomy, Neuropharmacology, Behavioral Neuroscience, and Neurochemistry), serving the needs of students in many programs in addition to those in Medical Neuroscience. As student populations differed in each course, there were necessary redundancies in content that limited the time available to any given topic. Furthermore, a small subset of the faculty were engaged in these courses, limiting the interactions between faculty and students. In 2004, the Curriculum Committee undertook a complete revision of our course offerings, consolidating material previously offered by departments into several core courses in fundamental neuroscience concepts that focus on the needs of the Medical Neuroscience graduate students while providing selective value for students in various departmental graduate programs. This is achieved by structuring the basic concepts into a series of 4-6 week modular courses each directed by faculty members from different departments. Each module carries 1-2 credits and 3-4 modular courses are available during any semester. Medical Neuroscience trainees are required to take all course modules outlined below, while other students may take different modules as their programs require or allow. This structure has had the desired effect of increasing the amount of time available for any specific topic (e.g. ion channels or neuronal plasticity) over that previously provided, while diminishing the overall classroom time (e.g. 4 semesters of core coursework has been replaced by 3). From year to year course content is updated in order to stay current with new findings in specific areas, as well as the expertise of new faculty. The modular structure means that we can make increments in content in units of less than a semester. The courses currently offered as modules are listed and described in a table below.

The following section, taken from the course handout at the start of the year, describes the philosophy of this series of modular courses, and specific expectations for both faculty and students in the course.

> *"The primary purpose of these course modules in Fundamental Neuroscience is to acquaint you with the experimental basis for our current concepts of nervous system function. The modules run during the spring (G743, G744, G745) semester of the first year and fall (N612, 614, 616) semester of the second year. They do NOT constitute survey courses in neurobiology as many of the areas of neuroscience may not be specifically covered. The goals of these course modules are not so much to inform as to foster an understanding of how we accumulate our information; not to provide a complete textbook picture of the functioning nervous system as we know it, but to provide you with intellectual tools to evaluate current and future hypotheses; not so much to provide answers to questions as to attempt to define the unanswered questions.*
>
> *The course material is organized into four-to-five-week modules or "Blocks". A student may take the Blocks separately but most students take all blocks sequentially. The student earns one or two credits per Block and receives a separate grade for each Block based primarily on the exam and class participation. 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 and auditors are not permitted.*
>
> *Fundamental aspects of cell biology, molecular biology, basic neuroanatomy and basic neurophysiology that are necessary to an understanding of the material of the rest of the course are obtained during the first semester core curriculum (Biomed I, II, and III). Because the course draws students from a wide variety of backgrounds, the core information provided in these first semester courses are crucial in setting a level of expected background knowledge required for good discussion and therefore are prerequisites to all of the modular courses.*
>
> *Students: It is crucial in undertaking this course that you view yourself as a beginning professional developing the skills of the profession--the ability to design and judge the quality of experiments, to talk about them with colleagues, to express ideas in writing, and to master material well enough to be confident in discussing it--and not as an undergraduate cramming in information on the expectation of being tested.*

Reading for the course is of two types: background reading in a text, and original research papers. Background reading for each class meeting will usually be assigned from the course text. Most faculty will assign one or two research papers per session. Clearly the reading must be done before the class session if meaty discussion is to ensue. You will be given a set of questions to guide your reading of original papers. These questions will form a basis for class discussion. Typical questions one should ask oneself in any case in reading a paper are these:

- *What is the hypothesis being tested?*
- *How strong is the evidence in support of the hypothesis?*
- *What is the point of each of the figures?*
- *Is there a central, most important figure?*
- *Are the experiments direct or indirect?*
- *Did the authors do the proper controls?*
- *Does the text of the paper deal completely with the data presented in the figures or are points overlooked?*

B. Specific Coursework Requirements

Fundamental Neuroscience I Electrical Signaling and Ion Channel Biology	**G743** - Membrane potentials and voltage-gated ion channels and their contribution to signaling in the nervous system.. Three lecture/discussion hours per week (5 weeks). *Spring* Cummins and staff.
Fundamental Neuroscience II Neuropharmacology of Synaptic Transmission	**G744** - Neuropharmacology of synaptic transmission; postsynaptic receptor biology; ionotropic/metabotropic receptors; pharmacodynamics of ligand-receptor interactions. Three lecture/discussion hours per week (5 weeks). *Spring* Nicol and staff .
Fundamental Neuroscience III Intracellular Signal Transduction in Neurons	**G745** - Signal transduction in neurons; G-proteins, post-translational events; growth factors; lipid signaling. Three lecture/discussion hours per week (4 weeks). *Spring*. Hingtgen and staff.
Fundamental Neuroscience IV Presynaptic Neurotransmitter Regulation & Synaptic Plasticity	**N612** - Neurotransmitter dynamics and synaptic plasticity; neurotransmitter transporters; dendritic signaling. Six lecture/discussion hours per week (4 weeks). *Fall*. Hudmon and staff.
Fundamental Neuroscience V Integrative Neurophysiology and Special Senses	**N614** - Special senses and integrative neurophysiology; sensory receptors; simple reflex circuits and analysis. Six lecture/discussion hours per week (4 weeks). *Fall*. DiMicco and staff.
Fundamental Neuroscience VI Developmental Neurobiology	**N616** - Developmental neurobiology; axon guidance; neuronal stem cell biology; patterning in the nervous system. Six lecture/discussion hours per week (4 weeks). *Fall*. Lee, Hashino and staff.
Translational Neuroscience and Neurogenetics	**N711 -** Consideration of the basic neuroscience underlying various disorders from clinical, historical and contemporary genetic views. 3 lecture/discussion hours per week (8 weeks). *Spring*. Niculescu, Murrell and staff.
Graduate Neuroanatomy	**D527 -** A comprehensive course in functional neuroanatomy for graduate students. Three lecture hours per week (16 weeks). *Spring*. Kubek and staff.
Behavioral Neuroscience** ****** *Currently not required.*	**P615 -** Learning & memory, cognitive neuroscience, addiction, emotion, motivation, stress, sleep & circadian rhythms. 3 hours/week (6 weeks). *Spring*. Goodlett and staff.
Research in Neuroscience	**N800 –** Research in laboratories of faculty mentors. Rotation experiences designed to expand technical exposure of trainees. *Variable credit*.
Neuroscience Seminar	**N801 -** Required of all 2nd and 3rd year trainees. Students work in teams to develop brief formal presentations on their own research and/or on the

	research of forthcoming visiting neuroscientists to Indianapolis. 1 hour/week. *Spring.* Neuroscience Training Committee.

Below is a table giving an example of a typical two year sequence for students entering the Medical Neuroscience Ph.D. program. The particular sequence may vary depending upon the background and interests of the students. Students are encouraged to apply to summer courses at the Marine Biological Laboratory or Cold Spring Harbor and can thus have optional summer experiences to supplement their rotation schedule. An example of the curriculum for an M.D./Ph.D. student is also illustrated. Regardless of program affiliation, all students are required to participate in the courses marked with green shading, while Medical Neuroscience specific requirements are shaded in yellow.

Fall Semester	Spring Semester	Summer Sessions
Year 1 of Training Program (IBMG Student / Medical Neuroscience Student)		
Biomed 1, 2, 3 (G715, 716, 717) 6 credits	Fundamental Neuroscience I-III (G743, 744, 745) 3-6 credits	Methods in Neuroscience (D526, Zhou) 2 credits
Consultation with TAC to assist in selection of optimum rotations/electives	Other IBMG Electives 3 credits	*Off-site course (opt.)*
Lab Rotation #1 2 credits (G718)	Lab Rotation #2 2 credits (G718) / Lab Rotation #3 2 credits (G718)	Dissertation Research in chosen laboratory
Exploring Neuroscience: The SNRI Seminar Series	Presentation Skills Course (G655) 2 credits	Principles of Experimental Design (F850) 2 credits
Year 2 of Training Program (Medical Neuroscience Student)		
Fundamental Neuroscience IV-VI (N612, 614, 616) 6 credits	Translational Neuroscience & Neurogenetics (N711) 2 credits / Behavioral Module (P615) 2 credits	*Candidacy Exam*
Dissertation Research	Dissertation Research	Dissertation Research
Biostatistics &Research Ethics (G855) 2 credits	Graduate Neuroanatomy (D527) 3 credits	Methods in Neuroscience (D526, Zhou) 2 credits
Year 1 of Training Program (MD/PhD Student)		
Fundamental Neuroscience IV-VI (N612, 614, 616) 6 credits	Fundamental Neuroscience I-III (G743, 744, 745) 3-6 credits	*Candidacy Exam*
Rotation Research	Dissertation Research	Dissertation Research
Elective	Seminar Course (N801) 2 credits	Principles of Experimental Design (F850) 2 credits

C. Elective Courses

During the second semester of the first and second years in the program, a number of elective courses are offered by various departments and programs in the School of Medicine. These courses are largely 5 week modules as are our required modules and include topics such as cellular signaling in carcinogenesis, advanced molecular imaging, and animal models of human disease. You are encouraged to consult the Training and Advisory Committee (TAC) to help in the selection of suitable electives that fit both your interests and needs.

D. The Minor Requirement

The Graduate School of Indiana University currently requires completion of a minor with varying requirements for credit hours. Should you be interested in a particular area beyond neuroscience, such as aging, bioinformatics, or diabetes there are organized minors in those areas with specific requirements. If, however, you elect not to pursue such a specific interest, the Life Sciences core courses (Biomed I, II, and III) offered during the first semester of the first year satisfy the minor requirement and no other coursework is necessary.

E. Research Rotations / Apprenticeships

All predoctoral trainees in the program (with the possible exceptions of MD/PhD students) are required to engage in a series of structured research apprenticeships (rotations) in laboratories of participating faculty prior to admission to Ph.D. candidacy. These rotations (G718) are scheduled as 8-week experiences beginning in the second half of the fall semester of the first year (Rotation 1) and ending in the spring (Rotation 3). In extraordinary circumstances, a rotation can take place during the summer following the first year, but most students are encouraged to have chosen a dissertation laboratory by that time. Didactic courses are taught only on Mondays, Wednesdays, and Fridays, freeing the entire days on Tuesdays/Thursdays (and weekends) for rotation research. It is expected that each student will spend a minimum of 15 hours per week in the lab during a rotation. Each rotation provides sufficient time for the trainee to become quite familiar with both a research project and methods and with the style and environment of that laboratory as a potential locus for dissertation research. A requirement of the Medical Neuroscience program is that all rotations chosen by any one student must be technically disparate and approved as such by the Training and Advisory Committee (TAC). This restriction means that trainees are exposed to research environments with technical emphases ranging from molecular cloning and genetics to cellular electrophysiology to behavioral paradigms to immunocytochemistry and functional imaging.

Information and guidance about rotations is provided by the program. All students will have access to a database of faculty that allows searching on both research interests and technical capabilities of the lab. Students can review this material to make a “wish list” of faculty who interest them. During the initial weeks of the fall semester of the first year, entering students will be invited to meet with the TAC to discuss their initial choices and get perspective on past rotations done in those labs or have other options presented. After this advisory meeting, each student will then seek out faculty and arrange rotations. It is desirable to have all rotations arranged at this time, but students may elect to delay a decision on later rotations.

An important part of any rotation experience is reaching closure on a project. However, it is also important that the apprenticeships do not drag on significantly beyond the expected time frame. This means that summer rotations should end by the start of the fall semester; and rotations during the school year should follow closely with the timing established by the IBMG program. It is understood that some excellent rotations may continue slightly beyond their expected time frame; however in order to allow for all three apprenticeships be completed by the start of the second year, this is strongly discouraged, and such continuations must be approved by the Director and/or the Neuroscience Training and Advisory Committee.

Upon completion of an apprenticeship, both the student and mentor are required to submit structured written reports detailing the scientific project and accomplishments of the student and addressing questions regarding the level of direct interaction between the mentor and trainee, the work schedule, and the degree to which mutual expectations of the experience were met. The final report is to be no more than 2 pages long, and should be submitted to the Medical Neuroscience program office within 3 weeks of completion of the rotation. Anonymized records of apprenticeship experiences will be maintained in the office for review by new trainees seeking apprenticeship opportunities.

IV. The Training and Advisory Committee

The Training & Advisory Committee (TAC), a standing committee of the program consisting of 5-6 faculty, serves two key functions in the program. The first function is advisory to all students during their first two years in the program. As detailed above, the TAC provides each entering student interested in Medical Neuroscience as a degree track with counsel on effective choices of laboratory rotations. A portfolio will be compiled on each student including course performance, rotation performance, and evaluations. Upon choosing the Medical Neuroscience program, the TAC will meet with each student twice a year to review progress in the program and advise the student on elective choices. Students will receive a summary of their progress in the program from the TAC every six months during the first two years. The second function of the TAC is making recommendations for policy changes to the Director as issues regarding training in classroom or laboratory settings arise. Members of the TAC are appointed by the Director and serve on rotating 3 year terms with 2 members of the committee rotating off every year.

V. The Qualifying Examination

In the Indiana University system, the graduate qualifying examination is the gateway to candidacy for the Ph.D. degree. All students, including those in Medical Neuroscience, must pass the qualifying examination to be admitted to candidacy after which they finish their dissertation research and defend a dissertation to complete the degree requirements. In the Medical Neuroscience program the qualifying examination has two parts, a written and an oral component, as described in detail below.

A. Part 1 – Written Qualifying Examination

The Qualifying (Candidacy) Examination is divided into two parts. Part 1, the Written Qualifying Examination (WQE), is intended to examine general knowledge of basic and contemporary neuroscience as presented in the core coursework and as gained during laboratory rotations, seminar participation, and journal club activities. The specific goals of the Written Qualifying Examination are to determine:

1. The working knowledge of the student in neuroscience.
2. The ability of the student to integrate information from various technical approaches to neuroscience research.
3. The organizational skills of the student in formulating hypotheses, designing experiments, and presenting evidence.
4. The ability of the student to identify and discriminate among key experimental observations.
5. The breadth of perspective related to neuroscience research problems.

The WQE is administered during the summer semester following the student's second year in the program, usually in June. The WQE is constructed and approved by the standing TAC of the program from questions solicited from teams of faculty members. The WQE consists of 4 extended questions. Associated with each question are several (2-5) neuroscience research articles or reviews from the scientific literature to serve as initial reference material. Each student is allowed to choose 3 of the 4 questions to answer during a 3-week period. The examination is "open literature" and students are encouraged to incorporate additional literature into answers. However, it should be emphasized that each student will work on their exam independently and without input from any other person as per the honor code of the School. Page limitations and format for the answers are provided at the time of the examination.

The answers (anonymized for grading) to each of the 3 chosen questions for each student are evaluated by at least three members of the Medical Neuroscience faculty with specific or related expertise in the

topic area of the question using the A,B,C,F scale of the Graduate School. The TAC reviews the results of the evaluation and determines the Pass/Fail result for each student. The possible outcomes and their consequences are as follows:

1. Passing grades (“B” or better performance) on all 3 questions constitutes passing of the WQE.
2. A consensus failing grade on 2 of 3 questions and a consensus "C" performance on the remaining question constitutes failure of the WQE.
3. If a student receives a consensus failing grade (can include a C letter grade along with F letter grades) on a single question, a new question will be administered and the student will have a choice between the new question and the one not chosen during the first attempt and will be given 1 week to successfully answer the question.
4. If a student receives consensus "C" grades on only a single question, the TAC can elect to have that question rewritten for evaluation or have the student answer a new question.
5. A consensus failing grade on all 3 questions constitutes failure of the WQE.

In accordance with regulations of the Graduate School, should a student fail the WQE they will automatically be given the option to retake a comparable, but not identical examination. The second attempt at passing the WQE will usually occur the following year, but may occur no sooner than 3 months following the first attempt at the discretion of the Director in consultation with the TAC. Under ordinary circumstances, failure of the WQE on the second attempt constitutes grounds for dismissal from the degree program. Under extraordinary circumstances, the student may petition the Graduate School and the Program in Medical Neuroscience for a third attempt at the WQE. Such an attempt will only be allowed by consensus agreement of the Executive Committee of the program, regardless of the opinion registered by the Graduate School.

B. Part 2 – Oral Qualifying Examination

Following successful completion of Part 1 (WQE), the student will defend the performance of the exam to the TAC in oral format. The oral exam will focus on clarification of issues revealed in the evaluation of the WQE. The TAC may elect to invite additional faculty, primarily involved in generating the written questions, to participate in the oral exam. The TAC may also ask general questions concerning the student’s knowledge of neuroscience, experimental methodology, and data analysis.

Successful completion of the oral component of the exam completes the candidacy examination. Failure of the oral component necessitates a reexamination by a subset of the TAC and additional faculty appointed by the Director. Failure of the oral component a second time necessitates a complete retake of the qualifying examination (both written and oral components) in accordance with the procedures outlined above.

C. Deadline for Completion of the QE

If a graduate student has not completed their qualifying examination by the beginning of their third year in the program, then at that time they will lose their stipend support regardless of source and their status as a full-time graduate student in the Medical Neurosciences program will be terminated. The student is permitted to remain in graduate school if they elect to do so, however, they will take on non-degree status and will no longer be affiliated with the Medical Neuroscience graduate program.

VI. Candidacy and Guidance / Completion of the Dissertation Research

A. The Research Guidance Committee

As soon as possible after passing the Qualifying Examination, a student should form his/her Research Guidance Committee (RGC). The chair of this committee must be a member of the Medical Neuroscience 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 RGC in consultation with the Director of the Medical Neuroscience graduate program.

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

Each RGC will consist of five or six members, at least three of whom must be primary members of the Medical Neuroscience faculty with endorsement (see http://www.indiana.edu/~grdschl/gradFaculty.php). 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 Indiana University. The composition of the committee must be approved by the Graduate School and the Director of the program. Forms for committee composition are available from the Graduate School and from the Medical Neuroscience admininstrative office.

The principle functions and responsibilties of each student's RGC will include:

1. Solicitation and evaluation of the dissertation proposal (see below).
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.

Following formation, the RGC should have an informal meeting with the student to make decisions and reach agreement on:

a. the student's area of specialization within neuroscience and the role each RGC member contributes to this area.
b. the nature of and schedule for the formal dissertation proposal.
c. the scope of the formal dissertation proposal within the context of the student's preliminary research results.

Within one year (limit) of passing the Qualifying Examination the RGC will evaluate and approve the dissertation proposal in both written and oral formats (see below). The RGC will meet to administer the final oral examination (dissertation defense). 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 RGC.

Each student is required to meet with the RGC twice each year to report on research progress. It is the responsibility of the RGC chair and the student to insure compliance with this requirement. Following the committee meeting the student is required to write a summary of the meeting with particular attention to documenting decisions made. The summary is to be approved by the chair of the RGC and copies sent to each committee member and to the administrative office of the program for inclusion in the student's official program file.

B. The Ph.D. Dissertation Proposal

Following the Qualifying Exam and the initial meeting of the RGC, the committee is to evaluate the formal dissertation proposal. The written document should be submitted to the RGC at least two weeks in

advance of a meeting at which the student will orally defend the proposal no later than 6 months following completion of the Qualifying Exam.

The proposal is to take the form of an NIH research grant and utilize guidelines for the R21 format with a 15-page limit on the research description. In this regard, it is expected that the proposal will contain an Introduction which presents the background and rationale for the dissertation project as well as a scholarly understanding of the relevent literature. It will also contain sufficient preliminary data to indicate some proficiency with the majority of procedures to be employed and feasibility of many, but not necessarily all, of the proposed experiments. Finally, it should include a section on expected results and their interpretation and a projected timetable for completion of the research. Budget, personnel, funding, and resources information are NOT required.

It is the responsibility of the RGC to evaluate (and approve if warranted) the proposal and the student's facility with the project as demonstrated during the meeting.. In this regard, it is expected that the committee will provide the student with a written critique, synthesized by the RGC chair, consistent with traditional NIH review criteria and consisting of elements from each committee member. Thus the meeting with the RGC will constitute a "site visit" of the dissertation proposal.

In addition, it is the responsibility of the committee to provide ongoing constructive criticism, guidance, and often technical support to insure that the student has a good opportunity to succeed with the project. It is the obligation of the student and the mentor to notify members of the RGC 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 RGC.

C. The Structure and 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 Research Guidance Committee. 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 program is in discussions with the Graduate School regarding this flexibility in format. Please check with the Director concerning details before writing the dissertation document.*

The formal defense of the dissertation is a two stage event. The first stage is a closed oral examination of the student by the RGC. 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. This event will follow the closed committee

defense by no less than one month. During the intervening period the student should make 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 Medical Neuroscience graduate program. Evidence that these conditions have been met are sufficient to warrant signature of the appropriate documents by all members of the student's RGC except the chairman. The chairman of the committee will provide the final signature following the public presentation.

VII. Faculty Participation and Policies

The Medical Neuroscience graduate program exists for the students, but it cannot exist without the energy and participation of the faculty. Unlike many departmental programs, 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 Medical Neuroscience program 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. In this section, we provide background information for the faculty that may help them understand the specifics of how the Medical Neuroscience program operates, some of the requirements that faculty may need to help a trainee accomplish their goals, and the overall training philosophy.

A. Criteria for Appointment to Training Faculty Status

Faculty are appointed to the Medical Neuroscience program as potential mentors by the Director following consultation with a Faculty Admissions Committee. The committee reviews the credentials of the applicant, and suggests the appropriate level/category of appointment to the program. The Faculty Admissions Committee consists of 3 Primary or Associate faculty appointed by the Director. Faculty who participate as mentors and committee members must be appointed to the IU Graduate Faculty by their departmental chair. There are 3 categories of faculty membership as follows.

Faculty Categories:

1. Primary: Faculty with funded research programs, capable of supporting a student both financially and intellectually and providing an appropriate research environment. All primary members must be "graduate faculty with endorsement", a status petitioned of the graduate school by the departmental chair of the home department (see http://www.indiana.edu/~grdschl/gradFaculty.php). These faculty may participate as dissertation advisors, rotation advisors, dissertation committee members, and course instructors.
2. Associate: Faculty who may not have independently funded research programs, but who are willing to serve as dissertation committee members or participate in the teaching or administrative missions of the program, and as rotation advisors. Associate faculty may not serve as dissertation advisors. Associate member status is generally conferred on faculty without independent space or research funding commitments from their home department.
3. Affiliate: Faculty outside the IU system who may participate in the activities of the Medical Neuroscience program. Affiliate faculty may be appointed to serve as members of the RGC, but are not eligible to be dissertation advisors. Affiliate faculty members may be joint appointees from other academic institutions or from the corporate sector.

Primary members of the faculty have access to Medical Neuroscience graduate students to engage in thesis research in their laboratory. Primary members may be asked to serve on dissertation committees of Medical Neuroscience students, to possibly serve on one of a variety of standing and *ad hoc* committees involved with the normal operation of the program (Admissions, Training & Advisory, Curriculum, Executive), and to contribute to the teaching and other intellectual activities as may be appropriate and mutually agreeable. The program will expect that Primary members will provide NIH biosketches, lists of trainees, and current Other Support pages in NIH format for use in training grant applications

B. Guidelines for Financial Support of Trainees

All IU School of Medicine Ph.D. students are now admitted through a common, centralized process referred to as the IBMG (**I**ndiana **B**io**M**edical **G**ateway). The IBMG processes applications, coordinates

annual recruitment events, decides on admissions, and supports student stipends, fees, and health insurance costs for the first year of matriculation.

At the present time, the Medical Neuroscience program has committed to provide stipend, tuition, fee, and health insurance support for those students successfully completing the first year and declaring Medical Neuroscience as their degree track. During the second year of training all Ph.D. students are expected to have chosen a laboratory for their dissertation research and completed their qualifying examination for admission to candidacy. Upon admission to candidacy or following two years in the program (whichever occurs first), the student becomes the financial responsibility of their mentor. Sources of funding may derive from research grants, foundation grants, competitive fellowships awarded to the student, or from resources in the home department. **In all cases** the order of financial responsibility is (1) the mentor, (2) the home department of the mentor, (3) the center/institute of the mentor, (4) the Medical Neuroscience graduate program. The Medical Neuroscience program can only provide support in exceptional or emergency cases. The mentor must arrange for payment of a stipend, health insurance, and tuition and fees each semester thereafter. A minimum stipend level is set by the IBMG program upon approval of the departmental chairs. Faculty mentors are prohibited from providing less than the minimum stipend for students in their laboratories and will otherwise forfeit their status as primary faculty of the Medical Neuroscience program. Details of financial support levels and changes in policy will be communicated to all faculty by an annual memo from the Director.

While financial responsibility of candidates lies with the mentor, we encourage our students to seek independent funding by way of fellowships from foundations, the NIH or NSF, or other organizations. The Medical Neuroscience program office can provide guidance in seeking such support and welcomes new opportunities that you may encounter. Furthermore, student support on NIH training grants is an additional avenue of support. One issue that often arises for students receiving NIH support in the form of a training grant (T32) or an individual NRSA fellowship (F31) is that the funded level of such grants is capped below the mandated level of the IU School of Medicine. Unfortunately, faculty are prohibited from supplementing federal fellowships with federal funds, thus research grants (e.g. R01s) cannot be used to fill in the gap. Departmental funds or IU Foundation account funds may be used, however, and mentors in this situation should make plans for this particular wrinkle.

C. Expectations for Faculty Participation

The objectives of formal interdisciplinary training will not be realized if the faculty do not support the concept of interdisciplinary research in neuroscience and set a personal example toward achievement of this goal. Although the faculty of the program includes many productive and well recognized scientists with high quality research programs in the areas of neurobiology and behavior, few of us are as broadly trained as we expect our students to be. In order to provide a model of interdisciplinary research and to make their own research programs strong, most members of the Medical Neuroscience faculty are involved in collaborative work across the boundaries of traditional research disciplines. These active collaborations serve as an intellectual framework to aid us in designing student training to develop the perspectives and insights that foster interdisciplinary research teams. These perspectives should be applied to guidance of rotations, teaching in courses, and ultimately dissertation mentoring. The structure and expectations for faculty involvement in each of these areas is discussed below.

Laboratory Research Rotations - All predoctoral trainees in the program are required to engage in a series of structured research apprenticeships (rotations) in laboratories of participating faculty prior to admission to Ph.D. candidacy (see section III,E above). Faculty will be canvassed each year regarding their desire to host a rotation student during the first year, and to provide information regarding possible rotation projects and techniques used in their lab. These data will be compiled for advising the students on labs that they may find interesting. When a student contacts a faculty member regarding a potential rotation it is important to discuss expectations of both student and faculty member regarding the research project, schedule, and involvement of other lab personnel in the rotation. If participation in

regular lab meetings is required of the rotation student, it is recommended that such meetings be scheduled for either Tuesdays or Thursdays as class schedules on MWF may interfere with attendance.

Upon completion of an apprenticeship, both the student and mentor are required to submit structured written reports detailing the scientific project and accomplishments of the student and addressing questions regarding the level of direct interaction between the mentor and trainee, the work schedule, and the degree to which mutual expectations of the experience were met. Forms for both student and faculty reports are available in the program office. Each report is to be no more than 2 pages long, and should be submitted to the Medial Neuroscience program office within 3 weeks of completion of the rotation. In addition, grades for the rotation must be turned in at this time. No deferred grades will be accepted.

Teaching in courses - An important part of the graduate program is that it organizes and teaches a curriculum in neuroscience. The overall philosophy of the core courses is described above, namely that an emphasis is placed on training students for the future, teaching students how to critically evaluate literature, and giving students an appreciation for both the past and the current state of the art in the wide variety of areas that form the discipline of neuroscience. To this extent, courses should emphasize discussion and paper reading over lecture and recitation. Whenever possible the courses should be "team taught", and continuity between sections should be considered. The courses are expressly not to be thought of as a way of introducing the students to the current research interests of a number of faculty, as this leads to fragmented courses in which a variety of concepts are jumbled together. The core courses in Medical Neuroscience curriculum have received very high ratings by the students in recent years, and should be looked upon as a model to emulate. For courses that are given in the program, under the MNEU 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 Program has a standard face page and honor code description that the student must sign that will 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 will collect a course/faculty evaluation at the end of the course.

The Program office provides 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 MNEU identifier, and not to courses in other departments. It is up to the course directors (and block captains) to review the grading and to be sure that their faculty return the grades and exams in a timely fashion, and to be sure that the grades are entered on the University grade sheets, which are available in the Program office.

The Program also calculates faculty teaching effort, and updates this in conjunction with other departments. This effort is allocated according to "student contact hours" for each faculty member involved in the course; sessions that are "team taught" are split between the responsible faculty members. This is done to allow individual faculty to present this teaching to their departments and to document their effort if necessary.

Courses in Medical Neuroscience are divided into the core series (e.g., N612, N614, etc.) and other courses that may be either elective or required. The core series is overseen by a Course Director, designated captains for each module, and staff support provided by the Program office. Significant changes to these courses or the course material should also be discussed with the appropriate Directors. Other courses may be developed but must be done so in conjunction with discussion with the Director of the Medical Neurosciences program and the core series Course Director.

Participation by faculty in teaching and developing courses is encouraged. You can contact the Director at any time to inquire about opportunities to participate and to present ideas for new courses. Not all faculty will be able to be involved in the core courses each year owing to the seminar style and need for continuity between sessions. Please do not hesitate to suggest new ways to become involved.

Dissertation 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 the program, such as the SNRI 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 it provides the greatest teaching opportunities. Remember 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 critique 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 Research Guidance Committee. 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 RGC 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”** 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.

**This term comes from the Carnegie Initiative on the Doctorate, Carnegie Foundation for the Advancement of Teaching. See http://www.carnegiefoundation.org/CID/stewards.htm and http://www.carnegiefoundation.org/CID.

VIII. Special Circumstances

Occasionally, students and/or mentors will encounter problems during their training that cannot be solved readily or amicably. Under these situations, there are two avenues of redress within the Program. The first is that either the student or the mentor may call a meeting of the student’s Research Guidance Committee, to provide an external review of the problem and to recommend solutions. In these situations, it is important for the RGC to communicate any findings, in writing if appropriate, to the

Director; or perhaps to involve the director in the Committee meeting. It is expected that differences of scientific opinion, minor concerns over ethics, or personal differences may be resolved in this manner.

A second avenue applies in certain circumstances where it may not be appropriate to involve the Research Guidance Committee in this way. In such cases, the student (or the faculty member) should contact the program Director for advice or help. If there is a perceived conflict of interest with the program director, one of the members of the SNRI Executive Committee should be contacted instead. Honor system violations, and sexual or racial harassment violations should be handled through the system(s) provided by the University for those purposes. Faculty should not try to handle these violations on their own.