

EP.90.07
December 4, 1989

UNIVERSITY OF ILLINOIS
URBANA-CHAMPAIGN SENATE
Committee on Educational Policy
(Final;Action)

APPROVED BY UIUC SENATE

Proposal to Establish a Ph.D Program in Neurosciences, School of Life Sciences,
Liberal Arts and Sciences

SPONSOR: School of Life Sciences

BRIEF DESCRIPTION: The UIUC program in Neural and Behavioral Biology (NBB) provides training in research and scholarship pertaining to the study of nervous system structure and function that underlies complex behaviors. Since its inception in 1971, this program has existed as a degree option for the Ph.D. in Biology. Since then, the field of Neuroscience has undergone a rapid expansion and the numbers of NBB faculty and students have increased dramatically at this and other campuses (see III.B). Neuroscience is fundamentally an *interdisciplinary* field and, as the topics expanded beyond those that are presented in traditional biology programs it has attracted students in diverse disciplines ranging from life sciences to engineering. In order that the title of the degree better represent the contemporary status of the training program on this campus, and the field of Neuroscience as it exists nationally and internationally, it is herein petitioned that the status of the NBB program be changed from that of a degree option in Biology to that of a Ph.D. in Neuroscience. Essentially, we request a change in both the program status as well as name but the program will remain to be administered through the School of Life Sciences.

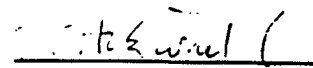
JUSTIFICATION: The major items justifying this petition are listed here and elaborated in Section IV. They are:

- 1) A degree in Neuroscience is a more accurate description of the actual training received, than is a degree in Biology.
- 2) The UIUC campus must have an independent degree program in Neuroscience if it is to remain competitive with other world-class universities.

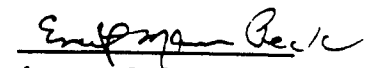
GUIDELINES FOR UNDERGRADUATE EDUCATION: Irrelevant for a graduate program.

BUDGETARY AND STAFF IMPLICATIONS: Since our request is mainly for a change in program status, there are no budgetary or staff implications.

CLEARANCES:

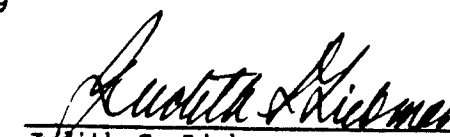

Chair, SOLS CCC


Acting Director, SOLS


Assoc. Dean, LAS

STATEMENT FOR BULLETIN: None

EFFECTIVE DATE: August 1989


Judith S. Liebman
Vice Chancellor for Research
Dean of the Graduate College

9/21/89
Date

I. EXPANDED STATEMENT OF REQUIRED COURSES, EXAMINATIONS, PROJECTS OR THESES, INCLUDING OUTLINE OF A SAMPLE PROGRAM INDICATING THE SEQUENCE

This information is contained in the attached NBB Guidelines as they currently stand.

II. SUMMARY OF RESEARCH INTERESTS OF THE FACULTY

A listing of program faculty and a brief statement describing the research interests of each member is given in the attached NBB Brochure. The faculty is an internationally distinguished group of 51 scientists offering a broad range of specialty areas. The faculty come from 12 departments and five colleges: Departments of Cell and Structural Biology; Chemical Sciences; Ecology, Ethology and Evolution; Electrical and Computer Engineering; Entomology; Medical Information Sciences; Physical Education; Philosophy; Physiology and Biophysics; Psychology; Veterinary Biosciences; and Veterinary Pathobiology.

III. CURRICULA VITAE OF CORE FACULTY

See attached

IV. EXPANDED JUSTIFICATION OF THE NEED AND DEMAND FOR THE PROPOSED PH.D PROGRAM IN NEUROSCIENCE

A. Prologue

In the following paragraphs the relationship of the proposed program in Neuroscience to the criteria of the Graduate College for new Ph.D. programs is addressed. However, it must be noted that the present petition is not for a new program but for a change in the status and name (i.e., from a Ph.D. degree program in Biology with an option in Neural and Behavioral Biology to a Ph.D. degree program in Neuroscience) of an existing program. A fortunate consequence of this circumstance is that ample data (as evidenced from the attached program documents) are in hand for the assessment of the conformity of this program to the Graduate College criteria.

B. Contribution to the broad mission of the University of Illinois at Urbana-Champaign

The debut of Neuroscience as a discipline occurred, arguably, in 1971 when the first meeting of the Society for Neuroscience was held in Washington D.C. The meeting was attended by roughly 300 scientists and at this time Neuroscience existed as a loose amalgam of Neuroanatomy, Neurophysiology, Neuropharmacology and Physiological Psychology. Since then the field of Neuroscience has expanded enormously. The Society presently has more than 13,000 members many of whom are associated with prestigious universities (e.g., Albert Einstein College of Medicine, MIT, Northwestern, Chicago, Columbia, Cornell, Cal Tech, Harvard, University of California, Illinois, Michigan, Minnesota, Wisconsin, Washington University, Princeton, Stanford, Yale, etc.). These universities now have Ph.D. programs, and in some cases departments, in Neuroscience. Associated with this growth is the formation and expansion of many new neuroscience programs within various funding agencies and establishment of journals devoted to the neurosciences. Thus it

is clear that Neuroscience has achieved the status of an independent discipline, and that it is universally recognized to be a vital and dynamic science. Moreover, it is having substantial impact on fields as diverse as engineering and computer science as well as biology and medicine, and has stimulated the establishment of high-technology and biotechnology programs in both industry and government. In the last three months alone, there are four new program announcements by Armed Forces, NIH and NSF related to research support in the area of computational neuroscience.

The understanding of nervous system function has increased dramatically in many areas as a result of the growth of Neuroscience. Neural computational algorithms are now widely applied in artificial intelligent systems; the principles of neural signal processing have given insights into the enormous potential of newly born bio-chip technology; the understanding of neurotransmitter structures, functions and the mechanisms of genetic vs environmental regulation of neuron growth has led to disclosure of new (e.g., nerve graft technique to treat Parkinson disease), or improvements in old, treatments of a number of neurological disorders; the cellular and molecular bases of learning, memory, and intelligence have begun to be unraveled. A full disclosure of these will have unparallel impact in science and technology. Yet, despite its phenomenal growth, Neuroscience is clearly a discipline of the future. Areas such as genetic encoding of brain structure and function, neural development, neuro-computation and clinical neuroscience (the study of etiology of complex pathologies such as Alzheimer's disease and epilepsy) are still in their infancy. These considerations indicate that strong representation in Neuroscience on the UIUC campus is clearly a desirable endpoint, directly compatible with the broad mission of UIUC.

C. Relation to other graduate programs on campus

An important aspect of Neuroscience is its interdisciplinary nature. The areas of expertise that comprise Neuroscience are available in various units, but not within any single traditional organizational entity on the UIUC campus. Neuroscience courses are offered by NBB (or proposed Neuroscience) faculty who have their principal affiliations in the colleges of Engineering, Veterinary Medicine, Liberal Arts and Sciences, Medicine, and Applied Life Studies. All of these units contribute to the training in areas essential to the principal mission of a Neuroscience program. By design, the NBB (or proposed Neuroscience) Program takes advantage of existing strengths within many campus units; such an interdisciplinary program could not have been established without the strong faculty we have at UIUC. The principal objective of the program is to provide intensive training in a diverse discipline. In contrast to department affiliated graduate programs where there is a rigid requirement of course work in traditional disciplines, the coursework and the training route of NBB (or proposed Neuroscience) students are individually tailored (determined by the student's diagnostic committee) in accordance to the specific interests and needs of the student. Under the program guidelines, NBB students are required to develop competence, through class and/or laboratory (e.g., research apprenticeship) work, in three different areas of concentration in neuroscience. This has proven to be a highly desirable option for many students who prefer to focus their studies in neuroscience over the traditional disciplines and is evidenced from the large number of graduate student applications received annually.

Yet, it is clear that the existing NBB, or the proposed Neuroscience, program does not merely take advantage of departmental graduate programs, it in turn provides benefits to those programs. For many faculty members, the program is the main (or alternate) source for students. The NBB program has vitalized departmental graduate programs by virtue of the cross-fertilization promoted by collegial interactions and research collaborations among the faculty of the participating units. Such interactions have occurred routinely as indicated by the highly cohesive and successful NBB research seminar program, and the many direct fruits of interaction and collaboration among Neuroscience faculty in various departments and colleges (e.g., NIH Systems and Integrative Biology Training Grant, Developmental Neurobiology Training Grant, Behavioral Neuroscience Training Grant and the establishment of a new NSF Center for the Neurobiology of Learning and Memory). The NBB (or the proposed Neuroscience) Program has played a key role, and will continue to be involved, in attracting new as well as retaining existing faculty in various departments.

It would be misleading to suggest that a program in Neuroscience will have a uniform relationship to all of the various existing programs. Several department-affiliated graduate programs share many features and goals in common with the NBB (or proposed Neuroscience) program. These include the Physiology, the Cell and Structural Biology, and Biological Psychology Programs. Many of the faculty in these three programs are core faculty in the Neuroscience program. However, it is of utmost important to recognize the complementary relationship between these department-affiliated programs and the proposed Neuroscience program. Thus, Physiology, Biophysics, and Cell and Structural Biology are concerned primarily with structural, physiological, and biochemical properties of the nervous system while Biological Psychology is concerned primarily with the neural mediation of behavior and cognition. On the other hand, the program in Neuroscience is designed specifically to promote research in both biochemical/structural and behavioral/cognitive topics, and to train individuals who are capable of studying scientific problems that require the multidisciplinary approach.

D. Body of knowledge encompassed by the program

Neuroscience is concerned primarily with the understanding of structure and function of the nervous system, the mechanisms underlying complex sensory perception, movements, learning/memory, brain-hormone interactions, and various analytical capacities as well as the etiology of neurological disorders. As the knowledge of these issues increases so also does the appreciation of the prodigious complexity of the nervous system, and our understanding that study of the nervous system requires many multifaceted research approaches. Areas of specialization in contemporary Neuroscience include: Neurophysiology; Neuroanatomy; Cognitive Neuroscience; Behavioral Neuroscience; Psychopharmacology; Molecular Neuroscience; Clinical and Biomedical Neuroscience; Computational Neuroscience; Genetic and Developmental Neuroscience; Neuroendocrinology; Neuroimmunology; Neurochemistry; Neuropharmacology and Neurotoxicology. These categories comprise the areas of concentration of the NBB (or proposed Neuroscience) graduate training program.

E. Research component of the graduate program and qualifications of core faculty

The curricula vitae of the core faculty are appended with this petition. All have extensive records of publication and virtually all have active federally-funded research programs in Neuroscience. All major areas of basic Neuroscience research are available in the proposed program. In addition to the diverse facilities within the laboratories of the program's faculty, other campus facilities offer invaluable resources for training and research. The Genetic Engineering Facility offers services pertinent to molecular cloning and DNA and protein sequencing and synthesis. The Center for Electron Microscopy is well-equipped and offers facilities and instruction in modern techniques including cryoultramicrotomy, X-ray microanalysis and freeze fracture. The Cell Science Center administers a hybridoma facility and flow cytometry center. The University is home to one of four National Centers for Supercomputing Applications, Nuclear Magnetic Resonance Laboratory, and the Beckman Institute for Advanced Science and Technology, an institute that provides daily interactions among faculty and students in Neurosciences, Cognitive Sciences, Computer Science and Artificial Intelligence.

F. Need for a Ph.D. program in Neuroscience

Understanding of nervous system function is one of the major frontiers of science. The meaningful scientific exploration of this frontier is only a few decades old, yet many important beginnings have been made and some of these have had a profound impact on society. Moreover, technologies of Neuroscience are exploding and major advances in understanding due to this explosion are on the immediate horizon. Virtually all major universities in the USA have Ph.D. programs in Neuroscience. Thus, one aspect of the need for a program in Neuroscience concerns the fact that Neuroscience is one of the most dynamic and promising fields currently on the spectrum of scientific disciplines which attracts students from life and physical sciences.

Second, because of the great diversity of approaches needed for the study of the brain, the training protocol of a cross-disciplinary program is more suitable, efficient and practical than that of traditional disciplinary programs residing in a single department.

Third, students in the academic job market are better served if the title of the degree earned reflects the nature and breadth of the training received.

Finally, a program in Neuroscience provides a focus for the interaction of campus Neuroscientists from many diverse disciplines. Good collegial interaction and the stimulation that this provides for meaningful research collaboration are generally acknowledged to be essential to the development of world-class scientific programs.

G. Demand for graduates of the program and potential clientele of qualified graduates

The demand for neuroscience graduates has continued to grow in the past few years as evidenced in the number and proportion of job advertisements which appear weekly in Science and Nature. Graduates of the Neural and

Behavioral Biology Program from UIUC have been well placed in major universities throughout the country (see Appendix). The program continues to receive numerous inquiries for program graduates to fill various faculty and postdoctoral vacancies.

H. Documentation of program resources

Recurrent budget:

College of Liberal Arts & Sciences	\$ 10,000
School of Life Sciences	\$ 5,000
Department of Psychology	\$ 5,000

One-time support in 1988-1989:

Office of the Vice-Chancellor for Acad. Affairs	\$ 25,000
College of Liberal Arts & Sciences	\$ 11,000
The Graduate College	\$ 10,000

I. Requirements of the Graduate College

The attached Guidelines for the NBB (or proposed Neuroscience) Program are identical to the guidelines under which the NBB program has been operating. They are in explicit conformity with the requirements of the Graduate College and do not in any way circumvent or abridge those requirements.

J. Comments on possible duplication and/or relation to other graduate programs on the campus, including comments from executive officers of related departments

The possibility that the proposed new program may be seen as duplicating programs in Cell and Structural Biology, Physiology and Biophysics and Biological Psychology is discussed in section C above, wherein the complementary relationship between these programs is indicated. The attached comments of the involved program officers substantiate the complementary nature of these programs.