ITEM 122-1003-R0104 Proposal **January 15-16, 2004**

1. Briefly describe the proposed new program. Please indicate if it is an expansion of an existing program; a new program; a cooperative effort with another institution, business, or industry; or an on-campus or off-campus program. Attach any formal agreements established for cooperative efforts.

The new program proposed is a Masters (M.S.)/Doctoral (Ph.D.) degree program in Neuroscience. This program will be a collaborative graduate program between the Department of Biomedical and Pharmaceutical Sciences of the School of Pharmacy and Allied Health Sciences at The University of Montana and the Department of Cell Biology and Neuroscience at Montana State University. Neuroscience encompasses those scientific disciplines concerned with the development, structure, function, chemistry, pharmacology, physiology, clinical assessments, and pathology of the nervous system. Neuroscientists study the structure and the function of the nervous system in both the normal state and during disease and/or injury. The goal of many of these studies is to develop new therapeutic approaches for the treatment of central nervous system (CNS) diseases such as Alzheimer's as well as the development of new strategies for the treatment of CNS injuries. In addition, neuroscientists are striving to sort through the functional complexity of the nervous system and these studies are leading to advances in computational technologies.

This new program is a natural result of the exponential growth in the area of neuroscience that has occurred simultaneously on both campuses. At the University of Montana, the newly established COBRE Center in Structural and Functional Neuroscience (CSFN) funded by an NIH COBRE (Center for Biomedical Research Excellence) award of over 6 million dollars in direct costs has helped to add 8 new neuroscientists to the UM campus (for a total of 18 neuroscience faculty) and supports the research of neuroscientists at UM, MSU and the McLaughlin Research Institute. At MSU, the newly created Department of Cell Biology and Neuroscience (CBN) has 14 faculty members. CBN currently offers the M.S. and Ph.D. degrees in Biological Sciences, a shared program with the Department of Ecology that originated many years ago under the old Biology Department. This "umbrella" degree program no longer serves the needs of MSU graduate students in CBN. Establishment of a collaborative Neuroscience graduate program between MSU and UM will enable the two campuses to use their resources in synergy, creating a nationally competitive graduate program in neuroscience at minimal cost. The new program is highly innovative in that it will utilize the Access Grid Node to teach classes. This is an internet-based video conferencing technology that will allow classes to be held simultaneously on both the UM and MSU campus. The University of Montana is currently creating an Access Grid Node (AGN) classroom in the basement of the Honors College and MSU has an AGN classroom housed within the Department of Cell Biology and Neuroscience. This technology will allow faculty and students at both Universities to simultaneously participate in lectures and seminars and creates a seamless classroom between the two sites. The advantage for students is that all 25 neuroscience faculty at UM and MSU will participate in their graduate education.

Please see Appendix 1 for attached letters of agreement from MSU.

2. Summarize a needs assessment conducted to justify the proposal. Please indicate how the assessment plan was developed or executed and the data derived from this effort.

No formal needs assessment has been conducted specifically for the proposed program. The Association of Neuroscience Departments and Programs (ANDP), a North American organization created in 1981 to promote training and research in neuroscience, published a summary report in May 2000 regarding the third annual ANDP survey. *The survey and its results are attached as Appendix II*. The survey indicates that as neuroscience has matured into a distinct discipline, there has been growth in the number of students applying and accepted into neuroscience programs. In 1986 there were an average of 24 applicants per program, by 1998, there were an average of 61 applicants per program. Graduates of neuroscience programs continue to find jobs at universities, research institutes, and pharmaceutical and biotechnology laboratories. The survey also suggested that the number of available jobs for neuroscientists is likely to increase due to the expansion of the biotechnology and pharmaceutical industries and the emergence of bioinformatics as well as targeted increases to the NIH budget projected over the next several years.

The Society for Neuroscience (SFN), the main professional society for neuroscientists, has determined that current and future research needs within the areas of neuroscience encompass the integration of research among all neuroscience-related disciplines, including fields beyond biology and medicine, such as the physical and social sciences, as well as the translation of neuroscience fundamental knowledge into strategies for the treatment of nervous system disorders (such as neurological, neurosensory, neurodevelopmental, psychiatric, addictive and other related illnesses). These needs have been incorporated into the SFN strategic plan (www.sfn.org/strategicplan) and reinforce the necessity for broad-based graduate training in the neurosciences.

Within the state of Montana, the emergence of neuroscience as a major growth area at The University of Montana has driven the development of this graduate program. Because of the interdisciplinary nature of

neuroscience, the merging of faculty expertise at both UM and MSU provides a unique opportunity for graduate training. We have capitalized on the fact that faculty expertise at the University of Montana focuses on neurochemistry, neuropharmacology, systems neuroscience, neurophysiology, neurotoxicology, and disease processes; while at Montana State University, faculty focus is on the cellular and molecular basis of neural development, neurophysiology, and computational biology of sensory systems, and response of the central nervous system to injury. Clearly the neuroscience strengths at each institution complement each other. The fact that many neuroscience faculty are already engaged in collaborative efforts across institutions emphasizes the cohesiveness of this group of faculty researchers. Neuroscience doctoral students will greatly enhance this cooperative effort and will provide an essential link between researchers at the two institutions. In addition, a strong doctoral program is critical for attracting outstanding faculty who can improve undergraduate education, graduate education, and research in the neurosciences.

3. Explain how the program relates to the Role and Scope of the institution as established by the Board of Regents.

The Mission Statement of The University of Montana states that:

> The mission of The University of Montana-Missoula is the pursuit of academic excellence as indicated by the quality of curriculum and instruction, student performance, and faculty professional accomplishments. The University accomplishes this mission, in part, by providing unique educational experiences through the integration of the liberal arts, graduate study, and professional training with international and interdisciplinary emphases. Through its graduates, the University also seeks to educate competent and humane professionals and informed, ethical, and engaged citizens of local and global communities. Through its programs and the activities of faculty, staff, and students, The University of Montana-Missoula provides basic and applied research, technology transfer, cultural outreach, and service benefiting the local community, region, State, nation, and world. (Approved by Board of Regents, March 2001.)

The University of Montana is a doctoral level University, committed to a diversity of programs that balance liberal learning and professional preparation. The University continues to respond to the needs of the citizens of Montana and provides excellence in undergraduate and graduate education. The proposed Masters and Doctoral Program in Neuroscience is consistent with the mission of the University. This new program will create a unique learning environment for graduate students through the use of the access grid node and promote new knowledge through research and other creative activities, which will ultimately contribute to the economic development of Montana.

Undergraduate students will have the opportunity for employment and research training experiences because of external grants and contracts generated by the faculty. This interactive environment will facilitate the involvement of undergraduates in the research enterprise and will encourage interactions of undergraduate students with faculty, postdoctoral fellows, and graduate students in the laboratory setting. In addition, professional pharmacy students will also have the opportunity to participate in on-going research and potentially expand their training to include a Ph.D.

4. Please state what effect, if any, the proposed program will have on the administrative structure of the institution. Also indicate the potential involvement of other departments, divisions, colleges or schools.

The proposed program will not affect the present administrative structure. The graduate program will be housed within the School of Pharmacy and Allied Health Sciences in the Department of Biomedical and Pharmaceutical Sciences. A Director of the Graduate Program in Neurosciences will be appointed by the Chair of the Department of Pharmaceutical Science in consultation with the Director for The Center for Structural and Functional Neuroscience. Dr. Diana Lurie is currently Acting Director and Dr. Michael Kavanaugh is currently Acting Assistant Director for the program. The Director will serve as principal liaison with the Dean of the Graduate School and the Chair of Pharmaceutical Sciences on all matters relevant to graduate applications and student progress through the program. The offering of new graduate courses will allow graduate students from other departments such as the Division of Biological Sciences, Chemistry, and psychology at UM to expand their elective course portfolio and encourage interdisciplinary interaction. Members of other departments, schools and colleges have been contacted regarding this new program and are actively encouraged to participate in this program.

5. Describe the extent to which similar programs are offered in Montana, the Pacific Northwest, and the states bordering Montana. How similar are these programs to the one herein proposed?

Montana: No formal Ph.D. training programs in Neuroscience are available for students
North Dakota: No formal Ph.D. training in Neuroscience is available.

South Dakota: No formal Ph.D. training in Neuroscience is in place.
Idaho: No formal Ph.D. training in Neuroscience is available at the *University of Idaho* or at *Idaho State University*.
Washington: The *University of Washington* houses the graduate Program in Neurobiology and Behavior. This interdisciplinary program encompasses over 80 faculty from 15 different departments within the College of Arts and Sciences and the School of Medicine. Education and research provide a broad background ranging from molecular, to developmental, cellular, systems, and behavioral neuroscience. *Washington State University* offers a Ph.D. degree in Neuroscience that is an interdisciplinary program. The program is administered through the Department of Veterinary and Comparative Anatomy, Pharmacology and Physiology (VCAPP) in the College of Veterinary Medicine.
Oregon: *The University of Oregon* houses an interdisciplinary Institute of Neuroscience. *Oregon Health Sciences University* provides the multidisciplinary Neuroscience Graduate Program to prepare students for research areas ranging from molecular to behavioral neurobiology.
Utah: The *University of Utah* offers an interdepartmental graduate program in neuroscience. Training and research foci include electrophysiology, molecular biology, genetics, and behavior and cognitive neuroscience.
Colorado: An interdisciplinary graduate program is offered at *Colorado State University*. The program emphasizes cellular, molecular and integrative aspects of nervous system function and systems neuroscience. The *University of Colorado Health Science Center* (UCHSC) provides a multidisciplinary Training Program in Neuroscience. The *University of Colorado Boulder* houses a Center of Neuroscience and offers an interdisciplinary graduate training program in neuroscience.
Wyoming: The Departments of Psychology, Zoology and Physiology, and Molecular Biology together with the College of Pharmacy provide an interdisciplinary graduate program in neuroscience.

SUMMARY

Formal training programs for graduate students to pursue a Ph.D. in Neuroscience are currently available in Washington State, Oregon, Utah, and Colorado. The existing programs in Washington State and Oregon are broad-based both in education and research opportunities. At present, neither Montana nor its neighboring states provide a comprehensive Ph.D. program in neuroscience. The University of North Dakota and the University of Idaho are in the process of trying to implement a formal Ph.D. training program but the limiting factor to a comprehensive Ph.D. program in neuroscience is the inherent broad spectrum of neuroscience.

A collaborative Ph.D. program between the University of Montana and Montana State University would combine expertise and resources in education, research, and technology to generate a comprehensive and truly interdisciplinary Ph.D. training program in neuroscience. The strength of the University of Montana in molecular and cellular neuroscience complements the strength of Montana State University in systems and computational neuroscience to cover the entire spectrum of neuroscience. Additional strength is gained through the Montana Neuroscience Institute Foundation, which encompasses a collaborative venture between the University of Montana and St. Patrick Hospital and Health Sciences Center and integrates clinical neuroscience with academic neuroscience. The proposed Ph.D. program in neuroscience would provide a unique and exceptional training opportunity for students that meets national and regional needs.

6. Please name any accrediting agency(ies) or learned society(ies) that would be concerned with the particular program herein proposed. How has this program been developed in accordance with the criteria developed by said accrediting body(ies) or learned society(ies)?

No existing accrediting agencies or learned societies can be identified that have been or would be concerned with the program herein proposed. The primary learned society dealing with the field of Neuroscience is the Society for Neuroscience, and this society does not publish guidelines relating to graduate training. Because of the interdisciplinary nature of the field of Neuroscience, no formal training guidelines have been published, although the ANDP holds annual spring meetings that are coordinated with the Society for Neuroscience to discuss graduate education and research in the neurosciences. Most faculty members and students who will be involved in the proposed program are members of the Society for Neuroscience and will be kept apprised of new developments in graduate training in the neurosciences through the Society.

7. Prepare an outline of the proposed curriculum showing course titles and credits. Please include any plans for expansion of the program during its first three years.

Students will enroll on their home campus. Program requirements at UM and MSU may differ in order to accommodate campus standards.

Core Curriculum (UM Campus)

PHIL	595#@	Research Ethics	1 cr.

PHAR 545	Research Lab Rotations	(3 cr. for Ph.D; 2 credit for MS)
PHAR 593	Current Research Literature	1 cr.
PHAR 594	Seminar	2 cr.
PHAR 600^	Adv. Cellular Biochemistry	4 cr.
PHAR 609@	Biomedical Statistics	3 cr.
PHAR 661#@	Neurosciences I	4 cr.
PHAR 662#@	Neurosciences II	4 cr.

^ Cross-listed as BIOC 600
# New course, under development
@ offered by Access Grid Node

Students will take at least **three (Ph.D.)** or **two (M.S.)** of the following courses:

BIOC 583	Lipids and Membranes	3 cr.	
PHAR 610@	Neuropharmacology		3 cr.
PHAR 646#@	Neurotoxicology	2 cr.	
PHAR 66x#@	Advanced Neurophysiology		3 cr.
PHAR 66y#@	Neurobiology of Disease		3 cr.
PHAR 66z#@	Structural Neurobiology	3 cr.	
PHAR 660#@/Biol 510-(MSU)	Topics in Neurobiology I	3 cr.	
PHAR 660#@Biol 510 (MSU)	Topics in Neurobiology II		3 cr.
PHAR 660#@/Biol 510 (MSU)	Topics in Neurobiology III		3 cr.

new course under development

The following are examples of *additional* elective courses available to meet student interests.

PHAR 615	Molecular Pharmacology		3 cr.
PHAR 621	Advanced Medicinal Chemistry	3 cr.	
PHAR 626	Research Meth Bioc Pharmacol	3 cr.	
PHAR 630	Pharmacogenetics		3 cr.
PHAR 641	Toxicology I		4 cr.
PHAR 642	Toxicology II		4 cr.
PHAR 643	Cellular and Molecular Toxicology		4 cr.
PHAR 644	Immunotoxicology		3 cr.
BIOC 581	Physical Biochemistry	3 cr.	
BIOC 582	Proteins and Enzymes		4 cr.
BIOC 586	Advanced Molecular Genetics	3 cr.	

Research, Thesis, Dissertation

Phar 597/599 Research/ Thesis	up to 10 credits for MS Degree
Phar 697/699 Research/Dissertation	up to 30 credits for the Ph.D. Degree

Total Graduate Credit Requirements (UM)

At least 60 credits for the Ph.D., At least 30 credits for the M.S.

Individual students may be required to take additional courses beyond the minimum program requirements as determined by their department or Graduate Committee. Students will be strongly encouraged to rotate through laboratories at both campuses.

Faculty at UM and MSU will contribute equally to the lectures offered in the new Neurosciences I and II core course (Phar 661,662) that will be offered simultaneously at both MSU and UM via the Access Grid Node. It is anticipated that existing and new faculty on both campuses will develop additional new courses. These courses would be optional courses. Finally, a weeklong yearly workshop will be developed that brings together faculty and students from both the UM and MSU campus in order to facilitate interactions between the two campuses. This workshop will provide an opportunity to organize joint activities for the coming year including a shared seminar series, multi-campus rotations, and collaborative research projects.

FACULTY AND STAFF REQUIREMENTS

1. **Please indicate, by name and rank, current Faculty who will be involved with the program proposed herein.**

The University of Montana (Dept. of Biomedical and Pharmaceutical Sciences)

*Steve Black, Associate Professor
*Fernando Cardoza-Peleaz, Assistant Professor
C. Sean Esslinger, Research Assistant Professor
*David J. Poulsen, Research Assistant Professor
*Thomas B. Kuhn, Assistant Professor
Craig A. Johnston, Associate Professor
*Michael P. Kavanaugh, Associate Professor
(Division of Biological Sciences)
*Mark L. Grimes, Associate Professor
*recent hires
Diana I. Lurie, Associate Professor
Keith K. Parker, Associate Professor
Richard J. Bridges, Professor
Charles L. Eyer, Professor
Charles M. Thompson, Professor

(Chemistry Dept.)
*John M. Gerdes, Associate Professor
*Sandy Ross, Professor

Clinical Faculty Affiliates (Dept. of Biomedical and Pharmaceutical Sciences)
Dr. H. Nick Chandler, Neurosurgery
Dr. Peter Von Doersten, Ear, Nose, and Throat
Dr. Brian Sippy, Ophthalmology

Montana State University (Dept. of Cell Biology and Neuroscience)

Roger Bradley, Assistant Professor
Alex Dimitrov, Research Assistant Professor
Steven Eiger, Associate Professor
Susan Gibson, Lecturer
Charles Gray, Professor
Thomas Hughes, Associate Professor
Gwen Jacobs, Professor
Frances Lefcort, Associate Professor
Jim McMillan, Professor
Christa Merzdorf, Assistant Professor
John Miller, Professor
Charles Paden, Professor
Dwight Phillips, Professor
Anne Rusoff, Associate Professor

2. Please project the need for new faculty over the first five-year program. Include special qualifications or training. If present faculty are to conduct the new program, please explain how they will be relieved from present duties.

A total of eight new faculty in the area of Neuroscience have recently been hired at the University of Montana for a total of 18 participating faculty. There are 14 CBN faculty at MSU who can contribute to the graduate program through teaching, supervising graduate research, or both. No additional resources are requested for faculty hires at either institution.

In total 32 Neuroscience faculty at the two institutions are projected to participate in the new graduate program. The number and breadth of the faculty at both institutions set this Neuroscience Graduate program apart from the majority of other programs.

3. Please explain the need and cost for support personnel or other personnel expenditures.

a. Systems Administrator:

UM:	0.4 FTE	Salary:	$24,000
		Fringe Benefits:	$ 5,280
			$29,280

The University of Montana has obtained grant funding of $80,000 to establish the Access Grid Node (AGN) classroom needed for distance teaching at the MSU site. For the collaborative program with MSU we will need a systems administrator.

b. Administrative Support:

UM: 0.25 FTE Salary: $6,000 Fringe Benefits: $1,320

Additional administrative support will be required to coordinate the program. The UM Department of Biomedical and Pharmaceutical Sciences will have 3 Ph.D. and 3 M.S. programs and currently has only a department secretary that helps to coordinate graduate activities. This is insufficient at present and will only be magnified by adding a new program. A 0.25 FTE is requested for staff administrative support to act as Graduate Coordinator.

c. Graduate Teaching Assistants:

UM: 5 @ $15,000 = $75,000 (plus fringe benefits @ $7,500)

These could be phased in at 2 per year for FY 05, two for FY 06, and one for FY 07. It is anticipated that these stipends would support half of the enrolled students and that grant funds would support the other half. On the UM campus, approximately $300,000 has been committed to the neuroscience Ph.D. program by the submitted and pending 2004-2007 NSF-Epscor Grant. Please note this grant expires December 31 2006. *Please see Appendix 1 for NSF-Epscor letter of support.*

CAPITAL OUTLAY, OPERATING EXPENDITURES, AND PHYSICAL FACILITIES

1. Please summarize operating expenditure needs.

		FY 05 FIRST YEAR FTE	FY 06 SECOND YEAR FTE	FY 07 THIRD YEAR FTE
I.	**PLANNED STUDENT ENROLLMENT**			
A.	New Enrollment	2	6	9
B.	Shifting Enrollment	2	1	1
GRAND TOTAL PLANNED STUDENT ENROLLMENT		**4**	**7**	**10**

		FIRST YEAR FTE	FIRST YEAR COST	SECOND YEAR FTE	SECOND YEAR COST	THIRD YEAR FTE	THIRD YEAR COST
II.	**EXPENDITURES**						
A.	Personnel Cost						
	AGN System Administrator	0.4	24,000	0.4	24,720	0.4	25,462
	Fringe Benefits	0.4	5,280	0.4	5,438	0.4	5,602
	Administrative Support	0.25	6,000	0.25	6,180	0.25	6,365
	Fringe Benefits	0.25	1,320	0.25	1,360	0.25	1,400
			36,600		37,698		38,829
	Graduate/Instruc Assistants	4	60,000	7	105,000	10	150,000
	Fringe Benefits	4	6,000	7	10,500	10	15,000
	Other (tuition/fees)	4	36,000	7	63,000	10	90,000
	Total Personnel FTE and Cost		138,600		216,198		293,829

		FIRST YEAR COST	SECOND YEAR COST	THIRD YEAR COST
B.	Operating Expenditures			
	Travel (seminar/recruitment)	10,000	15,000	20,000
	Total Operating Expenditures	10,000	15,000	20,000
GRAND TOTAL EXPENDITURES		**148,600**	**231,198**	**313,829**
III.	**REVENUES**			
A.	Source of Funds			
	Appropriated Fund Reallocation	24,000	24,000	24,000
	New Tuition	10,632	36,606	62.580
	Federal Funds	113,968	170,592	227,249
	Total Source of Funds	148,600	231,198	313,829
B.	Nature of Funds			

Recurring	69,600	103,698	121,329
Non-Recurring	79,000	127,500	192,500
GRAND TOTAL REVENUES	$148,600	$231,198	$313,829

2. Please evaluate library resources. Are they adequate for operation of the proposed program? If not, how will the library need to be strengthened during the next three years?

Neuroscience is an interdisciplinary science and as such, the library needs for this discipline are extremely diverse. The libraries at both The University of Montana and Montana State University are committed to providing electronic access to the majority of journals relevant to the field of neuroscience. The advent of e-journal access provided by scientific publishing houses ensures that a wide-range of journals are available on both campuses. At The University of Montana, such electronic packages include Science Direct, The American Chemical Society, Annual Reviews, OVID, Blackwell-Synergy, Wiley Interscience, and Science.

The MSU-Bozeman library has substantially expanded the availability of electronic publications in recent years, and now offers e-journal suites from Academic Press, Elsevier, Kluwer, JSTOR, and Nature in addition to those listed in the body of this proposal. MSU also subscribes to the powerful Web of Science database offered by Science Citation Index, enabling full citation searching for virtually any neuroscience article. Although neuroscience faculty will continue to work with the library staff in identifying areas where expanded access would be beneficial, no specific additions are required with respect to this proposal. The commitment of our libraries to provide e-journal access has had a profound impact in the area of neuroscience on both campuses and its effect should not be underestimated, particularly in the area of graduate education. Neuroscience faculty will continue to work with the libraries to identify additional needs and assist in the acquisition of funding to expand our electronic access.

3. Please indicate special clinical, laboratory, and/or computer equipment that will be needed. List those pieces of equipment or computer hardware presently available within the department.

Most computing needs are addressed through the program at The University of Montana to replace outdated computers on a three-year cycle. Additional needs for graduate students on both campuses will be addressed through departmental and external sources.

The scientific instrumentation available on both the UM and MSU is extensive and comparable to most medical school departments. A number of state-of-the art core facilities are also available to both faculty and students in the UM campus and include tissue culture, molecular modeling, molecular histology, confocal and light microscopy and imaging, and a genetics core facility located within the Skaggs building. Laboratories and offices of CBN faculty are located on the 5th floor of Leon Johnson Hall and in the Center for Computational Biology in the basement of Lewis Hall. Shared research facilities include cell culture, confocal and electron microscopy, image analysis, and computational capabilities. These include a Leitz confocal microscope equipped for two-photon excitation, an optical recording workstation, an Origin 2000 minisupercomputer, a 32 processor/16 GB Beowulf cluster, and a high bandwidth Access Grid Node connected directly to MSUs Internet 2 backbone. A more detailed description of this equipment can be found on the Department of Biomedical and Pharmaceutical Sciences website (www.umt.edu/pharmsci/) and the Dept. of Cell Biology and Neuroscience website (neuron.montana.edu/). These facilities provide outstanding support for graduate students at both the M.S. and Ph.D. levels, and no additional facilities or space is required to establish a graduate program in Neuroscience.

4. Please describe facilities and space required for the proposed program. Are current facilities adequate for the program? If not, how does the institution propose to provide new facilities?

Currently, space on both campuses is available for faculty, including new hires and space is available for graduate studies. At the University of Montana, plans are already underway for expansion of research space in the School of Pharmacy & Allied Health Sciences utilizing federal dollars and private donations to increase the available research space by approximately 10,000 sq. ft. This will provide adequate space for program growth. Facilities at MSU are adequate to support the program.

EVALUATION OF PROPOSED PROGRAM

1. Please name faculty committees or councils that have reviewed and approved the program herein proposed.

Graduate Standards Committee	Department of Biomedical and Pharmaceutical Sciences (UM)
Faculty	Department of Biomedical and Pharmaceutical Sciences (UM)
Faculty	Department of Cell Biology and Neuroscience (MSU)
Faculty	School of Pharmacy & Allied Health Sciences (UM)

2. If outside consultants have been employed, please list the names of these consultants, their current positions, and titles. Append copies of their written reports (this is required of new doctoral programs).
Please see Appendix 1

Edwin Rubel, Ph.D.
Professor of Otolaryngology
Founding Director, Bloedel Hearing Research Center
The University of Washington

Carl Cotman, Ph.D.
Professor of Psychobiology and Neurology
Director, UC Center on Aging and Alzheimers
The University of California, Irvine

Appendix I Letters of Support

Gwen A. Jacobs Ph.D.
Head, Department of Cell Biology and Neuroscience
College of Letters and Science
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P.O. Box 173148
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Bozeman, MT 59717-3148
Telephone 406-994-7334
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e-mail: gwen@cns.montana.edu
URL: cns.Montana.edu

Diana Lurie, PhD.
Acting Director, The Neuroscience Graduate Program
Associate Professor of Neuropharmacology
Dept. of Pharmaceutical Sciences
Skaggs Bldg. Rm 304
University of Montana
Missoula, MT 59812

Dear Diana,

I am delighted to offer my strong support for the development and implementation of The Neuroscience Graduate Program; a collaborative effort between The University of Montana and Montana State University. The faculty in the Department of Cell Biology and Neuroscience at MSU are very enthusiastic about this program and are excited about how this effort will attract top quality graduate students to our research Laboratories. Based on the many years of productive interactions between neuroscientists at UM and MSU, I believe this program will be very successful.

We are committed to implementing the first year curriculum in collaboration with faculty at the University of Montana through joint presentations of graduate curriculum via the Access Grid Node. We have encouraged all of our current graduate students to take these courses and will recruit students from our incoming class to participate as well.

I believe that the development of this new graduate program will position us well to compete successfully for graduate training grants from both federal and private funding sources. In addition this program will strengthen existing ties between faculty at our two institutions and foster new collaborative efforts beneficial to all of us.

On behalf of the neuroscience faculty at MSU, I support this effort with no reservations. We look forward to working with you and our colleagues at UM to implement this exciting program.

Best wishes,

Gwen A. Jacobs

VIRGINIA MERRILL BLOEDEL
HEARING RESEARCH CENTER

Edwin W Rubel, Ph.D.

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Seattle, Washington 98195-7923
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May 28, 2003

Diana I. Lurie, Ph.D.
Associate Professor of Neuropharmacology
Department of Pharmaceutical Sciences
Skaggs Bldg., Rm. 304
University of Montana
Missoula, MT 59812

Dear Dr. Lurie,

I am very pleased to write this letter in support of the proposed Ph.D. program in Neuroscience that will be offered jointly by The University of Montana and Montana State University. In my capacity as a member of the external advisory board for the Center for Structural and Functional Neuroscience (UM), as a WAMI faculty member, and as a neuroscientist, I have visited and interacted with neuroscience faculty at both campuses for many years. I have been tremendously impressed with the rapid and successful development of neuroscience research at each institution and with the commitment of both Universities toward building strong teaching and research faculties in the neurosciences. A major strength that has contributed to this success has been the collaborative nature of the interactions between the neuroscience faculties at UM and MSU. This is exemplified by the NIH Cobre grant which was submitted by UM but also supports faculty at MSU and the McLaughlin Research Institute. Because the field of neuroscience is by nature interdisciplinary, it is common for several research groups to work collaboratively on a single research question and the neuroscientists at UM and MSU already have a number of ongoing collaborative studies. That is, at both the organizational level and with respect to individual research programs, these groups have already shown the ability to work very well together toward common goals. This lays an ideal foundation for a successful Ph.D. program and ensures the best possible experience for graduate students.

A major strength of the proposed program is that the major areas of expertise of the faculty at each institution are different and complementary. For example, neuropharmacology is a particular strength at UM while computational and developmental neuroscience are particular strengths at MSU. I am also delighted to see that the proposed curriculum is very broad-based and interdisciplinary and will give graduate students an outstanding knowledge of the entire field of neuroscience. Another unique aspect to this program is the use of the Access Grid Node to teach courses simultaneously at both campuses. The Department of Pharmaceutical Sciences at UM is to be commended for raising the majority of the funds and spearheading the creation of an AGN classroom at UM. This new technology will revolutionize classroom delivery of information and the neuroscience program will be one of the first in the country to utilize this technology on a routine basis. Again, this adds strength to the program as faculty and students from both campuses will be interacting with each other almost daily.
Given the fact that this program will be interactive and delivered to two campuses, the proposed budget is quite modest. I also find it somewhat troubling that the majority of funding for the

program will come from external funds. With the outstanding faculty that have been recruited, their excellent track record and the opportunity to build a leading program in what is generally considered the most exciting area of science, it is surprising that the level of state commitment is not much higher. With more commitment from the institutions you would be competitive to attract the very best graduate students from around the nation. This is a program well worth supporting; it will serve as a benchmark for building increasingly strong research oriented graduate programs at both institutions, and will enhance the visibility of the state within the scientific community.

In summary, this is an innovative and creative program that has been carefully crafted and well-researched. The faculty are outstanding and have already shown the ability to work seamlessly together. Major strength lies in the collaboration between UM and MSU and the use of modem technologies to form unique teaching and research collaborations. I have no doubt it will be an outstanding research and training program and attract excellent students. I am proud to be affiliated with the program and look forward to continuing to work together.

Sincerely,

Edwin W Rubel, Ph.D.
Virginia Merrill Bloedel Professor of Hearing Science

UNIVERSITY OF CAUFORNIA, IRVINE

CARL W. COTMAN, PH.D.
DIRECTOR
INSTITUTE FOR DRAIN AGING AND DEMENTIA
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1113 GILLESPIE NELTROSCIENCE FACILITY
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June 17, 2003

Dr. Diana Lurie
Department of Pharmaceutical Sciences
University of Montana
Missoula, MT 59812

Dear Dr. Lurie:

I am writing in support of your proposal to establish a new Ph.D. program in the Neurosciences at the University of Montana. As a scientific advisor to both the COBRE Center for Structural and Functional Neuroscience and the Montana Neuroscience Institute, I have watched your research and training capacity increase dramatically over the past few years. For the University's research and educational endeavors in the neurosciences to really achieve a nationally recognition, in terms of both science and finding, it is critical that graduate, postdoctoral, and faculty programs continue to grow in a balanced manner. In my estimation, the program has evolved to the point where its further development will require a strong Ph.D. program. I have read your proposal to the Montana Board of Regents and would make the following comments and recommendations:

• Your decision to develop the program collaboratively with Montana State University is a wise one. The focus areas on the two campuses are quite complementary and there is no question that pooling resources makes your program considerably more competitive. This will increase opportunities for students and should be stressed in your recruitment efforts.

• The multi-disciplinary (cross departmental) design of the program is also a strong asset. Efforts must continue to keep the program "seamless" when faculty are participating from academic units outside of the School of Pharmacy.

• To establish such a program will absolutely require an infusion of resources, particularly as related to graduate student stipends and tuition waivers. I would suggest that your request as it now stands is on the conservative side and should be considered a minimum. If it is envisioned that the majority of the costs will be borne by research faculty through their grants, it would be wise to remind administrators that the cost of supporting a postdoc is often less expensive than a student when the P1 must pay for both a stipend and tuition!

• Following up on the point raised above, your proposal does not include a request for additional faculty positions. I am aware that the establishment of the COBRE Centers resulted in the recruitment a talented group of young neuroscientists. While it will be possible to initiate the

proposed program with existing faculty, I caution you that that its continued survival will require a very active research program that will most likely need additional faculty to remain competitive. In this respect, the existing faculty should be considered a minimum and it should be widely recognized that growth in neuroscience faculty must continue, particularly in the other participating units, such as Biology and Chemistry.

Finally, I would emphasize that a mechanism should be established for regular gatherings, such as a high level colloquium series that meets on a regular basis. This would promote "grass roots" interactions by bringing new information to the program and stimulating collaborations among colleagues. There needs to be sufficient funds to host such a series. Each year, at least at the start, I would also recommend having an external advisory committee to review the progress and make recommendations.

I hope these comments are of some value. I wish you luck with your proposal and look forward to seeing it start enrolling students. Please let me know if I can provide any additional information.

Sincerely,

Carl W. Cotman, Ph.D.
Director, Institute for Brain Aging and Dementia
Professor, Neurology and Neurobiology and Behavior

commentary

Neuroscience training at the turn of the century: a summary report of the third annual ANDP survey

R. Ranney Mize, Barbara R. Talamo, Ronald I. Schoenfeld, Lesly K .Huffman *and Robert B. Fellows*

The claim that there are too many life sciences graduate students has generated much debate, including a recent editorial In *Nature Neuroscience.* A 1998 survey suggests that these concerns are misplaced, and that career prospects for neuroscience graduates remain bright.

Neuroscience as a discipline has grown enormously during the past 25 years, and associated with this growth there has been a substantial expansion of neuroscience graduate education. The Association of Neuroscience Departments and Programs (ANDP), a North American organization created in 1981 to promote training and research in neuroscience, now has a membership of over 250 graduate and undergraduate departments and programs.

This growth reflects a broad trend within the life sciences, and whether such growth can and should continue has recently been hotly debated by national policy groups and in the press. There has been increasing concern that the United States is training more students than it can employ, and that the increase in numbers of students is producing strains on the system. Similar concerns have been raised in the United Kingdom, where it has been suggested that declining career prospects have led to a fall in the quality of students. Much of this debate has been captured in a l998 report from the U.S. National Research Council (NRC), which documented some alarming trends in graduate education in the life sciences, increasing more than a threefold,

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(367%) increase in the number of Ph.D. degrees awarded annually during the years 1963-1996, an increase in the length of time required to complete both the Ph.D. degree and postdoctoral training, and a decline in the fraction of graduates obtaining tenure-track faculty appointments.

Based on these data, the NRC report recommended restraint of the rate of growth in the number of graduate students, dissemination of accurate information on career prospects, and enhancement of opportunities for independence of postdoctoral fellows, including the ability to obtain independent grant support. The NRC also recommended that funding of graduate students in the life sciences be shifted away from individual R01 grants from the National Institutes of Health (NIH), and toward institutional training grants and individual fellowships that might promote closer monitoring of the quality of the applicant and the training environment.

In this commentary we discuss these issues as they relate to the field of neuroscience. Our viewpoint represents that of the leadership of the ANDP and is derived from data collected by the ANDP through questionnaires sent to its members. Three such surveys have been conducted, in 1986, 1991 (ref. 9) and 1998 (data available on the ANDP web site, http://www.andp.org). The 1998 questionnaire was sent to 189 directors or chairs of programs and departments of neuroscience throughout the United States. We received 90 responses, corresponding to about 48% of the estimated number of graduate degree-granting programs. The survey questions focused on characteristics of the student population, the nature of the training program, the numbers and rank of faculty, and post-doctoral trainees. Our findings confirm several aspects of the NRC report but differ in others, and the ANDP leadership disagrees with some of the NRC recommendations, as well as the positions expressed in a recent editorial in *Nature Neuroscience.*

Growth of neuroscience training

Growth of neuroscience as a Ph.D.-awarding discipline. In recent years, neuroscience has emerged as a distinct discipline, and this has been reflected in the labeling of Ph.D. degrees. In the past, graduate training in neuroscience typically led to a Ph.D. in anatomy, cell biology, physiology, pharmacology or psychology. In recent years, however, the trend has been toward dedicated programs in neuroscience. Figure 1 shows the percentage of doctoral programs in

neuroscience that grant neuroscience degrees versus neuroscience-related degrees awarded in other disciplines, as documented by ANDP surveys in 1986,1991 (ref. 9) and 1998. There has been a threefold increase in the fraction of Ph.D. degrees granted specifically in the field of neuroscience between 1986 and 1998 (not 1996 and 1998, as noted in ref. 6, see correction, ref 10). This indicates that neuroscience has matured as an identifiable discipline, and that the majority of our training is now conducted in programs or departments of neuroscience rather than in other basic science departments.

Increase in size of neuroscience degree programs and Ph.D.s awarded. Interest in neuroscience training has also increased, as indicated by growth in the number of students applying and accepted per neuroscience program. In 1986, there were on average 24 applicants per program, but this increased to 42 in 1991 and to 61 by 1998.

The number of students enrolled also increased over the same period, from an average of 3.6 to 5.2 per program. We cannot determine the total numbers of neuroscience graduate students or Ph.D.s granted from our survey, but the Survey of Earned Doctorates (which collects data by an annual census of new recipients of research doctorates tom US institutions) shows that the number of Ph.D.s awarded to those identifying themselves as neuroscientists is currently about 400 per year. This number has a more than doubled between 1988 and 1998 a (the most recent year for which numbers are available), although this may be due in part to an increased tendency to identify neuroscience as a specific discipline. There has been almost no change over the last three years (1996-1998). Thus, the growth of research in neuroscience has been reflected in the increase in earned doctorates, but the numbers now seem to have reached a plateau.

Quality of neuroscience Ph.D. students. Anecdotal observations that were quoted in the recent *Nature Neuroscience* editorial suggest that the quality of Ph.D. applicants and graduate students in the UK has declined[5]. Although student quality is difficult to evaluate, the quantitative measures that are available do not suggest that the quality of students entering neuroscience has declined in the U.S. Data from the ANDP survey show that average GRE scores and grade point averages of applicants and students in neuroscience training programs are little changed from 1986 to 1998.

Number of years to degree. One concern expressed by critics of the current system is that there has been an increase in the length of time spent in obtaining the degree. The NRC report claimed that the time to degree now averages 8 years for the life sciences as a whole, and 7.5 years for neuroscience. The ANDP survey generated somewhat different figures; although the time taken to obtain the Ph.D. degree in neuroscience lengthened between 1986 and 1998 (as indicated in the NRC report), the average in 1998 was only
5.5 years, which is within the 5-6 year duration recommended by the NRC. We do not know the reason for this discrepancy, but we note that similar inconsistencies with NRC data have been reported by the American Society of Cell Biology (5.6 years) and the American Physiological Society (5.2 years) for their disciplines.

Demographics of students in neuroscience. World immigration patterns have dramatically changed the demographic composition of graduate students in the lift sciences in the U.S., potentially adding to the pool of applicants for jobs. The number of PhD. degrees awarded annually in life sciences to U.S. citizens in the United States remained nearly constant from 1970 until 1996, whereas the number awarded to non-citizens almost tripled in the past decade. This trend is much less obvious in time field of neuroscience, where our survey results show that the percentage of foreign students in neuroscience Ph.D. programs remained at 19-20% from 1991-1998. There has been some increase in the fraction of non-citizens among postdoctoral trainees, up from 40% in 1991 to nearly 50% in 1998. The effect of this pool on job placement is uncertain because there are no data on whether these trainees remain in the U.S. or return to their home countries. However, of the neuroscience faculty positions reported (2025) in the 1998 ANDP survey, fewer than 3% were held by citizens of countries other than the U.S. and Canada.

Sources of support for students. The NRC suggested that numbers of graduate Students be constrained by decreasing support through research, grants. However, any discussion of changes in student funding should consider how our trainees are currently supported. Almost all (97%) neuroscience graduate students receive stipend support; for entering students, this is derived primarily from teaching assistant-ships and other university funds (67%), but after their first year graduate students receive only 40% of their support from these sources, and many of them instead receive support from research grants (37%). This dependence on research grant support is up from 33% in 1991 and 24% in 1986. During the same period, support from training grants and individual fellowships has declined fur this group, such that these sources now only account for 12% of the total support funds, down from 18% in 1986. These data indicate that training grant and fellowship funds have only a modest role in supporting education of neuroscience trainees, consistent with the NRC report. The possible impact of restrictions in support through R01 grants should therefore be carefully considered, because about one third of all graduate students are paid from these grants. Extension of training grants and individual predoctoral research training fellowships to more programs would be helpful, but eliminating the R01 mute of support would be devastating to many students and programs.

Employment prospects

Trends in postdoctoral training. Are the increased numbers of neuroscience graduates finding jobs? The answer is yes, but the jobs

they find are increasingly diverse. Consistent with the NRC report, our data show that very few graduates move directly to a faculty job after getting a Ph.D. degree. More than two-thirds of recent graduates with neuroscience Ph.D. degrees held at least one postdoctoral position, according to data from our 1998 survey, and this percentage has increased little from 1991. The average length of each postdoctoral experience is 2.3 years, a figure that is consistent with a 1995 survey by the Society for Neuroscience (http://www.nsf.org/membdata). However the percentage of postdoctoral trainees who take another postdoctoral position has increased. Of those postdocs who moved to a new position in 1991, 21% went to another postdoctora] position, whereas by 1998 this figure had risen to 30% (Fig.2).

Availability of jobs for neurosciences. The 1998 *survey* data indicate that neuroscience postdocs continue to find jobs, although-in contrast to earlier years-many of these jobs are no longer academic positions. The survey captured only postdoctoral fellows leaving programs in a single academic year (1997-1998, $n = 83$), but it suggests a trend away from faculty positions and jobs in research institutes, and toward additional postdoctoral time or positions in other environments such as pharmaceutical and biotechnology research laboratories. Of those postdocs who moved to a new position in 1991, nearly 45% moved to a faculty position, whereas 14% took research institute jobs and 13% other positions in science (Fig. 2). By contrast, of those who moved in 1998, only 28% moved to a faculty position, whereas 4% took jobs in research institutes and 29% took other positions requiring professional scientific training. In addition, as noted above, 30% took an additional postdoctoral position. Thus, an increasing percentage of postdocs may be finding alternative employment in areas other than the traditional academic disciplines.

Conclusions

Neuroscience is a thriving discipline. According to our survey; the number of neuroscience departments and programs has increased substantially in the past 12 years, and the number of Ph.D. degrees awarded specifically in the field of neuroscience has also increased. At issue is whether we are producing Ph.D. graduates who are not finding desirable jobs. The increase in numbers of Ph.D.s awarded in neuroscience seems to be less than in the life sciences as a wholes and may have leveled off. Although more Ph.D, students are doing multiple postdocs, and the percentage obtaining faculty positions has decreased, their placement in employment outside of science-related fields remains very low, and alternative science-related careers, such as pharmaceutical and biotechnology companies, are absorbing many neuroscience graduates. The perception that we are 'stockpiling' Ph.D.s or that they are in a 'holding pattern' waiting to land, implies that there is only one landing field and one desirable job—in academia. In fact, there are a variety of landings in appropriate and desirable jobs; consequently, training programs must continue to provide information about these opportunities.

The ANDP leadership takes the position that it is premature to either decrease or cap the numbers of students admitted into neuroscience training. The time required to obtain the Ph.D. in neuroscience is appropriate, and graduates are identifying opportunities related to their training. Although the period of graduate and postdoctoral training has increased in recent years, this may be warranted by the increased specialization and multidisciplinary skills required for contemporary neuroscience research. Finally, the number of available jobs for neuroscientists seems likely to increase, for at least two reasons. First, the expansion of the biotechnology and pharmaceutical industries promises to provide increased employment opportunities for neuroscientist outside academia. Second, the effort to double the NIH budget in five years remains on target, and some universities are now projecting a need for substantial additional faculty who will compete for these expanding funds.

Note: Results from the *ANDP survey* that *pertain to this commentary can be found on the Nature Neuroscience web site (http://www.nature.com/neuro/web_specials).*