

1. Program overview

1.1 Program mission and organization

The University of Utah's Interdepartmental Graduate Program in Neuroscience is an interdepartmental graduate program designed to provide predoctoral students with a broad-based training in neuroscience disciplines. This includes a wider choice of mentors than would otherwise be available to them in a conventional department-based program. The Program in Neuroscience has succeeded in attracting increased numbers of applications over the past years and has steadily increased the number of well-qualified students who have been admitted to the program. As is shown below, the University's Program in Neuroscience retains and graduates a high proportion of students that we admit and most go on to postdoctorate studies at well-regarded institutions. The Program in Neuroscience receives very strong support within the University of Utah's neuroscience community and has become an effective mechanism for bringing neuroscientists from the various departments together for teaching and scientific interaction. In recent years the Program in conjunction with the Utah Brain Institute has played an important role in attracting top-quality neuroscience faculty to participating departments. This has led to an overall strengthening of the Program. We believe that there is increasing recognition that quality training requires a truly integrated training environment and that our program has a very strong cohesion that supports this belief. This cohesion leads to a comprehensive broad-base learning experience for graduate students enrolled in the Program.

History

In 1986 the first graduate students were enrolled in the Interdepartmental Program in Neuroscience. Prior to that time graduate training in neuroscience at the University of Utah was carried out exclusively through discipline-based programs offered by a handful of departments. The Program in Neuroscience, which is the only interdepartmental program at the University of Utah that grants a Ph.D., was established to offer students broader training in neuroscience and a wider choice of mentors than a conventional, disciplinary program. This is exemplified in the ability of students to learn from and be trained by faculty based in clinical departments without graduate programs. Between 1986 and 1994 the Program was run by a steering committee consisting of a chairman, Dr. Thomas Parks, of the Department of Neurobiology and Anatomy and four committee members. This group directed the program in all of its different aspects including recruiting of students, admitting students, following students' progress through the program, establishing curricula and administrating all of the necessary paperwork upon a student's graduation.

In 1993 a taskforce was formed to evaluate the Program and to make recommendations on its effectiveness and its ability to meet the original, intended goals of the Program. The taskforce consisted of a number of Neuroscience related Department Chairs and several influential members of the Neuroscience community. Late in 1993 a report was generated and suggested widespread comprehensive changes in the way the Program operated and was administered in order to increase the interactions between neuroscience faculty on the campus and to increase the Program's ability to attract top-notch students and complete its educational mission. The report was enthusiastically embraced by the cognizant vice-presidents and the Program was given the direction to move forward with the four changes outlined below.

The first change that was implemented was the change of the Program Administration. The Steering Committee was dissolved and a Program Director was elected and a Program Directorate formed to help the Program Director in administering the Program. The first Program Director was Dr. Toto Olivera of the Department of Biology and the Director-Elect was Dr. Eric Lasater of the Department of Ophthalmology and Visual Sciences. At the time it was planned that the Director would serve a two-year term and then the Director-Elect would step into the Director's position and a new Director-Elect would be chosen from the participating faculty. When Dr. Lasater became Director, his term was continued until his unfortunate accident in 2004. Dr. Mary Lucero was appointed Interim Director until her election to Director in 2005. The term of Director is currently 5 years.

Next a curriculum committee and a recruiting and admissions committee were formed. The Curriculum Committee was charged with evaluating the current Neuroscience curricula and if warranted, establishing new courses. The Committee was also charged with following students in their coursework and assisting students who may be having academic difficulty. It was also decided at that time, as a requirement, that students would have to participate in three laboratory rotations. Rotations were established as a mechanism for students to assess potential research mentors. Currently, the students participate in 4 half-semester rotations; an abstract is written following each rotation so that future students can read about the lab experiences of their predecessors.

An Admissions and Recruitment Committee was established to recruit students into applying for the Program and then to evaluate and ultimately make offers for students to join the Program. This committee was charged with establishing an effective means for advertising the Program at other universities, with developing new program brochures and with screening all applicants that came about as a result of these advertisements. The Admissions Committee was also charged with establishing a recruiting weekend during which potential students would be brought to the University of Utah campus for a 2-day interview process. Details of the Recruitment Weekend can be found in Section 3.1 Student Recruitment.

As a result of the task force report, Program-sponsored activities were dramatically increased. The goal was to improve communication and scholarly interactions between the multiple neuroscience entities on campus including faculty, staff, students, and the community. A variety of activities were implemented to achieve these goals. First, a website was established listing the active faculty members and outlining their current research interests and the activities conducted within their laboratories. The website was later modified to include an on-line application packet through which prospective graduate students could apply to the Program over the web. A seminar series was established which continues to the present. Once a month a prominent neuroscientist is invited and hosted by one of the graduate students. The host student is responsible for presenting the speaker's papers at a student-only journal club meeting prior to the seminar. Thus all of the students are familiar with the work and can ask informed questions during the lunch with the speaker. The students are eager to participate in hosting seminar speakers because it provides important connections for future postdoctoral fellowships. This seminar series has proved to be a huge success with a large number of internationally recognized neuroscientists visiting campus and provides a focal point for interactions between on-campus

neuroscience laboratories. A list of the seminar speakers for the past 2 years is included in Appendix I.

A series of retreats were established. These retreats have changed slightly since their inception and currently are held in the spring and fall of every year. The idea is to provide a venue for participating neuroscience faculty, students, and postdocs to get together in one locale and exchange ideas and discuss topics of interest. In addition, the retreats provide three opportunities each year for students to give formal presentations of their research outside of their home department. The fall retreat is usually held at Snowbird Ski Resort. A topic for the retreat is chosen and three guest speakers, from outside the University, are invited to participate. The program starts on a Friday morning and includes a series of presentations from graduate students, local faculty and invited speakers. The formal talks are followed by a social hour and dinner. During dessert, the key note speaker gives a lecture that is designed to both entertain and inform. This is followed by an opportunity for faculty, students and laboratory members to interact with the guest speakers as well as with other program participants. The next morning consists of a breakfast for the Neuroscience students, Directorate, and invited speakers. In this less formal setting, the students have an opportunity to ask questions of the speakers both on their science and careers. Starting in 2008, the invited speakers were asked to provide a written evaluation of the program. The evaluations and a listing of the invited speakers over the past eight years are included in Appendix I. For the upcoming year, the Society for Neuroscience (SFN) Chapter meeting will be held during the Snowbird Symposium. The SFN Chapter obtained Grass Foundation funding to pay for the keynote speaker. Combining with the SFN Chapter will bring faculty and students from the participating institutions (Weber State, BYU, Utah State) and further increase the impact of the Program on neuroscience in Utah.

The second retreat is the Student Symposium held in the spring. Again, all participating program faculty, students, and laboratory members are encouraged to attend. This retreat starts at lunch and includes twenty minute presentations by neuroscience students at various stages in their training. Each presentation is followed by a question and answer period and the event concludes with plenty of opportunity for discussions and interactions.

The third retreat is the Student Orientation held the day before the start of fall semester. This student-organized and run program begins with a welcome from the Director, a brief presentation by the Chair of Curriculum, and several twenty minute faculty research presentations. The morning talks are followed by a luncheon with the Directorate and Curriculum Chair in which students are encouraged to discuss any problems, suggestions, or clarifications. Generally student representatives from the Directorate, Admissions, and Curriculum committees have polled the students before hand and raise issues on behalf of students who may hesitate to speak out. This meeting along with course evaluations provides the Directorate with the feedback for 'closing the loop' and allows for the Program to respond and adapt to the changing needs of students and faculty. Following lunch, the faculty are excused and the students give research presentations, elect the chairs and members of the student-run committees such as Seminar Committee, Brain Awareness Week, Student Retreat, and Recruitment Weekend as well as select the student representatives to the faculty committees. Following the afternoon activities, the students go to a cabin in a local canyon and have a bar-b-

que/camp out. The next morning, they have the opportunity to hike in the Wasatch mountains or just enjoy the scenery. The overnight retreat provides a relaxed setting for the incoming students to ask questions about all aspects of the program.

To implement all of the changes suggested by the Vice President's Neuroscience Task Force, funding for program activities had to be increased. Prior to implementing the changes during 1994 and 1995, the Program received 100% of its funding from the School of Medicine. This was a fixed amount of \$100,000 per year. This money was used to pay first-year student stipends as well as support program activities. To accomplish increased program funding, the Program Director went to various participating entities in the Program and requested support. This increased the Program's base support to roughly \$300,000 per year and provided the support necessary for increased graduate student admissions and the enhancement of Program-sponsored activities as suggested by the Vice President's Neuroscience Task Force. As a result of this investment, high quality faculty and students were successfully recruited, Neuroscience at the University of Utah has gained national recognition, and this past year, our faculty brought in ~\$32 million in direct-cost research dollars. In 2006, the Program was awarded a highly competitive 5 year NIH T32 predoctoral training grant with funding for 6 stipends and \$187,000 in annual direct costs. Currently, the Program is budgeted for 12 stipends and the ~\$550,000 in funding comes from the offices of the Senior Vice President for Academic Affairs, the Senior Vice President for Health Sciences, and the Vice-President for Research.

1.2 Program Planning

The main goals of the Program focus on improving our ability to recruit high-quality students, exposing them to a rich and diverse research environment, and offering them the best possible training. The means used to achieve these goals is to offer students, in one program, access to a wide variety of potential research sponsors and an improved curriculum that exploits the teaching expertise and diversity of our large faculty. Specifically, our goal is that our students will learn a core of basic neuroscience, learn to think critically, learn to give effective presentations, learn to write clear compelling research proposals and manuscripts, understand the importance of scientific integrity and research ethics, and complete a significant body of new research. The success of our recent recruitment and graduates shows that we are reaching these goals.

The primary goals of the program can be broken down into three main areas.

- A.** The first is the recruitment and admission to the program of outstanding doctoral students. This is accomplished by:
1. Preparing, producing and disseminating program materials designed to draw attention to the program and the potential educational opportunities afforded students.
 2. Critically evaluating all potential applicants to the program, in an effort to determine the highest quality applicants, and those who would fit best with our particular programmatic themes.
 3. Providing the necessary financial support for students during their first academic year.
 4. Providing continual formal advising while the student is enrolled in the program with the goal of ensuring that the student is exceptionally well trained in his or her chosen area of

expertise.

B. The second is the didactic training of PhD students. This is accomplished by:

1. Creating and teaching a core set of graduate level, neuroscience courses, covering the broadest possible subject areas.
2. Providing a wide range of ancillary courses, which enhance the student's training.
3. Providing for seminars and journal clubs in a formal setting.
4. Familiarizing students thoroughly with active faculty research interests.
5. Providing students with a broad range of thesis advisers whose expertise covers the full gamut of currently important neuroscience research topics.
6. Allowing students the opportunity to train, not only in an academic setting, but also in an industrial environment.

C. The third is the enhancement of collegial interactions between active neuroscientists at the University of Utah. This is achieved by:

1. Improving general communication among members, faculty and students, of the program who are at spatially divergent locations across campus.
2. Facilitating coordinated research efforts among labs.
3. Improving access of participating faculty to important research resources across campus.
4. Providing focal points (retreats, seminars, etc.) for students, faculty and their labs to come together to learn more about currently "hot" areas of neuroscience and to interact and potentially put together research collaborations.

By accomplishing the goals outlined above, the level of neuroscience training and research is enhanced campus-wide. Recruiting excellent students into the program and providing a venue for neuroscientists to gather and discuss research objectives raises the level and quality of neuroscience in general at the University of Utah.

Future directions and challenges

The future directions and challenges are to maintain and improve faculty involvement in teaching and training, to continue to improve the caliber and number of successful applicants, especially minorities, to increase the translational component of the training and to improve "closing the loop" of implementing curricular and program evaluations.

1. Maintain and improve faculty involvement:

With the implementation of Mission Based Management, the departments of participating faculty were receiving funds for both didactic teaching and lab training of Neuroscience Students. This greatly incentivized teaching and the program flourished. Now that funding has become tighter, it is unclear how or whether teaching incentives will continue. Faculty are feeling the pressure to obtain more extramural grants and time constraints may lead to reduced emphasis on teaching. The Program requests that the administrative financial support of neuroscience teaching, training and service continues in the future.

A more formalized procedure for replacement of faculty in administrative and teaching positions needs to be implemented. The current strategy is that the faculty member who wishes to rotate off of a position must first find a replacement. We plan to list the available positions

each year in the Spring NeuroNews to involve more faculty. For Directorate positions, nominations and approval are voted on by the entire faculty.

2. Improve the caliber and number of successful applicants, especially minorities:

The Program has grown from 30 to 50 students over the past seven years and is internationally recognized, attracting top students from all over the United States and abroad. However, competition between programs in the Western part of the United States remains keen. Seven years ago our competition included such schools as the University of Montana, University of Wyoming, Arizona State University, University of Nebraska, etc. That is to say that if we lost graduate students during our recruitment, they would go to such schools as these. Now, because of our growth and success, our competitors are much more high profile universities and colleges on the east and west coasts. Because competition is so stiff among various universities for graduate students, we are constantly striving to change and to better refine the way we recruit and enroll graduate students into our program. This will be a constant challenge to the program administration. Mechanisms for attracting better students are 1) renewing the NIH T32 Training Grant in Neuroscience 2) an increased emphasis in translational neuroscience training and 3) increased summer training opportunities for undergraduate minority students 4) more outreach to undergrad institutions (sponsored student visits etc.).

3. Training in Translational Neuroscience:

Recognizing the increasing emphasis on translational neuroscience in NIH funding, two new translational neuroscience courses have been added to the curriculum (Didactic Lectures in Pain and Functional Disorders, Epilepsy from Benchtop to Bedside) and 10 clinician scientists from the School of Medicine have been recruited to the Neuroscience Program. In addition, the Program Director along with the Utah Brain Institute and Neurosciences Medical Center have submitted a million dollar Howard Hughes Med-Into-Grad Training Grant application to create the University of Utah Masters in Translational Neuroscience (see details under Recommendation 3 below). If funded, this unique training experience will undoubtedly attract highly competitive applicants to the Program.

4. Closing the Loop

Over the past two years the Program initiated on-line course evaluations, the results of which are provided to the Chair of Curriculum, the Director, Course Directors and the participating faculty. The Course Directors have been very responsive to student suggestions. In addition, the Program initiated on-line evaluations from Neuroscience Alumni. Many of the suggestions put forward by the older alumni had already been put into practice. Snowbird symposium speakers will receive a more formal request for evaluating the program and suggestions will be provided to the Directorate.

1.3 Previous Review and Actions

Recommendation 1: Steps should be taken to increase the impact that this program has on the direction of neuroscience research and education at the University of Utah.

Two steps have been taken to increase the impact of the Neuroscience Program at the

University of Utah. One has been to obtain a prestigious NIH Neuroscience Training Grant. This five year grant funds six neuroscience students each year and allowed the program to grow to its present size of 50 students, making it one of the larger Ph.D. granting programs on campus. The second step was the establishment of the Utah Brain Institute in 2004. The founding Directors, Drs. Parks and Jorgenson along with input from department chairs and faculty identified future neuroscience research priorities with an emphasis on developing genetic models, acquiring state of the art neuroimaging facilities and promoting translational neuroscience research. The Interdepartmental Neuroscience Program has been an effective recruiting tool for the Brain Institute by providing outstanding graduate students and avenues for interaction among Brain Institute faculty members. Through administrative and legislative USTAR funding the Brain Institute has recruited outstanding new neuroscience faculty to the University of Utah.

Recommendation 2: Effort should be made to assure that participating faculty receive “credit” for their participation in the Neuroscience Graduate Program. This might include release time from teaching in their departments equal to the teaching commitment to the Neuroscience Program as well as recognition of their role in mentoring of Neuroscience students in RPT actions.

The Program Coordinator, Tracy Marble, provides each department with the annual teaching hours for faculty who teach Neuroscience courses. The majority of our courses are team taught and each faculty member’s participation is tracked individually back to the home department. In addition, Neuroscience courses are cross-listed with the faculty member’s home department course listing so that the course offerings of the home department are enriched and made available to non-neuroscience students. In addition, the Director writes letters of reference for the majority of faculty in clinical departments for their various stages of RPT actions and comments directly on faculty participation through teaching and service to the Program. No formal release time agreements have been made.

Despite these efforts to provide faculty “credit”, a major obstacle for improving the Program is the recruitment of faculty to teach and serve on committees above and beyond their normal departmental requirements. The main job of the Curriculum Chair is to identify and recruit faculty to teach in neuroscience courses. We need further support from Departmental Chairs and Deans to recognize and reward Neuroscience teaching and service.

Recommendation 3: The program administrators should begin to explore the possibility of offering a master’s degree in Neuroscience.

Since the previous review, the Program has gained approval to offer an M.Phil. degree to students who have completed all program requirements except for their dissertation research. This degree is rarely granted, but has been useful for a few students who for health or family reasons decided not to complete the Ph.D.

In 2007, Drs. Olivera, Dudek, and Lucero seriously investigated developing a Bachelors and Masters of Neuroscience Program. However their projections of required faculty teaching time versus student contact hour reimbursements revealed that with the budget structure at the time, the programs would not be fiscally solvent and the project was put on hold.

In 2009, Drs. Lucero, Renshaw and J. White submitted a HHMI Med-into-Grad application to create a University of Utah Masters in Translational Neuroscience. The HHMI proposal delineates a new and innovative training program that provides formal and informal clinical training opportunities throughout the pre-doctoral experience. The MTN capitalizes on the university's considerable infrastructure for the neurosciences which includes the Interdepartmental Neuroscience Program, the Utah Brain Institute, and several clinical neuroscience departments. Support from HHMI will enable the MTN directors and faculty to create new program elements that will broadly enrich the entire neuroscience community. Major program elements include 5 new, clinical courses (Diseases of the Eye, Psychopathology, Epilepsy, Topics in Neurology, and a Neuroimaging bootcamp), a Translational Neuroscience Journal Club, and an annual Translational Neuroscience Symposium. From the cohort of students who complete the above courses, the top 5 will be selected to enter the M.S.-degree granting MTN program and participate in the medical school's clerkships in Neurology, Psychiatry, and Ophthalmology where they will see patients. MTN students will have ongoing opportunities to shadow in subspecialty clinics and engage in medical training forums alongside residents in the clinical departments. Regardless of whether the application is funded, the intent is to continue development of this innovative training program.

Recommendation 4: Attention should be given to providing more teaching opportunities for students, especially for those interested in pursuing a career in academics.

The Neuroscience Program does not have a teaching assistant requirement. Students who are interested in TA-ing may do so through their training departments. Many students do take advantage of teaching opportunities and three of our recent graduates have obtained full-time teaching positions (Weber State College, Grove City College, Juan Diego HS). In addition, second year students supported by the T32 Training Grant are expected to tutor the first-year core courses. This provides the trainees with valuable teaching experience. An added bonus has been that none of the Neuroscience students have failed the core courses since the inception of the tutor program.

**1.4 Department Review Sheet
The University of Utah
Neuroscience Program
Program Review 2009**

Faculty Headcount: (for 2009 only. Additional information resides in departmental offices)

Full Professors				41
Associate Professors				14
Assistant Professors				15
Research Professors				2
Research Associate Professors				
Research Assistant Professors				1
Total Professors:				73

Research Expenditures

Total Annual Direct Costs for 2009	\$31,743,14
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Student Credit Hours

Total teaching hours: (for 2008-2009 only. Additional information resides in departmental offices)

NEUSC 6040 - Cellular and Molecular

Neuroscience: Fall 2008

Anesthesiology	12
Biology	15
Neurobiol/Ana t	4.5
Neurology	1.5
Physiology	19.5
Pharm/Tox	7.5

NEUSC 6050 - Systems

Neuroscience: Spring 2009

Bioengineering	46
Ophthalmolog y	5.5
Pharm/Tox	5
Psychiatry	1.5
Physiology	1.5

NEUSC 6060 - Neuroanatomy: Fall

2008

Neurobiol/Ana t	43.5
Radiology	1.5

NEUSC 7750 - Developmental Neuroscience:

Spring 2009

Neurobiol/Ana t	32
Human Genetics	3
Internal Medicine	2
Ophthalmolog y	2
Physiology	2

NEUSC 6245 - Electrophysiology Boot Camp:

Summer 2008

Physiology	40
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NEUSC 6250 - Molecular Biology Boot Camp:

Summer 2008

Internal Medicine	40
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Course/Instructor**Evaluations**

available on request

Enrolled Majors	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009
Total	30	30	32	33	39	38	41	50

Degrees Awards	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009
MPhil	NA	NA	1	0	2	2	0	0
Ph.D.	4	5	4	2	5	6	1	6

2. Faculty

2.1 Faculty profile

Faculty participation in the Neuroscience Program is voluntary, according to the guidelines described below; (For form sent to faculty requesting membership, see Appendix I).

Membership in one of the participating departments does not automatically entitle a faculty member to Neuroscience Program privileges, nor are faculty members of other departments excluded from participating in the Program. Since the principal goal of the Neuroscience Program is to provide an outstanding training environment for graduate students in the field of neuroscience, participating faculty are expected to meet and to maintain the following standards:

1. Basic research interests in one or more of the following general areas: cellular neuroscience, molecular neuroscience, developmental neuroscience, brain and behavior and neurobiology of disease. (Faculty with primarily clinical research interests in one of these areas may also be eligible).
2. An active research program in one of the above areas. (Evidence of activity would include a consistent record of publications and extramural funding).
3. A regular or adjunct appointment in one of the participating departments, a full participation within that department's activities with regards to graduate education (participation in journal clubs, research in progress, dissertation committees, qualifying exam committees, etc.)
4. A full commitment to the goals of the Neuroscience Program and willingness to participate actively in attaining these goals.

There are 73 faculty members that participate in the Neuroscience Program. Their NIH biosketches can be found in Appendix II, and a listing, alphabetically can be found at the end of this section in Table 2.1.1. A brief description of each faculty member's research interests can be found in the face books, used for student recruitment, in Appendix IV.

FACULTY STATS:

Average age: 52

Age Range: 37-72

*Gender: Male - 52; Female - 21

Minority: 1 Hispanic

*4 of 7 leadership positions in the Program (Director, 2 Directorate Members, Chair of Admissions) are held by women.

Individual departments conduct recruitment of faculty to the University of Utah, as well as retention, promotion and tenure review. However, it should be noted that the existence and performance of the Neuroscience Program is a major selling point for faculty recruitment, especially at the assistant professor level. The vast majority of faculty believe the Neuroscience Program to be of enormous benefit to themselves and to the scientific community in general.

TABLE 2.1.1 Interdepartmental Neuroscience Program Faculty Members

Faculty Name	Department	Title	Year joined NP
Anderson, Jeffrey	Radiology	Assistant Professor	2008
Angelucci, Alessandra	Ophthalmology/Visual Sci	Associate Professor	2001
Baehr, Wolfgang	Ophthalmology/Visual Sci	Professor	1996
Balagurunathan, Kuberan	Medicinal Chemistry	Assistant Professor	2005
Bass, Brenda	Biochemistry	Professor	2002
Bastiani, Michael	Biology	Professor	Before 1997
Bealer, Steven	Pharmacology/Toxicology	Professor	2007
Bonkowsky, Joshua	Pediatrics	Assistant Professor	2008
Capecchi, Mario	Human Genetics	Distinguished Professor	Before 1997
Chien, Chi-Bin	Neurobiology/Anatomy	Professor	1998
Clark, Gregory	Bioengineering	Associate Professor	1996
Condic, Maureen	Neurobiology/Anatomy	Associate Professor	1997
Creel, Donnell	Ophthalmology	Research Professor	Before 1997
Creem-Regehr, Sarah	Psychology	Associate Professor	2001
Crowley, William	Pharmacology/Toxicology	Professor	2001
Dorsky, Richard	Neurobiology/Anatomy	Associate Professor	2001
Dudek, F. Edward	Physiology	Professor	2006
Flanigan, Kevin	Neurology	Associate Professor	1998
Fleckenstein, Annette	Pharmacology/Toxicology	Professor	1997
Frederick, Jeanne	Ophthalmology	Research Assistant Professor	1996
Friedrich, Frances	Psychology	Associate Professor	Before 1997
Fu, Yingbin	Ophthalmology/Visual Sci	Assistant Professor	2007
Fuhrmann, Sabine	Ophthalmology/Visual Sci	Assistant Professor	2003
Fujinami, Robert	Pathology	Professor	Before 1997
Fults, Daniel	Neurosurgery	Professor	Before 1997
Goller, Franz	Biology	Professor	1999
Greger, Bradley	Bioengineering	Assistant Professor	2006
Grunwald, David	Human Genetics	Professor	Before 1997
Hanson, Glen	Pharmacology/Toxicology	Professor	Before 1997
Hoffman, John	Radiology	Professor	2008
Jensen, Randy	Neurosurgery	Associate Professor	2003
Jorgensen, Erik	Biology	Professor	Before 1997
Keefe, Kristen	Pharmacology/Toxicology	Professor	Before 1997
Kesner, Raymond	Psychology	Professor	Before 1997

Korenberg, Julie	Pediatrics	Professor	2008
Krizaj, David	Ophthalmology/Visual Sci	Associate Professor	2007
Lainhart, Janet	Psychiatry	Associate Professor	Before 1997
Levine, Edward	Ophthalmology	Associate Professor	2000
Light, Alan	Anesthesiology	Research Professor	2004
Lucero, Mary	Physiology	Professor	Before 1997
Mansour, Suzi	Human Genetics	Associate Professor	2001
Marc, Robert	Ophthalmology/Visual Sci	Professor	Before 1997
Maricq, A. Villu	Biology	Professor	1996
McIntosh, Michael	Psychiatry/Biology	Professor	Before 1997
Michel, William	Physiology	Professor	Before 1997
Normann, Richard	Bioengineering	Professor	Before 1997
Odelberg, Shannon	Internal Medicine	Assistant Professor	2002
Olivera, Baldomero	Biology	Distinguished Professor	1995
Piotrowski, Tatjana	Neurobiology/Anatomy	Assistant Professor	2001
Pulst, Stefan-M.	Neurology	Professor/Chairman	2008
Rabbitt, Richard	Bioengineering	Professor	Before 1997
Renshaw, Perry	Psychiatry	Professor	2008
Rogers, Scott	Neurobiology/Anatomy	Professor	Before 1997
Rose, Gary	Biology	Professor	Before 1997
Saijoh, Yukio	Neurobiology/Anatomy	Assistant Professor	2005
Sanchez, Alejandro	Neurobiology/Anatomy	Professor	2001
Sanguinetti, Michael	Physiology	Professor	1993
Schmid, Alosia	Human Genetics	Assistant Professor	2004
Schoenwolf, Gary	Neurobiology/Anatomy	Professor	Before 1997
Scott, Sheryl	Neurobiology/Anatomy	Professor	Before 1997
Statler, Kimberly	Pharmacology/Toxicology	Assistant Professor	2006
Taha, Sharif	Physiology	Assistant Professor	2008
Tresco, Patrick	Bioengineering	Professor	Before 1997
Vetter, Monica	Neurobiology/Anatomy	Professor	1996
Vickers, Neil	Biology	Professor	1998
Wang, Yong	Otolaryngology	Assistant Professor	2008
Watson, Jason	Psychology	Assistant Professor	2006
White, H. Steve	Pharmacology/Toxicology	Professor	Before 1997
White, John	Bioengineering	Professor	2007
Wilcox, Karen	Pharmacology/Toxicology	Associate Professor	1999
Yang, Jun	Ophthalmology/Visual Sci	Assistant Professor	2008
Yoshikami, Doju	Biology	Professor	Before 1997
Yurgelun-Todd, Deborah	Psychiatry	Professor	2008

2.2 Faculty diversity

Faculty diversity is controlled by recruitment and retention policies of the home departments. The low percentage of women and minorities mirrors the numbers for the University of Utah as a whole. Despite this, women are given full access to leadership and training opportunities within the Program and participate at disproportionately high numbers.

2.3 Faculty Teaching

A basic Neuroscience Program Core Curriculum has been designed for all entering students. (see section 4 for complete listing of core courses). These courses are taught by a team

of Neuroscience faculty members. Other participating faculty members, as well as those teaching in the Program courses, teach within their individual departments. About 25 faculty members were involved in the teaching of Program courses last year.

2.4 Faculty Scholarship

Tabulated below is a list of the Neuroscience faculty, research and Neuroscience student training. The highly accomplished faculty in the Program include one Nobel Laureate (Dr. Mario Capecchi), 5 Howard Hughes Investigators (Capecchi, Jorgensen, Sanchez Alvarado, Olivera, Bass) 3 members of the National Academy of Sciences (Olivera, Bass, Capecchi), 3 USTAR faculty (White, Korenberg, Renshaw), 2 Endowed Chairs (Vetter, Marc) and 2 winners of Distinguished Graduate and Postdoctoral Mentor Awards (Lucero, Marc). Program faculty teach at Woods Hole courses, International Courses, and are regularly invited to give seminars both nationally and internationally. For detailed scholarship information, see Biosketches in Appendix II.

2.5 Faculty Service

Many of the Neuroscience faculty are also actively involved (including holding chapter positions) with the Intermountain Chapter for the Society for Neuroscience. Faculty are also involved in the student organized Brain Awareness Week; another Society for Neuroscience activity recognized on the national level. Many of our faculty are invited to local schools and organizations to introduce the Neuroscience Program to up and coming college students. Many faculty serve on editorial boards and program reviews, such as this.

2.6 Retention, Promotion and Tenure

The Director routinely writes letters for faculty RPT packets however the guidelines for RPT are maintained within the home department. The Director meets each summer with faculty thesis advisors and students who have just joined their labs to go over the program requirements, expectations, resources, and provide mentoring information (also available on our website).

2.7 Faculty Vitae (see Appendix II)

Complete NIH Biosketches for each participating Neuroscience Faculty are provided for the reviewers.

3. Students

General Comments

One of the main strengths of the Neuroscience Program is the quality of students that apply to and are admitted to the program. Prospective students are attracted not only by the wide diversity of research opportunities available to them, but also by the strong neuroscience curriculum that is offered in the first year, and the sense of “community spirit” amongst the students and faculty, which is unusual in a program of this size and breadth. In the past five years the quality of students admitted to the Neuroscience Program has steadily improved due to efforts to encourage motivated and qualified students to apply to the program, and due to careful evaluation of applicants during the interview process.

3.1 Student Recruitment.

A. Initial Contacts.

Multiple steps are taken to encourage applications to the Neuroscience Graduate Program. The Program is listed in the Peterson's Guide under "Neuroscience", which is the major general source of information about graduate programs around the country. Recruiting posters with response postcards are sent out each year (approximately 2000). When postcards are received, brochures and application materials are promptly sent out. The Neuroscience Program has a web-site (<http://neuroscience.med.utah.edu>) which prominently features the graduate program. Inquiries from interested parties can also be made directly through the web-site (between 50-70% of the approx. 600 requests for graduate program information per year are generated through the web-site). Program brochures and information packet (admission requirements and deadline) are mailed out to those requesting information about the Program. The relevant specialized brochure(s) produced by the Program are sent to those expressing an interest in one or more of the major areas of research expertise represented within the Program.

In addition, we strongly feel that "word-of-mouth" plays an important role in recruiting and we encourage participating faculty to advertise the Program when they present invited talks at other institutions. For this purpose, the program has a set of informational slides. Faculty and students are also encouraged to place the University of Utah Neuroscience emblem prominently on any posters they may present at national or international meetings.

Each year the current Program graduate students organize activities for Brain Awareness Week (BAW). High school students are invited to visit the university campus on a pre-scheduled day and "shadow" a designated graduate student. This has produced some very positive feedback from the high school students in which they are given the opportunity firsthand to learn and experience life in a research environment. Additionally, a neuroscience kiosk staffed primarily by graduate students is located in the Salt Lake City area during BAW to raise the profile of the Program. (See student generated report of BAW in Appendix 1).

Recognizing that continuing efforts are needed to maintain and increase the number of applicants to the program, the directorate this year has suggested the formation of a Recruiting Committee, which will implement strategies for increasing the profile of the Neuroscience Program and encouraging students to apply here for graduate studies. For example, the Program will sponsor upper level graduate students who are interested in returning to their alma mater to give a research talk and distribute information about the graduate program. The idea is to increase the number of applicants from schools where we have successfully recruited students in the past. The University of Utah Neuroscience Program is a member of the Association of Neuroscience Departments and Programs (ANDP) and their resources are also used to tailor recruiting efforts. Our stats are communicated to them annually to help them determine national trends.

B. Application materials.

Inquiries to the Program from prospective domestic students and foreign nationals resident in North America are responded to promptly. Information packets (containing application forms) and brochures are sent to these students. All of this material is also available

on the web-site, and many students apply online. International students receive an information packet (containing international application forms) and the main Program brochure.

C. Review and evaluation of applications

The deadline for completed applications is January 1st. The admissions committee which currently consists of 8 faculty members representing the diverse interests of the Program as well as two graduate student representatives, meets by December 15th to begin the process of reviewing completed applications. All committee members receive copies of each application. Each faculty committee member is assigned a subset of applications to review in detail and present to the committee.

At the initial meeting all applications are discussed and a decision is made on whether or not to extend an invitation to interview. Members of the committee contact individual candidates immediately by telephone to notify them of our wish to interview. Usually, this initial telephone call is made by a member of the committee with research interests that intersect those of the candidate. In some cases, candidates cannot be reached within 48 hours and, in those cases, an e-mail message outlining particulars of the invitation is sent to the applicant, with arrangements made by email to speak by phone. Criteria that are used to determine whether to interview a candidate include: GRE scores, undergraduate education and grades (particularly in relevant biology and neuroscience classes), research experience, research interest statement, and particularly, letters of recommendation. The committee evaluates the merits of each application on an individual basis without applying hard and fast rules with respect to the above criteria. Some applicants are placed into a hold category, usually because the application is incomplete or further information is required. Other candidates are eliminated from further consideration. These candidates are notified by letter of the committee's decision.

Typically, applications from domestic students continue to be received after the "deadline" and are reviewed directly at a subsequent committee meeting or are circulated through campus mail and then a consensus is reached by polling committee members by e-mail. Interviews are not limited to a particular number of candidates per year. The goal of the admissions committee is to invite as many excellent and qualified candidates as possible for interview. Typically we interview 15-22 applicants per year.

D. Visit weekend.

The admissions committee targets a particular weekend on which to invite prospective students. A weekend in February is selected so as not to coincide with the recruiting activities of the combined Molecular Biology Program in which many of our faculty also participate. Invariably, there are some candidates who are unable to interview on the target weekend and they are offered the opportunity of interviewing on an alternative weekend. Some applicants with extenuating circumstances are interviewed on an individual basis. The itinerary for the visit weekend is as follows: candidates arrive on Thursday and are accommodated at a local hotel (University Park Marriott) or on campus at the recently opened University Guest House. On Friday morning there is a small breakfast reception followed by a Program overview and a meeting with the chair of the curriculum committee. One-on-one interviews with three or four admissions committee members are then conducted followed by lunch with Program students. In

the afternoon, candidates meet with 3 or 4 more Program faculty in whom they have expressed a research interest. On Friday evening there is a large reception and poster session which is an opportunity for applicants to socialize with all members of the Program and see student research. On Saturday the applicants are accompanied on an outing by Program students to various Salt Lake City locations (including skiing or sightseeing). The students take the recruits to dinner on Saturday evening.

Faculty members that interview prospective students are asked to provide feedback via an evaluation form to the Program secretary. The admissions committee meets within a week of the interview day to discuss and make a final decision on each interviewee. The graduate student representatives provide feedback on each candidate at the start of this meeting but are not privy to the final discussion and decision regarding applicants. Students that are granted interviews are not automatically extended offers of a place in the graduate program. The committee only extends offers to those students who demonstrate a strong likelihood of success in graduate school. Acceptance decisions are transmitted to applicants by telephone within a day. The committee asks faculty who were particularly impressed with a given student to make these calls. Subsequent to the candidate being successfully contacted, a letter outlining the details of the offer is sent. In some cases, additional telephone calls or emails are made to applicants to urge them to strongly consider attending the University of Utah. Applicants that were rejected are also notified promptly by mail.

E. Foreign applications.

In the past, applications from foreign nationals were handled at a second meeting of the committee. In the future, top foreign applications will be identified and contacted early on.

We ask our colleagues from foreign countries to identify the top five foreign applicants and present them to the committee. The top 2 or 3 applicants are then contacted by e-mail and a telephone interview is arranged. The performance of each candidate in the telephone interview is then evaluated to determine whether or not an offer should be extended. In many years, applications from Chinese students form the largest contingent of any applicant group. Many of these students have extraordinarily high GRE scores (a fact that has been receiving some scrutiny of late) and it would be very easy to make offers only to outstanding Chinese applicants. However, the admissions committee values a diverse international contingent in the Program and thus often extends offers to students from a number of different countries.

3.2. Recruitment and retention of minority and women students:

Recruitment of Underrepresented Minorities and Women:

Recruitment of minority students and women into our biomedical science graduate programs enhances the quality of these programs and also allows our institution to contribute to the critical national goal of including previously underrepresented groups in the scientifically- and technically-skilled workforce. Working with the Administration of the University of Utah, the Graduate Program in Neuroscience has assumed responsibility for a recruitment program that encourages diversity.

Women represent 40-50% of the total numbers of applicants, and approximately 40% of the students that are matriculated are women, so no particular measures have been taken to encourage female applicants.

Multiple steps have been taken to increase the number of applicants from underrepresented minorities. First, faculty members and graduate students in the Neuroscience Program have participated in conferences that serve to encourage scientific research among minority undergraduates, including those sponsored by MARC (Minority Access to Research Careers Program), MBRS (Minority Biomedical Research Support Program), and SACNAS (Society for the Advancement of Chicano and Native American Students). Second, the Neuroscience Program also actively recruits by targeted mailings of application material and program brochures to traditionally minority colleges. Letters soliciting minority student applications are sent, along with program posters, brochures and application materials, to approximately 150 MARC and MBRS program directors at colleges across the United States, and also to specific MARC and MBRS students located through the above meetings. The letters expressed our strong interest in attracting qualified minority students to the program. Third, recruiting trips by Utah faculty members to colleges with predominant enrollments of underrepresented minority students are encouraged by the Program in Neuroscience and supported by the University Administration. Fourth, faculty members in the Neuroscience Program participate in the Summer Research Opportunities Program (SROP), which is sponsored by the Graduate School at the University of Utah. The twin missions of this program are to identify bright minority undergraduates who are interested in basic science research, and to train these students in active research laboratories at the University of Utah.

Admission and retention of minority students:

Historically, the Neuroscience Program receives very few minority applications. In the past three years the Program in Neuroscience has received two applications from Hispanic or Native American students. One of these students was interviewed and offered admission but did not accept. The other student’s application was too far below the minimum requirements to merit an interview. We hope that our continued efforts to attract minority applicants will result in more minority students being admitted to the program. These students will be fully supported and effectively mentored to complete their studies.

3.3 Graduate Admissions

Table 3.3.1 **APPLICANT POOL 2007**

#	School	Degree/Major	GPA	GRE Cum	Interviewed	Accept	Matric	US Citiz/Res	Minor
AVERAGE		3.39	1186						
AVERAGE GRE of International students made offer to:	1245								

APPLICANT POOL 2008

#	School	Degree/Major	GPA	GRE Cum	Interviewed	Accept	Matric	US Citiz/Res	Minority
AVERAGE:			3.42	1178					
AVERAGE GRE of International students made offers to:				1050					

APPLICANT POOL 2009

#	School	Degree/Major	GPA	GRE Cum	Interviewed	Accept	Matric	US Citiz/Res	Minority
AVERAGE:			3.39	1214					
AVERAGE GRE of International students made offers to:				1213					

3.4 Student Support

All Ph.D. students in the Neuroscience Program are awarded financial support (living stipend, health insurance and tuition waiver) for the duration of their thesis work, provided their progress is satisfactory. Because we have a full two-year curriculum, both first and second year students are supported from stipends and the NIH T32 Training Grant (\$25,000 + ~\$1000 insurance for the 2008-2009 academic year). After their second year, students are supported from individual faculty grants, departmental resources, by graduate training grants (in genetics and developmental biology), or by research or teaching assistantships. Stipend levels, regardless of the source of support, are the same in all participating departments. Over the past 5 years, 28 Neuroscience students received support from training grants, 1 student receive support from a teaching assistantship, 1 student received a University of Utah Graduate Research Fellowship, 4 received private fellowships, and 3 students received support from NIH pre-doctoral NRSA grants.

The Neuroscience Program also sponsors an opportunity for undergraduate students to work in neuroscience labs. Neuroscience sponsors the Biology Department's Undergraduate Research Program (BURP), Neuroscience Undergraduate Research Program (NURP) and Undergraduate Research Access for Minorities Program (URAMP) and the Summer Research Opportunities Program (SROP). Here qualified students apply to work in a neuroscience lab. If selected (based on GPA and a personal statement) an undergraduate student will undergo a six-week training course in general laboratory techniques after which he/she will be placed in the neuroscience lab of his or her choice. The student then begins work on a conventional research project. During this time the NURP students meet regularly with one another and the BURP students to present progress on their work. At the end of the two years, usually when the student graduates, a public presentation of their research is made; either through a poster presentation or platform presentation. Students in the program are also eligible to apply for a "mini-grant" which is a small sum of money used to pay the student a stipend and to provide the laboratory in which they are working with a little bit of supply funds. Roughly 1/3 of the NURP students who have applied for this mini-grant received one.

3.5 Student Advising

The format for student advising has changed three times over the past sixteen years; from 1993 to 1997, three faculty member volunteers of the Neuroscience program were identified each year to serve as advisors to the incoming students. The students were divided equally among the advisors and they met once or twice with the advisor. The role of the academic advisor is outlined below. Starting in 1998, the curriculum and policy and procedures were

undergoing major revision and it was felt that the advisors were not familiar enough with the new curriculum to be of help to the students. At this time, the Chairman of Curriculum became the advisor to all of the incoming students. Each student's application folder was evaluated and letters were written to each student listing the required courses for the first year and suggesting additional specific courses if deficiencies were noted. The Chair of Curriculum met with the students as a group at the Fall retreat to explain the curriculum and encouraged the students to set up appointments. The Chair of Curriculum directly contacted students that were having difficulties. The Chairman of Curriculum with the help of the Program Administrator stayed in contact with the students throughout their career to see that they were completing qualifying exams, having supervisory committee meetings, and finishing their dissertations in a timely manner. In 2001, the Directorate and Curriculum Committee felt that a separate Academic Advisory committee should be formed. The first Chairman of this committee was Dr Robert Marc (a Directorate member). In 2006 Dr. Marc stepped down and was replaced by Dr. Richard Dorsky, who also serves on the Directorate.

Because of the relatively small number of incoming students in the Program each year, the Chair of Advising has performed all of the advising duties since 2001, without involvement of a committee. Beginning in 2009, the Program will add a second advisor whose research expertise complements the Advising Chair in order to better help students with diverse interests.

Incoming students are required to meet with an advisor before the beginning of Fall semester. After that initial meeting, advising is on a purely optional basis. However, if academic issues are identified during the first year, students will be strongly urged to meet with the Advisor.

Role of Academic Advisors:

- 1) To establish a relationship with the student in case problems develop.
- 2) To identify and aid students with academic problems.
- 3) To help students select laboratory rotations and a thesis lab.
- 4) To help students select appropriate advanced courses for their educational goals.
- 5) Once students join a thesis lab, to act as an "advisor of last resort" and as their advocate inside the Program.

Assessment of efficiency and effectiveness of our academic advising:

The main benefit to having the Chairman of Curriculum serve as the sole advisor to the students was that they all received consistent and accurate information. This was especially important during the transition years when the curriculum was being reformed. The major drawback to this system was the additional workload that it imposed on the Chairman of Curriculum. The subsequent Student Advisors are both familiar with the curriculum and Program requirements as members of the Directorate. A second identified problem was that there were no end of first year interviews to provide feedback to the program. Since 1996, during the Fall student retreat, a luncheon has been held with the students, members of the directorate and the Chair of Curriculum to get feedback and address student issues. Exit interviews are now handled separately from Advising.

Written Policy for Handling Student Appeals:

Should a student or faculty member disagree with the outcome of any stage of evaluation, the basis of that disagreement shall be presented in writing to the Program Director within 2 weeks of the event. The Program Director will render a decision and dictate the appropriate action. The Director may consult Neuroscience Program faculty regarding the issue and the Director's decision is final. If extensions in time are desired, the student and mentor should submit that request in writing to the Program Director for consideration. If the Director supports the request, it will be transmitted to the Graduate Dean. The decisions of the Program Director and the Graduate Dean are final. In 2000, the Neuroscience Program adopted (with minor modifications) the Guidelines for Student Conduct from the Interdepartmental Molecular Biology Program. Every student in the Neuroscience Program is required to read and sign the agreement to abide by these guidelines. The policy for handling student misconduct and student appeals is outlined in these guidelines (see Appendix I). A copy of the guidelines is also posted on the Neuroscience web site.

3.6 Teaching assistant (TA) training

The Neuroscience Program does not have a teaching assistant requirement. Students who are interested in TA-ing may do so through their training departments. In some instances, the Neuroscience Program will provide the financial support for such assistantships. Also, second year students on the Neuroscience Training Grant act as tutors for first year courses.

4. Curriculum and Programs of Study

4.1 Degree Requirements (see General Catalog, Appendix I)

4.2 Courses (see General Catalog, Appendix I for NEUSC course descriptions)

Core Curriculum (Course requirements of the Neuroscience Program)

Neuroscience Program graduates should be as strong in biochemical knowledge, cellular and organismal physiology and formal statistics as graduates of any program in biological sciences. With this in mind, a basic Neuroscience Program Core Curriculum has been designed for all entering students, most of which should be completed with a grade of B- or better within two years as a prelude to doctoral candidacy. Students with deficiencies in certain academic areas may be required to take undergraduate courses. Credit hours are indicated in parenthesis.

Neuroscience (all courses required as listed)

NEUSC 6010 Frontiers in Neuroscience (1); to be taken Fall Semester of first year

NEUSC 6040 Cellular and Molecular Neuroscience (4)

NEUSC 6050 Systems Neuroscience (4)

NEUSC 6060 Neuroanatomy for Biomedical Scientists (3)

NEUSC 6245 Cellular and Molecular Neurophysiology Laboratory (2); one-week course prior to fall semester of first year

NEUSC 6250 Molecular Biology Laboratory (2); one week course prior to fall semester of first year

NEUSC 6900 Neuroscience Rotations (1 per half-semester); to be taken 4X

NEUSC 7750 Developmental Neurobiology (3);

Quantitative Science (1 course required from the following, or equivalent)

PSYCH 5500 Quantitative Methods I (1-4)

PSYCH 5510 Quantitative Methods II (1-4)

PH TX 6680 Statistical Methods for Pharmacological Research (2)

ONCSC 6150 Biostatistics (2-3)

Ethics

MBIOL 7570 Research Ethics (1)

Grant Writing or Scientific Writing (1 course required from the following)

NEUSC 7950 Professional Skills/Grant Writing (2)

PH TX 6690 Professional Skills (2)

BIOEN 6080 Ideas into Dollars: Writing Grant Proposals (2)

MD/PhD requirements for students entering the Neuroscience Program

The MD/PhD program requires each student to take 9 credits of graduate coursework. For students joining the Neuroscience Program this must include:

1 Neuroscience core course (other than Neuroanatomy)

1 other semester of didactic course work (depending upon lab selected). (Minimum 3 credits)

1 research ethics class (1 credit)

In addition, students are required to attend the weekly RIP/Journal clubs in their department.

If the supervisory committee deems additional coursework to be necessary then the student will be asked to do this.

Otherwise all other Neuroscience Program requirements apply to MD/PhD students (except the supervisory committee, which must meet MD/PhD program guidelines by having one member from the MD/PhD Advisory Committee).

Advanced Lecture Courses

Neuroscience Program students are expected to take at least two advanced courses (totaling no less than 9 credit hours; 6 credit hours must be graded) beyond the core curriculum in addition to any ongoing seminar course participation or special topics courses. The opportunities are extensive as the Neuroscience Program is an interdepartmental program. Thus any graduate courses (6000-7000 series courses) in the participating departments can be used to augment a student's training. In certain cases, graduate or advanced undergraduate courses in non-program departments may be taken with the prior approval of the advisory and Curriculum committees. The following are abridged listings of possible 6000-7000 series courses. There are

many others available including 5000 series. Departmental Journal Club courses are also recommended/encouraged.

The following is a list of possible elective courses:

Biochemistry / Molecular Biology / Biology / Biological Chemistry

BIO C 7500 Biochemical Mechanisms of Signal Transduction (2)

BIOL 5330 Neural Mechanisms of Behavior (3)

BLCHM 6400 Genetic Engineering (2)

BLCHM 6450 Biophysical Chemistry (2)

MBIOL 6410 Protein and Nucleic Acids Biochemistry (2)

MBIOL 6420 Genetic and Genome (3)

MBIOL 6440 Gene Expression (1.5)

MBIOL 6480 Cell Biology (1.5)

Bioengineering

BIOEN 6000 Principles of Physiology I: Cellular, Molecular Physiology (4)

BIOEN 6010 Principles of Physiology II: Systemic Physiology (4)

BIOEN 6900 Neural Interfaces Laboratory (1-4)

Neuroscience

NEUSC 6100 Visual Neuroscience I (3)

NEUSC 6200 Pain/Function Disorders (1) JC

NEUSC 6005 Computational Neuroscience (3)

NEUSC 7790 Special Techniques in Microscopy (1)

Pharmacology & Toxicology

PH TX 7270 Biochemical Basis of Neuropharmacology (2)

PH TX 7280 Advances in Neuropharmacology (2)

Psychology

PSY 5750 Neurobiology of Behavior (4)

Special Topics Courses

In addition to the formal Neuroscience Rotations, students may also elect to carry out advanced readings courses or small scale research projects under any of the Neuroscience Program faculty at any time (NEUSC 7980 - faculty consultation).

Choosing a Mentor

By the end of the first year of study, each student is required to select a thesis advisor. Failure to join a lab by the end of year one indicates unsatisfactory progress and the student may be dismissed from the program. By the end of fall semester year 2, the student selects at least four other faculty members to form a supervisory committee. Together, the student and supervisory committee begin to chart the remainder of the academic program and assist in preparing the student for the doctoral candidacy examination. The supervisory committee provides regular reports to the Director and Curriculum Committee of the Neuroscience Program regarding student progress.

Admission to Candidacy

Students are admitted to candidacy for the Ph.D. degree after completing the course and seminar requirements and passing a qualifying examination given by the advisory committee by the end of the second year of training.

4.3 Program of Study (Ph.D.) (see "Program of Study", Appendix I)

(Suggested format Program of Study)

1st Year

Summer Semester

Lab Rotation

Boot Camp ~ 2 weeks

Fall Semester

Cellular and Molecular Neuroscience + Discussion 4

Neuroanatomy for Biomedical Students 3

Frontiers in Neuroscience 1

Lab Rotations 2

Spring Semester

Systems Neuroscience + Discussion 4

Developmental Neurobiology + Discussion 3

Lab Rotations 2

Select Mentor and begin work in lab during summer

2nd Year

Fall Semester

Statistics 2-3

Grant Writing 1-2

Research Ethics 1

Graduate Level Electives 6

Select Supervisory Committee

Spring Semester

Graduate Level Elective 3

Lab Research 6

Prepare for Qualifying Exam

Take Qualifying Exam at end of second year

3rd Year

Obtain approval of thesis research proposal

Meet with Supervisory Committee every 6 months (recommended)

5th Year

Submit Program of Study
 Submit written dissertation
 Defend dissertation research
 Available graduate level courses:

Area	Course	Course Title
Pharmacology	PH TX 7270 PH TX 7280	Biochemical Basis of Neuropharmacology Advances in Neuropharmacology
Molecular Biology	MBIOL 6410	Biochemistry
Biology	BIOL 5330	Neural Mechanisms of Behavior
Bioengineering/ Physiology	BIOEN 6000/6010	Cell and Tissue Physiology I/II
Psychology	PSY 5750	Neurobiology of Behavior
Neuroscience	NEUSC 6100 NEUSC 6200 NEUSC 6005 NEUSC 7790	Visual Neuroscience Pain/Function Disorders Computational Neuroscience Special Techniques in Microscopy

4.4 Professional development

Prior to 2006, Program students took the Pharm/Tox or Bioengineering Professional Skills/Grant Writing course. In response to student requests, the Program created a Neusc 7950 Professional Skills/Grant Writing course designed specifically for Neuroscience students. In addition, Program students take the MBIOL 7570 Research Ethics course which fulfills NIH training in the responsible conduct of research requirements. Students are also encouraged to attend Woods Hole courses or train in labs of collaborators at different institutions.

4.5 Outreach education

The Neuroscience students have an outstanding outreach opportunity through their participate in Brain Awareness Week (BAW) each Spring. Over the years, students have successfully obtained funding to support BAW and for each of the past several years have interacted with ~1000 K-12 students from Salt Lake schools. The Neuroscience students enjoy the teaching opportunity and provide fun and informative activities designed to spark children's interest in the brain as well as promote brain safety (helmets, drugs, nutrition, and sleep). The Program provides travel funds each year for a first year student to present the BAW poster at the SFN meeting. Please see an example of the student generated report for BAW in the Appendix I.

4.6 Qualifying Exams (see "Qualifying Exam", Appendix I)

4.7 Dissertations (Representative Abstracts in Appendix I)

Student	Faculty	Start	End	Qual	Defend	Title
Lee	Kesner	1998	2002	P	2002	In search of a behaviorally plausible hippocampal

						model: hippocampal subregional functions for encoding and retrieval of spatial memory
Mellem	Maricq	1995	2002	P	2002	Genetic and electrophysiological analyses of the control of locomotion by ionotropic glutamate receptors in <i>C. elegans</i>
Chong	Kesner	1997	2002	P	2002	Hippocampal activation as measured with magnetoencephalography in a running recognition paradigm
Hartman	Kesner	1999	2002	P	2002	Spatial pattern separation and the human hippocampus
Hutcheson	Vetter	1996	2003	P	2002	Mechanisms of retinal ganglion cell differentiation in the vertebrate retina
Renden	Broadie	1997	2003	P	2003	Genetic and physiological investigations of neuromodulation in <i>Drosophila melanogaster</i>
Simeone	White	1997	2003	P	2002	Regulation of allosteric modulation of GABAA receptor function: interaction between recombinant GABAA receptors and the novel anticonvulsant drug topiramate
Van Raay	Vetter	1997	2003	P	2003	Frizzled 5 and a role for Wnt signaling in <i>Xenopus</i> retinal development
Beg	Jorgensen	1998	2004	P	2003	Ligand-gated ion channels in <i>Caenorhabditis Elegans</i>
West	Olivera	1997	2004	P	2003	Delta- and Mu-conotoxins: Peptides from cone-snail venoms that selectively affect tetrodotoxin-sensitive and tetrodotoxin-resistant voltage-gated sodium channels
Messina	Tresco	1997	2004	P	2003	Isolation and characterization of human neural precursor populations for CNS transplantation
Guan	Condic	1998	2004	P	2004	Specification and pathfinding of sensory neurons
Dhond	Halgren	1997	2004	P	2004	Spatiotemporal mapping of visual language processing using magnetoencephalography
Burns	Vetter	1997	2005	P	2004	Mechanisms of differentiation and proliferation during development of specialized forebrain structures
Han	Lucero	2000	2005	P	2005	A-type potassium current in adult mouse olfactory receptor neurons
Logan	Vetter	1998	2006	P	2005	Mechanisms of neuronal differentiation in <i>Xenopus Laevis</i>
Juryneec	Grunwald	1999	2006	P	2006	Mechanisms of zebrafish development and disease
Wu	Capecchi	1999	2006	P	2006	Manipulating the mouse genome for cell lineage analysis and high-throughput genomic analysis
Pittman	Chien	1999	2006	P	2006	Axon guidance in the zebrafishretinotectal system
Daberkow	Keefe	2000	2007	P	2006	Learning-induced arc mRNA expression in striatal efferent neurons and impact of partial monoamine loss
Fogarty-Celestino	Vickers	2000	2007	P	2006	Multimodal sensory integration in the heliothine moth
Qiao	White	2002	2007	P	2006	The effect of methamphetamine on seizure threshold and epileptogenesis
Gribble	Dorsky	2002	2007	P	2007	Coordinating extracellular signaling and intracellular response in zebrafish spinal cord development

Cameron	Zhang	2004	2007	P	2007	Functional and genetic studies in the macular degeneration genes ELOVL4 and HTRA1
Sitthichai-Mobley	Lucero	2000	2007	P	2007	Heterogeneity and signal transduction in the squid olfactory epithelium
Vishwanath	McIntosh	2002	2007	P	2007	Design of alpha-conotoxin ligands: applications in neuronal nicotinic acetylcholine receptor localization and subtype specificity
Plamondon	Rose	2001	2008	P	2008	Song learning and development of syntax and phonology in the white-crowned sparrow (<i>Zonotrichia Leucophrys Orienta</i>)
Avasthi-Crofts	Baehr	2001	2009	P	2008	Functions of kinesin-II and centrin-1 in mouse photoreceptor ciliary transport
Stewart	White	2004	2009	P	2008	Theiler's virus encephalopathy: A novel model of epilepsy
Veien	Dorsky	2003	2009	P	2008	Wnt signaling and the establishment of dorsoventral retinal polarity
Takahashi	Wilcox	2003	2009	P	2009	Functional Properties of reactive astrocytes in an animal model of epilepsy
Farnsworth	Fleckenstein	2005	2009	P	2009	Differential effects of dopamine transporter inhibitors on dopamine sequestration and release: A function of muscarinic and gamma-aminobutyric acid modulation
Riedy	Keefe	2003	2009	P	2009	Reinstatement of cocaine-seeking behavior induced by discrete sensory cues and the associated immediate early gene expression

5. Program Effectiveness – Outcomes Assessment

5.1 Outcomes assessment procedures

The processes for assessing the Program's educational effectiveness include on-line course evaluations, on-line alumni evaluations, student representation on Curriculum, Admissions, and Directorate committees, student feedback session at the Fall Student Retreat, and tracking of student information (recruitment, retention, graduation rates, gender, ethnicity, post-graduate employment). All of the tracking information is performed and maintained by the Program Coordinator Tracy Marble. She also assembles the NeuroNews letter in Spring and Fall to provide information on committees, achievements, publications, and alumni (see sample of Spring 2009 NeuroNews in Appendix I).

5.2 Outcomes assessment feedback

Two examples of how the Program's assessment activities have been used to improve teaching are included below.

- 1) Online course evaluations: in 2008, student evaluations suggested additional guest lecturers in Systems Neuroscience; in 2009 the number of faculty in Systems Neuroscience increased from 2 to 6.
- 2) Fall Student Retreat with Directorate lunch: two recent issues raised at the lunch were requests to run our own Neuroscience Grant Writing and Professional Skills Course and to allow students who obtain extramural funding to supplement their stipends up to \$30K. Both of these requests have been implemented.

5.3 Degree completion data

Entering Student Cohort Academic Year	# of Entering Student w/ BA/BS	# of Students Entering w/ Masters	# who left before completing Qualifying Exam	# who left after completing Qualifying Exam	# who completed Ph.D.	Average time to complete Ph.D.	# of Students Remaining in Program
1999-2000	5	1	2	0	4	5.8	0
2000-2001	6	2	2	2	4	6	0
2001-2002	3	1	1	1	2	6.8	0
2002-2003	4	1	1	0	4	5.6	0
2003-2004	9	0	1	1	3	5.5	4
2004-2005	6	0	0		2	3.5	4
2005-2006	5	4	3		1	3.8	5
2006-2007	9	1	2				8
2007-2008	9	2					11
2008-2009	10	1	1				11

5.4 Employment

It is not difficult to predict future job markets within the context of our students. Our tracking data indicates that virtually all of the students who graduate with a Ph.D. and choose to do so, have a scientific position within a company, university, college, or other venue. A review of current positions occupied by past students is listed following this section. Nearly all of the students go on to do a scientific postdoc unless they can immediately assume a permanent position. In addition to the more traditional routes, our students have gone on to technology

transfer positions, patent coordinators, joined family businesses etc. A Ph.D. earned from the Neuroscience Program can open many different doors, of which the students are well aware. The relative success of our graduates does not mirror the national averages. The national picture suggests there are few jobs for qualified applicants and that we as a Program should reduce the numbers of students we train. Our experience suggests the opposite; all of our students who are past their postdoctoral training have good academic or industry jobs. Our goal as a Program, therefore, is to maintain Utah as one of the best institutions in neuroscience, to continue to accept only the best students, and to provide them with a solid training that will support them for the rest of their career. One change in the historic progression of a Ph.D. student to full time employment has been the increasing number of students that end up in a biotech company. While the biotechnology industry has had it ups and downs over the years, particularly lately, the number of individuals employed in biotech research continues to grow. We as a faculty thus must see our teaching goals as not only to produce future professors and educators but also as scientific researchers within industrial settings.

TABLE 5.4.1 Employment of Students Since the Previous Review

Student	Undergrad College	Major	Faculty	Start	Defend	Current Position
Lee	Seoul National U.	Psychology	Kesner	1998	2002	Associate Professor; Seoul National U.
Mellem	MT State U.	Psychology	Maricq	1995	2002	Research Assistant Professor, U. UT
Chong	Weber State U.	Psych/Zool	Kesner	1997	2002	Unknown
Hartman	Lynchburg C.	Life Sciences	Kesner	1999	2002	Unknown
Hutcheson	U. CT	Biol/Psych	Vetter	1996	2002	Postdoctoral Fellow; U. UT
Renden	Grinnell C.	Chemistry	Broadie	1997	2003	Senior Principal Scientist in the New Targets Biology Group at UCB
Simeone	Boston U.	Biology	White	1997	2002	Assistant Professor, Creighton U.
Van Raay	U. Windsor	Biology	Vetter	1997	2003	Assistant Prof; U. Guelph
Beg	U. Rochester	Neurosci	Jorgensen	1998	2003	Assistant Prof; U. MI
West	Lehigh U.	Biochem	Olivera	1997	2003	Research Scientist; Cephalon, Inc.
Messina	Northwestern U.	Math/ Human Comm	Tresco	1997	2003	Research Scientist, Johnson/Johanson
Guan	China Medical U.	Physiology	Condic	1998	2004	Postdoctoral Fellow; UCSF
Dhond	Washington U.	Biology/ Business	Halgren	1997	2004	Postdoctoral Fellow; Harvard Medical School
Burns	Temple U.	Neurosci	Vetter	1997	2004	Senior Research Technician, Washington U., St. Louis
Han	Beijing Medical U.	Medical Sci	Lucero	2000	2005	Postdoctoral Fellow; U. Calgary
Logan	Trinity C.	Neurosci	Vetter	1998	2005	Postdoctoral Fellow; U. MASS
Juryneec	Emory U.	Biology	Grunwald	1999	2006	Postdoctoral Fellow; U. UT
Wu	Beijing Agricultural U.	Veterinary Medicine	Capecchi	1999	2996	Postdoctoral Fellow; U. UT
Pittman	MT State U.	Psychology	Chien	1999	2006	Self-employed
Daberkow	Southeastern LA U.	Zoology	Keefe	2000	2006	Postdoctoral Fellow; IL State U.
Fogarty-Celestino	SUNY/ Geneseo	Biophysics	Vickers	2000	2006	High School Teacher, Juan Diego High, Draper, UT
Qiao	Shanxi Medical U.	Clinical Medicine	White	2002	2006	Resident, China

Gribble	Grove City C.	Molecular Biology	Dorsky	2002	2007	Assistant Prof; Dept. Chair of Biology; Grover City College, PA
Cameron	BYU	Molecular Biology	Zhang	2004	2007	Postdoctoral Fellow; Harvard
Sitthichai-Mobley	U. UT	Biology	Lucero	2000	2007	Postdoctoral Fellow; Yale U.
Vishwanath	Bangalore Medical U.	Medicine	McIntosh	2002	2007	Unknown
Plamondon	U. Prince Edward IS.	Physics	Rose	2001	2008	Postdoctoral Fellow; U. UT
Avasthi-Crofts	U. IL-Urbana	Physiology	Baehr	2001	2008	Postdoctoral Fellow; UCSF
Stewart	Benedict C.	Biology	White	2004	2008	Medical School, Stanford U.
Veien	MN State U.	Human Biology	Dorsky	2003	2008	Postdoctoral Fellow; UMASS
Takahashi	UCSD	Cognitive Sci	Wilcox	2003	2009	Postdoctoral Fellow; Stanford U.
Farnsworth	Weber St. U.	Psychology	Fleckenstein	2005	2009	Adjunct Faculty; Weber State U.
Riedy	OH State U.	Psychology	Keefe	2003	2009	Postdoctoral Fellow; Medical U SC

6. Facilities and Resources

6.1 Operating budget issues

The operating budget for the Neuroscience Program originates from Central Funds and the NIH T32 training grant. The budget has increased slightly over the past few years to reflect the increase in the number of student stipends (12) increased student insurance and student travel. The budget for 08-09 was \$606,706.

6.2 Physical facilities

The Program office is located within the Department of Neurobiology & Anatomy in the Medical Research and Education Building (MREB). Other than this office, there is no space formally allocated to the Program. Teaching, research space and equipment for participating faculty members are housed within individual departments.

6.3 Libraries

The Neuroscience Program has full access to the University Library System. The University libraries have been hard hit recently by escalating journal costs and a retreat in funding priorities. Fortunately, the advent of electronic journals has offset some of negative impacts of losing a paper subscription. Currently, many departments are setting up virtual libraries in which students can access the necessary journals either through personal subscriptions or through access subscriptions purchased by the institution.

6.4 Centers and institutes associated with the program.

Several Centers and institutes at the University of Utah include faculty that are participating members of the Program. Included are the Utah Brain Institute, the Scientific Computing and Imaging Institute, the Huntsman Cancer Institute, the Center for Human Toxicology, the Anticonvulsant Drug Development Program, Neurosciences Center, and the Utah Center on Aging. The Program cooperates with activities of the institutes (seminars, workshops, facilities) but autonomy of the Program has been maintained so that students have full access to work in labs of faculty in any of these different institutes and centers.

6.5 Computers

The Neuroscience Program has one iMac computer and one Brother copy-printer-scanner. The Neuroscience web pages are maintained on a server through the main campus.

6.6 Staff support

The Neuroscience Program employs one full time Program Coordinator, Ms. Tracy Marble. The Program Coordinator, a full-time staff member, maintains and updates our website; coordinates the Neuroscience Seminar Series and the annual Snowbird mini-symposium; ensures that courses are set-up with the University; prepares the Program Newsletter (each semester); prepares and sends out printed recruiting information; arranges interview visits for prospective students and ensures proper completion of admissions paperwork; assists enrolled students with relocation, payroll, immigration, insurance, travel and course enrollment matters; and ensures that accurate, timely and complete records are maintained on each student's academic progress. The Program Coordinator also administers all aspects of the T32 NIH Pre-doctoral Training Grant in Neuroscience.