



NEUROSCIENCE PROGRAM

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2009 — 2010

Graduate

Program

Handbook



Central Michigan University



GRADUATE PROGRAM HANDBOOK

This handbook will provide an overview of the graduate program in Neuroscience and their degree requirements. This handbook is not intended to replace the *CMU Graduate Bulletin* and the faculty advisor.

The student is expected to:

- Become familiar with the academic regulations of the university and the requirements of the specific program.
- Contact the advisor on a regular basis to keep informed of program requirements and to obtain general assistance in the completion of the program.
- Assume primary responsibility for complying with all regulations of the university, the College of Graduate Studies, and the department and to meet all requirements for the degree within the allowable time limits.

If you have any questions regarding the Neuroscience Program please contact the Program Directors.

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General Description

Objectives: The major objective of the MS/PhD Program in Neuroscience is to provide students with the requisite academic background, technical skills, and hands-on research experience that will allow them to successfully compete for neuroscience-related jobs in the private and public sectors.

Description: The program follows a mentorship model, whereby each student will work closely with his or her mentor. Students will design a program of study which best fits their interests and needs, selecting most of their courses in close consultation with their mentor. Most of the coursework will be taken in the first two years, with minimal requirements of two courses in statistics/research methods, a year-long core course in neuroscience, and a neuroscience seminar each semester. In addition, all students will do a practicum or internship that associates their bench research with clinical applications. The predominant philosophy of the program will be its emphasis on applied research, which will be conducted each year, but with a special emphasis on the third and fourth year when students prepare a publishable major paper and dissertation, respectively.

Entrance Requirements: Applicants need to provide GRE scores and should have a 3.00 GPA in neuroscience, psychology, chemistry, or one of the bioscience disciplines. Applicants with previous research experience in neuroscience-related areas will be heavily favored, and applicants should have an expressed research interest which matches that of at least one of our program mentors.

Student Support: Graduate students accepted into the neuroscience program will have four year support which includes a stipend plus remission of fees and tuition.

Unique Qualities of the Program: Although the proposed program will share the critical requirements and expectations of many Ph.D. programs in neuroscience, there are a few areas of emphasis which make this program relatively unique, including:

- **Applied focus.** Although our required core course ensure a fundamental understanding of neuroscience principles and an appreciation for basic research, our primary focus is on training students who have interests in applied research which match those of our program mentors.
- **Mentorship model.** Students in our program are involved in research with their mentors from start to finish. The program is designed for students who already know what area of neuroscience they want to pursue and who have a desire to focus their efforts refining their knowledge and research skills in this area. In fact, students have a great deal of latitude in tailoring their academic program in consultation with their mentor to target specific needs.
- **Clinical relevance.** Translational research, or the ability to bring research from the bench to the bedside, is an area which will be emphasized strongly in this program. As part of an applied focus, our students will have first-hand experience with clinical populations through practicum or internships. This will help students devise new research protocols which may more accurately address the needs of the targeted clinical population.

M.S. in Neuroscience Program Description

The Masters of Science (M.S.) in Neuroscience Program at Central Michigan University is designed to give each student a comprehensive understanding of the core principles in neuroscience and the requisite training that will prepare students for further, doctoral-level graduate training or for positions in academics, industry, or government that utilize highly trained research skills in specific areas of neuroscience. Throughout the program, all students are expected to be actively involved in research with a Program faculty member, who serves as a mentor. The focus of the M.S. Program in Neuroscience is to build a broad-based and comprehensive understanding of the basic principles of neuroscience and develop a strong background for applied research in some specific area of neuroscience. Current areas of specific research training include CNS control of respiration and studying the causes and potential treatments for Alzheimer's, Huntington's, and Parkinson's diseases. Students are encouraged to contact Program faculty members in their area of research interest prior to submitting application materials.

M.S. Degree Requirements

The Master of Science degree in Neuroscience is based upon the satisfactory completion of a minimum of 30 semester hours of graduate work, including a thesis. The program is broad yet flexible enough to develop individual scholarship in the student's area of study. Each student is assigned to a faculty member who serves as the student's mentor/advisor. The mentor is responsible for monitoring the student's progress through the program particularly with respect to development of research skills. Each student is required to be actively involved in research with their mentor.

Required Courses I (18 hours)

NSC 601 Principles of Neuroscience I – 4 hours

NSC 602 Principles of Neuroscience II – 4 hours

NSC 690 Research Seminar in Neuroscience – 1 to 4 hours

NSC 798 Thesis: Design – 1 to 3 hours

NSC 799 Thesis: Implementation – 1 to 3 hours

Note: A minimum of 4 hours of NSC 690 and 6 hours from a combination of NSC 798 and NSC 799 is required.

Required Courses II (3 hours)

One of the following:

BIO 500 Biological Statistics – 3 hours

PSY 511 Statistics in Psychology – 3 hours

Required Courses III (3 hours)

One of the following:

BIO 600 Biological Research Design and Analysis – 3 hours

PSY 611 Research Design – 3 hours

Electives (6 hours)

To be chosen in consultation with advisor. Students need a minimum of 2 credit hours from elective courses at the 600 level.

Total 30 semester hours

In addition to coursework, the student must complete an oral examination over thesis.

Ph.D. in Neuroscience Program Description

The Doctor of Philosophy (Ph.D.) in Neuroscience Program at Central Michigan University is designed to give each student a comprehensive understanding of the core principles in neuroscience and the requisite training that will prepare students for positions in academics, industry, or government that utilize highly trained research skills in specific areas of neuroscience. The foundation of the Program is provided during the first two years, which encompasses all the requirements for the Master of Science (M.S.) degree in Neuroscience. Throughout the program, all students are expected to be actively involved in research with a Program faculty member, who serves as a mentor. Upon receiving the M.S. degree in Neuroscience (or its equivalent, for students who enter the Ph.D. Program after their second year), students will work closely with their mentor to establish a line of research that will lead to a publishable-quality major paper and dissertation. As such, the focus of the Ph.D. Program in Neuroscience is to build upon the student's broad-based and comprehensive understanding of the basic principles of neuroscience and develop a strong background for applied research in some specific area of neuroscience. Current areas of specific research training include CNS control of respiration and studying the causes and potential treatments for Alzheimer's, Huntington's, and Parkinson's diseases. Students are encouraged to contact Program faculty members in their area of research interest prior to submitting application materials.

Ph.D. Degree Requirements

Required Courses (48 – 66 hours)

NSC 601 Principles of Neuroscience I – 4 hours

NSC 602 Principles of Neuroscience II – 4 hours

NSC 690 Research Seminar in Neuroscience – 1 to 4 hours

NSC 789 Graduate Seminar in Neuroscience – 1 to 12 hours

NSC 798 Thesis: Design – 1 to 3 hours

NSC 799 Thesis: Implementation – 1 to 3 hours

NSC 800 Neurological Research for Doctoral Candidacy – 1 to 12 hours

NSC 898 Doctoral Dissertation: Design – 1 to 12 hours

NSC 899 Doctoral Dissertation: Implementation – 1 to 12 hours

Note: A minimum of 4 hours of NSC 690, 6 hours of NSC 789, 6 hours from a combination of NSC 798 and NSC 799, 6 hours of NSC 800, and 18 credit hours from the combination of NSC 898 and NSC 899 is required. In addition to course work, a student must complete an oral examination over the thesis, major paper (NSC 800), and the dissertation.

One of the following:

BIO 500 Biological Statistics – 3 hours

PSY 511 Statistics in Psychology – 3 hours

Required Courses III (3 hours)

One of the following:

BIO 600 Biological Research Design and Analysis – 3 hours

PSY 611 Statistics in Psychology – 3 hours

Electives (18 – 36 hours) To be chosen in consultation with an advisor.

Total: 90 semester hours

In addition to coursework, the student must complete an oral examination over dissertation.

Neuroscience Program Course Descriptions:

NSC 600 Special Issues in Neuroscience 1–12 (Spec)

Subjects of contemporary neuroscience not covered by regular curriculum. May be repeated to a maximum of twelve hours. Prerequisites: Permission of instructor.

NSC 601 Principles of Neuroscience I 4 (4–0)

First of two core neuroscience graduate courses providing comprehensive coverage of neuroscience fundamentals. Prerequisites: none.

NSC 601 Principles of Neuroscience II 4 (4–0)

Second of two core neuroscience graduate courses providing comprehensive coverage of neuroscience fundamentals. Prerequisites: NSC 601.

NSC 690 Research Seminar in Neuroscience 1–4 (Spec)

Seminar emphasizing review of the primary literature in several areas of neuroscience. May be repeated for a maximum of four credits. Prerequisites: Graduate standing in the Neuroscience Program or permission of instructor.

NSC 696 Directed Research 1–12 (Spec)

For students who desire to investigate some research problem in neuroscience. Prerequisites: Graduate standing.

NSC 697 Independent Study 1–8 (Spec)

For students accept the responsibility of studying a specific area of neuroscience with minimal supervision. Prerequisites: Graduate standing.

NSC 789 Graduate Seminar in Neuroscience 1–12 (Spec)

In-depth exploration of a specific area in neuroscience through the review of the primary literature. May be repeated up to a maximum of 12 hours. Prerequisites: Permission of instructor.

NSC 798 Thesis: Design 1–3 (Spec)

Design of a Master's thesis. CR/NC only. Prerequisites: Graduate standing in Neuroscience Program.

NSC 799 Thesis: Implementation 1–3 (Spec)

Completion of a Master's thesis designed in NSC 798. CR/NC only. Prerequisites: NSC 798.

NSC 800 Neuroscience Research for Doctoral Candidacy 1–12 (Spec)

Major research course in which students work in close collaboration with instructor in preparing significant research project in a specific area of neuroscience. Prerequisites: NSC 799 and permission of instructor.

NSC 898 Doctoral Dissertation: Design 1–12 (Spec)

Design of a doctoral dissertation. CR/NC only. Prerequisites: NSC 800.

NSC 899 Doctoral Dissertation: Implementation 1–12 (Spec)

Completion of the doctoral dissertation designed in NSC 898: data collection, analysis, and write-up. CR/NC only. Prerequisites: Completion of NSC 898.

Sample of Potential Electives for Graduate Students in Neuroscience:

BIO 550 Transmission Electron Microscopy – 4 hours
BIO 552 Scanning Electron Microscopy – 4 hours
BIO 553 Confocal Microscopy – 4 hours
BIO 554 Advanced Electron Microscopy – 3 hours
BIO 556 Biological EDS Analysis – 3 hours
BIO 536 Histology – 3 hours
BIO 537 Immunology – 4 hours
BIO 576 Animal Cell Culture – 4 hours
BIO 591 Neurophysiology – 3 hours
BIO 629 Topics in Eukaryotic Molecular Genetics – 1 to 3 hours
BIO 635 Toxicology – 3 hours
BIO 637 Topics in Immunology – 1 to 3 hours
BIO 692 Topics in Physiology – 1 to 4 hours
BIO 695 Graduate Internship in Biology – 1 to 6 hours
CHM 511 Advanced Analytical Chemistry – 4 hours
CHM 521 Biochemistry I – 3 hours
CHM 522 Biochemistry II – 3 hours
CHM 523 Clinical Chemistry – 4 hours
CHM 527 Biochemistry Laboratory – 1 hour
CHM 528 Bioanalytical Techniques Laboratory – 2 hours
CHM 571 Topics in Chemistry – 1 to 9 hours
CHM 572 Selected Topics in Chemistry – 1 to 9 hours
CHM 624 Advanced Topics in Biochemistry – 1 to 9 hours
CHM 791 Directed Research – 1 to 6 hours
CDO 640 Cadaveric Anatomy for Communication – 3 hours
CDO 701 Psycholinguistic and Neurolinguistic Bases of Language – 3 hours
CDO 705 Traumatic Brain Injury – 2 hours
CDO 717 Aphasia and Related Neurogenic Disorder – 4 hours
CDO 720 Anatomy and Physiology Underlying Neuro-otology
CDO 740 Neuroanatomy
CDO 781 Electrophysiological Techniques in Audiology – 3 hours
CDO 785 Auditory Processing Disorders – 3 hours
HSC 560 Clinical Pharmacology I – 3 hours
HSC 561 Clinical Pharmacology II – 3 hours
HSC 582 Regional Human Anatomy – 5 hours
HSC 597 Physiological Response to Abused Substances – 3 hours
PSY 584 Cognitive Neuroscience – 3 hours
PSY 585 Psychophysiology – 3 hours
PSY 587 Physiological Psychology – 3 hours
PSY 588 Functional Neuroanatomy – 3 hours
PSY 661 Neuropsychological Assessment – 3 hours
PSY 687 Physiological Foundations – 3 hours
PSY 727 Developmental Neuropsychology – 3 hours
PHA 625 Clinical Pharmacology I – 3 hours
PHA 626 Clinical Pharmacology II – 3 hours
PTH 626 Neuroanatomy in Physical Therapy – 3 hours

Neuroscience Program Graduate Faculty

Gary Dunbar, Ph.D.

Dr. Dunbar's recent research is focused on testing the efficacy of stem cell transplants and pharmacological treatments for neuropathological and behavioral deficits in animal models of neurodegenerative diseases, particularly Huntington's and Alzheimer's diseases. Dr. Dunbar's research has been supported by awards from both private and public agencies, including the National Institutes of Health and the National Science Foundation.

Dr. Dunbar received his Ph.D. in Psychobiology (Behavioral Neuroscience) from Clark University in 1988. He is a former President of the Michigan Chapter of the Society for Neuroscience and former President of the Faculty for Undergraduate Neuroscience (receiving their Lifetime Achievement Award in 2003). Presently, he is the John G. Kulhavi Professor of Neuroscience, Director of the CMU's Brain Research and Integrative Neuroscience (BRAIN) Center, Scientific Advisor for the Michigan Chapter of the Huntington's Disease Society of America, and Associate Editor of the Journal of Undergraduate Neuroscience Education. Dr. Dunbar has received several teaching awards, including Michigan Professor of the Year from the Carnegie Foundation for the Advancement of Teaching and the Council for the Advancement and Support for Education in 1997, and a Distinguished Faculty Member award from the Michigan Association of Governing Boards of State Universities in 1998. He has published several book chapters and articles on recovery of function after brain injury or disease.

Richard Backs, Ph.D.

Dr. Backs defines his research focus as the psychophysiology of attention in human performance. It emphasizes the applied aspects of attention theory, and his recent studies have examined autonomic (electrocardiographic, impedance cardiographic, and pulmonary) and central (EEG and event-related potential) measures concurrently during focused and divided attention tasks in the laboratory and in the driving simulator. Dr. Backs has adopted a cognitive/energetic perspective to account for how cognition is affected by emotion and environmental and task stressors. He also investigates aging affects on the psychophysiology of attention, especially during driving.

Richard W. Backs received his Ph.D. in Experimental Psychology from the University of Southern California in 1984. He has previously held appointments at Occidental College, Washington University, the McDonnell Douglas Corporation, and Wright State University, conducting research in Human Factors Engineering. He has been at Central Michigan University since 1995.

Jonathan Kelty, Ph.D.

Dr. Kelty began his career investigating temperature control mechanisms and low-temperature responses of *Drosophila melanogaster*. During a postdoctoral fellowship at the University of Chicago he mastered in-vitro and ex-vivo electrophysiological recording techniques that he has applied primarily to brainstem mechanisms associated with pattern generation. He has explored pattern generation associated with respiration, and has developed extensive expertise regarding the role of the pre-Botzinger complex in this function. His work has extended into pharmacological explorations of respiratory control involving the pre-Botzinger complex and surrounding structures. He also continues to explore temperature response mechanisms of *Drosophila melanogaster*.

Justin Oh–Lee, Ph.D.

Dr. Justin D. Oh–Lee has over 10 years experience as a preclinical neuropharmacological research in Parkinson’s disease. His recent focus has been testing potential pharmacological treatments for motor dysfunction and response complications in animal models of Parkinson’s disease. He has published more than 30 original research articles and review articles in the areas of Parkinson’s and Alzheimer’s diseases. His NIH–supported L–Dopa research is currently funded by the NINDS.

Dr. Justin Oh–Lee received his Ph.D. in 1995 from the University of California, Los Angeles (UCLA), in Psychology. He received a postdoctoral National Institutes of Health Intramural Research Training Award from 1995 to 1999 and served as a research fellow from 1999 to 2001 at the Clinical Pharmacology Section, Experimental Therapeutics Branch, National Institute of Neurological Disorders and Stroke (NINDS), NIH, Bethesda, MD, before coming to CMU.

Mark Reilly, Ph.D.

Dr. Reilly’s research interests involve the experimental analysis of human and nonhuman behavior, operant/respondent conditioning, behavioral pharmacology and substance abuse. His research interests are eclectic but strive to elucidate basic principles of behavior. He has conducted research on schedules of reinforcement, behavioral variability, drug discrimination, drug tolerance and conditioned reinforcement. His current research focuses on three areas; the motivational properties of response effort or work, the contributions of classical and operant conditioning to impulsivity, and the environmental factors that establish alcohol as a reinforcer. Mathematical modeling of the behavior and its controlling variables is inherent to his research program.

Mark Reilly received his B.S. from the University of Florida in 1989, his M.S. from the University of North Texas in 1993 and his Ph.D. from West Virginia University in 1996. He held a Postdoctoral Fellowship at the University of Michigan and at Wayne State University from 1996 to 1999. He was an Assistant Professor of Research at Arizona State University from 1999 to 2003. He has been at Central Michigan University since 2003.

Michael Sandstrom, Ph.D.

Dr. Sandstrom uses techniques of single–unit neurophysiological recording and microdialysis to explore contributions of neurotransmitters to central nervous system function. He currently explores neurophysiological mechanisms underlying behavioral disruptions in a transgenic mouse model of Huntington’s disease. Dr. Sandstrom focuses research primarily on awake and freely moving animal models.

Dr. Sandstrom earned his doctorate in Neuroscience from Ohio State University in 1998 where he worked with a Parkinson’s disease animal model to explore age–dependent brain plasticity associated with the nigrostriatal dopamine system. During a subsequent postdoctoral fellowship with Dr. George Rebec at Indiana University in Bloomington he mastered techniques of single–unit neurophysiological

recording and explored contributions of ascorbate to basal ganglia function. In his current position as an assistant professor of psychology and neuroscience at Central Michigan University he has resumed research in deteriorative diseases of the brain, exploring neurophysiological mechanisms underlying behavioral disruptions in a transgenic mouse model of Huntington's disease. Dr. Sandstrom focuses research primarily on awake and freely moving animal models.

Reid Skeel, Ph.D.

Dr. Skeel's clinical and research interests focus on neurophysiological assessment. His clinical efforts center on providing functional application of neuropsychological assessment. His research interests are focused on examining variables that affect the ecological validity of neuropsychological tests. Examples of specific projects being conducted in his lab include examining the relationship between cognitive functioning and medication adherence, the impact of anxiety on neuropsychological performance, exploring how newer measures of executive functioning and decision making are related to behavior, cognitive effects of CABG surgery, and detection of sub-optimal effort during testing.

Dr. Skeel received his Ph.D. degree from the University of Florida in 1998. He joined the CMU faculty in 2000. Dr. Skeel coordinates the Neuropsychology Specialty Clinic at Central Michigan University. Dr. Skeel's research interests include: ecological validity of neuropsychological assessment; cognition and medication adherence; influence of affective variables on cognitive performance; decision-making, risk-taking and malingering.

Michelle Steinhilb, Ph.D.

Dr. Steinhilb's graduate studies focused on the cellular trafficking and metabolism of the Alzheimer's disease Amyloid Precursor Protein (APP) using cell culture models. She continued to study neurodegenerative disease during her postdoctoral studies at Harvard Medical School and Brigham and Women's Hospital, where she used the fruit fly *Drosophila melanogaster* as a genetic model system. Her research interests include molecular genetics, cellular and molecular biology, and neurodegeneration. Michelle Steinhilb received her B.S. from Wayne State University in 1996 and received her Ph.D. in biochemistry from the University of Michigan in 2002. Michelle's graduate studies focused on the cellular trafficking and metabolism of the Alzheimer's disease Amyloid Precursor Protein (APP) using cell culture models.

Ksenia Ustinova, Ph.D

Dr. Ustinova's lab covers motor control and learning, rehabilitation of patients with neurological diseases including stroke, spinocerebellar ataxia, and Parkinson's disease. The mechanisms of motor control and learning and their disruption in patients with different neurological diseases; the recovery and compensation of sensorimotor functions after neurological injury with the use of new rehabilitation techniques including virtual reality and biofeedback. Ksenia Ustinova received both her B.S. in Physical Education/Physical Therapy and her Pedagogy Ph.D. from the Russian State University of Sport, Moscow Russia.

Admission Policies

The following University and Program requirements are necessary for Regular Admission to the graduate program in Neuroscience:

- Completion of a Bachelor of Science degree
- Have at least 15 hours of courses in neuroscience, chemistry, and/or biology (including biologically-based psychology courses)
- Have at least 3 hours of statistics
- Have a 3.0 grade point average (on a 4.0 scale)

(Preference will be given to students with prior research experience, especially in the area of Neuroscience.)

Additional information can be found in the *Graduate Bulletin* at <https://bulletins.cmich.edu/>.

Application forms for regular admission are available at <http://www.chsbs.cmich.edu/Neuroscience/forms.asp>.

English Language Proficiency Requirements

CMU welcomes students from a wide variety of backgrounds. All international students must demonstrate English language competency in one of the following ways:

- Satisfactory score on the Test of English as a Foreign Language (TOEFL)
- Satisfactory completion of a course of study in which the language of instruction was English
- Successful completion (minimum grade point average of 3.0 on 4.0 scale or equivalent) of at least twelve credit hours of work in a recognized graduate program instructed in English
- Employment at a professional level for at least four years, with written verification of the student's competency in English provided by the student's current or former employer
- Employment in the United States at a professional level for at least two years in a position that relies on the use of English, with written verification of the student's competency in English provided by the student's current or former employer

Further information can be found in the *Graduate Bulletin* at <https://bulletins.cmich.edu/>.

Time Limit for Admission

Admission is valid for one year (four semesters: fall, spring, summer I, and summer II). If a student does not register for classes within one year after being admitted to the graduate college, the student will be required to reapply before taking classes. The student's credentials are again reviewed by the department and the student may or may not be readmitted.

Deferred Admission

Newly admitted students may petition the Admissions Committee for deferred admission. Granting deferred admission is at the discretion of the Admission Committee. Deferred admission is typically granted for no more than 12 months from the original matriculation date.

Conditional Admission

Students may be granted a conditional admission into the Neuroscience program in spite of deficiencies in certain subject areas (ex. statistics or chemistry). These students are expected to make up the identified deficiencies in addition to completing the normal prescribed graduate coursework for their degree. Once these standards have been met, students may apply for regular admission.

Academic Advisors

Upon admission, each student is assigned a faculty advisor (mentor) who will serve as the student's academic advisor for the rest of the student's enrollment in the program. The advisor will also serve as a mentor for the student's research. At the end of each school year the advisor will report to the Neuroscience Program Director regarding the student's progress on coursework and research involvement. This assignment need not be permanent; if the student's emphasis changes, a student may request a different advisor by submitting a request to the Neuroscience Program Director.

Both the student and the advisor are responsible for maintaining a successful mentoring relationship. It is very important that a good channel of communication be open between the advisor and student. All problems and questions should be brought to the attention of the advisor before seeking assistance elsewhere.

Responsibilities of the Graduate Student:

- Meet regularly with your major advisor and thesis committee
- Read the literature in your field of research
- Complete required courses maintaining a GPA > 3.0

- Complete your thesis (or Plan B paper) and submit manuscripts for publication
- Present your results at local, state and/or national meetings
- Become an independent, critical thinker—use library resources, experimental results, and advice from fellow graduate students
- Work Expectations:
 - GA's require 20 hours per week
 - Course work = 3 hours for every credit hour (ex: 3 x 9 =27)
 - Thesis work
- Maintain a clean, safe laboratory and work environment
- Be responsible for appropriate training (chemical safety, CPR, etc.)
- Assist others in the laboratory, especially new graduate and undergraduate students
- Apply for funding from different sources to support your research and travel
- Attend departmental seminars and other relevant presentations and functions

Responsibilities of the Faculty Advisor:

- Meet regularly with graduate students to assess progress
- Discuss overall program of study and course requirements with graduate students
- Discuss expectations regarding thesis research projects, time table, publication, etc.
- Help graduate students choose a thesis committee
- Acquaint students with the laboratory and its policies
- Assist with experimental protocol, data analysis, scientific writing, and seminar preparation
- Assist in obtaining funding for graduate student research
- Provide feedback on proposals, manuscripts, posters, etc. in a timely manner
- Encourage students to attend professional meetings
- Ensure that necessary research equipment is available and in working order

Academic Standards

<u>Letter Grades</u>	<u>Points Per Semester Hour</u>	<u>Not included in GPA or graduation credit</u>
A	4.0	NC = No Credit
A-	3.7	I = Incomplete
B+	3.3	W = Withdrawal
B	3.0	X = Audit
B-	2.7	Z = Deferred
C+	2.3	
C	2.0	
C-	1.7	CR = Credit (counts toward graduation, but not on GPA)
E	0.0	

Grades below a C do not count toward meeting requirements for any graduate degree.

A 3.0 grade point average (GPA) is required for all graduate degrees.

Graduate students are expected to maintain a 3.0 or higher GPA in their graduate program. If a semester GPA falls below a 3.0, the College of Graduate Studies will place the student on academic probation. A GPA below 3.0 for two consecutive semesters is sufficient justification for removing a student from degree candidacy or for removing financial assistance.

Academic Probation

If a student's GPA drops below 3.0 in any session, the student is placed on probation. Once placed on probation, a student must show satisfactory progress toward regaining a 3.0 cumulative GPA by earning a GPA ABOVE a 3.0 during the next semester. When the GPA reaches 3.0, the student will be removed from probation. If a student fails to obtain a GPA higher than 3.0 in the first session following notification of probation status, the department may recommend to the Dean of the College of Graduate Studies that the student be removed from the degree program. A department may ask to extend the probation for an additional session if circumstances warrant. If a student does not regain a 3.0 GPA by the end of the second session, they may continue in the program only if the department makes a specific request and the Dean of the College of Graduate Studies concurs. (A non-degree student who fails to obtain a GPA higher than 3.0 the first session after being placed on probation may not continue taking classes.)

Academic Load

The following is a typical academic load for full time graduate students; however, there is no minimum load requirement for graduate studies. It is expected that students will assess need, ability, and other factors in order to register for a class load that permits them to maintain academic standards.

<u>Semester</u>	<u>Credit Hours</u>
Fall	9 – 12
Spring	9 – 12
Summer Session	4 – 6

Registration for Classes

Students are encouraged to register for classes during Phase I registration to ensure course requests can be honored. The Neuroscience Department has no obligation to honor course requests when students fail to pre-register and classes are full. In order to add a class after it has reached capacity enrollment, the department requires written permission from the instructor.

Continuous Registration

Any on-campus student who has completed all academic coursework except the final project (Plan B project, thesis, dissertation, doctoral project) must be enrolled in at least one CMU graduate credit hour each fall and spring semester until graduation (summer sessions as well if summer coursework is normally required in the program). The continuing registration for the final research project can fulfill this one credit hour requirement. If, after all academic coursework except the final project is completed, a student does not enroll each semester (and summer, where appropriate) until graduation, the student must enroll retroactively for each missed semester (including summer where appropriate) once they return to complete the project. A student can request a leave of absence by submitting a Leave of Absence Request form to the College of Graduate Studies; if approved, continuous registration will be waived during the approved leave period. Regardless of whether the student has a leave of absence, the student must still complete the degree within the degree time limitations set forth under the degree requirements presented under **Duration of Admission Status** in the *Bulletin*. See the *Graduate Bulletin* for details at <https://bulletins.cmich.edu/>.

Milestones in Completion of Degrees

To complete their degree in a timely fashion, students should adhere closely to the schedules below. Forms and instructions can be found at <http://www.grad.cmich.edu/forms.htm>. Students also need to check with the Graduate College for deadlines to submit their Graduation Application. The Graduate College has developed a checklist for *Self Audit for Graduation* (<http://www.grad.cmich.edu/forms.htm>) for students to use to make sure that they complete all degree requirements and can submit all forms on time.

Master's Degree

Year	Semester	Milestones
1	Fall	Begin coursework
1	Spring	Begin M.S. Thesis Proposal Submit M.S. Authorization of Graduate Degree Program form
1	Summer	Continue research
2	Fall	M.S. Thesis Proposal approved Submit Prospectus for Thesis and Dissertation form
2	Spring	Complete M.S. Thesis Submit Thesis Plan A & B Completion Sign-off form

Ph.D. Degree

Year	Semester	Milestones
3	Fall	Begin Comprehensive Project Submit NSC 800 registration form Submit Authorization of Doctor of Philosophy in Neuroscience form
3	Spring	Finish Comprehensive Project Submit NSC 800 Completion form and copy of the approved project to Neuroscience Program secretary
3	Summer	Continue research
4	Fall	Complete Dissertation Proposal Submit Prospectus for Thesis and Dissertation form
4	Spring	Complete Doctoral Dissertation Submit Dissertation Project Sign-off form

Policy on Degree Time Limits

It is the program's policy that all course requirements for the M.S. degree be completed within seven years after matriculation and within eight years after matriculation for the Ph.D. degree. Both programs are full-time, on-campus degree programs. See the *Graduate Bulletin* (<https://www.bulletins.cmich.edu>) for details.

Comprehensive Examination

The paper and oral examination from the NSC 800 project serves as the comprehensive examination. Papers are expected to be publication quality and typically consist of a literature review, method, result, and discussion section reporting the outcome of a year-long empirical research project conducted in collaboration with the student's advisor. The examination generally includes the student's defense of thesis work, but any aspect of the student's graduate program is open for discussion.

A Comprehensive Examination Committee must be created to evaluate the oral portion of the examination. The committee must consist of at least two Neuroscience faculty members with graduate faculty status. This exam should generally be scheduled during fall or spring semester, when faculty are available.

A copy of the approved paper must be given to the Neuroscience Program secretary for the student's file.

Students who are unable to pass the comprehensive examination after three attempts will be dismissed from the program.

The student must register for all 12 credit hours and pass the oral examination prior to admission to doctoral candidacy. Students cannot take more than 6 hours of NSC 800 until finished with the thesis.

Thesis and Dissertation Committee

Thesis committees must consist of three members with graduate faculty status. Two members must be faculty advisors in the Neuroscience Program.

Dissertation committees must consist of at least three Neuroscience Program faculty advisors with graduate faculty status.

Thesis and Dissertation Proposal

A Prospectus for Theses and Dissertations must be completed to begin research on a thesis or dissertation. Students must complete the following steps for the prospectus forms:

1. Email thesis/dissertation committee members to schedule prospectus meeting
2. Email Neuroscience Program secretary to schedule a room with date and time of prospectus
3. Pick up Prospectus and required forms from the Neuroscience Program secretary
 - A. All graduate students using animals in their research must have IACUC approval for the use and care of animals before any work can begin.
 - B. All graduate students using humans in their research must have IRB approval of their research before any work can begin.
4. Complete Prospectus form prior to proposal meeting and get committee members signature at proposal meeting. A copy of the abstract must be turned in with the form.
5. Bring completed Prospectus form and IRB or IACUC application to the Neuroscience Program secretary, who will hold the forms until you receive IRB or IACUC approval email
6. Forward IRB approval email to Neuroscience Program secretary. Once IRB approval is received the Neuroscience Program secretary will get the required signatures and forward to the Graduate Office.

Students may not enroll for more than three thesis or dissertation credits until the project prospectus has been approved by both the department and the College of Graduate Studies and the College of Graduate Studies has verified the composition of the student's committee. The Graduate Bulletin (<https://bulletins.cmich.edu/>) outlines all University policies relating to theses/dissertations.

Thesis and Dissertation Requirements

The same principles generally hold for the master's thesis and doctoral dissertation. As a general concept, the doctoral dissertation (required of all doctoral students) will be related to the student's interests and to some aspect of professional practice. The goal of the doctoral dissertation is further integration of the student's graduate education in developing the ability to investigate a professional problem in a scholarly manner. Students must have been admitted to doctoral candidacy by the College of Graduate Studies prior to defending their dissertation proposal.

Information regarding University procedures for thesis or doctoral dissertation preparation is available from the College of Graduate Studies (<http://www.grad.cmich.edu/forms.htm>). The steps usually followed are:

1. Student discusses their idea with a faculty member
2. Student obtains a chair and committee members
3. Student writes a prospectus for committee approval. The prospectus includes the following topics:
 - A. Introduction to the problem (a case is made for the importance of the area of study)
 - B. Review of the literature
 - C. Statement of the problem
 - D. Method (as appropriate)
 - a. Participants or Sample
 - b. Instrumentation/Materials
 - c. Procedures
 - d. Statistical Analysis
4. Student convenes the committee to discuss, fine tune, and approve/disapprove the idea
5. Thesis and Doctoral Dissertation Prospectus form is filed with the graduate office and department. Also, approval from CMU's Institutional Review Board (IRB) or Institutional Animal Care and Use Committee (IACUC), must be obtained before research involving human or animal subjects is started.
6. Thesis/Dissertation is completed
7. Oral defense of project
8. Students are expected to provide the Library, department, and their committee chair person (unless they state otherwise) with a bound copy of the thesis or dissertation.

Graduation Procedures

To graduate, a Master's degree student must:

1. Have regular admission to the degree program
2. File an Authorization of Graduate Degree Program form
3. Complete a minimum of 30 semester hours of graduate work with a GPA of 3.0 or higher. Of these 30 credits, no more than 15 can be transfer credits, no more than 1/3 can be unspecified content or variable credit courses, and no more than 10 can be independent study or thesis credits.
4. Earn at least a "B" grade in each course
5. Earn 15 or more hours for the degree in courses at or above the 600 level
6. Fulfill all requirements of the chosen curriculum and all other university regulations pertaining to the program
7. Complete all requirements pertinent to either Plan A or Plan B or any alternative requirements of the department
8. Send a completed Graduation Application form along with a check or money order for the \$50.00 fee to the College of Graduate Studies approximately eight weeks before the end of the semester. Deadlines are listed on the College of Graduate Studies website at <http://www.grad.cmich.edu/dates.htm>.

To graduate, a doctoral degree student must:

1. Have a master's degree, if required
2. Have regular admission in the program
3. Be admitted to candidacy
4. Satisfy any research or professional requirements of the department
5. Complete a minimum of 90 semester hours of graduate work beyond the bachelor's degree with a GPA of 3.0 or higher
(individual programs may require additional credits)
6. Earn at least a "B" grade in each course. A student will not be awarded a doctoral degree with more than two grades below "B-" (coursework not part of a student's doctoral program is excluded from this policy)
(individual programs may require additional credits)

7. Complete a doctoral dissertation
8. Earn at least 15 hours in 700 level courses or above (excluding dissertation and internship credits) and 50 of the total hours at the 600 level or above
9. Pass a final oral exam in defense of the dissertation
10. Send a completed Graduation Application form along with a check or money order for the \$50.00 fee to the College of Graduate Studies approximately eight weeks before the end of the semester. Deadlines are listed on the College of Graduate Studies website at <http://www.grad.cmich.edu/dates.htm>.

Graduation Commencement Ceremony

Students must finish all requirements for their degrees before they can participate in graduation ceremonies. Diplomas are mailed to students approximately six weeks after commencement. If evidence of degree completion is required in less than six weeks, written verification can be obtained through the College of Graduate Studies.

Financial Assistance

Graduate Assistantships

Graduate Assistantships (GA's) are available through the Neuroscience Program each academic year. GA's are generally assigned to individual faculty to assist with research. Graduate assistant benefits include a stipend, tuition scholarship, classification as a Michigan resident, travel accident insurance, and special library privileges. Full-time graduate assistants will receive a stipend and tuition will be waived for up to 30 credits per academic year.

The tuition remission schedule for a full-time 12 month appointment is:

<u>Semester</u>	<u>Credit Hours Waived</u>
Summer II	5
Fall	10
Spring	10
Summer I	5

A student may register for more credits than the tuition remission schedule allows; however, the student will be responsible for the additional tuition.

Graduate Assistant appointments require that students maintain a 3.0 GPA in graduate work. GA's with fall/spring appointments must register and maintain a minimum of six semester hours of graduate credit at CMU during each semester. GA's with summer appointments must register for and maintain a minimum of one hour of graduate credit during the summer session at CMU. Requests for

exceptions will be evaluated on a case by case basis by the Dean of the College of Graduate Studies. Full-time GA's typically work approximately 20 hours per week during fall/spring semesters and approximately 320 hours throughout the summer. An Assistantship is like any other job; the GA must perform satisfactorily, that is, in line with his or her supervisor's expectations.

Graduate Fellowships

The College of Graduate Studies award Graduate Fellowships on a competitive basis to students with outstanding academic records who are interested in completing theses or other major works of scholarship. This fellowship is intended for graduate students who support the advancement of diversity in higher education. Only students enrolled in a full-time master's or specialist's degree program only at CMU's Mt. Pleasant campus are eligible. Doctoral students should apply for Doctoral Research Fellowships. Additional information can be found in the Financial Aid section of the *Graduate Bulletin* (<https://bulletins.cmich.edu/>).

Dissertation Research Support

The College of Graduate Studies provides small grants, up to a maximum of \$2,000, for dissertation-related costs such as photocopying, travel, supplies, etc. (wages cannot be covered). Students who have had their dissertation prospectus approved by their dissertation committee are eligible to apply for this support. Recipients will be selected on the basis of proposals reviewed by the Dissertation Support Selection Committee. Additional information is available at www.grad.cmich.edu under the Applications and Forms tab.

Publication and Presentation Grants

Graduate Student Publication and Presentation Grants are awarded to assist graduate students whose research or creative endeavors are accepted for publication or presentation at the state, national, or international level. The grant consists of reimbursement for up to \$350 of expenses associated with publication or presentation. Applications are available from the College of Graduate Studies and are reviewed as they are received.

The College of Humanities and Social and Behavioral Sciences offers a grant to undergraduate and graduate students whose research or creative endeavors are accepted for presentation at the state, national, or international level are eligible for an Undergraduate/Graduate Student Presentation Grant. The award consists of reimbursement for up to \$250 of expenses associated with presentation. Additional information is available at www.chsbs.cmich.edu/CurrentStudents/Scholarships.asp.

Outside Grants and Student Loans

Foundations and government agencies often have grant programs for which students may compete. Some of these can be quite generous. You can contact the College of Graduate Studies, Office of Research and Sponsored Programs, Office of Veterans' Benefits, or Student Personnel Services for further assistance.

Students may also get loans at favorable terms. You can find additional information on student loans at your local bank or the Office of Scholarships and Financial Aid. Tuition and living expenses at CMU are low compared to many universities; a modest loan may get you through graduate school at CMU.

Research and Training Facilities

The Neuroscience Program has a variety of facilities used for the education of students. Below is a partial list of the available campus and department facilities.

Graduate Student Offices: Graduate Assistants and Fellowship recipients have space available to them in faculty laboratories.

Computer Laboratories: The Department of Psychology maintains a computer laboratory with 6 workstations and a printer exclusively for graduate student use in Sloan Hall.

The Biology Department has a Resource Room available to Biology students in Brooks 171. The computer lab supports a variety of programs necessary for Biology coursework. There is also a computer lab located in Brooks 101 with 23 workstations including 4 Macintosh computer systems.

The Department of Psychology maintains computer laboratories for research and teaching purposes in Sloan Hall. The labs include a total of 12 workstations. These machines are networked to a printer and various experiment generation and SPSS software applications are installed. The lab serves students and faculty interested in research in cognitive processes, sensation and perception, learning, and social psychology.

Park Library: The Park Library provides a book collection of 1,000,000 volumes and an online catalogue which allows students to quickly peruse the holdings in a specific area. A wide variety of research databases are available. Desk and study carrels are also available for students.

BRAIN Center Labs

BRAIN Center Core Facilities: These facilities are shared among Brain Center faculty. We share two freezing microtome/cryostat units both of which cut frozen sections at -20°C (Vibratome Ultra-Pro 5000 and Microm HM505E). Our cell-molecular room contains two Coulochem III High Performance Liquid Chromatography units with electrochemical detectors and connected refrigerated autosamplers (ESA Corporation, Chelmsford MA). Within the Brain Research and Integrative Neuroscience (BRAIN) Center, our core facilities room has a spectrophotometer for tissue/protein analysis and two PCR units. We have two large upright -80°C ultrafreezers (Thermo Forma & Revco). There are also two Level 2 biosafety cabinets and two incubation chambers. There are two large refrigerated centrifuges. Our Microscope Lab has three powerful microscopes, two with fluorescent lamps for fluorescence viewing and one connected to Neura-Lucida. Our computer lab contains 10 PC desktop computers running Windows XP with full network service. We also have a walk-in cold room, a radio-isotope room, and a film-developing dark room. Our animal colony wing has five state of the art active animal housing rooms as well as two behavioral testing rooms where mouse and rat behavior tests are performed, and two surgery rooms equipped with precision stereotaxic equipment and stainless steel surfaces for rodent survival surgery.

Our behavior testing rooms include eight separate rooms for a wide variety of behavioral testing, including: operant testing (with several Skinner boxes for both rats and mice), elevated-plus mazes, Morris water mazes and T-mazes, freely moving animal microdialysis, freely moving animal

electrophysiology with iontophoresis capacity, and other specialized testing. All testing and procedure rooms are equipped with dim red lights and white light cycling for work performed in reverse day–night so behavior can be tested during animals' nocturnal phase. In addition, each of the testing and procedure rooms are equipped with a digital camera that can be controlled remotely and fed into one of eight customized analysis stations which contain video tracking and computer equipment with a variety of computer programs for specified behavior collection and analyses.

Dunbar Lab: The Field Neurosciences Institute (FNI) Laboratory is part of the Brain Research and Integrative Neuroscience (BRAIN) Center, located on the second floor of the research wing in the Health Professions Building. The research mission of the FNI laboratory is to better understand the mechanisms involved in recovery of function following damage to the central nervous system and to devise strategies to promote these mechanisms in clinically relevant ways. Current research focuses on devising potential treatments for neurodegenerative diseases, particularly Huntington's disease (HD), Parkinson's disease (PD), and Alzheimer's disease (AD). The lab is fully equipped with a wide variety of specialized equipment for testing the efficacy of pharmacological treatments, stem cell therapies, and genetic manipulations to counteract neuropathological and behavioral deficits in rodent models of HD, PD, and/or AD.

Oh–Lee Lab: The lab is located in the Health Professions Building. Studies are conducted in behavioral and neuronal plasticity and programmed cell death, particularly those that are related to neurodegenerative disorders such as Parkinson's disease, Huntington's disease, Alzheimer's disease, and other related neurodegenerative disorders. The laboratory is equipped with two large chemical safety hoods, stirrer hot plates, a Cryostat brain sectioning station, and numerous other scientific and behavioral instruments. The laboratory is also well equipped to carry out a variety of biochemical, molecular and histological tissue analyses central to the research carried out in this laboratory.

Sandstrom Lab: The Sandstrom lab is focused primarily on freely–moving animal research of deteriorative diseases. It is fully equipped for microdialysis neurochemical investigations, and is in process of establishing the necessary systems to initiate electrophysiology investigations in freely–moving animals. Current experiments focus on the relationship between neurochemical malfunctions occurring during early stages of Huntington's disease and early–stage cognitive decline. To accomplish this, microdialysis measurements are taken during trained operant behavior to drive goal–directed neuronal activity. Early disruptions of neurotransmitter control may provide clues into the initial malfunctions taking place in neuronal function that therapeutic interventions may be better off supporting rather than focusing heavily on the final stage of neuron death. Future experiments hope to incorporate experiments with electrophysiology and various therapeutic interventions such as targeted drugs or stem cell therapies. Ideally, these experiments can be performed with improved insights into the goal neurotransmitter release rates or activity states that otherwise healthy animals exhibit so that therapeutic success can be assessed at the level of the brain rather than exclusively behaviorally.

Backs Lab: The Cognitive and Affective Neurosciences laboratory conducts research on the central and autonomic nervous system concomitants of normal and impaired psychological functioning in

young adults and the elderly. Research on the cognitive and affective processing capabilities of healthy young and older adults and of adults who have neurodegenerative diseases is conducted using a battery of computerized tasks. A variety of measures are used in this laboratory, including electroencephalography (dense-array EEG and event-related brain potentials), cardiovascular (electro- and impedance cardiography, blood pressure), pulmonary, and electrodermal responses. Previous research projects have been funded by the US Air Force and General Motors Corp. These projects have investigated the use of physiological responses to measure attention during performance of manual control task and in driving simulations. Potential applications of this research include the prediction of driver distraction and the use of psychophysiological measures of attentional underload and/or overload as a component of an augmented-cognition adaptive-interface to technological systems in aircraft and automobiles. Previous projects have also looked at developing a psychophysiological selection test for jobs such as air traffic control specialist that have very high demands upon an operator's ability to divide attention.

Engineering Psychophysiology Lab: The Engineering Psychophysiology laboratory conducts research on the psychophysiology of attention in human performance. The current focus of the laboratory is on attention, distraction, and the use of advanced telematic devices during driving. A variety of central and autonomic nervous system measures are used in this laboratory, including electroencephalography (dense-array EEG and event-related brain potentials), cardiovascular (electro- and impedance cardiography, blood pressure), pulmonary, and electrodermal responses. Previous research projects have been funded by the US Air Force and General Motors Corp. These projects have investigated the use of physiological responses to measure attention during performance of manual control task and in driving simulations. Potential applications of this research include the prediction of driver distraction and the use of psychophysiological measures of attentional underload and/or overload as a component of an augmented-cognition adaptive-interface to technological systems in aircraft and automobiles. Previous projects have also looked at developing a psychophysiological selection test for jobs such as air traffic control specialist that have very high demands upon an operator's ability to divide attention.

Reilly Lab: The Behavior Analysis Behavioral Pharmacology Laboratory is located in rooms 201-204 of Rowe Hall. The facilities include both rodent and aviary colonies and state-of-the-art environmental control equipment and behavioral testing apparatuses. Experimental chambers are fully equipped with multiple response manipulanda and reinforcer delivery systems, including syringe pumps for drug delivery. There is a surgery room and a conference area with computer workstations for data analysis. There is also a student laboratory equipped with 10 operant conditioning stations.

Neurobiology Labs:

Microscopy Core Facilities: The Scanning Electron Microscope at CMU is a JEOL JSM-840A with a WinDISS add-on active scan digital image collection package. The system is fully networked and integrated with WinDISS EDS software and hardware. Image acquisition is under full user control with a

maximum pixel dimension of 4000x3200. Our TEM is a Philips CM10, a user-friendly instrument that still requires understanding of how to operate a TEM. It is remarkably stable and immune to undergraduate student use, making it an excellent teaching instrument. Film is used for recording images, and an Epson 4990 flat-bed scanner is used to digitize the micrographs. A lab that is used to generate high quality digital images from the negatives.

The Olympus Fluoview 300 is the newest addition to the facility. Our Confocal Laser Scanning Microscope (CLSM) is based on an Olympus BX50 upright microscope, and has Differential Interference Contrast (DIC) optics and two extra-long working distance water immersion objectives on a special two position turret. A microinjection system for electrophysiological studies is also available. This microscope uses three PMT detectors, two for epi-confocal imaging, and one for transmitted-light imaging. Imaging capabilities include reflected-light confocal and transmitted-laser DIC imaging. Argon 488 nm and He/Ne lasers are installed on the microscope.

DNA Sequencing and Analysis Core Facility: The DNA Sequencing and Analysis Core facility has an ABIPrism 310 Genetic Analyzer, a fully automated instrument used for DNA sequencing. Our data collection software manages the instrument set-up and controls instrument operations which minimizes human induced error. The facility also has a Molecular Devices GenePix 4000B microarray scanner, which is a highly sensitive laser-based system designed for rapid imaging of microarrays. This instrument is useful in determining differences in gene expression or gene copy number and can be used for single organism studies, including yeast, Drosophila, C. elegans, E. coli, and mixed environmental samples. A Kodak Gel Logic 2200 Molecular Imaging System is also available. This system has the flexibility to detect chemiluminescent, fluorescent, and colorimetric samples and is widely used to image and quantify both nucleic acids and proteins. This instrument also can act as a plate reader for ELISA reactions, automate bacterial colony counting, and eliminate the need for film development of Western blots. An ABI 7500 Real-time PCR instrument is also housed in our facility and enables high speed thermal cycling in a 96-well format that reduces run times to less than 40 minutes. This instrument utilizes variable excitation and five-color detection systems and enables you to use a broad range of fluorophores for greater assay versatility.

Kelty Lab: The laboratory contains all of the equipment needed to support electrophysiological recording including a Sutter P97 pipette puller, a Vibratome vibrating tissue slicer and a Nikon dissection microscope to guide slicing, a pH meter, magnetic stir plates, 2 refrigerators/freezers, analytical balance, and fume hood. **Recording Setups:** The Principle Investigator's laboratory houses three setups for electrophysiology experiments. One of these setups is for visually guided patch clamp & extracellular recording from brainstem slices. This setup comprises an Olympus BX51WI infrared normarski/DIC compound microscope with translation stage, camera (Dage) and monitor (Sony), TMC anti-vibration table, faraday cage, 4-axis motorized manipulator (Siskiyou Design), 3-axis manual manipulator (Narishige), thermostated superfusion chamber (Warner), peristaltic pump (Rainin), computer, AC amplifier (Grass), integrator, oscilloscope, computer, data acquisition system and Heka EPC8 voltage clamp amplifier. Another setup is used for blind patch clamp recording and extracellular recording. This setup is similar to the above, but with a Nikon binocular microscope instead of an Olympus compound scope. A third setup is used exclusively for extracellular recording. This setup is similar to the blind setup, but without the Heka amplifier and only using one (Narishige 3-axis) manipulator. **Refrigerated Baths and digital chart recorder (temperature):** Dr. Kelty's laboratory contains 3 refrigerated recirculation baths (Neslab RTE740) for examination of cold stress. Up to 8 channels of temperature data may be monitored concurrently during such studies. The laboratory also contains 2 incubators that may be programmed for diurnal light and temperature cycling.

Steinhilb Lab: Dr. Steinhilb's research lab is equipped with resources to conduct neuroscience research including several stereo microscopes, environmental chambers designed for insect growth, molecular biology tools (PCR thermocycler, agarose/acrylamide gel electrophoresis) and tissue culture equipment. In addition, there is immediate access to the DNA Sequencing and Analysis Facility and the Microscopy Facility, both in Brooks Hall. Undergraduate and graduate research projects in neuroscience utilize several scientific approaches including molecular genetics as well as cellular and molecular biology. The Steinhilb lab has equipment and resources to perform and analyze experiments utilizing *Drosophila* modifier analysis, genetic screens, biochemical pathways, tissue culture, and cell biology.

Student Grade Grievance Policy

Responsibility for resolving grading disputes is shared among the instructor, the student, the department, and the college. A student who desires discussion of a complaint about a grade must follow these steps:

1. Contact the instructor (if the instructor is unavailable, contact the department chairperson). This may be done in person or in writing as soon as possible, but no later than 60 days after the next semester begins. Exceptions will only be made in the most compelling situations.
2. If still dissatisfied, the student should request, in writing, a joint consultation with the instructor and department chairperson. If the instructor is also the department chair person, the request should be addressed to the dean of the college.
3. If the student still feels the grade is the result of capricious grading, they may file an appeal within 90 days of the start of the next regular semester. This appeal is made to the dean of the college and will be forwarded to the School Committee on Review of Change of Grade.

The Grade Grievance Policy can be found in the *Graduate Bulletin* (<https://bulletins.cmich.edu/>).

Academic Integrity Policy

Because academic integrity and ethical behavior are vital to an academic environment and to the development of qualified neurologists, graduate students are responsible for learning and upholding professional standards of research, writing, assessment and ethics. In the academic community the high value placed on truth implies a corresponding intolerance of scholastic dishonesty. Written or other work which a student submits must be the product of his/her own efforts and must be consistent with appropriate standards of professional ethics. Academic dishonesty, which includes plagiarism, cheating and other forms of dishonest behavior is prohibited. Allegations of academic dishonesty or unethical behavior will be handled according to the policies given here. Appeals of decisions are processed according to the policies set forth in the "Academic Integrity Policy for

Graduate Students” published in the *Graduate Bulletin* (<https://bulletins.cmich.edu/>). Any appeal decision reached pursuant to this section shall be final and not subject to further review.

Although no specific time line is included in this policy, it is understood that matters should be handled expeditiously.

1. In cases where an instructor, supervisor, or fellow student believes a student has demonstrated academic dishonesty or professionally unethical behavior, the instructor, supervisor, or fellow student should report the incident to the Program Director.
2. The Program Director will discuss the allegation with the person(s) making them. If the Program Director believes that there is evidence to support the allegations the Director will notify the student of the charges in writing. This letter will inform the student of the allegation and that program faculty will be asked to review the allegation, look at evidence and determine what, if any, sanctions should be issued. The student will be offered the opportunity to admit to the violation, remain silent, meet with the committee to share their perceptions of the incident or submit a written rebuttal to the charges. The student will be given a response deadline, at least two weeks in the future.
3. The program faculty will review allegations of academic dishonesty or unethical behavior. In any case where a member of the program faculty made the original allegation, the faculty member will be excluded from judging the particular case.
4. If the student elects to meet with the committee to present his/her version of the events under investigation, the student may bring another person (i.e. an advocate) to the meeting to provide support and advice.
5. The faculty’s decision on culpability and appropriate sanctions will be communicated in writing to the student. If the student is found not culpable or if sanctions other than dismissal or suspension from the program are issued, the department chairperson will be notified in writing.
6. If the sanction is dismissal or suspension from the program, the sanction will be communicated through the department chairperson to the Dean of the College of Graduate Studies. The Dean of the College of Graduate Studies will inform the student of the decision. This decision is final and is not subject to further review.
7. If sanctions are issued, committee records will be retained for a least one year.

Policy on Research Integrity

Integrity in research and creative endeavors is at the heart of many academic endeavors and a fundamental principle in the university community. Faculty, staff, students and independent contractors all have a responsibility to assure that research and creative endeavors meet accepted standards of scholarly performance. The increasing complexity of the research and creative process, the requirements of federal and state agencies, and the accountability of university personnel to colleagues, students, the university, and the larger community necessitate that CMU specify an acceptable code of conduct, provide a mechanism for investigating alleged violations of accepted standards, delineate appropriate public record follow any discovery of misconduct.

The policy for dealing with allegations of research misconduct at Central Michigan University follows:

General Provisions

A. Applicability

1. This policy shall apply to all faculty, staff, students, and independent contractors involved in research or creative endeavors.
2. Nothing in this policy is intended to diminish or waive an individual's rights under any applicable collective bargaining agreement to which CMU is a party or other university policies and procedures.
3. This policy shall apply to students involved in the following research and creative endeavors:
 - a. Those conducted jointly with a CMU faculty or staff member or with any person from another university
 - b. Those externally funded under a grant or contract to CMU or one or more of its employees
 - c. Those expected to be published, presented, or shared with the broader academic community outside the student's classroom
 - d. Those done in conjunction with a thesis or dissertation
 - e. Those done in conjunction with a graduate Plan B paper, which also satisfy Paragraph 3.a, 3.b, or 3.c.

Except as noted above, this policy does not apply to a student's class assignments, independent study projects, Plan B papers, or directed research work which is not expected to be submitted for publication, presentation, or sharing with a community of scholars other than the members of the class.

B. Research Misconduct

“Research misconduct” shall mean, for the purposes of this policy, fabrication, falsification, plagiarism or other practices that seriously deviate from those that are commonly accepted within the scholarly community for proposing, conducting, or reporting research and creative endeavors. It does not include honest error or honest differences in interpretations or judgments of data.

1. Research misconduct consists of, but is not limited to, commission of one of the following:
 - a. Falsification of data, including fabrication of data, selective reporting of data, and manipulation of experiments, statistical procedures or analytical procedures with the intent to deceive
 - b. Improper assignment of authorship, such as excluding other contributors or claiming the work of another person as one’s own, presenting substantially the same material as an original article in more than one publication, including individuals as authors who have not made a definite contribution to the work published, and submitting multi-authored publications without the concurrence of all authors
 - c. Claiming another person’s research as one’s own, including plagiarism, appropriation of ideas as expressed in grant proposals or articles received for peer review, or in student papers, and violation of intellectual property laws
 - d. Misappropriation of research funds, including expenditure of funds for purposes not appropriately related to the research or in ways explicitly prohibited by the internal or external funding source

Except as noted above, this policy does not apply to a student’s class assignments, independent study projects, Plan B papers, or directed research work which is not expected to be submitted for publication, presentation, or sharing with a community of scholars other than the members of the class.

B. “CMU” shall mean, for purposes of this policy, the administration of Central Michigan University

C. “Day” shall mean, for purposes of this policy, a calendar day

E. Responsibilities

1. All members of the academic community are encouraged to report research misconduct if and when they believe substantive evidence exists. Persons who in good faith report alleged misconduct will be protected, to the maximum extent possible, against personal and institutional reprisals.
2. The mere suspicion or allegation of wrongdoing, even if totally unjustified, is potentially damaging to an individual's career. Consequently, no information about charges of alleged misconduct in research may be disclosed except to the appropriate CMU and federal or state authorities or as otherwise required by law.
3. When an allegation related to research misconduct has been directed at an individual, that individual must, in a timely fashion, be advised in writing of the nature of the allegation. The individual must be offered an opportunity to present information to CMU before a decision is made. The affected individual must be afforded confidential treatment to the extent possible and a prompt and thorough investigation consistent with any applicable collective bargaining agreement, or other university policies and procedures. An individual shall have the right to have a representative of the applicable collective bargaining unit, employee group or student group present when the individual meets with the representatives of CMU or any inquiry or investigative bodies in connection with the allegation made.
4. The Assistant Vice President for Research is responsible for coordinating and implementing this policy, disseminating this policy to all faculty and to others involved in research or creative endeavors, maintaining all documents and records relating to this policy, and obtaining and keeping current any and all assurances of compliance with federal and state regulations pertaining to misconduct.

Procedures for Handling Allegations of Misconduct

A. The Inquiry Stage

1. Inquiry is the stage of the review process where factual information is gathered and reviewed to determine if an investigation of the allegation is warranted. An inquiry is not a formal investigation; its purpose is to separate allegations deserving of further investigation from frivolous, unjustified or clearly mistaken allegations.
2. Before making a written allegation, a person is encouraged to discuss the matter with the Assistant Vice President for Research. The Assistant Vice President for Research will advise the person about responsibilities and rights under this policy and the procedure that shall be followed once an allegation is formally presented.

3. An allegation against any faculty, staff, student, or independent contractor for misconduct in research or creative endeavors shall be submitted in writing to the Assistant Vice President for Research. An allegation may be submitted by any person, including the Assistant Vice President for Research. The identity of a person making an allegation shall remain confidential so long as such confidentiality does not compromise the inquiry or due process or contractual rights of the individual against whom an allegation has been filed.
4. The Assistant Vice President for Research shall notify the individual against whom an allegation is made and the appropriate supervisor. In the Academic Affairs Division, the dean of the college should be notified concerning an inquiry, and the dean may inform the appropriate chairperson.
5. The Assistant Vice President for Research in consultation with the supervisor, or their designees, is responsible for conducting an inquiry regarding the allegation. The purpose of this inquiry is to determine whether an investigation is warranted. The Assistant Vice President for Research will be responsible for preparing a written report at the conclusion of the inquiry. The report must include a description of the evidence reviewed, a list and summary of interviews, and a recommendation as to whether an investigation is warranted. The individual against whom the allegation was made shall be given a copy of the report and he/she may respond in writing about any part of the inquiry. This response shall become part of the inquiry report.
6. The inquiry stage must be completed within 60 days of receipt of the written allegation unless circumstances clearly warrant a longer period. If the inquiry takes longer than 60 days to complete, the written inquiry report shall include documentation of the reasons for extending the 60 day period.
7. Upon completion of the inquiry, the Assistant Vice President for Research shall forward the report (as specified in Paragraph II.A.5.) to the Provost. If the Provost concludes that no misconduct has occurred, the issue will be dropped. If the Provost suspects that research misconduct has occurred, he/she shall initiate an investigation.
8. The Assistant Vice President for Research shall maintain sufficiently detailed documentation of inquiries. The documentation shall be used only where required by law, to assist in the defense of the University and/or its employees in legal actions, and to assist in responding to duplicative claims of research misconduct. Such records shall be maintained in a place and manner calculated to provide maximum confidentiality.

B. Investigative Stage

1. Where an investigation is warranted, the Provost shall commence an investigation within 30 days of the receipt of the inquiry report.

2. Where required by regulations or law, the Provost will inform appropriate state and federal agencies that an investigation is to be conducted. The Provost will take any interim steps that he/she deems necessary to protect university, state, or federal funds and property.
3. The Provost shall appoint an Investigative Committee. The Investigative Committee should contain members who have the appropriate expertise to carry out a thorough search for and an authoritative evaluation of the relevant evidence. The committee may include members or consultants from outside the university community having appropriate substantive expertise if such expertise is not present within the university community or if a conflict of interest could arise from appointing a member of the university community to evaluate the evidence.
4. The Provost will appoint the chair of the Investigative Committee. The Assistant Vice President for Research or her/his designee shall serve as secretary and be responsible for maintaining committee minutes and detailed records of all documentary evidence.
5. The investigation normally will include examination of all documentation including, but not necessarily limited to, relevant research data and proposals, publications, correspondence, and memoranda of telephone calls. Whenever possible, interviews shall be conducted with all individuals either involved in making the allegation or against whom the allegation is made. In addition, every effort should be made to interview others who might have information regarding relevant aspects of the allegation. The individual against whom the allegation was made shall have the right to have a representative of the applicable collective bargaining unit, employee group or student group present in interviews in which he/she may be asked or required to be involved.
6. Before the Investigative Committee makes its final recommendation, the individual against whom the allegation was made shall be given a copy of the Committee's report and he/she may respond in writing to any part of the investigation and report. This response shall be a part of the investigative report.
7. The investigation should be conducted and completed within 90 days of its initiation. If the report cannot be completed within 90 days, the Provost may request an interim report and an explanation for the delay. The Provost shall notify the individual against whom the allegation has been made of the delay and of the probable date of completion.
8. When completed, the Investigative Committee shall prepare for the Provost a written report containing its findings, with evidence attached, and its recommendations as to whether the allegation is supported by the evidence. The comments of the individual against whom an allegation was made shall be part of the investigative report forwarded to the Provost.

C. Complying with Federal and State Regulations

1. During the inquiry and investigative stages, CMU will comply with all applicable federal and state regulations governing allegations of research misconduct. For example, all Public Health Service grants require that the Office of Research Integrity (ORI) be notified of the following: the decision to begin an investigation, including the name of the person against whom the allegation is made, the general nature of the allegation, and the PHS application or grant number; termination of an inquiry or investigation before completion; any developments during the investigation which may affect funding for the individual under investigation or that PHS needs to know to ensure appropriate use of federal funds and protect the public interest; if any stage of the inquiry or investigation reveals that any of the following conditions exist:
 - a. there is an immediate health hazard involved,
 - b. there is an immediate need to protect federal funds or equipment
 - c. there is an immediate need to protect the interests of the person making the allegation or of the individual who is the subject of the allegation as well as his/her coinvestigators and associates
 - d. it is probable that the alleged incident is going to be reported publicly
 - e. there is a reasonable indication of possible criminal violation.

Public Health Service grants also require that all documentation substantiating findings of an investigation must be made completing an investigation beyond 120 days, and that a final report shall be submitted to ORI. Federal regulations also require that, for federally sponsored projects, the institution must take appropriate interim action to protect federal funds. This might include suspending an investigator from a research project while an investigation is being carried out.

Resolution

A. Absence of Misconduct

1. If the result of the investigation reveals that the allegation of misconduct is not substantially supported by the evidence, the Provost shall notify in writing the individual against whom the allegation was made. In making any further announcements, the Provost should consult with the individual who was the subject of the allegation to determine whether the announcement should be public or selective and what organizations should receive information about the findings. The Provost should be guided by whether a public announcement will be helpful or cause further harm in restoring the reputation of an individual against whom an unfounded allegation was made.

2. Irrespective of the results of any inquiry or investigation, if an allegation was made in good faith, the Provost will ensure that no disciplinary action is taken against the person making the allegation and will make diligent efforts to prevent retaliatory action.
3. If, during the course of any inquiry or investigation, it is determined that an allegation of misconduct was not made in good faith, the Provost shall initiate appropriate action against the person making such an allegation.
4. If the allegation of research misconduct against an individual is not supported during the inquiry or investigative stage, records of the inquiry or investigation will be maintained by the Assistant Vice President for Research. The documentation shall be used only where required by law or to assist in the defense of the University and/or its employees in responding to duplicative claims of research misconduct. No records of the inquiry or investigation will be maintained in official CMU personnel files pertaining to that individual.

B. Presence of Misconduct

1. Upon completion of the investigation, and prior to CMU issuing its written decision regarding what disciplinary action to take, the following procedures shall be followed:
 - a. The Provost will offer the individual against whom an allegation has been made an opportunity to meet with her/him. If the individual against whom the allegation has been made requests such a meeting, at the meeting the Provost will share with the individual notice of the action he/she intends to take and an explanation of the evidence in support of the proposed action. The individual against whom an allegation has been made shall be given an opportunity to present her/his view of the matter along with any evidence he/she considers relevant to the proposed action.
 - b. At the conclusion of any meeting conducted pursuant to Paragraph 2 (a) the Provost shall offer the individual against whom the allegation has been made two (2) weeks to file a written response to the proposed action. An election by the individual not to respond shall not be interpreted as an admission of, or agreement with, any of the information provided by the Provost.
2. The Provost shall provide to the individual against whom an allegation has been made a written decision regarding what disciplinary action, if any, is to be taken, together with her/his rationale for the decision

3. Disciplinary actions will be based on just cause and may include, but are not limited to:
 - a. Removal from the research project
 - b. Written reprimand
 - c. Financial restitution of grant funds
 - d. Denial of access to university research funds
 - e. Notification to journal editors, book publishers
 - f. Notification to professional organizations
 - g. Suspension from the university; and/or
 - h. Separation from the university
4. The Provost shall make a decision and take action within 30 days from the receipt of the Investigative Committee's report.
5. When there is a finding of research misconduct, the Provost will promptly notify the university supervisor, federal and state agencies where required by law, the person who made the allegation, and organizations informed of the investigation.
6. In any disciplinary action, the grievance and hearing provisions of any applicable collective bargaining agreements, Academic Senate grievance procedures, and other university policies or procedures will be strictly adhered to. A challenge (i.e., an appeal or grievance) to the disciplinary action may be made under one university procedure only.
7. The Assistant Vice President for Research will maintain the records of the investigation where there is a finding of research misconduct.

Approved by: Leonard E. Plachta, President

Date: 6/26/95

Note: This document is base upon several sources from which language is taken in whole or in part to fit the situation at Central Michigan University:

Department of Health and Human Services, Responsibilities of Awardee and Applicant Institutions for Dealing with Reporting Possible Misconduct in Science, Federal Register, Vol. 54, No. 151, August 8, 1989, pp. 3244632451.

Guidelines for the Conduct of Research at the National Institutes of Health, 1991.

1996—1999 Agreement between CMU and the Central Michigan University Faculty Association.

National Science Foundation regulations on misconduct in science and engineering research (45 CFR Part 689).

Policy on Integrity in Research, Executive Memorandum No. C-22, Purdue University, September, 1991.

Policy on Misconduct in Research, Bowling Green State University, November, 1990.

Research Integrity at Northern Illinois University, Spring, 1991.

University Policy Regarding Misconduct in Research and Scholarship, Kent State University, June, 1989.

Important Contact Information

Career Services

Bovee University Center 215

Phone: (989) 774- 3068

E-mail: www.careers.cmich.edu

Student Disability Services

Park Library 120

Phone: (989) 774-3018

E-mail: www.cmich.edu/student-disability/

Counseling Center

Foust Hall 102

Phone: (989) 774-3881

E-mail: www.counsel.cmich.edu

University Health Services

Foust Hall

Phone: (989) 774-6599

E-mail: www.healthservices.cmich.edu

Minority Student Services

Bovee University Center 121

Phone: (989) 774-3945

E-mail: www.diversity.cmich.edu/mss

Sources of Information within this Handbook

Central Michigan University- Department of Biology- <http://www.bio.cmich.edu/default.htm>

Central Michigan University—Department of Psychology—<http://www.chsbs.cmich.edu/Psychology/>

Central Michigan University—Office of Research and Sponsored Programs—
<http://www.orsp.cmich.edu/>

College of Graduate Studies 2008–2009 GRADUATE BULLETIN—<https://bulletins.cmich.edu/>

Central Michigan University 2008—2009 UNDERGRADUATE BULLETIN—<https://bulletins.cmich.edu/>