New Undergraduate Course Approval Cover Form
Montana State University

This four-page form collects basic information about the proposed new course, provides information on the approval process, and includes all required approvals. Additional information (see INFO sheet) is also required as part of the New Undergraduate Course Packet.

Proposed New Course Information

Requested Rubric, Course Number, Core Designation (if needed): BIOH 465

Course Title: Gene Expression Lab: From Genes to Proteins to Cells
Abbreviated Course Title (≤30 chars): Gene Exp: Genes/Proteins/Cells
First Semester to be Offered: Spring 2014
Submitted by: Franese Lefcort
Submitter's Contact Info: Phone, Email: 994-5856, flfcort@gmail.com
Instructor: Marc Mergy
Department: Cell Biology and Neuroscience
College: Letters and Science

New Course Review Process

- Instructor completes the New Course Packet, with Core Information if a Core designation is requested.
- Instructor checks for "equivalent" course in the MUS system and recommends a common or unique course number.
- Department Head's signature indicates that course has been approved by the process used within the Department.
- The Chair of the College Curriculum Committee signs to indicate college academic approval.
- The College Dean signs to indicate that adequate resources are available to offer the course. Supporting information (Dean's Statement) is typically required.
- The New Course Packet (as PDF) is uploaded to the Provost's Office server for distribution to other committees.
- Course requests are sent to Core/Advisory and Program Committees (CPC). Core review forms to appropriate Core Subcommittee. Correlation work in parallel when possible to support approval process. Special topics courses (291, 491) skip the CPC review (limited to two years.)
- Provost's Office reviews the new course request. New courses are submitted to MUS for Genomes Course Number (CGPN) review. Dean and Department informed upon approval.
- Approved new course sent to Registrar for inclusion in the Catalog and Schedule of Classes.

APPROVALS

Submitter: 10/7/13
Department Head: 10/7/13
Chair, College Curriculum Comm.: 
Dean: 
Chair, Core Subcommittee (if app.) 
Chair, CPC: 
Assoc. Provost: 

Note: This diagram illustrates the typical flow path, but at any review step there can be a request for additional information or modifications. Careful review in early steps is the best way to speed the overall process. * Special topics courses (x91) require fewer signatures, but cannot be offered more than two times without committee review.
INFORMATION NEEDED FOR COMMON COURSE NUMBERING

The process for identifying a common course number for a new course is as follows:

1. Course learning outcomes are prepared for the new course.
2. The person submitting the new course request looks at the CCN website to see if a course with similar outcomes already exists in the MUS system.
   
   www.mus.edu/Qtools/CCN/ccn_default.asp
   
   - If a course exists with at least 80% of the same outcomes, the course is considered "equivalent" to the proposed new course, and the new course should use the existing rubric and course number.
   - If no "equivalent" course is found, the person submitting the new course request should identify a unique course number that has not been used by any other course in the MUS system.
3. The requested rubric and course number are submitted as part of the new course packet.
4. The Provost’s Office submits the learning outcomes and the requested rubric and course number to the MUS to have a course number assigned to the course. (This will typically be the requested course number, but it could be changed.)
5. The assigned common course number is reported back to the person submitting the new course request.

Requested Rubric, Course Number, Core Designation (if needed):

   BIOH 465 R
   Gene Expression Lab: From Genes to Proteins to Cells
   Gene Exp: Genes/Proteins/Cells
   Credits: 3
   Department Offering Course: Cell Biology and Neuroscience
   College: Letters and Science

   Is this course "equivalent" to a course in the MUS System?:  
   [ ] Yes  [ ] No

   Learning Outcomes for the Course:
BIOH 465R Learning Outcomes

By the end of this course, students will be able to:

- critically evaluate primary literature sources in order to form a novel research question
- design appropriately controlled experiments to test hypothesis based on an overarching research objective
- proficiently perform lab tasks required to test experimental hypothesis (including human tissue culture, DNA expression in cultured cells, fluorescence microscopy, DNA and protein gel electrophoresis, reverse-transcription polymerase chain reaction (RT-PCR), and Western blotting)
- appropriately quantify and analyze data collected from experimental procedures
- proficiently explain the research goal, approaches, and findings in written and spoken form
INFORMATION REQUIRED BY THE REGISTRAR

The data needed to enter the new course into the MSU Catalog and Schedule of Classes is collected on this page. Once the new course has been approved, this page is automatically forwarded to the Registrar for data entry.

Assigned Rubric, Course Number, Core Designation (if needed): BIOH 4155 R
Course Title (for Catalog): Gene Expression Lab: From Genes to Proteins to Cells
Course Title (for Schedule of Classes, 30 characters, max.): Gene Exp: Genes/Proteins/Cells
First Semester to be Offered: Spring 2014
Restricted Entry/Consent of Instructor Required:
Instructor’s GID (last 4 digits only): ☐ Yes ☐ No
Department Offering Course: Cell Biology and Neuroscience
College: Letters and Science

Is the requested course number available? (x4155 to check): ☐ Yes ☐ No
Frequency of course offering:
Semester(s) offered (check all that apply):
Summer Options (check all that apply):
Credits by mode of instruction:
Lecture:
Seminar:
Independent Study:
Lab/Studio:
Recitation/Discussion:
TOTAL CREDITS: 3

Primary Mode(s) of Delivery:
Face-to-face ☐ Web-Enhanced (small on-line comp.)
On-Line Only ☐ Blended (significant on-line portion)

Time and Location – Call the Registrar’s Office at x4155 to find a time and location for the course:

Assigned Day(s): ☒ M ☐ Tu ☐ W ☒ Th ☐ F ☐ Sa ☐ Su
Assigned Time(s): 4-7pm
Assigned Building: LJJ
Assigned Room: 107
Capacity (room capacity, or enrollment “cap”): 22

Co- and Pre-Requisites – Courses numbered 200 and above are normally expected to have prerequisites. When listing multiple prerequisites, please separate courses with “and” if both are required, or “or” if only one is required:
Prerequisite(s):
Co-Prerequisite(s):

Course Description – Provide a course description of 40 words or less for the MSU Catalog:

This course will give students the opportunity to design a unique research project, then learn and use the appropriate methods to pursue their research question. The course will expose students to the research process used in most basic science labs.
DEAN'S STATEMENT

The reviewing committees are being asked to take a closer look at the resources required for each proposed new course. In many cases new courses will replace existing courses and the new course request is effectively resource neutral, however that is not always the case. For example, a new elective course that would result in distributing an existing student population across a larger number of courses would represent a significant increase in expenditures for the new course, and no increase in total student credit hours. A funding mechanism for such a course would need to be identified. The Dean's Statement is the place to document how the costs of the proposed new course will be covered.
Please provide the following information in narrative format. Substantive responses to all criteria are required. Although not required, a draft syllabus can also be helpful to the committee in understanding the details of the proposed course.

**General Course Information**

1. Requested Rubric, Course Number, and Core Designation (if any)

   > BIOH 410S

2. Course Title

   > Gene Expression Lab: From Genes to Proteins to Cells

3. Provide a general description of the course explaining the need for the course, its goals, and its overall structure. This is the most important part of the application and should offer a good sense of what students will experience by taking this class.

   > This lab course is intended to address some of the demand for research experience for advanced cell biology and neuroscience majors. The course will give students experience with a broad array of laboratory techniques (including tissue culture, heterologous expression, microscopy, RNA extraction, RT-PCR, gene expression analysis, protein extraction and expression analysis, and data quantification) in the context of a novel project that is guided by the students. Structurally, the course will begin as an extension of the fall semester Gene Construction Lab; students will have the opportunity to express the plasmid constructs they designed and synthesized in the fall semester in cultured cells and perform experiments using their own DNA constructs. The second phase of the course will utilize Dr. Frances Lefcort's IKAP mutant mice (central and peripheral nervous system-specific inactivation of the IKAP gene and protein), a model for familial dysautonomia. Dr. Lefcort's lab has already generated data that identified several genes that are dysregulated in this model system. Students will have the opportunity to perform confirmatory experiments to validate the existing data. The students will also be challenged to identify candidate genes that may contribute to other phenotypes present in the IKAP mutant mice. For example, the IKAP mutant mice display a growth phenotype, a characteristic that could arise from dysfunction in the hypothalamic signaling pathways. The students will read the primary literature to identify genes that may underlie this growth retardation, then perform experiments on brain tissue isolated from IKAP mutant mice and wild-type control mice to assay changes in gene and/or protein expression for the targets that they have identified.

4. Based on what types of student work (e.g., tests, homework assignments, papers, performances, etc.) will grades be determined?

   > Students will be evaluated based on their performance in the laboratory, their lab notebooks, and lab reports throughout the semester.
5. Provide a course content outline containing all major topics plus a brief description of the material to be covered under each major topic heading.

The course is designed to give students experience with a variety of laboratory techniques and to allow the students to design their own experiments and direct their own research project over the course of the semester. Techniques covered will include:

Tissue culture, heterologous expression, microscopy: This part of the course will teach students how to maintain and use cultured human cell lines. The students will express exogenous genes in cultured cells (in some cases, the DNA constructs they designed and synthesized in the fall semester Gene Construction Lab), and assay the function of the expressed genes. Students will have the opportunity to express fluorescently labeled proteins in cultured cells, as well, and observe the fluorescent proteins in live cells.

Experimental design: Students will have the opportunity to identify candidate genes that may underlie some of the characteristics observed in a human disease, and are recapitulated in the IKAP mutant mice (a model of familial dysautonomia). They will then design a series of controlled experiments to assay the genes that they selected.

RNA extraction, RT-PCR, gene expression analysis: The first series of experiments will be to examine differences in candidate gene expression in control and mutant mice. These experiments involve isolating and purifying RNA from brain tissue, creating cDNA from the isolated RNA (reverse-transcription (RT) PCR), and analyzing the expression patterns of the candidate genes (using gel electrophoresis to visualize the PCR products).

Protein extraction, protein expression analysis: In addition to examining genes that may be differentially expressed in IKAP mutant mice, students will examine protein expression. Proteins will be extracted from brain tissue, then the protein samples analyzed by gel electrophoresis and Western blotting.

6. List required texts or other required references.

> None. Reading for the course will draw from primary literature sources.

7. What are the estimated enrollment and student credit hour (SCH) production?
   \[ \text{SCH} = \text{enrollment} \times \text{credits} \]

> This will be a 3 credit hour lab course offered to junior and senior students. Enrollment is estimated at 20 students.

8. Will there be an enrollment cap that restricts enrollment below the level of student demand? If so, what is the enrollment cap and why is it necessary?

> Yes, enrollment will be capped at 20 students. This cap is necessary to ensure that there is enough space and lab equipment available for all of the students.

9. Will course be a “restricted enrollment” course? If so, why is restricted enrollment necessary?
> No, enrollment will not be restricted.

10. Describe how the success of the course will be evaluated? ("End-of-semester student evaluations" is not the answer to this question. How will the instructor determine if the learning outcomes are being met, and how will the department determine if the course is fulfilling its intended purpose?)

> Learning outcomes will be evaluated based on the quality of the students' lab notebooks and lab reports, as well as their abilities in the laboratory. The department head or other senior faculty will be invited to sit in on the course to help evaluate its success, too.

11. Is the instructor a member of the regular faculty (i.e., tenured or tenure-track)? If no, please describe the instructor's qualifications, attach a Vita, and provide a separate letter of support, signed by the department head (or appropriate unit director), addressing the instructor's qualifications to teach this course.

> I am not a member of the regular faculty. I feel that I am qualified for this course, as I recently completed my Ph.D. in Neuroscience from Vanderbilt University in the fall of 2013 and during the course of my thesis research, I have gained experience in all of the techniques that will be used in the course. In addition, I had several experiences mentoring undergraduate students in a lab setting while in graduate school. I am very comfortable teaching students in the lab.

Level of Offering
12. Has the course been offered previously under 280/291 or 480/491? If so, when? Under what number? What was the enrollment? What level of students took the course?

> No, this course has not been offered previously.

13. Justify the level of course offering.

> The course is for advanced students. The department is seeking to offer more upper-level laboratory courses to meet the demands of the growing number of students.

Relationship to other Courses, Curricula, and Departments
14. Does this course build on or interrelate with other courses in your curriculum or related curricula? If so, which ones?

> This course reflects a topic about which students in the department want to learn more and will help students achieve their goals of pursuing graduate or medical school. In addition, this course will complement our Gene Construction Lab.

15. Do the topics in the proposed course duplicate or reiterate those in other courses in this or any other department? If so, how do the coverage and educational experience differ and how is this duplication or reiteration justified? Also, what liaison (which is expected in cases of apparent overlap) has been conducted with other departments? Report reactions, both favorable and unfavorable.

> This course does not duplicate content offered in other courses.
16. What programs (departments, colleges) will be impacted by the SCH production of this course? That is, where do you think the SCH in the proposed course are likely to come from? If the expected SCH production of the proposed course is greater than 1000, and the SCH are expected to come from other colleges, what steps have been taken to make the other units aware of the potential loss of SCH? Report reactions, both favorable and unfavorable.

> This course will only impact the SCH production of the Cell Biology and Neuroscience Department.

17. If this proposed course has a significant interdisciplinary component, please explain briefly. Otherwise, indicate n/a.

>n/a

**Students Served**

18. Does the proposed course serve majors only? Non-majors only? Both majors and non-majors? What other majors might be interested in this course? State areas or disciplines to be served and indicate the specific efforts that will be made to make the course material relevant to all disciplines served.

> This course will primarily serve Cell Biology and Neuroscience majors. It is an advanced laboratory course. It will also be open to other qualified pre-med, life sciences, engineering, and psychology majors.

**Resources**

19. What additional resources (e.g., additional instructional FTE, required technologies), if any, will be required to offer this course? Are there any resource issues for the students who will take the course (e.g., required technologies, travel, on-line access requirements)? Will there be an additional fee charged to students taking this course? Please explain.

> This course will have a lab fee. Several of the reagents needed to perform the experiments described are rather expensive. Since this course will be pursuing a novel research project, it might be possible to obtain a small grant (i.e. from the National Science Foundation) to support undergraduate research. Such a grant would help defray the lab fees.

20. What existing information resources -- print (books, journals, documents), audiovisual (videos, DVDs, CDs or other), and/or electronic (e-books, databases, electronic journals and web sites) -- provided by the MSU Libraries will be used by students in this course? Provide examples as well as descriptive information. If additional information resources are necessary, please discuss those acquisitions with the library (x6549 Collection Development) at least three months prior to the beginning of the semester in which this course will be taught.

> Students will be expected to use print and/or electronic journals for this course. No further resources are expected to be needed for this course.

**Other Supporting Material**

21. Include any additional information you feel is needed to support this request.
Proposal Cover Sheet: CORE 2.0

Cell Biology and Neuroscience  
L&S  
Department

BIOH 465  
Course Number
R
(if known)

Spring 2014  
First Semester

to be offered

Gene Expression Lab: From Genes to Proteins to Cells
Course Title

Core Category (Please check one):

☐ Contemporary Issues in Science
☐ Inquiry-Arts
☐ Inquiry-Humanities
☐ Research-Arts
☐ Research-Humanities
☐ Diversity
☐ Inquiry-Natural Sciences
☐ Inquiry-Social Sciences
☐ Research-Natural Sciences
☐ Research-Social Sciences

Does the course have any prerequisites:  BIOB 425 and BCH 380

Frequency offered:  ☑ Annual
☐ Alternate Years
☐ If alternate, starting year __

Semester(s) offered:  ☑ Spring
☐ Summer
☐ Fall

Credits by mode of instruction:  Lecture: _____  Seminar: _____  Recitation/Discussion: _____  Lab/Studio: __

Total credits: __3__

Number of sections/year:  1  
Section capacity:  20

Name of person submitting this proposal:  Frances Lefcort and Marc Mergy

Phone: 994-5656  
E-mail: flefcort@gmail.com

You need to obtain only those that are marked with an asterisk(*)

Required signatures

Department Head  
Date

Chair, College Curriculum Committee  
Date

Chair, Departmental Curriculum Committee  
Date

Chair, CORE 2.0 Steering Committee  
Date

College Dean or Assistant Dean  
Date

Vice Provost for Undergraduate Education  
Date

Revised: 8/27/2003
New CORE Course Narrative  
Montana State University  
Reviewed August 23, 2012  

Please provide the following information in narrative format. Substantive responses to all criteria are required. A draft syllabus must be attached to the New Course Packet. For CORE courses, the syllabus must include:

- The CORE designation after the course rubric and number (e.g., PHL 361 RH)
- The CORE learning outcomes appropriate to the CORE designation.

You may (and are strongly encouraged to) include course learning outcomes in addition to the CORE learning outcomes, but they should be kept in separate lists.

CORE learning outcomes are listed at: http://www.montana.edu/newcore/criteria.html.

General CORE Course Information
1. Requested Rubric, Course Number, and Core Designation  
   [CORE Designations: CS, D, IA, IH, IN, IS, Q, R, RA, RH, RN, RS, US, W]

> BIOH 476.5  

2. Course Title  

> Gene Expression Lab: From Genes to Proteins to Cells  

Information on CORE Criteria: http://www.montana.edu/newcore/criteria.html  
(called “Guidelines” for R courses)  
3. For CS, D, I, or R designations, how will the proposed course meet the Criteria (or Guidelines) for the requested CORE designation? [Skip this question for Q, US, or W designations.]

> The proposed course is intended to receive an R designation. Students will have the opportunity to use the products of their previous lab course (Gene Construction Lab), when applicable, to learn the appropriate methods to express and analyze DNA constructs in cultured human cells. Then, students will guide the direction of the course, as they will research the primary literature and determine a specific research question related to a human disease, for example, Dr. Frances Lefcort’s IKAP mutant mice (central and peripheral nervous system-specific inactivation of the IKAP gene and protein), a model for familial dysautonomia. Subsequently, students will learn and implement the appropriate research techniques to assay changes in both gene and protein expression (i.e., RT-PCR, DNA gel electrophoresis, Western blotting, and data quantification).

Information on CORE Learning Outcomes: http://www.montana.edu/newcore/criteria.html  
4. How will the proposed course prepare students to meet the Learning Outcomes for the requested CORE designation?  
   [Options: CS, D, I, Q, R, US, W]
Note: For R designations please recognize that committee members do not have experience in all disciplines; therefore it is helpful if you will describe how the proposed experience is related to the research/creative norms in your discipline.

The proposed course is intended to be a new research project guided by the students. They will be required to expand and subsequently use their knowledge about how to study a mouse model of a disease state and then put those concepts into action in the laboratory setting. It will be essential that the students work as a team, as several of the methods that will be used require multiple time-consuming steps. Finally, the research project will involve techniques commonly used in research labs in the biomedical sciences. The experience in this lab course will provide the experience necessary for students to be successful in medical and research careers.

Additional Information for R courses: [www.montana.edu/newcore/areadescriptions.html](http://www.montana.edu/newcore/areadescriptions.html)

For R designations, describe how the courses meet the criteria for the Arts, Humanities, Natural Sciences, or Social Sciences.

The proposed course will fulfill the criteria for an R designation in the Natural Sciences because it encompasses the entire research process. Since students will be designing the specific research question that they will pursue during this course, they will be required to understand a large body of previous scientific research to propose a feasible project. The students will then learn and use appropriate techniques to answer their research question. Such efforts will most certainly involve troubleshooting experiments, thus developing a solid understanding of the techniques used. Finally, because the course will be investigating a novel research question, there is a very real potential that the findings will not only expand the students’ understanding of the natural world, but will also be and advance for the greater research community.
Marc A. Mergy

Vanderbilt University School of Medicine
7150 Medical Research Building III
465 21st Avenue South
Nashville, TN 37232
marc.mergy@vanderbilt.edu

Education:

St. Xavier High School, Cincinnati, Ohio 1998-2002

Baccalaureate, summa cum laude, Kenyon College, Gambier, Ohio 2002-2006
Majors: Biochemistry, Neuroscience, Advisor: Dr. John Lutton
Independent Research: Dr. Kathryn L. Edwards,
Biology Dept., Kenyon College
Project: Non-Muscle Myosin II Regulatory Mechanisms in the slime mold Dictyostelium discoideum

Kenyon College Summer Science Scholars Program, Gambier Ohio Summer 2004
Advisor: Dr. Kathryn L. Edwards, Biology Dept, Kenyon College
Project: Generation and Characterization of Random Gene Knockout Mutants in the slime mold Dictyostelium Discoideum

Vanderbilt University Summer Science Academy Summer 2005
Advisor: Dr. Louise Rollins-Smith, Dept. of Microbiology and Immunology Vanderbilt University
Project: Effects of the Pesticide Carba1yl on the Innate Immune Defenses of the Northern Leopard Frog, Rana pipiens

Neuroscience Graduate Program, Vanderbilt Univ. School of Medicine 2006-present
Doctor of Philosophy, Neuroscience, expected spring of 2013
Ph.D. Thesis Advisor: Dr. Randy D. Blakely
Thesis: Creation and Analysis of a Novel Mouse Model of ADHD

Teaching and Mentoring Experience:

Undergraduate mentorship in the laboratory of Dr. Kathryn Edwards 2004-2006
Coordinated and directed several simultaneous projects performed by other Kenyon students

Students: Chris Heffelfinger, class of 2005
Louisa Harding and Hayes Wong, class of 2006
Melissa Martin, class of 2007
Emmett Brady and Christina Kucher, class of 2009

Individual tutor for Shawn Gulati, Kenyon class of 2008, 2004-2005
Introductory Chemistry
Tutor, Kenyon College Math and Science Skills Center
Peertutoring for introductory and second-year courses in biology, chemistry, economics, mathematics, physics, and psychology

Mentor for Vanderbilt Summer Science Academy research students:

Raymond Rivera, University of Puerto Rico
Project: Investigation of the Role of the ADHD-Associated Dopamine Transporter Variant Val24Met (V24M)
Summer 2010

B.J. Waters, Lipscomb University College of Pharmacy
Project: Anomalous Amphetamine Response in a Novel Mouse Model of Attention-Deficit/Hyperactivity Disorder (ADHD)
Summer 2011

Mentor for Vanderbilt undergraduate research students:

Chesney Oravec, class of 2012
Austin Wheeler, class of 2014
Francisco Ochoa-Vargas, class of 2015
Fall 2009- Spring 2011
Fall 2011- present
Spring 2012

Mentor for first-year graduate student lab rotations:

Michael Nedelcovych
Joined Carrie Jones' lab, Pharmacology
February-May 2011

Gwynne Davis
Join joined Randy Blakely's lab, Neuroscience
February-May 2012

Distinctions and Awards:

Michelson-Morley Science Award
(awarded by the Case Western Reserve University Cincinnati Alumni Association to the high school junior that has achieved in and shows promise for a career in science)
2001

National Merit Scholar
2002-2006

Kenyon Science Scholarship
2002-2006

Kenyon College Biology Department Independent Study Prize
2005

University Graduate Fellowship
2006-2011

Ruth R. Kirschstein Predoctoral Fellowship, NIMH
2010-present

Irv Kopin Travel Award, Tenth International Catecholamine Symposium (XICS)
2012

Professional Societies/Affiliations:

Society for Neuroscience

America Chemical Society, Biological Chemistry Division

Sigma Xi, The Scientific Research Society
Publications:


Abstracts:


References

**Randy Blakely, Ph.D.**
Allan D. Bass Professor of Pharmacology  
Professor of Psychiatry  
Director, Silvio O. Conte Center for Neuroscience Research  
Director, Vanderbilt Postdoctoral Training Program in Neurogenomics  
randy.blakely@vanderbilt.edu

** Gregg Stanwood, Ph.D.**
Assistant Professor of Pharmacology  
gregg.stanwood@vanderbilt.edu

**Mark Wallace, Ph.D.**
Director, Vanderbilt Brain Institute  
Professor of Hearing and Speech Sciences  
Professor of Psychology  
Professor of Psychiatry  
Associate Director, Silvio O. Conte Center for Neuroscience Research  
mark.wallace@vanderbilt.edu
Hi Ron,

CBN elected to change their original request for a 491R to a hard-numbered course: BIOH 465 R. The College Committee and I have read the proposal and approved it. The course, CORE proposal form and instructor vita are being sent over by my assistant, Jen Storment. Because of the quick turn around, your copy may not have the Dean’s statement. It should say: This course is financial covered for this first offering by a faculty replacement. Future offerings must be covered as part of regular faculty workloads.

If you need anything more from us to move ahead with this course, please let Jen and me know.

Cheers,
Melody

Melody M. Zajdel, Ph.D.
Associate Dean, College of Letters and Science
Montana State University
2-205 Wilson Hall
Bozeman, MT 59717-2360
(406) 994-4288
BIOH 465 – Gene Expression Lab: From Genes to Proteins to Cells
Montana State University
Spring Semester 2014

Instructor:

Marc Mergy
506 Leon Johnson Hall
406-994-5328 (office), 615-870-9404 (cell)
marc.mergy@montana.edu

Office Hours:

TBD

Required Texts and Materials:

Textbook: There is no required textbook. Research will draw from the current primary literature and lab protocols will be provided.

Lab notebook: a blank, bound (not spiral) notebook is required for recording all lab activities and results.

Flash drive: a USB flash drive (any size) is required. You will be collecting data on lab computers and will need the data for your lab write-ups.

Prerequisites:

BCH 380 (Biochemistry), BIOB 425 (Advanced Cellular and Molecular Biology)

ADA Compliance:

Reasonable accommodations will be provided for all persons with disabilities to ensure equal participation in the course. If you have a documented disability for which you are or may be requesting accommodation, please contact Marc and the MSU Disabled Student Services (DSS) office as soon as possible.

Student Conduct Policy:
This course adheres to the MSU Student Conduct Code and Instructor Responsibilities, available at http://www2.montana.edu/policy/student_conduct/.
Overall Themes and Goals:

This course is intended to provide students with the opportunity to develop a specific research question and to learn the appropriate techniques necessary to address the chosen research question. The primary focus will be experience with a wide breadth of laboratory techniques including tissue culture, heterologous expression, microscopy, RNA extraction, RT-PCR, gene expression analysis, protein extraction, protein expression analysis, and data quantification.

Content:

The first phase of the course will be an extension of the fall semester Gene Construction Lab; students will have the opportunity to express the plasmid constructs that they designed and synthesized in the fall semester in cultured cells. Students that were not in Gene Construction Lab will be provided with DNA constructs encoding fluorescent proteins. Students will learn fluorescence microscopy, time-lapse microscopic imaging, and image analysis.

The second phase of the lab will utilize Dr. Frances Lefcort’s IKAP mutant mice (central and peripheral nervous system-specific inactivation of the IKAP gene and protein), a model for familial dysautonomia. Dr. Lefcort’s lab has already generated data that identified several genes that are dysregulated in this model system. Students will have the opportunity to perform confirmatory experiments to validate the existing data. The students will also be challenged to identify candidate genes that may contribute to other phenotypes present in the IKAP mutant mice. Students will then perform experiments on brain tissue isolated from IKAP mutant mice and wild-type control mice to assay changes in gene and/or protein expression for the targets that they have identified.

Grades and Assignments:

Lab Participation and Lab Notebook (50% of final grade)

- This course requires your presence in the lab for all meetings.
- The focus will be on research techniques and how to apply them to a novel research question. You will be performing real experiments (we don’t know the answers!) and will be evaluated on your ability to properly design and perform experiments.
- You are required to keep meticulous notes of your activities in the lab in your notebook. Lab notebooks should be arranged in a logical fashion (i.e. by date and experiment) and present methods/protocols, deviations from protocol, results, and interpretation of data. Lab notes must be presented legibly and clearly so that another researcher could replicate your experiments.
- Lab notebooks will be evaluated every 1-2 weeks.

Lab Reports (3, each worth 10% of final grade)
Present your experiment in the written form in the manner of a published scientific article.
Lab reports will explain the rationale for an experiment, methods used, findings, and interpretation of data.

Final Lab Report (worth 20% of final grade)
- Present a series of related experiments as a scientific article.
- The final lab report will compile the data from all of the lab reports into a single coherent presentation of the overall research question, techniques used, results, discussion of results, and discussion of future experimental aims.
- The final lab report will take the form of a manuscript one would submit for publication, including figures, data tables, etc.
Schedule:

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<tr>
<th>#</th>
<th>Day</th>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>W</td>
<td>1/8</td>
<td>Intro, Tissue Culture Demo, Hemocytometers</td>
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<tr>
<td>2</td>
<td>M</td>
<td>1/13</td>
<td>Transfection Intro; Tissue Culture and Transfection of Fluorescent Constructs</td>
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<tr>
<td>3</td>
<td>W</td>
<td>1/15</td>
<td>Fluorescence Microscopy, Image Analysis</td>
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<tr>
<td>4</td>
<td>M</td>
<td>1/20</td>
<td>No Class - MLK Day</td>
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<tr>
<td>5</td>
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*RT-PCR, DNA Gel Electrophoresis, and Gene Expression Analysis (2/19-3/5) is allotted substantial time to allow for experimental troubleshooting as well as multiple attempts to identify genes with altered expression.

*Protein Gel Electrophoresis, Western Blotting, and Protein Expression Analysis (4/7-4/23) is allotted substantial time to allow for experimental troubleshooting.
Marc A. Mergy
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Nashville, TN 37232
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Education:

St. Xavier High School, Cincinnati, Ohio 1998-2002

Baccalaureate, summa cum laude, Kenyon College, Gambier, Ohio 2002-2006
Majors: Biochemistry, Neuroscience, Advisor: Dr. John Lutton
Independent Research: Dr. Kathryn L. Edwards, Biology Dept., Kenyon College
Project: Non-Muscle Myosin II Regulatory Mechanisms in the slime mold Dictyostelium discoideum

Kenyon College Summer Science Scholars Program, Gambier Ohio 2004
Advisor: Dr. Kathryn L. Edwards, Biology Dept, Kenyon College
Project: Generation and Characterization of Random Gene Knockout Mutants in the slime mold Dictyostelium Discoideum

Vanderbilt University Summer Science Academy 2005
Advisor: Dr. Louise Rollins-Smith, Dept. of Microbiology and Immunology Vanderbilt University
Project: Effects of the Pesticide Carbaryl on the Innate Immune Defenses of the Northern Leopard Frog, Rana pipiens

Neuroscience Graduate Program, Vanderbilt Univ. School of Medicine 2006-present
Doctor of Philosophy, Neuroscience, expected spring of 2013
Ph.D. Thesis Advisor: Dr. Randy D. Blakely
Thesis: Creation and Analysis of a Novel Mouse Model of ADHD

Teaching and Mentoring Experience:

Undergraduate mentorship in the laboratory of Dr. Kathryn Edwards 2004-2006
Coordinated and directed several simultaneous projects performed by other Kenyon students

Students: Chris Heffelfinger, class of 2005
Louisa Harding and Hayes Wong, class of 2006
Melissa Martin, class of 2007
Emmett Brady and Christina Kucher, class of 2009

Tutor, Kenyon College Math and Science Skills Center 2004-2006
Peer tutoring for introductory and second-year courses in biology, chemistry, economics, mathematics, physics, and psychology

Mentor for Vanderbilt Summer Science Academy research students:

Raymond Rivera, University of Puerto Rico Summer 2010
Project: Investigation of the Role of the ADHD-Associated Dopamine Transporter Variant Val24Met (V24M)

B.J. Waters, Lipscomb University College of Pharmacy Summer 2011
Project: Anomalous Amphetamine Response in a Novel Mouse Model of Attention-Deficit/Hyperactivity Disorder (ADHD)

Mentor for Vanderbilt undergraduate research students:

Chesney Oravec, class of 2012 Fall 2009- Spring 2011
Austin Wheeler, class of 2014 Fall 2011- present
Francisco Ochoa-Vargas, class of 2015 Spring 2012

Mentor for first-year graduate student lab rotations:

Michael Nedelcovych February-May 2011
Joined Carrie Jones’ lab, Pharmacology

Gwynne Davis February-May 2012
Joined Randy Blakely’s lab, Neuroscience

Distinctions and Awards:

Michelson-Morley Science Award 2001
(awarded by the Case Western Reserve University Cincinnati Alumni Association to the high school junior that has achieved in and shows promise for a career in science)

National Merit Scholar 2002-2006

Kenyon Science Scholarship 2002-2006

Kenyon College Biology Department Independent Study Prize 2005

University Graduate Fellowship 2006-2011

Ruth R. Kirschstein Predoctoral Fellowship, NIMH 2010-present

Irv Kopin Travel Award, Tenth International Catecholamine Symposium (XICS) 2012

Professional Societies/Affiliations:

Society for Neuroscience
America Chemical Society, Biological Chemistry Division
Sigma Xi, The Scientific Research Society
Publications:


Abstracts:


References

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Director, Vanderbilt Postdoctoral Training Program in Neurogenomics
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Assistant Professor of Pharmacology
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Director, Vanderbilt Brain Institute
Professor of Hearing and Speech Sciences
Professor of Psychology
Professor of Psychiatry
Associate Director, Silvio O. Conte Center for Neuroscience Research
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