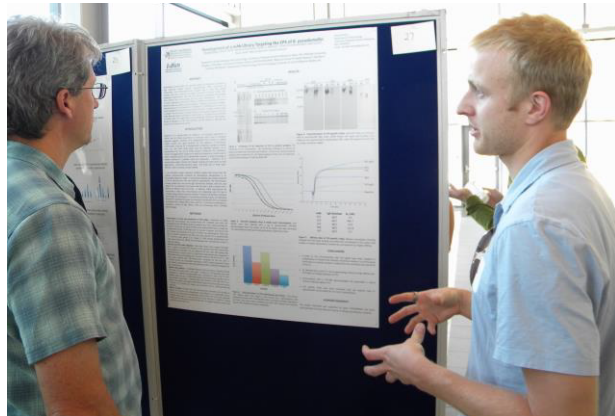


# **Cell and Molecular Biology (CMB) Interdisciplinary Graduate Program**

University of Nevada, Reno

## **2016 Program Review Self-Study Report (2008-2015)**



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## CMB Program Vital Statistics (2008-2015)

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CMB Program established	1984
Current number of CMB faculty	70
Current number of CMB students	29 (Ph.D.) 7 (MS)
Number of Departments represented by CMB faculty 2008-2015	8
Students graduated with CMB degree 2008-2015	66 in total 48 (Ph.D.), 18 (MS)
Average time to Ph.D. degree (years) 2008-2015	5.4
Average GPA of incoming CMB students 2008-2015	3.49
Average combined GRE scores of incoming CMB students 2008-2015	305
Number of CMB student publications 2008-2015	85
CMB faculty Grant Awards (total) 2011-2015	\$ 99,894,880

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## **I. PROGRAM HISTORY, MISSION AND ADMINISTRATIVE STRUCTURE**

### **I. 1 Program History**

The Interdisciplinary Graduate Program in Cell and Molecular Biology (CMB) was established and approved by the Board of Regents in 1984, as a Ph.D. and Masters degree granting program. The CMB program initially had a focus on the emerging field of molecular genetics, but has evolved such that it now offers training in a broad range of disciplines. The graduate faculty affiliated with the CMB program has doubled since 2008. The program has currently 70 graduate faculty members (from 35 graduate Faculty in 2008) from the College of Agriculture, Biotechnology and Natural Resources (CABNR), College of Science (COS) and School of Medicine (UNSOM). Participating Departments include: Agriculture, Nutrition and Veterinary Sciences, Biochemistry and Molecular Biology, Biology, Chemistry, Microbiology and Immunology, Pharmacology and Physiology and Cell Biology. Currently, there are 29 full time graduate students pursuing their Ph.D. and 7 graduate students pursuing a Master's degree.

Between 1984 and 2001, the CMB program continued to grow and increase the number and quality of admitted students. In 2001, and after years of strategic planning by the administration, the Office of the Vice-President for Research and Dean of the Graduate School conceived a plan to restructure the existing biomedical-oriented graduate programs at UNR into a broad "umbrella" program modeled after programs offered by other universities. The new program, called "Molecular and Cellular Biosciences" (MCB) was developed between 2001 and 2004, started admitting students in July of 2003. At the same time, all interdisciplinary biomedical programs, including CMB, were terminated. This change resulted in confusion about the status of students already enrolled in the eliminated programs, the new curriculum, the admission process, and the rules determining how different departments would distribute incoming students and the financial burden. Eventually, this project was abandoned by the VPR office, and the previously eliminated programs were reinstated at the beginning of 2005.

Dr. Stephen St. Jeor assumed the position of Director of the CMB program in 2005 and he led the program into a period of steady growth by obtaining significant financial commitments from the administration.

In 2008, Dr. Gregory Pari was appointed Director of the CMB program. During his administration, Dr. Pari continued to grow the student enrollment of the CMB program and secured substantial funds to support this growth.

In 2010, Dr. Grant Mastick was appointed Director of the CMB program. This represented the first time that the CMB program was administered from a department (Biology, COS) outside of the University of Nevada School of Medicine. In addition, it was during Dr. Mastick's administration when integration of the CMB program with other biomedical programs (Molecular Biosciences graduate programs) started. These include the Biochemistry (BCH) and Cell and Molecular Pharmacology and Physiology (CMPP) programs. This integration included a joint admissions process, which resulted in an increasingly larger and better applicant pool.

In 2013, Dr Patricia Berninsone was appointed Director of the CMB program. Dr. Berninsone continued to integrate the CMB program into the Molecular Biosciences Interdisciplinary programs. In addition to continuing the joint admission process, Dr. Berninsone in conjunction with the BCH and CMPP directors, established joint recruitment activities and continued to refine the CMB curriculum to coordinate and optimize coursework and research opportunities within the Molecular Biosciences umbrella programs.

### **I.1.2 Molecular Biosciences Interdisciplinary Graduate Programs**

Since 2010, the CMB graduate program, the departmental Biochemistry graduate program (BCH) and the interdisciplinary Cell and Molecular Physiology and Pharmacology graduate program (CMPP) have integrated into the Molecular Biosciences (MB) Interdisciplinary Graduate Programs, with the following aims: 1) to conduct joint recruitment and admissions of new graduate students at the regional, national and international levels, 2) to improve the quality of admitted students, 3) to improve recruitment of underrepresented and minority groups, 4) to improve funding stability for graduate students through the joint administration of Graduate Research and Teaching

Assistantships, 5) to provide greater flexibility and broader options in matching students with research mentors, 6) to provide a broader range of course options, 7) to support an interdisciplinary seminar program, 8) to coordinate teaching of the common first year core curriculum, 9) to foster research collaborations by overcoming departmental and programmatic barriers that currently separate students and faculty, 10) to strengthen the ability of the MB programs to attract financial support and improve the current precarious financial situation.

The Molecular Biosciences graduate programs are supported by the office of the Vice-President of Research and Innovation, directed by Dr. Mridul Gautam, and administered by the Graduate School, directed by Dr. David Zeh. The Graduate School provides administrative support in the admission process and in addressing students' inquiries.

The CMB, BCH and CMPP graduate programs have cooperated and operated jointly in the following areas:

- A common Molecular Biosciences Graduate Programs website was designed in 2014, offering prospective students information and access to a broad range of specializations, via the three existing degree programs (<http://www.unr.edu/molecularbiosciences>).
- A new digital recruiting campaign under the Molecular Biosciences name was established in 2014 with excellent results thus far.
- Since 2010, the admission process has been administered by a joint admissions committee. This committee is formed with representatives from each of the major departments with faculty members affiliated with the CMB, BCH and CMPP programs.
- First year students are offered the opportunity to participate in a rotation in any Molecular Bioscience lab on campus, increasing the appeal of the program to incoming graduate students.
- Students in all three programs take together the main courses of the Core Curriculum. Most students take additional elective courses, based on their research

interests and their program requirements. The three graduate programs have similar requirements for qualifying exams.

- For the past several years, the Molecular Biosciences programs have held a joint Annual Graduate Student retreat at the beginning of the fall semester. This event serves as an orientation for incoming students and gives current graduate students the opportunity to present and discuss their research.
- The Molecular Biosciences programs utilize the shared budget funds primarily for the first year student stipends, bridge funding for graduate students if necessary, a director's stipend, administrative support, and operations including support for external seminar speakers.

## **I.2 CMB Program Mission**

The mission of the CMB graduate program is to involve graduate faculty from different disciplines in training professionals for careers in basic, applied and medical research, and biotechnology in academia, private industry and governmental institutions. During their training, CMB students are critical to the research mission of the University of Nevada, Reno, generating new interdisciplinary knowledge relevant to regional, national and international development. In addition, CMB graduate students are essential to fulfill the educational mission of the University of Nevada, Reno, as they perform Teaching Assistant duties in undergraduate courses in the Biology and Biochemistry and Molecular Biology departments.

## **I-3 Administrative Structure and Objectives**

The CMB graduate program relies on the cooperative interaction of Departments and Colleges for its entire academic program. Courses are offered through the departments of Biochemistry and Molecular Biology, Biology, Microbiology and Immunology, Pharmacology and Physiology and Cell Biology. The current organization of the CMB graduate program allows students to perform their dissertation/ thesis-related research in the laboratories of any faculty affiliated with the program.

The Dean of the Graduate School administers the CMB graduate program. Until the upcoming fiscal year, the VPRI office provided an annual budget for program operations. Starting this FY, the budget is administered by the Graduate School. The Graduate School also provides a home department of the directors of interdisciplinary programs, coordinating an annual evaluation of the CMB director.

### *Management of the CMB program*

Internal management of the CMB program is primarily the responsibility of the program director. During the period covered by this review (2008-2015), the position of CMB director was held by:

Dr. Greg Pari (2008-2010)

Dr. Grant Mastick (2010-2013)

Dr. Patricia Berninsone (2013-current)

The CMB director is charged with the overall administrative responsibility for the CMB program. Particular responsibilities include:

1. The CMB director coordinates and administers development of the instructional program, including curriculum development and implementation.
2. The CMB director stimulates and facilitates interactions among all UNR faculty.
3. The CMB director administers the budget and prepares new and special budgets as required.
4. The CMB director coordinates recruitment efforts, the admissions process, and orientation of new students.
5. The CMB program director meets with the students, individually or in groups, collects relevant information regarding their progression through the program, advises them on an individual basis, and monitors their progression.

The program director relies on *ad-hoc* committees for curriculum and program progression/examination (advisory).



### *Admissions Committee*

Admissions to the CMB program is administered jointly with the BCH and CMPP programs under the Molecular Biosciences Interdisciplinary programs. The MB programs receive between 60 and 90 applications annually, and between 8 and 12 students are admitted each Fall, depending on the available funds. The MB Admissions Committee is composed of seven to nine faculty members from the major departments affiliated with the CMB, BCH and CMPP programs. These include the Animal Nutrition and Veterinary Sciences, Biology, Biochemistry and Molecular Biology, Microbiology and Immunology, Pharmacology and Physiology and Cell Biology Departments.

Applications to the MB programs are centrally received by the Graduate School and checked for completeness. A Summary table with applicant information and relevant scores is shared with the admissions committee members. The committee is charged with reviewing the applications, evaluating all available information, including letters of recommendation, and reporting on their recommendations by a written report that includes a ranked list of student applicants. Admission recommendations are usually made by the CMB, BCH and CMPP directors in February or March. The program directors forward the list of students recommended for admission to the Graduate School, and send notification of admission letters to the accepted students.

In addition, individual faculty may identify a qualified applicant from the list recommended by the admissions committee and inform the admissions committee in writing of their willingness to provide financial support for the student, who is then accepted into the graduate program.

### *Administrative Support*

Ms. Kathryn (Kayleigh) Burns serves as administrative assistant for the Molecular Biosciences and other Interdisciplinary graduate programs and helps with admissions and organization of the annual retreat. Ms. Burn's salary is supported by the Graduate School and office of the VPRI. Ms. Kelsie Little is an undergraduate student worker assisting the CMB and EECB program directors. Ms. Little's stipend is supported by the Biology Department.

## II. GRADUATE COURSES AND DEGREE PROGRAMS

### II.1 Graduate Program organization, objectives and effectiveness

#### *Overview of the Mission of the Program:*

The mission of the CMB graduate program is to train students for careers in basic biological and biomedical research, industry, and teaching, with a research focus on Cell Biology, Molecular Biology, Developmental Biology, and Microbiology and Immunology. The program emphasizes interdisciplinary training, ranging from molecular and cell biology approaches to organismal development and physiology, to prepare students for tackling research questions that span the molecular, cellular, tissue and organismal levels.

### II.2 Graduate Degrees, Major, Options, Certificates And Interdisciplinary Programs Contributing To The Graduate Program

The CMB graduate program offers Master of Science (MS) and Doctor of Philosophy (PhD) degrees. The CMB program benefits from courses offered by other programs (Biochemistry and Molecular Biology, and Cell and Molecular Pharmacology and Physiology graduate programs), and also provides critical course options to those programs. The gradual integration of the three MB graduate programs, started in 2010, has enabled optimization of resources, teaching capabilities and an increase in opportunities for research interactions. Courses offered by the different programs is shown in **Table I**

**Table I.** *Courses offered by Different graduate programs at UNR*

Course Name	Course Number	Number of Credits	Program Or Department Offering Course	Year Taken
Molecular Cell Biology	CMB 710	4	Biology (with guest instructors from other Departments)	1 (Spring)
Molecular Genetics	BCH 705	3	Biochemistry	1 (Fall)
Ethics and Scientific Research	PHAR 725	2	Pharmacology	2, 3, or 4 (Fall)
Biostatistics in Public Health	CSH 780	3	Community Health	2, 3, or 4 (Fall)
Grant Writing for Molecular Biosciences	BCH 703	2	Biochemistry	1 or 2 (Fall)

## II. 3 Overall Structure of the CMB curriculum

### DOCTOR OF PHILOSOPHY DEGREE

#### Program Entrance Requirements

An applicant to the program at the doctoral level must meet the requirements established by the Graduate School. Applicants are expected to have an undergraduate B.S. or B.A. degree in biology, biochemistry, molecular biology, chemistry or related area and a GPA of 3.0 or higher and combined Graduate Record Exam (GRE) scores of 300 or better (GRE Inst. Code = 4844 U Nevada Reno). A competitive TOEFL exam score is also required for students for whom English is their second language for admission and eligibility for graduate assistantships according the following standards: For Admission: New computer based = 180 or New Internet based TOEFL = 64. For Assistantships: New computer based = 213 or New Internet based TOEFL = 79. In addition, a completed on-line application to the graduate school (<http://www.unr.edu/grad/>), a statement of purpose, and three letters of recommendation are required.

In addition, all students admitted to the program in good standing will be expected to have completed the following courses:

Calculus, 5 semester hours (or equivalent)  
Physics, 6 semester hours  
Organic Chemistry, 8 semester hours  
Biology, 8 semester hours  
Statistics, at undergraduate or graduate level (recommended: CHS 780  
Biostatistics)

#### Program of Study

##### *Degree Requirements for the Ph.D. degree*

The minimum requirements for a Ph.D. degree are established by the Graduate School at 72 graduate credits, including at least 48 credits in course work. A maximum of 24 credits -with grades B or better- from a Master's degree may be transferred towards the doctoral degree. The CMB program requires the following minimum credits:

<b>CMB core curriculum</b>	<b>28 credits</b> (see below)
<b>CMB research and dissertation</b>	<b>24 credits</b> (600 or 700 level)
<b>Electives</b>	<b><u>20 credits</u></b>
<b>Total credits required</b>	<b>72 credits</b>

The specific program of study for individual students is determined in conjunction with by the student's Advisory /Examination committee and the approval of the Program director.

**Core Curriculum (28 credits required)**

BCH 613, Molecular Biophysics,	3 credits
BCH 705, Molecular Genetics,	3 credits – offered every FALL
CMB 701 <sup>1</sup> , Laboratory Practicum I	3 credits
CMB 702 <sup>1</sup> Laboratory Practicum II	3 credits
CMB 703, Laboratory Practicum III (see Appendix A)	3 credits
CMB 710, Cell Biology,	4 credits – offered every SPRING
CMB 730, Classroom/Laboratory Teaching	0 credits
CMB 790, Graduate Seminar (1 credit)	up to 6 credits
CMB/BCH/CMPP 794, Colloquium (1 credit)	up to 6 credits
PHAR 725 Ethics in research	2 credits – Offered FALL odd years
CMB 795 <sup>2</sup> Comprehensive Exam	1 credit

<sup>1</sup> The CMB 701 and CMB 702 courses should be taken even if the student is NOT formally rotating through a minimum of two different laboratories.

<sup>2</sup> Grades for Comprehensive Examination (CMB 795) must be filled by the end of the semester following the semester in which you registered for the course. If a grade is not filled by then, you will have to register again to receive credit for that course.

**Elective Courses (20 credits required)**

	Course Credits
BCH 605 Molecular Biology	3
BCH 610 Plant Physiology	3
BCH 613 Molecular Biophysics	3
BCH 617 Metabolic Regulation	3
BCH 706 Functional Genomics	3
BCH 707 Protein Structure and Function	3
BCH 709 Bioinformatics	3
BCH 718 Plant Mol Biol & Biotech	3
BCH 740 Enzymology	3
CMB 793 Independent Study	1-3
CMB 794 Colloquium	1-8
BIOL 604 Population Genetics	3
BIOL 610 Plant Physiology	3
BIOL 615 Evolution	4
BIOL 650 sect. 1002 Genomics and Bioinformatics	3
BIOL 653 Immunology	3
BIOL 654 Genomic Conflict, Epigenetics and Human Disease	3
BIOL 656 Molecular Basis of Epigenetics	3

BIOL 666 Developmental Biology	3
BIOL 675 Neurobiology	3
BIOL 677 Genes, Brain, and Behavior	3
BIOL 682 Cell Biology of Disease	3
BIOL 705 Principles and Applications of Flow Cytometry	3
BIOL 792 Computational Tools for Genomic Biology	2
BME 601 Intro to Biomedical Engineering	3
BME 626 Biomedical Engineering	3
BME 725 Ethics and Scientific Research	2
BME 730 Introduction to Imaging & Optics	3
CMPP 740 Neuroeffector Mechanisms	3
CMPP 750 Molec. Mech. of Excitability	3
MICR 670 Cellular Microbiology	3
MICR 676 Cancer Immunobiology	3
MICR 700 Biotechnology Today & Tomorrow	2
MICR 780 Intro Cellular Immunology	3
MICR 784 Molecular Mech Virus	3
NURS 717 Advanced Pathophysiology	3
PHAR 600 Introduction to Human Pharmacology	3
PHAR 710 Molecular Pharmacology	3
PHAR 730 Introduction to Imaging & Optics	3
PHAR 750 Cellular & Molec Mech Excitability	3

## Year 1

### Typical Year 1 Curriculum in Molecular Biosciences: Fall Semester:

Course	Credits
Laboratory Practicums/Research Rotations:	
BCH/CMB 701 or CMPP 770	3
BCH 705 Molecular Genetics	3
BCH 703 Grant Writing for the Mol. Biosci.	2
BCH/CMB/CMPP 794 Colloquium	1
Total credits	9

### Spring Semester:

Course	Credits
Laboratory/Research Rotations:	
BCH/CMB 702 or CMPP 770	3
CMB 710 Molecular Cell Biology	4
PHAR 725 Ethics and Scientific Research	2
Total credits	9

Lab Rotation courses should be taken by all 1<sup>st</sup> year Ph.D. degree candidates through a minimum of two different laboratories as they have not yet selected a research advisor. If you already have an advisor sponsoring your graduate research assistantship, then you will complete both of your rotations in the laboratory of your advisor. M.S. degree candidates need only take one lab rotation course.

**Other required courses** (BCH and CMPP required courses shown for comparison purposes):

**Cell and Molecular Biology (CMB)**

CHS 780 Biostatistics in Public Health	3
CMB 790 Seminar	1 x 3 times = 3

**Biochemistry (BCH)**

CHS 780 Biostatistics in Public Health	3
BCH 707 Protein Structure and Function	3
BCH 790 Seminar	1 x 3 times = 3

**Cell and Molecular Pharmacology and Physiology (CMPP)**

CHS 780 Biostatistics in Public Health	3
PCB 711 Systems Physiology	7
CMPP 790 Seminar	1 x 3 times = 3

All incoming students are provided with a copy of the “*First Year Molecular Biosciences Curriculum*”. This document (shown above) illustrates a sample program of study for a typical MB student admitted in the Fall semester.

The Year 1 curriculum is designed to provide the student with advanced knowledge in Molecular Genetics (BCH 705) and Molecular and Cell Biology (CMB 710). It also allows the student to explore different research areas by taking two rotation courses (CMB 701 and CMB 702). These rotations aim to expose the first year student to a range of research and aid in the selection of an advisor by the start of his/her second year. Students are also required to take Seminar (CMB 790) to be exposed to other areas of research and state-of-the-art advances in the broad field of Cell and Molecular Biology. Additionally, students are required to participate in Colloquium (CMB 794) during the course of their studies. The Colloquium courses are organized as Journal Clubs, where the students are expected to actively participate in discussions and present papers for discussion. The topics of the Journal Clubs vary in each semester. A list of some representative Journal Clubs offered in the past two years and their coordinators is shown:

### Journal Club

Virology and Infectious Disease  
MicroRNAs and Disease  
Neurogenetics  
Post-translational Modifications  
Neurodegeneration and Physiology  
  
Cardiovascular Health and Disease  
Translational Research in Muscle Disease

### Coordinator

Dr. Subhash Verma (Microbiology)  
Dr. Seungil Ro (Physiology)  
Dr. Alex Keene (Biology)  
Dr. Patricia Berninsone (Biology)  
Drs. Ruben Dagda and Thomas  
Gould (Pharmacology)  
Dr. Yumei Fang (Pharmacology)  
Dr. Dean Burkin (Pharmacology)

## **Year 2**

By the start of Year 2, students are expected to select an advisor for their research. The CMB coursework for years 2 and beyond is intentionally flexible; this allows the student to take elective courses in a variety of areas and from different departments and programs. In the Spring semester of Year 2, the student must enroll in **Comprehensive Exam** (CMB 795) and **select an Advisory/Examination committee**. During this semester, the student must prepare and pass an exam consisting of written and oral sections as detailed in the next section.

### **Advisory/Examination Committee Selection**

Every CMB graduate student must form a graduate committee. The role of this committee is to advise and guide the student through the effective and timely completion of their thesis or dissertation research and to administer the oral and written Comprehensive Examination. Each student will set up their graduate committee no later than the end of their 3<sup>rd</sup> semester in the graduate program, consisting of five (5) or more members of the graduate faculty. To ensure quality and competence of graduating and graduated students, students select the members of their graduate committee from among eligible graduate faculty members.

## **Comprehensive Examination**

Only PhD students are required to pass a Comprehensive Examination. The purpose of the comprehensive examination is to assess the readiness of the Ph.D. candidate to continue to pursue the Ph.D. degree. In addition, this exam introduces the student to the complexities of the grant proposal process. The examination consists of the development and oral defense of a written scientific hypothesis. The examination committee or student prepare a list of at least three acceptable topics for the written hypothesis; the committee selects one of these topics and advise the student within three days after receiving the list of topics. The student's own potential hypothesis may be disapproved if it is quite closely related to the student's thesis research. However, the Advisory committee may allow a topic related to the student's research area if it represents a significant advance or novel approach to the research problem. The student is expected to develop an original hypothesis related to the selected topic based on the literature in the field.

The student is allowed four weeks from the date of the assignment of hypothesis topics to prepare a written document acceptable to the examination committee. If rewriting the proposal is deemed necessary prior to the oral defense, up to two additional weeks may be allowed, at the discretion of the committee.

Upon approval of the written hypothesis, the examination committee will schedule an oral defense of the research proposal by the student. This examination focuses on the written hypothesis, but is not be limited to this and may, at the discretion of committee members, include appropriate general questioning in the field of cell and molecular biology.

The examination committee makes the determination as to whether the student has completed the preliminary examination requirements in satisfactory fashion to continue work on the Ph.D. degree. Criteria to be considered by the committee will include the quality of the student's written hypothesis and performance in the oral examination. To pass this exam, the student must be well versed in the current literature in the field, and be able to formulate and defend their research plan, approach and methodology.

If the student fails the examination, she/he may be allowed to retake the exam one time. The examining committee, in consultation with the director of the CMB graduate program, makes the decision as to whether or not the student may repeat the exam, if there



are extenuating circumstances that contribute to an unsatisfactory performance. Should the student be offered the chance to repeat, the full examination procedure, including the development of a written hypothesis and its oral defense, may be required by the committee. Students who fail the exam may continue in the M.S. degree program.

## **MASTERS DEGREE**

### **Program Entrance Requirements**

An applicant to the program at the M.S. level must meet all requirements established by the Graduate School: including an undergraduate B.S. degree in a biochemistry or molecular biology or related area and a GPA of 2.75 or higher and combined Graduate Record Exam (GRE) scores of 300 or better (GRE Inst. Code = 4844 U Nevada Reno). Students are expected to submit Graduate Record Examination (GRE) scores as well as a complete transcript to the director of the CMB program. A competitive TOEFL exam score is also required for students for whom English is their second language for admission and eligibility for graduate assistantships according the following standards: For Admission: New computer based = 180 or New Internet based TOEFL = 64. For Assistantships: New computer based = 213 or New Internet based TOEFL = 79. In addition, a completed on-line application to the graduate school (<http://www.unr.edu/grad/>), a statement of purpose, and three letters of recommendation are required.

In addition, all students admitted to the program in good standing will be expected to have completed the following courses:

- Calculus, 5 semester hours (or equivalent)
- Physics, 6 semester hours
- Organic Chemistry, 8 semester hours
- Biology, 8 semester hours
- Statistics, at undergraduate or graduate level (recommended: CHS 780 Biostatistics)

## Program of Study

### *Degree Requirements for the Masters degree*

The CMB program requires the following minimum credits:

#### **Completion Requirements**

<b>CMB core curriculum</b>	<b>14</b>
<b>CMB research and thesis</b>	<b>9</b>
<b>Electives</b>	<b>7</b>
<b>Total</b>	<b>30 credits</b>

#### **Core Curriculum Courses (14 credits required)**

CMB 710, Cell Biology, 4 credits  
BCH 705, Molecular Genetics, 4 credits  
CMB 701, Laboratory Practicum I, 3 credits  
CMB 790, Graduate Seminar, 2 credits  
CMB/BCH/CMPP 794, Colloquium, 2 credits  
PHAR 725 Ethics in research, 2 credits (fall of even years only)  
Statistics (if not previously taken)

#### **An Example Plan of Study**

(Elective courses can be found in Ph.D. requirements)

##### **Semester I (Fall):**

B CH 705 Molecular Genetics	4
CMB 701 Laboratory Practicum I	3
CMB 790 Graduate Seminar	1
PHAR 725 Ethics in research	2
	10 credits

##### **Semester II (Spring):**

CMB/B CH/BIOL/CMPP 794 Colloquium	1
CMB 710 Cell Biology	4
Statistics	3
	8 credits

#### **<<SELECT ADVISOR AND DEFINE RESEARCH PROJECT>>**

##### **Semester III (Fall):**

Electives	4
CMB/B CH/BIOL/CMPP 794 Colloquium	1
Thesis	2
	7 credits

##### **Semester IV (Spring):**

CMB 790 Graduate Seminar	1
CMB/B CH/CMPP 793 Independent Study	1
Thesis	3
	5 credits

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<b>Total</b>	<b>30 credits</b>
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## **II. 4 Advising and Mentoring**

Upon completion of the second rotation, each student selects a Dissertation Advisor who will serve as chair of his or her Advisory/Evaluation Committee. The Dissertation Advisor must agree to take the student on and will be responsible for supporting the student's research and providing a stipend consistent with CMB guidelines. Students who are unable to identify a willing mentor at the completion of the second rotation will be advised by the members of the Executive Committee over the summer following the first year of study.

In addition to evaluating the Comprehensive Examination, the Advisory/Examination Committee is responsible for approval of the student's Program of Study and Dissertation. It also serves in an advisory capacity during his or her tenure in the CMB program. The student and committee must meet at least annually to assess the student's progression in the program.

### **Dissertation and Oral Examination**

Prior to choosing a date for the oral examination, graduate students must submit a copy of their dissertation for review by their examining committee. The format of the dissertation must adhere to the requirements of the Graduate School. If a student has a publication accepted or published in a peer-reviewed journal, the student may ask the committee to include this publication together with an appropriate introductory chapter instead of the standard format. The committee may require additional chapters to be included in addition to published papers.

### **Advisement Policies, Conflict Resolution, and Student Governance**

CMB graduate students are advised by their primary graduate faculty advisors, in conjunction with their Advisory Committee. CMB students are expected to meet at least annually with their Advisory Committees. Conflicts arising between a graduate student and advisor are addressed to the graduate program director. If the conflict cannot be resolved at this level, the issue is brought to the Dean of the Graduate School. The UNR Graduate Student Association (GSA) oversees student affairs and policies.

### **III. PROFILE OF CMB GRADUATE STUDENTS**

#### **III.1 Recruiting and Admissions Procedure**

The minimum qualifications for admittance to the MS/PhD degree program include an undergraduate BS degree in Biology, Biochemistry or related area, a GPA of 2.75/3.0 or higher (for Masters and Ph.D. applicants, respectively) and combined Graduate Record Exam (GRE) scores 300 or better. A competitive TOEFL exam score is also required for students for whom English is their second language for admission and eligibility for graduate assistantships according the following standards: for Admission with a teaching or research assistantship: New Internet based TOEFL = 79. In addition, a completed on-line application to the graduate school (<http://www.unr.edu/grad/>), a statement of purpose, and three letters of recommendation are required.

Applications for admission to the CMB program are processed through the Molecular Biosciences Interdisciplinary Program; applicants indicate their program of interest (CMB, CMPP or BCH) during the application process. Applications received by the deadline (January 15) are compiled by the Graduate School and evaluated by a joint Admissions Committee. The MB Admissions Committee is composed of seven to nine faculty members from the major departments affiliated with the CMB, BCH and CMPP programs. These include the Animal Nutrition and Veterinary Sciences, Biology, Biochemistry and Molecular Biology, Microbiology and Immunology, Pharmacology and Physiology and Cell Biology Departments. The committee reports on their recommendations by a written report to the CMB, CMPP and BCH program directors that includes a ranked list of student applicants. Based on the number of stipends available (as described below), the CMB, CMPP and BCH Program Directors make recommendations for admissions to the Graduate School. In addition, individual faculty may identify a qualified applicant from the list recommended by the admissions committee and inform the admissions committee in writing of their willingness to provide financial support for the student, who is then accepted into the graduate program. The stipend for the first year of training of these “buy-in” students is provided by the grant funding of the faculty member.

## **Recruitment efforts**

In the last two years, the Graduate School initiated projects aimed at increasing the visibility of doctoral programs at UNR (digital marketing test campaign) and at increasing the enrollment of students from historically underrepresented backgrounds in graduate education (GradFIT program).

### **Digital Marketing Test Campaign**

In an effort to gain a better understanding of how PhD programs at the University of Nevada, Reno are positioned in the regional, national and international markets, the Office of Marketing and Communications launched a paid media test. The Digital Marketing Test Campaign ran between 7/5/2015 and 8/8/2015. This campaign implemented inquiry forms on the degree pages of 13 graduate programs, including the CMB and MB programs, and launched paid media advertisements on Google AdWords. This test generated 249 inquiries from prospective PhD students, with 87 coming from paid traffic and 160 coming from non-paid sources (mostly organic traffic from Google searches). The Office of Marketing and Communications reported: *“The test has revealed we do have a market to use online media channels to engage with doctoral students and the targeting and marketing continues to need refinement.”* In addition, the Office of Marketing and Communications report included the following major takeaways:

- Develop a back-end tracking and conversion system to assess quality and measure application and enrollment yield
- Develop a better understanding of the student markets for individual graduate programs
- Align recruiting cycles to application deadlines, student interest, and available assistantship funding lines
- Because of fantastic organic inquiry conversion rates, continue to focus on increasing traffic to our degree pages and optimizing user experience on those pages
- Conduct a deep dive into international markets, as they present a major area of opportunity for student recruitment

### **GradFIT – Fully Inclusive Training for Diverse Graduate Students**

GradFIT was created with the goal of recruiting a more diverse student population at the graduate level using a broad definition of diversity to accomplish this goal. In the Spring of 2014, the Graduate School and the Office of Diversity Initiatives, in collaboration with Nevada State College, introduced GradFIT to eight undergraduate students. Fifty-five percent of Nevada State College's student population is from historically underrepresented backgrounds and fifty-one percent of Nevada State College's students self-identified as being first generation students. GradFIT 2014 was a three-day intensive program focusing on Biology and Psychology graduate studies at the University of Nevada, Reno, offered at no cost to the students. Eight Nevada State College students were selected on the criteria that they identified as first generation, low income and came from historically underrepresented backgrounds. During the three-day program, participants went through a series of activities including: lectures given by UNR faculty, tour of campus and laboratories, workshop on preparing for the Graduate Record Exam, workshop on communicating with faculty advisors and writing a personal statement, financial aid workshop in regards to graduate students, and a panel discussion with graduate students.

In June 2015, GradFIT was expanded to a 4-day intensive boot-camp style program, encompassing three academic programs: 1. life sciences, 2. psychology, behavioral and social sciences, and 3. creative and liberal arts. GradFIT continued its collaboration with Nevada State College (NSC), but expanded to include undergraduate students from California State University (CSU), Chico, CSU Sacramento and the University of Nevada, Reno. Students from these institutions submitted an online application and selection of participants was based on grade point average, class standing, and answers to submitted essay questions. A total of 32 students were selected (six from CSU, Chico, nine from CSU, Sacramento, nine from NSC, and eight from UNR). The University of Nevada, Reno, funded full room and board for the students during the program, and the other participating institutions paid for transportation to and from UNR. The GradFIT 2015 sessions covered several topics including: lectures given by UNR faculty, tour of campus and laboratories, workshop on preparing for the Graduate Record Exam, workshop on communicating with faculty advisors and writing a personal statement, financial aid workshop in regards to graduate students, and a panel discussion with graduate students.

GradFIT will continue to expand, with the goal of serving an increasing number of students from historically underrepresented backgrounds in their pursuit of graduate education at the University of Nevada, Reno.

### **NSF Proposal for Innovation in Graduate Education**

In response to the limited submission NSF solicitation “NRT Innovations in Graduate Education (IGE) Track”, the Dean of the Graduate School assembled a team of faculty members from the College of Science, College of Agriculture, Biotechnology and Natural Resources and College of Education to collaborate in elaborating a proposal. The resulting Proposal “*GradFIT: Hard and Soft Skills for Hard Science*”, was submitted to NSF in February 2016. This proposal aims to enhance technical proficiencies of incoming graduate students, with particular focus on students from underrepresented groups. The proposal includes training in computational techniques to analyze large datasets, molecular techniques via a summer boot camp and workshops on advanced topics –including genome editing, optogenetics, and RNAseq - and career and professional skills.

### **III. 2 Historical Trends in Graduate Student Assistance**

In the last three years, stipends for the first year of training for Molecular Biosciences incoming students were provided by the Graduate School, the Office of the Provost, the School of Medicine, the College of Science, the College of Agriculture, Biotechnology and Natural Resources, and the Departments of Biology and Biochemistry and Molecular Biology. The positions available to support first year students are a combination of Graduate Research Assistantships and Graduate Teaching Assistantships. In the previous review period (2002-2007), the majority of first year CMB students were supported by research assistantships. Due to increasing availability of teaching assistantships to the MB programs through the Office of the Provost and Graduate School, and the reduced number of research assistantships available, a growing proportion of CMB students are required to perform teaching duties during their first year.

## III.2 Graduate Student Composition

### III.2.1 Quality, Number and Diversity of CMB students

The number of applicants, number of admitted students, and number of students matriculating in the CMB Graduate Program are shown in **Table I**.

**Table I:** *Student Application Data for the CMB Graduate Program*  
(Source: UNR Institutional Analysis)

	2008	2009	2010	2011	2012	2013	2014
Grad Number of Applicants	30	33	38	51	35	38	48
Grad Number of Admits	11	11	9	28	19	12	11
Grad Number of Matriculants	9	7	7	19	15	5	10

Between 2008 and 2015, the CMB program received a total of 273 applications, an average of 34 applications per year. During the period reported by the previous program review (2002-2007), the total number of applications received was 171, an average of 24 applications per year.

The qualifications of the students admitted to the CMB program over the last seven years are summarized in **Table II**.

**Table II:** *Qualifications of Students Admitted to the CMB program since 2008*  
(Source: UNR Institutional Analysis)

Averages	2008	2009	2010	2011	2012	2013	2014
GPA	3.58	3.64	3.28	3.32	3.51	3.60	3.49
GRE scores V/Q	149/151	150/155	155/148	151/154	153/152	157/153	157/155
GRE Analyt	3.4	4.1	3.8	4.1	3.9	4.6	4.5

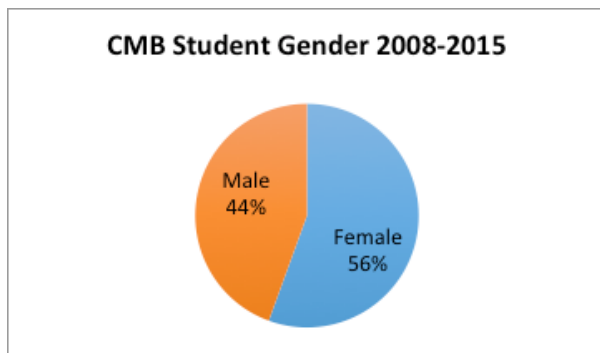
The data reveals that the profile of the students admitted to the CMB program (measured by their GPA and GRE scores) has remained relatively constant over the 2008-2015 period.

The profile of all students who have graduated and/or have been admitted to the CMB graduate program since 2008 was analyzed. (Source: UNR Institutional Analysis).

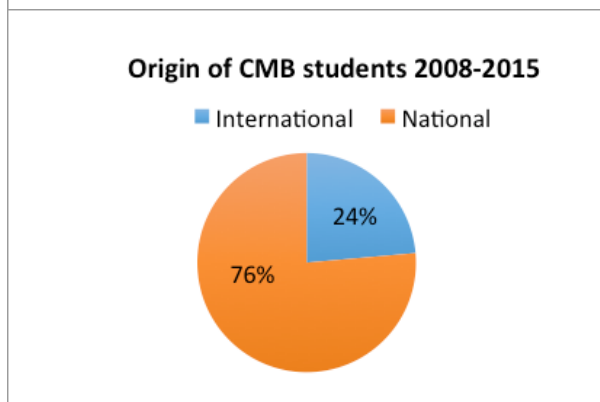


Extracted data was examined by gender (Figure 1), origin (Figure 2), and ethnicity (Figure 3).

**Figure 1:** *Gender of CMB students who have graduated and/or were admitted since 2008*



Between 2008 and 2015, 56% of the enrolled students were female and 44% were male. Data from the period reported by the previous program review (2002-2007) was 61% female and 39% male.

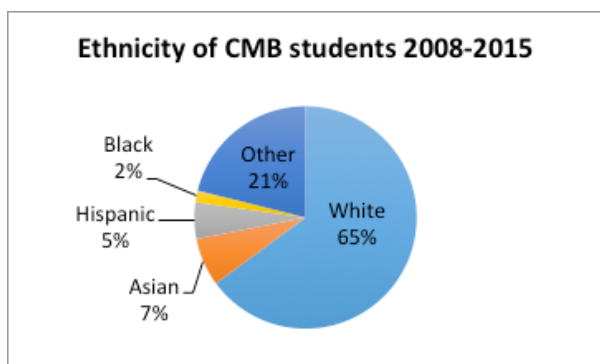


**Figure 2:** *Origin of CMB students who have graduated and/or were admitted since 2008*

International students comprised 24% of the CMB enrolled student body between 2008 and 2015, while 29% of international students were reported for the 2002-2007

period.

**Figure 3:** *Ethnicity of CMB students who have graduated and/or were admitted since 2008*



Between 2008 and 2015, 65% of the CMB students enrolled in the CMB program were white. Hispanic and black students constituted 5% and 7%, respectively, of the student body.

Efforts to increase recruitment of underrepresented minorities, including the GradFIT program, started being implemented in 2014.

### III.2.2 Retention and Graduation

The CMB program granted a total of 66 degrees (48 Ph.D. degrees and 18 Masters degrees) between 2008 and 2015. During the previous program review period (2002-2007), the CMB program granted a total of 34 degrees (27 Ph.D. degrees and 7 Masters degrees). Degrees granted per year are summarized in **Table III**.

**Table III.** *Degrees Granted by the CMB program since 2008*  
(Source: UNR Institutional Analysis)

Degrees Granted	2008	2009	2010	2011	2012	2013	2014	2015*
Masters	0	4	4	2	4	1	2	1
Ph.D.	10	4	6	7	8	3	6	4
Total	10	8	10	9	12	4	8	5

Of the 58 Ph.D. students admitted between 2008 and 2015, five graduated with a Master's degree and three left the program. Of the 14 Masters students admitted during the same period, four applied for admission to the Ph.D. program and qualified for admission. The average time to graduation was 5.4 years for Ph.D. students, and 2.8 years for Masters students.

### III.3 Analysis

In order to compare the profile of CMB students with students from similar programs, quantitative data from Interdisciplinary Graduate Programs at other institutions was obtained. These programs include:

- Program in Molecular and Cellular Biosciences, Oregon Health and Science University, Portland, OR (**OHSU**)
- Molecular, Cellular, and Developmental Biology Program, Colorado State University, CO (**CSU**)
- Biomedical Sciences Graduate Program, University of New Mexico, NM (**UNM**)

**Table IV.** Comparison of CMB student profile with those enrolled in Interdisciplinary Graduate Programs at Oregon Health and Science University (OHSU), Colorado State University (CSU), and University of New Mexico (UNM)

Index	CMB	OHSU	CSU	UNM
Average GPA	3.49	3.54	3.33	n/a
GRE Verbal	153	156	155	518*
GRE Quantitative	153	154	154	663*
GRE Analytical Writing	3.7	4.1	3.4	4.3
Graduation time (years)	5.4	5.5	n/a	5.5

\* Old scoring system (up to 2012) for GRE reported

Students admitted to the CMB program had GPAs and GRE scores comparable to those admitted to Interdisciplinary Programs at OHSU, CSU and UNM. The average graduation time for CMB Ph.D. students (5.4 years) was also comparable to that of students graduating from these programs. For comparison, the time to completion of CMPP and Biochemistry graduate students at UNR is 4.8 and 6.4 years, respectively.

### **Program Objectives, Performance Indicators, and Learning Outcomes**

The Student Learning Outcomes used to assess the effectiveness of the CMB Interdisciplinary Graduate Program include:

- Graduate students will demonstrate an advanced level of competency in the general fields of cell and molecular biology and in the specialized subject area of their research.
- Graduate students will demonstrate competence in oral and written communication skills, including the ability to orally present independent research in public, the ability to write independent research, including scientific journal articles for publication and grant proposals, and the ability critically evaluate relevant scientific literature in cell and molecular biology.

- Graduate students will demonstrate ability to complete experimental laboratory-based research in their field of study, including the mastering of common and specialized techniques, the testing of a hypothesis or answering scientific questions formulated independently or in conjunction with their advisors or advisory committee members.
- Graduates of the program will be professionally employed in positions related to their training.

### **Quantitative and Qualitative Measures of Student Research Output**

CMB graduate students authored 85 publications between 2008 and 2015. These are listed in **Appendix B**. The average number of publications authored per student was 1.89 (2011-2014). CMB Advisory Committees provide extremely valuable input in the research projects of CMB students, ensuring timely progression to graduation and encouraging generation of results for high quality publications. Although publication of one or more research articles is not a Graduate School or program requirement for graduation, Advisory Committees strongly support the idea that Ph.D. students should have at least one first author publication to graduate.

### **Enhancement of Academic Courses through Seminar Series, Internships, and other Opportunities**

CMB students are required to attend seminars as part of their training. A number of seminar series on biomedical topics are available, including those organized by the CMB, CMPP and Biochemistry graduate programs, and the three COBRE program projects at UNR. Maintaining a high quality seminar series is critical for student training and for establishing and maintaining strong research programs. The funds available to the Molecular Biosciences program currently only allow a total of nine invited external seminar speakers per year. Since these funds are shared by the CMB, CMPP, and Biochemistry graduate programs, a maximum of three invited CMB seminars per year can be funded, limiting the exposure of CMB students to potential collaborators and postdoctoral advisors. All CMB students are required to participate with poster or oral presentations in the

Annual George G. Bierkamper Graduate Student Retreat held every year the week before the start of the Fall semester. This Annual Retreat, organized jointly by the CMB, CMPP and Biochemistry graduate programs, also serves as the Program Orientation to incoming MB graduate students. In addition, all CMB students have had the opportunity to participate and present their research at national and international conferences.

### Employment of CMB graduates

Table V shows the current employment of 56 CMB students who graduated between 2008 and 2015. All of these students are professionally employed in positions related to their training. Twenty-two of these CMB alumni (39%) have found positions in academia. Fifteen are postdoctoral fellows, two are Assistant Professors, and three are employed as university research associates or instructors. All others have found employment in the industry related to their graduate training– nineteen (35%) are scientists at companies, three are employed in the science education field, one pursued veterinary school, one works in public policy, and one is a medical writer.

**Table V.** *Current Employment of CMB graduates (2008-2015)*

Name	Former Mentor	Graduation Year	Current Position
Gracie Andrews	Kidd	2008	Instructor, Nashville State Community College
William Farmer	Mastick	2008	Post-doctoral Fellow, Neuroscience, McGill University
Jessica Skopal-Chase	Zanjani	2008	Veterinarian, Eastern Animal Hospital
Marjorie Sutherland	Kozel	2008	Product Development Analyst, Medtronic
Omar Akbari	Pai	2008	Assistant Professor of Entomology, UC Riverside
Laurie Bollinger	Hall	2008	Project Manager, MagArray, Inc
Takashi Yamagami	Almeida-Porada	2008	Field application Specialist, Presicion NanoSystems, Inc
Jennifer Tichemor		2008	Research Scientist, Charles River Laboratories
Bryce Alves	Hudig	2009	Research Scientist, Active Motif
Daniel Boudreaux	St.Jeor	2009	Postdoctoral Fellow, University of Michigan

Kory Alderson	Murphy	2009	Public Policy, Bethesda, MD
Joseph Tellez	Porada	2009	Postdoctoral Fellow, UC Davis
Cyprian Rosetto	Pari	2009	Research Assistant Professor, UNR
Neil O'Kane	Don Koh	2009 MS	Client Manager, Charles River Laboratories
Chad Sanada	Almeida-Porada	2010	Scientist, Fluidigm
Melisa Soland	St.Jeor	2010	Gene and stem cell therapy specialist, University of North Carolina at Chapel Hill
Dominique Kagele	Pari	2010	Senior Marketing specialist, The Jackson Laboratory
Danice Wilkins	Murphy	2010	Research Scientist, Charles River Laboratories
Christine Jenablanc	Zanjani	2011	Postdoctoral Fellow, UNR
Myriam Bouchlaka	Murphy	2011	Postdoctoral Fellow, University of Wisconsin-Madison
Gunnar Newquist	Kidd	2011	Founder/CEO, Brain2Bot
Lisa Keyes	St.Jeor	2011	Postdoctoral Fellow, ATGC
Maria Hovenden	Kozel	2012	Senior Medical Writer, Complete Publication Solutions
Minmin Song	Titiger	2012	Postdoctoral Fellow, UNR
Adam Bousum	Kidd	2012	Assistant Professor, Middle Georgia University
Amanda Burnham-Marusich	Berninsone	2012	Principal Scientist, DxDiscovery
Casey Snodgrass	Berninsone	2012	Custom Solutions Applications Specialist at Hamilton Company
Nucharee Yokdang	Buxton	2012	Postdoctoral Fellow, UC Davis
Mark Hubbard	AuCoin	2012	Chief Technology Officer, DxDiscovery, Inc.
Daniel Oliver	Clark	2013	Postdoctoral Fellow, UNR
Ryan Robinson	Clark	2013	Antibodies online, Inc.
Farnaz Shoja Taheri	Mastick	2013	Postdoctoral Fellow, UC Davis
Mariam Ba	Valencik	2013	Postdoctoral Fellow, UNR
Joshua Rumsfeld	Kozel	2013 MS	Sales Account Manager, BUCHI Corporation
Claire Smalley	AuCoin	2013 MS	Graduate Research Assistant at UTMB
Nicole Ortogero	Yan	2014	Research Scientist, Charles River Laboratories
Michael Dillon	AuCoin	2014	Postdoctoral Research Fellow, University of Exeter, UK
Chris Loosbroock	Hunter	2014	Research Scientist at Charles River Laboratories
Meagan Roberston	Keene	2014 MS	Tutor, Washoe Tribe
Kevin Jenson	Berninsone	2014 MS	Science Education Supervisor, doTERRA International

Hannah Jordan	Mastick	2014 MS	PhD student, UNR
Suhani Thakker	Verma	2015	Scientist, Thermo Fisher
Maryam Alavi	Kidd	2015	Postdoctoral Fellow, Boston Children's Hospital
Breeana Hubbard	Kozel	2015	Performance Evaluator, Western Governors University
Margaret Elorza	Pari	2015	Scientific Associate at Charles River Laboratories
Apurva Sarathy	Burkin	2015	Postdoctoral Fellow, NIH
Karla Hernandez	Kidd	2015	Postdoctoral Fellow, UNR

**The CMB Graduate Student handbook is available in Appendix A.**

**List of CMB student publications is available in Appendix B.**

## IV. PROFILE OF CMB FACULTY

### IV. 1 Faculty Composition and Workloads

#### *Description and distribution of faculty*

The graduate faculty of the CMB program between 2008 and 2015 is listed in **Table VI**. The CMB program currently consists of 70 participating faculty. Of these, 27 faculty members have served as dissertation/thesis advisor, and a total of 47 faculty have actively participated by serving on a dissertation/thesis committee within the last eight years.

**Table VI. Graduate Faculty of the CMB program**

COS = College of Science

CABNR = College of Agriculture, Biotechnology and Natural Resources

UNSOM = University of Nevada School of Medicine

<b>Name (Last, First)</b>	<b>Affiliation Department / College</b>	<b>Rank</b>	<b>Tenure Status</b>	<b>Degrees Held</b>
Alvarez-Ponce, David	Biology / COS	Asst. Professor	Untenured	Ph.D.
Angermann, Jeff	Pharmacology / UNSOM	Asst. Professor	Untenured	Ph.D.
AuCoin, David	Microbiology/Immunology / UNSOM	Assoc. Professor	Tenured	Ph.D.
Baker, Josh	Biochemistry / CABNR	Assoc. Professor	Tenured	Ph.D.
Barsky, Sanford	Pathology / UNSOM	Pathology and Lab Chair		M.D.
Bell, Thomas W.	Chemistry / COS	Professor	Tenured	
Berninsone, Patricia	Biology / COS	Assoc. Professor	Tenured	Ph.D.
Blomquist, Gary	Biochemistry / CABNR	Professor	Tenured	Ph.D.
Borgeson, Charlotte	Biology / COS	Lecturer III		Ph.D.



Burkin, Dean	Pharmacology / UNSOM	Professor of Pharmacology, Director, CMPP graduate program	Tenured	Ph.D.
Burkin, Heather	Pharmacology / UNSOM	Asst. Professor	Untenured	Ph.D.
Buxton, Iain L. O.	Pharmacology / UNSOM	Regents Professor and Chair, Department of Pharmacology		Ph.D., Pharm. D., FAHA
Clark, Scott	Biology / COS	Assoc. Professor	Tenured	Ph.D.
Courchesne, William	Microbiology & Immunology / UNSOM	Assoc. Professor	Tenured	Ph.D.
Cramer, Grant	Biochemistry / CABNR	Professor	Tenured	Ph.D.
Craviso, Gale L.	Pharmacology / UNSOM	Professor	Tenured	Ph.D.
Cremo, Christine	Biochemistry / CABNR	Professor	Tenured	Ph.D.
Cushman, John	Biochemistry / CABNR	Biochemistry, Graduate Program Director		Ph.D.
Dagda, Ruben	Pharmacology / UNSOM	Assist. Professor	Untenured	Ph.D.
Damke, Hanna	Biochemistry / CABNR	Assist. Professor	Untenured	Ph.D.
Duan, Dayue Darrel	Physiology and Cell Biology / UNSOM	Professor	Tenured	Ph.D.
Earley, Scott	Pharmacology / UNSOM	Assoc. Professor of Pharmacology	Tenured	Ph.D., FAHA
Ellison, Patricia	Biochemistry / CABNR	Assoc. Professor	Tenured	Ph.D.
Facemyer, Kevin	Biochemistry / CABNR	Research Assist. Professor	Untenured	Ph.D.
Feng, Yumei	Pharmacology and Physiology and Cell Biology / UNSOM	Assist. Professor	Untenured	Ph.D.

Gould, Thomas	Physiology and Cell Biology / UNSOM	Assist. Professor	Untenured	Ph.D.
Grzmski, Joe	Biochemistry / CABNR	Assoc. Research Professor	Tenured	Ph.D.
Harper, Jeffrey F.	Biochemistry / CABNR	Professor	Tenured	Ph.D.
Harvey, Robert	Pharmacology / UNSOM	Professor	Tenured	Ph.D.
Hennig, Grant	Pharmacology / UNSOM	Assist. Professor	Untenured	Ph.D.
Howard, Christie	Biochemistry / CABNR	BS-MS Biotechnology Program Director		Ph.D.
Hudig, Dorothy	Microbiology & Immunology / UNSOM	Professor	Tenured	Ph.D.
Hunter, Kenneth W.	Microbiology & Immunology / UNSOM	Professor	Tenured	Sc.D.
Keef, Kathleen	Physiology and Cell Biology / UNSOM	Professor	Tenured	Ph.D.
Keene, Alex C.	Biology / COS	Assist. Professor	Untenured	Ph.D.
Kenyon, Jim	Physiology and Cell Biology / UNSOM	Professor	Tenured	Ph.D.
Kidd, Thomas	Biology / COS	Assoc. Professor	Tenured	Ph.D.
Koh, Sang Don	Physiology and Cell Biology / UNSOM	Professor	Tenured	Ph.D.
Kosma, Dylan	Biochemistry / CABNR	Assist. Professor	Untenured	Ph.D.
Kozel, Thomas	Microbiology & Immunology / UNSOM	Professor	Tenured	Ph.D.
Kruse, Kristina		Nevada Genomics Center, Operational Manager		

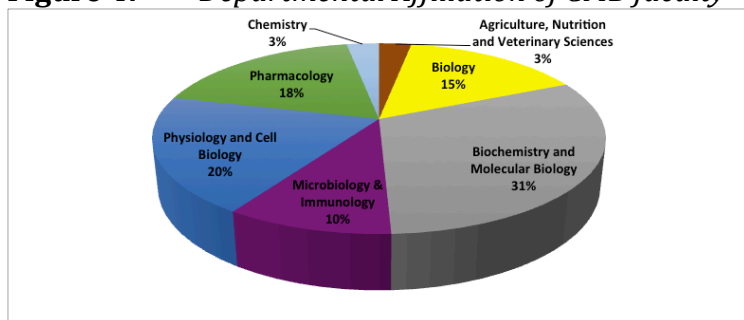
LeBlanc, Normand	Pharmacology / UNSOM	Professor	Tenured	Ph.D.
Liebman, Susan	Biochemistry / CABNR	Research Professor	Tenured	Ph.D.
Mastick, Cynthia	Biochemistry / CABNR	Assoc. Professor	Tenured	Ph.D.
Mastick, Grant	Biology / COS	Professor	Tenured	Ph.D.
Mathew, Dennis	Biology / COS	Assist. Professor	Untenured	Ph.D.
Miller, Glenn	Biochemistry & Biophysics	Professor	Tenured	Ph.D.
Miura, Hiroto	Physiology and Cell Biology / UNSOM	Assoc. Professor	Tenured	M.D.
Miura, Pedro	Biology / COS	Assist. Professor	Untenured	Ph.D.
Murray, Alison		Research Professor	Tenured	Ph.D.
Mutafova-Yambolieva, Violeta	Physiology and Cell Biology / UNSOM	Professor	Tenured	M.D., Ph.D.
Pardini, Ron	Biochemistry / CABNR	Professor	Tenured	Ph.D.
Pari, Greg	Microbiology & Immunology / UNSOM	Professor & Chair	Tenured	Ph.D.
Peacock, Mary	Biology / COS	Professor of Internal Medicine	Tenured	M.D.
Perrino, Brian A.	Physiology and Cell Biology / UNSOM	Assoc. Professor	Tenured	Ph.D.
Pritsos, Chris	Agriculture, Nutrition and Veterinary Sciences / CABNR	ANVS Professor & Associate Director of Nevada Agriculture Experiment Station		
Quilici, David		Director, Nevada		Ph.D.

Proteomics Center				
Redelman, Doug	Physiology and Cell Biology / UNSOM	Director and Research Professor	Tenured	Ph.D.
Renden, Robert	Physiology and Cell Biology / UNSOM	Assist. Professor	Untenured	Ph.D.
Ricketts, Marie-Louise	Agriculture, Nutrition and Veterinary Sciences / CABNR	Assist. Professor	Untenured	Ph.D.
Ro, Seungil	Physiology and Cell Biology / UNSOM	Associate Professor	Tenured	Ph.D.
Sanders, Kenton	Physiology and Cell Biology / UNSOM	Professor and Chairman	Tenured	Ph.D.
Santos, Patricia	Biochemistry / CABNR	Assist. Research Professor	Untenured	Ph.D.
Schegg, Kathy	Biochemistry / CABNR	Research Biochemist		Ph.D.
Schlauch, Karen	Biochemistry / CABNR	Professor	Tenured	Ph.D.
Schooley, David	Biochemistry / CABNR	Emeritus Professor	Tenured	Ph.D.
Shintani, David	Biochemistry / CABNR	CABNR Associate Dean for Academic Programs, Associate Professor of BMB		Ph.D.
Singer, Cherie A.	Pharmacology / UNSOM	Assist. Professor	Untenured	Ph.D.
Smith, Terence	Pharmacology / UNSOM	Professor	Tenured	Ph.D.
St. Jeor, Steve	Microbiology & Immunology / UNSOM	Professor	Tenured	Ph.D.
Sumby, Paul	Microbiology & Immunology / UNSOM	Assoc. Professor	Tenured	Ph.D.

Tal-Gan, Yftah	Chemistry, COS	Assist. Professor	Untenured	Ph.D.
Tittiger, Claus	Biochemistry / CABNR	Professor and Department Chair	Tenured	Ph.D.
Valencik, Maria	Biochemistry / CABNR	Assoc. Professor	Tenured	Ph.D.
van der Linden, Alexander	Biology / COS	Assoc. Professor	Untenured	Ph.D.
Verma, Subhash C.	Microbiology & Immunology / UNSOM	Assoc. Professor	Untenured	Ph.D.
von Bartheld, Christopher	Developmental & Cell Biology	Professor	Tenured	Ph.D.
Wallace, Ian	Biochemistry / CABNR	Assist. Professor	Untenured	Ph.D.
Wan, Qi	Physiology and Cell Biology / UNSOM	Assoc. Professor	Tenured	Ph.D.
Ward, Sean M.	Physiology and Cell Biology / UNSOM	Professor	Tenured	Ph.D.
Welch, William	Biochemistry / CABNR	Emeritus Professor	Tenured	Ph.D.
Yan, Wei	Physiology and Cell Biology / UNSOM	Professor	Tenured	Ph.D.
Zanjani, Esmail		Emeritus Professor	Tenured	Ph.D.
Zepeda, Veronica	Biochemistry / CABNR	Lecturer		Ph.D.

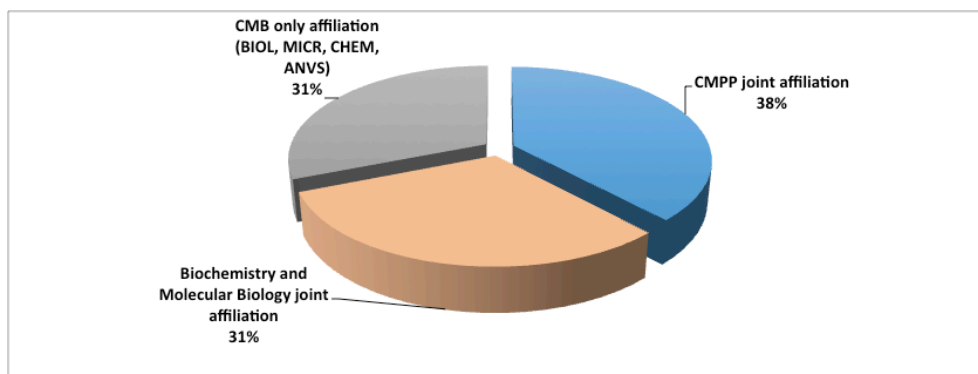
The departmental affiliation of CMB faculty is shown in **Figure 4**.

**Figure 4:** *Departmental Affiliation of CMB faculty*



A total of 76 faculty members at the University of Nevada, Reno participate in the MB programs (CMB, BCH and CMPP). The almost precise overlap between the CMB faculty roster and the joint MB programs roster results from the fact that 69% of the graduate faculty of the CMB program also belong to other programs (38% belong to the CMPP graduate program and 31% belong to the BCH program), while only 31% of the faculty are associated only with the CMB program.

**Figure 5:** *Participation of CMB faculty in other graduate programs*



### *New faculty searches*

The CMB program has limited involvement in specific faculty searches. Faculty vacancies and new searches are carried out almost exclusively with considerations of departmental needs.

### *Faculty Allocation of Responsibilities*

Courses in the Core curriculum are taught by CMB faculty in the Departments of Biology, Biochemistry, Pharmacology, and Physiology and Cell Biology. The departments

oversee and evaluate distribution of faculty time and hence the CMB program has limited influence with respect to course content and development of new courses.

#### **IV.2 Research, Scholarship, Creative Activity, Outreach and Professional Service**

CMB faculty members have been extremely productive in terms of quality and quantity of publications in the past seven years. They have also been very successful in obtaining extramural funding, bringing over a total of over \$99M between 2011 and 2014 (*Source: UNR Office of Sponsored Projects, Annual Reports*). These values reflect the success of CMB faculty in obtaining R01 and other NIH grants, as well as program grants such as COBRE and INBRE. The recruitment of graduate students has been in part tied to the availability of extramural funding, since graduate students are supported by grant funding to their advisors starting in Year 2. It is worth noting that these grants were obtained with a significant contribution of research by graduate students in the laboratories of CMB faculty.

## V: PROGRAM RESOURCES, PHYSICAL PLANT AND FACILITIES

### V.1 Funding sources

The CMB program relies upon faculty, departments, colleges and the Graduate School for all resources. Individual investigators support students from extramural sources, which include all costs associated with dissertation related projects.

Current graduate student stipend and associated costs are:

Graduate student stipend	\$22,000
Fringe (15% of stipend)	\$3,300
Health insurance	\$2,760
Tuition waiver 9 credits at \$187.04 per credit	$\$1,683.36 \times 2$ (semesters)=3,366.72
Total	\$31,427 per student

The budget for the Molecular Biosciences Graduate Programs is administered through the Graduate School with the CMB, BCH and CMPP program directors having signature authority on the account. These funds are used to partially cover first year stipends, to support external speakers, to partially defray costs associated with students requiring a third rotation, and to organize the Annual Retreat. The Program Director receives an annual stipend of \$ 1,341 from the Graduate School, which is included in the annual Molecular Biosciences budget. **Table VI** shows data provided by the Graduate School showing the decrease in ICR and State Funds allocated to the program between 2008 and 2015.

**Table VI.** *Combined CMPP and CMB Operating Budget (2008-2015)*

Year	ICR Funds	State Funds	Total	Percent of Maximum
<b>FY08</b>	\$121,068.00	\$20,000.00	\$141,068.00	100%
<b>FY09</b>	\$110,925.00	\$10,000.00	\$120,925.00	86%
<b>FY10</b>	\$102,453.00	\$10,000.00	\$112,453.00	80%
<b>FY11</b>	\$76,775.00	\$20,000	\$96,775.00	69%
<b>FY12</b>	\$96,378.00	\$20,000	\$116,378.00	82%
<b>FY13</b>	\$43,892.00	\$0	\$43,892.00	31%
<b>FY14</b>	\$36,744.00	\$0	\$36,744.00	26%
<b>FY15</b>	\$26,652.00	\$0	\$26,652.00	19%

In 2015, these contributions were only 19% of those in 2008. This is in part due to the downturn in the Nevada economy and its impact on State contributions to the University of Nevada, Reno starting in 2009. However, recent improvements in the economy have not



been reflected in the program budget. Considering the significant contributions made by CMB faculty in the form of extramural funding, there should be a major effort to increase the budget of the Molecular Biosciences Graduate Programs.

### *Program Grants*

As an IDEA state, Nevada is eligible for NIH funding targeting research and infrastructure development. These include COBRE (Center of Biomedical Research Excellence) center grants, which provide ~\$10 million in funding for 5 years, including R01-level funding for junior faculty project leaders and funding for research cores. UNR has a longstanding INBRE (IDEA Network of Biomedical Research Excellence) grant (PI J Kenyon), which has just been awarded a renewal, and supports statewide infrastructure and education, including pilot grants for junior faculty and research cores. The COBRE for Smooth Muscle Plasticity (PI K Sanders) is currently in Phase III and has focused on research and cores related to the enteric nervous system. UNR currently has two COBREs in Phase I. The COBRE for Cell Biology (PI C von Bartheld) was awarded in 2011 and funds research projects in the School of Medicine (SOM) and Biology, with a primary focus on cellular and molecular neuroscience. The COBRE for Integrative Neuroscience (PI M Webster) was awarded in 2012 and supports faculty in Psychology, Biology, and Biomedical Engineering. A new COBRE for Epigenetics (PI W Yan) is currently under review. These program grants have provided a significant infusion of research funds and enhanced the research facilities available to the CMB and other MB graduate programs.

## **V.2 Physical Facilities**

Faculty affiliated with the CMB program are housed in the departments of Animal Nutrition and Veterinary Sciences, Biology, Biochemistry, Chemistry, Microbiology & Immunology, Pharmacology, and Physiology and Cell Biology. Animal Nutrition and Veterinary Sciences and Biology faculty have office and laboratory space in the Fleischmann Agriculture (FA) building, which includes an Agriculture south wing, and a Life Sciences north wing. The Agriculture wing of the building was completed in 1958, and the Life Sciences wing was added in 1963. Facilities in FA are a mixture of original construction, and renovated spaces, and the building is currently occupied at its maximum

capacity. Biochemistry faculty have offices and laboratory space in the Howard building. The departments of Pharmacology, Physiology and Cell Biology, and Microbiology & Immunology occupy the basic science area of the Center for Molecular Medicine (CMM) building, which was opened in 2010. The CMM building provides state-of-the-art research facilities, including a mouse facility, and the Nevada Transgenic Center.

**Additional description of Research Facilities and Cores is available in Appendix C.**

## VI. FUTURE PLANS

### Strengths and Challenges

The 2008-2015 Self-Study shows the success of the CMB program with the following strengths:

1. Students admitted to the CMB program had GPAs and test scores similar to those admitted to comparable programs, and graduated in approximately the same time.
2. The CMB program offers an excellent environment for students to work closely with faculty who have a wider range of interests, allowing students the flexibility to choose courses that will best suit their needs and career goals.
3. Most of the students who graduated from the CMB program between 2008 and 2015 have careers in academia by pursuing postdoctoral training, or have found positions in the private industry.
4. The faculty members of the CMB program have an outstanding track record in obtaining extramural funding from federal agencies.

The challenges of the CMB program are:

**Recruitment:** The University of Nevada, Reno is undergoing an exciting transformation into a top tier research institution. UNR is in the process of adding over 300 new faculty lines over a 5-6 year period, funded primarily by enrollment growth. Over the last 3 years, 131 new lines have been allocated, with a significant number of hires in departments associated with the Molecular Biosciences graduate programs. While the number of CMB faculty members doubled (from 35 in 2008 to 70 in 2015), the average number of students admitted per year decreased (from an average of 11.7 students admitted per year to the CMB program between 2002 and 2007, to an average of 10.2 admitted students per year to the CMB, Biochemistry and CMPP programs combined between 2008 and 2015). At this time, the limited number of students admitted in the Molecular Biosciences graduate programs is restricting the vibrant research projects of existing and new faculty members. Increasing the number of teaching assistant positions would allow our faculty to realize their full research potential, and support the instructional needs of the growing undergraduate student population at UNR.

The Graduate Programs at UNR do not host in campus recruitment events for prospective students, which are standard in equivalent programs at similar institutions. Inviting prospective students to visit UNR during department-wide or graduate program-specific recruitment events would expose them to the attractive aspects of UNR, our graduate programs, and the Reno area, enabling our graduate programs to recruit better students. Our program has made some progress in recruiting students from underrepresented minorities, and will strive to increase the diversity of our graduate students.

**Funding:** Recent improvements in the State economy have not been reflected in support to the CMB program to restore historical funding levels after the precipitous decline in recent years. Increased funding is needed to support more incoming graduate students, who are key to the success of our existing newly hired tenure-track faculty, to sustain and increase extramural funding, and to increase visibility of our graduate programs.

**Seminar Series:** A strong Seminar Series is critical to Molecular Biosciences student training and to strengthen program ties with other institutions. The funds currently available only allow for supporting a maximum of nine invited speakers annually, shared among the CMB, BCH and CMPP programs. Increased funding to support a strong Seminar Series is key to program improvement.

**Student Stipends:** The current stipend of CMB/MB students is \$22,000. While this is above the current TA stipend at UNR, it is still well below the stipends offered by similar programs at other institutions, making it difficult to recruit the best students. Increasing stipend levels would help our program compete at a national level, and provide students with fair and livable wages.

**Faculty involvement:** Involvement of faculty in the CMB program is variable and voluntary. Although there is a strong base of faculty that provide graduate research experiences to students, there is little commitment of faculty in regard to service on CMB

committees. This is mostly due to the fact that contribution to interdisciplinary programs is mostly disregarded in the overall context of priorities and performance criteria that are external to the CMB program. Therefore, there is a need for an adequate acknowledgement of faculty contributions to the CMB program that is reflected in annual merit review.

**Program Identity and Relation to other Molecular Biosciences Programs:** Many CMB faculty are involved in other two graduate programs, making program ownership by faculty difficult to achieve. Since 2009, the CMB graduate program, the departmental Biochemistry graduate program (BCH) and the interdisciplinary Cell and Molecular Physiology and Pharmacology graduate program (CMPP) have cooperated in the joint recruitment and admissions of new graduate students. These activities have been conducted under the “Molecular Bioscience (MB)” umbrella denomination without a formal merger of the existing programs. Starting in 2013, the “Molecular Biosciences” identity as an interdisciplinary collaboration was reflected on the Graduate School website (<http://www.unr.edu/molecularbiosciences>) and offers the students access to a broad range of specializations, via the three existing degree programs. The CMB, BCH, and CMPP programs share the first-year experience of common courses and lab rotations. Considering the fact that the CMB graduate program encompasses most of the MB faculty in campus, an initiative to change the name of the CMB program to Molecular Biosciences program was proposed and voted by the CMB faculty with unanimous support. The reorganization of the graduate programs into a common Molecular Biosciences would improve the management and support of the interdisciplinary graduate programs and improve the visibility and versatility of the program for a wider range of potential graduate students.