Biochemistry

Academic Program Review

Self-Study

2015

Biochemistry - College of Arts and Sciences

TABLE OF CONTENTS

CRITERION 0. INTRODUCTORY SECTION AND BACKGROUND INFORMATION

The section should provide a brief introduction to the self-study

0A. Executive

An executive Summary that provides a one- to two-page summary/abstract of the information contained within the self-study.

The mission of the Department of Biochemistry and Molecular Biology is to be a center of academic excellence that creates and imparts knowledge of the biochemical and molecular bases of disease through individual and collaborative multidisciplinary and translational research; undergraduate, graduate, postgraduate, and medical education; and the training of basic and clinical research scientists and the junior faculty. The Department faculty members conduct basic and translational research on the biochemical and molecular bases of disease, with particular emphasis on diseases affecting New Mexico's population. Faculty research interests comprise three areas: metabolism and metabolic disease, cancer biology and cancer therapeutics, and biochemistry education research.

Biochemistry is an Undergraduate Major in the College of Arts & Sciences, founded and administered by the Department of Biochemistry and Molecular Biology since 1984. The Department is located in the Health Sciences Center School of Medicine, which is within walking distance of the main campus. The School of Medicine grants Bachelor degrees in four medically related areas: Medical Laboratory Science, Dental Hygiene, Radiological Sciences and Emergency Medical Services. However, it does not confer Bachelor of Science (B.S.) or Bachelor of Arts (B.A.) degrees in any "academic " disciplines. The two degrees offered by the Biochemistry Program, B.S. and B.A., are granted by the College of Arts & Sciences.

The Biochemistry Program is a model of collaboration between the University of New Mexico College of Arts & Sciences and the School of Medicine. The College of Arts & Sciences has degree granting authority and provides many resources, including student advisement, lower division courses instruction, and classroom facilities for most courses. The School of Medicine hires the Biochemistry and Molecular Biology Department faculty and staff, provides faculty office and research laboratory space, and supports fundamental programmatic activities, such as office and laboratory teaching supplies, teaching laboratory instrumentation, and teaching assistantships. The vast majority of the student research experiences are in Health Sciences Center laboratories.

Delivery of the biochemistry program is divided between Departments located within the School of Medicine (Department of Biochemistry and Molecular Biology) and College of Arts & Sciences (Departments of Biology and Chemistry and Chemical Biology). The lower division course requirements are offered through the Department of Biology and the Department Chemistry and Chemical Biology, along with core curricular requirements in University College. Once students have completed the fundamental pre-requisites, they are then formally admitted into the College of Arts & Sciences to begin the required courses for the biochemistry degree (often at the beginning of their junior year). The Department of Biochemistry and Molecular Biology faculty teaches the sequence of upper division courses needed to fulfill the degree plan for biochemistry, which is routinely completed in two years. Elective courses are available through the Departments of Biochemistry, Biology, Chemistry, Mathematics, Biomedical Sciences Graduate Program, and College of Pharmacy.

In addition to the Biochemistry Major, the Department also administers 2 sections per semester of Introductory Biochemistry for non-majors (Bioch 423). One section is primarily dedicated to the combined BA/MD Program, while the other is open to all other majors in the University. This course satisfies pre-requisite needs for admission into the UNM medical school, out of state medical and dental schools, UNM pharmacy programs, and most recently the UNM nutrition program.

Enrollment in the Biochemistry Program includes 50-60% students from underrepresented populations. In this respect, we are supporting the objectives of the University and providing traditionally underrepresented students, especially in the sciences, with excellent opportunities for career advancement in biochemistry and the health fields. The number of students completing the Biochemistry Degree has increased substantially. It has doubled over the past 6 years, from 26 recipients in 2008 to 52 in 2014. This of course matches increased enrollment into the Program. It has additionally been an increased percentage of students choosing a B.S. degree over the B.A. Thus, more students are opting for experiential learning through hands-on biochemical principles. The faculty members in our Department are considering eliminating the B.A. degree option and focusing more effort and resources on the B.S. degree. An immediate challenge is thereby to sustain the rapidly rising enrollment and still maintain our educational excellence. The rapidly growing number of Biochemistry Majors will demand significantly more resources, including faculty and space. To help address these concerns a new teaching laboratory is under construction, and the Department will hire 2 faculty members in the tenure-track by FY2016 and FY2017, who will contribute to the Department research, education, and service missions.

The Biochemistry program seeks to develop students with skills in problem-solving, critical thinking, and communication that are necessary for successful scientific careers. The program provides students with a solid foundation in basic biochemical principles and opportunities to apply these principles to understand pathologic processes. We strive to make research-based and inquiry-based learning the normal learning mode and encourages all students to become involved in research and teaching opportunities available within the Department and other units within the University. Students can arrange research projects with individual faculty members or they may participate in one of several research programs. In addition to carrying out their research requirements in laboratories of Departmental Faculty, Biochemistry majors are also permitted to conduct research in laboratories of other School of Medicine, College of Pharmacy, Biology and Chemistry faculty members, which provides breadth and depth to their research opportunities.

Although the Biochemistry Program does not have a mechanism for student retention that originates in the Department itself, several of our students take advantage of UNM wide pipeline programs that are designed to expose students to excellent research opportunities. These programs include, NSF Research Experiences for Undergraduates (REU) Program, Initiative for Minority Student Development (IMSD), Minority Access to Research Careers (MARC) Program, and Undergraduate Pipeline Network (UPN). The Department also has close ties to the combined BA/MD Program and participates in the UNM Science, Technology, Engineering, and Mathematics (STEM) Gateway Initiative**.**

Consistent with our past trends, the Undergraduate Biochemistry Major continues to attract some of the University's best students, including many Presidential and Regents Scholars. Our majors are academically successful during their time at UNM, as measured by the overall GPA and achievement of university honors. The average GPA for the 2013 and 2014 graduating classes were 3.5 and 3.57, respectively. Over the past 12 years, the exit scores on the American Chemical Society Biochemistry certification exam (used as a direct measure of exit content knowledge) of Biochemistry graduates have remained relatively stable (average 64 (+/- 5.7) of the nation ranking percentile), as has retention of URM Biochemistry graduates. Data obtained from the graduating classes for the past 5 years showed that a significant portion of our graduates continue to our School of Medicine (19%), yet many others enter diverse programs ranging from business and law to graduate programs in engineering, chemistry, dentistry, and the biomedical sciences.

In 2014, we modified our programmatic assessment to further evaluate the Biochemistry Program on a national level by comparing our student outcomes with those from biochemistry programs at other Universities. We adopted new national standards published by the Partnership for Undergraduate Life Science Education (PULSE) and the American Society for Biochemistry and Molecular Biology (ASBMB). Prior to this change in 2014, the Department used ASBMB assessment guidelines published in 2003. The program new learning goals with associated student learning outcomes (listed in criterion

1C) are informed by the principles and core concepts provided by ASBMB, in alignment with our biochemistry core courses (criterion 3A). Beginning Spring 2016, we will participate in the National ASBMB Degree Certification Exam (broadly administered for the first time in Summer 2015). This new ASBMB exit exam addresses our student learning outcomes and provides students with the opportunity to have their degrees certified by ASBMB if they attain a satisfactory score as determined by the ASBMB. This instrument will be an excellent benchmark for our continuous Programmatic assessment.

The Biochemistry Program recently received full accreditation (2015-2022) by the ASBMB (Criterion 0A ***Appendix*** "Biochemistry Undergraduate Program Accreditation Letter from ASBMB"). As an ASBMB-accredited Program we require students to engage in a cumulative total of 400 or more contact hours of direct, hands-on laboratory experience in STEM areas over the course of the degree program. It is recommended by the ASBMB that at least one of these experiences be research/inquiry-based. Along with our accreditation by ASBMB, comes the expectation that we modify our curricular methods to align more closely with current education research findings. Some of these modifications include student-centered learning experiences, peer-learning opportunities, problem-based curricula, and classroom activities that rely heavily on active learning principles.

The ASBMB accreditation committee identified the following as areas of strength for the UNM Undergraduate Biochemistry Program: (i) very strong inquiry-based, student-centered teaching; (ii) classrooms designed for inquiry teaching and collaboration; (iii) support for very diverse student body; and (iv) attention to assessment at course and program level. The committee identified the following as areas in need of improvement: (i) a limited number of full professors among the core faculty (currently one full professor), especially those trained in Biochemistry; (ii) more internships and research opportunities for students other than those enrolled in the Honors Research Program. Addressing these areas is a priority for the Department. Additional priorities are: recruiting a pool of faculty adequate to the growing size of the Biochemistry Program, adopting and implementing the PULSE Life Sciences Departmental rubrics for courses and program assessment, and increasing communication with the Biology and Chemistry Departments to provide the most seamless education for our students.

0B. Program History

A brief description of the history of each program within the unit.

The Biochemistry Program milestones are summarized in Criterion 0B ***Appendix*** ("Program Milestones").

The Department of Biochemistry, one of the original academic departments of the UNM School of Medicine, was established in 1964. Robert B. Loftfield, Ph.D., was the founding Chair. The modern Department of Biochemistry and Molecular Biology was established in 1997, with Jeffrey Griffith as Chair. Jeffrey Griffith was succeeded by William Anderson in 2007, who served as Department Chair until 2012. Karlett Parra succeeded William Anderson in 2012.

In 1969, the SOM Biochemistry Department was given responsibility for providing undergraduate biochemistry instruction at UNM, in response to recommendations by a Danforth Foundation review of the UNM Chemistry Department. The faculty in the Department of Biochemistry developed and instructed the courses in the main campus facilities. The present Undergraduate Biochemistry Major was implemented in 1984 and has been highly successful. Consistent with our past trends, the Undergraduate Biochemistry Major continues to attract some of the University's best students, including many Presidential and Regents Scholars. For example, the average GPA for the 2013 and 2014 graduating classes was 3.5 and 3.57, respectively. Upon graduation approximately 25% of these students had received letters of acceptance to medical, dental, veterinary schools and graduate schools. On average, 20% of graduates attend the UNM School of Medicine. The program has graduated over 450 students the last 30 years.

In 2015, the Undergraduate Biochemistry Major received full accreditation by the American Society for Biochemistry and Molecular Biology (ASBMB). Accreditation has been granted for a full 7-year term commencing on June 1, 2015. Strengths especially highlighted by the ASBMB reviewers are: a very strong inquiry-based, student-centered teaching program, classrooms specifically designed for inquiry teaching and collaboration, support available for a very diverse student body, particular attention to assessment at both course and program level. The Undergraduate Biochemistry Major at the University of New Mexico is one of only 38 ASBMB accredited programs nationwide.

Accreditation will provide our graduating students the opportunity to demonstrate their competitiveness with peers from across the nation. In addition, receipt of a certified Biochemistry and Molecular Biology degree will affirm to prospective graduate and professional schools or potential employers that the recipient in question has: (1) Matriculated through a program whose curriculum and infrastructure meet the basic expectations of the ASBMB. (2) Demonstrated a grasp of fundamental concepts and critical reasoning skills on the ASBMB Evaluation Instrument.

0C. Organizational Structure and Governance

A brief description of the organizational structure and governance of the unit, including a diagram of the organizational structure.

The Department of Biochemistry and Molecular Biology organizational structure diagram is provided in the Criterion 0C ***Appendix*** "Organizational Structure Diagram".

The President of the University, Robert Frank, PhD, is its Chief Executive Officer. He reports directly to the Board of Regents. The President responsibilities are implementing the policies adopted by the Board of Regents and overseeing the quality of University programs. The Provost of the University, Chaouki Abdallah, PhD, is the Chief Academic Officer. The Provost works with the President and the Chancellor of the Health Sciences Center to coordinate Main Campus academic planning and budgeting. The Provost oversees the activities of the Schools and Colleges in the Main Campus, including the College of Arts & Sciences. Mark Peceny, PhD, is the Dean of the College of Arts & Sciences. The Dean provides academic leadership for the College programs. He reviews and assesses the College Departments, including the Department of Biology and the Department Chemistry and Chemical Biology, and makes decisions concerning each Department budget and instructional programs.

The Department of Biochemistry and Molecular Biology is located in the Health Sciences Center School of Medicine. Paul Roth, MD, Chancellor for Health Sciences, provides leadership and has administrative responsibility for all activities, operations, and programs of the Health Sciences Center. Dr. Roth also retains the title and responsibility of the Dean, and is the presiding/principal officer of the School of Medicine. In order to ensure that University policies and procedures are properly followed and administered within the School of Medicine and that the School of Medicine enjoys effective and responsive leadership and management, Chancellor Roth created the administrative position Executive Vice Dean of the School of Medicine, now held by Dr. Martha McGrew. Programmatic governance is through the Senior Associate Deans for Education, Research, and Academic Affairs. The goals of the School of Medicine Strategic Plan are implemented through completion of specific objectives, each with measurable metrics/deliverables that comprise the annual Action Plans of the Executive Vice Dean, the Senior Associate Deans and Department Chairs. These Action Plans guide and prioritize Department Chairs' allocation of human and financial resources, and provide the basis for each faculty member's annual performance plan. The Executive Vice Dean, Senior Associate Deans, and Department Chairs are appointed by and serve at the discretion of the Dean of the SOM. The Dean of the SOM conducts performance evaluation of the SOM Departments Chairs, including the Department of Biochemistry and

Molecular Biology Chair (FY2013-FY2015) every year in the spring. The SOM Chairs evaluations are scheduled semiannually from FY2016.

The Department of Biochemistry and Molecular Biology Chair, Karlett Parra, PhD, has administrative responsibility for the operations and programs of the Department. The Chair allocates financial resources, reviews and assesses individual faculty research and instructional activities, and allocates teaching and committee assignments. The Department Vice Chair is David Vander Jagt, PhD. The Vice Chair oversees the development of individual faculty research programs. The Undergraduate Biochemistry Program Director is Robert Orlando, PhD. With Dr. Marcy Osgood assistance (Undergraduate Biochemistry Program Director, 2008-2014), Dr. Orlando oversees the activities of the program, including course/course directors and all aspects of curricula. The Undergraduate Biochemistry Program Director reports directly to the Chair. A Chair advisory committee was established in FY2016, which provides recommendations for education and research programs strategic planning and execution of goals. The Chair Executive Advisory Committee consists of three senior faculty members of the Department, Dr. David Vander Jagt, Dr. Marcy Osgood, and Dr. Jeffrey Griffith.

0D. External Program Accreditations

Information regarding specialized/external program accreditations associated with the unit including a summary of findings from the last review, if applicable. If not applicable, indicate that the unit does not have any specialized/external program accreditations.

The Department has recently received program accreditation by the American Society for Biochemistry and Molecular Biology (ASBMB) for its first full 7-year term (June 1, 2015 through May 31, 2022). See Criterion 0A ***Appendix*** ("Biochemistry Undergraduate Program Accreditation Letter from ASBMB").

Background
As described by the ASBMB, an accreditation program for bachelor's degrees in Biochemistry and Molecular Biology (BMB) constitutes a powerful vehicle by which the ASBMB can:

- Actively and visibly promote excellence and innovation in undergraduate BMB education.
- Connect with and recruit aspiring young biochemists and molecular biologists on a nation-wide scale.
- Raise the profile and enhance the relevance of our society among STEM educators.
- Raise the profile and relevance of our society in the private sector, where employers are often frustrated by the heterogeneity in knowledge and skills exhibited by graduates of different BMB programs.

The goals described by the ASBMB Degree Accreditation Program are to provide:

1. A national, outcomes-based mechanism by which students receiving a B.S. or B.A. in Biochemistry & Molecular Biology or closely related majors are given an opportunity to have their degree accredited by the ASBMB.
2. A vehicle for recognizing undergraduate BMB programs whose features and infrastructure fulfill the basic expectations of the ASBMB.
3. Access to an independently constructed and scored instrument for assessing student achievement and program effectiveness.
   There are two application deadlines each year: March 15 and October 15.

For **BMB educators**, access to an independent, nationally-recognized evaluation tool will materially assist them in meeting the growing demand from collegiate accrediting bodies, university administrators, etc., for regular outcomes assessment. Independent assessment will, in turn, assist them in pinpointing strengths and weaknesses in their curriculum.

For **students**, receipt of a certified degree will affirm to prospective graduate and professional schools or potential employers that the recipient in question has:

- Matriculated through a program whose curriculum and infrastructure meet the basic expectations of the ASBMB.
- Demonstrated a grasp of fundamental concepts and critical reasoning skills on the ASBMB Evaluation Instrument.
- Accreditation will provide students graduating from diverse programs the opportunity to demonstrate their competitiveness with peers from across the nation.

To have their degree certified by the ASBMB, a student must:

- Earn a B.A., B.S. or equivalent degree from an ASBMB-accredited program, and
- Exhibit acceptable performance on an assessment instrument provided by the ASBMB. Students who exhibit exceptional performance on the assessment instrument will be recognized as having graduated with distinction by the ASBMB.

ASBMB is working on an independent, nationally-recognized evaluation tool that will be meeting the growing demand from collegiate accrediting bodies, university administrators, program directors, etc., for a regular standardized outcomes assessment. The independent assessment will assist in pinpointing strengths and weaknesses our curriculum, and allow us to compare our curriculum outcome with other accredited institutions.

The accreditation committee identified the following as areas of strength for the UNM Undergraduate Biochemistry Program:

- Very strong inquiry-based, student-centered teaching
- Classrooms designed for inquiry teaching and collaboration
- Support for very diverse student body
- Attention to assessment at course and program level

The accreditation committee identified the following as areas in need of improvement for the UNM Undergraduate Biochemistry Program:

- A limited number of full professors among the core faculty (currently one full professor), especially those trained in Biochemistry
- More internships and research opportunities for students other than those enrolled in the Honors Research Program

0E. Previous Academic Program Review

A brief description of the previous Academic Program Review for the unit. The description should note when the last review was conducted. The description should also provide a summary of the findings from the review team's final report, the resulting action plan to address the recommendations, and a summary of actions taken as a result of the previous academic program review.

No prior academic program review has been conducted for the Biochemistry Program.

Annual report to Provost Office describing student learning outcomes

The most recent annual report submitted by the Department of Biochemistry and Molecular Biology was for the 2011-12 academic year and primarily focused on Student Learning Outcomes (SLOs). Many of the stated SLOs are derived from curricular documents published by our disciplinary society, American Society for Biochemistry and Molecular Biology (ASBMB), as well as the Association of American Medical Colleges and the Howard Hughes Medical Institute.

Measures used for each learning outcome included sample size of students from whom data were collected, timetable for the collection, and the setting in which the measures were administered. Measurements included:

- Capstone experience
- Subject matter exams
- Laboratory Skill Performance (Practicum)
- Student academic awards

Submission of the annual report to the Provost Office will be reinstated for academic year 2015-2016. New forms have been received for this purpose. The gap in annual reporting was largely due to transition in Program leadership and significant changes in course directorship. Now that these leadership changes are in place, accurate annual reporting can recommence.

CRITERION 1. PROGRAM GOALS

The unit should have stated learning goals for each program and demonstrate how the goals align with the vision and mission of the unit and of the university. (Differentiate by program where appropriate.)

1A. Vision and Mission

Provide a brief overview of the vision and mission of the unit and how each program fits into the vision and mission of the unit.

University of New Mexico Biochemistry Undergraduate Program Goals

The Baccalaureate Program in Biochemistry at UNM provides students with a solid foundation in basic biochemical principles and provides them with opportunities to apply these principles to understand pathologic processes. The Baccalaureate Degree in Biochemistry prepares students for success in graduate or professional school in the biomedical sciences and/or employment in biotechnology or pharmaceutical industries. Students are provided with opportunities to learn fundamental biochemical principles and apply these principles to real-life situations via a variety of active pedagogies in their courses (e.g., small-group discussion, problem-based or case-based learning, and/or authentic research). The undergraduate program in Biochemistry seeks to develop students with skills in problem-solving, critical thinking, and communication that are necessary for successful scientific careers.

Two degree tracks are currently offered by the Department which include Bachelor of Science (B.S.) and Bachelor of Arts (B.A.). The majority of students matriculating in the biochemistry program select the B.S. option. The difference between the two degree tracks is minimal with the B.S. requiring the Laboratory Methods course (Bioc 448L), whereas this course is optional for the B.A. degree. Because of the national STEM agenda encouraging greater exposure for students to experiential laboratory work, the faculty of the Department are currently considering the option of eliminating the B.A. degree track. This action is also supported by the significant shift in enrollment from the B.A. track to the B.S. option.

Department Mission Statement
The mission of the Department of Biochemistry and Molecular Biology is to be a center of academic excellence that creates and imparts knowledge of the biochemical and molecular bases of disease

through individual and collaborative multidisciplinary and translational research; undergraduate, graduate, postgraduate, and medical education; and the training of basic and clinical research scientists and the junior faculty. To fulfill this mission, the Department strives to:

- Conduct individual and collaborative basic / translational science research into the biochemical and molecular bases of disease, particularly diseases affecting New Mexico's tri-ethnic population
- Provide a dynamic environment that develops critical thinking, technical skills, and intellectual independence in our undergraduate, graduate, medical, and postgraduate students
- Make research a fundamental part of the educational experience for all of our students, especially students from underrepresented populations
- Attract and retain high caliber and diverse faculty and staff
- Provide the culture, environment, and state-of-the-art resources for faculty, staff, and students to achieve their full potential

1B. Relationship of the BMB's Vision and Mission to UNM's Vision and Mission.

Describe the relationship of the unit's vision and mission to UNM's vision and mission.

BMB's vision, mission and core values are in excellent alignment with the mission and goals of the University of New Mexico (https://www.unm.edu/welcome/mission.html) and School of Medicine (http://hsc.unm.edu/about/mission.shtml). Examples include the goals of:

- Educating and encouraging students to develop the skills they need to contribute to the state and national economies
- Discovering and disseminating new knowledge and creative endeavors.
- Demonstrating and growing excellence in teaching and research.
- Fostering innovation, discovery and creativity; and translating our research and discoveries into clinical or educational practice.
- Building the workforce of New Mexico by providing a premier education and transformative experience that prepares students to excel in the workplace.
- Nurturing and embracing an environment of diversity, integrity and transparency

1C. Student Learning Outcomes (SLO) for BMB undergraduate program

List the overall learning goals for each undergraduate and/or graduate program within the unit.

The UNM Biochemistry Program has adopted the American Society for Biochemistry and Molecular Biology (ASBMB) guidelines for undergraduate Biochemistry programs, as guiding principles for the following learning goals. These objectives, as defined by the ASBMB, are grouped in terms of Skills and Core Concept Content Knowledge. We have taken these objectives and configured them into six program goals that address and align with the ASBMB core concepts and skills. These student learning outcomes are expected for all Biochemistry majors, including both B.S. and B.A. tracks.

Goal 1: Graduates demonstrate personal communication and team-building skills.

Student will be able to:

1A) Develop a hypothesis, and design and conduct appropriate experiments to test that hypothesis, explaining the basis of the proposed experiments, and discussing potential results in the context of the hypothesis

1B) Analyze and interpret data using appropriate quantitative modeling and simulation tools

1C) Access, assess, and use available information

1D) Present scientific data in an appropriate context and in a variety of ways, at different levels

1E) Recognize and take advantage of opportunities for interdisciplinary collaboration

1F) Appreciate and promote the ethical dimensions of science

1G) Work safely alone and in an effective team in a variety of laboratory settings

1H) Work in an effective team

1I) Practice critical self-reflection in order to progress as a scientist and as a life-long learner

Goal 2: Graduates can explain how energy is required by and is transformed in biological systems

Student will be able to:

2A) Apply knowledge of basic chemical thermodynamics to biologically catalyzed systems

2B) Relate the laws of thermodynamics to homeostasis and explain how a cell or organism maintains homeostasis (a system seemingly in equilibrium) using nonequilibrium mechanisms

2C) Quantitatively model how these reactions occur, and calculate kinetic parameters from experimental data

2D) Discuss the concept of Gibbs free energy, and apply it to chemical transformations

2E) Identify which steps of metabolic pathways are exergonic and which are endergonic and relate the energetics of the reactions to each other

2F) Show how reactions that proceed with large negative changes in free energy can be used to render other biochemical processes more favorable

2G) Describe homeostasis at the level of the cell, organism, or system of organisms and hypothesize how the system would react to deviations from homeostasis

2H) Summarize the different levels of control (including reaction compartmentalization, gene expression, covalent modification of key enzymes, allosteric regulation of key enzymes, substrate availability, and proteolytic cleavage), and relate these different levels of control to homeostasis

Goal 3: Graduates can identify and explain the relationship between macromolecular structure with function and regulation

Student will be able to:

3A) Discuss the diversity and complexity of various biologically relevant macromolecules and macromolecular assemblies in terms of the basic repeating units of the polymer and the types of linkages between them

3B) Outline the chemical and physical relationships between sequence and structure of macromolecules and evaluate chemical and energetic contributions to the appropriate levels of structure of the macromolecule

3C) Predict the effects of specific alterations of structure on the dynamic properties of the molecule

3D) Predict the determinants of specificity and affinity of a macromolecule-ligand complex

3E) Compare and contrast the potential ways in which the function of a macromolecule might be altered, including examples of allosteric regulation, covalent regulation, and gene level alterations of macromolecular structure/function.

Goal 4: Graduates understand that information storage and flow are dynamic and interactive

Student will be able to:

4A) Define what a genome consists of, and how the information in the various genes and other sequence classes within each genome are used to store and express genetic information

4B) Explain the central dogma of biology (the message in DNA is transcribed into RNA and translated into protein) and relate the commonality of the process to all of life

4C) Diagram how DNA is replicated and genes are transmitted from one generation to the next in multiple types of organisms including bacteria, eukaryotes, viruses, and retroviruses

4D) Describe how the cell insures high fidelity DNA replication and identify instances where the cell employs mechanisms for damage repair

Goal 5: Graduates appreciate that scientific discovery requires objective measurement, quantitative analysis, and clear communication

Student will be able to:

5A) Develop a hypothesis, and design and conduct appropriate experiments to test that hypothesis, explaining the basis of the proposed experiments and discussing potential results in the context of the hypothesis

5B) Analyze and interpret data using appropriate quantitative modeling and simulation tools

5C) Access, assess, and use available information

5D) Present scientific data in an appropriate context and in a variety of ways, at different levels

Goal 6: Graduates will understand the role of biochemistry in evolution

Student will be able to:

6A) Describe the principles of evolution through natural selection as foundational to biochemistry and molecular biology, and defend these principles in their work, schools, and communities

6B) Use the tools of biochemistry and molecular biology (including databases of biological molecules and functional assays) to explain changes in traits, adaptations, and the success or failure of organisms and species

6C) Analyze pre-existing or novel data and relate the findings in light of the theory of evolution

6D) Describe what a mutation is at the molecular level and how it comes about

6E) Predict how changes in a nucleotide sequence can influence the expression of a gene or the amino acid sequence of the gene product (protein) and translate these findings into a conclusion about how said mutation would impact the general fitness of an organism or population

1D. Communication of learning objectives to students and specific examples

Explain the manner in which learning goals are communicated to students and provide specific examples.

Learning goals and expected outcomes are explicitly presented in course syllabi along with an explanation of how outcomes will be measured during the course (explicit assessment criteria); in addition outcomes and their measurements are discussed with students numerous times during the course.

However, at this time not all instructors have fully mastered matching and aligning assignments and student practices to achieve student learning goals.

A specific example is provided (*in Criterion 1D* ***Appendix,*** *"445-2015 Syllabus"*).

1E. Primary constituents and stakeholders

Describe the unit's primary constituents and stakeholders.

The constituents for the Biochemistry Program are a top-ranking group (as defined by GPA and recipients of University Awards) of undergraduate students in the Arts & Sciences who wish to pursue a degree that bridges the disciplines of biology and chemistry. Entrance into the Biochemistry Program requires students to achieve minimum grade standards in the lower division biology and chemistry core courses before being admitted to our Program. Our Program is highly desirable to students because of our location in the School of Medicine and with our emphasis on medical biochemistry, this being the integration of fundamental biochemistry with the dysfunction that occurs in human disease states. A significant portion of the Biochemistry Undergraduate Program graduates (19%) continues to our School of Medicine. The majority of our students are interested in pursuing post-graduate studies in the health sciences, which includes graduate, medical, dental, and pharmacy programs. Because of this, we have adapted our Program objectives to meet student career goals.

The primary stakeholders are the School of Medicine, the College of Arts & Sciences, and the State of New Mexico. The Biochemistry Program is a model of collaboration between the University of New Mexico School of Medicine and the College of Arts & Sciences. Administration of the program has been a responsibility of the School of Medicine for the past 30 years. The program is supported and highly praised by Dr. Paul Roth, the Dean of the School of Medicine and Chancellor of the Health Sciences Center. He has demonstrated his commitment to the program by providing i) compensation for the faculty FTE committed to the administration and instruction of the undergraduate Biochemistry Major, ii) office and research laboratory space for the faculty, and iii) financial resources used to support basic programmatic operational activities (office and laboratory teaching supplies, instruments for the teaching laboratory course, TA support, etc.). In FY2015, a new laboratory space was dedicated for the Bioc 448L course; the School of Medicine also provided the financial support for the remodeling. The College of Arts & Sciences has the B.A. and B.S. degrees granting authority. The College has supported the program by providing i) student advisement, ii) the pre-requisite courses for biochemistry

majors, and iii) classroom facilities for most courses.

Significantly more resources (e.g., additional faculty, space, and student advising) will be required to sustain the excellence in the program. The number of Biochemistry Bachelors degree awarded has increased substantially. It has doubled over past 6 years, from 26 recipients in 2008 to 52 in 2014. This rapid growth of the Biochemistry Program will entail additional and greater communication and cooperation between the School of Medicine and the College of Arts and Sciences in the future.

1F. Examples of how satisfaction of the program goals serves constituents.

Provide examples of how satisfaction of the program goals serves constituents.

Successful advancement of student career objectives include entrance to graduate, medical, and other professional programs. See "where have students gone" below for specific examples (section 4F).

1G. Examples of outreach or community activities

Provide examples of outreach or community activities (local, regional, national, and/or international) offered by the unit. These could include activities such as colloquia, conferences, speaker series, performances, community service projects, etc. Provide an assessment of these activities in relation to the unit's educational objectives.

- BMB Annual Research Day – faculty from SOM and College of Pharmacy, and Departments of Biology, Chemistry, and Chemical Engineering are invited to our research day presentations. In addition, we are often joined by faculty from Lovelace Respiratory Research Institute and Sandia National Laboratories.
- Cellular and Molecular Basis of Disease weekly seminar series – This seminar is sponsored by SOM Departments and invites nationally recognized speakers specializing in biomedical research. This series provides opportunities for students to learn and discuss recent scientific discoveries of special interest to both the basic sciences and medical therapies.
- Weekly Departmental journal club meetings – Departmental faculty and graduate students are required to attend these weekly meetings. Undergraduates, especially those engaged in Honors Research, are encouraged to attend when their course schedule permits. This opportunity provides students with exposure to faculty research currently being pursued in the Department.
- Participation in the IDeA Network of Biomedical Research Excellence (INBRE) – the INBRE offers periodic seminar opportunities for students to learn of local and regional science projects, as well as networking with fellow students both at UNM and NMSU.
- Participation in local, regional and state science fairs, and providing research experiences for high school students.

Criterion 2. Teaching and Learning: Curriculum

The unit should demonstrate the relevance and impact of the curriculum associated with each program. (Differentiate by program where appropriate.)

2A. Description of curricula for each program

Provide a detailed description of curricula for each program within the unit. Include a description of the general education component, required and program-specific components for both the undergraduate and graduate programs. Provide a brief justification for any programs within the unit that require over 120 credit hours for completion.

Program Description

Biochemistry is an Undergraduate Major in the College of Arts & Sciences, founded and administered by the Department of Biochemistry and Molecular Biology since 1984. The Department is located within the Health Sciences Center, School of Medicine, which is within walking distance of the main campus. The curricula leading to the Bachelor's degree in Biochemistry is consistent with current national recommendations for education practices for the 21st century. The national recommendations have been compiled and published by the Partnership for Undergraduate Life Science Education (PULSE Vision and Change (http://www.pulsecommunity.org/) and (http://www.pulsecommunity.org/page/v-c-certification) and American Society for Biochemistry and Molecular Biology (ASBMB, http://www.asbmb.org/teachbmb/). The academic year for the Biochemistry Program is divided into Fall and Spring semesters.

Curricular Overview

Successful completion of the core courses with minimum grades shown in the table below is required of both B.S. and B.A. students. Students must successfully complete the one year sequence of Organic Chemistry courses (Chem 301 and 302) before they can register for their first Biochemistry course (Bioc 445). Students are advised to begin the series of Biochemistry courses during their Junior year.

Students majoring in Biochemistry are required to seek academic advisement from the College of Arts & Sciences and the Department early in their college experience. To complete degree requirements within 4 years, Biochemistry majors are advised to take a minimum of two science or math courses each semester.

Major Study Requirements

The Department of Biochemistry and Molecular Biology at the School of Medicine is responsible for teaching biochemistry courses and for administering the Biochemistry major in Arts and Sciences. It is expected that students spend at least three semesters (not including summer) completing required biochemistry courses. Two degree tracks are currently available for Biochemistry Majors, Bachelor of Arts and Bachelor of Science. The majority of students (typically >85% as determined from the past three years) elect to complete the requirements for a Bachelor of Science degree. The difference between the two degree tracks is minimal with the B.S. requiring the Laboratory Methods course (Bioc 448L), whereas this course is optional for the B.A. degree. The prescribed curricular plan is shown in the table below.

Bachelor of Arts in Biochemistry

Bachelor of Arts in Biochemistry Required Core Courses

- Calculus 1 & 2 - MATH 162–163 (or 180-181)
- Physics 1 & 2 with laboratory - PHYC 151–151L, 152–152L (or 160–160L, 161–161L, 262)
- Genetics & Cell Biology - BIOL 201L–202

- General Chemistry with laboratory - CHEM 131 and 123L (or 121 and 123L); 132 and 124L (or 122 and 124L);
- Quantitative Analysis – CHEM 253L;
- Organic Chemistry with laboratory - CHEM **301–**302; 303L–304L;
- Physical Chemistry - CHEM **315 (or **311–**312)
- Intensive Biochemistry 1 & 2 - BIOC 445L–446L

In addition to the core courses, the B.A. requires: BIOC 448L OR 3 credit hours from an approved advanced course in Biochemistry (BIOC 463 or 464) or a related discipline; six credit hours from approved elective Biochemistry courses above the 400 level to a minimum of a total of 62 credit hours. BIOC 497, 498, and 499 may not be applied to elective requirements. No minor study is required.

Bachelor of Science in Biochemistry

In addition to the core courses required for the B.A. degree, the B.S. degree also requires:
Biochemical Methods - BIOC 448L;
Physical Chemistry - CHEM **311–**312 or CHEM **315 (or CHEM **311) and BIOC 451L;

Six credit hours of electives must be selected from approved elective Biochemistry courses above the 400 level. Note: Calculus 3 (MATH 264) is a required co-requisite for the full year sequence in Physical Chemistry (CHEM 311–312), but not for CHEM 315. BIOC 497, 498, and 499 may not be applied to elective requirements. The total credit hours of approved courses required for the B.S. degree is 65. No minor study is required.

Note: In the past, Physical Biochemistry (Bioc 451) was a required course for the B.S. degree; however, due to retirement of a qualified faculty member from the Department who taught this course in previous years, this course is on permanent hold. As a substitution, students are permitted to select from advanced science courses above the 400 level. These substitutions must be selected from the list of faculty approved courses offered by the Departments of Biology, Chemistry, Mathematics, Biomedical Sciences Graduate Program, and College of Pharmacy (see Criterion 2A ***Appendix*** "Faculty Approved Electives"). Because the approved elective courses are controlled by other Departments, timing of when these courses are offered can be a challenge for biochemistry majors when planning their time to graduation. Some courses are offered every two years, while others are offered only when a minimum number of students enroll. For this reason, we have chosen to broaden the list of courses to provide greater options for our students. Also, each of these courses has their own pre-requisite courses. Informal agreements have been reached with faculty instructors in other Departments to allow our students to substitute Intensive Biochemistry courses (Bioc 445 or 446) for some of these pre-requisites. However, formal agreements from the Chairs of these Departments need to be secured in the future. No minor course of study is required for the Biochemistry Major, but students often complete a minor in Chemistry.

2014-15 Degree Plan Biochemistry,
College of Arts & Sciences: Department of Biochemistry (4 Year Plan)

Term 1 Hours Towards Degree: 17	Hours	Minimum Grade
ENGL 110: Accelerated Composition or ENGL 111: Composition I and ENGL 112: Composition II or ENGL 113: Enhanced Composition	3	C
Freshman Academic Choice	3	D-
Math 162: Calculus I	4	C
Chem 121: General Chemistry I	3	C
Chem 123L: General Chemistry I Lab	1	C

Second Language		3	C
	Term Hours:	17	
Term 2 Hours Towards Degree: 35		**Hours**	**Minimum Grade**
ENGL 120: Composition III		3	C
CHEM 122: General Chemistry II		3	C
CHEM 124L: General Chemistry II Lab		1	C
BIOL 201: Molecular and Cell Biology		4	C
MATH 163: Calculus II		4	C
PHYC 151 or PHYC 160: General Physics I		3	C
	Term Hours:	18	
Term 3 Hours Towards Degree: 51		**Hours**	**Minimum Grade**
BIOL 202: Genetics		4	C
CHEM 253L: Quantitative Analysis		4	C
CHEM 301: Organic Chemistry I		3	C
CHEM 303L: Organic Chemistry I Lab		1	C
PHYC 151L or PHYC 161L: General Physics I Laboratory		1	C
CJ 130 or PHIL 156 or ENGL 219 or ENGL 220		3	C
	Term Hours:	16	
Term 4 Hours Towards Degree: 68		**Hours**	**Minimum Grade**
PHYC 152 or PHYC 161: General Physics		3	C
PHYC 152L or PHYC 161L: General Physics Laboratory		1	C
CHEM 302: Organic Chemistry II		3	C
CHEM 304L: Organic Chemistry II Lab		1	C
Fine Arts		3	C
Humanities		3	C
Upper Division Elective		3	D-
	Term Hours:	17	
Term 5 Hours Towards Degree: 85		**Hours**	**Minimum Grade**
* BIOC 445: Intensive Introductory Biochemistry I		4	C
CHEM 315: Introductory Physical Chemistry or CHEM 311: Physical Chemistry		4	C
Social and Behavioral Science		6	C
Upper Division Elective		3	D-
	Term Hours:	17	
Term 6 Hours Towards Degree: 102		**Hours**	**Minimum Grade**
* BIOC 446: Intensive Introductory Biochemistry II		4	C
* BIOC 448L: Biochemical Methods (req for B.S. degree only)		3	C
BIOC 451 OR CHEM 312: Physical Chemistry		4	C
Humanities		3	C
Upper Division Elective		3	D-
	Term Hours:	17	
Term 7 Hours Towards Degree: 115		**Hours**	**Minimum Grade**
** BIOC Upper Division Elective (Bioc 463, 464, or 465)		3	C
** BIOC 497: Senior Honors Research OR BIOC 498: Senior		3	C
Upper Division Elective		3	D-

Elective any level		3	D-
Elective any level		1	D-
Term Hours:	Term Hours:	13	

Term 8 Hours Towards Degree: 128	**Hours**	**Minimum Grade**
** BIOC Upper Division Elective (Bioc 463, 464, or 465)	3	C
** BIOC 499: Undergraduate Research	3	C
*** Upper Division Elective	3	D-
Elective any level	3	D-
Elective any level	1	D-
Term Hours:	13	

** Biochemistry core course*
*** Biochemistry elective*
**** Upper division electives must be chosen from Department faculty approved course list (see Criterion 2A **Appendix**, "Faculty Approved Electives")*

The total number of credit hours offered by our Biochemistry Program is shown in the table below.

Bioc course	**Credit hours**
*445	4
*446	4
*448L	3
*463	3
464	3
*451	4
497	3
498	3
499	1-3
Minimum credits required for a B.S. degree in Biochemistry (courses indicated by *)	**18**
Total credit hours offered by Bioc courses	**28-30**

The total number of credit hours taken by our most recent 117 graduates of the Biochemistry Program is shown in the table below. These data were obtained by a transcript analysis provided by the College of Arts & Sciences advisement team.

Total BIOC hours:	**11**	**14**	**15**	**17**	**18**	**21**	**24**
Number of Students:	**3**	**17**	**5**	**11**	**34**	**46**	**1**

These data show that the majority of Biochemistry Majors are taking full advantage of our course offerings. Most of our graduates exceed the minimum credit hour requirement for the B.S. degree.

Experiential learning – As an ASBMB-accredited Program we require students to engage in a cumulative total of 400 or more contact hours of direct, hands-on laboratory experience in Science, Technology, Engineering, Math (STEM) areas over the course of the degree program (see table below). It is recommended by the ASBMB that at least one of these experiences be research/inquiry-based. Attention is devoted to the topic of laboratory safety, including the recognition of common laboratory hazards, responsible laboratory practices, and methods and equipment used for the prevention of, protection from, and response to incidents involving potential hazards. The principles of ethical conduct of research and scholarship, including plagiarism and appropriate citation, qualifications for authorship, appropriate application of image and data manipulation techniques, confidentiality, etc., are also addressed.

Required Laboratory Courses	
General Chemistry 1 Laboratory (Chem 123L)	3 hr/week (45 hr semester total)
General Chemistry 2 Laboratory (Chem 124L)	3 hr/week (45 hr semester total)
Organic Chemistry 1 Laboratory (Chem 303L)	3 hr/week (45 hr semester total)
Organic Chemistry 2 Laboratory (Chem 304L)	3 hr/week (45 hr semester total)
Physics 1 Laboratory (Phys 151L)	3 hr/week (45 hr semester total)
Physics 2 Laboratory (Phys 152L)	3 hr/week (45 hr semester total)
Quantitative Analysis (Chem 253L)	4 hr/week (60 hr semester total)
*Biochemical Methods (Bioc 448L)	4 hr/week (60 hr semester total)
	390 hrs total requirement
Elective Laboratory Courses	
Histology (Biol 416L)	3 hr/week (45 hr semester total)
Laboratory Methods in Molec Biol (Biol 446)	5 hr/week (60 hr semester total)
Parasitology (Biol 482L)	3 hr/week (45 hr semester total)
	150 hrs total electives

* *Required for B.S. degree in Biochemistry; optional for B.A. degree*

Honors in Research - Students who wish to earn the Bachelor of Science Degree with Honors must allocate at least two semesters (in Bioc 497 and 498) to complete a significant research project. Most students who elect to do research have been co-authors on peer-reviewed publications, which include scientific articles and book chapters. In additional to carrying out their research requirements in laboratories of Departmental Faculty, Biochemistry majors are also permitted to conduct research in laboratories of other School of Medicine, College of Pharmacy, Biology and Chemistry Departments faculty members, which provides breadth and depth to their research opportunities.

One of the most important missions of the Department of Biochemistry and Molecular Biology is to provide a research experience for Majors in Biochemistry. Students are eligible to receive Departmental Honors at graduation if they complete a research project under the supervision of a mentor in addition to other requirements. Upon completion of the Honors requirements, a progress report in 497 and a thesis and a thesis defense in 498, a student will receive cum laude, magna cum laude, or summa cum laude honors in Biochemistry depending on the quality and presentation of their research work and thesis.

The Department also offers Bioc 499 for those students who wish to explore biochemical and biomedical research without the rigors of the Honors Research requirements. Like the Honors Program, this course requires a student to identify a research mentor and actively participate in research protocols. Many of these students transition into the Honors Research Program after experiencing a less formal research opportunity. We have been very successful over the past 5 years in recruiting students into undergraduate research as seen in the matriculation data in the following table.

Number of Biochemistry Students Participating in Laboratory Research

	2010	2011	2012	2013	2014
Honor Students (Bioc 497/498)	4	10	6	8	8
Undergraduate Research (Bioc 499)	2	1	4	7	9
Total:	6	11	10	15	17

In the previous 10 years, the average number of Research Honors students was 7/year.

For each hour of credit, the student is expected to spend 3 to 4 hours per week in the laboratory. The student is required to meet, at minimum, once a week with the research mentor to discuss their progress. At the end of the semester, the student must submit a written progress report to the Research Mentor and provide a copy to the Program Director. This progress report, as well as the quality and quantity of the effort in the laboratory, is used to assign a grade.

If the student is qualifying for Departmental Honors at graduation, he/she must complete 3 credit hours in both Bioc 497 and Bioc 498, and present their research to the faculty of the Department of Biochemistry and Molecular Biology at the annual Research Day in April (or during the departmental Journal Club, if the student is graduating in December). A written thesis of the work must also be submitted by the student to the mentor and the faculty for review.

Honors Research Requirements

- GPA of ≥ 3.2 at the completion of course work
- Presentation of research at the Departmental Research Day
- Submission of senior honors thesis
- Completion of 6 hours of research credit (Bioc 497 and Bioc 498)

Students usually start their research experience at the end of the second year of course work. However, interested students may begin earlier depending on their interest and the availability of research mentors.

Loftfield Award for Undergraduate Research
Students who qualify for honors are eligible to receive one of the Robert B. Loftfield Awards that are presented to senior students for outstanding academic or research performance. These awards are named for Professor Emeritus Robert B. Loftfield, the founding Chairperson of the Biochemistry Department, and are presented at the Department commencement ceremony.

Communication skills – Oral and written communication skills represent important elements in preparing students for long-term professional success. To meet this objective, the Biochemistry Program offers students training in written and electronic communication practices, including:

- Reading and consistently adhering to standard laboratory operating procedures – practiced in Biochemical Methods (Bioc 448L)
- Maintaining complete and accurate records, including laboratory notebooks – practiced in Biochemical Methods (Bioc 448L)
- Preparing complete and informative laboratory reports – practiced in Biochemical Methods (Bioc 448L)
- Preparing manuscripts and presenting scientific posters to disseminate research accomplishments – practiced in Biochemistry of Disease (Bioc 463 and 464), and Undergraduate Research (Bioc 497, 498, and 499)
- Participation in team-based projects and classroom discussion sessions – practiced in Intensive Biochemistry 1 & 2 (Bioc 445 and 446)

Other potential activities include preparing research proposals or grant applications, writing intensive projects, constructing or contributing to web pages or blogs, etc.

Core Biochemistry course-specific details

445. Intensive Introductory Biochemistry I. (4 credits; Fall semester)
An introduction into the physical and chemical properties of proteins and enzymes; enzyme catalysis; structure, synthesis and processing of nucleic acids and proteins.

446. Intensive Introductory Biochemistry II. (4 credits; Spring semester)
An introduction to intermediary metabolism and hormonal control of catabolic and anabolic pathways.

Intensive Biochemistry 1 (Bioc 445) and Intensive Biochemistry 2 (446) incorporate both lecture and inquiry-based components and are taught in a studio classroom designed for collaborative learning that includes case-based learning and peer instruction. The primary emphasis is placed on the scientific method (hypothesize, investigate, evaluate, integrate, and reflect). Students are expected to solve scientific problems in biochemistry and molecular biology at different levels of complexity by:

- Applying concepts, facts and algorithmic approaches to solve simple illustrative biochemical problems (one-step problem solving).
- Addressing important problems and questions in the health sciences that require a deeper understanding of biochemical principles and concepts, and employ quantitative reasoning and knowledge of experimental techniques (two-step problem solving).
- Designing experimental approaches to solve complex real-world biochemical problems both as individuals and as teams (multi-step problem solving).

448L. Biochemical Methods. (3 credits; Spring semester)
Biochemical techniques including, but not limited to, bio-computational analysis of protein and DNA sequences and functional motifs/domains, protein salting out, chromatographic purification of enzymes, determination of enzyme parameters (Vmax, Km), and analysis of DNA using recombinant DNA techniques.

463. Biochemistry of Disease I. (3 credits; Fall semester) and
464. Biochemistry of Disease II. (3 credits; Spring semester)
Five three-week topics, each designed to develop some basic concepts of biochemistry, cell and molecular biology in the context of health and disease states. Biochemistry of Disease incorporates both lecture and small group study components, and may have physician lecturers sharing their expertise.

465. Biochemistry Education. (3 credits; Fall and Spring semesters)
Seminars and readings in current methods of Biochemistry education. The course includes a practical experience in Biochemistry education techniques and practices. Biochemical Education incorporates small group discussion/inquiry to develop and implement education research proposals.

497. Senior Honors Research. (1-3 credits; Summer and Fall semesters)
498. Senior Honors Research. (1-3 credits; Spring semester)
Senior thesis based on independent research mentored by UNM professors and UNM-affiliated principal investigators in the national laboratories and Lovelace Respiratory Research Institute.

Biochemistry Core Course Schedules, Course Directors, and Course Capacities

All Biochemistry courses and Electives
are offered on a Fall or Spring semester (16 week) schedule.

Fall semester	Course	Course Director	Capacity
Bioc 445	Intensive Biochemistry I	M. Rosenberg M.Osgood	126
Bioc 463	Biochemistry of Disease I	A. Hu	50
Bioc 465	Biochemistry Education	R. Orlando	5
Bioc 497	Senior Honors Research	A. Hu	Unlimited
Bioc 499	Undergraduate Research	A. Hu	Unlimited
*Bioc 423	Introductory Biochemistry	M. Rosenberg	30
*Bioc 423	Introductory Biochemistry	R. Orlando	160
Spring semester			
Bioc 446	Intensive Biochemistry II	M.Osgood	126
Bioc 448L	Biochemical Methods	A. Hu	32
Bioc 464	Biochemistry of Disease II	M. Rosenberg	50
Bioc 465	Biochemistry Education	R. Orlando	5
Bioc 498	Senior Honors Research	A. Hu	Unlimited
Bioc 499	Undergraduate Research	A. Hu	Unlimited
*Bioc 423	Introductory Biochemistry	M. Rosenberg	30
*Bioc 423	Introductory Biochemistry	R. Orlando	160

Note: **Bioc 423 is for non-Biochemistry majors and fulfills admission pre-requisites for graduate, medical, pharmacy, dental schools, and the UNM Nutrition Program.*

2B. Contributions of the unit to other internal units within UNM

Describe the contributions of the unit to other internal units within UNM, such as offering general education core courses for undergraduate students, common courses for selected graduate programs, courses that fulfill pre-requisites of other programs, cross-listed courses.

In addition to the Biochemistry Major, the Department also administers 2 sections per semester of Introductory Biochemistry for non-majors (BIOC 423). One section is primarily dedicated to the BA/MD Program, while the other is open to all other majors in the University. This course satisfies pre-requisite needs for admission into the UNM medical school, out of state medical and dental schools, UNM pharmacy programs, and most recently the UNM Nutrition Program. BIOC 423 is also now serving as a substitution course for Quantitative Analysis for Chemistry minors. This substitution was implemented beginning Spring 2015 to relieve the strain of heavy enrollment issues for the Quantitative Analysis laboratory course. Typical enrollment for Bioc 423 sections range from 30-40 students for the non-lecture based section and 150-160 students for the lecture based section.

The Bioc 445 and 446 Intensive Biochemistry core courses are also cross listed in the catalog as Bioc 545 and 546 (BSGP 511/512). This allows for graduate level credit for graduate students in the Biomedical Sciences Graduate Program, as well as students in Chemistry and Engineering and Clinical Laboratory Sciences.

2C. Modes of delivery used for teaching courses

Describe the modes of delivery used for teaching courses.

Most courses in the Biochemistry and Molecular Biology Program are administered using main campus classroom facilities, while more advanced courses and senior research are conducted in two modern, well equipped research buildings in the Medical School complex. Biochemistry and Molecular Biology education is a comprehensive program that capitalizes on a variety of instructional methods including both lecture and small learning communities. The program strives to make research-based and inquiry-based learning the normal learning mode and encourages all students to become involved in research and teaching opportunities available within the Department. Each spring there is a capstone experience for students at the annual Departmental Research Retreat where students present the results of their individual research projects.

Intensive Biochemistry I (Bioc 445) and Intensive Biochemistry II (Bioc 446)
Case studies are utilized each week that focus on mastering the skills in biochemical problem solving and critical reasoning at different levels. In this case-based approach to learning, students are expected to:

- Use background information in the textbook and lectures in order to read and comprehend the primary literature in biochemistry and molecular biology, including the identification of the specific steps in the scientific method that the authors have employed to answer an important question.
- Identify the most appropriate scientific question, select a proper method/technique to solve a specific biochemical problem, and explain their reasoning (critical thinking and analytical problem solving).
- Identify challenges and limitations in research approaches and devise improvements.
- Apply biochemical processes to other disciplines and to world issues.
- Work and communicate effectively in a group, orally and in writing, about biochemistry.

Both Bioc 445 and 446 are based on individual preparation, active learning, and small group work. Before-class preparation (assigned reading, testing by short, in-class quizzes) is routine. There are relatively few lectures and substantial in-class and out-of-class group work focused on scientific inquiry to identify solutions to biochemical problems. The small group cooperative learning format is used for students to construct and evaluate scientific knowledge (i.e., engage in the scientific process). Benefits of this pedagogical approach include:

- Implementation of case-based problem solving exercises to promote quantitative reasoning skills. Exercises to promote self-reflection of learning and identifying knowledge gaps.
- "Quiz-based learning" – Students read materials prior to attending class; once in class, students complete an individual quiz, then peer-grade them and discuss the questions. The quizzes are then followed by mini-lectures and group problem sets that extend knowledge to the cognitive levels of application, synthesis, and integration.
- Group discussion of primary literature and evaluation of data.
- Hypothesis development, selecting a proper method/technique to solve a specific biochemical problem, and provide reasoning.
- Group work to identify challenges and limitations in research approaches and devise improvements.

Biochemical Methods Laboratory Course (Bioc 448L)
The Methods course incorporates lecture, inquiry-based exercises, small group discussion/study, and experiential laboratory procedures.

- Students work individually or in pairs to maximize experiential learning of biochemical methods.

- Afternoon class session prior to laboratory exercise focuses on protocol development and interpretation, as well as group discussions on methods choice and possible improvements.
- Students interpret and graph their data individually, then compare and discuss their results in groups to identify sources of error and ways to improve accuracy.
- Students practice a problem-based approach to protein/isoform identification using NCBI protein database information.
- Group study and discussion of primary literature on the enzyme they are responsible for purifying and measuring activity to fully understand biologic function.

Biochemistry of Disease I and II (Bioc 463 and 464)
Each course consists of five three-week topics that address the use of biochemistry in modern research and how aberrant biochemical reactions or regulation can lead to disease states. Individual topic experts serve as instructors and are at liberty to choose their method of instruction. Typically both lecture and small group study activities are incorporated into these courses.

Biochemistry Education (Bioc 465)
This course is tailored to individual student needs and requires a practical experience in Biochemistry education techniques. Instructors work one-on-one with student trainees. Students design lecture or small group activities, implement these in core courses, and develop methods to assess outcomes for quantitative feedback. Readings are also expected to educate students on current pedagogical methods, as well as current problems in education research.

Criterion 3. Teaching and Learning: Continuous Improvement

The unit should demonstrate that it assesses student learning and uses assessment to make program improvements. In this section, the unit should reference and provide evidence of the program's assessment plan(s) and annual program assessment records/reports. (Differentiate for each undergraduate and graduate degree/certificate program and concentration offered by the unit.)

3A. Assessment process and evaluation of learning goals

Describe the assessment process and evaluation of student learning outcomes for each program by addressing the questions below. • What skills, knowledge, and values are expected of all students at the completion of the program (refer to learning goals outlined in Criterion1)? • What are the student learning outcomes for the program? • How have the student learning outcomes been changed or improved? • How are the student learning outcomes clearly defined and measurable? • How are the student learning outcomes communicated to faculty and students? • What current direct and indirect assessment methods are used to evaluate the extent to which students are meeting the student learning outcomes? • How have the program's assessment methods been changed or improved?

Delivery of the biochemistry program is divided between Departments located within the School of Medicine (Department of Biochemistry and Molecular Biology) and College of Arts & Sciences (Departments of Biology and Chemistry). During the first two years of their education, biochemistry majors complete lower division course requirements offered by the Departments of Biology and Chemistry, along with core curricular requirements in University College. Once students have completed the fundamental pre-requisites, they are then formally admitted into the College of Arts & Sciences to begin the required courses for the biochemistry degree. This typically happens at the beginning of their third (junior) year; however, this can take longer than the prescribed two years

depending on how long students matriculate before committing to a declared major in biochemistry. Once students are admitted into the College of Arts & Sciences, they begin the sequence of courses needed to fulfill the degree plan for biochemistry and this is routinely completed in two years.

The majority of the program-level assessments are direct and course embedded and include content level exams and case studies graded with clearly defined rubrics. Assessment of student learning for the biochemistry degree is carried out by faculty within the Department of Biochemistry and Molecular Biology. Multiple types of assessment are used and are included at both the course- and program-levels. These are in place to 1) ensure consistency in education when instructors change, 2) as a check-and-balance measure when new pedagogical approaches are implemented into core courses, and 3) to measure improvement in student learning as a determinant of programmatic success. The assessment plan, which includes program goals and student learning outcomes, will be posted on the upcoming assessment learning webpage for SOM in Spring of 2016.

Assessment based on national standards provided by the Partnership for Undergraduate Life Science Education and the American Society for Biochemistry and Molecular Biology

Program-level assessment is vital to monitor the health of the biochemistry degree plan. Because of this, we have recently modified our programmatic assessment by adopting new national standards published by the Partnership for Undergraduate Life Science Education (PULSE; http://www.pulsecommunity.org/) and the American Society for Biochemistry and Molecular Biology (ASBMB; http://www.asbmb.org/accreditation/overview/). This change occurred in 2014. The PULSE has used the extensive peer-reviewed literature available on assessment best practices and developed a set of rubrics to guide assessment in undergraduate life sciences programs. The Department of Biochemistry Faculty voted in 2014 to adopt these guidelines for Course and Program-level assessment.

Prior to this change in 2014, the Department used ASBMB assessment guidelines published in 2003; however, these guidelines were largely focused on annual course-level assessment. The frequency of assessment varied by course, but always included at least 3 in-class exams, performance assessments, and/or writing assignments. All Biochemistry content-based student learning outcomes were, in addition, assessed by the American Chemical Society Biochemistry exit exam.

The following describes the variable measures that were administered to assess course and programmatic outcomes:

- Individual course assessments were administered according to the individual course syllabi
- the ACS exam was administered in a classroom, following the guidelines set by the American Chemical Society (2 hours, closed book)
- GPA information was obtained through UNM student records
- Research Honors designations were assessed by the BMB faculty as a group, based on evaluation of Research Honors written theses and student presentation of their work at the Biochemistry Research Symposium (Capstone Experience). Outside guests are invited to these presentations, but only the BMB faculty members evaluate the students for level of Honors awarded.
- Acceptance into graduate and professional programs, and university honors designation were self-reported by students through a required Graduating Biochemistry Majors Survey, which was sent to the students, and returned, via e-mail.

The new, improved national standards provided by PULSE and ASBMB for student learning goals will not only allow us to enhance our programmatic evaluation, but will also allow us to evaluate our program on a national level by comparing our student outcomes with those from biochemistry programs at other Universities. Since these standards are new, implementation in our program is in development.

In accordance with the ASBMB student learning outcome criteria, we have adopted six program

learning goals with associated student learning outcomes that are informed by the principles and core concepts provided by ASBMB. These learning goals, listed in criterion 1C, require that students demonstrate their proficiency in biochemistry through performance and behavioral examples. A student learning outcome matrix is provided in the table below which demonstrates how the Biochemistry core courses align with these learning goals and how assessment is made to ensure each goal is being met.

Specific Student Learning Outcomes Matrix

	Junior year		**Senior year**	
Student Learning Outcomes	**BIOC 445**	**BIOC 446**	**BIOC 448**	**Additional Program level Assessment**
Goal 1: Graduates demonstrate personal communication and team-building skills.				
1A	Question bank Final exam Case study	Question bank Final exam Case study	Notebook assessment	ASBMB program exit exam. Exit survey (semi structured) free response. We will add Likert-style questions that address goals 1-6.
1B	Question bank Final exam Case study	Question bank Final exam Case study	Notebook assessment Resource evaluation Data collection Statistical analysis of data	ASBMB program exit exam
1C	Question bank Final exam Case study	Question bank Final exam Case study	Resource evaluation	ASBMB program exit exam
1D			Notebook assessment Group presentations	ASBMB program exit exam
1E				ASBMB program exit exam
1F				ASBMB program exit exam
1G			Direct observation by instructors and teaching assistant Evaluation of data sharing	ASBMB program exit exam
1H	Question bank Final exam Case study		Direct observation by instructors and teaching assistant Evaluation of data sharing	ASBMB program exit exam
1I	Question bank Final exam Case study		Notebook assessment Data evaluation and interpretation	ASBMB program exit exam
Goal 2: Graduates can explain how energy is required by and is transformed in biological systems				
2A	Question bank Final exam Case study			ASBMB program exit exam
2B	Question bank Final exam Case study	Question bank Final exam Case study		ASBMB program exit exam
2C	Question bank		Notebook assessment	ASBMB program

	Final exam Case study		Data collection Statistical analysis of data	exit exam
2D	Question bank Final exam Case study			ASBMB program exit exam
2E		Question bank Final exam Case study		ASBMB program exit exam
2F	Question bank Final exam Case study	Question bank Final exam Case study		ASBMB program exit exam
2G	Question bank Final exam Case study	Question bank Final exam Case study		ASBMB program exit exam
2H	Question bank Final exam Case study	Question bank Final exam Case study		ASBMB program exit exam
Goal 3: Graduates can identify and explain the relationship between macromolecular structure with function and regulation				
3A	Question bank Final exam Case study			ASBMB program exit exam
3B	Question bank Final exam Case study		Online resource activity	ASBMB program exit exam
3C	Question bank Final exam Case study		Online resource activity	ASBMB program exit exam
3D		Question bank Final exam Case study		ASBMB program exit exam
3E	Question bank Final exam Case study	Question bank Final exam Case study	Online resource activity	ASBMB program exit exam
Goal 4: Graduates understand that information storage and flow are dynamic and interactive				
4A	Question bank Final exam Case study			ASBMB program exit exam
4B	Question bank Final exam Case study			ASBMB program exit exam
4C	Question bank Final exam Case study			ASBMB program exit exam
4D	Question bank Final exam Case study			ASBMB program exit exam
Goal 5: Graduates appreciate that scientific discovery requires objective measurement, quantitative analysis, and clear communication				
5A	Question bank Final exam Case study	Question bank Final exam Case study	Notebook assessment	ASBMB program exit exam
5B		Question bank	Notebook assessment	ASBMB program

		Final exam Case study	Resource evaluation Data collection Statistical analysis of data	exit exam
5C	Question bank Final exam Case study		Resource evaluation	ASBMB program exit exam
5D			Notebook assessment Group presentations	ASBMB program exit exam
Goal 6: Graduates will understand the role of biochemistry in evolution				
6A				ASBMB program exit exam
6B				ASBMB program exit exam
6C	Question bank Final exam Case study	Question bank Final exam Case study		ASBMB program exit exam
6D	Question bank Final exam Case study			ASBMB program exit exam
6E	Question bank Final exam Case study			ASBMB program exit exam

Note: *445/446 is a two semester sequence taught in similar structure, but different content*
Note*: BIOC 463 and 464 are not included in program level assessment due to number of faculty involved and the fact that instructors are on a rotation schedule.*

Gaps identified between course assessment methods and Student Learning Outcomes

Gaps are noted for both Bioc 445 and 446; however, the gaps are complimentary since this two-course, one-year sequence is designed to address the majority of goals when students successfully complete the entire sequence. Some gaps found for both 445 and 446 focus on experimental approaches and are expected to be addressed by the Biochemical Methods laboratory course (Bioc 448L). It is important to note that significant gaps are present for the Biochemical Methods laboratory course (Bioc 448L). The course directors for the core courses, together with the Chair, have begun discussing these gaps in order to identify a remedy. One of the biggest challenges to laboratory course curricular modifications that are needed to address these gaps is the lack of sufficient resources. Laboratory courses are highly resource intensive requiring extensive faculty hours, expensive reagents, and updating aging and heavily used equipment. In addition, space concerns are also noted by faculty. Although we are currently remodeling dedicated laboratory space for Bioc 448L, concerns have been raised if this space will be sufficient for the future with the substantial increase we have seen in the number of biochemistry majors.

Problem-based Learning – use and assessment criteria (Case studies in Bioc 445 and Bioc 446)

For seven years, faculty (Osgood and Anderson) in the Department of Biochemistry and Molecular Biology used interactive online Problem-Based Learning (PBL) case discussions in our large-enrollment 445 and 446 classes. We believed the use of online PBL-cases was a way to get small-group discussions into our large classes, to encourage students to use their basic biochemical knowledge in practical contextual situations, to develop the ability to integrate different pieces of their knowledge, and, most importantly, to practice and improve their problem-solving skills. We developed and iteratively revised simple rubrics for each case study that allowed us to quickly grade student contributions, and to provide targeted intervention, as appropriate, to groups and individual students. An example of case study rubrics used for assessment of student proficiency is provided in Criterion

3A.1 ***Appendix*** ("Example Rubric for Case Study"). These rubrics were developed by Department of Biochemistry and Molecular Biology faculty and modified annually for improvement based on the student performance results obtained over the last 10 years. The grading rubric allows the grader to assign a point value describing how close the student's contribution is to the solution of the problem. Grading rubrics have been developed by several faculty members and modified over time based on student contributions. The rubric in the Criterion 3A.1 ***Appendix*** is for the case "CSI-Albuquerque" (see case list below).

In the past three years, we have adapted these case studies for in-class use; because we are now able to teach in the Collaborative Teaching and Learning Building studio classroom, interactive pedagogies are more practical. The case studies are, in many cases, the same as before, and the rubrics are as well; however, now we are able to provide opportunities for face-to-face discussion for the students around the cases, while before, we had the students "talk" in on-line chat groups.

Case-study Student Learning Goals – Our overall learning goals for our students are for them to:

- Apply biochemical principles by working with the content in contextual situations
- Improve oral communication skills to optimize collaborative exchange of ideas
- Develop awareness and appreciation of the real-life applications of biochemistry
- Practice the higher order learning skills necessary for problem-solving
- Explore their individual strengths/weaknesses in addressing problems

Examples of PBL cases and the topics covered in each case are shown in the table below. The data provided in the cases can be altered from semester to semester, leading to different final solutions, while utilizing the same general opening presentation. Not all cases are used every year.

PBL-Case Titles	**Biochemistry Topics covered**
Where's the Beef	Characteristics of biomolecules, protein separation protocols
John's High Altitude Adventure	Hemoglobin, allosterism, ligand-binding curves
Terrorist Attack	Enzyme mechanisms, kinetics
Poisons in Paradise	Membrane transport, signal transduction
CSI-Albuquerque	Carbohydrate metabolism
Million Dollar Baby Yeast	Electron transport, bioenergetics, carbohydrate metabolism
Too Late for Julie	Nitrogen metabolism
Hike to Snakebite Mountain	Nucleotide metabolism
Designer Weed	Information pathways, Molecular techniques

Exit Examination for Biochemistry Majors prior to graduation

For many years, up until 2013, the Department administered the Biochemistry Exit Examination from the American Chemical Society to graduating seniors in order to monitor individual student performance and as an overall assessment of the Degree Program. Over a 12 year period (2001-2012), our students scored 64 (+/- 5.7) of the national ranking percentile. Although this practice has been discontinued, as part of the ASBMB Accreditation of our Program, we plan to participate in the National ASBMB Degree Certification Exam. This National Exam will provide students with the opportunity to have their degrees certified by ASBMB if they attain a satisfactory score as determined by the ASBMB. We believe this instrument will be an excellent benchmark for continuous Programmatic assessment, in addition to our students receiving all the positive benefits from ASBMB Certification. Because this national exam by ASBMB is new (broadly administered for the first time in Summer 2015), we plan to make the exam optional for students through Spring 2016. Beginning in Fall 2016, the exit exam will be mandatory for graduation. It is important to note that the ASBMB exit exam addresses all our student learning outcomes.

The ASBMB Exam is administered by a designated department faculty member. All completed exams

and unused copies must be returned to the ASBMB. The faculty member will be charged with maintaining the confidentiality of the assessment instrument on behalf of the ASBMB. Applications are scored by a committee of ASBMB members using rubrics provided by the authors of the respective questions. Each student response is scored by three or more independent evaluators. Any items exhibiting unusually disparate scores will be investigated by a team of two additional evaluators. The members of the committee are selected to ensure programmatic diversity and balance by region and institutional classification. Students are notified directly as to whether they passed the exam. The designated departmental faculty member will receive the names of all students who received a certified degree so that the students may receive appropriate recognition upon graduation. The department will also receive aggregated scores for each question and for the assessment examination as a whole.

Departmental Exit Survey

Prior to graduation, students are required to complete a departmental exit survey, an indirect assessment of the biochemistry program. For this instrument, students receive an email from the Program Director explaining the survey. This survey questions student satisfaction with the program. An example of this survey can be found in Criterion 3A.2 ***Appendix*** ("Department Exit Survey").

Assessment of Departmental Undergraduate Research Program

Designation for Departmental Honors for Research is assessed by the entire faculty and is based on an evaluation of the written thesis and student presentation of their work at the Annual Biochemistry Research Symposium, which convenes during Spring semester.

Annual report to Provost Office describing Student Learning Outcomes

The most recent report submitted by the Department of Biochemistry and Molecular Biology was for the 2011-12 academic year and primarily focused on Student Learning Outcomes. This report is included in Criterion 3A.3 ***Appendix*** ("Biochemistry Annual Report to Provost 2011-2012"). Many of the listed Student Learning Outcomes are derived from curricular documents published in 2003 by our disciplinary society, American Society for Biochemistry and Molecular Biology (ASBMB), as well as the Association of American Medical Colleges and the Howard Hughes Medical Institute.

Challenges with our Student Learning Assessment Plans

Examination of course alignment with our Student Learning Outcomes shown in the table in section 3B, identifies that some Learning Outcomes are not adequately addressed by courses in our program, i.e. concepts related to evolution. Initial coverage of these topic areas would best involve lower division courses offered by other Departments in the College of Arts & Sciences. Because of this, better communication and planning is necessary with these main campus Departments. Without more thorough introductory courses on topics such as evolution, our attempts at integrating principles of evolution with an understanding of the role of biochemistry is likely to fall short of our expectations. To correct this deficiency, we plan to engage in discussions with College of Arts & Sciences Departments (Biology and Chemistry) for better integration of course topic coverage to ensure that our learning outcomes are being met.

NOTE: It is important to note that our assessments are specific for our Department's upper level biochemistry courses only. This assessment plan does not address pre-requisite courses within the Departments of Biology and Chemistry.

3B. Actions taken to improve programs based upon the assessment process.

Synthesize the impact of the program's annual assessment activities by addressing the questions below. • How have the results of the program's assessment activities been used to support quality teaching and learning? • How have the results of the program's assessment activities been used for program improvement? • Overall, how is the program engaged in a

coherent process of continuous curricular and program improvement? • How does the program monitor the effects of changes?

Direct and course embedded assessment

Over the past 10 years we have monitored yearly final exam performance for our core intensive biochemistry courses (Bioc 445 and 446) and will continue this practice to obtain comparative student performance data to share with Departmental faculty on an annual basis. Questions selected for the final exam are drawn from a Departmental database, which makes exams consistent from year to year for comparative needs. Also, the question bank we draw upon is transferred to each instructor who teaches these courses to ensure educational consistency even when instructors change. We have used data collected from previous exams to inform pedagogical changes and to ensure that any changes made positively impact our students.

Based on years of data accumulated from course-level assessment exams, our students were not performing at our expected levels in terms of quantitative skills. This prompted us to modify our pedagogical approach to include more integrative learning, such as the introduction of case studies described in section 3A, which provides the additional benefits of incorporating more process skills application in our final exams. For example, incorporation of case studies requires students to use more process skills for biochemical interpretation and to enhance quantitative literacy. Our primary goal for implementing case studies is to better engage student thinking into the processes of biochemistry.

ASBMB Exit Examination Results

Beginning in the Fall of 2016 all graduates will be required to take the ASBMB exit exam. This data will be shared with Departmental faculty in an annual meeting dedicated to yearly curricular review. We intend to use this data to inform us how our students perform nationally and to inform curricular and pedagogical changes in the future.

Indirect Assessment

In the current student exit survey, we inquire about immediate and future career plans to determine the impact our Biochemistry Program has made on career choices. We also inquire about academic awards our students have received and community service opportunities our students have participated in to determine if the Biochemistry Program is making a positive impact on student awards and community engagement. We also ask students to describe their favorite biochemistry education experience. With this open ended question, students are free to express their thoughts without influence from more guided questions. For future improvement, we plan to expand our current exit survey to include more focused questions regarding student learning satisfaction and recommendations for course and programmatic improvement.

Criterion 4. Students (Undergraduate and Graduate)

The unit should have appropriate structures in place to recruit, retain, and graduate students. (Differentiate by program where appropriate.)

4A. Student recruitment and Admissions

Provide information regarding student recruitment and admissions (including transfer articulation).

The majority of our biochemistry majors intend on pursuing a career in medicine, which is documented in section 4F showing the career trajectory of most students following graduation. Because the

Department is housed within the School of Medicine, it is naturally attractive to most of our students. Because of this, we do not have to recruit students in the traditional sense who desire to major in biochemistry. Students are counseled by our faculty, as well as Arts and Sciences advisers, on the benefits of majoring in biochemistry, but this is done on a more informal basis through one-on-one conversations. Enrollment trends into biochemistry have been rising more rapidly in recent years, placing strain on our capacity to accept more students into the Program, which is exacerbated by our declining faculty number over the past three years. Reasons for this significant increase are not obvious; however, beginning in 2015 the MCAT exam will contain a section on biochemistry, which may provide some explanation for the increase in enrollment.

4B. Analysis of enrollment trends, persistence, and graduation trends.

Provide an analysis of enrollment trends, persistence, and graduation trends.

As seen in the table below, the number of students entering the field of biochemistry at UNM has increased significantly over the past 10 years, increasing from approximately 70 students per year to over 520 enrolled in 2014 (~260 declared majors in University College and ~260 intended majors in the College of Arts & Sciences who are now officially admitted to the Biochemistry program). Reasons explaining this substantial increase in enrollment are unclear and subject only to speculation. Concern among the faculty who are directly involved in the Program is rising. Questions are being raised if the Department is able to sustain such rapidly rising enrollment and still maintain our educational excellence. In addition, along with our accreditation by ASBMB, comes the expectation that we modify our curricular methods to align more closely with current education research findings. Some of these modifications include student-centered learning experiences, peer-learning opportunities, problem-based curricula, and classroom activities that rely heavily on active learning principles. These types of learning experiences are well documented in the literature as significantly benefitting student performance and knowledge retention. However, these types of learning formats are resource intensive and require many hours of faculty time to develop and implement. With our small faculty number, together with other commitments unique to being located in the School of Medicine, such as our required participation in medical education and securing extramural research funding, raises critical questions concerning our future capabilities to manage continued growth.

Enrollment Trends

Fall Enrollment by Major and Level (2005 to 2014)
Biochemistry

Undergraduate Students in University College with Declared Biochemisty Major in Discipline										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Year 1: Freshman	23	34	34	41	40	50	60	59	85	103
Year 2: Sophomore	25	28	26	34	28	48	31	46	67	80
Year 3: Junior	3	11	8	3	7	7	14	10	19	31
Year 4: Senior	1	2	1	0	1	2	2	2	7	3
Total	**52**	**75**	**69**	**78**	**76**	**107**	**107**	**117**	**178**	**217**

Undergraduate Students with Intended Biochemistry Major Admitted to Major College (Arts & Sciences)										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Year 1: Freshman	1	0	1	3	4	0	5	4	3	0
Year 2: Sophomore	11	10	17	14	13	16	20	20	23	30
Year 3: Junior	36	49	57	54	56	45	58	50	47	60
Year 4: Senior	72	72	88	84	90	95	83	95	120	114
Total	**120**	**131**	**163**	**155**	**163**	**156**	**166**	**169**	**193**	**204**

Note: Students who are classified as Intended Majors are those who have successfully completed lower division science pre-requisite courses and are officially admitted into the College of Arts & Sciences. These students are eligible to enroll in the first Biochemistry course (Bioc 445).

Data Source:21-day enrollment file for HED reporting

UNM Office of Institutional Analytics: Heather Mechler

Total University Undergraduate Headcount by Race/Ethnicity for Spring 2015 Enrollment

	Hispanic	American Indian	Asian	African American	Native Hawaiian	White	Race/Ethnicity Unknown	Foreign	Two or more races	Total
Student no.	8,405	1,059	578	462	30	6,711	295	252	648	18,440
%	45.58	5.74	3.13	2.51	0.16	36.39	3.51	1.37	3.51	100.00

Data obtained from UNM Institutional Analytics webpage, Student Data Warehouse.

Enrollment into Biochemistry by Sex and Ethnicity of Students Admitted to Program [1]
Fall 2005 to Fall 2014

Sex		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Female	Total	70	71	83	71	68	62	78	85	102	100
	Percent Minority	**62.9**	**57.7**	**55.4**	**53.5**	**57.4**	**64.5**	**53.8**	**56.5**	**59.8**	**62.0**
Male	Total	50	60	80	84	95	94	88	84	91	104
	Percent Minority	**50.0**	**51.7**	**42.5**	**51.2**	**46.3**	**50.0**	**56.8**	**65.5**	**61.5**	**59.6**
Male & Female Combined	Total	120	131	163	155	163	156	166	169	193	204
	Percent Minority	**57.5**	**55.0**	**49.1**	**52.3**	**50.9**	**55.8**	**55.4**	**60.9**	**60.6**	**60.8**

[1] *Undergraduate enrollment excludes declared majors in program who are in University College and have not yet been admitted to their major college.*

Data Source: 21-day enrollment file for HED reporting

UNM Office of Institutional Analytics: Heather Mechler

Persistence to Graduation

				Graduated Within 4 years		Graduated Within 5 years		Graduated Within 6 years	
Semester	**Admit College**	**Admit Major**	**Admit Major Cohort**	**#**	**%**	**#**	**%**	**#**	**%**
Fall 2006	College of Arts and Sciences	Biochemistry	34	8	23.53	16	47.06%	16	47.06
Fall 2007	College of Arts and Sciences	Biochemistry	24	10	41.67	16	66.67%	17	70.83

Fall 2008	College of Arts and Sciences	Biochemistry	35	6	17.14	17	48.57%	18	51.43

Note: entrance into the Biochemistry Program is permitted when students have completed all pre-requisites for admission into the College of Arts and Sciences. This typically occurs at the beginning of the junior year. Time to graduation from entrance into the Biochemistry Program is routinely two years. Time from initial matriculation at UNM to entrance into the Biochemistry Program is variable.

Graduation Trends

The number of students completing the Biochemistry Degree has increased substantially over the past several years. This of course matches increased enrollment into the Program. We are also experiencing a shift in degree sought by our students, with an increased percentage choosing a B.S. degree over the B.A. The primary difference between these two degree programs is that the B.S. degree requires students to achieve a "C" or better grade in the Bioc 448L laboratory course. We view this as a positive shift because more students are opting for experiential learning through hands-on biochemical principles. Laboratory courses are well known to better prepare students for the rigors of post-graduate work, and because of this significant trend, faculty in our Department are considering eliminating the B.A. degree option and focusing more effort and resources on the B.S. program.

Total Number of Biochemistry Degree Recipients – 2004-2005 to 2013-2014

Major	Degree	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
Biochemistry	BA	2	5	3	3	13	9	10	11	5	7
Biochemistry	BS	20	19	21	23	20	16	29	19	37	45
Total Degrees Awarded		22	24	24	26	33	25	39	30	42	52

B.S. Degree Recipients by Ethnicity and Gender

Ethnicity	Gender	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14
All Ethnic Groups Combined	F	11	13	9	12	10	7	7	10	15	23
	M	9	6	12	11	10	9	22	9	22	22
	Total	**20**	**19**	**21**	**23**	**20**	**16**	**29**	**19**	**37**	**45**

B.A. Degree Recipients by Ethnicity and Gender

Ethnicity	Gender	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14
All Ethnic Groups Combined	F	0	3	1	3	5	4	4	4	0	4
	M	2	2	2	0	8	5	6	7	5	3
	Total	**2**	**5**	**3**	**3**	**13**	**9**	**10**	**11**	**5**	**7**

Data Source: Data extracted from the Academic Outcome table.
UNM Office of Institutional Analytics: Heather Mechler
Degrees are based on Academic Year (leading summer, fall semester, spring semester).

Students who receive multiple degrees over the ten-year period are counted each time.

4C. Program advisement for students.

Provide a description of program advisement for students.

Student advisement duties are divided between the Department of Biochemistry and Molecular Biology and the College of Arts and Sciences, a reflection of a department situated within the HSC School of Medicine that offers an undergraduate program with a degree in Arts and Sciences. General Arts and Sciences advisement is supporting students from initial matriculation at UNM through graduation and includes all aspects of academic progress, i.e. related to admission, registration, holds, transfer, and all coursework related to students prerequisite courses before they declare a major in Biochemistry, as well as academic milestones required for timely graduation.

Biochemistry Advisers

Martina Rosenberg, PhD, Biochemistry Department Advisor
Dr. Rosenberg is an Assistant Professor in the Department of Biochemistry and Molecular Biology and actively involved in education research. She is responsible for advising Biochemistry Majors on course sequence, career planning, summer activities, mentor selection, and identifying research opportunities abroad.

Additional Advisement through the College of Arts & Sciences (A&S)
The mission of A&S is to assist and guide students in their pursuit of an A&S Degree. Advisors are available to collaborate with the diverse community of students in a dynamic learning environment, developing tools and strategies to navigate their academic careers with confidence and efficiency, while also providing them with a way to translate those skills into lifelong practices.

Valarie Maestas, Senior Academic Advisor
Valarie earned a degree in Anthropology and Psychology from UNM. As a recent UNM graduate and native New Mexican she has a primary emphasis in serving her community and assisting students in achieving their academic goals. Valaried performs integrated academic advisement and consultation of prospective, current, and former students within the College of Arts & Sciences. She is specially assigned to the Department of Chemistry and the Biochemistry Program. She assesses academic level and advises on academic programs and changes, develops academic plans and class schedules, analyzes applications, transfer evaluations, and transcripts for entry and exit from the university, and maintains appropriate records. Valarie also coordinates special functions associated with an academic function, such as assisting with curriculum planning, committee service, and guiding the work of assistants or work study students.

Biochemistry Advisement Maturity Rubric for 2013-2014

Assessment of the Biochemistry Program advisors based on an analysis completed by the College of Arts & Sciences. Matrix provided in Criterion 4C ***Appendix*** ("Biochemistry Advisement Maturity Matrix").

4D. Student support services

Describe any student support services that are provided by the unit.

Student advisement services within the Department are provided by Martina Rosenberg, PhD. These services include providing the necessary resources and information for students to make informed

decisions, e.g. whether or not their want to pursue a degree in Biochemistry and which one, B.A. or B.S. Dr. Rosenberg also assists advisees in managing their academic and professional careers related to the program and is often sought out to advise on course options, opportunities for lab experience (within or outside of BMB and UNM), sequence of courses, and graduation requirements.

4E. Participation in student success and retention initiatives

Describe any student success and retention initiatives in which the unit participates.

Although the Biochemistry Program does not have a mechanism for student retention that originates in the Department itself, several of our past students have taken advantage of UNM wide pipeline programs that are designed to expose students to excellent research opportunities. These programs immerse students into modern research facilities and foster enthusiasm for continued biochemical study and research. Research opportunities range from volunteer work, work study, and non-work study jobs, to independent research projects. Students can arrange research projects with individual faculty members or they may participate in one of several research programs. These programs provide special emphasis on attracting minorities and women in an effort to benefit students of all ethnic backgrounds and under-represented groups. Independent research through any of these programs can lead to Research Honors in Biochemistry.

- National Science Foundation Research Experiences for Undergraduates (REU) Program - Students have numerous opportunities to share ideas and explore issues within and across disciplines. The program's goal is to increase exposure to a large, multidisciplinary research program, motivate students to continue into professional careers, and prepare students for the rigors of graduate school, professional research, and responsible citizenship. The program exemplifies the integration of research and education. As students conduct research, they will learn how to become a scientist, along with many technical, methodological, and ethical issues that arise in scientific research.
- Initiative for Minority Student Development (IMSD) - The University of New Mexico's IMSD Program offers research training and professional development to prepare students for graduate work in biomedical research. The emphasis is to draw on students majoring in STEM-related fields including biology, chemistry, biomedical and chemical engineering, psychology, computer science, and mathematics. Students in the IMSD program receive financial support, scientific education, and mentoring. In addition, the IMSD program provides training in various areas of professional development, including leadership skills and professional communication.
- Minority Access to Research Careers (MARC) Program – The MARC Program is funded by a competitive grant from the National Institutes of Health and offers research training and support to prepare undergraduate scholars for graduate school. The primary goal of this Program is to increase the number and competitiveness of underrepresented minorities engaged in biomedical research by increasing the availability of research training opportunities. MARC supports talented UNM undergraduates with training that directly prepares them for careers in biomedical research. The fields of research can be biology, chemistry, cell and molecular biology, genetics, biophysics, mathematics, pharmacology, biochemistry, bioengineering or computer science.
- Undergraduate Pipeline Network (UPN) - The Undergraduate Pipeline Network summer research experience is designed to cultivate students' interest in research while helping them to acquire skills needed to apply for and succeed in post-baccalaureate education. The program provides the opportunity for students to choose from research in either Biomedical Science or Community-Based/Health Disparities. The program period covers 10 weeks and students participate in the program a minimum of 40 hours per week. Opportunities are included to increase students' competency in presentation skills, preparing applications to graduate programs (writing the essay, interviewing skills), working with mentors, professional skills and research etiquette, responsible conduct of research, being a member of a multi-disciplinary team, and understanding career options in clinical and translational science. The students have the opportunity to observe research

activities in different settings, such as within core facilities and within clinical and community-based settings, and are exposed to other facets of clinical and translational research that are different than the one to which they are assigned.

The Department also has close ties to the **combined BA/MD Program**, which is designed to address the need for physicians in rural and under-served areas of New Mexico. Each year, 28 students who are broadly diverse in their background preparation are admitted from New Mexico high schools into the Program and receive a conditional admission to the School of Medicine (UNM SOM). The BA/MD Program supports one section of the introductory biochemistry non-majors course (Bioc 423), which is a requirement for admission to the SOM. In addition, the BA/MD Program provides a teaching assistant, a supplementary instruction leader (SI), as well as ~60% salary of the faculty instructor teaching this course (M. Rosenberg).

The Department participates in the **UNM STEM Gateway Initiative**. This Program seeks to increase the number of Hispanic and low-income students attaining science, technology, engineering, and mathematics (STEM) degrees by encouraging and supporting richer learning opportunities for students. Courses offered by BMB are not the typical classes that receive STEM gateway support for course redesign efforts for two reasons. First, students finalize their decision to graduate in Biochemistry when they are already advanced in their undergraduate career. Therefore some of the challenges related to transition and adjustment to college learning do not apply. Typically our majors are in their junior year by the time they enroll into the program entry course, Intensive Biochemistry (Bioc 445). Bioc 445 has a failure/ drop rate of < 10% on the first try. Second, student cohorts on average have a GPA of 3.5 by the time they graduate. The percentage of URMs varies between 38-53% in recent years and we experience exceptionally low attrition rates (see graduation trends, section 4B above).

In fall 2015, the BMB instructor (M. Rosenberg) will be supported by the STEM Gateway with two Peer Learning Facilitators (PLFs) for Biochemistry 445, who will help to implement the revised learning goals. These will include opportunities for experiential work, application and integration of quantitative reasoning, which are recommended on a national level (UNM STEM Gateway, http://stemgateway.unm.edu/; Vision and Change, http://visionandchange.org/), but are currently not emphasized enough in our curriculum.

4F. Graduate placement of each program

Describe where graduates of each program are typically placed. Describe efforts to measure the success of program graduates and the results of those measures.

Each year prior to graduation, the Undergraduate Biochemistry Program Director requests students to complete a survey form. Response rates for this survey are typically >90%. In this form, we ask for immediate future plans following graduation and a forwarding email address to maintain contact with the students. In this manner, we are able to informally track student progress as they enter post-graduate programs or pursue other types of scientific careers. The table below provides Programs in which our students have matriculated following their graduation from the Biochemistry Program. This data is obtained from the graduating classes for the past 5 years. A significant portion of our graduates continue to our School of Medicine (19%), yet many others enter diverse programs ranging from business and law to engineering, chemistry, dentistry, and the biomedical sciences.

Student no.	Where have they gone after graduating from Biochemistry 2011-2015?
2	Anderson School of Management, MBA Program, UNM
4	College of Pharmacy, PharmD Program, UNM HSC
2	Department of Biomedical Engineering, UNM
2	School of Law, JD Program, UNM

1	School of Medicine, MD/PhD program, UNM HSC
1	Biomedical Sciences Graduate Program, Masters of Science Program, UNM HSC
1	Medical Lab Sciences, Bachelor of Science Program, UNM HSC
1	Masters of Public Health Program, UNM HSC
1	Department of Chemistry, PhD Program, UNM
2	Biomedical Sciences Graduate Program, PhD Program, UNM HSC
1	School of Dentistry, Baylor University
1	Department of Biochemistry, PhD Program, SUNY Syracuse
1	Neuroscience technician at UNM, now in Peace Corps in Mozambique
1	Oregon Health Sciences laboratory technician, now employed by the US Geological Survey, planning to apply to grad school in Hydrology
1	Cardiovascular Technician at the UNMH Heart Station, studying for med school
1	Intern at Sandia National Labs, soon to be a research technician in the Adolphi group
1	Department of Biological Sciences, PhD Program, Univ of CA, San Diego
1	Department of Chemistry and Biochemistry, PhD Program, Univ of CO, Boulder
1	School of Dentistry, Pacific Dental College, CA
1	PhD Program, Portland State University, Portland, OR
1	PhD Program, University of Arizona, Tucson, AZ
1	PhD Program, University of Pennsylvania, Philadelphia, PA
1	PhD Program, University of Washington, Seattle, WA
1	PhD Program, University of Nebraska, Lincoln, NE

Biochemistry Students Matched with UNM School of Medicine Graduates (up to August 2015)

Total no. of Biochemistry Graduates from 2011-2015	Total no. of Biochemistry Students who Matriculated to UNM/SOM	Total no. Graduated UNM/SOM	Residency Match Information*
193	37 (19% matriculation rate)	8	**1.** Internal Medicine – West Virginia University SOM (VA) **2.** OBGYN – Banner Good Samarian Medical Center (AZ) **3.** Anesthesiology – Univ. of Kentucky Med. Center (KY) **4.** Internal Medicine – Univ. of New Mexico (NM) **5.** Internal Medicine – California Pacific Med. Center (CA) **6.** Transitional year – San Antonio Military Med. Center (TX) **7.** OBGYN – Univ. of Missouri (MO) **8.** Internal Medicine – Scripps Clinic/Green Hospital (CA)

**Match information data all graduates from the Class of 2015. Of the 37 students that matriculated 29 are still in UNM Medical School.*

Criterion 5. Faculty

The faculty associated with the unit's programs should have appropriate qualifications and credentials. They should be of sufficient number to cover the curricular areas of each program and other research and service activities. (Differentiate by program where appropriate.)

5A. Composition of the faculty and their credentials.

Describe the composition of the faculty and their credentials. Provide an overall summary of the percent of time devoted to the program for each faculty member and roles and responsibilities within each program.

List of all faculty directly participating in the delivery of the core BMB requirements for the bachelor degree program

- Natalie L. Adolphi, PhD, Research Associate Professor
  PhD, Physics, Washington University, St. Louis, MO
- William Sherman Garver, PhD, Assistant Professor
  PhD, Chemistry and Biochemistry, New Mexico State University, Las Cruces, NM
- Chien-An (Andy) Hu, PhD, Associate Professor
  PhD, Molecular Genetics, The Ohio State University, Columbus, OH
- Meilian Liu, Ph.D. Assistant Professor
  PhD, Biochemistry, Xiangya School of Medicine, Central South University, P. R. China
- Robert A. Orlando, PhD, Associate Professor
  PhD, Cellular Biochemistry, University of California, Irvine, CA
- Marcy Osgood, PhD, Associate Professor
  PhD, Biochemistry, Rensselaer Polytechnic Institute, Troy, NY
- Karlett J. Parra, PhD, Associate Professor
  PhD, Biochemistry and Molecular Biology, SUNY Upstate Medical University, Syracuse, NY
- Martina Rosenberg, PhD, Assistant Professor
  PhD, Biochemistry, Freie Universität, Berlin, Germany
- Vallabh Raj Shah, Ph.D. Professor
  PhD, Parasitology and Microbiology, GAU University, Anand, India
- Dorothy J. VanderJagt, PhD, Research Associate Professor
  PhD, Medical Science, University of New Mexico, Albuquerque, NM

UNM Biochemistry Faculty numbers by rank

	2010	2011	2012	2013	2014	2015
Tenure, Tenure-Track Faculty by Rank						
Professor	0	0	0	1	1	1
Associate Professor	5	5	5	4	4	4
Assistant Professor	3	2	2	3	3	3
Non-Tenure Track Faculty by Primary Job Category						
Research Faculty	6	6	6	6	5	3
Total Faculty	**14**	**13**	**13**	**14**	**13**	**11**

Faculty summary table

BMB Faculty Name	Rank	Time (%) commitment to BMB program for FY16	Role in BMB Program	# of Research UG Students Mentored in last 5 yrs
Robert Orlando	Associate professor	52.6%	Biochemistry Program Director; Instructor in Biochemical Methods (Bioc 448L); Instructor for Fall/Spring semesters for Intro Bioc (Bioc 423)	8
Marcy Osgood	Associate professor; Assistant Dean	45%	Faculty member: Instructor for Intensive Biochemistry I & II (Bioc 445/446)	none
Karlett Parra	Associate professor; Chair	10%	Instructor in Biochemistry of Disease (Bioc 463) and Undergraduate Student Research Mentor	11
Martina Rosenberg	Assistant Professor	60.4%	Advisor for Biochemistry majors; Course director of Biochemistry of Disease (Bioc 463); Instructor and co-director for Intensive Biochemistry I beginning Fall 2015 (Bioc 445); Instructor for Intro Biochem (BIOC423) for BA/MD Program every semester	3
William S. Garver	Assistant Professor	14.5%	Instructor in Intensive Biochemistry I beginning Fall 2015 (Bioc 445); Instructor in Intensive Biochemistry II (Bioc 446); Undergraduate student research mentor	3
Chien-An Hu	Associate Professor	42.8%	Director of Undergraduate Honors Research Program; Course Director/Instructor for Biochemical Methods (Bioc 448L) and Bioc463; Past Course Director for Biochemistry of Disease (Bioc 464)	10
Meilian Liu	Assistant Professor	10%	Instructor in Biochemistry of Disease (Bioc 463)	5
Vallabh Shah	Professor	20.4%	Instructor in Biochemistry of Disease (Bioc 464); Undergraduate student research mentor	5

Dorothy Vanderjagt	Associate Research Professor	25%	Instructor in Biochemistry of Disease (Bioc 463 and 464)	0
Natalie Adolphi	Associate Research Professor	0%	Instructor in Biochemistry of Disease (Bioc 463); Undergraduate student research mentor	3
Colleen Fordyce	Assistant Research Professor	0%	Research mentor	3

The Faculty Education FTE Allocation between FY201 and 2016 is presented in Criterion 5A ***Appendix*** "Faculty Education FTE, FY2013-2016"

Names and affiliations of additional faculty who participate in the Biochemistry Program

Faculty who have participated in Bioc 463 in the past 5 years – Biochemistry of Human Disease I
Each faculty member contributed a 3 week session (9 contact hours)

Faculty Name	Department Affiliation
Natalie Adolphi, PhD	Biochemistry and Molecular Biology
Christian Bologa, PhD	UNM Translational Informatics Division
Lawrence Cole, PhD	UNM Women's Health Research
Chien-An Andy Hu, PhD	Biochemistry and Molecular Biology
Meilian Liu, PhD	Biochemistry and Molecular Biology
Yohannes Mebratu, PhD	Lovelace Respiratory Research Institute
Edward Moczydlowski, PhD	Sandia National Laboratories
Tudor Oprea, MD, PhD	UNM Translational Informatics Division
Robert A. Orlando, PhD	Biochemistry and Molecular Biology
Karlett Parra, PhD	Biochemistry and Molecular Biology
Surojit Paul, PhD	Neurology
Vallabh Raj Shah, PhD	Biochemistry and Molecular Biology
Dorothy VanderJagt, PhD	Biochemistry and Molecular Biology

Faculty who have participated in Bioc 464 in the past 5 years – Biochemistry of Human Disease I
Each faculty member contributed a 3 week session (9 contact hours)

Faculty Name	Department Affiliation
William S. Garver, PhD	Biochemistry and Molecular Biology
Chien-An Andy Hu, PhD	Biochemistry and Molecular Biology
Yohannes Mebratu, PhD	Lovelace Respiratory Research Institute
Robert A. Orlando, PhD	Biochemistry and Molecular Biology
Karlett Parra, PhD	Biochemistry and Molecular Biology
Martina Rosenberg, PhD	Biochemistry and Molecular Biology
Vallabh Raj Shah, PhD	Biochemistry and Molecular Biology
Dorothy VanderJagt, PhD	Biochemistry and Molecular Biology

Faculty who have participated in Bioc 497/498 over the past 5 years as Honors Research Mentors

Faculty Name	Department Affiliation
Elaine Bearer, PhD	Pathology
William S. Garver, PhD	Biochemistry and Molecular Biology
Jennifer Gillette, PhD	Pathology

Chien-An Andy Hu, PhD	Biochemistry and Molecular Biology
Nancy Kanagy, PhD	Cell Biology and Physiology
David Lee, MD, PhD	Radiation Oncology
Johnnye Lewis, PhD	Pharmaceutical Sciences
Meilian Liu, PhD	Biochemistry and Molecular Biology
Eric Loker, PhD	Biology
Chad Melancon, PhD	Chemistry and Chemical Biology
Robert A. Orlando, PhD	Biochemistry and Molecular Biology
Michelle Ozbun, PhD	Molecular Genetics and Microbiology
Karlett Parra, PhD	Biochemistry and Molecular Biology
David Peabody, PhD	Molecular Genetics and Microbiology
Stephanie Ruby, PhD	Molecular Genetics and Microbiology
Vallabh Raj Shah, PhD	Biochemistry and Molecular Biology
Laurel Sillerud, PhD	UNM BRaIN Imaging Center
Kristina Trujillo, PhD	Cell Biology and Physiology

Faculty who have participated in Bioc 499 over the past 5 years as Undergraduate Research Mentors

Faculty Name	**Department Affiliation**
Natalie Adolphi, PhD	Biochemistry and Molecular Biology
David Bear, PhD	Cell Biology and Physiology
Marco Bisoffi, PhD	Biochemistry and Molecular Biology
Steve Cabaniss, PhD	Chemistry and Chemical Biology
Colleen Fordyce, PhD	Biochemistry and Molecular Biology
William S. Garver, PhD	Biochemistry and Molecular Biology
Chien-An Andy Hu, PhD	Biochemistry and Molecular Biology
Diane Lidke, PhD	Pathology
Deborah Dunway-Mariano, PhD	Chemistry and Chemical Biology
Robert A. Orlando, PhD	Biochemistry and Molecular Biology
Karlett Parra, PhD	Biochemistry and Molecular Biology
Vallabh Raj Shah, PhD	Biochemistry and Molecular Biology
Laurel Sillerud, PhD	UNM BRaIN Imaging Center
Kristina Trujillo, PhD	Cell Biology and Physiology

5B. Professional development activities for faculty

Provide information regarding professional development activities for faculty within the unit.

Center for Teaching Excellence

The Center for Teaching Excellence (CTE) serves as a general resource center for all University of New Mexico (UNM) instructors including tenured and tenure-track faculty, lecturers, adjunct faculty, faculty on branch campuses, teaching assistants, clinician educators, and all others who have an instructional role in the classroom. The primary programs currently sponsored by CTE are:

- New Faculty Orientation
- UNM's Teaching Fellows Program
- Success in the Classroom conferences
- Workshop and brown-bag series on topics of interest to faculty
- Course design institutes
- Presentation of University teaching awards; coordinated with the Faculty Senate Teaching Enhancement Committee

Mission
The mission of the Center for Teaching Excellence (CTE) is to engage and empower UNM instructors to develop effective, diverse learning opportunities to enhance the success of diverse learners. CTE works to make teaching and teaching improvement an indispensable part of university life and a key dimension of the professional identity of every faculty member. CTE endeavors to cultivate a campus-wide learning community that values and rewards excellence in teaching and learning and is responsive to the needs of instructional staff who want to enhance their teaching.

CTE provides opportunities for faculty to think and talk about their teaching, to get help with any aspect of their teaching, and to engage in a national discourse about university teaching where teaching is valued, visible, integrated, and cutting edge. Accordingly, CTE also provides resources for faculty to study teaching and to contribute to the burgeoning scholarship of teaching.

Faculty Research
UNM provides a strong research environment. UNM Health Sciences Center (HSC) is the State's largest health care, teaching, biomedical research and patient care organization in the state; and includes one of the leading NCI designated Comprehensive Cancer Research and Treatment Centers in the nation, the UNM Cancer Center. The UNM HSC Office of Research (http://hsc.unm.edu/research/), UNM CTSC (http://hsc.unm.edu/research/ctsc/) and UNM Cancer Center (http://cancer.unm.edu) offer a diversity of research development and funding resources available to all faculty.

Faculty Sabbatical Leave
Sabbatical leave is available under the following four options to any faculty member with tenure or to any faculty member in the last year of the probationary period for which a favorable decision has been reached with regard to tenure.

After any period of at least three years of full-time service at the University of New Mexico:
- One semester at 2/3 salary for that semester

After any period of at least six years of full-time service (or equivalent part-time service) at the University of New Mexico without a sabbatical:
- One semester at no reduction in annual salary
- One full academic year at 2/3 salary
- Semester II of one year and Semester I of the following year, at 2/3 salary for each semester of leave

Only few faculty members have requested the opportunity for sabbatical leave; only two BMB faculty members have taken sabbatical leave the past 10 years. Due to the small size of the Department and teaching responsibilities, some faculty members are considering opportunities for short-term sabbatical leave during multiple summers.

5C. Summary and examples of research/creative work of faculty

Provide a summary and examples of research/creative work of faculty members within the unit.

Faculty research interests and selected examples of their peer-reviewed scholarly work are provided in Criterion 5C ***Appendix*** ("Research-Creative Work of BMB Faculty").

5D. Abbreviated vitae or summary of experience for each faculty member

Provide an abbreviated vitae (2 pages or less) or summary of experience for each faculty member (if a program has this information posted on-line, then provide links to the

information).

The web site for the Department of Biochemistry and Molecular Biology is located at: http://bmb.unm.edu/index.html

Abbreviated vitae are included in Criterion 5D ***Appendix*** ("Faculty Bios").

Criterion 6. Resources and Planning

The unit has sufficient resources and institutional support to carry out its mission and achieve its goals.

6A. Resource allocation and planning.

Describe how the unit engages in resource allocation and planning. If the program or unit has an advisory board, describe the membership and charge and how the board's recommendation are incorporated into decision making.

The Department Chair allocates faculty teaching and committee participation. For the last three years, the Chair has consulted her faculty teaching assignments with Dr. Marcy Osgood who was the Undergraduate Program Director (2008-2014) and Department Vice Chair for Education under William Anderson's leadership. This year, a Chair Executive Advisory Committee was established to make recommendations regarding resources allocation and strategic planning. The Chair advisors are David Vander Jagt (Department Vice Chair), Marcy Osgood (Assistant Dean for Undergraduate Medical Education), and Jeffrey Griffith (Senior Advisor to the Dean and prior Executive Vice Dean and Biochemistry and Molecular Biology Chair). They offer research, education, and administrative expertise, respectively.

Planning takes place in the spring semester, when the Chair meets with each faculty member to conduct annual evaluations and discuss his or her annual Action Plan for the next year. Individual Action Plans include teaching and committee assignments, as well as goals for research (grant submissions, peer-reviewed publications, scientific presentations, etc.). All tenure track faculty members in the Department of Biochemistry and Molecular Biology are expected to develop and maintain strong research programs, contribute to the Department teaching activities, including undergraduate lectures, laboratory teaching, graduate courses, medical lectures, and tutoring in designated UME blocks.

Faculty members share the teaching assignments of the Department in proportion to "available effort" as defined by the BMB FIBCI policy. The policy states: "Available effort is the fraction of total FTE that is not committed to administrative posts, "release time" for sponsored research or assigned activities." If the FTE in any area is increased or decreased during the year, yearly assignments are revised proportionately. The teaching FTE is calculated according to UNM Faculty Handbook, which states that 1.0 FTE corresponds to 18 cr/year (Criterion 6A ***Appendix*** Table 1 "FTE Estimations per Course and Contact Time"). The research FTE is determined by faculty rank (pre-tenured faculty have protected time for research) and time protected by extramurally funded research projects.

The department has always had an expectation that faculty hired as *researchers* would generate external support. The *minimum* contributions expected for extramurally-funded, tenure track faculty members conducting biomedical research are 0.03 FTE (Pre-Tenure, Years 1-3) and 0.06 FTE (Pre-

Tenure years 4-6; and Tenured). As described below, tenured faculty members conducting biomedical research who lack external funding are expected to increment the *minimum* teaching assignments proportionally to the number of years unfunded (Criterion 6A ***Appendix***, Table 2 "Minimum Teaching FTE Allocated to Tenure Track Faculty"). While the majority of the BMB Department faculty conducts biomedical research, the Department has two faculty members in the tenure track conducting education research. They are Marcy Osgood and Martina Rosenberg, who were hired primarily to teach and conduct discipline-based education research with only modest expectations for external funding. Expectation for extramural funding is significantly less for education researchers than for biomedical researchers, because funding is limited in the education field. In addition, many educational funding mechanisms prohibit significant funding of faculty salaries.

The faculty compensation for educational activities comes exclusively from unrestricted funds. Education researchers traditionally have a greater teaching load than the biomedical researchers with external funding or actively seeking external funding. Regardless of the research area, the criteria for faculty promotion in the Biochemistry and Molecular Biology Department are excellence in two of the three categories (Research/Scholarship and Education in the BMB Department), and competence in the third (Service).

Every BMB faculty in the tenure track and several research faculty members contribute to teaching courses of the undergraduate Biochemistry and Molecular Biology Program. In addition to the undergraduate program, the Biochemistry and Molecular Biology faculty teach in the medical and graduate programs. The Department is responsible of the 7-week intensive GI/Nutrition/Metabolism/Endocrinology (GINME) Block in the Phase 1-2 (Aug.-Oct) of the Medical School. Four to five (dependent on year) BMB faculty members participate in class instruction and PBL tutorials for the GINME Block (Marcy Osgood, Raj Shah, Dorothy Vander Jagt, Rob Orlando, Sherman Garver). Marcy Osgood co-chairs the GINME Block since FY2013. Prior Block chairs include Robert Orlando, Dorothy Vander Jagt and David Vander Jagt. One faculty (Raj Shah) also contributes to the Cardiovascular, Pulmonary, Renal Block and the Public Health Block and is a circuit rider for medical student Practical Immersion Experience. One faculty (Andy Hu) participates in the Biomedical Graduate Program (BSGP), where the Department is responsible for the Cancer Biology course (Biom515), a multi-instructor course taught by faculty from the School of Medicine and the College of Pharmacy.

The Criterion 6A ***Appendix*** Tables 1-3 serve as reference to allocate education, service, and research FTE and assignments. They summarize: FTE estimations per course (Table 1), the *minimum* teaching assignments allocated to tenure track faculty conducting biomedical research, independent of other assignments (Table 2) and the extramural funding level per tenure track faculty the last 8 years (Table 3).

The teaching loads were significantly increased for some tenured faculty in FY2015 (Criterion 6A ***Appendix*** Figure 1 "Faculty total FTE Allocation" and Criterion 5A ***Appendix*** Table "BMB Faculty Education FTE, FY2013-2016"). This FTE allocation change was driven by two factors: First, securing new extramural grant funding by faculty in the tenure track has been a major challenge of the Department (Criterion 6A ***Appendix*** Table 3 "Tenure Track Faculty Time Protected by Research"), despite faculty efforts (Criterion 6A ***Appendix*** Figure 2 "Faculty Grant Submissions and Awards FY2012-FY2015"). Second, two faculty members who taught undergraduate biochemistry courses for more than 10 years, William Anderson and Andrzej Pastuszyn, retired in June 2012 and 2014, respectively.

The individual faculty assignments are allocated on the basis of departmental and School of Medicine priorities. Teaching, participation in standing committees, and other activities by faculty are listed in the Criterion 6A Appendix Table 4 "BMB Faculty Teaching and Committee Assignments as Described in FY2014 - FY2016 Faculty Action Plans". The corresponding FTEs are summarized in Criterion 6A Appendix Figure 1 "Faculty FTE Allocations in Education, Research, Service". The BMB faculty

additionally participates in other institutional and/or departmental committees and task forces, often non-standing. They include, faculty search committees, BSGP curriculum review (AdHoc), SOM 50th anniversary BMB celebrations, BMB APR self-study committee, and main campus Academic Freedom & Tenure committee. Martina Rosenberg is an active member of the BA/MD Committee for Curriculum and Student Progress and CCSP sub-committee, Basic Sciences Sub-Group, which are standing committees in the College of A&S (not listed in Table 4)

6B. Budget including support received from the institution as well as external funding sources.

Provide information regarding the unit's budget including support received from the institution as well as external funding sources.

The Department faculty and staff are hired through the School of Medicine, which provides faculty compensation, as well as resources traditionally used to support fundamental programmatic activities (e.g., teaching assistantships and staff support), supplies for office, classroom, and laboratory instruction, and laboratory instrumentation for the Bioc 448L course. Budget planning takes place in the spring semester when the Department budget projections for the ending year are made, and the School of Medicine planning for the next fiscal year takes place. The Department Chair, Administrator, and Accountant meet with the School of Medicine Dean (Dr. Paul Roth), Executive Vice Dean (Dr. Martha McGrew), and Finances Director (Kristin Gates) to review budget projections and discuss the Department finances for the next fiscal year. This is an open meeting that anyone can attend. One faculty member has attended the BMB Department budget meeting; however, dates and times for this meeting have not been broadly publicized for faculty consideration.

Instruction and General (I&G) funds are the only recurring revenue of the Department (1.03 – 1.09 M, FY2013 - FY2015). Only $10,780 is attributable to student tuition generated by the undergraduate biochemistry program (FY2015 and FY2016). Before FY2015, the Department did not receive College of Arts & Sciences support derived from the student tuition. The Department receives $50,000 in support through allocations from BA/MD for the biochemistry course Bioc 423 instruction. However, this support is not additional revenue on the Department's operating ledger; it is a reduced expenditure. These unrestricted funds support a significant proportion of the total faculty compensation (on average 83%, FY2013 - 2015). The remaining comes from extramural (restricted) support. Any additional unrestricted revenue is used to support the operational activities fundamental to the teaching and research missions of the Department, such as TAs and laboratory supplies for the undergraduate Biochemistry Program, instrument maintenance & service, staff salary, new faculty start-up packages, etc. The proportion of the total revenue from restricted sources has decreased from 60% in FY2013 to 40% in FY2016 (Criterion 6B ***Appendix*** Figure 1 "Restricted and Unrestricted Revenue per Fiscal Year"). This steady decline has limited resources available to purchase new instruments for research and teaching laboratories, reward excellence, and fund start-up packages for new faculty recruitment.

6C. Composition of the staff assigned to the unit (including titles and FTE) and their responsibilities.

Describe the composition of the staff assigned to the unit (including titles and FTE) and their responsibilities.

The Department office is staffed with 3 administrative personnel that provide secretarial and administrative support services for 9 full-time Faculty and 2 part-time Faculty.

- **SHARON PRUITT, Department Administrator**

Summary

Oversees and administers programs, strategies, and initiatives designed to develop, enhance, and support the missions of a larger, more complex Research Intensive* academic department of the University, as measured by annual revenue and number of faculty and staff. Oversees all internal and external business activities, accounting and finance, grant administration, and human resources. Coordinates the administrative activities of the post-award contracts and grants functions of all units within the department. Manages and coordinates facility and resource management, information services, and general department administration. Participates with the Chair and senior departmental faculty in strategic and operational decision making as a member of the department's leadership team. *Having or requiring a relatively large expenditure on research and development in comparison to capital and labor. Research programs, including all grants and contracts is $3 million or more.

Duties and Responsibilities

- ✓ Manages daily administrative operations of the organization; provides direct supervision to subordinate employees including planning, assigning, and organizing work; interviews, hires, and trains support personnel.
- ✓ Oversees and coordinates the fiscal activity of the department, to include participation in development and management of operating budgets, contracts and/or grants administration (as applicable), inventory management, payroll administration, travel, purchasing, and/or distributions; reviews and reconciles monthly ledgers and reports for unit accounts, and assists with departmental fiscal planning.
- ✓ Assists in and provides input to determining strategic objectives for the organization, including research, trend analysis, and compilation and preparation of statistical, regular, and ad hoc reports; assists with program/project development.
- ✓ Guides and facilitates faculty and staff in the development and preparation of research proposals, contracts, sub-contracts, and agreements, to include budgets, documentation, and interpretation of funding requirements.
- ✓ Formulates processes and procedures for post-award administration and contract compliance.
- ✓ Participates directly in formulation of department policies, ensuring that the fiscal and personnel practices are in compliance with university regulations, policies, and appropriate laws; interprets university and department policies, and advises faculty, staff, postdoctoral fellows, and students on their provisions.
- ✓ Assists with departmental personnel planning; assists in the coordination of faculty, staff, and post doctorate recruitment and makes recommendations; has signatory authority for various personnel transactions; oversees and/or processes employment documents, and provides information on administrative procedures and requirements to prospective faculty, staff, post doctoral fellows, and students; may coordinate the processing of faculty, teaching assistant, and graduate assistant contracts, and/or hiring of additional part-time instructors to meet student enrollment demands.
- ✓ Coordinates special department activities, including conferences, workshops, graduation, and other similar functions.
- ✓ May provide administrative support and direction to the instructional, research, and service programs of the department including those at satellite locations.
- ✓ May coordinate environmental health and safety programs for the department; may oversee building maintenance, space assignments, vehicle fleet operations, security, and other related matters.
- ✓ May serve on various policy-making committees.
- ✓ May assist with the administrative components of the graduate and undergraduate student selection and admission process, including routine student advisement, review of transcripts, and problem resolution related to curriculum and course prerequisites.

- ✓ May coordinate activities for ordering textbooks, including desk copies, and developing the schedule of courses, classrooms, and laboratories.
- ✓ Performs miscellaneous job-related duties as assigned.

- **DANAI MORNINGSTAR, Accountant II**

Summary

Performs advanced, multifaceted accounting and related functions in such areas as ledger maintenance and analysis, cost and/or financial analysis, fund reconciliation, posting, and inventory control. Analyzes complex financial and operating data and prepares management reports, financial statements, and projections.

Duties and Responsibilities

- ✓ Analyzes and reviews budgets and expenditures for local, state, federal, and private funding, contracts, and grants ensuring compliance with fiscal accountability and reporting and funding requirements.
- ✓ Monitors and reviews accounting and related system reports for accuracy and completeness; prepares and reviews budget, revenue, expense, and payroll entries, invoices, and other accounting transactions.
- ✓ Analyzes revenue and expenditure trends, recommends appropriate budget levels, and ensures expenditure control.
- ✓ Advises and interprets policies to faculty, staff, and outside persons such as vendors, funding source representatives, and patients; explains billings and reports, and resolves related problems.
- ✓ Develops accounting applications; oversees the input and handling of financial data and reports for the institution's finance and human resources systems.
- ✓ May participate in auditing projects, as appropriate to individual operating needs.
- ✓ May coordinate the preparation of regularly scheduled and special billings and financial statements for local, state, federal, and private funding sources.
- ✓ May prepare accounting entries for proration of indirect costs, letters of credit, salary reallocations, loan transactions, financial aid disbursements, refunds, and repayments.
- ✓ May develop, negotiate, and defend a unit's operating budget and consult with management of the unit on the fiscal aspects of program planning, salary recommendations, and other administrative actions.
- ✓ May supervise and/or lead lower graded staff and/or student employees.
- ✓ Performs miscellaneous job-related duties as assigned.

- **JESSICA GUTIERREZ, Fiscal Services Tech**

Summary

Assists in maintaining records of fiscal and budgetary controls, ledgers, and/or other related transactions, in either direct or indirect support of accountants or administrators. Processes routine financial documents and fund transactions, reconciles financial records, and analyzes routine financial data. Assists in the development, coordination, and maintenance of unit budgets, as appropriate. May serve as unit requisitioner or initiator of financial transactions.

Duties and Responsibilities

- ✓ Maintains or assists in the maintenance of unit fiscal control systems and ledgers, which may involve requesting setting up indexes, preparing and processing fiscal transactions and documents, uploading and downloading financial entries and reports, preparing trial balances, clearing suspense items, and/or coordinating period closings.
- ✓ Posts routine budget, revenue, expense, and correcting entries for internal unit financial control systems or the institution's finance system.
- ✓ Maintains fund levels appropriate for daily operations and prepares deposits of cash and cash-related items; balances cash funds and accounts to the financial reporting system.

- ✓ As appropriate to the position, performs transaction initiation, requisition, or journaling duties, such as processing purchasing requisitions, direct pay requests, journal vouchers, and/or petty cash reimbursements.
- ✓ Reviews and processes routine accounting data; prepares revenue and expense projections and financial reports.
- ✓ Responds to a range of inquiries regarding financial transactions; researches and resolves problems.
- ✓ Prepares documentation for accounts payables/receivables, cost reimbursements, and other billings for processing; maintains supporting worksheets.
- ✓ Prepares time sheets, including overtime and shift differential calculations; maintains leave and payroll records, as appropriate to operational requirements.
- ✓ Reviews purchasing, travel, and personnel transactions for availability of funding, mathematical accuracy, coding and distribution of account numbers, and adherence to funding regulations and university policy; may also originate or prepare these documents; processes complex invoices for payments.
- ✓ Assists in the development and management of budgets for the department or assigned areas; may suggest financial control procedures.
- ✓ Distributes periodic financial reports, maintains physical inventories, and assists with other clerical functions as required.
- ✓ May supervise and/or lead lower graded staff and/or student employees.
- ✓ Performs miscellaneous job-related duties as assigned.

6D. Library resources that support the unit's academic and research initiatives.

Describe the library resources that support the unit's academic and research initiatives.

The University Information Technologies group manages eight computer labs and 13 computer classrooms around main campus. All are open to all UNM students, faculty and staff. Classrooms are staffed by Student Consultants who are trained to answer general computing questions.

Computer availability: Each library has student PC Windows 7 workstations loaded with Office, Matlab, Endnote Web, and other standard software. Six Macs are available on Zimmerman's 2nd floor. They are loaded with Office 2010 and other standard software. Laptops are available for checkout at each of the library Service Desks. All of the University Libraries have wireless access through LoboWifi.

Accessibility Resource Center (ARC): The ARC provides a variety of services to UNM students with disabilities. Students with disabling conditions that affect a major life activity are eligible for these services. This includes students with visual, hearing, learning, and mobility disabilities, as well as chronic conditions. The primary duty of the department is to help all qualified students with disabilities gain equal educational access and opportunities throughout the UNM community.

Libraries of the University of New Mexico

Mission
The University of New Mexico University Libraries (UL) provides information, services, and education in any place and at any time, as well as providing and maintaining exceptional facilities for the evolving education, research, and service needs of UNM and the wider community. The UL plays a key role in fulfilling UNM's mission to serve as New Mexico's flagship institution of higher learning through demonstrated and growing excellence in teaching, research, patient care, and community service.

Vision
The University of New Mexico University Libraries is seen as a proactive and adaptable source of knowledge for UNM and the wider community. They remain the leading academic library in New Mexico by:

- Making available extensive and valuable collections.
- Being a trusted partner in the academic culture.
- Enabling students in the use of information and informatics.
- By offering extensive and user-centered electronic services.
- Being a desired destination by providing functional and attractive physical places.
- Ensuring that our employees have the necessary skills and tools to serve the evolving needs of our students.
- Having varied funding sources.

The Undergraduate Libraries that provide the greatest level of support for students studying the basic sciences include:

- **Centennial Science & Engineering Library** - collections: sciences, engineering, mathematics, psychology, Map & Geographic Information Center
- **Zimmerman Library** - collections: humanities, education, social sciences, government documents

Zimmerman Library opened a renovated collaborative space for students on the eastern end of the first floor on August 17th, 2014. New service desks, a large number of computers and laptops, more power and connectivity, energy saving features, and a range of furniture and tools that can be rearranged to create workspaces on the fly are integral to their vision of collaborative learning. In addition, group study rooms are available at all four libraries and can be reserved by UNM students, staff or faculty.

In addition, the students and faculty have access to resources offered by the UNM's Health Sciences Library and Informatics Center (HSLIC) uses advanced information systems and a state-of-the-art collection of electronic, print and audiovisual materials to serve the needs of UNM's Health Sciences Center (HSC) faculty, staff, students and health care providers. In addition to offering reference services, online literature searches and document delivery, our librarians and IT professionals provide instruction in the use of health-related resources and information technologies. HSLIC is composed of three programmatic areas: Library and Education Services, Technology Support Services, and Biomedical Informatics, Research, Training and Scholarship.

Criterion 7. Facilities

The facilities associated with the unit are adequate to support student learning as well as scholarly and research activities.

7A. Facilities associated with the department and the BMB program

Describe the facilities associated with the unit and associated programs including, but not limited to, classrooms, program space (offices, conference rooms, etc.), laboratories, equipment, access to technology, etc.

Classroom Space

Ample classroom space is available on the Main Campus, reserved through the central scheduling office. The majority of classrooms are designed for lecture format and can accommodate small groups of 20-30 students and classes as large as 150-250 students.

Classroom space is also available to our Department on the Health Sciences Center Campus, which is used both Fall and Spring semesters for our Biochemistry of Human Disease courses (Bioc 463 and 464). This space includes classrooms in the Nursing and Pharmacy Building, the Biomedical Research Facility (room 218), and in the recently constructed Domenici Center for Medical Education. These classrooms are fully equipped with modern educational amenities, including computer consoles, projection systems, document cameras, large LCD monitors, and mobile furniture allowing classroom organization for various learning styles.

Learning Studio Classrooms

New classroom environments have been constructed on the main campus for collaborative learning in any discipline. In Fall 2014, two studio classrooms became available for scheduling in the new Collaborative Teaching and Learning Building (CTLB), one with 63-seat capacity and one with 126-seat capacity. The University of New Mexico was awarded the 2014 Best Buildings Award sponsored by the American General Contractors (AGC) of America for the Collaborative Teaching and Learning Building. In Fall 2015, one studio classroom with 80-seat capacity became available in the Domenici Center of the Health Sciences Center.

Learning studios are designed to enhance and enable collaborative learning that is centered on the students rather than the instructor. The instructor works from the middle of the room, lecturing sparingly, and allowing ease of access to all students. Provided computers enable opportunities to access online resources, use simulations and animations, and for paperless team-generated assignments to be completed and submitted for instructor assessment. While many of these functions can be accomplished to varying extents in traditionally furnished classrooms, research at other universities demonstrates much better collaboration and learning that are facilitated by the 9-seat, circular tables.

Features of the DSH 224 Learning Studio:

- Six, 9-seat tables, each equipped with three, secured notebook-PC computers with a standard UNM IT software image and enhanced Wi-Fi access.
- A centrally located teacher station with CPU, SMART Podium monitor, Blu-Ray/DVD player, and document camera.
- Two projection screens and LCD projectors to maximize viewing from all seats; instructor can send images from any of the students' table computers to the main screens.
- Whiteboards on all walls to accommodate student work for discussion.

Features of the CTLB 300 Learning Studio: This studio classroom is being used routinely for the Bioc 445 and Bioc 446 core courses required for the Biochemistry Major and provides ample room for 126 students participating in an active learning pedagogical format.

- 14, 9-seat circular tables.
- A centrally located teacher station with CPU, SMART Podium monitor, Blu-Ray/DVD player, and document camera.
- Two projection screens and LCD projectors to maximize viewing from all seats; instructor can send images from any of the students' table computers to the main screens.
- Whiteboards on all walls to accommodate student work for discussion.

Features of the CTLB 330 Learning Studio:

- 7, 9-seat circular tables.
- A centrally located teacher station with CPU, SMART Podium monitor, Blu-Ray/DVD player, and document camera.

- Two projection screens and LCD monitors to maximize viewing from all seats; instructor can send images from any of the students' table computers to the main screens.
- Whiteboards on all walls to accommodate student work for discussion.

Features of the HSC DCNE 2470 Learning Studio:

- Built-in Overhead Projector with large screen to maximize viewing from all seats.
- iClicker system for instant feedback students learning.
- Instructor computer complete with a wide-screen monitor and wireless internet access.
- White board installed to accommodate visual student needs and enhance student discussions.

Teaching Laboratory Space

Dedicated space for the Biochemistry Methods Laboratory course (Bioc 448L) is located on the second floor of the Reginald Heber Fitz Hall Building, near the Department office and the shared instrumentation room. The lab space will be remodeled in 2015 (see letter of institutional support included in Criterion 7A ***Appendix*** "SOM Dean Letter of Support"). The newly remodeled space will allow us to teach two 4-hour lab sections of 20 students per section (10 work stations) and will be available in the 2016 Spring.

Dedicated teaching laboratory equipment:

Various spectrophotometers (UV and visible), spectrofluorometer (Shimadzu), DNA gel electrophoresis units, SDS-PAGE gel electrophoresis units, power supplies, gel-filtration, ion-exchange and affinity chromatography units, high-speed centrifuge, refrigerators, -20 freezers, micro-centrifuges, floor model centrifuge, chemical fume hood, pH meters, balances (top loading and analytical), water bath, shakers, and pipetman sets.

Teaching and research shared instrumentation:

Q-PCR machine, PCR thermal cycler, orbital cell culture shakers, Cell Culture Core Facility, PCR hoods, immunoblotting apparatus, film developer, Syngene Chemiluminescence-Chemifluorescence-Gel Documentation System, high-speed centrifuges, ultra-speed centrifuge, water purification system, VIS/fluorescence microtiter plate reader, and ice maker machine.

Dedicated Research Facilities

The individual Department faculty research laboratories total of approximately 700 square feet of space each in addition to shared departmental instrumentation and cell culture rooms. These rooms are located within the University of New Mexico, School of Medicine, Biomedical Research Facility Building, and the Reginald Heber Fitz Hall Building.

The Department is located on the UNM Health Sciences Campus, which includes the School of Medicine. It has a Clinical and Translational Science Center, an NCI designated Cancer Center, and a newly established Brain and Behavioral Health Initiative. The University of New Mexico Cancer Center offers state-of-the-art core facilities in genomics, flow cytometry, microscopy and informatics. The Cancer Center houses the New Mexico Tumor Registry, which is one of 11 NCI-funded SEER Cancer Registries. The Cancer Center is also home to the University of New Mexico Center for Molecular Discovery, dedicated to identifying novel drug targets in cancer and other diseases, as well as the Keck-UNM Small Animal Imaging Resource. Shared core facilities are extensive and include those for MRI/NMR/EPR, microscopy, genomics/DNA microarray analysis, and molecular screening technologies.

Department common use equipment includes: IncuCyte ZOOM Live Cell Imaging System, Metabolic Cage System, Zeiss A-1 immunofluorescence microscope, fluorescent inverted microscope (Olympus CK40-RFL), Zeiss LSM 510-META-Confocal Microscope, Two-photon Confocal Microscope (Zeiss LSM 510), Olympus DSU Spinning Disk Confocal/Stereology System, Olympus IX71 microscope with Andor iXon camera, multiple image analysis workstations, electroporator, ultrasound sonicator, water bath incubators, PCR machines, gel electrophoresis equipment, UV transilluminator, iso-temperature

microbiology incubator, automatic cell counter, tissue immunohistochemical staining (IHC) facility, UV/Vis spectrophotometers, spectrofluorometer, water purification system, shaker incubator, gel dyer, ELISA reader, ultracentrifuge, speed concentrator and gel dryer, gamma and scintillation counters, CO2 incubators, biological safety cabinets, refrigerators, -20 C freezers, -80 C freezers, liquid nitrogen tanks.

UNM Health Sciences Center Biomedical Genomics Core Facility. Laboratory space is available for "clean" DNA and RNA isolation and cDNA clone propagation. A complete Affymetrix microarray system was recently purchased for the facility, which includes all molecular instrumentation required for scanning and analysis of oligonucleotide microarrays plus a fully integrated computer software analysis system (restricted to the analysis of oligonucleotide-based arrays) and a LIMS server for storage and processing of initial genomic data.

UNM Proteomics and Mass Spectrometry Facility capabilities with MALDI Time of Flight Mass Spectrometry (MALDI-TOF) and electrospray (ESI) tandem mass spectrometry (MS-MS) with a high resolution mass analyzer (Micromass). Protein identification is accomplished with the Micromass® BioLynx and ProteinLynx or the Applied Biosystems GPS with MASCOT software packages. The proteomic facility is also equipped with multiple mass spectrometry (MS) instruments that are coupled to either gas chromatographs (GC) or liquid chromatographs (LC), so that samples can be analyzed by both GC/MS and LC/MS.

Academic & Instructional Support

- *Classroom Technology Support -* Information Technologies (IT) computer classrooms and lab spaces are available for classes or conferences sponsored by UNM faculty, staff, or student groups. Fees are based on the services provided. These services include custom software installation where required.
- *Conference Room Technology Support -* IT provides assistance with planning, obtaining cost estimates and oversight of installation of conference room technologies. Technologies such as projection systems, audio systems, control systems and computing can be assessed to determine best fit.
- *Faculty Course Evaluations, Test Scoring & Survey Software -* Faculty and Course Evaluations provide student feedback to faculty on teaching strengths and weaknesses. Evaluations are completed at the end of the course by students and faculty receive summary reports within two months of semester end.
- *Faculty Development and Support* - IT provides training on all classroom academic technologies. Group and individual training sessions can be scheduled to provide detailed instruction on how to operate technologies within classrooms.
- *Instructional Technology Space Design* - IT provides professional consulting and space design for new conference rooms, classrooms, or redesigned educational spaces. IT is continually in the process of evaluating, vetting, assessing and making recommendations regarding current and emerging instructional methods.
- *Learning Commons Support -* IT operates 14 computer classroom and labs, as well as 150 computer-equipped classrooms on campus for UNM students, faculty, and staff.
- *Learning Management System* - UNM Learn is UNM's official online learning management system. UNM Learn provides a comprehensive suite of tools for delivering instruction to students over the web, including quizzing, assignments, course materials, discussion groups, and grading.
- *Media Services (iTunes U, Anti-plagiarism) -* IT offers development and publishing of digital multimedia content for academic and administrative uses. One such service is iTunes U. UNM on iTunes U includes a public site offering courses and faculty lectures available from iTunes U.
- *Print Services -* The University of New Mexico is committed to student success in all academic pursuits. In order to better meet our students printing requirements throughout main campus

we have expanded the Enterprise Printing Program. The PawPrints program allows students to print at all IT managed lab locations and at all satellite print location across the UNM campus.

Laboratory Preparation and Teaching Assistants

One Teaching Assistant (TA) position per year have been allocated for the Biochemical Methods course (Bioc 448L) the past four years. TAs are educated in code of conduct and are experienced in the protocols used in the course. Selection priority is given to the students who have taken and earned an "A" in the Bioc 448L course previously or graduate students who have required hands-on research experiences. One TA new position for each course, Bioc 445 and Bioc 446, has been allocated beginning in FY2016 due to the increasing number of students in these courses.

7B. Computing facilities maintained by the unit

Describe any computing facilities maintained by the unit.

Departmental: None
Institutional: The HSC Technology Support of the Health Sciences Library & Informatics Center provides support for core services to all Health Science Center (HSC) faculty and staff for standard HSC-owned and -operated workstations.

Criterion 8. Program Comparisons

The programs within the unit are of sufficient quality compared to relevant peers. (Differentiate by program where appropriate.)

8A. Distinguishing characteristics of the programs and comparison with other programs

Provide information on the distinguishing characteristics of the programs within the unit. Discuss the unit's programs in comparison with other programs such as number of faculty, student characteristics, types of programs: Parallel programs at any of our 22 peer institutions. Parallel programs at any of our regional/student referent peer institutions. Regional and national comparisons of academic programs.

Because undergraduate Biochemistry programs are often part of other, larger programs, (i.e., Biology, Chemistry), it is difficult to obtain comparison data of size of the programs (in terms of number of UG degrees awarded or number of faculty), and/or on the relative "success" of the programs. US News and World Report and other rating publications tend to measure success based on number of PhD degrees conferred or funding awarded to graduate-based programs.

As of mid-summer 2015, UNM's program was granted ASBMB accreditation for our Biochemistry and Molecular Biology degree program. The list of schools so accredited is included below:

Bloomsburg University of Pennsylvania
Brigham Young University
California State University, Long Beach
Colby College
Goucher College
Hampden-Sydney College
Hendrix College

Hope College
Miami University
Middle Tennessee State University
Minnesota State University, Mankato
Northeastern University
Oregon State University
Otterbein University
Pennsylvania State University
Purdue University
Roanoke College
Rowan University
San Francisco State University
South Dakota State University
St. John's University
Texas State University
*Texas A&M
Tulane University
*University of Arizona University of California Davis
University of New Mexico
University of Minnesota, Twin Cities
University of Southern Mississippi
University of St. Joseph
University of Tampa
University of the Sciences
Villanova University
Virginia Tech
Wayne State University
Wellesley College
Willamette University
Winthrop University

*Though only two of the above are considered peer institutions to UNM, the ASBMB list contains some very highly rated institutions, so we are in good company from that viewpoint.

Criterion 9. Future Direction

The unit engages in strategic planning and prioritization in order to achieve its mission and vision.

9A. Summary of strengths and challenges

Provide a summary of strengths and challenges for the unit.

STRENGTHS of the Biochemistry Program

The ASBMB accreditation committee identified the following as areas of strength for the UNM Undergraduate Biochemistry Program:

1. Very strong inquiry-based, student-centered teaching
2. Classrooms designed for inquiry teaching and collaboration
3. Support for very diverse student body
4. Attention to assessment at course and program level

Department Faculty identified the following strengths:

5. The students are academically successful at UNM (GPA, Research experiences, and career choices/opportunities after graduation)
6. Faculty commitment to undergraduate BMB student education and training of students
7. BMB Faculty with expertise to diverse learning methods and curricular development
8. Inquiry-based and student centered teaching
9. Support from SOM Leadership to Advance the program (for example, designated newly remodeled teaching lab in Fitz Hall)
10. Model of collaboration between Undergraduate Program at the University of New Mexico and School of Medicine
11. Graduates enter into UNM School of Medicine and Biomedical Sciences Graduate Program

CHALLENGES of the Biochemistry Program

The ASBMB accreditation committee identified the following as areas in need of improvement for the UNM Undergraduate Biochemistry Program:

1. A limited number of full professors among the core faculty (currently one full professor), especially those trained in Biochemistry
2. More internships and research opportunities for students other than those enrolled in the Honors Research Program

The Department faculty identified the following challenges:

3. Hiring of new faculty who are formally educated and/or trained in the fields of biochemistry/molecular biology and can teach the content of our courses (more than one), with the pedagogy that has been shown to be effective.
4. Improving/Solidifying the biochemistry laboratory course (Bioc 448L) in terms of instructors, format, content, and resources such as equipment and lab space to accommodate the growing number of students pursuing the B.S. degree.
5. Enhancing the undergraduate research experience. Explore novel research opportunities for our UG students in the greater NM community (i.e., national lab internships) and whether there is a mechanism for using undergraduate laboratory research experiences (in individual laboratories) toward fulfilling the laboratory course requirements.
6. Meeting the student career needs: By i) offering adequate number/variety of electives, ii) expanding the experiential opportunities, iii) advancing problem-solving and quantitative skills, iv) ensuring alignment with the national vision for life sciences departments (i.e., Vision and Change), and v) communicating more frequently with the Biology and Chemistry Departments to provide the most seamless education for our students.
7. Improving assessments. Implement the ASBMB exit exam, and use consistent grading and course assessment across the curriculum.
8. Increasing faculty involvement in the planning and implementation of the Undergraduate Major.
9. Clarifying and promoting alignment of Undergraduate Programmatic goals with Department mission objectives.

9B. Strategic planning efforts

Describe the unit's strategic planning efforts.

To address Challenge 1:

- The Department faculty is exploring possibilities for career advancement that reevaluate teaching contributions and are aligned with the School of Medicine guidelines and

expectations.

To address Challenge 3:
- The Department is conducting a faculty search (FY2016) at the Assistant Professor rank in the tenure-track. A second search is planned for FY2017.

To address Challenge 4:
- The Department is considering eliminating the B.A. degree option address the shift in enrollment from the B.A. track to the B.S., and to optimize/focus Departmental resources expenditure.
- Beginning the FY2016, lab fees for the Bioc 448L course will be collected to partially defray supplies costs.

To address Challenges 6 and 7:
- The ASBMB exit exam will be implemented beginning 2016 Spring.
- Adopt and implement the PULSE Life Sciences Departmental rubrics for courses and program assessment (see previous URL notes for these national rubrics)
- Develop a list of minimal competencies per course.
- The department faculty will meet to assess the program, including courses instruction and student learning outcomes at the end of each academic year (early summer) using the Vision and Change rubrics, minimal competencies, and ASBMB exit exam.
- Continue discussion with the Biology Department to make Bioc445 a prerequisite for the upper elective course offered through Biology.

9C. Strategic directions and priorities for the unit

Describe the strategic directions and priorities for the unit.

Within the next 5-10 years

To address Challenge 3:
- Recruit a pool of faculty adequate to the size of the Undergraduate Biochemistry Program and other teaching obligations in the Medical and Graduate programs.

To address Challenge 6:
- Develop/offer at least one additional Department elective course.

To address Challenges 2 and 5:
- Investigate how undergraduate programs in other academic institutions maximize student research experiences.
- Double the number of BMB graduates who have lab research experiences.

To address Challenge 4:
- Define minimal competencies for the biochemistry laboratory course (Bioc 448L) to explore possibilities to substitute Bioc 448L with Honors Research laboratory experiences (Bioc 497 and/or Bioc 498). This strategy will help addressing Bioc 448L student capacity.
- Develop a state-of-the-art biochemistry teaching lab course with intensive bench work and that incorporates diverse research project experiences.

To address Challenge 7:
- Use the PULSE Vision and Change rubrics to ensure the Program meets student needs.
- Develop rubrics for assessment of all departmental courses and the program.

To address Challenges 1-9:

- Institute faculty mini-retreats to define 3-5-year unit goals and the action plan to achieve the program goals.

Criterion 0A

Biochemistry Undergraduate Program Accreditation Letter from ASBMB

American Society for
Biochemistry and Molecular Biology
11200 Rockville Pike, Suite 302
Rockville, Maryland
20852-3110

June 26, 2015

Karlett Parra, Ph.D.
Department of Biochemistry and Molecular Biology
University of New Mexico, Health Sciences Center
Albuquerque NM 87131

Dear Dr. Parra:

Thank you very much for your application for ASBMB department/program accreditation. We are pleased to inform you that ASBMB has accredited your program for the **full 7-year term (June 1, 2015 through May 31, 2022).**

Aspects of your application that were considered particularly noteworthy included:

- Very strong inquiry-based, student-centered teaching
- Classrooms designed for inquiry teaching and collaboration
- Support for very diverse student body
- Attention to assessment at course and program level

Despite the overall strength of your application, some areas of relative weakness, ambiguity, or concern were identified:

- There is only one full professor among the core faculty, and that individual is not trained as a biochemist
- Internships and research opportunities are strong for those in the honors and similar academic-year programs; however, other options, e.g. summer research, are not described

As we gain experience with this new program, we continue to identify ways in which the process can be improved in both substance and execution. In particular, we would appreciate receiving more information on the following topics as part of your next renewal application:

- How faculty are being mentored towards promotion
- Mapping of concepts for courses beyond the core biochemistry curriculum
- Safety training for faculty

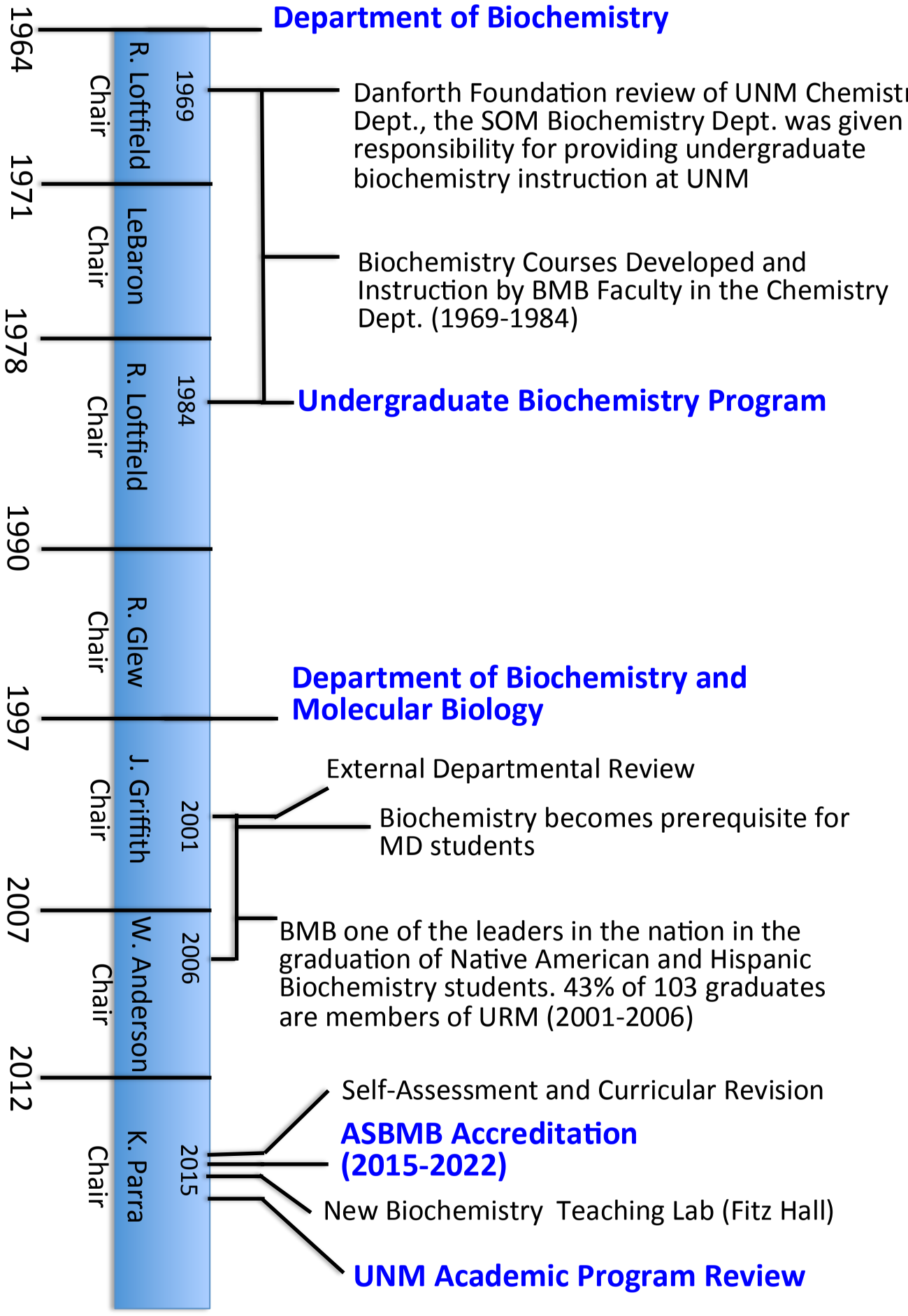
We encourage you to share this good news with your university community and stakeholders. If you are contemplating the release of an article, blog post or press release, please know that the ASBMB is very interested in helping to promote it. We therefore ask that you send a copy to Allison Frick (africk@asbmb.org). If you send a tweet, tag @ASBMB in it, and we'll retweet you.

Again, we thank you for your well-conceived application and congratulate you on your strong program. We look forward to working with you in the future.

Sincerely,

Adele J. Wolfson for the ASBMB department/program accreditation sub-committee

Criterion 0B. Program Milestones


1964
Department of Biochemistry
R. Loftfield
Chair
1969
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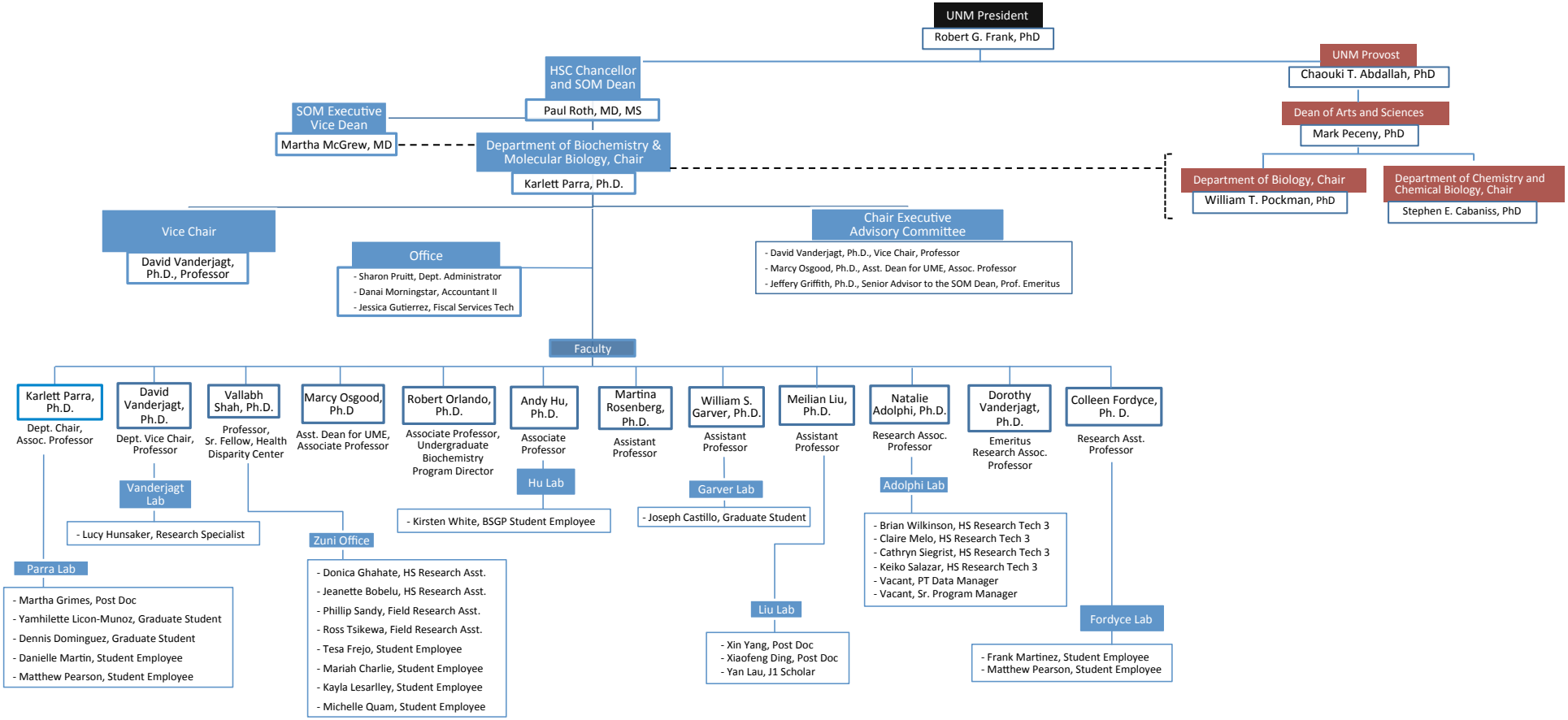
LeBaron
Chair
1978
R. Loftfield
Chair
1984
1990
R. Glew
Chair
1997
Department of Biochemistry and Molecular Biology
J. Griffith
Chair
2001
2007
W. Anderson
Chair
2006
2012
K. Parra
Chair
2015
Danforth Foundation review of UNM Chemistr
Dept., the SOM Biochemistry Dept. was given
responsibility for providing undergraduate
biochemistry instruction at UNM
Biochemistry Courses Developed and
Instruction by BMB Faculty in the Chemistry
Dept. (1969-1984)
Undergraduate Biochemistry Program
External Departmental Review
Biochemistry becomes prerequisite for
MD students
BMB one of the leaders in the nation in the
graduation of Native American and Hispanic
Biochemistry students. 43% of 103 graduates
are members of URM (2001-2006)
Self-Assessment and Curricular Revision
ASBMB Accreditation
(2015-2022)
New Biochemistry Teaching Lab (Fitz Hall)
UNM Academic Program Review

Criterion 0C
Organizational Structure Diagram

Organizational Structure Diagram



– – – Denotes Department frequent communication and cooperation with the the School of Medicine and the College of Arts & Sciences to provide the most seamless Biochemistry Undergraduate education experiences for our students.

Criterion 1D – 445-2015 syllabus

INTENSIVE BIOCHEMISTRY 445/545/511

INSTRUCTORS:

Marcy Osgood, Ph.D.
mosgood@salud.unm.edu
Office hours: M 3:35-5 PM, or by appt., BMSB 255

Martina Rosenberg, PhD
mrosenberg@salud.unm.edu
Office hours: Tuesday, 3:30-5 PM

Sherman Garver, PhD
wgarver@salud.unm.edu

Graduate Teaching Assistants
Jessica Binder
Nate Madrid
Peer Learning Facilitators:
Abigail Ritz
Zach Hazlettt

COURSE DESCRIPTION AND OBJECTIVES:

The course is designed specifically for students who are majoring in Biochemistry and who plan to continue their education in the field, through a graduate or professional program. It is the first class in a two-class sequence, and you should NOT take this course unless you also plan to enroll in BCHM 446/546/512 in the Spring. We will concentrate on the concepts, practices, and ways of thinking that define biochemistry. You will see connections to other disciplines; biochemistry is integrative. Because of this, you should be prepared to review material from your earlier biology, chemistry and physics courses (and, we suggest that you read the first chapter in the course textbook, "The Foundations of Biochemistry", to remind you of all that you have previously learned!)

Content Expectations:

We will be exploring, and you will be expected to assimilate (in quite a lot of detail), the concepts of:
-the aqueous environment of the cell (weak non-covalent interactions, pH, pKa)
-energy and organization (bioenergetics)
-complexity and complementarity of molecular structures (structure = function)
-catalysis (thermodynamic principles and kinetics)
-cellular communication (transport and signal transduction)
-information transfer (replication, transcription, translation, and gene regulation)

BCHM 445/545/511 will largely focus on PROTEINS and NUCLEIC ACIDS, while BCHM 446/546/512 will deal largely with CARBOHYDRATES and LIPIDS, though still building on knowledge about proteins and nucleic acids.

Process Expectations:

What we hope you get out of this course, besides content knowledge, is the ability to:
-"speak" biochemistry (disciplinary literacy) to a wide variety of other people, with differing scientific backgrounds and abilities
-identify the right question, select a proper method/technique to solve a specific biochemical problem, and explain your reasoning (critical thinking and analytical problem solving)
-identify challenges and limitations in research approaches, and devise improvements
-apply biochemical processes to other disciplines and to world issues
-apply and integrate quantitative reasoning to solve biochemical problems
-work and communicate effectively in a group (understand others and express yourself), orally and in writing, about biochemistry
-determine, and act upon, the knowledge of how you learn best

How to Succeed in this Course

The course is based on **individual preparation, active learning, and small group work**. What you take away from this class is determined by how much effort you invest in your own learning. There is a high expectation of before-class preparation (assigned reading, tested by short, in-class quizzes). There will be relatively little lecture, and a lot of in-class and out-of-class group work. Just as scientists and physicians work in teams to advance the field and make the right decisions, we will use the small group cooperative learning environment to construct and evaluate scientific knowledge (i.e., engage in the scientific process). Throughout the semester we will practice organizing, communicating, applying and reflecting on biochemical knowledge in different contexts.

Come to class regularly and be engaged and involved; it gives you an opportunity to test if you can apply what you know. After each class, and each assignment or activity, reflect on what you think the take-home message was, what you need to do to close the gaps in your knowledge, how you can test if your understanding is correct, and how this new information relates to things that you have learned previously.

The course will emphasize deeper understanding and application of concepts rather than memorization (**though you will need to memorize much of the large "vocabulary" of the language of biochemistry**), which makes it unlikely that you will do well by cramming just before an exam. A good strategy, which will help you to improve your understanding, is trying to explain your thinking to your classmates. That's why working in groups will be encouraged. In addition, exams make up only half of the points that you can earn for your final grade (see Grading Policies below), so you MUST be in class for the regular quizzes and activities, and participate in your group work, and complete the other assignments before and after class. **If you want to sit passively and listen to lectures, this is not the course (or the major) for you.**

LEARNING RESOURCES

Textbook:
The book chosen for BCHM 445 and 446 for AY 2015-2016 is
***Lehninger* Principles of Biochemistry ("POB"), 6th Edition by Nelson and Cox**

You can also use any other good Biochemistry text; however, the page assignments will ONLY be given for the POB Nelson and Cox 6th edition text, but the Objectives and Outlines available for each topic area will make it possible for you to use any other text in order to learn the material.

You need to purchase an iClicker if you do not already have one, and bring it class regularly.

BIOCHEM 445/545/511 Resources:

The UNM-Learn 445 course web site is restricted to students in this course.
This site contains:
Objectives, and usually an **Outline**, for each topic. The Quizzes that are given in class will be drawn from the Objectives and Outlines. Some of the Outlines will be extensive, and some less-detailed.
Some days there will also be PDF files which will consist of the figures that may have been used during the in-class discussion (minus any duplications or illustrative photographs), or that we have found to be helpful to students.
The **Objectives** and **Outlines** for each week will be posted (usually) by the Friday afternoon before that week. You can download these files and print them if you desire, to bring to class to help you during the class.

In addition, primary literature readings, problem sets/activities, and any additional materials, will be made available through the course UNMLearn website. Materials on UNMLearn will be separated into Folders designated Section 1, Section 2, etc.; each "Section" is the (approximately) three-week part of the course that ends with an in-class exam.

Faculty Office Hours:
The instructors are available outside of class times to help in your learning of biochemistry. Do not hesitate to contact them if you have questions. The biochemistry course covers a large amount of material. It is an upper division course that requires you to review information of previous courses and it integrates materials from biology, chemistry, and physics courses. Students use different methods to learn biochemistry and if you find that your selected method is unsuccessful the faculty may have suggestions for a more productive method to approach this topic. The easiest method to contact the faculty is through e-mail, to either ask a specific question or to schedule a meeting. In this course it is important to seek help sooner rather than later. **The TAs and the PLFs are also available to answer specific questions.**

Guidelines for office hours

Before you come to office hours please read and follow these instructions, so that your time is most efficiently used:

If you have content questions: Come with specific written questions based on the provided Objectives and Outlines. Bring material for discussion with appropriate sections marked. Be ready to discuss what you have done to understand this specific concept, so that we can try and help you with different strategies.

If you have process questions (how the course is designed), and find yourself struggling, in general, be ready to discuss: Do you attend class, read and review assigned material before and after class, actively participate in the in-class group activities? If there are barriers to your participation in any of these, let us know so that we can help.

COURSE POLICIES AND CONDUCT

Academic Integrity

You are expected to:

-Commit to a code of values that honors academic and personal integrity, honesty and ethical standards.

-Complete your own work. All students are expected to work individually on in-class exams, individual quizzes, primary literature summaries or any other assignments that are designated as "individual".

-Acknowledge work and ideas of another person by appropriate citation. Collaborators must be acknowledged on any assignments, and assignments must not contain verbatim copying of any kind, from any source, including the Internet.

-In this course, any incidence of academic dishonesty will result in the attachment of a failing grade for that assignment and may involve university disciplinary action.

Courtesy

The following is expected of each student to ensure an undisrupted experience for everyone in class:

-Be on time and prepared for class.

-No cell phone use during class, unless specifically directed; please turn them off.

-Computer and tablet use is permitted only for class related activities.

Attendance

Attendance is expected.

However: Life happens. During any absences, you are responsible for acquiring any material covered, but there are no make-ups for assignments (see **Grading Criteria** below.)

Accommodations

If you have a disability or special needs, please notify the Instructor as soon as possible of any concerns or requests for accommodations and specific arrangements needed. It is your responsibility to contact the UNM Accessibility Resource Center (ARC), located on

the second floor of Mesa Vista Hall, Room 2021. Mesa Vista Hall is located across the courtyard from the SUB. ARC will provide written documentation of your verified disability and recommended accommodations.
(ARC contact information: http://arc.unm.edu; phone: (505) 277-3506).

GRADING CRITERIA

This is a 4-credit course, with commensurate expectations. The following table outlines the weight of the various assessments that will be used.

Assessment	Maximum Points	% of Final Grade
Individual Clicker Quizzes (5pts each; best 20 of 29)	100	10
Activities (20 total, 20 pts each) These will include any/all of the following: Group Quizzes, Case Studies, Problem Sets, Article Synopses and Figure Summaries	400	40
Exams (best 3 of 4, 100 pts each)	300	30
Final Exam	200	20
Total	**1000**	**100**

There is no make-up for any missed activity and extra credit is not available.

Exams: Best 3 out of 4 Scores from the In-Class Exams
The four exams will be designed to be completed within a 50-minute class period, and will contain mixtures of the following:
-multiple-choice and short answer questions;
-problems similar to those you have worked on in class or in the cases, etc.
-interpretations of data sets, figures, graphs, that are the same as or similar to those you have seen in or out of class before.

Although the exams are *not* technically cumulative, they will build on understanding of concepts from previous sections throughout this semester.
The best 3 exam scores will count for this part of the course grade (in other words, the one lowest exam grade will be dropped.)
NOTE: You must take at least 3 of the 4 exams to pass the class.

Final Exam
The Final Exam will be given during Finals Week in the Final Exam time period (see **Schedule**). **This Final exam is required of ALL students.**

If the Final Exam percentage is GREATER than the regular exam average, the Final Exam percentage can replace the regular exam percentage for that portion (30%) of the grade, as well as count for the Final Exam portion (20%).

There will be NO make–up exams given. NONE. No exceptions.
In the case of university-sanctioned activities (athletic matches, for example) or professional/graduate school interviews, EARLY exams can be arranged.

NOTE: If UNM is closed (because of inclement weather) on the exact date and time of one of the 4 section exams, this exam will be administered during the next class period.
If UNM is closed on the date and time of the scheduled Final Exam, the average of your 3 best Exams will replace the Final Exam grade. There will be NO alternate date/time for the Final Exam. (These policies are in alignment with UNM's overall policies for weather or other closures.)

NOTE that ~75% of your grade is based on individual performance; ~25% of the grade is based on group activities or products.

Grading Scale
The final grade will be the based on the above components and determined as follows:

Some type of A (A-, A, A+)	90% or more
B	80% or more
C	70% or more
D	60% or more
Fail	less than 60%

There is no extra credit offered, and there is no curve applied to grade distributions. We do not "take off" points. You earn them. The difference is not merely rhetorical, nor is it trivial. In other words, you start with zero points and earn your way "up" to a grade.

GRADUATE CREDIT (for students registered for BCHM 545 or BIOMED 511)
If you are registered for graduate credit (which is appropriate ONLY if you are part of a graduate degree program, NOT if you are a "non-degree graduate student"), you have an extra assignment: to design an active-learning video, activity, or exercise based on an instructor-approved topic in Biochemistry. This assignment can receive a maximum of 100 points. The points earned on this graduate assignment will be added to the rest of the

assessment points earned (for a total of 1100 points max) and graduate student grades will be determined in terms of percentage of points earned out of 1100, rather than 1000 pts.

The guidelines for this assignment will be provided to graduate students during the fourth week of the semester, describing the expectations in detail.

Criterion 2A

Faculty Approved Electives

Because the approved elective courses are controlled by other Departments, timing of when these courses are offered can be a challenge for biochemistry majors when planning their time to graduation. Some courses are offered every two years, while others are offered only when a minimum number of students enroll. For this reason, we have chosen to broaden the list of courses to provide greater options for our students. Also, each of these courses has their own pre-requisite courses. Informal agreements have been reached with faculty instructors in other Departments to allow our students to substitute Intensive Biochemistry courses (Bioc 445 or 446) for some of these pre-requisites. However, formal agreements from the Chairs of these Departments need to be secured in the future. Department Faculty have approved the following elective courses to encourage a well-rounded education in multidisciplinary science:

Department of Anthropology

452 Anthropological Genetics (Human Genetics) - This course examines theory, data and methods used by genetic anthropologists to address questions about human origins and prehistory, race, natural selection, disease, and the social and scientific implications of research in genetic anthropology.

Department of Biology

412 Developmental Biology - Comparative biology of animal development emphasizing regulatory mechanisms.

461L Histology - Microscopic structure of vertebrate tissues, emphasizing correlation of structure and function.

425 Molecular Genetics - Molecular biology of the gene.

428 Human Heredity - Genetic principles applied to humans.

429 Molecular Cell Biology - Cellular processes with emphasis on membranes; includes reading original landmark papers in cell biology.

437 Evolutionary Genetics - Mutation, natural selection, genetic drift; how evolutionary forces shape population structure. Mechanisms of speciation. Macroevolution of biochemical processes essential to higher organisms, such as signal transduction pathways, developmental genes and complex organs.

444 Genomics and Genomic Analyses - Overview of genomic analyses from DNA sequence to gene expression and proteomics.

445 Biology of Toxins - Principles of toxicology; pharmacology and biotransformation of xenobiotics. Mechanism of action, medical uses, and evolutionary ecology of biological toxins.

446 Laboratory Methods in Molecular Biology - Principles of DNA and RNA purification, enzymatic manipulation of nucleic acids, molecular cloning, gel electrophoresis, hybridization procedures and nucleotide sequencing. Max. enrollment: 15 students per year, course taught once every two years.

450 General Virology - Structure, properties, and molecular biology of viruses; virus-host interactions, multiplication, pathology, epidemiology, effects of chemical and physical agents, classification.

451 Microbial Ecology - Role of microorganisms in terrestrial and aquatic ecosystems. Emphasis on biogeochemistry and nutrient cycling.

456 Immunology - Immunoglobulin structure, antigen-antibody reactions, immunity and hypersensitivity; experimental approach will be emphasized. Formally approved by Dept. of Biology for Biochemistry Majors. Course taught once per year.

460 Microbial Physiology - Physiological and biochemical activities of bacteria and fungi with emphasis on cell energetics.

482L Parasitology - The protozoa and worms important in human and veterinary medicine. Emphasis on life histories, epidemiology and ecology of parasites with laboratory practice in identification and experimentation.

490 Biology of Infectious Organisms - The full spectrum of infectious entities including prions, viruses and parasitic prokaryotes and eukaryotes will be discussed with respect to their transmissibility, interactions with immune systems and their influences on evolutionary processes and biodiversity issues.

497 Principles of Gene Expression - A detailed and critical study of how different genes are regulated during the life of an organism, principally at the level of transcription.

Department of Chemistry

312 Physical Chemistry (Part 2) - An introduction to chemical thermodynamics. Topics will include basic thermodynamic principles, phase diagrams, and solution phase thermodynamics.

422 Molecular Biology of the Gene - Focuses on the biological chemistry of gene structure, expression and regulation and the structure and function of the cell nucleus.

425 Organic Chemistry of Biological Pathways - Covers basic principles of mechanisms, acidity, stereochemistry; structures; properties of biomolecules; reactions in lipid, carbohydrate, amino acid, nucleotide metabolic pathways.

457 Environmental Chemistry - Introduction to the chemistry of natural and polluted environments, including both atmospheric and aquatic systems.

Department of Statistics

345 Elements of Mathematical Statistics and Probability Theory - An introduction to probability including combinatorics, Bayes' theorem, probability densities, expectation, variance and correlation. An introduction to estimation, confidence intervals and hypothesis testing. Pre-req: STAT 145

Biomedical Sciences Graduate Program

505 Scientific Writing – This is a one semester course that is offered in the fall semester each year. Participants include graduate students, postdoctoral fellows, advanced undergraduates, faculty, and other health professionals from both the Health Sciences Center and the UNM main campus. The course provides instruction in the structure and organization of a research manuscript and addresses other topics such as ethics of authorship, efficient use of reference data bases, and an overview of the publication process presented by a current editor of a scientific journal. Max enrollment: 10 per year.

509 Principles of Neurobiology - This course covers cellular structure of neurons and glia, the

electrical properties of neurons, intercellular communication, and the formation, maintenance and plasticity of chemical synapses.

510 Physiology - Course in regulatory and systems biology, and cardiovascular and pulmonary biology.

515 Cancer Biology - Fundamental elements of cancer development, progression, presentation and treatment will be the focus of this course. Basic genetic, biochemical, cell, and molecular mechanisms of tumorigenesis will be interwoven with clinical perspectives, normal versus tumor pathology, and therapeutic strategies. Specific blood cancer and solid tumor examples and readings of current literature will offer perspectives on distinctions between tumor types, molecular drivers, roles of the immune system and the microenvironment in progression and metastasis. Class format will include a combination of instructor- and student-led discussions.

516 Molecular Genetics and Genomics - Covers genetic and genomic approaches in model organisms (prokaryotes, fungi, worms, mouse and fruit flies) and humans to study biological processes at the molecular, cellular, tissue, organism, population and evolutionary levels. Provides an introduction to bioinformatic and computational methods used in such studies.

522 Experimental Design and Methods in Molecular and Cellular Biosciences - This case-based course is intended for first year graduate students and focuses on practical issues of how to design, plan and conduct scientific studies through appropriate use of experimental methods and data analysis.

532 Neurochemistry - An introduction to neurochemistry and neuropharmacology, with heavy emphasis on student participation, by reading and evaluating current publications.

School of Pharmacy

576 Cellular and Molecular Pharmacology (1 credit) WITH Pharm 580 General Toxicology (2 credits) – Must be taken together.

- **PHRM 576. Introductory Pharmacology.** Pharmacology is a basic science concerned with all aspects of the action of drugs on living systems. In its entirety, pharmacology embraces biochemical and physiological effects, mechanisms of action, pharmacokinetics, and therapeutic and diagnostic uses of drugs. A strong working knowledge of pharmacology is essential to the professional role of pharmacists and to basic scientists engaged in drug discovery and understanding how drugs work. The goal of this course is to give an overview of the principles of modern molecular and cellular pharmacology, as well as some details of drug delivery. Topics include: biopharmaceutical properties of drugs; receptor theory; absorption, distribution, metabolism and elimination; pharmacokinetics and drug delivery. It also serves as an introductory course to PHRM 580 and PHRM 598 courses.
- **PHRM 580 - General Toxicology.** Toxicology is an important broad-based discipline that incorporates information from many areas bridging the gap between molecular mechanisms of toxin activity to their implications in real-world problems. For the Spring 2015 semester, the General Toxicology course has been revamped to focus on basic scientific literature relevant to toxicology and the scientific method that are of interest to graduate students. Scientific literature relevant to toxicology and the scientific method are emphasized in all topics covered. The goal of this course is to give students a broad, but comprehensive, overview of the principles of toxicology. Topics will be taught by experts in each area and will include aspects of toxicology

on relevant toxic agents, molecular and cell-based mechanisms of action, as well as details of target organ systems and physiology that are affected by toxins.

Note: Many of these course options are offered every two years, which can have impact on student graduation time. Timing and delivery of courses to fulfill the elective requirements needs to be continually evaluated.

Additional note for students selecting 500-level courses:

Although courses numbered above 500 are normally open only to graduate students, senior students with GPAs of 3.0 or higher may receive undergraduate credit. They must obtain approval in advance from the instructor concerned, the chair of the department, and the dean of their undergraduate college. Undergraduates may not enroll in graduate problems for undergraduate credit.

Undergraduate students may take graduate courses for graduate credit provided they meet requirements and follow procedures listed below:

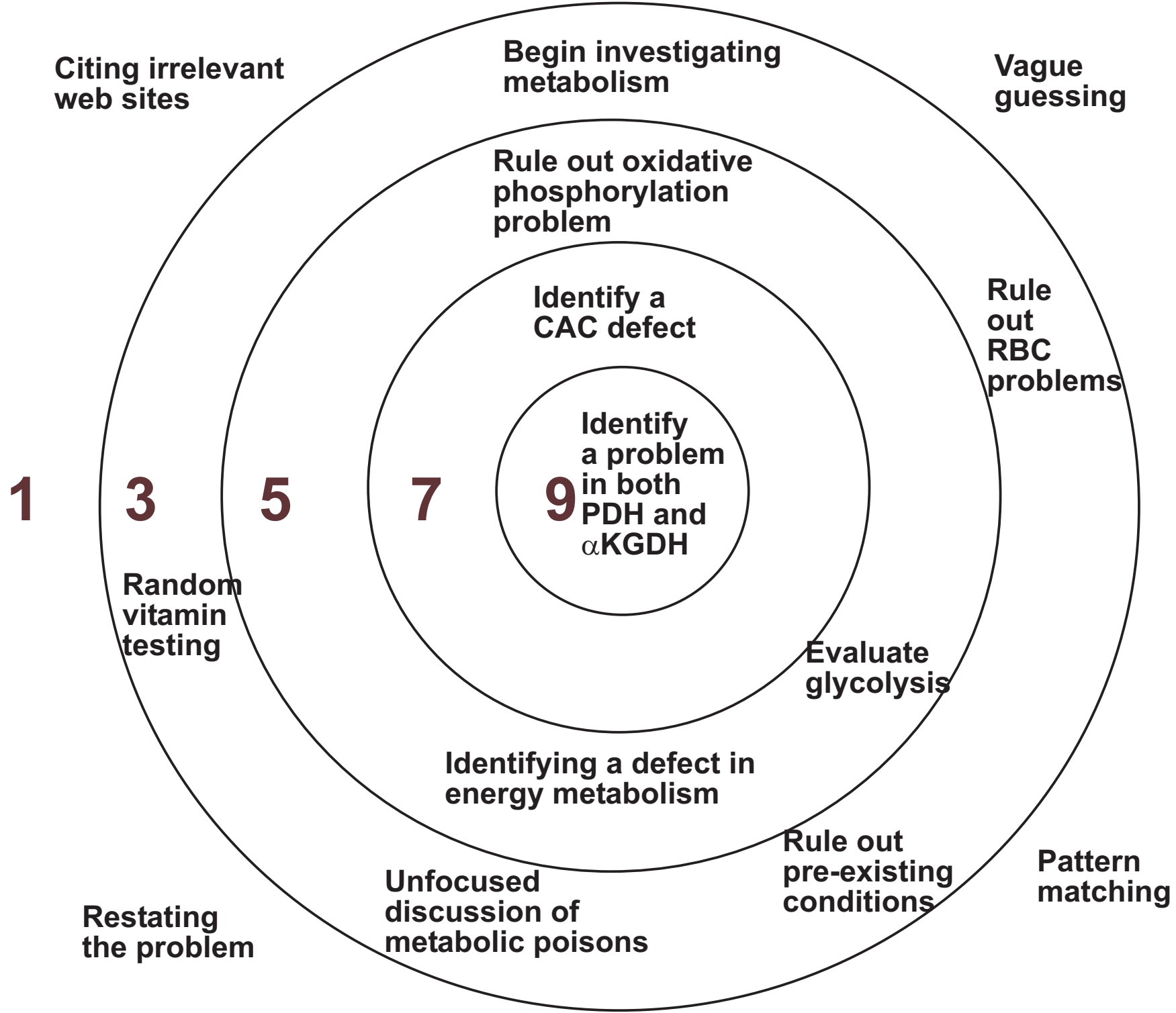
1. Must be within 10 hours of the baccalaureate degree.

2. Must have an overall GPA of 3.0.

3. Seeks no more than nine hours of graduate credit during that semester

If these requirements are met, the student should obtain a GCA card from the department and obtain the instructor's signature in the appropriate place on the card. The student must then obtain a signature from the advisement office of their undergraduate college certifying that they meet the above requirements. The student must then bring the card to the Office of Graduate Studies. OGS will verify that the course is available for graduate credit and that the student is in undergraduate status. OGS will sign the card and forward it to the Records and Registration Office. The course(s) taken will apply toward an advanced degree after completion of the baccalaureate degree. The same course cannot count for both graduate and undergraduate credit. Undergraduate students must have the card filed by the last day of the fourth week of classes during the regular semester. No changes will be permitted after these deadlines.

Criterion 3A.1 – Example Rubric for Case Study


Citing irrelevant web sites
Begin investigating metabolism
Vague guessing
Rule out oxidative phosphorylation problem
Identify a CAC defect
Rule out RBC problems
Identify a problem in both PDH and αKGDH
1
3
5
7
9
Random vitamin testing
Evaluate glycolysis
Identifying a defect in energy metabolism
Rule out pre-existing conditions
Pattern matching
Unfocused discussion of metabolic poisons
Restating the problem

Criterion 3A.2 – Department Exit Survey

Spring 2015 Biochemistry Convocation

Friday, May 8th at 2:00-4:00 pm in the Domenici Auditorium

NAME:

Attending the Biochemistry Graduation Ceremony? ☐ **YES** ☐ **NO**

Immediate Goal Upon Graduation:

Long Term Career Goal:

Scholarships & Honors Received

Volunteer / Community / Campus Service:

Your favorite thing about your Biochemistry education experience?

Have you conducted undergraduate research? When and for how long?
Who was your research mentor?

Please provide an Email for contact after graduation.

Criterion 3A.3 – Biochemistry annual report to Provost 2011-2012

Biochemistry and Molecular Biology Annual Report for Academic Year 2011-2012

Department/Program: Biochemistry and Molecular Biology Degree program(s): Biochemistry BA/BS
Person(s) preparing report: Marcy P. Osgood, Ph.D., Associate Professor, Program Director
Date submitted: December 16, 2012

1. List the student learning outcomes (SLOs) that were assessed during the academic year, including those for which data were gathered as well as those for which developmental work was done, such as the creation or piloting of assessment measures.

Please refer to Table 1 "Global and Specific Student Learning Objectives for the Biochemistry Major".

Many of the stated SLOs are derived from curricular documents published by our disciplinary society, American Society for Biochemistry and Molecular Biology (ASBMB); (1) and by the Association of American Medical Colleges and the Howard Hughes Medical Institute (2).

A new problem-solving exit exam was piloted in May 2012, and will be used in May 2013.

Note that in early 2013, ASBMB plans to release a new set of criteria for certification of Biochemistry Undergraduate programs; at that time, we will revisit our SLOs.

2. For each learning outcome, describe a) the measures used (at least one-half of the measures used are to be direct measures, and at least one direct measure must be used for each SLO), b) the sample of students from whom data were collected, c) the timetable for the collection, and d) the setting in which the measures were administered.

Please refer to Table 1 "Global and Specific Student Learning Objectives for the Biochemistry Major", for a synopsis of the SLOs and of the direct measures of student learning.
The direct measures of student learning used for assessment are abbreviated as follows:

- Capstone experience (CE)
- Subject matter exams (SE)
- National standardized subject matter exam from the American Chemical Society (ACS)
- Laboratory Skill Performance (Practicum) (LS)
- Student academic awards (AA)
- Problem-solving exams (3,4,5) (PS)

In this matrix, "X" in a cell indicates the course(s) in which that the concept/skill is assessed by either in-course exams, or, a performance assessment (in laboratory sessions.)

Please refer to Table 2 "Undergraduate Biochemistry Major: Summary of Class Statistics", for both direct and indirect measures of student learning.

The students from whom data were collected included all graduating Biochemistry majors.
The timetable for the collection (of all except individual course assessment data) was the final semester before graduation (so, for the May 2012 graduates, all information was gathered in the Spring 2012 semester.)

For the individual course assessments, the frequency of administration varied by course, but always included at least 3 in-class exams, performance assessments, and/or papers. All Biochemistry content-based SLOs were, in addition, assessed by the ACS Biochemistry exit exam.

The settings in which the measures were administered varied:

- Individual course assessments were administered according to the individual course syllabi.
- the ACS exam was administered in a classroom, following the guidelines set by the American

Chemical Society (2 hours, closed book)
- GPA information was obtained through UNM student records
- Research Honors designations were assessed by the BMB faculty as a group, based on evaluation of Research Honors written theses and student presentation of their work at the Biochemistry Research Symposium (Capstone Experience). (Outside guest are invited to these presentations, but only the BMB faculty evaluate the students for level of Honors awarded.)
- Acceptance into graduate and professional programs, and university honors designation were self-reported by students through a required Graduating Biochemistry Majors Survey, which was sent to the students, and returned, via e-mail.

3. Describe the results of the assessment. (What do they tell you about student learning in general and mastery of measured SLOs in particular? What did you learn about strengths and weaknesses of your program?) If specific results are not available, describe the progress that has been made on the initiatives included in the approved assessment plan.

In general, our majors are academically successful during their time at UNM, as measured by the overall GPA, and achievement of university honors. The length of time to degree is very acceptable. Over the past 10 years, the exit scores on the American Chemical Society Biochemistry certification exam (used as a direct measure of Biochemistry majors' exit content knowledge) of Biochemistry graduates have remained relatively stable, as has retention of URM Biochemistry graduates.

Analysis of student performance on specific content areas in the course content exams and in the ACS exam is underway, as part of a new post-doctoral scholar's research project; those data should be available by the end of this AY. In addition, based on the disciplinary recommendations for process competencies (1, 2), we have focused on providing our students extensive practice in scientific problem solving strategies (3, 4, 5), and a new problem-solving exit exam was piloted in May 2012, and will be used in May 2013. Results of this pilot are being analyzed as part of a larger and longer-term PhD project by a graduate student of one of the BMB faculty.

NOTE: Because students do not actually begin taking courses in the degree program until after at least two years of prerequisite courses, students are considered to be entering the program when they enter the first Biochemistry course, BCHM 445, as officially declared Biochemistry majors.

4. Describe the departmental process by which faculty reviewed the assessment procedures and results and decided on the actions and/or revisions that were indicated by them.

The BMB faculty as a whole are kept apprised of the yearly assessment data. M. Osgood, as Director of the program, is primarily responsible for implementing the changes described below. Osgood will also educate the faculty about the new ASBMB certification criteria when they are released.

5. Describe the actions and/or revisions that were implemented in response to the assessment processes and results.

We have developed problem-solving strategy assessments, for both group and individual use, to allow us to provide practice in, and evaluation of, student development of problem-solving skills. We are continuing to gather data using these tools, and have developed several other process measurement tools. (3, 4, 5)

6. Given the assessment activities and results to date, describe your assessment plans for the next academic year. If significant changes have been made to degree program SLOs or to the general assessment strategy, please clearly describe. (Remember that half of all assessment measures must be direct measures of student learning (see link in #2 above).)

We plan to continue to gather assessment data as described above. A new problem-solving exit exam was piloted in May 2012, and will be used in May 2013.

We plan to use the new ASBMB criteria (expected to be announced in early 2013) to revisit our SLOs and assessment methods for those SLOs.

References

1. American Society for Biochemistry and Molecular Biology (2003) *Recommended Curriculum for a Program in Biochemistry and Molecular Biology*, Education and Professional Development Committee, Bioc. Mol. Biol. Educ. 31: 161-162.
2. Association of American Medical Colleges (2009) *Scientific Foundations for Future Physicians*, AAMC-HHMI Committee, Washington, DC.
3. Anderson, W.L., Mitchell, S.M., Osgood, M.P. (2008) *Gauging the Gaps in Student Problem-Solving Skills: Assessment of Individual and Group Use of Problem-Solving Strategies Using Online Discussions*, CBE Life Sci Educ. 7: 254-262.
4. Osgood, M.P., Mitchell, S.M., Anderson, W.L. (2008 October) *Tracking student problem-solving strategies in online PBL case discussions: a method to target interventions to individuals and groups most in need of help*, National Academy of Sciences - Board on Science Education, Workshop on Linking Evidence and Promising Practices in STEM Undergraduate Education, Washington, D.C., http://www7.nationalacademies.org/bose/Osgood_Commissioned_Papers.html.
5. Anderson, W.L., Mitchell, S.M., Sensibaugh, C.A., Osgood, M.P. (2010) *Assessing Individual Problem-Solving Performance.* International Journal for the Scholarship of Teaching and Learning (submitted).

Table 1 below: Global Student Learning Objectives for the Biochemistry Major and Assessment Measures

1. Understanding of the fundamentals of chemistry and biology and the key principles of biochemistry and molecular biology (SE, ACS)
2. Awareness of the major issues at the forefront of Biochemistry (CE, SE, ACS, LS)
3. Ability to evaluate primary papers critically (CE, LS, PS)
4. Good “quantitative” skills such as the ability to accurately and reproducibly prepare reagents for experiments (LS)
5. Ability to dissect a problem into its key features (CE, PS)
6. Ability to design experiments and understand the limitations of what the experimental approach can and cannot tell you (LS, PS)
7. Ability to interpret experimental data and identify consistent and inconsistent components (LS, PS)
8. Ability to design follow-up experiments (LS, PS)
9. Ability to work safely and effectively in a laboratory (LS)
10. Awareness of the available resources and how to use them (LS, PS)
11. Ability to use computers as information and research tools (CE, LS, PS)
12. Ability to collaborate with other researchers (CE, LS, PS)
13. Ability to use oral, written and visual presentations to present work to both a science-literate and a science-non-literate audience (CE, LS, AA, PS)
14. Ability to think in an integrated manner and look at problems from different perspectives (CE, SE, ACS, LS, PS)
15. Awareness of the ethical issues in the molecular life sciences (LS)

Direct measures of student learning used for assessment:

- Capstone experience (CE)
- Standardized subject matter exams (SE)
- National standardized subject matter exam from the American Chemical Society (ACS)
- Laboratory Skill Performance (Practicum) (LS)
- Student academic awards (AA)
- Problem-solving exams (see references 3,4,5) (PS) Indirect measures of student learning used for asse ssment
- Job/graduate/professional school placement (PP)

Table. In the matrix below, "X" in a cell indicates the course(s) in which that the concept/skill is assessed by either in-course exams, or, a performance assessment (in laboratory sessions.)
Specific Student Learning Objective Matrix

Concept / Skill	**Gen Chem 121, 122, 253**	**OChem 301, 302, 303L, 304L**	**Physics**	**Math**	**BIOL 201 202**	**BIOC 445**	**BIOC 446**	**BIOC 448**	**CHEM 315 BIOC 451**	**BIOC 463/4**	**Performance Assessment**
Chemistry											
Atomic structure	**X**										
Molecular structure	**X**										
Spectroscopy	**X**								**X**		
Periodicity	**X**										
Thermodynamics	**X**					**X**	**X**		**X**		
Kinetics	**X**					**X**		**X**	**X**		
Bonding	**X**										
Reactions & stoichiometry	**X**										
Acids/bases	**X**										
Descriptive inorganic	**X**										
Descriptive inorganic	**X**										
Transition metals	**X**										
Redox reaction	**X**					**X**	**X**			**X**	
Organic structure/bonding		**X**									
Nomenclature		**X**									
Functional groups		**X**				**X**					
Instrumental structure analysis		**X**									
Stereochemistry		**X**								**X**	
Reaction mechanisms		**X**								**X**	
Synthesis		**X**									
Molecular recognition		**X**								**X**	
Organometallics		**X**									
Combinatorial chemistry								**X**			
Calculus				**X**							
Physics, calculus based or life-science oriented			**X**						**X**		

Concept / Skill	Gen Chem 121, 122, 253	OChem 301, 302, 303L, 304L	Physics	Math	BIOL 201 202	BIOC 445	BIOC 446	BIOC 448	CHEM 315 BIOC 451	BIOC 463/4	Performance Assessment
Biology					X					X	
Cell structure and function					X					X	
Introduction to metabolism					X					X	
Compartmentalization					X		X			X	
Tissue specialization					X		X			X	
Cell types					X					X	
Central dogma					X	X					
Classical genetics					X					X	
Genomics					X	X				X	
Regulation of gene expression					X	X	X			X	
Protein synthesis					X	X				X	
Genetic engineering					X	X				X	
Cell Cycle										X	
Cell Death Mechanisms										X	
Malignancy										X	
Biochemistry											
Molecular Cell structure						X				X	
Biomolecule structure and function						X				X	
Protein structure/function						X			X	X	
Bioenergetics and equilibria						X	X			X	
DNA/RNA structure/function						X			X	X	
Signal transduction										X	
Supramolecular assemblies						X	X		X	X	
Advanced topics in protein						X				X	
Enzyme kinetics						X		X		X	
Enzyme mechanisms						X		X		X	
Enzyme inhibitors						X		X		X	
Ligand binding						X				X	
Molecular basis of protein function						X				X	
Regulation of protein activity						X	X			X	

Concept / Skill	Gen Chem 121, 122, 253	OChem 301, 302, 303L, 304L	Physics	Math	BIO 201 202	BIOC 445	BIOC 446	BIOC 448	CHEM BIOC 451	BIOC 463/4	Performance Assessment
Proteomics								X		X	
Physical biochemistry									X		
Thermodynamics						X	X		X		
Carbohydrate							X				
Glycolysis							X			X	
CAC							X			X	
Beta-oxidation							X				
Oxidative							X			X	
Photosynthesis							X				
Gluconeogenesis							X				
Fatty acid synthesis							X				
Amino acid oxidation							X			X	
Nitrogen metabolism							X				
Amino acid synthesis							X				
Phospholipid oxidation /							X				
Protein Synthesis						X				X	
Drug Development										X	
Sphingolipid oxidation/synthesis							X				
Cholesterol transport							X				
Cholesterol synthesis							X				
Ecosinoid synthesis							X				
Nucleotide synthesis							X			X	
Nucleotide oxidation							X			X	
Hormonal regulation of metabolism							X			X	
Allosteric regulation of metabolism							X			X	
Metabolic errors / disease							X	X		X	

Concept / Skill	Gen Chem 121, 122, 253	OChe 301, 303L, 304L	Physics	Math	BIOL 201 202	BIOC 445	BIOC 446	BIOC 448	CHEM BIOC 451	BIOC 463/4	Perfor Assess ment
LAB SKILLS											
Isolation of						X		X			X
Enzyme kinetics						X		X			X
Genetic engineering techniques						X		X			
Quantitative techniques								X			X
Data acquisition	X							X			X
Computer databases								X			
Spectroscopy	X							X	X		X
Chromatography	X					X		X			X
Electrophoresis						X		X			X
DNA isolation						X		X			X
DNA sequencing						X					
Cloning						X					
PCR						X		X			X
Microarrays								X			
Experiment design						X	X	X			X
Laboratory safety	X							X			X
Oral presentation of information								X		X	X
Written presentation of information								X			X
Problem-solving/critical thinking						X	X	X			X
Ethical issues in the life sciences						X	X	X			

Criterion 4C – Biochemistry advisement maturity matrix

Biochemistry Advisement Maturity Rubric for 2013-2014

Biochemistry Department 2013-2014					
Outcomes	***What opportunities are provided for advisors to achieve the desired outcome.***	***How will you know if the outcome has been met/what evidence might you gather.***	***How can you verify this activity.***	***Compliance Score****	***Notes***
Effectively utilizing LoboAchieve (Early Alerts, Appointments, Comments, etc.)	1. Create Workbook to build center. 2. Attend necessary training to gain access to LoboAchieve. 3. Open Lab Assistance 4. Monthly workgroup or brown bag sessions Website resources- http://loboachieveinfo.unm.edu/	1. All advisors in Center have access 2. All appointments are scheduled via LoboAchieve 3. Advising comments are entered into LoboAchieve 4. Tracking items are addressed within 72 hours (i.e., sending email to student, meeting with student or calling student)	1. Run daily, weekly or monthly usage reports in LoboAchieve	4	Professional advisor actively uses LoboAchieve for sending emails to students for pre-NSO, scheduling appointments and entering comments. The professional advisor has entered over 450 students comments, followed-up with over 100 emails and processed over 50 forms for students.
Entering comments/notes after each student interaction.	1. Training on how to enter comments/notes	1. Tracking comments/notes in LoboAchieve 2. Frequency of comments /notes entered 3. Quality of comments/notes (information captured: reason for visits, GPA discussion, grade replacement, use of LoboTrax, courses taking next semester, next steps, referrals, etc.)	1. Run daily, weekly or monthly usage reports in LoboAchieve	5	Department received the training during their advisor training and within the college.
Utilizing the degree audit for student success.	1. Attend required training in Learning Central	1. Updated and accurate degree audit (Academic Department)	1. Checking with departments and Audit team at the beginning of	5	Department participates in all required training and any training that is suggested.

		2. Updated four year plan on the degree map website	the semester to see if all the audits are correct 2. Survey students.		Biochemistry currently has a degree map for both their BA or BS programs.
Advising Center will participate in New Student Orientation, Transfer and Non-Traditional Orientation.	1. Participate in part of NSO/CEP (i.e. presentation, advisement or general triage and assistance) 2. Participate in advisor training for NSO	1. Centers participate in NSO by either having students come to their college or assist other colleges with the orientation session	1. Learning outcome from NSO 2. NSO Assessment Tool	5	The advisor always participates in NSO as part of the College of Arts & Sciences advisement requirement. Consistently uses LoboAchieve to reach out to students. Active participate in college and university wide advising training. Completed an intensive shadowing and training at the college level.
Collaborate with other advising centers or departments for student success.	1. Collaborate with other departments and programs across campus	1. Information obtain from their annual advising report	1. Survey Students 2. Learning Central attendance sheets	4	The Pro-fessional advisor works very closely with the faculty advisor within the department. Works closely with other advising centers and departments to ensure that the best results for students as it relates student program, minor completion and promoting seminars out of the biochemistry department.
Effectively communicate with students.	1. Use of departmental E-mail &/or newsletter 2. Use of Social Media 3. Student traffic in the	1. Report on use of email (amount of emails sent and/or received).	1. Information obtain from their annual	3	Consistently uses departmental email to

	center	2. Submit analytics for use of social media sites. 3. Submit report on student traffic and interaction.	advising report.		communicate with students. Uses the departmental website to promote seminars.
Advisors have the opportunity for professional development.	1. Participate in Advise-L, GAN or attend the Advisor Institute 2. Attend or present at conferences 3. Department or College Retreats 4. Regular staff meetings with updates, case studies, etc	1. Information obtain from their annual advising report	1. Information obtain from their annual advising report 2. Survey/Assessments to advisors	4	Actively participates in advising functions and activities.
Centers effectively use their student learning outcomes.	1. College should have student learning outcome that align with the overall advising learning outcome.	1. Assessment that measures outcomes	1. Report on the assessment	2	There are college level learning outcomes that is utilized for all departments.
Effectively conduct outreach opportunities for student success.	1. Participate in Senior Day 2. Conduct group advising sessions 3. Conduct student workshops 4. Branch and community college visits 5. Participate in UNM CNM Transfer Day	1. Center provides group advising sessions 2. Conduct student workshops 3. Advising Report/Admission Office 4. Advising Report/Manager of UCAC	1. Information obtain from their annual advising report 2. Admission Office	4	Works with the College level advisement center to provide graduation workshops and transfer in workshops. The advisor also participates in Senior Day and transfer day at the college level.
			Overall Advisement Maturity Score	**36**	**The professional advisor in the Biochemistry Department is very closely linked to the college level advising center in Arts & Sciences. They work very collaboratively on advising initiatives. The professional advisor actively participates in professional**

					development and training at the college and departmental level.

***Advisement Maturity Score is based on a range of 1-5 in each category. The highest possible score is 45.**
Scoring Matrix:
0 = Information not provided
1 = Achieving only one area of the category.
2 = Achieving only two areas of the category.
3 = Achieving only three areas of the category.
4 = Achieving only four areas of the category or not consistent in entering information.
5= Achieving all the areas of the category.

Criterion 5A

Table
Faculty Education FTE, FY2013-2016

BMB Faculty Education FTE Allocation FY2013 – FY2016

	FY16	FY15	FY14	FY13
Tenure Tract Faculty				
Marco Bisoffi	N/A	N/A	N/A	0.1
William S. Garver	0.145	0.12	0.11	0.1
Chie-An Andy Hu	0.428	0.43	0.1	0.1
Meilian Liu	0.1	0.1	N/A	N/A
Marcy Osgood	0.55 ***	0.405	0.42	0.28
Robert Orlando	0.526	0.526	0.327	0.33
Karlett Parra	0.1	0.1	0.1	0.1
Martina Rosenberg	0.604	0.487	0.515	0.5
Vallabh (Raj) Shah	0.204	0.20	0.2	0.19
Research Track Faculty				
Natalie Adolphi	-	-	-	0.07
Jun Chen	N/A	N/A	-	-
Colleen Fordyce	-	-	-	-
Kristina Trujillo	N/A	-	0.033	0.120
Laurel Sillerud	N/A	N/A	0.27	0.24
Working Retiree				
Andrzej Pastuszyn	N/A	N/A	0.25	0.25
David Vanderjagt	-	-	-	-
Dorothy Vanderjagt	0.25	0.25	0.25	0.25

*** Dr. Osgood BMB Department Education FTE allocation includes 0.45 (BMB) + 0.1 (PREP). In FY16, an additional 0.12 FTE has been included in the “I” component of her FIBCI.

Criterion 5C – Research-creative work of BMB faculty

5C. Summary and examples of research/creative work of faculty

Faculty research interests and selected examples of their peer-reviewed scholarly work are provided in ***Appendix***.

William Sherman Garver, PhD, Assistant Professor

Dr. Garver's lab focuses on gene-diet and gene-gene interactions that predispose to common metabolic diseases such as obesity and diabetes. The focus is to determine the molecular basis for how Niemann-Pick C1 (NPC1) gene variants predispose to different yet coexistent metabolic diseases (obesity and diabetes).

- Jelinek D, Heidenreich RA, and Garver WS. The Niemann-Pick C1 gene interacts with a high-fat diet and modifying genes to promote weight gain. American Journal of Medical Genetics 155: 2317-2319, 2011.
- Jelinek D, Castillo JJ, Richardson LM, Luo L, Heidenreich RA, and Garver WS. The Niemann-Pick C1 gene is downregulated in livers of C57BL/6J mice by dietary fatty acids, but not dietary cholesterol, through feedback inhibition of the SREBP pathway. Journal of Nutrition 142:1935-1942, 2012.
- Poirier S, Mayer G, Murphy SR, Garver WS, Chang TY, Schu P, Seidah NG. The cytosolic adaptor AP-1A is essential for the trafficking and function of Niemann-Pick type C proteins. Traffic 14:458-469, 2013.
- Jelinek D, Castillo JJ, Garver WS. The C57BL/6J Niemann-Pick C1 mouse model with decreased gene dosage has impaired glucose tolerance independent of body weight. Gene 527:65-70, 2013.
- Jelinek D, Heidenreich RA, Orlando RA, Garver WS. The Niemann-Pick C1 and caveolin-1 proteins interact to modulate efflux of low density lipoprotein-derived cholesterol from late endocytic compartments. Journal of Molecular Biochemistry 3:14-26, 2014.
- Garver WS, de la Torre L, Brennan MC, Luo L, Jelinek D, Castillo JJ, Meyre D, Orlando RA, Heidenreich RA, Rayburn WF. Differential association of Niemann-Pick C1 gene polymorphisms with maternal prepregnancy overweight and gestational diabetes. Journal of Diabetes and Obesity 2:1-6, 2015.

Chien-An (Andy) Hu, PhD, Associate Professor

Dr. Hu investigates the function and regulation of novel genes and proteins in health and disease, and to apply what is understood to a better treatment of associated diseases. He is one of the authorities in proline metabolic enzymes, the apolipoprotein L (ApoL) protein family, and the crosstalk between apoptosis and autophagy. Hu has formed a number of international, cross-, and trans-disciplinary collaborative teams in the following research areas:

- **High-throughput screening in the identification and characterization of repurposed drugs, dipeptides, and amino acids in modulating apoptosis and autophagy in various disease models (since 2011)** (This project has been supported by UNM HSC CTSC internal grants. Collaborators include Larry Sklar (UNM Center for Molecular Discovery), Warren Laskey (UNMH Cardiology), Guoyao Wu (Texas A&M), and Yongqin Hou (Wuhan Polytechnic University, China)
- **Human ApoL protein family in cancer cell death (since 2001)** (this project has been supported by ACS-IRG, NCI RO1, DOD, and NM-INBRE. Collaborators include Ke-Jian Jim Liu (UNM BRaIN Imaging Center), Jian Yu (U Pitt), and Songqin Pan (UC Riverside)

- **ApoL6 in atherosclerosis and acute myocardial infarction (since 2008)** (this project is supported by UNMHSC internal fund. Collaborators include Timothy McCaffrey (George Washington), Warren Laskey, Brian Walton and Siqin Zhaorigetu (Texas Heart Institute), and Songqin Pan
- **ApoL1 in HIV-associated nephropathy (since 2010)** (this project is supported by NIDDK R01DK103564, and UNM HSC internal fund. Collaborators include Patricio Ray (George Washington/Children's National), and Songqin Pan
- **Proline and tryptophan metabolic enzymes in inborn errors, cancer, and other diseases (since 1993)** (the project has been supported by HHMI, JHMI, UNM HSC, and DOD. Collaborators include David Valle (Center for Genetic Medicine, JHMI), James Phang (NCI, Frederick), Guoyao Wu, Jian Yu, Yongqin Hou, and Yulong Yin (Institute of Subtropical Agriculture).

Representative peer-reviewed publications:

- Nigot P, **Hu CA,** Ma T. (2015) Autophagy enhancement of intestinal epithelial tight junction barrier function by targeting claudin-2 degradation*. **J Biol Chem.*** 2015 Mar 13; 290(11):7234-46
- Yang J, **Hu CA,** Miao Y. (2015) Tc-99m-labeled RGD-conjugated alpha-melanocyte stimulating hormone hybrid peptides with reduced renal uptake. ***Amino Acids.*** 2015 Apr;47(4):813-23.
- Neuwelt A, **Hu CA**, Brett M, Mlady G, Eberhardt SC, Sillerud LO. (2015) Iron-based contrast agents for magnetic resonance imaging of infection and inflammation. ***AJR Am J Roentgenol.*** 2015 Mar; 204(3):W302-13. doi: 10.2214/AJR.14.12733; PMID: 25714316
- Zhang H, **Hu CA**, Mine Y. (2014) Functions of dietary dipeptides and amino acids in inflammatory bowel disease. ***Amino Acids.*** (Published on line; PMID: 25501277).
- Yang Y, Li W, Sun Y, Ji Y, Han F, **Hu CA**, and Wu Z. (2014) Amino acid deprivation disrupts barrier function and induced protective autophagy in intestinal porcine epithelial cells. ***Amino Acids.*** (Published on line; PMID: 25287255).
- **Hu CA**, Hou Y. (2014) Mammalian P5CR and P5CDH: protein structure and disease association. ***BJO Biochem. 1: 4-7.***
- Contreras AU, Mebratu Y, Delgado M, Montano G, **Hu CA**, Ryter SW, Choi AM, Lin Y, Xiang J, Chand H, Tesfaigzi Y. Deacetylation of p53 induces autophagy by suppressing Bmf expression. ***J Cell Biol.*** 2013 Apr 29;201(3):427-37.
- Kaini RR, Sillerud LO, Zhaorigetu S, **Hu CA**. Autophagy regulates lipolysis and cell survival through lipid droplet degradation in androgen-sensitive prostate cancer cells. ***Prostate.*** 2012 Sep 15;72(13):1412- 22.
- Kaini RR, **Hu CA**. Synergistic killing effect of chloroquine and androgen deprivation in LNCaP cells. ***Biochem Biophys Res Commun.*** 2012 Aug 24;425(2):150-6.
- **Hu CA**, Klopfer EI, Ray PE. Human apolipoprotein L1 (ApoL1) in cancer and chronic kidney disease. ***FEBS Lett.*** 2012 Apr 5;586(7):947-55.
- Klionsky DJ, **Hu CA** et al. Guidelines for the use and interpretation of assays for monitoring autophagy. ***Autophagy.*** 2012 Apr;8(4):445-544.

Meilian Liu, Ph.D. Assistant Professor

Dr. Liu's research goal is to identify potential therapeutic targets for the treatment of obesity and its related diseases by studying the development and function of white and brown adipose tissue. The current study mainly focuses on the browning of white adipose tissue and interaction between adipocytes and other resident immune cells in fat using in vivo, ex vivo, cell culture and in vitro

- **Liu M**, Chen H, Wei L, Hu D, Dong K, Jia W, Dong LQ, Liu F. ER localization is critical for DsbA-L to Suppress ER Stress and Adiponectin Down-Regulation in Adipocytes (2015). J Biol Chem. 17;290(16):10143-8.
- **Liu M,** Bai J, He S, Villarreal R, Hu D, Zhang C, Yang X, Liang H, Slaga T, Zhou Z, Yu Y, Zhou Z, Blenis J, Scherer P, Dong L, and Liu F (2014). Grb10 Promotes Lipolysis and Brown Adipocyte Gene Expression by Phosphorylation-dependent Feedback Inhibition of mTORC1. ***Cell Metabolism***, 19(6):967-80.
- **Liu M,** Xiang R, Wilk S, Zhang N, Kian, A, Sloane L, Zhou L, Chen H, Xiang G, Walter C, Austad S, Musi N, Defronzo R, Asmis R, Scherer P, Dong L, Liu F (2012). Fat-specific DsbA-L overexpression promotes adiponectin multimerization and prevents mice from diet-induced obesity and insulin resistance. ***Diabetes,*** 61(11):2776-86.
- **Liu M*,** Zhou L, Wei Li, Ricardo, Yang X, Hu D, Riojas R, Holmes B, Langlais P, Lee H, Dong L* (2012). Phosphorylation of Adaptor Protein Containing Pleckstrin Homology Domain, Phosphotyrosine Binding Domain and Leucine Zipper Motif 1 (APPL1) at Ser^{430} Mediates ER stress-induced Insulin Resistance in Hepatocytes. ***J Biol Chem.*** 287(31): 26087-92. (* Corresponding author)

More publications can be found in the following link:
http://www.ncbi.nlm.nih.gov/pubmed/?term=liu+meilian+university+of+Texas

Robert A. Orlando, PhD, Associate Professor

Dr. Orlando's research is focused on obesity-dependent inflammation, lipid metabolism in obesity, and natural product drug discovery to identify novel therapeutic anti-inflammatory agents.

- Nitta, C.F., **Orlando, R.A.** NF-κB and mitogen-activated protein kinase (MAPK) signaling pathways regulate cytokine secretion in crosstalk between adipocytes and immune cells. *J Biomol Res and Therapeutics*, submitted, 2015.
- Ferguson, J. and **Orlando, R.A**. Curcumin Reduces Cytotoxicity of 5-Fluorouracil Treatment in Human Breast Cancer Cells. *J. Med. Food*, 1:1-6, 2014.
- Card, N., Nitta, C.F., Garver, W.S. and **Orlando, R.A.** Additive effects of β-adrenergic and cytokine signaling on lipolytic activation. *F1000Research*, 3:134, 2014.
- **Orlando, R.A.** and Garver, W.S. The hidden costs of high fructose corn syrup: challenges to energy balance and fat mobilization from adipose tissue. *J Biomol Res and Therap*, 2:e1, 2013.
- Nitta, C.F., **Orlando, R.A.** Crosstalk between immune cells and adipocytes requires both paracrine factors and cell contact to modify cytokine expression. *PLoS ONE*, 8(10):e77306, 2013.
- Garver W.S., Newman S.B., Gonzales-Pacheco D.M., Castillo J.J., Jelinek D., Heidenreich R.A., and **Orlando R.A.** The genetics of childhood obesity and interaction with dietary macronutrients. *Genes Nutr.* 8(3):271-87, 2013.
- **Orlando, R.A.**, Gonzales, A.M., Royer, R.E., Deck, L.M., Vander Jagt, D.L. A chemical analog of curcumin as an improved inhibitor of amyloid Abeta oligomerization. *PLoS*, 7(3):e31869, Epub, 2012.

Marcy Osgood, PhD, Associate Professor

Dr. Osgood's research area is categorized as Discipline-based Education research ("DBER"). I am involved in national groups focused on aligning STEM educational practices with what is known about learning from cognitive and educational psychology, the learning sciences, and neuroscience. The list below

provides examples of this work.

- E. Offerdahl, J. Momsen, **M. Osgood**. 2014. Commentary: PhDs in Biochemistry Education – 5 years later. Biochemistry and Molecular Biology Education. Volume 42, Issue 2, pp. 103–105, March/April 2014
- K.M. Aguirre, T.C. Balser, T. Jack, K. E. Marley, K. G. Miller, **M. P. Osgood**, P. A. Pape-Lindstrom, and S. L. Romano. 2013. PULSE Vision & Change Rubrics. CBE Life Sci Educ.Vol 12:579-581 http://www.lifescied.org/content/12/4/579.full.html?etoc
- **Marcy Osgood** and Karen Ocorr. *The Absolute, Ultimate Guide to Lehninger Principles of Biochemistry* (by Nelson and Cox, 6th Edition), 2013. W. H. Freeman and Company, 41 Madison Avenue, New York, NY. 10010. 675 pages.
- National Research Council. *Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering.* Washington, DC: The National Academies Press, 2012. **(M. P. Osgood, Authoring Committee Member)**
- W. L. Anderson, C. A. Sensibaugh, **M. P. Osgood**, and S. M. Mitchell. 2011. What really matters: assessing individual problem-solving performance in the context of biological sciences. International Journal for the Scholarship of Teaching and Learning Vol. 5 (1). http://academics.georgiasouthern.edu/ijsotl/v5n1/articles/Mitchell_et_al/index.html

Karlett J. Parra, PhD, Associate Professor

Dr. Parra investigates the functions and assembly of V-ATPase proton pumps with emphasis on the mechanisms that (1) sustain nutrient and cellular pH homeostasis and (2) link glucose metabolism and V-ATPase function. Major goals include: i) defining the contributions of V-ATPase-mediated pH homeostasis in health and disease; ii) identifying V-ATPase-dependent pathways and cellular events that could be used to selectively target V-ATPase pumps to control processes relevant to disease; and iii) establishing the molecular mechanisms that regulate activity and assembly of V-ATPase proton pumps. In pursue of these goals we use three model systems (cancer cell lines, *S. cerevisiae*, *C. albicans*) (*refs 1-4*) and biochemical and genetics tools. The research group consists of 1 Assistant Research Professor, 1 ASERT Post-doctoral Fellow, 1 Ph.D. student, 1 Masters student, and 4 undergraduate students. I have previously mentored 4 Post-doctoral Fellows, 1 Ph.D. student, 3 M.S. students, 42+ undergraduate students, and 6 high school students.

Representative Peer-reviewed RESEACH Publications:

- (1) Michel V., Licon-Munoz Y., Trujillo K., Bisoffi M., and **Parra K**. "Inhibitors of Vacuolar ATPase Proton Pumps Inhibit Human Prostate Cancer Cell Invasion and Prostate-Specific Antigen Expression and Secretion". *International Journal of Cancer*. *Int J Cancer*. 2013
- (2) Raines SM, Rane H, Bernardo SM, Binder JL, *Lee SA*, **Parra KJ.** "Deletion of V-ATPase Voa isoforms clarifies the role of vacuolar pH as a determinant of virulence-associated traits in *C. albicans*" *Journal of Biological Chemistry*. 288(9):6190-201 (2013) PMID: 23316054
- (3) Ediger B., S. D. Melman, D. L. Pappas Jr., M. Finch, J. Applen, and **Karlett J. Parra**. **"**The Tether Connecting Cytosolic (N-terminus) and Membrane (C-terminus) Domains of Yeast V-ATPase Subunit a (Vph1) is Required for Assembly of V_o Subunit d". *Journal of Biological Chemistry.*,284:19522-19532 (2009). PMID: 19473972
- (4) Chan CY and **Parra Karlett J**. Yeast Phosphofructokinase-1 Subunit Pfk2p is Necessary for pH Homeostasis and Glucose-Dependent V-ATPase Reassembly. *Journal of Biological Chemistry,* 289(28): 19448-57 (2014).

In addition, Dr. Parra developed research-based laboratory projects adapted from her research to fit into undergraduate teaching courses, have been published by Dr. Parra and her students in peer-reviewed Education Journals (refs *5-7*). Eventually, she created a semester-long research-based

laboratory course (ref 8), which exposed every student majoring in Chemistry/Biochemistry to the excitement of new discovery by offering biochemistry research experiences

Peer-reviewed EDUCATION Publications:

- (5) Karlett J. Parra-Belky, Kathryn McCulloch, Nicole Wick, Rebecca Shircliff, Nicolas Croft, Katrina, Margalef, Jamie Brown, Todd Crabill, Ryan Jankord, and Eric Waldo. "Immunoprecipitation of Protein Complexes from Yeast." *Biochemistry and Molecular Biology Education*, 33: 289-292 (2005).
- (6) Parra-Belky, Karlett J. "Identification of Yeast V -ATPase Mutants by Western Blots Analysis of Whole Cell Lysates." *Journal of Chemical Education*, 79: 1348 -1350 (2002).
- (7) Parra-Belky, Karlett J. "Identification of Yeast V -ATPase Mutants by Western Blots Analysis of Whole Cell Lysates." *Journal of Chemical Education* , 79: 1348-1350 (2002).
- (8) Karlett J. Parra, Marcy Osgood, and Donald Pappas Jr. "A Research -Based Biochemistry Laboratory Course Designed to Strengthen the Research-Teaching Nexus." *Biochemistry and Molecular Biology Education*, 38(3): 172– 179 (2010).

Martina Rosenberg, PhD, Assistant Professor

Scholarly work in DBER supports excellence in STEM-H education by formulating instructional strategies and methods as well as assessing the effectiveness of these pedagogies to prepare a diverse technical workforce and science-literate citizenry. It combines an understanding of the challenges of learning and teaching in a specific discipline with the science of learning and teaching generally. Dr. Rosenberg is studying how people master concepts and practices in biochemistry and identify the nature and development of expertise in the field. She is also defining appropriate learning goals and exploring which instructional approaches best meet those goals. This work will contribute to a better understanding of how to apply DBER insights in the classroom, while making UNM's biochemistry program more effective and inclusive.

Representative Peer-reviewed RESEACH Publications:

- **Rosenberg MJ,** Abel, E, Garver, WS and Osgood, MP. Taking the Hassle out of Hasselbalch. CourseSource *In review.*

Representative National Conference Presentations:

- "Discipline-based Education Research (DBER) for and from Biochemistry curricula " ASBMB Special Symposia Series: Transforming Undergraduate Education in Molecular Life Sciences, July 30-Aug 2, 2015 – Saint Joseph, MO
- "Classroom Innovation: Metacognition2 " Institutional Research and Academic Career Development Awards (IRACDA) National Conference, Albuquerque , NM, June 8-10, 2014
- "Rethinking the undergraduate neurobiology course: fostering student engagement in the class room". American Society for Biochemistry and Molecular Biology (ASBMB), Washington, D.C., 2011

Vallabh Raj Shah, Ph.D. Professor

Dr. Shah is a molecular epidemiologist with a broad background in clinical translational and community participatory studies in minorities including Native Americans and Hispanics. He has carried out the original cross sectional research in the Zuni Kidney Project with many secondary data analyses on disparity aspects of chronic diseases, in particular diabetes and CKD and its complications. He also serves as a PI and or Co-PI on several NIDDK funded grants including: (1) Cytokine gene

polymorphism in the CRIC Cohort Study; (2) Zuni Kidney Project; (3) Zuni component of FIND; (4) Genetics of Kidney Disease in Zuni Indians.

Currently Dr. Shah is the PI on the UNMHSC component of the NIGMS funded NM INBRE grant and obtained an ARRA supplement to work with minority kids and young adults in educational intervention of life style, diet/nutrition and obesity in preventing chronic disease. Recently he received a 3yr pilot funding award from PCORI to develop effective measures of chronic diseases among Zuni Indians, including; 1) methods to improve health care delivery to patients with or at risk of obesity, DM, heart disease and proteinuria; 2) strategies to implement pharmacological intervention for proteinuria, DM, abnormal lipids, hypertension, and obesity; 3) strategies to promote healthy lifestyles to reduce the risk of DM and prevent or reverse overweight and obesity; and 4) new cost effective ways to identify people with pre-DM and undiagnosed DM.

In terms of **educational research** Dr. Shah has focused primarily on problem based learning (PBL) as part of medical school curriculum with didactic lectures about diabetes and its complications for more than 20 years. He has also participated in Practical Immersion Experience (PIE) for second year medical students as a circuit rider for many years and has been involved in research training for clinical fellows. Teaching comes in many forms and one of the most challenging and enjoyable to Dr. Shah has been in the community based educational activities with special emphasis on training the underserved community about the chronic diseases at individual, family and community levels for more than 15 years at different venues including schools and tribal get-togethers about the role of nutrition and disease; role of exercise; diabetes; kidney disease; cardiovascular diseases; importance of genetic research; alcohol and smoking; and jewelry making and environmental exposures.

- Robert C. Williams…**Vallabh O. Shah**… and Robert L. Hanson and the FIND Research Group. Individual Genetic Ancestry in the Family Investigation of Nephropathy and Diabetes (FIND): Balancing Information for Poly-Ancestry (>2) Models for Stable Estimates. PLOS Genetics, 11(8): e1005352, 2015
- **Vallabh Shah**, Casey Carroll*, Ryan Mals*, Donica Ghahate, Jeanette Bobelu, Phillip Sandy, Kathleen Colleran, Ronald Schrader, Thomas Faber, Mark Burge. A Home-based Educational Intervention Improves Patient Activation Measures and Diabetes Health indicators Among Zuni Indians. PLOS1 May 2015, 10(5): e0125820
- **Vallabh O. Shah**, Donica M Ghahate, Jeanette Bobelu, Phillip Sandy, Sara Newman*, Deborah L. Helitzer, Thomas Faber, and Philip Zager. Identifying Barriers to Healthcare to Reduce Health Disparity in Zuni Indians Using Focus Group Conducted by Community Health Workers. Clin Trans Sci 2014, 7:6-11, PMID:24528897
- Sara Newman*, Terri Cheng*, Donica M Ghahate, Jeanette Bobelu, Phillip Sandy, Thomas Faber and **Vallabh O. Shah**. Assessing Knowledge and Attitudes of Diabetes in Zuni Indians using a Culture-Centered Approach. PLoS One. 2014 Jun 11;9(6):e99614, PMID:24919064

Dorothy J. VanderJagt, PhD, Research Associate Professor

For the past 20 years, the focus of Dr. VanderJagt's research has been on maternal/child health in Africa and New Mexico. This includes, among others, the nutritional quality of breast milk, the body composition and pulmonary function of children with sickle cell disease and rickets, the measurement of the bone quality of pre- and post-menopausal women in Africa, and the nutritional analysis of non-cultivated plants in sub-Saharan West Africa. From 1994 to 2007, Dr. VanderJagt was the Co-Director of a research training program for minority students funded by the Fogarty Center of the National Institute of Health that provided 160 students a research experience abroad. She also conducted a manuscript writing workshop once a year for faculty at a Nigerian teaching hospital.

- Glew RH, Wold RS, Corl B, Calvin CD, **Vanderjagt DJ**. Low docosahexaenoic acid in the diet and milk of American Indian women in New Mexico. J Am Diet Assoc. 2011;111:744-8.
- **Vanderjagt DJ**, Ujah IA, Patel A, Kellywood J, Crossey MJ, Allen RH, Stabler SP, Obande OS, Glew RH. Subclinical vitamin B12 deficiency in pregnant women attending an antenatal clinic in Nigeria. J Obstet Gynaecol. 2009;29::288-95.PMID:19835494

Natalie L. Adolphi, PhD, Research Associate Professor

Natalie L. Adolphi holds a Ph.D. in Physics (1995) from Washington University in St. Louis, where she developed expertise in nuclear magnetic resonance (NMR), and an M.S. in Medical Physics (2013) from the University of New Mexico. As a PI or key collaborator involved with a number of multi-disciplinary biomedical research projects, her recent research experience includes the development of magnetic relaxometry methods for detecting targeted magnetic nanoparticles in vivo, targeted magnetic nanoparticles for MRI detection of cancer, microcoil NMR methods for in vitro detection of magnetic particles, and novel MRI techniques for pulmonary imaging. Currently, Dr. Adolphi's funded research is focused on two main areas: 1) methods for assessing and improving the targeting and imaging of nanoparticles for therapeutic applications, to cancer and infectious disease, and 2) developing advanced imaging methods (MRI and CT) for forensic death investigation. She recently co-authored an introductory radiation biology text book, and she is an inventor on two U.S. patents (both involving in vitro magnetic nanoparticle detection methods).

- Butler KM, **Adolphi NL***, Bryant HC, Lovato DM, Larson RL, Flynn ER. Modeling the Efficiency of a Magnetic Needle for Collecting Magnetic Cells. Phys. Med. Biol. 2014 May 29;59(13):3319-3335. doi: 10.1088/0031-9155/59/13/3319. Epub 2014 May 29. PubMed PMID: 24874577; PubMed Central PMCID: PMC4084562. (*corresponding author)
- Elifritz JM, Nolte KB, Hatch GM, **Adolphi NL**, and Gerrard C. Forensic Radiology. In: McManus LN and Mitchell RN. Pathobiology of Human Disease: A Dynamic Encyclopedia of Disease Mechanisms. Elsevier, 2014, pp. 3448-3458.
- **Adolphi, NL**, Butler KS, Lovato DM, Tessier TE, Trujillo JE, Hathaway HJ, Fegan DL, Monson TC, Stevens TE, Huber DL, Ramu J, Milne ML, Altobelli SA, Bryant HC, Larson RS, Flynn ER. Detection and Imaging of Her2-Targeted Magnetic Nanoparticles: Comparison of SQUID-detected Magnetic Relaxometry and MRI. Contrast media & molecular imaging. 2012; 7(3):308-19. NIHMSID: NIHMS536186 NIHMSID: NIHMS536186

Colleen Fordyce, PhD, Research Assistant Professor

Dr. Fordyce's research is primarily focused on delineating how cellular response to stress contributes to carcinogenesis. The generation and maintenance of pH gradients across the endomembrane system is critical to essential cellular functions including protein sorting, maturation and degradation, cell motility and endo- and exo-cytosis. Vacuolar-ATPase (V-ATPase) is an ATP-dependent proton pump that is critical for pH homeostasis in eukaryotic cells. Dr. Fordyce's research program examines the role V-ATPase in normal breast, in carcinogenesis and its potential as a therapeutic target. V-ATPase is upregulated in response to cellular stress and in tumors and tumor cell lines. Inhibition of V-ATPase is associated with decreased motility and invasion and increased sensitivity to chemotherapeutics and cell death in adenocarcinomas. Recent studies have focused upon elucidating the mechanisms by which V-ATPase interacts with cell-stress pathways, (ex p53, HIF1a), and nuclear receptors (ex estrogen and androgen receptors) to regulate cell fate decisions.

- **Colleen A. Fordyce**, Martha M. Grimes, Yamhilette Licon-Munoz, Lucas Chan and Karlett J. Parra. Regulation of Ca2+-ATPase, V-ATPases and F-ATPases 2016 Edited by S. Chakraborti

and N. Dhalla. Chapter 17: Vacuolar ATPase in Physiology and Pathology: Roles in Neurobiology, Infectious Disease and Cancer (IN PRESS)

- DeFilippis R*, **Fordyce CA***, Patten KT, Chang H, Zhao J, Fontenay GV, Kerlikowske K, Parvin B, Tlsty TD**.** Stress Signaling from Human Mammary Epithelial Cells Contributes to Phenotypes of Mammographic Density. (2014; Epub) *Cancer Research*, Sep 15:74 (18): 5032. awaiting additional experiments. (*Co First Authors).

- **Fordyce, C.A.**, Heaphy C.M., Bisoffi M., Wyaco J.L., Joste N.D., Mangalik A., Baumgartner K., Baumgartner R., Hunt W.C. and Griffith J.K. Telomere DNA content correlates with stage and prognosis in breast cancer. (2006) *Breast Cancer Research and Treatment* Sep; 99(2):192-202

- **Fordyce CA**, Patten K, T Fessenden, DeFilippis RD, Hwang SE, Zhao J, and Tlsty TD. Cell Extrinsic Consequences of Epithelial Stress: Activation of Pro-tumorigenic Tissue Phenotypes. (2012; Epub) *Breast Cancer Research* Dec; 7(14): R155

- **Fordyce, C.A**., Fessenden T., Jung, J., Singla, V., Berman, H.K. and Tlsty, T.D. DNA Damage Drives an Activin A-Dependent Induction of COX-2 in Premalignant Cells and Lesions. (2010; Epub 2009) *Cancer Prevention Research* Feb;3(2):190-201.

Jeffrey K. Griffith, Ph.D. Professor Emeritus

Dr. Griffith has over 30 years of experience in the conduct and administration of biomedical research, undergraduate and graduate science education, pipeline development and faculty development at UNM. He has served in several leadership roles at UNM, including Senior Advisor to the Dean of the School of Medicine (2012-present), Executive Vice Dean of the School of Medicine (2007-2012), Chair, Department of Biochemistry and Molecular Biology (1997-2007), and Co-director of the UNM NCI-designated Cancer Center's Women's Cancers Research Program (2001-2009). He is founder of the UNM Undergraduate Pipeline Program (UPN) that provides Summer Research Experiences. He served as a member of the internal advisory boards for UNM's MARC and IMSD programs for over 20 years. He has received approximately $8M in research funding during the past 20 years and has authored 77 research papers, books and patents. He reviews grants for several private, state, federal and international funding agencies, including NCI, NIH, BCRP and PCRP, and manuscripts for numerous peer-reviewed journals. He has mentored many undergraduate, graduate and medical students, postdoctoral and medical fellows and junior faculty, including several from underrepresented groups. Six of his former Ph.D. students now hold faculty positions.

- Hines WC, Fajardo AM, Joste NE, Bisoffi M and **Griffith JK** (2005) Quantitative and Spatial Measurements of TERT Expression within Normal and Malignant Human Breast Tissue, Molecular Cancer Research, 3:503-509. PMID: 16179497.

- Kristina A. Trujillo, William C. Hines, Keith M. Vargas, Anna Jones, Marco Bisoffi and **Jeffrey K Griffith** (2011) Breast Field cancerization: Identification and Isolation of Telomerase Expressing Cells from Tumor Adjacent Histologically Normal Breast Tissue. Mol Cancer Res. 9:1209-21. [Epub ahead of print Aug 30. 2011]. PMID: 21775421.

- Kimberly S. Butler, William C. Hines, Christopher M. Heaphy, **J.K. Griffith** (2012) Coordinate regulation between expression levels of telomere-binding proteins and telomere length in breast carcinomas. Cancer Medicine. 1:165-175. PMID:23342266.

- Vaughan RA., Garcia-Smith R, Dorsey, J, Bisoffi M., **Griffith, JK**, Trujillo KA. Tumor Necrosis Factor Alpha Induces Warburg-Like Metabolism in Breast Cells and Can Be Reversed by Anti-Inflammatory Dietary Agents. Int J Cancer. 2013 Nov 15;133(10):2504-10. doi: 10.1002/ijc.28264. Epub 2013 Jun 10.

David L. Vander Jagt, Ph.D. Professor Emeritus

Dr. Vander Jagt's training and research are in synthetic/medicinal chemistry and biochemistry. He leads the ***University of New Mexico Natural Products-based Drug Development Program (NPD Program)*****,** which currently involves numerous faculty members in a variety of basic and clinical departments, including **Drs. Robert Royer, Lorraine Deck and Lisa Whalen who, with Dr. Vander Jagt, comprise the medicinal chemistry team.** Dr. Vander Jagt has directed the research efforts of over 100 students, including graduate and undergraduate students, postdoctoral and medical students. He has a longstanding interest in targeted drug development, with special focus on selected targets important in parasitic diseases, cancer, diabetes, Alzheimer's disease (AD). Although Dr. Vander Jagt officially retired in 2007, he assumed a part time appointment as Research Professor and continues his research collaborations. In addition, he was appointed vice chair for research in 2013.

- N.O. Solberg, R. Chamberlin, J.R. Vigil, L.M. Deck, J.E. Heidrich, D.C. Brown, C.I. Brady, T.A. Vander Jagt, M. Garwood, M. Bisoffi, V. Severns, **D.L. Vander Jagt**, and L.O. Sillerud **(2014)** Optical and SPION-enhanced imaging shows that trans-stilbene inhibitors of NF-kB concomitantly lower Alzheimer's disease plaque formation and microglial activation in A□PP/PS-1 transgenic mouse brain. J Alzheimer's Disease 40, 191-212.PMID: 24413613.

- L.O. Sillerud, N.O. Solberg, R. Chamberlin, J.E. Heidrich, D.C. Brown, C.I. Brady, T.A. Vander Jagt, M. Garwood, and **D.L. Vander Jagt** (2013) SPION-Enhanced magnetic resonance imaging of Alzheimer's plaques in APP/PS-1 transgenic mouse brain. J Alzheimer's Disease 34, 349-365. PMID: 23229079.

- V.O. Shah, R. R. Townsend, H. I. Feldman, K. L. Pappan, E. Kensicki,and **D. L. Vander Jagt** (2013) Plasma metabolomic profiles in different stages of chronic kidney disease. Clin J Am Soc Nephrol 8, 363-370.

- P. Dytta, A. Le, **D.L. Vander Jagt,** T. Tsukamoto, G.V. Martinez, C.V. Dang and R.J. Gillies (2013) Evaluation of LDH-A and glutaminase inhibition in vivo by hyperpolarized 13C-pyruvate magnetic resonance spectroscopy of tumors. Cancer Res 73, 4190-4195.

Criterion 5D – Faculty bios

BIOGRAPHICAL SKETCH

NAME: **Natalie L. Adolphi, Ph.D.**

eRA COMMONS USER NAME (credential, e.g., agency login): **nadolphi**

POSITION TITLE: **Research Associate Professor, Department of Biochemistry and Molecular Biology**

A. Education/Training

INSTITUTION AND LOCATION	DEGREE	Completion Date MM/YYYY	FIELD OF STUDY
Augustana College, Rock Island, IL	B.A.	05/1989	Physics
Washington University in St. Louis	M.A.	05/1991	Physics
Washington University in St. Louis	Ph.D.	07/1995	Physics
University of New Mexico	M.S.	12/2013	Medical Physics

B. Positions and Honors

Research Associate Professor – University of New Mexico (Albuquerque, NM)	2014-present
Clinical MRI Physics Consultant for X-ray Associates of New Mexico	2012-2015
Research Assistant Professor – University of New Mexico (Albuquerque, NM)	2008-2014
Scientist – New Mexico Resonance (Albuquerque, NM)	2003-2008
Visiting Scientist – New Mexico Resonance (Albuquerque, NM)	2002-2003
Associate Professor of Physics (with tenure) – Knox College (Galesburg, IL)	2001-2003
Assistant Professor of Physics – Knox College (Galesburg, IL)	1995-2001
NSF National Need Fellow, Washington University in St. Louis	1990-1994
Hughes Fellow, Washington University in St. Louis	1989-1991
Phi Beta Kappa	1988-present

C. Recent Peer-Reviewed Publications (selected from >40)

Butler KM, Adolphi NL*, Bryant HC, Lovato DM, Larson RL, Flynn ER. Modeling the Efficiency of a Magnetic Needle for Collecting Magnetic Cells. *Phys. Med. Biol.* 2014 May 29; 59(13):3319-3335. doi: 10.1088/0031-9155/59/13/3319. Epub 2014 May 29. PubMed PMID: 24874577; PubMed Central PMCID: PMC4084562. (*corresponding author)

McBride AA, Price DN, Lamoureux LR, Elmaoued AA, Vargas JM, Adolphi NL, Muttil P. Preparation and characterization of novel magnetic nano-in-microparticles for site-specific pulmonary drug delivery. *Mol Pharm.* 2013 Oct 7; 10(10):3574-81. doi: 10.1021/mp3007264. Epub 2013 Sep 12. PubMed PMID: 23964796.

Johnson C, Adolphi NL, Butler KL, Lovato DM, Larson R, Schwindt PDD, Flynn ER. Magnetic relaxometry with an atomic magnetometer and SQUID sensors on targeted cancer cells. *J. Magn. Magn. Mater.* 2012 August; 324(17):2613-19. PubMed PMID: 22773885; PubMed Central PMCID: PMC3389787.

Adolphi, NL, Butler KS, Lovato DM, Tessier TE, Trujillo JE, Hathaway HJ, Fegan DL, Monson TC, Stevens TE, Huber DL, Ramu J, Milne ML, Altobelli SA, Bryant HC, Larson RS, Flynn ER. Detection and Imaging of Her2-Targeted Magnetic Nanoparticles: Comparison of SQUID-detected Magnetic Relaxometry and MRI. *Contrast Media Mol. Imaging* 2012 Aug 1;324(17):2613-2619. PubMed PMID: 22773885; PubMed Central PMCID: PMC3389787.

Hathaway HJ, Butler KS, Adolphi NL, Lovato DM, Belfon R, Fegan D, Monson TC, Trujillo JE, Tessier TE, Bryant HC, Huber DL, Larson RS, Flynn ER. Detection of Breast Cancer Cells using Targeted Magnetic Nanoparticles and Ultra-Sensitive Magnetic Field Sensors. *Breast Cancer Research* 2011 Nov 3; 13(5):R108. PMID:22035507

Bryant HC, Adolphi NL, Huber DL, Fegan DL, Monson TC, Tessier TE, Flynn ER. Magnetic properties of nanoparticles useful for SQUID relaxometry in biomedical applications. *J. Magn. Magn. Mater.* 2011 Mar 1; 323(6):767-774. PubMed PMID: 21516188; PubMed Central PMCID: PMC3079235.

Adolphi NL, Huber DL, Bryant HC, Monson TC, Fegan DL, Lim J, Trujillo JE, Tessier TE, Lovato DM, Butler KS, Provencio PP, Hathaway HJ, Majetich SA, Larson RS, Flynn ER. Characterization of single-core magnetite nanoparticles for magnetic imaging by SQUID-relaxometry. *Phys. Med. Biol.* 2010 Oct 7;55(19):5985-6003. doi: 10.1088/0031-9155/55/19/023. Epub 2010 Sep 21. PubMed PMID: 20858918; PubMed Central PMCID: PMC3883308.

Jaetao JE, Butler KS, Adolphi NL, Lovato DM, Bryant HC, Rabinowitz I, Winter SS, Tessier TE, Hathaway HJ, Bergemann C, Flynn ER, Larson RS. Enhanced leukemia cell detection using a novel magnetic needle and nanoparticles. *Cancer Res.* 2009 Nov 1; 69(21):8310-6. doi: 10.1158/0008-5472.CAN-09-1083. Epub 2009 Oct 6. PubMed PMID: 19808954; PubMed Central PMCID: PMC2783727.

Complete List of Published Work in MyBibliography:

http://www.ncbi.nlm.nih.gov/sites/myncbi/1bIMagojgZvAr/bibliography/44861440/public/?sort=date&direction=ascending

D. Research Support

Ongoing Research Support

Sandia Natl Labs Contract 1517079 (PI Adolphi) 11/10/14 – 8/15/16
Title: Development of a Mesoporous Silica Nanoparticle-Supported Lipid Bilayer Platform for Targeted, Triggered, Sustained and Systemic Delivery of Antibiotics The goal of the contract is to perform in vivo animal experiments (biodistribution, microscopy, and imaging) in support of this project. Prime award from DTRA (PI Brinker). Role: Contract PI, Co-investigator

NIJ 2013-DN-BX-K004 (PI Hatch) 01/01/14 – 12/31/16
Title: Investigation of Post-Mortem Magnetic Resonance Imaging for the Detection of Intraneural Hemorrhage
The goal of this project is the development MR protocols, optimized and validated for detecting intraneural hemorrhage, for future application to the evaluation of the cervical spine in pediatric subjects with suspected shaken baby syndrome (SBS). Role: Co-Investigator

NIJ 2012-DN-BX-K019 (PI Adolphi) 01/01/13 – 12/31/15
Title: Investigation of the Impact of Body Temperature and Post-Mortem Interval on Magnetic Resonance Imaging of Unfixed Tissue The goal of this project is to determine how normal post-mortem changes, such as decomposition and changes in body temperature, affect the quality of post-mortem MRI.

Recent Completed Research Support

NIH/NHLBI 1R21HL092812-01A1 (PI Smyth) 07/01/10 – 06/30/14
Title: Multi-functional Nanoparticles: Nano-Knives and Nano-Pullies for Enhanced Drug Delivery to the Lung
The goal of this project is to more effectively deliver therapeutic agents across the mucus barrier in the lungs of cystic fibrosis patients using magnetic nanoparticles as the drug carrier. Role: Co-investigator

Sandia National Labs Contract 1400793 (PI Wu) 12/05/13 – 9/30/14
Title: Development of a Mesoporous Silica Nanoparticle-Supported Lipid Bilayer Platform for Targeted, Triggered, Sustained and Systemic Delivery of Antibiotics The goal of the contract is to perform in vivo animal experiments (toxicology, efficacy, biodistribution, and imaging) in support of this project. Prime award from DTRA (PI Brinker). Role: Co-investigator

DOD BC102825 (PI Adolphi) 06/01/11 – 05/31/13
Title: Novel Synergistic Therapy for Metastatic Breast Cancer: Magnetic Nanoparticle Hyperthermia of the Neovasculature Enhanced by a Vascular Disruption Agent (VDA) The goal of this project is to demonstrate that the combination of a VDA with magnetic nanoparticle-mediated hyperthermia is an effective strategy for treating tumors.

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
David L. Vander Jagt	**Research Professor, Biochemistry and Molecular Biology**
eRA COMMONS USER NAME JENISON	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Calvin College, Grand Rapids, MI	A.B.	1963	Chemistry
Purdue University, West Lafayette, IN	Ph.D.	1967	Chemistry
Northwestern University, Evanston, IL	Postdoctoral	1967-1969	Biochemistry

A. Personal Statement

Dr. Vander Jagt's training and research are in synthetic/medicinal chemistry and biochemistry. He leads the ***University of New Mexico Natural Products-based Drug Development Program (NPD Program)*****,** which currently involves numerous faculty members in a variety of basic and clinical departments, including **Drs. Robert Royer, Lorraine Deck and Lisa Whalen who, with Dr. Vander Jagt, comprise the medicinal chemistry team.** Dr. Vander Jagt has directed the research efforts of over 100 students, including graduate and undergraduate students, postdoctoral and medical students. He has a longstanding interest in targeted drug development, with special focus on selected targets important in parasitic diseases, cancer, diabetes, Alzheimer's disease (AD). Although Dr. Vander Jagt officially retired in 2007, he assumed a part time appointment as Research Professor and continues his research collaborations. In addition, he was appointed vice chair for research in 2013.

B. Positions and Honors.

Positions

2013-	**Vice Chair, Dept Biochem & Mol Biol, Univ. New Mexico School of Medicine**
2007-	**Research Professor, Univ. New Mexico School of Medicine**
1980-2006	**Professor of Biochemistry, Univ. New Mexico School of Medicine**
1974-1980	**Assoc. Prof. of Biochemistry, Univ. New Mexico School of Medicine**
1969-1974	**Assist. Prof. of Biochemistry, Univ. New Mexico School of Medicine**

Honors

2000	**Basic Science Outstanding Teacher, UNM School of Medicine**
1987	**Basic Science Outstanding Teacher, UNM School of Medicine**
1979	**Sigma Xi Research Lecturer, University of New Mexico**
1974-1979	**USPHS Research Career Development Awardee.**
1967-1969	**NIH Postdoc. Fellow, Northwestern University (with M.L. Bender)**
1963-1967	**NSF Graduate Fellow, Purdue University (with H.C. Brown)**

Other Experience

1980-1985	**American Heart Assoc Regional Study Section**
1990	**NIHStudy Section, Diabetic Complications**
2000	**DOD Breast Cancer Study Section**
2001	**NIH Study Section, Animal Models and Type 2 Diabetes**

C. Selected Recent Peer-reviewed Publications (from total 155)

N.O. Solberg, R. Chamberlin, J.R. Vigil, L.M. Deck, J.E. Heidrich, D.C. Brown, C.I. Brady, T.A. Vander Jagt, M. Garwood, M. Bisoffi, V. Severns, **D.L. Vander Jagt,** and L.O. Sillerud (2014) Optical and SPION-enhanced imaging shows that trans-stilbene inhibitors of NF-kB concomitantly lower Alzheimer's disease plaque formation and microglial activation in AβPP/PS-1 transgenic mouse brain. **J Alzheimer's Disease** Epub ahead of print; PMID: 24413613

L.M. Deck, J.A. Greenberg, L.J. Whalen, **D.L. Vander Jagt** and R.E. Royer (2013) Synthesis of naphthalene and indene precursors to naphthoic and indenoic acids. **Tetrahedron Letters 54**, 6015-6018.

L.O. Sillerud, N.O. Solberg, R. Chamberlin, J.E. Heidrich, D.C. Brown, C.I. Brady, T.A. Vander Jagt, M. Garwood, and **D.L. Vander Jagt** (2013) SPION-Enhanced magnetic resonance imaging of Alzheimer's plaques in APP/PS-1 transgenic mouse brain. **J Alzheimer's Disease 34**, 349-365. PMID: 23229079

V.O. Shah, R. R. Townsend, H. I. Feldman, K. L. Pappan, E. Kensicki, and **D. L. Vander Jagt** (2013) Plasma metabolomic profiles in different stages of chronic kidney disease. **Clin J Am Soc Nephrol 8,** 363-370

P. Dytta, A. Le, **D.L. Vander Jagt**, T. Tsukamoto, G.V. Martinez, C.V. Dang and R.J. Gillies (2013) Evaluation of LDH-A and glutaminase inhibition in vivo by hyperpolarized 13C-pyruvate magnetic resonance spectroscopy of tumors. **Cancer Res 73**, 4190-4195.

R.A. Orlando, A.M. Gonzales, R.E. Royer, L.M. Deck, and **D.L. Vander Jagt** (2012) A chemical analog of curcumin as an improved inhibitor of amyloid Abeta oligomerization. **PLoS One 7**, e31869. PMID: 22442659

L.M. Deck, Q. Mgami, A. Martinez, A. Martinic, L.J. Whalen**, D.L. Vander Jagt** and R.E. Royer (2012) Synthesis of benzyl substituted naphthalenes from benzylidene tetralones. Tetrahedron Letters 53, 373-376.

A.M. Fajardo, D.A. MacKenzie, M. Ji, L.M. Deck, **D.L. Vander Jagt**, T.A. Thompson and M. Bisoff (2012) The curcumin analog ca27 down-regulates androgen receptor through an oxidative stress mediated mechanism in human prostate cancer cells**. Prostate 72**, 612-625. PMID: 2179654

V.O. Shah, J. Ferguson, L.A. Hunsaker and **D.L. Vander Jagt** (2011) Cardiac glycosides inhibit LPS-induced activation of pro-inflammatory cytokines in whole blood through an NF-κB-dependent mechanism. **Internat J Applied Res Natural Prod 4**, 11-19.

A. Le, C.R. Cooper, A.M. Gouw, A. Maitra, R. Dinavahi, L.M. Deck, R.E Royer, **D.L. Vander Jagt**, G.L. Semenza and C.V.Dang (2010) Inhibition of lactate dehydrogenase A induces oxidative stress and inhibits tumor progression. **Proc Natl Acad Sci** 107, 2037-2042. PMID: 20133848

V.O. Shah, J.E. Ferguson, L.A. Hunsaker, L.M. Deck and **D.L. Vander Jagt** (2010) Natural products inhibit LPS induced activation of pro-inflammatory cytokines in peripheral blood mononuclear cells. **Natural Prod Res 24**, 1177-1188. PMID: 20582811

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel in the order listed on Form Page 2.
Photocopy this page or follow this format for each person.

NAME	POSITION TITLE
Colleen Fordyce	Assistant Research Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
University of New Mexico, Albuquerque, New	BS	1991-1995	Biology/Chemistry
University of New Mexico, Albuquerque, New	Ph.D.	1997-2002	Biomedical Sciences
University of California, San Francisco	Post Doc	2002-2009	Cancer

RESEARCH AND PROFESSIONAL EXPERIENCE: Concluding with present position, list, in chronological order, previous employment, experience, and honors. Include present membership on any Federal Government public advisory committee. List, in chronological order, the titles, all authors, and complete references to all publications during the past three years and to representative earlier publications pertinent to this application. If the list of publications in the last three years exceeds two pages, select the most pertinent publications. **DO NOT EXCEED TWO PAGES**.

POSITIONS AND HONORS

Professional Positions:

1996-1997 Research Technician
Department of Biochemistry
Boston University, Boston Massachusetts

2002-2009 Postdoctoral Fellow
Department of Pathology
University of California, San Francisco, San Francisco, California

2009-2012 Associate Specialist
Department of Pathology
University of California, San Francisco, San Francisco, California

2012-present Research Assistant Professor
Department of Biochemistry and Molecular Biology
University of New Mexico Health Sciences Center, Albuquerque, New Mexico

Fellowships and Honors:

1992-1995 Minority Biomedical Research Support Fellowship for Undergraduate Research
1997-2000 Minority Biomedical Research Support Fellowship for Graduate Research
1999 Pfizer Scholars in Urology Award
2000-2002 DOD Breast Cancer Predoctoral Fellowship
2003-2006 DOD Breast Cancer Postdoctoral Fellowship
2006-2008 NIH RO1 Research Supplement for Underrepresented Minorities

SELECTED PUBLICATIONS:

C.A. Fordyce, C. M. Heaphy and J.K. Griffith Chemiluminescent measurement of telomere DNA content in biopsies. (2002) *Biotechniques* Jul;33(1):144-6

Tlsty TD, Crawford YG, Holst CR, **Fordyce C.A.**, Zhang J, McDermott K, Kozakiewicz K, Gauthier ML. Genetic and epigenetic changes in mammary epithelial cells may mimic early events in carcinogenesis. (2004) *J Mammary Gland Biol Neoplasia*. Jul;9(3):263-74

Fordyce C.A., Heaphy CM, Joste NE, Smith AY, Hunt WC, Griffith JK. Association between cancer-free survival and telomere DNA content in prostate tumors. (2005) *Journal of Urology* Feb;**173**(2):610-4.
Gauthier ML, Pickering CR, Miller CJ,

Fordyce C.A., Chew KL, Berman HK, Tlsty TD. p38 regulates cyclooxygenase-2 in human mammary epithelial cells and is activated in premalignant tissue. (2005) *Cancer Research*. Mar;1;65(5):1792-9

Heaphy C.M., Bisoffi M., **Fordyce C.A.**, Haaland C.M., Hines W.C., Joste N.E. and Griffith J.K. Telomere DNA content and allelic imbalance demonstrate field cancerization in histologically normal tissue adjacent to breast tumors. (2006) *International Journal of Cancer* Jul: 1;119(1):108-16

Fordyce, C.A., Heaphy C.M., Bisoffi M., Wyaco J.L., Joste N.D., Mangalik A., Baumgartner K., Baumgartner R., Hunt W.C. and Griffith J.K. Telomere DNA content correlates with stage and prognosis in breast cancer. (2006) *Breast Cancer Research and Treatment* Sep; 99(2):192-202

Dumont, N., Crawford,Y., Sigaroudinia, M., Nagrani, S., Wilson, M., Buehring, G., Gauthier, M. **Fordyce, C.A**., McDermott, K., Tlsty, T.D. Human mammary cancer progression model recapitulates methylation events associated with breast premalignancy (2009*) Breast Cancer Research* 11(6):R87

Fordyce, C.A., Fessenden T., Jung, J., Singla, V., Berman, H.K. and Tlsty, T.D. DNA Damage Drives an Activin A-Dependent Induction of COX-2 in Premalignant Cells and Lesions. (2010; Epub 2009) *Cancer Prevention Research* Feb; 3(2):190-201.

Fordyce CA, Patten K, T Fessenden, DeFilippis RD, Hwang SE, Zhao J, and Tlsty TD. Cell Extrinsic Consequences of Epithelial Stress: Activation of Pro-tumorigenic Tissue Phenotypes. (2012; Epub) *Breast Cancer Research* Dec; 7(14): R155.

DeFilippis R.D., **Fordyce C.A.**, Patten K., Chang H., Zhao J., Fontenay G.V., Kerlikowske K., Parvin B., Tlsty T.D. Stress Signalling from Human Mammary Epithelial Cells Contributes to Phenotypes of Mammographic Density. (2014; Epub) Cancer Research.
Note C Fordyce is co-first author.

Book Chapters:
C.A. Fordyce and T.D. Tlsty Telomere structure and function provides insight into the generation of genomic instability and carcinogenesis. (2004) Chapter 13: *Cell Cycle and Growth Control*. Wiley & Sons Inc

RESEARCH SUPPORT:

2P20RR016480-09, NCRR/NIGMS **PI: Arterburn J; Co-I: K. Parra** 05/01/2009 - 02/28/2014
Title: V-ATPase Pumps in Prostate Cancer: Regulatory and Functional Studies
Overall goals: To study V-ATPase expression and functions in prostate cancer cell lines.

UNM-Research Allocation Committee **PI: Fordyce, CA** 08/01/2013 - 07/31/2014
Title: V-ATPase Driven p53 Induction and Cell Death in Breast Cancer
Overall goals: To determine if inhibition of V-ATPase induces p53 and cell death in breast tumor cell lines.

Q01681-NM-INBRE **PI: Fordyce, CA** 06/2014 – 03/2016 (renewable)
Title: V-ATPase-Dependent Regulation of Estrogen Receptor in Breast Cells.
Overall goals: To determine if V-ATPase is required for Estrogen Receptor expression

NCGR Sequencing and Bioinformatics Pilot Project Award **PI: Fordyce, CA** 11/2014-11/2015
Title: Cellular pH During Carinogenesis and Potential for Therapeutic Benefit
Overall goals: Evluate gene expression changes in tumor cell lines in response to V-ATPase inhibition

NAME: William S. Garver, Ph.D. POSITION TITLE: Assistant Professor of Biochemistry and Molecular Biology

INSTITUTION AND LOCATION	DEGREE	MM/YYYY	FIELD OF STUDY
University of New Mexico, Albuquerque, NM	B.A.	05/1986	Biochemistry
New Mexico State University, Las Cruces, NM	M.S.	05/1988	Chemistry/Biochemistry
New Mexico State University, Las Cruces, NM	Ph.D.	12/1991	Chemistry/Biochemistry
University of Washington, Seattle, WA	Postdoctoral	10/1995	Metabolism

Employment History

1995-1999 Research Scientist, Section of Medical and Molecular Genetics, Department of Pediatrics, College of Medicine, University of Arizona Health Science Center, Tucson, AZ

2000-2004 Research Assistant Professor, Section of Medical and Molecular Genetics, Department of Pediatrics, College of Medicine, University of Arizona Health Science Center, Tucson, AZ

2005-2009 Research Associate Professor, Section of Medical and Molecular Genetics, Department of Pediatrics, College of Medicine, University of Arizona Health Science Center, Tucson, AZ

2010- Assistant Professor, Department of Biochemistry and Molecular Biology, School of Medicine, University of New Mexico Health Science Center, Albuquerque, NM

Professional Recognition and Honors

1995- Member, American Society of Biochemistry and Molecular Biology (ASBMB)
2010- Member, The Obesity Society (TOS)
2011- Editorial Board Member, Journal of Pediatric Biochemistry
2013- Fellow of The Obesity Society (FTOS)
2013- Fellow of the National Academy for Scientific Teaching
2013- Editorial Board Member, Annals of Nutritional Disorders and Therapy
2013- Editorial Board Member, Journal of Obesity and Bariatrics
2014- Member, American Society of Nutrition (ASN)
2015- Editorial Board Member, Journal of Diabetes and Obesity

Peer-Reviewed Original Research Published During the Past Five Years

1. Garver WS, Jelinek D, Meaney FJ, Flynn J, Pettit KM, Shepherd G, Heidenreich RA, Walsh-Vockley C, Castro G, and Francis GA. The National Niemann-Pick type C1 Disease Database: Correlation of lipid profiles, mutations, and biochemical phenotypes. Journal of Lipid Research 51:406-415, 2010.

2. Jelinek D, Heidenreich RA, Erickson RP, and Garver WS. Decreased *Npc1* gene dosage in mice is associated with weight gain. Obesity 18:1457-1459, 2010.

3. Jelinek D, Millward V, Birdi A, Trouard TP, Heidenreich RA, and Garver WS. *Npc1* haploinsufficiency promotes weight gain and metabolic features associated with insulin resistance. Human Molecular Genetics 20: 312-321, 2011.

4. Jelinek D, Heidenreich RA, and Garver WS. The Niemann-Pick C1 gene interacts with a high-fat diet and modifying genes to promote weight gain. American Journal of Medical Genetics 155: 2317-2319, 2011.

5. Jelinek D, Castillo JJ, Richardson LM, Luo L, Heidenreich RA, and Garver WS. The Niemann-Pick C1 gene is downregulated in livers of C57BL/6J mice by dietary fatty acids, but not dietary cholesterol, through feedback inhibition of the SREBP pathway. Journal of Nutrition 142:1935-1942, 2012.

6. Poirier S, Mayer G, Murphy SR, Garver WS, Chang TY, Schu P, Seidah NG. The cytosolic adaptor AP-1A is essential for the trafficking and function of Niemann-Pick type C proteins. Traffic 14:458-469, 2013.

7. Jelinek D, Castillo JJ, Arora SL, Richardson LM, Garver WS. A high-fat diet supplemented with fish oil improves metabolic features associated with type 2 diabetes. Nutrition 29:1159-1165, 2013.

8 Jelinek D, Castillo JJ, Garver WS. The C57BL/6J Niemann-Pick C1 mouse model with decreased gene dosage has impaired glucose tolerance independent of body weight. Gene 527:65-70, 2013.

9. Jelinek D, Heidenreich RA, Orlando RA, Garver WS. The Niemann-Pick C1 and caveolin-1 proteins interact to modulate efflux of low density lipoprotein-derived cholesterol from late endocytic compartments. Journal of Molecular Biochemistry 3:14-26, 2014.

10. Garver WS, de la Torre L, Brennan MC, Luo L, Jelinek D, Castillo JJ, Meyre D, Orlando RA, Heidenreich RA, Rayburn WF. Differential association of Niemann-Pick C1 gene polymorphisms with maternal prepregnancy overweight and gestational diabetes. Journal of Diabetes and Obesity 2:1-6, 2015.

Pre-Baccalaureate Student Mentoring

Surpreet Arora (2010-2011): Graduated with a B.S. in Biochemistry from the University of New Mexico. He worked in the lab for his honors thesis. He attended dental school at Baylor University and graduated in 2015.

Lisa Richardson (2011-2012): Graduated with a B.S. in Biochemistry from the University of New Mexico. She worked in the lab for practical research experience. She is attending University of New Mexico Medical School.

Kathleen Smith (2012-2013): Graduated with a B.S. in Biochemistry from the University of New Mexico. She worked in the lab for practical research experience. She is attending graduate school in the Department of Biochemistry at the University of New York at Syracuse.

Laeticia Meyraux (2014-2015): Graduated with a B.S. in Biochemistry from the University of New Mexico. She worked in the lab for her honors thesis and applying to graduate schools.

Zachary Sky Hazlett (2015-present): Will graduate with a B.S. in Biochemistry at the University of New Mexico. He is working in the laboratory performing bioinformatics-related research and will also serve as a tutor in Biochemistry 445.

Chien-An Andy Hu, Ph.D.
Department of Biochemistry and Molecular Biology
University of New Mexico (UNM) School of Medicine (SOM), and Health Sciences Center (HSC)
MSC08 4670, BMSB258, 915 Camino de Salud, Albuquerque, NM87131-0001
505-272-8816; AHu@salud.unm.edu

EDUCATION:

1997 **Postdoctoral Fellow, Human Molecular Genetics**
Howard Hughes Medical Institute, McKusick-Nathans Institute of Genetic Medicine,
Department of Pediatrics and Department of Molecular Biology and Genetics,
Johns Hopkins University School of Medicine, Baltimore, Maryland

1993 **Ph.D., Molecular Genetics**
Department of Molecular Genetics, The Ohio State University, Columbus, Ohio

1991 **M.S., Molecular Genetics**
Department of Molecular Genetics, The Ohio State University, Columbus, Ohio

1985 **B.S., Microbiology**
Department of Microbiology, Soochow University, Taipei, Taiwan

PROFESSIONAL APPOINTMENTS:

2012-present ***Director, Undergraduate Honors Research,*** BMB, UNM SOM
2010 -2012 ***Vice Chairman,*** BMB, UNM SOM
2006 -2015 ***Associate Professor,*** BMB, UNM SOM
2001- 2006 ***Assistant Professor,*** BMB, UNM SOM

UNM HSC & MAIN CAMPUS COMMITTEE:

2012-present ***Member***, Human Tissue Repository Committee and Human Tissue Repository Scientific Review Committee, UNM HSC
2006-present ***Member***, Scientific Advisory Council (SAC) to the Deans, UNM HSC
2005-present ***Member***, Cancer Research and Treatment Center, UNM HSC
2008-2014 ***Faculty senator,*** UNM Main and HSC Campuses

HONORS AND AWARDS:

2014-present *Evergreen Scholar,* Institute of Animal Sciences, Wuhan Polytechnic University, China

SELECTED MEMBERSHIP IN PROFESSIONAL SOCIETIES:

American Heart Association (AHA); American Society for Biochemistry and Molecular Biology (ASBMB)
American Society of Cancer Research (AACR)

COMMITTEES:

National and International

2004-present Committee, *Proline Symposium: Proline Metabolism in Health and Disease*
2013 Co-President, The 13th International Congress on Amino Acids, Peptides and Proteins (ICAPP), October 5-7, Galveston, TX

UNM-HSC

2012- 2013 Chair, Search Committee, BMB and BBHI Tenure-track Assistant Professor
2011-2012 Institutional Animal Care and Use Committee (IACUC), UNM HSC
2010-2011 UNM SOM Promotion & Tenure Committee

GRANT REVIEWER

American Association for the Advancement of Science (AAAS) Research Grants
Florida Bankhead-Coley Cancer Research and James & Esther King Biomedical Programs
Rhode Island Research Alliance Grant
American Heart Association (AHA)

JOURNAL EDITOR FOR:

Guest Editor-in-Chief, *Special Issues, Amino Acids*
Editor, *Amino Acids (2008-)*

SELELCTED INVITED PRESENTATIONS (from 2014):

1. **Invited Speaker:** *Autophagy and tight junction proteins in intestinal cells.* "2015 China Engineering Science and Technology Forum - Animal Nutrition and Aquaculture Environmental Control" Chinese Academy of Engineering and Institute of Subtropical Agriculture, Changsha, China. July 14, 2015.
2. **Invited Speaker:** *Proline and tryptophan in apoptosis and autophagy.* Institute of Subtropical Agriculture, Chinese Academic Sciences, Changsha, Hunan, China. November 03, 2014.
3. **Evergreen Scholarship Lecture:** *Proline metabolism in humans and animals.* Institute of Animal Sciences, Wuhan Polytechnic University, Wuhan, China, October 30, 2014.

REPRESENTATIVE PUBLICATIONS (from 2012):

Nigot P, **Hu CA,** Ma T. (2015) Autophagy enhancement of intestinal epithelial tight junction barrier function by targeting claudin-2 degradation. ***J Biol Chem.*** 2015 Mar 13; 290(11):7234-46

Zhang H, **Hu CA**, Mine Y. (2014) Functions of dietary dipeptides and amino acids in inflammatory bowl disease. ***Amino Acids.*** (published on line; PMID: 25501277).

Yang Y, Li W, Sun Y, Ji Y, Han F, **Hu CA**, and Wu Z. (2014) Amino acid deprivation disrupts barrier function and induced protective autophagy in intestinal porcine epithelial cells. ***Amino Acids.*** (published on line; PMID: 25287255).

Hu CA, Hou Y. (2014) Mammalian P5CR and P5CDH: protein structure and disease association. ***BJO Biochem. 1: 4-7.***

Contreras AU, Mebratu Y, Delgado M, Montano G, **Hu CA**, Ryter SW, Choi AM, Lin Y, Xiang J, Chand H, Tesfaigzi Y. Deacetylation of p53 induces autophagy by suppressing Bmf expression. ***J Cell Biol.*** 2013 Apr 29;201(3):427-37.

Kaini RR, Sillerud LO, Zhaorigetu S, **Hu CA**. Autophagy regulates lipolysis and cell survival through lipid droplet degradation in androgen-sensitive prostate cancer cells. ***Prostate.*** 2012 Sep 15;72(13):1412-22.

Kaini RR, **Hu CA**. Synergistic killing effect of chloroquine and androgen deprivation in LNCaP cells. ***Biochem Biophys Res Commun.*** 2012 Aug 24;425(2):150-6.

Hu CA, Klopfer EI, Ray PE. Human apolipoprotein L1 (ApoL1) in cancer and chronic kidney disease. ***FEBS Lett.*** 2012 Apr 5;586(7):947-55.

Klionsky DJ, **Hu CA** et al. Guidelines for the use and interpretation of assays for monitoring autophagy. ***Autophagy.*** 2012 Apr;8(4):445-544.

Current Research Support:

Project title: *"Role of cytokines and APOL1 in the pathogenesis of childhood HIV associated nephrology";* **Funding organization:** NIDDK (R01DK103564)**. Principal investigator: Ray, Patricio,** Children's National Medical Center, Washington, DC**. Co-investigator/Consultant: HU, Chien-An A. Starting and stopping dates:** August 01, 2014-June 30, 2018. **Direct costs: $**150,000/year

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Liu, Meilian

eRA COMMONS USER NAME (credential, e.g., agency login): Liumeilian

POSITION TITLE: Assistant Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Hunan Normal University, P. R. China	B.S.	06/93	Chemistry
Xiangya School of Medicine, Central South University, P. R. China	Ph.D.	06/04	Biochemistry
University of Texas Health Science Center	Post-doc	07/09	Biochemistry and Cellular Biology

Position and employment

2014 - Present Assistant Professor (Tenure-track), Department of Biochemistry and Molecular Biology, University of New Mexico Health Science Center
2011 - 2013 Assistant Professor (Research), Department of Pharmacology, University of Texas Health Science Center at San Antonio (UTHSCSA)
2009 - 2011 Instructor (Research), Department of Pharmacology, UTHSCSA
2005 - 2006 Associate professor, Department of Biochemistry, Xiangya School of Medicine, Central South University, Changsha, Hunan, P. R. China
2004 - 2005 Instructor, Department of Biochemistry, Xiangya School of Medicine, Central South University, Changsha, Hunan, P. R. China

Professional Recognition and Honors

2015 Grant in aid award of American Heart Association, USA
2013 Junior Faculty Award of American Diabetes Association, USA
2011 Beginning in aid award of American Heart Association, USA
2005 Young Core Teacher, Hunan Government Department of Education, China
2003 The Excellent Ph.D. Student Award, Central South University, China
2002 The Excellent Graduate Student Award, Central South University, China,
2002 Award for the 1st Place of Science and Technology Association Thesis, Hunan, China
1998 Award for Ten Excellent Young Teachers, Hunan Medical University, China

Other Experience and Professional Memberships

2008 – Present, Member, American Diabetes Association
2009 – Present, Member, American Heart Association

Manuscript reviewer for:

Endocrinology; Autophagy; British Journal of Pharmacology; Journal of Biological Chemistry; Journal of Molecular Endocrinology; PLOS ONE

Selected Peer-reviewed Publications (of 29 total publications. Before 2007 under name Liu Mei-Lian)

1. **Liu M**, Chen H, Wei L, Hu D, Dong K, Jia W, Dong LQ, Liu F. ER localization is critical for DsbA-L to

Suppress ER Stress and Adiponectin Down-Regulation in Adipocytes (2015). ***J Biol Chem***. 17;290(16):10143-8.

2. **Liu M,** Bai J, He S, Villarreal R, Hu D, Zhang C, Yang X, Liang H, Slaga T, Zhou Z, Yu Y, Zhou Z, Blenis J, Scherer P, Dong L, and Liu F (2014). Grb10 Promotes Lipolysis and Brown Adipocyte Gene Expression by Phosphorylation-dependent Feedback Inhibition of mTORC1. ***Cell Metabolism***, 19(6):967-80
3. Sha H, Yang L, **Liu M**, Xia S, Liu Y, Liu F, Kersten S, Qi L. Adiopocyte XBP1s promote adiponectin multimerization and systemic glucose homestasis (2013). ***Diabetes***, 63(3):867-79.
4. Liu J, Guo M, Zhang D, Cheng S, **Liu M,** Ding J, Shcerer P, Liu F, Lu X (2012). Adiponectin is critical in determining susceptibility to depressive behaviors and has antidepressant-like activity. ***Proc Natl. Acad. Sci. USA.*** 109(30): 12248-53.
5. **Liu M,** Xiang R, Wilk S, Zhang N, Kian, A, Sloane L, Zhou L, Chen H, Xiang G, Walter C, Austad S, Musi N, Defronzo R, Asmis R, Scherer P, Dong L, Liu F (2012). Fat-specific DsbA-L overexpression promotes adiponectin multimerization and prevents mice from diet-induced obesity and insulin resistance. ***Diabetes***, 61(11):2776-86.
6. **Liu M*,** Zhou L, Wei Li, Ricardo, Yang X, Hu D, Riojas R, Holmes B, Langlais P, Lee H, Dong L* (2012). Phosphorylation of Adaptor Protein Containing Pleckstrin Homology Domain, Phosphotyrosine Binding Domain and Leucine Zipper Motif 1 (APPL1) at Ser^{430} Mediates ER stress-induced Insulin Resistance in Hepatocytes. ***J Biol Chem***. 287(31): 26087-92. **(* Corresponding author)**
7. Zhang J, Zhang N, **Liu, M**, Li, X, Zhou, L, Huang W, Xu, Z, Liu, J, Musi, N, DeFronzo, R, Cunningham J, Zhou, Z, Lu, X, Liu, F (2012). Disruption of Grb10 in the Pancreas Enhances β-cell Proliferation and Protects Mice from Streptozotocin-induced β-cell Apoptosis. ***Diabetes.*** 61(12):3189-98.
9. Wang A, **Liu M*,** Liu X, Dong L, Glickman R, Slaga T, Zhou Z and Liu F***** (2011). Up-regulation of Adiponectin by Resveratrol: The Essential Roles of the Akt/FOXO1 and AMPK Signaling Pathways and DsbA-L. ***J Biol Chem***. *286: 60-6.* **(* Corresponding author)**
10. Zhou L, **Liu M,** Zhang J, Chen H, Dong L.Q, and Liu F (2010). DsbA-L Alleviates Endoplasmic Reticulum Stress-induced Adiponectin Down-regulation. ***Diabetes***. 59, 2809-16
11. **Liu M*,** Wilk S, Wang A, Zhou L, Wang R, Ogawa W, Deng C, Dong L, Liu F***** (2010). Resveratrol inhibits Amino Acid-induced mTOR signaling by Promoting the Interaction between mTOR and DEPTOR. ***J Biol Chem***. 285: 36387-94. **(* Corresponding author)**
12. Liu X*, **Liu M***, Zhang JJ, Bai X, Ramos FJ, Van Remmen H, Richardson A, Liu FY, Dong LQ, Liu F (2009). Reducing Grb2 Expression Mediates the Insulin Sensitizing Effect of Calorie Restriction. ***Am J Physiol Endocrinol Metab*** 296: E1067-75 (***First two authors contribute equally to this work**)
13. Wang C, **Liu M**, Riojas RA, Xin X, Gao Z, Zeng R, Wu J, Dong LQ, Liu F (2009). PKC theta-dependent phosphorylation of PDK1 at ser504 and ser532 contributes to hyperlipidemia-induced insulin resistance. ***J Biol Chem*** 284: 2038-2044.
14. **Liu M**, Zhou L, Xu A, Lam KS, Wetzel MD, Xiang R, Zhang J, Xin X, Dong LQ, Liu F (2008). A Disulfide-bond-A Oxidoreductase-like Protein (DsbA-L) Regulates Adiponectin MultimeriZation. ***Proc Natl. Acad. Sci. USA*** 105: 18302-7

Ongoing research support:

Grant in Aid 15GRNT24940018 Liu M (PI) 07/01/15-06/30/17
American Heart Association
The goal of this project was to investigate the role of mTORC1 in regulating browning of white fat
Role: PI

Junior Faculty Award 1-13-JF-37 Liu M (PI) 01/01/13-12/30/15
American Diabetes Association
The goal of this project is to investigate the role of DsbA-L in regulating liver mitochondria function and insulin sensitivity
Role: PI

R01 DK DK100697 Liu F (PI) 09/01/13-08/31/18
NIH/NIDDK
The goal of this project is to characterize the physiological role of Grb10 in regulating mTOR signaling and thermogenic function in adipose tissue
Role: Co-investigator

NAME **Robert A. Orlando, Ph.D.**	POSITION TITLE **Associate Professor of Biochemistry and Molecular Biology**		
INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
The University at Albany, Albany, NY	B.S.	1980-1983	Biology/Chemistry
University of California, Irvine, Irvine, CA	Ph.D.	1985-1989	Cellular Biochemistry
The Scripps Research Institute, La Jolla, CA	Postdoctoral	1989-1991	Cell Biology
University of California, San Diego, La Jolla, CA	Postdoctoral	1991-1995	Cell Biology

Employment History:

2014-present	Director, UG Biochem	Univ. of New Mexico	Dept. of Biochem. And Molec Biol.
2006-present	Associate Professor	Univ. of New Mexico	Dept. of Biochem. and Molec Biol.
2000-2006	Assistant Professor	Univ. of New Mexico	Dept. of Biochem. and Molec Biol.
1997-2000	Assistant Professor	UC, San Diego	Dept. of Pathology
1995-1997	Asst. Rsrch. Cell Biol.	UC, San Diego	Dept. of Pathology
1991-1995	Postdoctoral Fellow	UC, San Diego	Div. of Cell. and Molec. Med.
1989-1991	Postdoctoral Fellow	Scripps Rsrch. Inst.	Dept. of Immunology
1988-1989	Research Assistant	Univ. of CA, Irvine	Dept. of Devel. and Cell Biol.
1985-1988	Teaching Assistant	Univ. of CA, Irvine	Dept. of Devel. and Cell Biol.

Professional Recognition, Honors:

2015	Recipient of the Ervin W. Lewis Basic Science Teaching Award – UNM School of Med
2014	Recipient of the Ervin W. Lewis Basic Science Teaching Award – UNM School of Med
2013-2015	Leadership in Education and Development – Association of American Medical Colleges
2013	Recipient of the UNM SOM Class of 2015 HIPPO Award
2012	Recipient of the UNM SOM Class of 2014 HIPPO Award
2011	Recipient of the UNM SOM Class of 2013 HIPPO Award
2011	UNM Medical School – Medical Education Scholars Program
1993-1995	National Institutes of Health Postdoctoral Fellowship
1990-1992	National Institutes of Health Training Grant Position
1984-1985	University Fellowship from the University of Chicago

Memberships in Professional Societies:

- International Association for Medical Science Educators
- American Association for the Advancement of Science
- American Society of Biochemistry and Molecular Biology
- Editorial Board Member for 7 Basic and Clinical Science Journals
- Ad hoc reviewer for 19 professional journals

Extramural Professional Activities

2014-present	NIH/NICCAM - Member of ZAT1 PK (29) P01 Centers of Excellence in CAM Research
2013-present	NIH/NICCAM - Member of ZAT1 HS-14 Training, Education and AREA Study Section
2007-present	American Heart Association, Region III Consortium Study Section Member
2007-present	Clinical Medicine: Pathology, Honorary Editorial Board Member
2001-present	NIH/Fogarty International Study Section, ad hoc Member
2001-present	Research Corporation, Tucson, Arizona, ad hoc Member

Selected Peer-reviewed publications from last five years (of 60 total publications)

1. Nitta, C.F., **Orlando, R.A.** NF-κB and mitogen-activated protein kinase (MAPK) signaling pathways regulate cytokine secretion in crosstalk between adipocytes and immune cells. *J Biomol Res and Therapeutics*, submitted, 2015.
2. Ferguson, J. and **Orlando, R.A**. Curcumin Reduces Cytotoxicity of 5-Fluorouracil Treatment in Human Breast Cancer Cells. *J. Med. Food*, 1:1-6, 2014.
3. Card, N., Nitta, C.F., Garver, W.S. and **Orlando, R.A.** Additive effects of β-adrenergic and cytokine signaling on lipolytic activation. *F1000Research*, 3:134, 2014.

4. **Orlando, R.A.** and Garver, W.S. The hidden costs of high fructose corn syrup: challenges to energy balance and fat mobilization from adipose tissue. *J Biomol Res and Therap*, 2:e1, 2013.
5. Nitta, C.F., **Orlando, R.A.** Crosstalk between immune cells and adipocytes requires both paracrine factors and cell contact to modify cytokine expression. *PLoS ONE*, 8(10):e77306, 2013.
6. Garver W.S., Newman S.B., Gonzales-Pacheco D.M., Castillo J.J., Jelinek D., Heidenreich R.A., and **Orlando R.A.** The genetics of childhood obesity and interaction with dietary macronutrients. *Genes Nutr.* 8(3):271-87, 2013.
7. Garver W.S., Newman S.B., Gonzales-Pacheco D.M., Castillo J.J., Jelinek D., Heidenreich R.A., and **Orlando R.A.** The genetics of childhood obesity and interaction with dietary macronutrients. *Genes Nutr.* 8(3):271-87, 2013.
8. **Orlando, R.A.**, Gonzales, A.M., Royer, R.E., Deck, L.M., Vander Jagt, D.L. A chemical analog of curcumin as an improved inhibitor of amyloid Abeta oligomerization. *PLoS*, 7(3):e31869, Epub, 2012.
9. Sun, Y., Scavini, M., **Orlando, R.A.**, Murata, G.H., Servilla, K.S., Tzamaloukas, A.H., Schrader, R., Bedrick, E.J., Burge, M.R., Abumrad, N.A., Zager, P.G. Increased CD36 expression signals monocyte activation among patients with type 2 diabetes. *Diabetes Care*, 33(9):2065-7, 2010.

Pre-baccalaureate Student Mentoring:

Perenkita Mendiola PREP Student Rsch	7-2014 to 7-2015 Biochemistry Major	Accepted into UNM Biomedical Sci PhD Program
Maria Herrera Student Rsch	1-2013 to 5-2013 Biochemistry Major	Attending Baylor Univ. Masters Program, 2014
Gabrielle Chacon Student Rsch	1-2012 to 5-2012 Biology Major	Attending UNM School of Medicine, Class of 2019
Oscar Munoz Student Rsch	1-2010 to 5-2011 Biology Major	Graduated, May 2011
Morgan Pruitt Student Rsch	1-2009 to 5-2013 Biology Major	Graduated, May 2013
Katie Thomas Honors Rsch	5-2008 to 5-2009 Biochemistry Major	Graduated Vanderbuilt Ph.D. program, 2014
Eric Vallejo Student Rsch	5-2007 to 12-2008 Biology Major	Graduated, May 2010
Mark Anderson Honors Rsch	9-2007 to 5-2008 Biochemistry Major	Graduated UNM Medical School, 2012
Amelia Hilgart IMSD student	9-2006 to 5-2007 Biochemistry Major	Graduated, May 2010
Anabel Guerra Student Rsch	9-2006 to 5-2007 Biology Major	Graduated, December 2008
Jeannette Ferguson Honors Rsch	9-2006 to 5-2007 Graduated May 2007	Graduated UNM Medical School, 2011
Geneva Williams IMSD student	5-2005 to 5-2006 Biochemistry Major	Graduated, May 2008
Desiree Martinez Student Rsch.	2-2005 to 5-2006 Biochemistry Major	Expected graduation, December 2008
Britny Candia MARC student	12-2003 to 12-2005 Biochemistry Major	Attending Ph.D. program, Oregon Health Sciences Center
Amy Baca Student Rsch.	9-2002 to 5-2004 Biochemistry Major	Graduated UNM Medical School, 2015
Stephanie Zamora Pathways Student	6-2003 to 9-2003 Graduated May 2004	Graduated UNM PharmD program, 2008
5 additional undergraduate trainees from 1999- 2002		Graduated from UNM School of Medicine, School of Pharmacy, School of Nursing, MPH Emory Univ, PhD Univ of Massachusetts

MARCY P. OSGOOD, Ph.D.
Associate Professor, Department of Biochemistry and Molecular Biology
Assistant Dean of Pre-Clinical Education
University of New Mexico School of Medicine
MSC08 4670, 1 University of New Mexico, Albuquerque, NM 87131-0001
505-272-8184
mosgood@salud.unm.edu

a. Professional Preparation:

Institution	Major Degree and Year
Bates College	Biology BS, 1977
Rensselaer Polytechnic Institute	Biology MS, 1984; PhD, 1987
Rensselaer Polytechnic Institute	Biochemistry, Postdoctoral Fellow, 1987-89
Clarkson University	Molecular Biology Research Associate 1989-91

b. Academic/Professional Appointments:

- Assistant Dean of Pre-Clinical Education, July 2012-, Division of Undergraduate Medical Education, University of New Mexico School of Medicine, Albuquerque, NM
- Undergraduate Program Director July 2008-2014; Department of Biochemistry and Molecular Biology, University of New Mexico Health Sciences Center, Albuquerque, NM
- Associate Professor, July 2008-present, Department of Biochemistry and Molecular Biology, University of New Mexico Health Sciences Center, Albuquerque, NM
- Assistant Professor, July 2002-2008, Department of Biochemistry and Molecular Biology, University of New Mexico Health Sciences Center, Albuquerque, NM
- Lecturer III, January 1994 – June 2002, Biology Department, University of Michigan, Ann Arbor, MI
- Assistant Professor, August 1991-December 1993, Department of Physical Sciences, Albany College of Pharmacy, Union University, Albany, NY
- Adjunct Assistant Professor, Fall 1988, Department of Physical Sciences, Albany College of Pharmacy, Albany, NY

c. Publications

- C. Sensibaugh, W. A. Anderson, and **M. Osgood**. Scientific problem solving within an undergraduate biochemistry and molecular biology curriculum. Submitted, CBE-LSE, in review, July 2015.
- E. Offerdahl, J. Momsen, **M. Osgood**. 2014. Commentary: PhDs in Biochemistry Education – 5 years later. Biochemistry and Molecular Biology Education. Volume 42, Issue 2, pp. 103–105, March/April 2014
- K.M. Aguirre, T.C. Balser, T. Jack, K. E. Marley, K. G. Miller, **M. P. Osgood**, P. A. Pape-Lindstrom, and S. L. Romano. 2013. PULSE Vision & Change Rubrics. CBE Life Sci Educ.Vol 12:579-581 http://www.lifescied.org/content/12/4/579.full.html?etoc
- **Marcy Osgood** and Karen Ocorr. *The Absolute, Ultimate Guide to Lehninger Principles of Biochemistry* (by Nelson and Cox, 6th Edition), 2013. W. H. Freeman and Company, 41 Madison Avenue, New York, NY. 10010. 675 pages.
- National Research Council. *Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering.* Washington, DC: The National Academies Press, 2012. **(M. P. Osgood, Authoring Committee Member)**
- W. L. Anderson, C. A. Sensibaugh, **M. P. Osgood**, and S. M. Mitchell. 2011. What really matters: assessing individual problem-solving performance in the context of biological sciences. International Journal for the Scholarship of Teaching and Learning Vol. 5 (1). http://academics.georgiasouthern.edu/ijsotl/v5n1/articles/Mitchell_et_al/index.html
- K. J. Parra, **M. P. Osgood** and D. L. Pappas Jr. 2010. A research-based laboratory course designed to strengthen the research-teaching nexus. Biochemistry and Molecular Biology Education Vol. 38:1 pp. 172–179.
- **M. P. Osgood**, S. M. Mitchell, and W. L. Anderson. 2008, "Tracking student problem-solving

strategies in online PBL case discussions: a method to target interventions to individuals and groups most in need of help." Invited paper for the Board on Science Education, The National Academies. http://www7.nationalacademies.org/bose/PP_Commissioned_Papers.html

- W. L. Anderson, S. M. Mitchell, and **M. P. Osgood**. 2008. Gauging the gaps in student problem solving skills: assessment of individual and group use of problem-solving strategies using online discussions. CBE Life Sciences Education 7(2): 254-262.
- P. DeVoe, C. Niles, N. Andrews, A. Benjamin, L. Blacklock, A. Brainard, E. Colombo, B. Dudley, C. Koinis, **M. Osgood**. 2007. Lessons learned from a study-group pilot program for medical students perceived to be "at risk". Medical Teacher, Vol 29:1.
- W. L. Anderson, S. M. Mitchell, and **M. P. Osgood**. 2005. Comparison of student performance in cooperative-learning and traditional lecture-based biochemistry classes. Biochemistry and Molecular Biology Education. Vol 33:6, pp. 387-393.
- **M. P. Osgood**, S. M. Mitchell, and W. L. Anderson. 2005. Teachers as learners in cooperative learning and traditional lecture-based biochemistry classes. Biochemistry and Molecular Biology Education. Vol 33:6, pp. 394-398.
- M. F. Varela, M. M.F. Lutnesky, and **M. P. Osgood**. 2005. Assessment of Student Skills for Critiquing Published Primary Scientific Literature Using a Primary Trait Analysis Scale. Microbiology Education, Vol 6, pp. 20-27.
- K. Ocorr, **M.P. Osgood**. Self, or Help? 2003. A Comparison of a Personalized System of Instruction Biochemistry Class to a Standard Lecture-based Biochemistry Class. Biochemistry and Molecular Biology Education, Vol 31, 5, pp. 308-312.

d. Synergistic Activities

- 2014 Stage I reviewer, HHMI Professors Competition
- 2012-2015 Partnership for Undergraduate Life Sciences Education (PULSE) Fellow. The PULSE program is a joint initiative of the National Science Foundation, Howard Hughes Medical Institute, and the National Institutes of Health
- 2010-present, founding member, Society for Advancement of Biology Education Research
- 2010-2012, authoring member, The National Academies, National Research Council, Board on Science Education Committee: Status, Contributions, and Future Directions of Discipline-Based Education Research
- 2009-2012, Regional Field Leader, FIRST IV: Faculty Institutes for Reforming Science Teaching NSF CCLI - Phase III (DUE 618501). D. Ebert-May (PI), Terry Derting (co-PI).
- 2009-2010, Workshop presenter and career mapping facilitator, Association of American Medical Colleges, Early Career Women Faculty Professional Development Seminar, Washington, DC.

e. Collaborators and Other Affiliations

William Anderson, UNM emeritus
Diane Ebert-May, Michigan State
Steven Mitchell, UNM
Karen Ocorr, Sanford-Burnham Medical Research Institute
Erika Offerdahl, North Dakota State University
Karlett Parra, UNM
Cheryl Sensibaugh, UGA

Graduate and Postdoctoral Advisors

Charles Boylan, RPI
David Holmes, Universidad de Santiago de Chile
John Salerno, Kennesaw State University

Thesis Advisor and Postgraduate-Scholar Sponsor

Sergio DeHaro, UNM
Cheryl Sensibaugh, UNM (starting a post-doc at UGA, Athens, Georgia, June 2015)

INSTITUTION AND LOCATION	DEGREE	Dates attended	Conferred	FIELD OF STUDY
Universidad Simon Bolivar, Caracas,Venezuela	B.S.	9/83-5/90	05/1990	Biology
Universidad Simon Bolivar, Caracas,Venezuela	M.S.	6/90-7/92	07/1992	Biochemistry
SUNY Upstate Medical University, Syracuse, NY	Ph.D.	8/92-12/97	05/1998	Bioch. & Mol. Biol.

A. POSITIONS/EMPLOYMENT, MEMBERSHIPS AND HONORS

Professional Positions

Dec. 1997 - Aug.1999	**Post-Doct. Research Associate.** Dr. Patricia M. Kane, Dept. of Biochemistry and Molecular Biology, SUNY Upstate Medical University, Syracuse, NY.
Aug. 1999 - June 2000	**Visiting Assist. Professor.** Biology Dept., Le Moyne College, Syracuse, NY.
Aug. 2000 - Aug. 2004	**Assist. Professor.** Chemistry Dept., Ball State University, Muncie, IN.
Aug. 2004 - Dec. 2006	**Assoc.Professor.** Chemistry Dept., Ball State University, Muncie, IN.
Jan. 2007 - July 2010	**Assist.Professor**. Biochem. & Molec. Biol. Dept., School of Medicine, UNM, Albuquerque, NM.
July 2010 - present	**Assoc.Professor**. Biochem. & Molec. Biol. Dept., School of Medicine, UNM, Albuquerque, NM.
July 2012 - present	**Chair**, Biochem. & Molec. Biol. Dept., School of Medicine,UNM, Albuquerque, NM.

Leadership and Honors

1983	Outstanding Graduate Award, High School Liceo Gustavo Herrera, Venezuela.
1990-1992	Graduate Scholarship, CONICT, Venezuela.
1998	The John Bernard Henry, M.D. Endowed Scholarship Award, Grad. Sc. SUNY.
2001	Chair Chemistry Session, Indiana Academy of Sciences Fall Meeting.
2003	NSF Faculty Early Career Development (CAREER) Award.
2005	The Ball State University 2004-2005 Award for Outstanding Junior Faculty.
2006	Gordon Research Conference, Mol. and Cell. Bioenergetics, Discussion Leader.
2010	Faculty of Color Award for Research, Project of New Mexico Graduates of Color.
2011	Faculty of Color Award for Mentoring, Project of New Mexico Graduates of Color.
2011	Session Chair Bioenergetics Gordon Research Conference, NH, June.
2013	Vice Chair, 2013 Bioenergetics Gordon Research Conference, NH, June.
2014-2019	Journal of Biological Chemistry, Editorial Board
2015	Chair, Bioenergetics Gordon Research Conference, NH, June 21 - 26

Reviewer. Grants: (1) The Wellcome Trust, London, UK, Ad Hoc reviewer for International Research Fellowships (2003). (2) Advisory Panel for Molecular Biochemistry, National Science Foundation, Arlington, VA (2004, 2009), (3) Ad Hoc Reviewer NSF Research Proposals, 2004, 2006-2008 (2-3 proposals/year). (4) NIH Special Emphasis Panel/Scientific Review Group HTS Assays/Probes for drug and probe discovery, Washington DC**,** June 26-27.
Journals: *Ad Hoc* for *FEBS Lett.*, *Gene*, *Biochemistry*, *Mol. Memb. Biology*, *J. Exp. & Clin. Cancer Res., Anal. Biochem., Nature, International Journal of Molecular Sciences.*

B. PEER REVIEWED PUBLICATIONS

-K.J. Parra., and P. M. Kane. *J. Biol. Chem.*, 271:19592-9598 (1996).
-Zhang, J., **K. J. Parra**, J. Liu, and P. M. Kane. *J. Biol. Chem.*, 273:18470-18480 (1998).
-K.J. Parra., and P. M. Kane. *Mol. Cell. Biol.*, 18: 7064-7074 (1998).
-K.J. Parra, K. Keenan, and P. M. Kane. *J. Biol. Chem.,* 275: 21761-21767 (2000).
-Kane, P. M., and **K. J. Parra**. *J. Exp. Biol.*, 203: 81-87 (2000).
-Parra-Belky, K.J. *J. Chem. Ed.*, 79: 1348-1350 (2002).
-K.J. Parra-Belky, K. McCulloch, N. Wicket et al. *Biochem. Mol. Biol. Ed.*, 33: 289-292 (2005).

-M. A. Owegi, A. Carenbauer, N. Wick, et al, and **K.J. Parra-Belky** *J. Biol. Chem.*, 280: 18393- 18402 (2005). PMID: 15718227
-M. A. Owegi, D. L. Pappas Jr., M. W. Finch, et al, and **K.J. Parra.** *J. Biol. Chem.*, 281:30001-30014 (2006).
-Ediger B., S. D. Melman, D. L. Pappas Jr., et al. and **K.J. Parra**. *J. Biol. Chem.*,284:19522-19532 (2009). PMID: 19473972
-K.J. Parra, M. Osgood, and D. Pappas Jr**.** *Biochem. Mol. Biol. Ed.*38: 172-179 (2010).
-R.M. Johnson, Chris A., S.D. Melman, et al. and **K.J. Parra**. *Anal. Biochem.* 15:398(2):203-211(2010). PMID: 20018164
-Parra, KJ. "Vacuolar ATPase (V-ATPase) a Model Proton Pump for Antifungal Drug Discovery", In *Emerging Strategies for Antimicrobial Drug Discover*y. GP Tegos and E. Mylonakis (Ed.), CABI, Oxfordshire, UK p.89-100 (2012)
-Chan CY, Prudom C, et al. and **Parra KJ**. *J. Biol. Chem*. 287(13):10236-50. (2012) PMID: 22215674.
-Michel V., Licon-Munoz Y., Trujillo K., Bisoffi M., and **Parra K**. "*Intern. J. Cancer*. Jan15;132(2):E1-10. doi: 10.1002/ijc.27811. (2013)PMID: 22945374
-Raines SM, Rane H, Bernardo SM, et al. and **Parra KJ.** *J. Biol. Chem*. 288(9):6190-201 (2013) PMID: 23316054
-Rane HS, Bernardo SM, Raines SM, Binder JL, **Parra** KJ, Lee SA. *Eukaryot Cell*. Oct;12(10):1369-82. (2013) PMID: 23913543
-Hayek SR, Lee SA, **Parra KJ**. *Front Pharmacol*. 5:4 (2014) PMID: 24478704
-Parra KJ., Chan Y.C., Chen J. *Eukaryot Cell.* 13(6):706-14 (2014).
-Chan CY and **Parra K.J**. *Journal of Biological Chemistry,* 289(28):19448-57 (2014).
-Rane HS, Bernardo SM, Hayek SR, Binder JL, **Parra KJ**, Lee SA. *Eukaryot Cell*. Sep;13(9):1207-21.(2014). PMID: 25038082
-Kulkarny VV, Chavez-Dozal A, Rane HS, Jahng M, Bernardo SM, **Parra KJ**, Lee SA. *Antimicrob Agents Chemother*. 58(12):7501-9. (2014) PMID: 25288082
-C.A. Fordyce, M.M. Grimes, Y.Licon-Munoz, C.Y. Chan and **K.J. Parra**. Vacuolar ATPase in Physiology and Pathology: Roles in Neurobiology, Infectious Disease and Cancer. In *Regulation of Ca^{2+}-ATPases, V-ATPases and F-ATPases* under the Series "Advances in Biochemistry in Health and Disease", S.Chakraborti , N.S. Dhalla (ed.) Springer, NY(2015).

C. RESEARCH SUPPORT

ONGOING Research Support

R01GM086495, NIH/NIGMS **PI: Parra** 08/01/2009 - 05/31/2015
Title: V-ATPase H+ Pump Regulation in Fuel Energy Selection 11/30/2015 (NCE)

COMPLETED Research Support (last 3 years)

14PRE19020015, AHA/SWA PI:Chan (Grad.St.),Sponsor:Parra 01/01/2014 – 12/31/2015
Title: Beta-subunit of the yeast PFK complex modulates glucose-dependent reassembly of V-ATPase pumps.

2P20RR016480-09, NCRR/NIGMS **PI: Arterburn J** 05/01/2009 - 02/28/2014
*NM-INBRE UNM: Subcontrac*t, **Role: Project PI**
Title: V-ATPase Pumps in Prostate Cancer: Regulatory and Functional Studies

1R03DA031666, NIH/NIDA **PI: Parra** 01/01/2011 - 12/31/2013
Title: Flow Cytometry HTS for Small Mol. that Regulate V-ATPase Proton Transport in Yeast.

NIH-NIGMS; NRSA, (F32) Award **PI: De Haro L.** 03/1/2012 - 02/28/2014
Post-Doctoral Fellowship, Role: Sponsor
Title: The Role GADPH in the Regulation of V-ATPase Function (*Relinquished).*

1R01GM086495, NIH/NIGMS **PI: Parra** 01/01/2011 - 05/31/2012
Pre-Baccalaureate Diversity Research Supplement

1R01GM086495, NIH/NIGMS **PI: Parra** 02/04/2010 - 02/03/2012
Postdoctoral Diversity Supplement (Dr. Leyma DeHaro)

1R01GM086495, NIH/NIGMS **PI: Parra** 01/01/2010 - 12/31/2012
Pre-Baccalaureate Research Supplement (Joshua Sheak)

Martina Rosenberg

• University of New Mexico • MSC08 4670 • 1 University of New Mexico • BRF 223J• Albuquerque, NM 87131 • Phone: 505.272.6778 • mrosenberg@salud.unm.edu •

Educational History:

- **PhD**. 2000, Biochemistry
  Department of Biology, Chemistry and Pharmacy, Freie Universität Berlin, Germany
- **M.Sc**. 1992, in Biochemistry,
  Department of Chemistry, Institute of Biochemistry, Freie Universität Berlin, Germany
- **B.Sc**. 1989, Biochemistry
  Department of Chemistry, Institute of Biochemistry, Freie Universität Berlin, Germany

Employment History - principal positions since the terminal degree

- **Assistant Professor** 7/12-present
  Dept. of Biochemistry and Molecular Biology, University of New Mexico, Albuquerque, NM
- **Research Scientist** 1/06-5/12
  Department of Neurosciences, University of New Mexico, Albuquerque, NM
- **Research Scientist** 5/00-7/05
  College of Pharmacy, University of New Mexico, Albuquerque, NM

Memberships in Professional Societies

American Society for Biochemistry and Molecular Biology (**ASBMB**)
Society for the Advancement of Biology Education Research (**SABER**)
Faculty for Undergraduate Neuroscience (**FUN**)
Society for Neuroscience (**SfN**)

Extramural professional activities

- NM EPSCoR funded working group, invited to plan statewide collaborative proposal, Spring 2014
- **Think tank participant** NSF Biology Phase I IdeasLab, 2014
- **Organizer and PI** for NSF Workshop for discipline-based education researchers in NM, 2013
- National Academies Summer Institute on Undergraduate Education in Biology, participant (2013), **facilitator and presenter** (2014, 2015)
- **Reviewer** for CourseSource open-access Journal, 2013, 2014
- **Reviewer** for Tymoczko, Biochemistry, a short course, 3rd edition, 2014
- American Society of Microbiology (ASM) **Research Residency in Education Scholar**, (2013-14 cohort)

Selected original research or scholarly articles in refereed journals:

Rosenberg MJ, Abel, E, Garver, WS and Osgood, MP. Taking the Hassle out of Hasselbalch. CourseSource *In review*

Varaschin, RK, **Rosenberg, MJ,** Hamilton DA, Savage, DD. Differential effects of the histamine h3 receptor agonist methipip on dentate granule cell excitability, paired-pulse plasticity and lont-term potentiation. Alcohol Clin Exp Res. 2014 Jul;38(7):1902-11. doi: 10.1111/acer.12430, 2014

Staples, MC, **Rosenberg, MJ**, Porch, M, Allan, NASavage, DD. Impact of Combined Prenatal Ethanol and Prenatal Stress Exposure on Anxiety and Hippocampal-sensitive Learning in Adult Offspring Alcoholism: Clinical and Experimental Research, 37(12):2039-47. doi: 10.1111/acer.12190.,2013

Savage DD, **Rosenberg MJ**, Wolff CR, Akers KG, El-Emawy A, Staples MC, Varaschin RK, Wright CA, Seidel JL, Caldwell KK, Hamilton DA. Effects of a novel cognition–enhancing agent on fetal ethanol-induced learning deficits. Alcohol Clin Exp Res. 34(10):1793-801, 2010

Hamilton DA, Candelaria-Cook FT, Akers KG, Rice JP, Maes LI, **Rosenberg M**, Valenzuela CF, Savage DD. Patterns of social-experience-related c-fos and Arc expression in the frontal cortices of rats exposed to saccharin or moderate levels of ethanol during prenatal brain development. Behav Brain Res. 6;214(1):66-74. 2010

Varaschin RK, Akers KG, **Rosenberg MJ**, Hamilton DA, Savage DD. Effects of the cognition-enhancing agent ABT-239 on fetal ethanol-induced deficits in dentate gyrus synaptic plasticity. J Pharmacol Exp Ther. 334(1):191-8, 2010

Rosenberg MJ, Wolff CR, El-Emawy A, Staples MC, Perrone-Bizzozero NI, Savage DD. Effects of moderate drinking during pregnancy on placental gene expression. Alcohol. 44(78):673-90, 2010

Selected invited oral presentations at professional meetings:

"Discipline-based Education Research (DBER) for and from Biochemistry curricula " ASBMB Special Symposia Series: Transforming Undergraduate Education in Molecular Life Sciences, July 30-Aug 2, 2015 – Saint Joseph, MO

"Classroom Innovation: Metacognition^2"
Institutional Research and Academic Career Development Awards (IRACDA) National Conference, Albuquerque , NM, June 8-10, 2014

"Rethinking the undergraduate neurobiology course:
fostering student engagement in the class room". American Society for Biochemistry and Molecular Biology (ASBMB), Washington, D.C., 2011

Mentoring

Undergraduate mentoring:

- Regent's Scholar Mentor for Nicole Graham

Graduate student mentoring:

- Miranda Staples for 'Certificate Program in University Science Teaching', PhD in spring of 2013.
- Sumit Patel, independent project in education research, currently MS2019 at the UNM SOM

Mentoring of Faculty in Education

- **Co-facilitator** of Teacher Education Development (TED) Workshop, Designing Learning that lasts: Evidence-based approach to curriculum development, December 4, 2012,
- **Co-facilitator and presenter**: "Generating Solutions in Introductory-level Science Classes", Workshop at NM Highlands University (Nov 16, 2013)

Advisor for Biochemistry Majors

Name and Terminal Degree(s): Vallabh (Raj) Shah, PhD, FASN –Molecular Epidemiologist

Educational History:

Senior Fellow, 2012, Appointed -New Mexico Center for the Advancement of Research, Engagement, & Science on Health Disparities (NM CARES HD)
FASN 2005, Appointed –Fellow of American Society of Nephrology, ASN
Trainee MPH 1994-2002 University of New Mexico - special emphasis on rural health
Post-Doctorate 1986, Summa Medical Corporation sponsored by NCI/NIH, Albuquerque, NM – Immuno-genetics
Ph.D. 1984, GAU University, Anand, India - Preclinical Science (Parasitology / Microbiology)
M.Sc. 1979, M.S. University, Baroda, India - Reproductive Physiology and Endocrinology - Zoology
B.Sc. 1977, M.S. University, Baroda, India - Biology major – Chemistry minor

Employment History:

11/12-Present	**Senior Fellow** -New Mexico Center for the Advancement of Research, Engagement, and Science on Health Disparities (NM CARES HD).
07/11-Present	**Co- Leader** / Member -Community Engagement core of UNMHSC CTSC and member of "Key Function Committee" group in community engagement for the CTSA consortium.
07/13-Present	**Professor** –tenured -Department of Internal Medicine and Dept of Biochemistry and Molecular Biology, UNMHSC, Albuquerque, New Mexico
06/10-06/2013	**Associate Professor** –tenured -Department of Internal Medicine and Dept of Biochemistry and Molecular Biology, UNMHSC, Albuquerque, New Mexico
06/04-2010	**Associate Professor** –tenure track -Department of Internal Medicine and Dept of Biochemistry and Molecular Biology, UNMHSC, Albuquerque, New Mexico
06/02-2004	**Associate Professor**-research, Department of Internal Medicine, UNMHSC, Albuquerque, New Mexico
06/90-6/02	**Assistant Professor**-research, Department of Internal Medicine, UNMHSC, Albuquerque, New Mexico

Professional recognition honors:

- 2014 6th Annual Excellence in Research Award in Population Science, Health Science Center, University of New Mexico
- 2011 Sarah Belle Brown Community Service Award, University of New Mexico

Original research or scholarly articles in refereed journals For current year:

1. Robert C. Williams…Vallabh O. Shah… and Robert L. Hanson and the FIND Research Group. Individual Genetic Ancestry in the Family Investigation of Nephropathy and Diabetes (FIND): Balancing Information for Poly-Ancestry (>2) Models for Stable Estimates. PLOS1 Nov 2015. Vallabh Shah, Casey Carroll*, Ryan Mals*, Donica Ghahate, Jeanette Bobelu, Phillip Sandy, Kathleen Colleran, Ronald Schrader, Thomas Faber, Mark Burge. A Home-based Educational Intervention Improves Patient Activation Measures and Diabetes Health indicators Among Zuni Indians. Plos1 Feb 2015
2. Vallabh O. Shah, Donica M Ghahate, Jeanette Bobelu, Phillip Sandy, Sara Newman*, Deborah L. Helitzer, Thomas Faber, and Philip Zager. Identifying Barriers to Healthcare to Reduce Health Disparity in Zuni Indians Using Focus Group Conducted by Community Health Workers. Clin Trans Sci 2014, 7:6-11, PMID:24528897
3. Sara Newman*, Terri Cheng*, Donica M Ghahate, Jeanette Bobelu, Phillip Sandy, Thomas Faber and Vallabh O. Shah. Assessing Knowledge and Attitudes of Diabetes in Zuni Indians using a Culture-Centered Approach. PLoS One. 2014 Jun 11;9(6):e99614, PMID:24919064

Complete List of Published Work in MyBibliography:
http://www.ncbi.nlm.nih.gov/sites/myncbi/1r9YzydW9MK5b/bibliography/44800817/public/?sort=date&direction=descending

Current Grant and Contract Funding:

- PCORI Community engagements grant for home base kidney care in Zuni –July 2013 – June 2016 -2.4 calendars. Role: PI
- Zuni Health Initiative, NIGMS/NCRR (PI- Sub-project -NMINBRE) -2P20 RR016480-09 (05/01/14-04/30/1019) -2.4 calendars. The project is a community based education project with a goal of reduction of risk for chronic diseases in Zuni Indians. Role: PI
- UNMHSC - Cardiovascular and Metabolic Diseases Signature Program about gut microbiome, June 2013 – 2014
- UNMHSC CTSC pilot project about obesity intervention in Zuni children, April 2013 – 2014
- UNMHSC CTSC joint institutional pilot project award about health literacy in urban Native Americans of Oklahoma and reservation based Zuni Indians, April 2013 – 2014
- Clinical and Translational Science Award, University of New Mexico - NIH-NCRR, UL1RR0319977 (Larson - PI) 07/01/2010 – 06/30/2014 -0.60 calendar $24 million (5% efforts), The overall goals of this project are to provide transformative clinical and translational research infrastructure to funded investigators at the University of New Mexico Health Sciences Center. Role: Leadership role in the Community engagement core.

Teaching / Education
Classroom, laboratory teaching, and tutoring (courses or blocks taught or team-taught):

- Nephrology Fellows training in research methods and use of system biology tolls in basic science - the training was continuous throughout the year for every year since 1990 -we admitted more than 3-6 fellows.
- Biochem of disease –Biochem 464/564 –part II –Teaching in for more than 15 yrs –Once a year class for 2hrs, twice a week.
- Circuit rider –PIE –minimum two students –Once a year for 8-12 weeks -3 students 2013
- CVPR block – committee member and tutor -13 weeks/yr. -3 times with 3 hrs each time tutoring.
- GI Block – Tutor – 7 weeks/yr. -3 times with 3 hrs each time tutoring.
- Health Equity: Introduction to Public Health Block –tutor -2 weeks/yr.
- Master Tutor –tutoring new tutors (faculties and post doc student) twice yearly and member of TED tutor training steering committee -4 times / yr.

Mentoring:

Sanchez Frank–Medical student research 2014; Nelson Cole–Medical student research 2014; Lowe, Janae–Medical student research 2013; Carson, TreChelle–Medical student research 2013; Lambeth, Stacey–Medical student research 2013; Malls Ryan, MSII –Medical student research 2013; Carroll Casey, MSII –Medical student research 2013; Moen Hans, MSII –Medical student research 2013; Joan Goldsworthy, MSII –Medical student research 2011-12; Thomas Vanderjagt, PhD, MSII – Post Doctoral fellow 2011, Medical student research 2012; Quynh-Anh Bui, MSII –Medical student research 2011; Terri Cheng, MSII –Medical student research, 2010

Biochemistry Honors: Meyrueix Laetitia 2014-15; Katherine Juarez, BS –UPN student 2010, honors research 2012-13; Anju Shah, BS –honors research 2011; Amber Sulahria, BS –UPN summer research student 2012; Neugebauer, Monica, BS –honors research 2010; **Under Graduate Research in Zuni:** 2014 – 15 - Gchachu Joni –UNM Gallup; Wyaco Tammy–UNM Gallup; Charlie Taffany–UNM Gallup; Mandy Selecion–UNM Gallup; Tesa Frejo–UNM Gallup; Michelle Quam–UNM Gallup; Mariah Charlie–UNM Gallup; Kayla Lesarlley–UNM Gallup

Dorothy J. VanderJagt, PhD

Mailing address: Department of Biochemistry and Molecular Biology
University of New Mexico School of Medicine
Basic Medical Sciences Building, Room 249
Albuquerque, NM, 87131
(505)-272-5799
Dvanderjagt@salud.unm.edu

Education:

B.A., Chemistry, Holy Family College, Philadelphia, PA, 1963
M.S., Chemistry, Purdue University, West Lafayette, IN, 1967
Ph.D., Medical Sciences, University of New Mexico, Albuquerque, NM, 1988

Professional experience:

Chemical Analyst, Vick Manufacturing Company, Hatboro, PA, 1963-1965

Graduate Teaching Assistant, Chemistry Department, Purdue University, West Lafayette, IN, 1965-1967.

Research Technologist, Department of Biochemistry, Northwestern University, Evanston, IL, 1967-1969.

Research Technologist, Department of Biochemistry, University of New Mexico School of Medicine, Albuquerque, NM, 1969-1972.

Graduate Research Assistant, Clinical Nutrition Laboratory, Department of Pathology, University of New Mexico School of Medicine, Albuquerque, NM, 1981-1988.

Research Assistant Professor, Department of Pathology, University of New Mexico School of Medicine, Albuquerque, NM, 1988-1990.

Research Assistant Professor, Department of Biochemistry, University of New Mexico School of Medicine, Albuquerque, NM, 1990-1997.

Project Co-Director, Editorial Committee, Tool Kit for Interdisciplinary Training Grant Programs, Prepared for the US Department of Health and Human Services , Health Resources and Services Administration, 1994-1995.

Steering Committee for the Interdisciplinary Training of Health Care Workers for Rural Areas, School of Allied Health, University of New Mexico School of Medicine, 1990-1994.

Research Assistant Professor, Department of Biochemistry and Molecular Biology, Albuquerque, NM, 1997- 2001.

Co-Director of the University of New Mexico Minority International Exchange Program (MIRT), 1994 to 2007

Research Associate Professor, Department of Biochemistry and Molecular Biology, University of New Mexico School of Medicine, 2001 to present.

Awards:

Faculty Teaching Excellence Award, Phase 1, University of New Mexico School of Medicine, October 22, 1998.

International Excellence Award, University of New Mexico, May 10, 1999.

Publications: (selected from 129)

Glew RH, Wold RS, **VanderJagt DJ**. Comparison of diets of urban American Indian and non-Hispanic whites: populations with a disparity for biliary tract cancer rates. Asian Pac J Cancer Prev. 2012;13(7):3077-82.

Glew RH, Wold RS, Corl B, Calvin CD, **Vanderjagt DJ**. Low docosahexaenoic acid in the diet and milk of American Indian women in New Mexico. J Am Diet Assoc. 2011;111:744-8. doi: 10.1016/j.jada.2011.02.001.

Chuang LT, Glew RH, Li CC, **VanderJagt DJ**, Broyles JS, Ray GM, Shah VO. Comparison of the fatty acid composition of the serum phospholipids of controls, prediabetics, and adults with type 2 diabetes. J Diabetes Mellitus. 2012;2:393-401.

Vanderjagt DJ, Ujah IA, Ikeh EI, Bryant J, Pam V, Hilgart A, Crossey MJ, Glew RH. Assessment of the vitamin_B12_status_of_pregnant_women_in_Nigeria_using_plasma_holotranscobalamin. ISRN Obstet Gynecol. 2011;2011:365894. doi: 10.5402/2011/365894. Epub 2011 Jul 14.

VanderJagt DJ, Waymire L, Obadofin MO, Marjon N, Glew RH. A cross-sectional study of the growth characteristics of Nigerian infants from birth to 2 years of age. J Trop Pediatr. 2009;55:356-62. doi: 10.1093/tropej/fmp022. Epub 2009 Apr 16.PMID:19372149

VanderJagt DJ, Trujillo MR, Jalo I, Bode-Thomas F, Glew RH, Agaba P. Pulmonary function correlates with body composition in Nigerian children and young adults with sickle cell disease. J Trop Pediatr. 2008;54:87-93. Epub 2007 Sep 26.PMID: 17901067

Vanderjagt DJ, Ujah IA, Patel A, Kellywood J, Crossey MJ, Allen RH, Stabler SP, Obande OS, Glew RH. Subclinical vitamin B12 deficiency in pregnant women attending an antenatal clinic in Nigeria. J Obstet Gynaecol. 2009;29::288-95.PMID:19835494

Xu Z, Gabaldon D, Wiggins B, Rondon-Berrios H, **VanderJagt DJ**, Tzamaloukas AH. Increase in serum creatinine in a patient on continuous peritoneal dialysis: potential mechanisms and management. Adv Perit Dial. 2012;28:32-6. PMID: 23311210

BIOGRAPHICAL SKETCH

NAME	POSITION TITLE
Jeffrey K. Griffith, Ph.D.	Professor and Senior Advisor to the Dean, School of Medicine
eRA COMMONS USER NAME (credential, e.g., agency login) JKgriffith	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Portland State University, Portland, OR	B.S	1970	Genetics, Biology
Purdue University, West Lafayette, IN	Ph.D.	1975	Mol. Develop. Biol.
University of Hawaii, Honolulu, HI	Post Doc	1975-1979	Mol. Develop. Biol.

A. Personal Statement

Dr. Griffith's has 30 years of experience in the conduct and administration of biomedical research, undergraduate and graduate science education, pipeline development and faculty development at UNM. He has served in several leadership roles at UNM, including Senior Advisor to the Dean of the School of Medicine (2012-present), Executive Vice Dean of the School of Medicine (2007-2012), Chair, Department of Biochemistry and Molecular Biology (1997-2007), and Codirector of the UNM NCI-designated Cancer Center's Women's Cancers Research Program (2001-2009). The ARRA-funded Undergraduate Pipeline Program he established provided the foundation for the present INBRE/CTSC UPN Summer Research Experience. He served as a member of the internal advisory boards for UNM's MARC and IMSD programs for over 20 years. He has received approximately $8M in research funding during the past 20 years and has authored 77 research papers, books and patents. He reviews grants for several private, state, federal and international funding agencies, including NCI, NIH, BCRP and PCRP, and manuscripts for numerous peer-reviewed journals. He has mentored many undergraduate, graduate and medical students, postdoctoral and medical fellows and junior faculty, including several from underrepresented groups. Six of his former Ph.D. students now hold faculty positions.

B. Positions and Honors

Positions and Employment

1979-1982 Staff Member, Genetics Group, Los Alamos National Laboratory, Los Alamos, NM.
1982-1995 Associate Professor, Department of Cell Biology, Tenured, July, 1984, University of New Mexico Health Sciences Center, Albuquerque, NM.
1995-1997 Associate Professor, Department of Biochemistry, University of New Mexico Health Sciences Center, Albuquerque, NM.
1997-2007 Chair, Department of Biochemistry and Molecular Biology, University of New Mexico Health Sciences Center, Albuquerque, NM
1997-present Professor, Department of Biochemistry and Molecular Biology, University of New Mexico Health Sciences Center, Albuquerque, NM
2006-present Professor, Department of Surgery, Division of Urological Oncology, University of New Mexico Health Sciences Center, Albuquerque, NM
2007-2012 Executive Vice Dean, School of Medicine, University of New Mexico Health Sciences Center, Albuquerque, NM.
2012-present Senior Advisor to the Dean, School of Medicine, University of New Mexico Health Sciences Center, Albuquerque, NM

Other Experience and Professional Memberships

1985-1997 Visiting Staff Member, Center for Human Genome Studies, Los Alamos National Laboratory, Los Alamos, NM.
1996-2001 Codirector, UNM-LANL Center for Genetics in Medicine, University of New Mexico Health Sciences Center, Albuquerque, NM.

1999-2012 Member, various NCI, BCRP and PCRP study sections
2001-2006 Board of Directors, New Mexico Biomedical & Biotechnology Association
2001-2008 Codirector, UNM Women's Cancers Research Program, University of New Mexico Health Sciences Center, Albuquerque, NM.
2007-2012 Member, Board of Directors, University New Mexico Medical Group
2009-2012 Member, Board of Directors, UNM Sandoval Regional Medical Center
2007 Chair, NCI Innovative Technologies Program Study Section
2004-present Science Director, New Mexico Idea Network of Biomedical Research Excellence (INBRE)

Honors

1981 Los Alamos National Laboratory, Distinguished Performance Award,
1992 Elected to Lifetime Membership, Clare Hall, University of Cambridge, England.
1994,1995 UNM School of Medicine Faculty Excellence in Teaching Award
1990-1992 Visiting Scholar, Department of Biochemistry, University of Cambridge, England.
2000 DOD Joint Genome Institute Achievement Award, 2000.

C. Selected peer-reviewed publications (from a total of 74)

1. Hines WC, Fajardo AM, Joste NE, Bisoffi M and Griffith JK (2005) Quantitative and Spatial Measurements of TERT Expression within Normal and Malignant Human Breast Tissue, Molecular Cancer Research, 3:503-509. PMID: 16179497.
2. Heaphy C, Bisoffi M, Fordyce C, Haaland-Pullus C, Joste NE and Griffith JK, (2006) Telomere DNA Content and Allelic Imbalance in Histologically Normal Tissue Adjacent to Breast Tumors: Implications for Prognosis, International Journal of Cancer, 119: 108-116. PMID: 16450377.
C, Haaland-Pullus C, Heaphy C, Butler KS, Fischer EG, Griffith JK and Bisoffi M (2009) Differential Gene Expression in Tumor Adjacent Histologically Normal Prostatic Tissue Indicates Field Cancerization. International Journal of Oncology, 35:537-46. PMID: 19639174.
3. Christopher M. Heaphy, Jeffrey K.Griffith and Marco Bisoffi (2009) Mammary Field Cancerization - Molecular Evidence and Clinical Importance, Breast Cancer Research and Treatment. 118: 229-239. Epub ahead of print, Aug 15, 2009. PMID: 19639174.
Kristina A. Trujillo, Christopher M. Heaphy, Keith M. Vargas, Minh Mai, Marco Bisoffi, Nancy E. Joste, Kimberly Butler and Jeffrey K Griffith (2011). Markers of Fibrosis and Epithelial to Mesenchymal Transition in Histologically Normal Tissue Adjacent to Breast Tumors. International Journal of Cancer, 129: 1310-1321. [Epub ahead of print Feb 11, 2011]. PMID: 21105047.
4. Kristina A. Trujillo, William C. Hines, Keith M. Vargas, Anna Jones, Marco Bisoffi and Jeffrey K Griffith (2011) Breast Field cancerization: Identification and Isolation of Telomerase Expressing Cells from Tumor Adjacent Histologically Normal Breast Tissue. Mol Cancer Res. 9:1209-21. [Epub ahead of print Aug 30. 2011]. PMID: 21775421.
5. Kimberly S. Butler, William C. Hines, Christopher M. Heaphy, Jeffrey K. Griffith (2012) Coordinate regulation between expression levels of telomere-binding proteins and telomere length in breast carcinomas. Cancer Medicine. 1:165-175. PMID:23342266.
6. Harriet O Smith, Nicole D Stephens, Clifford R Qualls, Tal Fligelman, Tao Wang, Chang Yun-Lin, Elizabeth Burton, Jeffrey K Griffith, Jeffrey W Pollard (2013) The Clinical Significance of Inflammatory Cytokines in Primary Cell Culture in Endometrial Carcinoma. Molecular Oncology. 7:41-54 [Epub ahead of print September 5, 2012].PMID:22944067.

Completed Research Support

RR0164880 (Arterburn, Jeffrey) 7-1-09 to 6-31-14
NIH $525,000 Annual Direct Costs (Subcontract)
New Mexico INBRE
Objective: Improve university research infrastructure throughout New Mexico
Role: JKG is PI of the UNM subcontract and Director of the State Science Core

Criterion 6A

Table 1.
FTE Estimations per Course and Contact Time

TABLE 1. FTE Estimations per Course and Contact Time

BMB Faculty Teaching FTE Estimation
UNM: 1 FTE = 18 cr/y

Minimum Teaching: 0.06 FTE
TT Faculty (Tenured; Funded)

Minimum Teaching: 0.03 FTE
R Faculty
TT Faculty (Untenured)

Minimum Teaching Non-Funded (extramural) TT Faculty (Tenured):

Up to 1 Year	0.06 FTE
1 Year	0.09 FTE
2 Years	0.12 FTE
3 Years	0.15 FTE
4 Years	0.18 FTE

	NEW	Prior
1 hour Lecture	0.004 FTE	0.0035
1.25 hour Lecture	0.005 FTE	0.0035
3 hour Tutorial Session	0.004 FTE	0.0035
5 hour Lab Session/week (Th;F)	0.016 FTE	0.007
5 hour Lab Session/week (Th;F) + Lecture	0.02 FTE	0.0105
One 3-week block BIOC 463/464	0.03 FTE	0.03
One 4-week block BIOC 463/464	0.04 FTE	
One 3-week block BIOM 515	0.03 FTE	0.03
One 3-week block BIOC 448L	0.06 FTE	
One 4-week block BIOC 448L	0.076 FTE	
7.5 hour Lectures (GI Block)	0.03 FTE	
Tutorial 5 weeks/cases (2x3 hour/week)	0.04 FTE	
3-cr Course	0.168 FTE	0.168
3-cr Course + course director (add 7%)	0.18 FTE	0.18
4-cr Course	0.224 FTE	0.224
4-cr Course + course director (add 7%)	0.24 FTE	0.24
Course director with multiple instructors (add 10% to 3-cr Course)	0.0168 FTE	0.03
3-cr BIOC 448L Course (Th & F)	0.3 FTE	
Course director BIOC 448L (multiple instructors)	0.05 FTE	0.03
GI Block Chair (UME)	0.20 FTE	0.25

Criterion 6A

TABLE 2.
Minimum Teaching FTE Allocated to Tenure-track Faculty Conducting Biomedical Research, Independent of other Assignments.

Biomedical Research Faculty Teaching Assignment Relative to Extramural Funding		
Years Unfunded (Tenured *)	*Minimum* Teaching (FTE)	
	Tenured(*)	Pre-Tenure
-	0.06	0.03
Up to 1 year	0.06	0.03
1 Year	0.09	0.03
2 Years	0.12	0.03
3 Years	0.15	0.03
4 Years	0.18	0.06
5 Years	≥ 0.36	0.06
6 Years	≥ 0.6	0.06

TABLE 2. *Minimum* Teaching FTE Allocated to Tenure-Track Faculty Conducting Biomedical Research, Independent of Other Assignments.

Criterion 6A

TABLE 3.
Tenure Track Faculty Time Protected by Research Funding FY2009 - FY2016

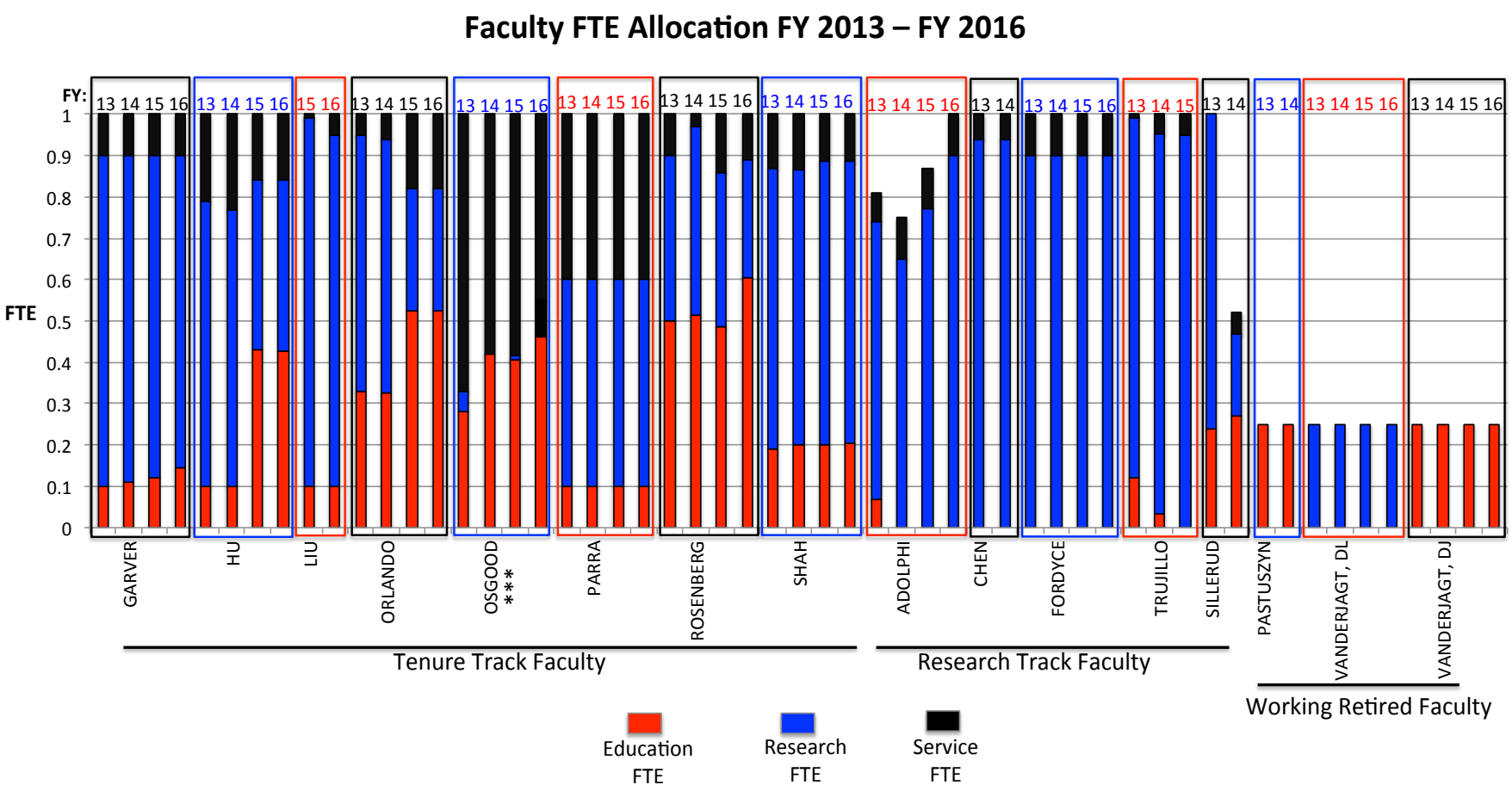
	% Extramural Salary Support (Tenure Track Faculty) FY2009-2016							
	Garver	Hu	Orlando	Osgood	Parra	Rosenberg	Shah	Bisoffi
FY09	0.00	54.81	15.00	5.00	20.00	N/A	44.17	57.00
FY10	0.00	31.00	0.00	0.00	45.75	N/A	68.33	65.50
FY11	0.00	4.72	0.00	0.00	47.07	N/A	61.05	60.50
FY12	0.00	5.57	0.00	0.00	57.47	N/A	38.67	53.23
FY13	0.00	4.72	0.00	2.38	19.00	0.00	48.59	45.44
FY14	30.00	4.72	0.00	0.00	19.00	0.00	50.00	N/A
FY15	10.00	0.00	0.00	0.00	19.00	0.00	35.00	N/A
FY16	10.00	0.00	0.00	0.00	1.00	0.00	60.00	N/A

TABLE 3. Tenure-Track Faculty Time Protected by Research Funding Between FY2009 and FY2016

Criterion 6A

Figure 1
Faculty FTE Allocations in Education, Research, Service

Figure 1. Faculty FTE Allocations in Education, Research, and Service

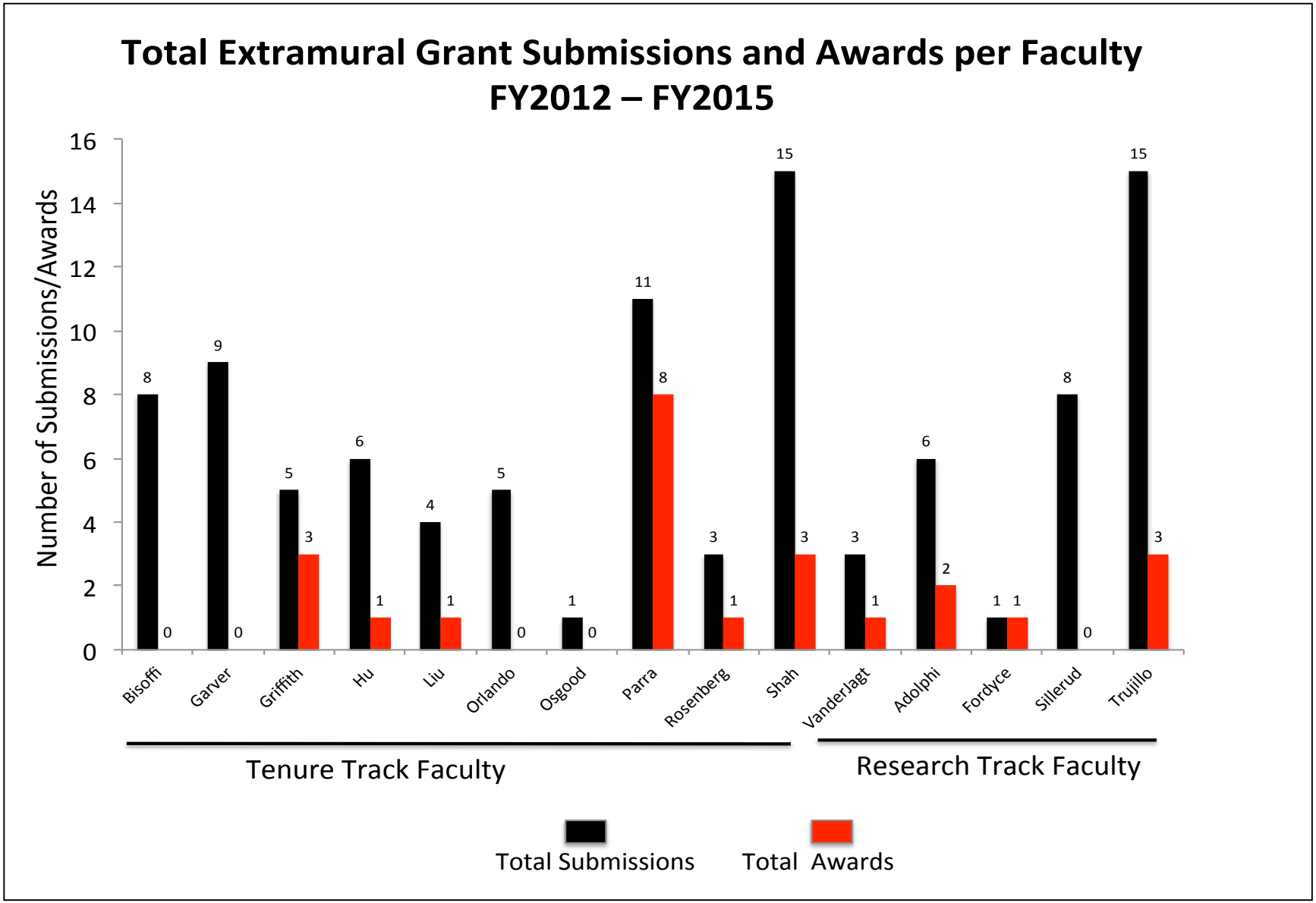


*** Dr. Osgood FTE allocations is as follows: 0.45 FTE Assistant Dean Administrative roles, 0.45 FTE BMB Department, and 0.10 FTE PREP program. The same distribution applies for FY16, except that additional 0.12 FTE has been assigned to Education, which is included in the "I" component of her compensation.

Criterion 6A

Figure 2
Faculty Grant Submissions and Awards
FY2012- FY2015

Figure 2. Faculty Grant Submissions and Awards FY2012- FY2015



Criterion 6A

Table 4.
BMB Faculty Teaching and Committee Assignments, as Described in FY2014 - FY2016 Faculty Action Plans

Table 4. BMB Faculty Teaching and Committee Assignments as Described in FY2014 - FY2016 Faculty Action Plans.

BMB Faculty Teaching and Committee Assignments FY16	
Teaching	**Committees**
TENURE TRACK FACULTY	
M. Liu, Assistant Prof._TT_Untenured_ Years in Rank = 2	
One 3-week block in Biochemistry of Disease BIOC 463 (Spring, 2016)	CMBD (Chair),Organize HSC Seminars series
M. Rosenberg, Assistant Prof._TT_Untenured_ Years in Rank = 3	
Instructor for the BIOC 423 (2.00) Course (Fall, 2015) and serve as course director.	BMB Undergraduate Student Advising
Instructor for the BIOC 423 (2.00) Course (Spring, 2016) and serve as course director.	
Instructor BIOC 445 Course 8 weeks (Fall, 2015)& Co-director	
One 3-week block in Biochemistry of Disease BIOC 464 Spring, 2016) and Course Director	
S. Garver, Assistant Prof._TT_Untenured_ Years in Rank = 5	
Provide one 4-week block and 4 additional lectures in the Biochemistry Course BIOC446 (Spring, 2016)	BSGP Steering Committee/Sub-Committee
Provide 4 lectures (or 4 hours) in the BIOC445 course and visit Dr.Osgood's classes (Fall, 2015)	IACUC
3 lectures(or 3 hours) in the GI/Endo Block (Fall, 2015)	
One 3-week block of BIOC464 (spring 2016)	
A. Hu, Associate Prof._Tenured_ Years in Rank = 10	
One 3-week block in Biochemistry of Disease BIOC 463 and serve as course director (Fall, 2015)	Director for the Honors BMB Program including retreat
One 3-week block in the BIOC 515 Cancer Course and serve as course director (Spring, 2016)	HSC Sci. Review Committee (2013 - June 30th,2016)
BIOC 448L Course and serve as course director (Spring, 2016)	
	RAC
R. Orlando, Associate Prof._Tenured_ Years in Rank = 10	
Instructor(4 weeks) in the BIOC 448L course (Spring, 2016)	Undergraduate Program Director (no advising)
Instructor in the BIOC 423 course and serve as course director (Fall, 2014)	Institutional Biosafety Committee
Instructor in the BIOC 423 Course and serve as course director (Spring, 2015)	RAC
M. Osgood, Associate Prof._Tenured_ Years in Rank = 8	
Instructor (25 lectures) in the BIOC 446 Course and serve as course director (Spring, 2016). In addition, Provide 11 lectures (equivalent to 0.05126 FTE) in the Bioc 446 course (I)	
Co-Instructor (20 lectures, 8 weeks) in the BIOC 445. Course and serve as course director (Fall, 2015)	
5 lectures in the GI/Endo/Metab Block (Fall, 2015)	
Serve as Co-Chair of the GI Block (UME). In addition, Provide 18 lectures (0.072	

BMB Faculty Teaching and Committee Assignments FY15	
Teaching	**Committees**
TENURE TRACK FACULTY	
M. Liu, Assistant Prof._TT_Untenured_ Years in Rank = 1	
One 3-week block in Biochemistry of Disease BIOC 463 (Spring, 2015)	CMBD
M. Rosenberg, Assistant Prof._TT_Untenured_ Years in Rank = 2	
3 lectures or equivalent in the GI/Endo/Meatb Block (Fall, 2014)	BA-MD Committee for curriculum and student progress, subcommittee (basic science)
Instructor for the BIOC 423 (2.00) Course (Fall, 2014) and serve as course director.	BMB Undergraduate Student Advising
Instructor for the BIOC 423 (2.00) Course (Spring, 2015) and serve as course director.	
Visit BIOC 445 course classes (50%) (Fall, 2014)	
One 3-week block in Biochemistry of Disease BIOC 464 Spring, 2015) & Course Director	
S. Garver, Assistant Prof._TT_Untenured_ Years in Rank = 4	
Provide one 4-week block and 4 additional lectures in the Biochemistry Course BIOC446 (Spring, 2015)	BSGP Steering Committee/Sub-Committee
Visit 50% of the BIOC445 course classes (Fall, 2014)	IACUC
One 3-week block of BIOC464 (spring 2015)	
A. Hu, Associate Prof._Tenured_ Years in Rank = 9	
One 3-week block in Biochemistry of Disease BIOC 463 and serve as course director (Fall, 2014)	Director for the Honors BMB Program including retreat
One 3-week block in the BIOC515 Cancer Course and serve as course director (Spring, 2015)	HSC Sci. Review Committee (2013 - June 30th,2016)
BIOC 448L Course and serve as course director (Spring, 2015)	
	RAC
R. Orlando, Associate Prof._Tenured_ Years in Rank = 9	
4 lectures in the GI/Endo/Metab Block (Fall, 2014)	Undergraduate Program Director (no advising)
Instructor(4 weeks) in the BIOC 448L course (Spring, 2015)	Institutional Biosafety Committee
Instructor in the BIOC 423 course and serve as course director (Fall, 2014)	RAC
Instructor in the BIOC 423 Course and serve as course director (Spring, 2015)	
M. Osgood, Associate Prof._Tenured_ Years in Rank = 7	
Instructor (36 lectures) in the BIOC 446 Course and serve as course director (Spring, 2015)	Post-baccalaureate Research and Education Program (PREP) Steering Committee (UME)
10 lectures in the GI/Endo/Metab Block (Fall, 2013)	Assist new Program Director in the review/assessment and application for ASBMB accreditation.
Serve as Co-Chair of the GI Block (UME).	

BMB Faculty Teaching and Committee Assignments FY14	
Teaching	**Committee**
TENURE TRACK FACULTY	
M. Rosenberg, Assistant Prof._TT_Untenured_ Years in Rank = 1	
3 lectures or equivalent in the GI/Endo/Metab Block (Fall, 2013)	BA-MD Committee for curriculum and student progress, subcommittee (basic science)
Instructor for the BIOC 423 (2.00) Course (Fall, 2013) and serve as course director.	
Instructor for the BIOC 423 (2.00) Course (Spring, 2014) and serve as course director.	
S. Garver, Assistant Prof._TT_Untenured_ Years in Rank =3	
	CHAG Signature Program
Provide one 5-week block in the Biochemistry Course BIOC 446 (Spring, 2014)	BSGP Steering Committee/Sub-Committee
Provide 5 lectures in the GI/Endo/Metab Block (Fall, 2013)	CVMD Signature Program Committee
A. Hu, Associate Prof._Tenured _ Years in Rank = 8	
One 3-week block in Biochemistry of Disease BIOC 463 and serve as course director (Fall, 2013)	Director for the Honors BMB Program including retreat
Serve as course director for the Biochemistry of Disease BIOC 464 (Spring, 2014)	HSC Sci. Review Committee (2013 - June 30th,2016)
One 3-week block in the BIOC515 Cancer Course (Spring, 2014)	UNM Senate/ HSC Faculty Council
	CMBD Committee
R. Orlando, Associate Prof._Tenured_ Years in Rank = 8	
One 3-week block in Biochemistry of Disease BIOC 463 and serve as course director (Fall, 2013)	Institutional Biosafety Committee
Instructor(5 weeks) in the BIOC 448L course and serve as course director (Spring, 2014)	Medical Student Research Committee
Instructor in the BIOC 423 course and serve as course director (Spring, 2014)	
M. Osgood, Associate Prof._Tenured_ Years in Rank = 6	
Instructor (36 lectures, 11-12 weeks) in the BIOC 446 Course and serve as course director (Spring, 2014)	MD/PhD Steering Committee
Serve as Co-Chair of the GI/Endo/Metab Block (UME).	Post-baccalaureate Research and Education Program (PREP) Steering Committee (UME)
10 lectures in the GI/Endo/Metab Block (Fall, 2013). Serve as Co-Chair of the GI Block (UME).	ASERT Program Admissions Committee

BMB Faculty Teaching and Committee Assignments Fiscal Years 14-16 (Contd.)

R.Shah, Prof._Tenured_ Years in Rank = 3	
Tutor (5-7 weeks) in the GI/Nutrition/Metabolism Block (Fall, 2015)	Rep. Signature Program at BSGP Adm. Subcommittee (AdHoc)
Provide one 3-week block in Biochemistry of Disease BIOC 464 (Spring, 2016)	CTSC Four Pillars
Tutor 14 weeks CVPR Block (Spring, 2016)	CTSC SAGE committee (review RFAs & project grants)
Tutor 3 weeks in Principals of Publich Health	CTSC Community Engagement Core (5% efforts covered from Jan 2012)
	Medical Student Research Committee
K.Parra, Associate Prof.Tenured_ Years in Rank= 5	
3-week block in Biochemistry of Disease BIOC463 (Fall, 2015)	BMB Chair Administration
	HSC Chemical Safety Committee, Chair
	Committee of Chairs
	Research Strategic Planning Committee
	Research Compliance Exceutive Committee
RESEARCH TRACK FACULTY	
N. Adolphi, Associate Research Professor_ Years in Rank= 3	
	BMB JC/Forum director
C.Fordyce, Assistant Research Professor_ Years in Rank= 3	
	BMB Cell Culture Room Management
Working RETIRED FACULTY	
David Vandergajt	
	Dept Vice Chair
Dorothy Vandergajt	
Tutor 5-7 weeks in the GI/Endo/Metabolism Block (Fall, 2015)	SOM Admissions Committee
One 3-week block in the BIOC 463 Course (Fall, 2015)	Participate in the GI/Endo/Metabolism advisory group
One 3-week block in the BIOC 464 Course (Spring, 2016)	
Instructor for the BIOC 505 (Fall, 2015)	

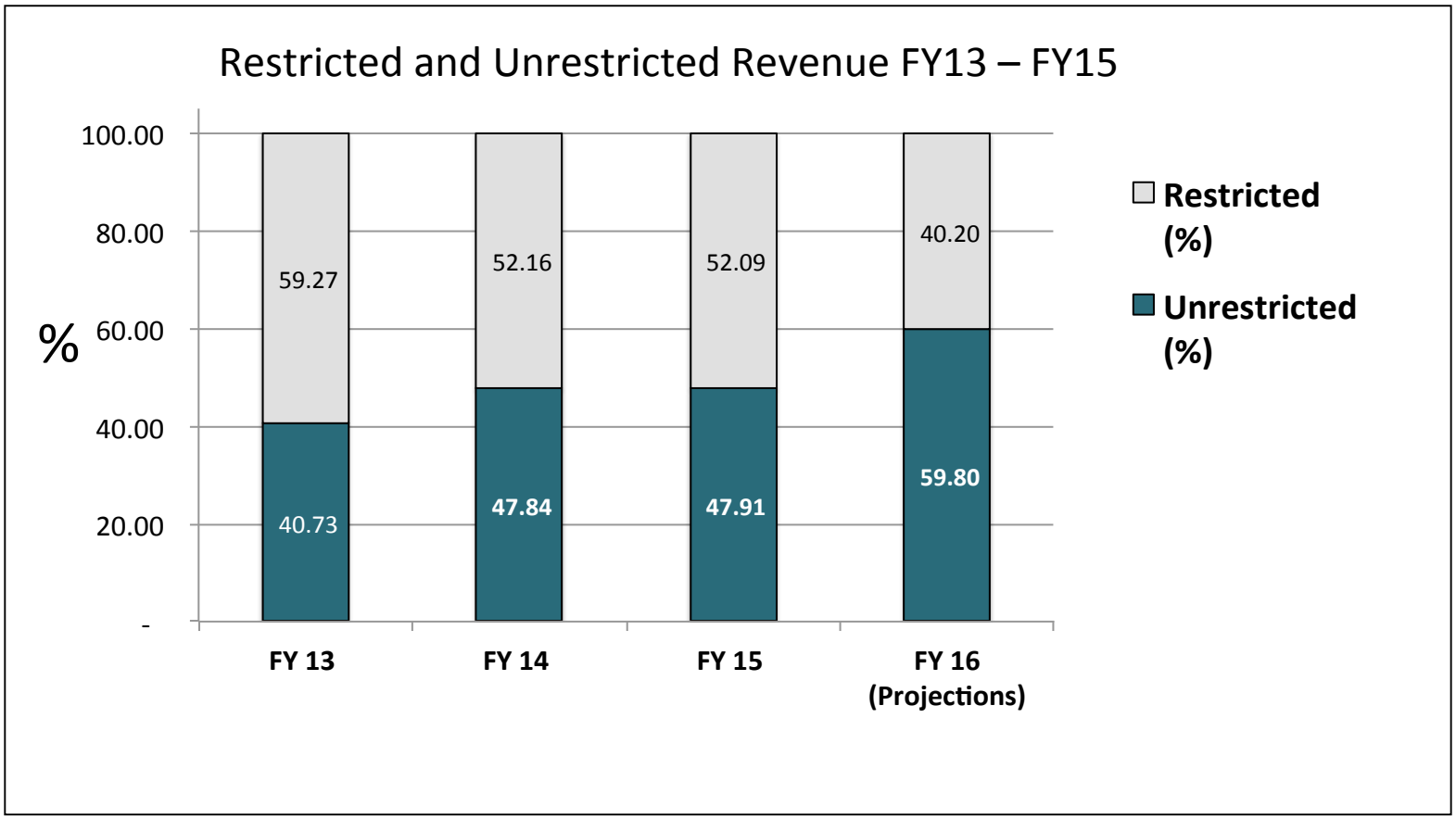
R.Shah, Prof._Tenured_ Years in Rank = 2	
Tutor (5-7 weeks) in the GI/Nutrition/Metabolism Block (Fall, 2014)	Rep. Signature Program at BSGP Adm. Subcommittee. (AdHoc)
Provide one 3-week block in Biochemistry of Disease BIOC 464 (Spring, 2015)	CTSC Four Pillars
Tutor 14 weeks CVPR Block (Spring, 2015)	CTSC SAGE committee (review RFAs & project grants)
	CTSC Community Engagement Core (5% efforts covered from Jan 2012)
	Medical Student Research Committee
K.Parra, Associate Prof.Tenured_ Years in Rank= 4	
4 lectures in the GI/Endo/Metab Block (Fall, 2014)	BMB Chair Administration
3-week block in Biochemistry of Disease BIOC463 (Fall, 2014)	HSC Chemical Safety Committee, Chair
	Committee of Chairs
	Research Strategic Planning Committee
	Research Compliance Exceutive Committee
RESEARCH TRACK FACULTY	
N. Adolphi, Associate Research Professor_ Years in Rank= 2	
	BMB JC/Forum director
C.Fordyce, Assistant Research Professor_ Years in Rank= 2	
	BMB Cell Culture Room Management
K.Trujillo, Assistant Research Professorzz- Years in Rank= 4	
Working RETIRED FACULTY	
David Vandergajt	
	Dept Vice Chair
Dorothy Vandergajt	
Tutor 5-7 weeks in the GI/Endo/Metabolism Block (Fall, 2014)	SOM Admissions Committee
One 3-week block in the BIOC 463 Course (Fall, 2014)	Participate in the GI/Endo/Metabolism advisory group
One 3-week block in the BIOC 464 Course (Spring, 2015)	
Instructor for the BIOC 505 (Fall, 2014)	
Others	
David Bear	
48 lectures in BIOC 445 Course (Fall, 2014) and serve as course director	

R.Shah, Prof._Tenured_ Years in Rank = 1	
Tutor (5-7 weeks) in the GI/Endo/Metab Block (Fall, 2013)	CTSC Four Pillars, CTSC SAGE and CTSC –CEnR committee/task force
Provide one 3-week block in Biochemistry of Disease BIOC 464 (Spring, 2014)	Medical Student Research Committee
Tutor 14 weeks CVPR Block (Spring, 2014)	CTSC Community Engagement Core (5% efforts covered from Jan 2012)
	Medical Student Research Committee
	UNM Senate/ HSC Faculty Council
K.Parra, Associate Prof.Tenured_ Years in Rank = 3	
10 lectures or equivalent in the GI/Endo/Metab Block (Fall, 2013)	BMB Chair Administration
3-week block in Biochemistry of Disease BIOC 463(Fall, 2013)	HSC Chemical Safety Committee, Chair
	Committee of Chairs
	Research Strategic Planning Committee
	Research Compliance Exceutive Committee
RESEARCH TRACK FACULTY	
N. Adolphi, Associate Research Professor_ Years in Rank= 1	
	BMB JC/Forum (16 slots) and JC director
C.Fordyce, Assistant Research Professor_ Years in Rank= 1	
	BMB Cell Culture Room Management
K.Trujillo, Assistant Research Professor_ Years in Rank =3	
One 3-week block in the BIOM 515 Cancer Course and serve as course director (Spring, 2014)	
L.Sillerud, Research Professor_ Years in Rank =2	
Instructor for the BIOC 451 (Spring, 2014) and serve as course director	
One 3-week block in Biochemistry of Disease BIOC 463 (Fall, 2013)	
Working RETIRED FACULTY	
Andrzej Pastuszyn (25%)	
Instruct 9 weeks in the BIOC 448L course and oversees course (Spring, 2014)	
David Vandergajt	
	Dept Vice Chair
Dorothy Vandergajt	
Tutor 5-7 weeks in the GI/Endo/Metabolism Block (Fall, 2013)	SOM Admissions Committee
One 3-week block in the BIOC 463 Course (Fall, 2013)	Participate in the GI/Endo/Metabolism advisory group
One 3-week block in the BIOC 464 Course (Spring, 2014)	Assists Dr. Hu in the planning of BMB Retreat
Instructor for the BIOC 505 (Fall, 2013)	
Other	
David Bear	
48 lectures in BIOC 445 Course (Fall, 2014) and serve as course director)	
Education Research Post-Doc(Dr.DeHaro)	
Instructor for the BIOC 423 (1.00) Course (Fall, 2012) and serve as course director	

Criterion 6B

Figure 1.
Restricted and Unrestricted Revenue per Fiscal Year

Figure 1. Restricted and Unrestricted Revenue per Fiscal Year



Criterion 7A

SOM Dean Letter of Support

THE UNIVERSITY OF NEW MEXICO ◆ HEALTH SCIENCES CENTER
SCHOOL OF MEDICINE

March 10, 2015

Dear Dr. Parra,

It is with pleasure that I offer my highest support for the ASBMB accreditation of the Undergraduate Program in Biochemistry and Molecular Biology. The Program has been a centerpiece of the basic sciences in the School of Medicine for 30 years and a model of collaboration between the undergraduate Program at the University of New Mexico and the School of Medicine.

Many graduates of the Program enter the School of Medicine, the Biomedical Sciences Graduate Program, and more recently bridges students who are in our innovative BA/MD Program. The students are academically successful during their time at UNM as measured by the overall GPA, and achievement of University Honors and Biochemistry Research Honors designation. They are well prepared for the rigors of graduate and professional schools and much credit goes to your Department. You and our faculty teaching, training and mentoring the students in the Program are committed to its excellence. At the School of Medicine, we have committed teaching lab space for the Program and plan to remodel it in the coming year.

Once again, let me reiterate my support for the Undergraduate Biochemistry Program and offer my highest recommendation for its accreditation.

Sincerely,

Paul B. Roth
Chancellor for Health Sciences
CEO, UNM Health System
Dean, School of Medicine

Martha C. McGrew
Executive Vice Dean
University of New Mexico School of Medicine
Professor, Family and Community Medicine

Accreditation Application to the American Society for Biochemistry and Molecular Biology

A. TABLE OF CONTENTS

B. INSTITUTION

B1. NAME OF THE DEGREE PROGRAM AND IDENTITY OF THE PARTICIPATING UNIT(S) (DEPARTMENTS AND/OR SCHOOLS)

Degrees Offered: Bachelor of Science in Biochemistry (B.S.)
Bachelor of Arts in Biochemistry (B.A.)

Department of Biochemistry and Molecular Biology
University of New Mexico, Health Sciences Center, School of Medicine
and College of Arts & Sciences

B2. CONTACT PERSON

Karlett Parra, PhD, Associate Professor, Chairperson
University of New Mexico, Health Sciences Center, School of Medicine
Department of Biochemistry and Molecular Biology
Email kjparra@salud.unm.edu
Phone: 505-272-1633

B3. LETTER OF SUPPORT FROM THE DEAN INDICATING THE LEVEL OF INSTITUTIONAL SUPPORT

See Appendix 1

B4. (CARNEGIE) CLASSIFICATION OF INSTITUTION

University of New Mexico-Main Campus
Albuquerque, New Mexico
Level 4-year or above
Control Public
Total Student Population 27,241

Classification Category

- Undergraduate Instructional Program: Bal/HGC: Balanced arts & sciences/professions, high graduate coexistence
- Graduate Instructional Program: CompDoc/MedVet: Comprehensive doctoral with medical/veterinary
- Enrollment Profile: HU: High undergraduate
- Undergraduate Profile: FT4/S/HTI: Full-time four-year, selective, higher transfer-in
- Size and Setting: L4/NR: Large four-year, primarily nonresidential
- Basic RU/VH: Research Universities (very high research activity)

B5. TOTAL NUMBER OF UNDERGRADUATES AT INSTITUTION

18,440 undergraduates enrolled at the University for Spring 2015 semester.
4,816 undergraduates enrolled for Spring 2015 semester through the College of Arts & Sciences.

B6. TOTAL FACULTY FTE AT THE INSTITUTION

1,174 tenure / tenure-track faculty as of 2009.

B7. NUMBER OF BMB DEGREES AWARDED EACH YEAR FOR THE PRECEDING FIVE YEARS

Year	Bachelor of Science	Bachelor of Arts	Total
2014	45	7	52
2013	37	5	42
2012	19	11	30
2011	29	10	39
2010	16	9	25
Total	146	42	188

Consistent with our past trends, the Undergraduate Biochemistry Major continues to attract some of the University's best students, including many Presidential and Regents Scholars. For example, the average GPA for the 2013 and 2014 graduating classes were 3.5 and 3.57, respectively. Upon graduation approximately 25% of these students had received letters of acceptance to medical, dental, veterinary schools and graduate schools. On average, 20% of graduates attend the UNM Medical School Program.

B8. DESCRIPTION OF LABORATORY FACILITIES AND MAJOR INSTRUMENTATION. SPECIFY IF INSTRUMENTATION IS AVAILABLE FOR RESEARCH OR TEACHING OR BOTH.

The BMB faculty research laboratories and shared departmental instrumentation and cell culture rooms occupy a total of approximately 700 square feet of space each within the University of New Mexico, School of Medicine, Biomedical Research Facility Building, and the Reginald Heber Fitz Hall Building.

Teaching:

Various spectrophotometers (UV and visible), spectrofluorometer (Shimadzu), DNA gel electrophoresis units, SDS-PAGE gel electrophoresis units, power supplies, gel-filtration, ion-exchange and affinity chromatography units, refrigerators, -20 freezers, micro-centrifuges, floor model centrifuge, chemical fume hood, pH meter, balances (top loading and analytical), water bath, shakers, pipetman sets,

Teaching and research:

Q-PCR machine, PCR thermal cycler, orbital cell culture shakers, Cell Culture Core Facility, PCR hoods, immunoblotting apparatus, film developer, Syngene Chemiluminescence/Chemifluorescence/Gel Documentation System, high-speed centrifuges, ultra-speed centrifuge, water purification system, VIS/fluorescence microtiter plate reader, ice machine.

Research:

The Department is located on the UNM Health Sciences Campus, which includes the School of Medicine. It has a Clinical and Translational Science Center, an NCI designated Cancer Center, and a newly established Brain and Behavioral Health Initiative. The University of New Mexico Cancer Center offers state-of-the-art core facilities in genomics, flow cytometry, microscopy and informatics. The Cancer Center houses the New Mexico Tumor Registry, which is one of 11 NCI-funded SEER Cancer Registries. The Cancer Center is also home to the University of New Mexico Center for Molecular Discovery, dedicated to identifying novel drug targets in cancer and other diseases, as well as the Keck-UNM Small Animal Imaging Resource. Shared core facilities are extensive and include those for MRI/NMR/EPR, microscopy, genomics/DNA microarray analysis, and molecular screening technologies.

Department common use equipment includes: SeaHorse XF Analyzer, IncuCyte ZOOM Live Cell Imaging System, Metabolic Cage System, Zeiss A-1 immunofluorescence microscope, fluorescent inverted microscope (Olympus CK40-RFL), Zeiss LSM 510-META-Confocal Microscope, Two-photon Confocal Microscope (Zeiss LSM 510), Olympus DSU Spinning Disk Confocal/Stereology System, Olympus IX71 microscope with Andor iXon camera, multiple image analysis workstations, electroporator, ultrasound sonicator, water bath incubators, PCR machines, gel electrophoresis equipment, UV transilluminator, iso-temperature microbiology incubator, automatic cell counter, tissue immunohistochemical staining (IHC) facility, UV/Vis spectrophotometers, spectrofluorometer, water purification system, shaker incubator, gel dyer, ELISA reader, ultracentrifuge, speed concentrator and gel dryer, gamma and scintillation counters, CO2 incubators, biological safety cabinets, refrigerators, -20 C freezers, -80 C freezers, liquid nitrogen tanks.

UNM Health Sciences Center Biomedical Genomics Core Facility. Laboratory space is available for "clean" DNA and RNA isolation and cDNA clone propagation. A complete Affymetrix microarray system

was recently purchased for the facility, which includes all molecular instrumentation required for scanning and analysis of oligonucleotide microarrays plus a fully integrated computer software analysis system (restricted to the analysis of oligonucleotide-based arrays) and a LIMS server for storage and processing of initial genomic data.

UNM Proteomics and Mass Spectrometry Facility capabilities with MALDI Time of Flight Mass Spectrometry (MALDI-TOF) and electrospray (ESI) tandem mass spectrometry (MS-MS) with a high resolution mass analyzer (Micromass). Protein identification is accomplished with the Micromass® BioLynx and ProteinLynx or the Applied Biosystems GPS with MASCOT software packages. The proteomic facility is also equipped with multiple mass spectrometry (MS) instruments that are coupled to either gas chromatographs (GC) or liquid chromatographs (LC), so that samples can be analyzed by both GC/MS and LC/MS.

B9. DESCRIPTION OF INSTRUCTIONAL FACILITIES INCLUDING TEACHING LABORATORIES AND CLASSROOMS

Teaching Laboratory Space

Dedicated space for the Biochemistry Methods Laboratory course (Bioc 448L) is located on the second floor of the Reginald Heber Fitz Hall Building, near the Department office and the shared instrumentation room. The lab space will be remodeled in 2015 (see attached letter of institutional support). The newly remodeled space will allow us to teach two 4-hour lab sections of 20 students per section (10 work stations) and will be available for the Spring semester of 2016.

Classroom Space

Ample classroom space is available on the Main Campus, reserved through the central scheduling office. The majority of classrooms are designed for lecture format and can accommodate small groups of 20-30 students and classes as large as 150-250 students.

Classroom space is also available to our Department on the Health Sciences Center Campus, which is used both Fall and Spring semesters for our Biochemistry of Human Disease courses (Bioc 463 and 464). This space includes classrooms in the Nursing and Pharmacy Building, the Biomedical Research Facility (room 218), and in the recently constructed Domenici Center for Medical Education. These classrooms are fully equipped with modern educational amenities, including computer consoles, projection systems, document cameras, large LCD monitors, and mobile furniture allowing classroom organization for various learning styles.

Learning Studio Classrooms

New classroom environments have been constructed on the main campus for collaborative learning in any discipline. In Fall 2014, two studio classrooms have become available for scheduling in the new Collaborative Teaching and Learning Building (CTLB), one with 63-seat capacity and one with 126-seat capacity. The University of New Mexico was awarded the 2014 Best Buildings Award sponsored by the American General Contractors (AGC) of America for the Collaborative Teaching and Learning Building.

Learning studios are designed to enhance and enable collaborative learning that is centered on the students rather than the instructor. The instructor works from the middle of the room, lecturing sparingly, and ease of access to all students. Provided computers enable opportunities to access online resources, use simulations and animations, and for paperless team-generated assignments to be completed and submitted for instructor assessment. While many of these functions can be accomplished to varying extents in traditionally furnished classrooms, research at other universities demonstrates much better collaboration and learning that are facilitated by the 9-seat, circular tables.

Features of the DSH 224 Learning Studio:

- Six, 9-seat tables, each equipped with three, secured notebook-PC computers with a standard UNM IT software image and enhanced Wi-Fi access.
- A centrally located teacher station with CPU, SMART Podium monitor, Blu-Ray/DVD player, and document camera.
- Two projection screens and LCD projectors to maximize viewing from all seats; instructor can send images from any of the students' table computers to the main screens.
- Whiteboards on all walls to accommodate student work for discussion.

Features of the CTLB 300 Learning Studio: This studio classroom is being used routinely for the Bioc 445 and Bioc 446 core courses required for the Biochemistry Major and provides ample room for 126 students participating in an active learning pedagogical format.

- 14, 9-seat circular tables.
- A centrally located teacher station with CPU, SMART Podium monitor, Blu-Ray/DVD player, and document camera.
- Two projection screens and LCD projectors to maximize viewing from all seats; instructor can send images from any of the students' table computers to the main screens.
- Whiteboards on all walls to accommodate student work for discussion.

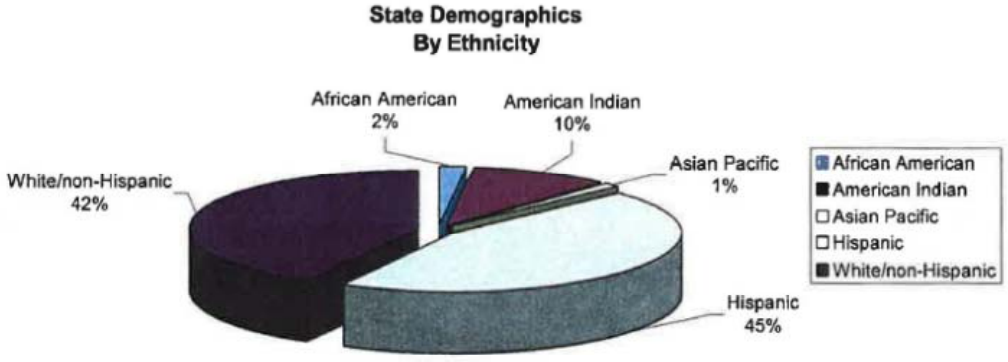
Features of the CTLB 330 Learning Studio:

- 7, 9-seat circular tables.
- A centrally located teacher station with CPU, SMART Podium monitor, Blu-Ray/DVD player, and document camera.
- Two projection screens and LCD monitors to maximize viewing from all seats; instructor can send images from any of the students' table computers to the main screens.
- Whiteboards on all walls to accommodate student work for discussion.

B10. EVIDENCE OF INSTITUTIONAL VALUE AND SUPPORT FOR DIVERSITY OF FACULTY AND STUDENTS

State of New Mexico Demographics

The State of New Mexico has a historically diverse population, and today stands as one of four states in the U.S. that can claim minority/majority status - that is where the minority population of the state outnumbers the non-minority population. Our state is one in which diversity and cultural richness has been recognized



(Population Total 1.9 Million)

Ethnicity	% of Population
African American	2%
American Indian	10%
Asian Pacific	1%
Hispanic	45%
White/non-Hispanic	42%
Total (1.9 Million)	***100%***

through the centuries. The University of New Mexico recognizes that diversity needs to be articulated, cultivated and made meaningful in future planning. New Mexico has unique traditions, languages, and a multi-cultural heritage that provides inspiration to cultivate an important model for university diversity efforts.

In July 2007, the Regents of the University of New Mexico (UNM) approved the creation of a Division of Institutional Diversity. Under the leadership of former University President David Schmidly and Interim Provost Viola Florez, this Division was charged with the development of an Institution-wide plan for Diversity, Equity and Inclusion. Efforts were led by the Interim Vice President for Institutional Diversity (IVPID), Rita Martinez-Purson.

University of New Mexico commitment to diversity in student and faculty populations

Total University Undergraduate Headcount by Race/Ethnicity for Spring 2015 Enrollment

	Hispanic	American Indian	Asian	African American	Native Hawaiian	White	Race/Ethnicity Unknown	Foreign	Two or more races	Total
Head Count	8,405	1,059	578	462	30	6,711	295	252	648	18,440
%	45.58	5.74	3.13	2.51	0.16	36.39	3.51	1.37	3.51	100.00

Biochemistry (B.S.) Degree Recipients by Ethnicity and Gender

Ethnicity	Gender	2009-10	2010-2011	2011-12	2012-13	2013-14
Hispanic	F	3	3	6	4	10
Hispanic	M	1	7	4	8	9
Hispanic	**Total**	**4**	**10**	**10**	**12**	**19**
American Indian/Alaska Native	F	0	0	0	0	0
American Indian/Alaska Native	M	1	0	1	1	0
American Indian/Alaska Native	**Total**	**1**	**0**	**1**	**1**	**0**
Asian	F	0	0	0	1	0
Asian	M	1	6	0	2	4
Asian	**Total**	**1**	**6**	**0**	**3**	**4**
Black/African American	F	0	0	0	1	1
Black/African American	M	0	1	0	0	0
Black/African American	**Total**	**0**	**1**	**0**	**1**	**1**
Native Hawaiian/Other Pacific Islander	**F**	0	0	0	0	0
Native Hawaiian/Other Pacific Islander	**M**	0	0	0	0	0
Native Hawaiian/Other Pacific Islander	**Total**	**0**	**0**	**0**	**0**	**0**
White	F	3	3	4	6	8
White	M	6	6	4	10	9
White	**Total**	**9**	**9**	**8**	**16**	**17**
Race/Ethnicity Unknown	F	0	0	0	1	0
Race/Ethnicity Unknown	M	0	1	0	0	0
Race/Ethnicity Unknown	**Total**	**0**	**1**	**0**	**1**	**0**
International	F	1	0	0	2	1
International	M	0	1	0	1	0
International	**Total**	**1**	**1**	**0**	**3**	**1**
All Ethnic Groups Combined	F	**7**	**7**	**10**	**15**	**23**
All Ethnic Groups Combined	M	**9**	**22**	**9**	**22**	**22**
All Ethnic Groups Combined	**Total**	**16**	**29**	**19**	**37**	**45**

University of New Mexico, School of Medicine commitment to faculty and student diversity

The UNM School of Medicine has had a firm commitment to serve the communities within New Mexico and the surrounding region, where diversity is the foremost strength and core value. The HSC Office of Diversity, established in 1973 as the Basic Medical Sciences Program by a faculty from the Biochemistry Department, is responsible for a full panoply of programs addressing faculty diversity and mentoring, linguistic and cultural competence, K-20 educational pipeline, research data and analyses, family involvement/community engagement, and leadership on issues of inclusion and equity.

Tenure/Tenure-Track Faculty in Biochemistry by Gender & Ethnicity, as of October 31, 2014

Ethnicity	Gender	2010	2011	2012	2013	2014
Hispanic	F	1	1	2	2	2
Hispanic	M	0	0	1	1	1
Asian	F	0	0	0	0	1
Asian	M	2	2	2	3	2
White, non-Hispanic	F	4	2	2	3	3
White, non-Hispanic	M	6	6	3	2	1
International	F	0	0	0	0	0
International	M	0	0	1	0	0
Total:		13	11	11	11	10

Diversity in Undergraduate Biochemistry Research

Undergraduate students are strongly encouraged and recruited to participate in research, especially for those students coming from underrepresented populations. Research opportunities range from volunteer work, work study, and non-work study jobs, to independent research projects. Students can arrange research projects with individual faculty members or they may participate in one of several research programs. These programs provide special emphasis on attracting minorities and women in an effort to benefit students of all ethnic backgrounds and under-represented groups. Independent research through any of these programs can lead to Research Honors in Biochemistry.

- **NSF Research Experiences for Undergraduates (REU) Program** - Students have numerous opportunities to share ideas and explore issues within and across disciplines. The program's goal is to increase exposure to a large, multidisciplinary research program, motivate students to continue into professional careers, and prepare students for the rigors of graduate school, professional research, and responsible citizenship. The program exemplifies the integration of research and education. As students conduct research, they will learn how to become a scientist, along with many technical, methodological, and ethical issues that arise in scientific research.
- **Initiative for Minority Student Development (IMSD)** - The University of New Mexico's IMSD Program offers research training and professional development to prepare students for graduate work in biomedical research. The emphasis is to draw on students majoring in STEM-related fields including biology, chemistry, biomedical and chemical engineering, psychology, computer science, and mathematics. Students in the IMSD program receive financial support, scientific education, and mentoring. In addition, the IMSD program provides training in various areas of professional development, including leadership skills and professional communication.
- **Minority Access to Research Careers (MARC) Program** – The MARC Program is funded by a competitive grant from the National Institutes of Health and offers research training and support to prepare undergraduate scholars for graduate school. The primary goal of this Program is to increase the number and competitiveness of underrepresented minorities engaged in biomedical research by increasing the availability of research training opportunities.

MARC supports talented UNM undergraduates with training that directly prepares them for careers in biomedical research. The fields of research can be biology, chemistry, cell and molecular biology, genetics, biophysics, mathematics, pharmacology, biochemistry, bioengineering or computer science.

- **Undergraduate Pipeline Network (UPN)** - The Undergraduate Pipeline Network summer research experience is designed to cultivate students' interest in research while helping them to acquire skills needed to apply for and succeed in post-baccalaureate education. The program provides the opportunity for students to choose from research in either Biomedical Science or Community-Based/Health Disparities. The program period covers 10 weeks and students participate in the program a minimum of 40 hours per week. Opportunities are included to increase students' competency in presentation skills, preparing applications to graduate programs (writing the essay, interviewing skills), working with mentors, professional skills and research etiquette, responsible conduct of research, being a member of a multi-disciplinary team, and understanding career options in clinical and translational science. The students have the opportunity to observe research activities in different settings, such as within core facilities and within clinical and community-based settings, and are exposed to other facets of clinical and translational research that are different than the one to which they are assigned.

B11. DESCRIPTION OF INFORMATIONAL AND COMPUTATIONAL RESOURCES AND, WHERE APPLICABLE, LIBRARY FACILITIES

The University Information Technologies group manages eight computer labs and 13 computer classrooms around main campus. All are open to all UNM students, faculty and staff. Classrooms are staffed by Student Consultants who are trained to answer general computing questions.

Computer availability: Each library has student PC Windows 7 workstations loaded with Office, Matlab, Endnote Web, and other standard software. Six Macs are available on Zimmerman's 2nd floor. They are loaded with Office 2010 and other standard software. Laptops are available for checkout at each of the library Service Desks. All of the University Libraries have wireless access through LoboWifi.

Accessibility Resource Center (ARC): The ARC provides a variety of services to UNM students with disabilities. Students with disabling conditions that affect a major life activity are eligible for these services. This includes students with visual, hearing, learning, and mobility disabilities, as well as chronic conditions. The primary duty of the department is to help all qualified students with disabilities gain equal educational access and opportunities throughout the UNM community.

Libraries of the University of New Mexico

Mission

The University of New Mexico University Libraries (UL) provides information, services, and education in any place and at any time, as well as providing and maintaining exceptional facilities for the evolving education, research, and service needs of UNM and the wider community. The UL plays a key role in fulfilling UNM's mission to serve as New Mexico's flagship institution of higher learning through demonstrated and growing excellence in teaching, research, patient care, and community service.

Vision

The University of New Mexico University Libraries is seen as a proactive and adaptable source of knowledge for UNM and the wider community. They remain the leading academic library in New Mexico by:

- Making available extensive and valuable collections.
- Being a trusted partner in the academic culture.

- Enabling students in the use of information and informatics.
- By offering extensive and user-centered electronic services.
- Being a desired destination by providing functional and attractive physical places.
- Ensuring that our employees have the necessary skills and tools to serve the evolving needs of our students.
- Having varied funding sources.

The Undergraduate Libraries includes the following individual libraries and their specialties:

- **Centennial Science & Engineering Library** - collections: sciences, engineering, mathematics, psychology, Map & Geographic Information Center
- **Fine Arts & Design Library** - collections: architecture, landscape architecture, art & art history, theatre & dance, film & photography, music
- **Parish Memorial Library for Business & Economics** - collections: business, economics, management
- **Zimmerman Library** - collections: humanities, education, social sciences, government documents
- **Center for Southwest Research & Special Collections (CSWR)** - collections: located in Zimmerman Library, CSWR specializes in interdisciplinary subjects relating to New Mexico, the Southwestern U.S., Mexico and Latin America, as well as rare materials from around the world.

Zimmerman Library opened a renovated collaborative space for students on the eastern end of the first floor on August 17th, 2014. New service desks, a large number of computers and laptops, more power and connectivity, energy saving features, and a range of furniture and tools that can be rearranged to create workspaces on the fly are integral to their vision of collaborative learning. In addition, group study rooms are available at all four libraries and can be reserved by UNM students, staff or faculty.

B12. DESCRIPTION OF PROFESSIONAL DEVELOPMENT PROGRAMS AND OPPORTUNITIES IN RESEARCH AND PEDAGOGY FOR BMB FACULTY INCLUDING SABBATICALS.

Center for Teaching Excellence

The Center for Teaching Excellence (CTE) serves as a general resource center for all University of New Mexico (UNM) instructors including tenured and tenure-track faculty, lecturers, adjunct faculty, faculty on branch campuses, teaching assistants, clinician educators, and all others who have an instructional role in the classroom. The primary programs currently sponsored by CTE are:

- New Faculty Orientation
- UNM's Teaching Fellows Program
- Success in the Classroom conferences
- Workshop and brown-bag series on topics of interest to faculty
- Course design institutes
- Presentation of University teaching awards; coordinated with the Faculty Senate Teaching Enhancement Committee

Mission

The mission of the Center for Teaching Excellence (CTE) is to engage and empower UNM instructors to develop effective, diverse learning opportunities to enhance the success of diverse learners. CTE works to make teaching and teaching improvement an indispensable part of university life and a key dimension of the professional identity of every faculty member. CTE endeavors to cultivate a campus-wide learning community that values and rewards excellence in teaching and learning and is responsive to the needs of instructional staff who want to enhance their teaching.

CTE provides opportunities for faculty to think and talk about their teaching, to get help with any aspect of their teaching, and to engage in a national discourse about university teaching where teaching is

valued, visible, integrated, and cutting edge. Accordingly, CTE also provides resources for faculty to study teaching and to contribute to the burgeoning scholarship of teaching.

Faculty Research

UNM provides a strong research environment. UNM Health Sciences Center (HSC) is the State's largest health care, teaching, biomedical research and patient care organization in the state; and includes one of the leading Cancer Research and Treatment Centers in the nation, the UNM Cancer Center. The UNM HSC Office of Research (http://hsc.unm.edu/research/), UNM CTSC (http://hsc.unm.edu/research/ctsc/) and UNM Cancer Center (http://cancer.unm.edu) offer a diversity of research development and funding resources available to all faculty.

Faculty Sabbatical Leave

Sabbatical leave is available under the following four options to any faculty member with tenure or to any faculty member in the last year of the probationary period for which a favorable decision has been reached with regard to tenure.
After any period of at least three years of full-time service at the University of New Mexico:

- One semester at 2/3 salary for that semester

After any period of at least six years of full-time service (or equivalent part-time service) at the University of New Mexico without a sabbatical:

- One semester at no reduction in annual salary
- One full academic year at 2/3 salary
- Semester II of one year and Semester I of the following year, at 2/3 salary for each semester of leave

B13. DESCRIPTION OF COURSE AVAILABILITY: TIMING (WHEN THE COURSE IS OFFERED AND HOW FREQUENTLY) AND CAPACITY

All Biochemistry courses and Electives are offered on a Fall or Spring semester (16 week) schedule.

Fall semester (16 weeks)	**Course No.**	**Course Title**	**Course Capacity**
	Bioc 445	Intensive Introductory Biochemistry I	126
	Bioc 463	Biochemistry of Disease I	50
	Bioc 465	Biochemistry Education	5
	Bioc 497	Senior Honors Research	No restriction
	Bioc 499	Undergraduate Research	No restriction
Spring semester (16 weeks)	Bioc 446	Intensive Introductory Biochemistry II	126
	Bioc 448L	Biochemical Methods	32
	Bioc 464	Biochemistry of Disease II	50
	Bioc 465	Biochemistry Education	5
	Bioc 498	Senior Honors Research	No restriction
	Bioc 499	Undergraduate Research	No restriction

B14. DESCRIPTION OF SAFETY PROGRAM FOR BMB FACULTY AND STUDENTS, INCLUDING TRAINING FOR COURSES AND RESEARCH, INFRASTRUCTURE, AND WHEN STUDENTS RECEIVE SAFETY TRAINING

Self-training safety modules – all students are required to pass online training prior to working in faculty laboratories while receiving credit for Bioc 497/498/499. These modules are the same requirements for all University staff and faculty.

- Self-training modules are designed for self-directed learning providing individuals with more control over when they learn and the pace at which they learn.
- The modules provide both new information and as refresher training. Modules include, but are not limited to:

- ❖ Bloodborne Pathogens
- ❖ Compressed Gasses
- ❖ Exit Routes
- ❖ Fire Extinguisher Safety
- ❖ Flammable Liquids
- ❖ PPE Clothing and Shoes
- ❖ PPE Eye Protection
- ❖ Slips Trips and Fall Protection

B15. BRIEF DESCRIPTION OF THE STAFF SUPPORT SERVICES AVAILABLE TO BMB FACULTY INCLUDING ADMINISTRATIVE, IT, SAFETY AND LABORATORY PREP.

Department Biochemistry and Molecular Biology Office Staff Support

The Department office is staffed with 3 administrative and clerical personnel that provide secretarial and administrative support services for 11 full-time Faculty and 2 part-time Faculty.

Academic & Instructional Support

- **Classroom Technology Support** - Information Technologies (IT) computer classrooms and lab spaces are available for classes or conferences sponsored by UNM faculty, staff, or student groups. Fees are based on the services provided. These services include custom software installation where required.
- **Conference Room Technology Support** - IT provides assistance with planning, obtaining cost estimates and oversight of installation of conference room technologies. Technologies such as projection systems, audio systems, control systems and computing can be assessed to determine best fit.
- **Faculty Course Evaluations, Test Scoring & Survey Software** - Faculty and Course Evaluations provide student feedback to faculty on teaching strengths and weaknesses. Evaluations are completed at the end of the course by students and faculty receive summary reports within two months of semester end.
- **Faculty Development and Support** - IT provides training on all classroom academic technologies. Group and individual training sessions can be scheduled to provide detailed instruction on how to operate technologies within classrooms.
- **Instructional Technology Space Design** - IT provides professional consulting and space design for new conference rooms, classrooms, or redesigned educational spaces. IT is continually in the process of evaluating, vetting, assessing and making recommendations regarding current and emerging instructional methods.
- **Learning Commons Support** - IT operates 14 computer classroom and labs, as well as 150 computer-equipped classrooms on campus for UNM students, faculty, and staff.
- **Learning Management System** - UNM Learn is UNM's official online learning management system. UNM Learn provides a comprehensive suite of tools for delivering instruction to students over the web, including quizzing, assignments, course materials, discussion groups, and grading.
- **Media Services (iTunes U, Anti-plagiarism)** - IT offers development and publishing of digital multimedia content for academic and administrative uses. One such service is iTunes U. UNM on iTunes U includes a public site offering courses and faculty lectures available from iTunes U.
- **Print Services** - The University of New Mexico is committed to student success in all academic pursuits. In order to better meet our students printing requirements throughout main campus we have expanded the Enterprise Printing Program. The PawPrints program allows students to print at all IT managed lab locations and at all satellite print location across the UNM campus.

Laboratory Preparation

Pending on the total student number each year, at least one Teaching Assistant (TA) position per year is allocated for the Biochemical Methods course (Bioc 448L). TAs are educated in code of conduct and are experienced in the protocols used in the course. Selection priority is given to the

students who have taken and earned an “A” in the Biochemical Methods course previously or graduate students who have required hands-on research experiences.

C. FACULTY

C1. LIST OF ALL FACULTY DIRECTLY PARTICIPATING IN THE DELIVERY OF THE BMB BACHELOR’S DEGREE PROGRAM

- William Sherman Garver, PhD, Assistant Professor
- Chien-An (Andy) Hu, PhD, Associate Professor
- Meilian Liu, Ph.D. Assistant Professor
- Robert A. Orlando, PhD, Associate Professor
- Marcy Osgood, PhD, Associate Professor
- Karlett J. Parra, PhD, Associate Professor
- Martina Rosenberg, PhD, Assistant Professor
- Vallabh Raj Shah, Ph.D. Professor
- Dorothy J. VanderJagt, PhD, Research Associate Professor

Curriculum Vitae for each individual are included in Appendix 2.

UNM Biochemistry Faculty - as of October 31, 2014

	2010	2011	2012	2013	2014
Tenure, Tenure-Track Faculty by Rank					
Professor	0	0	0	1	1
Associate Professor	5	5	5	4	4
Assistant Professor	3	2	2	3	3
Non-Tenure Track Faculty by Primary Job Category					
Research Faculty	4	4	4	4	3
Total Faculty	**12**	**11**	**11**	**12**	**11**

C2. COMPLETE FACULTY SUMMARY TABLE

Included in Appendix 3.

C3. PROVIDE NAMES AND AFFILIATIONS OF ANY ADDITIONAL FACULTY OR OTHER KEY PERSONNEL RELEVANT TO THE PROGRAM, SUCH AS FACULTY WHO SPONSOR UNDERGRADUATE RESEARCH EXPERIENCES FOR BMB MAJORS

Faculty participants in Bioc 463 – Biochemistry of Human Disease I

Faculty Name	Department Affiliation
Natalie Adolfi, PhD	Biochemistry and Molecular Biology
Christian Bologa, PhD	UNM Translational Informatics Division
Lawrence Cole, PhD	UNM Women's Health Research
Chien-An Andy Hu, PhD	Biochemistry and Molecular Biology
Meilian Liu, PhD	Biochemistry and Molecular Biology
Yohannes Mebratu, PhD	Lovelace Respiratory Research Institute
Edward Moczydlowski, PhD	Sandia National Laboratories
Tudor Oprea, MD, PhD	UNM Translational Informatics Division
Robert A. Orlando, PhD	Biochemistry and Molecular Biology
Karlett Parra, PhD	Biochemistry and Molecular Biology
Surojit Paul, PhD	Neurology

Vallabh Raj Shah, PhD	Biochemistry and Molecular Biology
Dorothy VanderJagt, PhD	Biochemistry and Molecular Biology

Faculty participants in Bioc 464 – Biochemistry of Human Disease II

Faculty Name	**Department Affiliation**
William S. Garver, PhD	Biochemistry and Molecular Biology
Chien-An Andy Hu, PhD	Biochemistry and Molecular Biology
Yohannes Mebratu, PhD	Lovelace Respiratory Research Institute
Robert A. Orlando, PhD	Biochemistry and Molecular Biology
Karlett Parra, PhD	Biochemistry and Molecular Biology
Martina Rosenberg, PhD	Biochemistry and Molecular Biology
Vallabh Raj Shah, PhD	Biochemistry and Molecular Biology
Dorothy VanderJagt, PhD	Biochemistry and Molecular Biology

Faculty participants in Bioc 497/498 as Honors Research Mentors

Faculty Name	**Department Affiliation**
Elaine Bearer, PhD	Pathology
William S. Garver, PhD	Biochemistry and Molecular Biology
Jennifer Gillette, PhD	Pathology
Chien-An Andy Hu, PhD	Biochemistry and Molecular Biology
Nancy Kanagy, PhD	Cell Biology and Physiology
David Lee, MD, PhD	Radiation Oncology
Johnnye Lewis, PhD	Pharmaceutical Sciences
Meilian Liu, PhD	Biochemistry and Molecular Biology
Eric Loker, PhD	Biology
Chad Melancon, PhD	Chemistry and Chemical Biology
Robert A. Orlando, PhD	Biochemistry and Molecular Biology
Michelle Ozbun, PhD	Molecular Genetics and Microbiology
Karlett Parra, PhD	Biochemistry and Molecular Biology
David Peabody, PhD	Molecular Genetics and Microbiology
Stephanie Ruby, PhD	Molecular Genetics and Microbiology
Vallabh Raj Shah, PhD	Biochemistry and Molecular Biology
Laurel Sillerud, PhD	UNM BRaIN Imaging Center
Kristina Trujillo, PhD	Biochemistry and Molecular Biology

Faculty participants in Bioc 499 as Undergraduate Research Mentors

Faculty Name	**Department Affiliation**
Natalie Adolfi, PhD	Biochemistry and Molecular Biology
David Bear, PhD	Cell Biology and Physiology
Marco Bisoffi, PhD	Biochemistry and Molecular Biology
Steve Cabaniss, PhD	Chemistry and Chemical Biology
William S. Garver, PhD	Biochemistry and Molecular Biology
Chien-An Andy Hu, PhD	Biochemistry and Molecular Biology
Diane Lidke, PhD	Pathology
Deborah Dunway-Mariano, PhD	Chemistry and Chemical Biology
Robert A. Orlando, PhD	Biochemistry and Molecular Biology
Karlett Parra, PhD	Biochemistry and Molecular Biology
Vallabh Raj Shah, PhD	Biochemistry and Molecular Biology
Laurel Sillerud, PhD	UNM BRaIN Imaging Center
Kristina Trujillo, PhD	Biochemistry and Molecular Biology

D. CURRICULUM

D1. BRIEF DESCRIPTION OF CURRICULUM, INCLUDING HOW SCHOOL-YEAR IS DIVIDED (QUARTER, SEMESTER, TRIMESTER ETC.).

Program Description

Biochemistry is an Undergraduate Major in the College of Arts & Sciences, founded and administered by the Department of Biochemistry and Molecular Biology since 1984. The Department is located within the Health Sciences Center, School of Medicine, which is within walking distance of the main campus. The Bachelor's degree in Biochemistry is consistent with current national recommendations for education practices for the 21st century. The school year at the University of New Mexico is divided into Fall and Spring semesters. Summer sessions are available with limited course offerings.

Curricular Overview

Most courses are administered using main campus classroom facilities, while more advanced courses and senior research are conducted in two modern, well equipped research buildings in the Medical School complex. Biochemistry and Molecular Biology education at the University of New Mexico is a comprehensive program that capitalizes on a variety of instructional methods including both lecture and small learning communities. The program strives to make research-based and inquiry-based learning the normal learning mode and encourages all students to become involved in research and teaching opportunities available within the Department. Each spring there is a capstone experience for students at the annual Departmental Research Retreat where students present the results of their individual research projects.

Students majoring in Biochemistry are encouraged to seek academic advisement from the Department early in their college experience. To complete degree requirements within 4 years, Biochemistry majors are advised to take a minimum of two science or math courses each semester.

Two degrees are offered: Bachelor of Science (B.S.) and Bachelor of Arts (B.A.). No minor course of study is required for the Biochemistry Major, but students often complete a minor in Chemistry. A total of 65 credit hours are required for the B.S. degree. Successful completion of the core courses is required of both B.S. and B.A. students. Students must successfully complete the one year sequence of Organic Chemistry courses (Chem 301 and 302) before they can register for their first Biochemistry course (Bioc 445). Students are advised to begin the series of Biochemistry courses during their Junior year.

A roadmap for a 4-year schedule of courses is provided in Appendix 4.

Honors in Research - Students who wish to earn the Bachelor's Degree with Honors must allocate at least two semesters to complete a significant research project. Most students who elect to do research have been co-authors on peer-reviewed publications. In additional to carrying out their research requirements in laboratories of Departmental Faculty, Biochemistry majors are also permitted to conduct research in laboratories of other School of Medicine faculty members, which provides breadth and depth to their research opportunities.

D2. A STATEMENT OF OBJECTIVES FOR BMB MAJORS AND AN OUTLINE OF OVERALL EDUCATIONAL APPROACH/PHILOSOPHY.

University of New Mexico Biochemistry Undergraduate Program Goals

The Baccalaureate Program in Biochemistry at UNM provides students with a solid foundation in basic biochemical principles and provides them with opportunities to apply these principles to understand pathologic processes. In this manner, the Baccalaureate Degree in Biochemistry prepares students for success in graduate or professional school in the biomedical sciences and/or employment in biotechnological or pharmaceutical industries. Students are provided with opportunities to learn and apply biochemical principles to real-life situations via a variety of active pedagogies in their courses (e.g., small-group discussion, problem-based or case-based learning, and/or authentic research). The undergraduate program in Biochemistry seeks to develop students with skills in problem-solving, critical thinking, and communication that are necessary for successful scientific careers.

Department Mission Statement

The mission of the Department of Biochemistry and Molecular Biology is to be a center of academic excellence that creates and imparts knowledge of the biochemical and molecular bases of disease through individual and collaborative multidisciplinary research; undergraduate, graduate, postgraduate, and medical education; and the training of basic and clinical research scientists. To fulfill this mission, the Department strives to:

- Conduct individual and collaborative research into the biochemical and molecular bases of disease, particularly diseases affecting New Mexico's tri-ethnic population.
- Provide a dynamic environment that develops critical thinking, technical skills, and intellectual independence in our undergraduate, graduate, medical, and postgraduate students.
- Make research a fundamental part of the educational experience for all of our students, especially students from underrepresented populations.
- Attract and retain high caliber faculty and staff.
- Provide the culture, environment, and state-of-the-art resources for faculty, staff, and students to achieve their full potential.

With these larger goals in mind, the UNM Biochemistry Program has adopted the American Society for Biochemistry and Molecular Biology (ASBMB) guidelines for undergraduate Biochemistry programs, as guiding principles for the following Programmatic Objectives. These Objectives are grouped in terms of Skills and Core Concept Content Knowledge.

Skills - Students completing a degree in Biochemistry are expected to:

1) Develop a hypothesis, and design and conduct appropriate experiments to test that hypothesis, explaining the basis of the proposed experiments and discussing potential results in the context of the hypothesis.
2) Analyze and interpret data using appropriate quantitative modeling and simulation tools.
3) Access, assess, and use available information.
4) Present scientific data in an appropriate context and in a variety of ways, at different levels.
5) Recognize and take advantage of opportunities for interdisciplinary collaboration.
6) Appreciate and promote the ethical dimensions of science.
7) Work safely alone and in an effective team in a variety of laboratory settings.
8) Practice critical self-reflection in order to progress as a scientist and as a life-long learner.

D3. BRIEF COURSE DESCRIPTION FOR EACH COURSE IN THE CURRICULUM (CATALOG DESCRIPTIONS ARE SUFFICIENT). MAP COURSES TO CORE CONCEPTS USING THE MAJOR COURSEWORK TEMPLATE.

Major coursework template can be found in Appendix 5.

Course structure and alignment tables can be found in Appendix 6.

BIOCHEMISTRY CORE COURSES

445. Intensive Introductory Biochemistry I. (4 credits)

An introduction into the physical and chemical properties of proteins and enzymes; enzymic catalysis; structure, synthesis and processing of nucleic acids and proteins.

446. Intensive Introductory Biochemistry II. (4 credits)

An introduction to intermediary metabolism and hormonal control of catabolic and anabolic pathways.

448L. Biochemical Methods. (3 credits)

Biochemical techniques including, but not limited to, biocomputational analysis of protein sequences and functional motifs/domains, protein salting out, chromatographic purification of enzymes, determination of enzyme parameters (Vmax, Km), isolation of chromatin, and analysis of DNA.

463. Biochemistry of Disease I. (3 credits)

Five three-week topics, each designed to develop some basic concepts of biochemistry, cell and molecular biology in the context of health and disease states.

464. Biochemistry of Disease II. (3 credits)

Five three-week topics, each designed to develop some basic concepts of biochemistry, cell and molecular biology in the context of health and disease states.

465. Biochemistry Education. (3 credits)
Seminars and readings in current methods of Biochemistry education. The course includes a practical experience in Biochemistry education techniques and practices.

497. Senior Honors Research. (1-3 credits)
Senior thesis based on independent research.
Restriction: permission of instructor.

498. Senior Honors Research. (1-3 credits)
Senior thesis based on independent research.
Restriction: permission of instructor.

499. Undergraduate Research. (1-3 credits)
Offered on a Credit / No Credit basis only.
Restriction: permission of instructor.

Faculty Approved Elective Choices for Biochemistry Majors

Department of Biology

410 Ecology and Evolutionary Genomics - This course focuses on methods, both experimental and computational, to study the structure of genomes and to analyze gene expression and protein function on a genome-wide scale. Computational topics include graph approaches in sequence assembly; discriminant analysis in gene finding; dynamic programming in sequence comparison; and clustering techniques in the analysis of gene expression data.

412 Developmental Biology - Comparative biology of animal development emphasizing regulatory mechanisms.

461L Histology - Microscopic structure of vertebrate tissues, emphasizing correlation of structure and function.

425 Molecular Genetics - Molecular biology of the gene.

428 Human Heredity - Genetic principles applied to humans.

429 Molecular Cell Biology - Cellular processes with emphasis on membranes; includes reading original landmark papers in cell biology.

437 Evolutionary Genetics - Mutation, natural selection, genetic drift; how evolutionary forces shape population structure. Mechanisms of speciation. Macroevolution of biochemical processes essential to higher organisms, such as signal transduction pathways, developmental genes and complex organs.

444 Genomics and Genomic Analyses - Overview of genomic analyses from DNA sequence to gene expression and proteomics.

445 Biology of Toxins - Principles of toxicology; pharmacology and biotransformation of xenobiotics. Mechanism of action, medical uses, and evolutionary ecology of biological toxins.

446 Laboratory Methods in Molecular Biology - Principles of DNA and RNA purification, enzymatic manipulation of nucleic acids, molecular cloning, gel electrophoresis, hybridization procedures and nucleotide sequencing.

450 General Virology - Structure, properties, and molecular biology of viruses; virus-host interactions, multiplication, pathology, epidemiology, effects of chemical and physical agents, classification.

451 Microbial Ecology - Role of microorganisms in terrestrial and aquatic ecosystems. Emphasis on biogeochemistry and nutrient cycling.

452 Anthropological Genetics (Human Genetics) - This course examines theory, data and methods used by genetic anthropologists to address questions about human origins and prehistory, race, natural selection, disease, and the social and scientific implications of research in genetic anthropology.

456 Immunology - Immunoglobulin structure, anitigen-antibody reactions, immunity and hypersensitivity; experimental approach will be emphasized.

460 Microbial Physiology - Physiological and biochemical activities of bacteria and fungi with emphasis on cell energetics.

482L Parasitology - The protozoa and worms important in human and veterinary medicine. Emphasis on life histories, epidemiology and ecology of parasites with laboratory practice in identification and experimentation.

490 Biology of Infectious Organisms - The full spectrum of infectious entities including prions, viruses and parasitic prokaryotes and eukaryotes will be discussed with respect to their transmissibility, interactions with immune systems and their influences on evolutionary processes and biodiversity issues.

497 Principles of Gene Expression - A detailed and critical study of how different genes are regulated during the life of an organism, principally at the level of transcription.

Department of Chemistry

312 Physical Chemistry (Part 2) - An introduction to chemical thermodynamics. Topics will include basic thermodynamic principles, phase diagrams, and solution phase thermodynamics.

422 Molecular Biology of the Gene - Focuses on the biological chemistry of gene structure, expression and regulation and the structure and function of the cell nucleus.

425 Organic Chemistry of Biological Pathways - Covers basic principles of mechanisms, acidity, stereochemistry; structures; properties of biomolecules; reactions in lipid, carbohydrate, amino acid, nucleotide metabolic pathways.

457 Environmental Chemistry - Introduction to the chemistry of natural and polluted environments, including both atmospheric and aquatic systems.

Department of Statistics

345 Elements of Mathematical Statistics and Probability Theory - An introduction to probability including combinatorics, Bayes' theorem, probability densities, expectation, variance and correlation. An introduction to estimation, confidence intervals and hypothesis testing.

Biomedical Sciences Graduate Program

505 Scientific Writing – This is a one semester course that is offered in the fall semester each year. Participants include graduate students, postdoctoral fellows, advanced undergraduates, faculty, and other health professionals from both the Health Sciences Center and the UNM main campus. The course provides instruction in the structure and organization of a research manuscript and addresses other topics such as ethics of authorship, efficient use of reference data bases, and an overview of the publication process presented by a current editor of a scientific journal.

509 Principles of Neurobiology - This course covers cellular structure of neurons and glia, the electrical properties of neurons, intercellular communication, and the formation, maintenance and plasticity of chemical synapses.

510 Physiology - Course in regulatory and systems biology, and cardiovascular and pulmonary biology.

515 Cancer Biology - Fundamental elements of cancer development and progression will be the focus of this course. Basic biochemical and genetic mechanisms of tumorigenesis, including genomic instability, principles of tumor cell invasion and growth dysregulation will be emphasized.

516 Molecular Genetics and Genomics - Covers genetic and genomic approaches in model organisms (prokaryotes, fungi, worms, mouse and fruit flies) and humans to study biological processes at the molecular, cellular, tissue, organism, population and evolutionary levels. Provides an introduction to bioinformatic and computational methods used in such studies.

522 Experimental Design and Methods in Molecular and Cellular Biosciences - This case-based course is intended for first year graduate students and focuses on practical issues of how to design, plan and conduct scientific studies through appropriate use of experimental methods and data analysis.

532 Neurochemistry - An introduction to neurochemistry and neuropharmacology, with heavy emphasis on student participation, by reading and evaluating current publications.

School of Pharmacy

576 Cellular and Molecular Pharmacology (1 credit) WITH Pharm 580 General Toxicology (2 credits) – Must be taken together.

- **PHRM 576. Introductory Pharmacology.** Pharmacology is a basic science concerned with all aspects of the action of drugs on living systems. In its entirety, pharmacology embraces biochemical and physiological effects, mechanisms of action, pharmacokinetics, and therapeutic and diagnostic uses of drugs. A strong working knowledge of pharmacology is essential to the professional role of pharmacists and to basic scientists engaged in drug discovery and understanding how drugs work. The goal of this course is to give an overview of the principles of modern molecular and cellular pharmacology, as well as some details of drug delivery. Topics include: biopharmaceutical properties of drugs; receptor theory; absorption, distribution, metabolism and elimination; pharmacokinetics and drug delivery. It also serves as an Introductory course to PHRM 580 and PHRM 598 courses.

- **PHRM 580 - General Toxicology.** Toxicology is an important broad-based discipline that incorporates information from many areas bridging the gap between molecular mechanisms of toxin activity to their implications in real-world problems. For the Spring 2015 semester, the General Toxicology course has been revamped to focus on basic scientific literature relevant to toxicology and the scientific method that are of interest to graduate students. Scientific literature relevant to toxicology and the scientific method are emphasized in all topics covered. The goal of this course is to give students a broad, but comprehensive, overview of the principles of toxicology. Topics will be taught by experts in each area and will include aspects of toxicology on relevant toxic agents, molecular and cell-based mechanisms of action, as well as details of target organ systems and physiology that are affected by toxins.

D4. PROVIDE A TOTAL OF REQUIRED STEM EXPERIENTIAL LEARNING CONTACT HOURS (400 MINIMUM), INCLUDING LABORATORY CLASSES OR EQUIVALENT. IN ADDITION, YOU MAY INCLUDE A LIST OF ELECTIVE COURSES WITH THEIR LAB CONTACT HOURS.

Required Course Name	Number of laboratory hours
* Cell and Molecular Biology (Biol 201L)	1 hr/week (15 hr semester total)
* Genetics (Biol 202L)	1 hr/week (15 hr semester total)
General Chemistry 1 Laboratory (Chem 123L)	3 hr/week (45 hr semester total)
General Chemistry 2 Laboratory (Chem 124L)	3 hr/week (45 hr semester total)
Organic Chemistry 1 Laboratory (Chem 303L)	3 hr/week (45 hr semester total)
Organic Chemistry 2 Laboratory (Chem 304L)	3 hr/week (45 hr semester total)
Physics 1 Laboratory (Phys 151L)	3 hr/week (45 hr semester total)
Physics 2 Laboratory (Phys 152L)	3 hr/week (45 hr semester total)
Quantitative Analysis (Chem 253L)	4 hr/week (60 hr semester total)
Biochemical Methods (Bioc 448L)	4 hr/week (60 hr semester total)
	420 hrs total requirement

Elective Course Name	Number of laboratory hours
HIstology (Biol 416L)	3 hr/week (45 hr semester total)
Laboratory Methods in Molec Biol (Biol 446)	5 hr/week (60 hr semester total)
Parisitology (Biol 482L)	3 hr/week (45 hr semester total)
	150 hrs total electives

* Note: Biol 201L and 202L have weekly sessions for active, participatory learning experiences that include problem solving, group-learning activities, data analysis (including statistical analyses, such as chi-square test), and reading and interpreting current scientific literature.

D5. DESCRIPTION OF INQUIRY-BASED COMPONENTS OF THE CURRICULUM, WHETHER LAB- OR LECTURE-BASED

Bioc 445 and 446 incorporate both lecture and inquiry-based components and are taught in a studio classroom designed for collaborative learning that includes case-based learning and peer instruction. The primary emphasis is placed on the scientific method (hypothesize, investigate, evaluate, integrate, and reflect). Students are expected to solve scientific problems in biochemistry and molecular biology at different levels of complexity:

- Apply concepts, facts and algorithmic approaches to solve simple illustrative biochemical problems (one-step problem solving).
- Address important problems and questions in the health sciences that require a deeper understanding of biochemical principles and concepts, and employ quantitative reasoning and knowledge of experimental techniques (two-step problem solving).

- Design experimental approaches to solve complex real-world biochemical problems both as individuals and as teams (multi-step problem solving).

Case studies are utilized each week that focus on mastering the skills in biochemical problem solving and critical reasoning at different levels. Students are expected to:

- Use background information in the textbook and lectures in order to read and comprehend the primary literature in biochemistry and molecular biology, including the identification of the specific steps in the scientific method that the authors have employed to answer an important questions.
- Identify the right question, select a proper method/technique to solve a specific biochemical problem, and explain your reasoning (critical thinking and analytical problem solving).
- Identify challenges and limitations in research approaches and devise improvements.
- Apply biochemical processes to other disciplines and to world issues.
- Work and communicate effectively in a group (understand others and express yourself), orally and in writing, about biochemistry.

Both Bioc 445 and 446 are based on individual preparation, active learning, and small group work. Before-class preparation (assigned reading, testing by short, in-class quizzes) is routine. There are relatively few lectures and substantial in-class and out-of-class group work focused on scientific inquiry to identify solutions to biochemical problems. The small group cooperative learning format is used for students to construct and evaluate scientific knowledge (i.e., engage in the scientific process).

- Bioc 448L incorporates lecture, inquiry-based exercises, small group discussion/study, and experiential laboratory exercises.
- Bioc 463 and 464 incorporate both lecture and small group study components.
- Bioc 465 incorporates small group discussion/inquiry to develop and implement education research proposals.

D6. DESCRIBE UNDERGRADUATE RESEARCH OPPORTUNITIES, COOP, AND/OR INTERSHIP PROGRAMS AVAILABLE TO BMB MAJORS. INCLUDE NUMBER OF STUDENTS THAT PARTICIPATE.

One of the most important missions of the Department of Biochemistry and Molecular Biology is to provide a research experience for Majors in Biochemistry. Students are eligible to receive Departmental Honors at graduation if they complete a research project under the supervision of a faculty member in addition to other requirements. Upon completion of the Honors requirements a student will receive cum laude, magna cum laude, or summa cum laude honors in Biochemistry depending on the quality and presentation of their research work.

Program Requirements

- GPA of ≥ 3.2 at the completion of course work
- Presentation of research at the Departmental Research Day
- Submit your senior honors thesis
- Complete 6 hours of research credit (Bioc 497 and Bioc 498)

Students usually start their research experience at the end of the second year of course work. However, interested students may begin earlier depending on their interest and the availability of research mentors.

The Department also offers Bioc 499 for those students who wish to explore biochemical and biomedical research without the rigors of the Honors Research requirements. Like the Honors Program, this offering requires a student to identify a research mentor and actively participate in

research protocols. Many of these students transition into the Honors Research Program after experiencing a less formal research opportunity.

Loftfield Award for Undergraduate Research

Students who qualify for honors are eligible to receive one of the Robert B. Loftfield Awards that are presented to senior students for outstanding academic or research performance. These awards are named for Professor Emeritus Robert B. Loftfield, the founding Chairperson of the Biochemistry Department, and are presented at the Department commencement ceremony.

Number of Biochemistry Students Participating in Laboratory Research

	2010	2011	2012	2013	2014
Honor Students (Bioc 497/498)	4	10	6	8	8
Undergraduate Research (Bioc 499)	2	1	4	7	9
Total:	6	11	10	15	17

D7. Description of how the program promotes communication skills.

- Open / group classroom work, peer-learning and teaching opportunities in Bioc 445 and 446.
- Group preparation and presentation of biochemical methods in the 448L laboratory course.
- Teaching Assistant opportunities for Bioc 445, 446, and 448L.
- Honors Research presentations during the Annual Departmental Research Day
- Independent research presentations at the Initiative for Maximizing Student Development (IMSD) Program Biomedical Research Symposium and IDeA Networks of Biomedical Research Excellence (INBRE) Annual Symposium.

D8. Description of curricular activities for the development of teamwork skills, such group projects and problem-based learning

Biochemistry Core Course (Bioc 445 and 446)

Small group cooperative learning environments established using University Studio Classrooms to construct and evaluate scientific knowledge (i.e., engage in the scientific process).

- Implementation of case-based problem solving exercises to promote quantitative reasoning skills. Exercises to promote self-reflection of learning and identifying knowledge gaps.
- "Quiz-based learning" – Students read materials prior to attending class; once in class, students complete an individual quiz, then peer-grade them and discuss the questions. The quizzes are then followed by mini-lectures and group problem sets that extend knowledge to the cognitive levels of application, synthesis, and integration.
- Group discussion of primary literature and evaluation of data.
- Hypothesis development, selecting a proper method/technique to solve a specific biochemical problem, and provide reasoning (critical thinking and analytical problem solving).
- Group work to identify challenges and limitations in research approaches and devise improvements.

Biochemical Methods Laboratory Course (Bioc 448L)

- Students work individually or in pairs to maximize experiential learning of biochemical methods.
- Afternoon class session prior to laboratory exercise focused on protocol development and interpretation, as well as group discussions on methods choice and possible improvements.

- Students interpret and graph their data individually, then compare and discuss their results in groups to identify sources of error and ways to improve accuracy.
- Problem-based approach to protein/isoform identification using NCBI protein database information.
- Group study and discussion of primary literature on enzyme they are responsible for purifying and measuring activity to fully understand biologic function.

D9. DESCRIPTION OF HOW THE PROGRAM INCORPORATES THE TEACHING OF RESPONSIBLE CONDUCT OF RESEARCH/PROFESSIONAL CODE OF CONDUCT. (ETHICS)

Departmental Expectations for Academic Integrity

- Commit to a code of values that honors academic and personal integrity, honesty and ethical standards.
- Complete your own work. All students are expected to work individually on in-class exams, individual quizzes, primary literature summaries or any other assignments that are designated as "individual".
- Acknowledge work and ideas of another person by appropriate citation. Collaborators, including fellow students, must be acknowledged on any assignments, and assignments must not contain verbatim copying of any kind, from any source, including the Internet.
- Any incidence of academic dishonesty will result in the attachment of a failing grade for that assignment and may involve university disciplinary action.

Presentation of Research Ethics – 3 week module in Bioc 464

Dorothy VanderJagt, PhD
This section provides an overview of research ethics and includes such topics as authorship, plagiarism, treatment of data, conflict of interest, use of human and animal subjects, genomic research, and international research. Students are assessed through a group presentation to the class during the last two sessions on an assigned problem. A brief written report on the same problem is also required.

D10. DESCRIPTION OF ACADEMIC AND CAREER ADVISING RESOURCES AND PROGRAMS.

Advisement through the College of Arts & Sciences (A&S)

The mission of A&S is to assist and guide students in their pursuit of an A&S Degree. Advisors are available to collaborate with the diverse community of students in a dynamic learning environment, developing tools and strategies to navigate their academic careers with confidence and efficiency, while also providing them with a way to translate those skills into lifelong practices.

Staff

Stephanie Hands, Director
Stephanie has been at the University of New Mexico since she was 19 years old. She grew up on the UNM campus and in advisement. She previously supervised the University College Advisement Center and then moved to A&S in 2004. She has a Bachelor's in Psychology and an MBA from the UNM Anderson School of Management. Her goal is to continuously improve the A&S Advisement Center's practices and policies to enhance the experience for the students. She believes that advisement is an active partnership between students, staff, and faculty.

Julie Bustamante, Advisement Coordinator
Julie has been a part of the UNM community for many years.

Kelli Hulslander, Advisement Coordinator

Kelli is the STEM Advisement Coordinator for the College of A&S. She earned a Bachelor's Degree in Chemical Engineering from UNM. Kelli believes that as a student advisement coordinator she is able to help STEM students to not only excel academically but to also enjoy their time as a college student as well.

William McClary, Advisement Coordinator

William earned both his undergraduate degree in Journalism and graduate degree in American Studies from the University of New Mexico. He has advised different student populations and interpreted various degree programs for nearly six years at UNM. His efforts are focused on structuring a student-centered atmosphere which is conducive to the many aspects of higher learning

Kathie Watland, Unit Administrator

Kathie relocated to Albuquerque from Superior in 2012 and worked on the HSC Campus before joining the A&S Advisement office. Prior to UNM, she worked for the State of Wisconsin and UW-Superior for 27 years.

Biochemistry Advisors

Martina Rosenberg, PhD, Biochemistry Department Advisor

Dr. Rosenberg is an Assistant Professor in the Department of Biochemistry and Molecular Biology and actively involved in education research. She is responsible for advising Biochemistry Majors on course sequence, career planning, summer activities, mentor selection, and identifying research opportunities abroad.

Valarie Maestas, Senior Academic Advisor

Valarie earned a degree in Anthropology and Psychology from UNM. As a recent UNM graduate and native New Mexican she has a primary emphasis in serving her community and assisting students in achieving their academic goals.

Brian Vineyard, Senior Academic Advisor

Brian has a degree in Mathematics from UNM, and along with working in Advisement has also served UNM as a part-time faculty member. Brian enjoys working with students to resolve the different academic challenges they face and in helping them to reach their full potential not only as students but also productive members of today's society.

D11. DESCRIPTION OF THE INTERNAL ASSESSMENT METHODS USED TO EVALUATE STUDENT PERFORMANCE.

The type of internal assessments administered varied according to the individual course syllabi as determined by each course director. These included:

- Multiple choice examinations, short answers, essay questions
- Analysis of current scientific literature
- Analyses and interpretation of experimental data
- Mini-grant preparation
- Oral presentations
- Term papers
- Individual and group quizzes in peer-learning environments
- Data generation, interpretation, small group presentation, and small group report for laboratory course
- Individual student transcript assessment, including overall and science grade point averages, is obtained through UNM student records.

Designation for Departmental Honors for Research is assessed by the entire faculty and is based on an evaluation of the written thesis and student presentation of their work at the Annual Biochemistry Research Symposium, which convenes during Spring semester.

For many years, up until 2013, the Department administered the Biochemistry Exit Examination from the American Chemical Society in order to monitor individual student performance and as an overall assessment of the Degree Program. Although this practice has been discontinued, we look forward toward ASBMB Accreditation of our Program and our participation in the National ASBMB Degree Certification Exam. We believe this instrument will be an excellent benchmark for continuous Programmatic assessment, in addition to our students receiving all the positive benefits from ASBMB Certification.

D12. DESCRIPTION OF THE ASSESSMENTS METHODS USED TO EVALUATE THE DEGREE PROGRAM.

In general, our majors are considered academically successful during their time at UNM, as measured by their overall grade point averages, their receipt of numerous university honors, and prestigious post-baccalaureate Programs they enter. The length of time to degree is very acceptable, averaging between 4-5 years. These are important benchmarks we assess to ensure the quality of our Academic Program. In addition, the Department administrated the American Chemical Society performance exam to graduating seniors over the last 12 years (2001-2012). Our students scored 64 (+/- 5.7) of the national ranking percentile.

Academic Programmatic Review currently in preparation for UNM Provost Office

The Academic Program Review (APR) process at the University of New Mexico supports and advances the mission of the university by providing a mechanism for academic programs to examine their achievements, goals, and strategic plans for the future. Within this context, the APR office's primary purpose is to assist academic programs through the process of preparing a unit self-study, organizing and preparing for a site visit from a review team comprised of both internal and external reviewers, and preparing a well formulated action plan for the future. The Department of Biochemistry and Molecular Biology is currently undergoing this review process which will conclude during the Fall 2015 semester. A satisfactory review from the Provost Office will provide a 7-year internal accreditation status.

Annual report to Provost Office describing student learning outcomes

The most recent report submitted by the Department of Biochemistry and Molecular Biology was for the 2011-12 academic year and primarily focused on Student Learning Outcomes (SLOs). Many of the stated SLOs are derived from curricular documents published by our disciplinary society, American Society for Biochemistry and Molecular Biology (ASBMB), as well as the Association of American Medical Colleges and the Howard Hughes Medical Institute.

Measures used for each learning outcome included sample size of students from whom data were collected, timetable for the collection, and the setting in which the measures were administered. Measurements included:

- Capstone experience
- Subject matter exams
- Laboratory Skill Performance (Practicum)
- Student academic awards

Annual reports for individual Departments in the University have been temporarily suspended by the Provost Office. A new individual has been hired and charged with rebuilding and converting the University reporting system to an online process. It is anticipated that submission of annual reports will be reinstated later in 2015.

Appendix 1

Letter of Support from the Dean Indicating the Level of Institutional Support

THE UNIVERSITY OF NEW MEXICO ◆ HEALTH SCIENCES CENTER
SCHOOL OF MEDICINE

March 10, 2015

Dear Dr. Parra,

It is with pleasure that I offer my highest support for the ASBMB accreditation of the Undergraduate Program in Biochemistry and Molecular Biology. The Program has been a centerpiece of the basic sciences in the School of Medicine for 30 years and a model of collaboration between the undergraduate Program at the University of New Mexico and the School of Medicine.

Many graduates of the Program enter the School of Medicine, the Biomedical Sciences Graduate Program, and more recently bridges students who are in our innovative BA/MD Program. The students are academically successful during their time at UNM as measured by the overall GPA, and achievement of University Honors and Biochemistry Research Honors designation. They are well prepared for the rigors of graduate and professional schools and much credit goes to your Department. You and our faculty teaching, training and mentoring the students in the Program are committed to its excellence. At the School of Medicine, we have committed teaching lab space for the Program and plan to remodel it in the coming year.

Once again, let me reiterate my support for the Undergraduate Biochemistry Program and offer my highest recommendation for its accreditation.

Sincerely,

Paul B. Roth
Chancellor for Health Sciences
CEO, UNM Health System
Dean, School of Medicine

Martha C. McGrew
Executive Vice Dean
University of New Mexico School of Medicine
Professor, Family and Community Medicine

Appendix 2

Curriculum Vitae for Major Faculty Participants in the Biochemistry and Molecular Biology Curriculum

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Garver, William Sherman	Assistant Professor of Biochemistry and Molecular Biology
eRA COMMONS USER NAME (credential, e.g., agency login) wgarver	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
University of New Mexico, Albuquerque, NM	B.A.	05/86	Biochemistry
New Mexico State University, Las Cruces, NM	Ph.D.	12/91	Biochemistry
University of Washington, Seattle, WA	Postdoctoral	12/94	Metabolism and Nutrition

A. Statement

The objective of my research program is to determine how the Niemann-Pick C1 (NPC1) gene and encoded protein regulate cellular, tissue, and whole body lipid metabolism. The NPC1 gene was originally investigated in relation to a rare autosomal-recessive lipid-storage disease (NPC1 disease), but more recent studies indicate that the NPC1 gene variants is also associated with common metabolic diseases (obesity and diabetes). My laboratory is performing basic research using mouse models and translational research using patient/participate cohorts.

B. Professional Appointments

1995 – 2000 Research Scientist, Department of Pediatrics, College of Medicine, University of Arizona, Tucson, AZ

2000 – 2005 Research Assistant Professor, Department of Pediatrics, College of Medicine, University of Arizona, Tucson, AZ

2005 – 2009 Research Associate Professor, Department of Pediatrics, College of Medicine, University of Arizona, Tucson, AZ

2010 – Assistant Professor, Department of Biochemistry and Molecular Biology, School of Medicine, University of New Mexico, Albuquerque, NM

C. Publications (Last 5 Years)

1. Garver WS, Jelinek D, Meaney FJ, Flynn J, Pettit KM, Shepherd G, Heidenreich RA, Walsh-Vockley C, Castro G, and Francis GA. The National Niemann-Pick type C1 Disease Database: Correlation of lipid profiles, mutations, and biochemical phenotypes. Journal of Lipid Research 51:406-415, 2010.

2. Jelinek D, Heidenreich RA, Erickson RP, and Garver WS. Decreased *Npc1* gene dosage in mice is associated with weight gain. Obesity 18:1457-1459, 2010.

3. Jelinek D, Millward V, Birdi A, Trouard TP, Heidenreich RA, and Garver WS. *Npc1* haploinsufficiency promotes weight gain and metabolic features associated with insulin resistance. Human Molecular Genetics 20: 312-321, 2011.

4. Jelinek D, Heidenreich RA, and Garver WS. The Niemann-Pick C1 gene interacts with a high-fat diet and modifying genes to promote weight gain. American Journal of Medical Genetics 155: 2317-2319, 2011.

5. Jelinek D, Castillo JJ, Richardson LM, Luo L, Heidenreich RA, and Garver WS. The Niemann-Pick C1 gene is downregulated in livers of C57BL/6J mice by dietary fatty acids, but not dietary cholesterol, through feedback inhibition of the SREBP pathway. Journal of Nutrition 142:1935-1942, 2012.

6. Poirier S, Mayer G, Murphy SR, Garver WS, Chang TY, Schu P, Seidah NG. The cytosolic adaptor AP-1A is essential for the trafficking and function of Niemann-Pick type C proteins. Traffic 14:458-469, 2013.

7. Jelinek D, Castillo JJ, Arora SL, Richardson LM, Garver WS. A high-fat diet supplemented with fish oil improves metabolic features associated with type 2 diabetes. Nutrition 29:1159-1165, 2013.

8. Jelinek D, Castillo JJ, Garver WS. The C57BL/6J Niemann-Pick C1 mouse model with decreased gene dosage has impaired glucose tolerance independent of body weight. Gene 527:65-70, 2013.

9. Jelinek D, Heidenreich RA, Orlando RA, Garver WS. The Niemann-Pick C1 and caveolin-1 proteins interact to modulate efflux of low density lipoprotein-derived cholesterol from late endocytic compartments. Journal of Molecular Biochemistry 3:14-26, 2014.

10. Garver WS. Gene-diet interactions in childhood obesity. Current Genomics 12: 180-189, 2011.

11. Garver WS, Newman SB, Gonzales-Pacheco DM, Castillo JJ, Jelinek D, Heidenreich RA, and Orlando RA. The genetics of childhood obesity and interaction with dietary macronutrients. Genes and Nutrition 8: 271-287, 2013.

12. Conn CA, Vaughn R, and Garver WS. Nutritional genetics and energy metabolism in human obesity. Current Nutrition Reviews 2:142-150, 2013.

13. Orlando RA and Garver WS. The hidden costs of high fructose corn syrup: Challenges to energy balance and fat mobilization from adipose tissue. Biomolecular Research & Therapeutics 2:1-3, 2013.

D. Grants and other Awards

DHHS/NIH/NCRR (UL1TR000041) Garver (PI) 01/01/2012 – 12/31/2012
Department of Biochemistry and Molecular Biology, School of Medicine, University of New Mexico
The Niemann-Pick C1 gene and predisposition to adult obesity and diabetes
The objective of this CTSC Pilot Project Grant was to determine frequency of NPC1 gene variants and association with obesity and diabetes in the local population of New Mexico.
Role: Principal Investigator

DHHS/NIH/NCRR (UL1TR000041) Garver and Fields (Co-PI) 04/01/2013 – 03/21/2014
Department of Biochemistry and Molecular Biology, School of Medicine, University of New Mexico
Genetic determinants of early childhood adiposity
The objective of this CTSC Consortium Inter-Institutional Pilot Project Grant was to determine frequency of childhood obesity susceptibility genes and association with measures of childhood adiposity and energy metabolism.
Role: Co-Principal Investigator

E. Professional Organizations

American Society of Biochemistry and Molecular Biology (ASBMB), The Obesity Society (TOS), American Society of Nutrition (ASN)

F. Placement of Advisees in Graduate/Professional School

Surpreet Arora	Graduated with a B.S. from the Department of Biochemistry and Molecular Biology at The University of New Mexico Health Sciences Center (2011). He is attending Baylor University as a dental student.
Lisa Richardson	Graduated with a B.S. from the Department of Biochemistry and Molecular Biology at The University of New Mexico Health Sciences Center (2013). She is attending University of New Mexico School of Medicine.
Kathleen Smith	Graduated with a B.S. from the Department of Biochemistry and Molecular Biology at The University of New Mexico Health Sciences Center (2013). She is attending State University of New York as a graduate student.

Chien-An Andy Hu, Ph.D.
Department of Biochemistry and Molecular Biology
University of New Mexico (UNM) School of Medicine (SOM), and Health Sciences Center (HSC)
MSC08 4670, BMSB258, 915 Camino de Salud, Albuquerque, NM87131-0001
505-272-8816
AHu@salud.unm.edu; AndyHu793@gmail.com

EDUCATION:

1997 **Postdoctoral Fellow, Human Molecular Genetics**
Howard Hughes Medical Institute, McKusick-Nathans Institute of Genetic Medicine,
Department of Pediatrics and Department of Molecular Biology and Genetics,
Johns Hopkins University School of Medicine, Baltimore, Maryland

1993 **Ph.D., Molecular Genetics**
Department of Molecular Genetics, The Ohio State University, Columbus, Ohio

1991 **M.S., Molecular Genetics**
Department of Molecular Genetics, The Ohio State University, Columbus, Ohio

1985 **B.S., Microbiology**
Department of Microbiology, Soochow University, Taipei, Taiwan

PROFESSIONAL APPOINTMENTS:

2012-present ***Director, Undergraduate Honors Research,*** BMB, UNM SOM
2010 -2012 ***Vice Chairman,*** BMB, UNM SOM
2006 -2015 ***Associate Professor,*** BMB, UNM SOM
2001- 2006 ***Assistant Professor,*** BMB, UNM SOM

UNM HSC & MAIN CAMPUS COMMITTEE:

2012-present ***Member***, Human Tissue Repository Committee and Human Tissue Repository Scientific Review Committee, UNM HSC
2006-present ***Member***, Scientific Advisory Council (SAC) to the Deans, UNM HSC
2005-present ***Member***, Cancer Research and Treatment Center, UNM HSC
2008-2014 ***Faculty senator,*** UNM Main and HSC Campuses

HONORS AND AWARDS:

2014-present *Evergreen Scholar,* Institute of Animal Sciences, Wuhan Polytechnic University, Wuhan, China

SELECTED MEMBERSHIP IN PROFESSIONAL SOCIETIES:

American Heart Association (AHA); American Society for Biochemistry and Molecular Biology (ASBMB)
American Society of Cancer Research (AACR)

COMMITTEES:

National and International

2004-present Committee, *Proline Symposium: Proline Metabolism in Health and Disease*

2013 Co-President, The 13th International Congress on Amino Acids, Peptides and Proteins (ICAPP), October 5-7, Galveston, TX

UNM-HSC

2012- 2013 Chair, Search Committee, BMB and BBHI Tenure-track Assistant Professor
2011-2012 Institutional Animal Care and Use Committee (IACUC), UNM HSC
2010-2011 UNM SOM Promotion & Tenure Committee

GRANT REVIEWER

American Association for the Advancement of Science (AAAS) Research Grants
Florida Bankhead-Coley Cancer Research and James & Esther King Biomedical Programs
Rhode Island Research Alliance Grant
American Heart Association (AHA)

JOURNAL EDITOR FOR:

Guest Editor-in-Chief, *Special Issue, "Amino Acids and Autophagy", Amino Acids, 2014. (together with Drs. Zhenlong Wu and Junjun Wang), Deadline of manuscript submission, November 30 , 2014; Special Issue, "Proline Metabolism in Health and Disease", Amino Acids, 35(4), 2008. (together with Drs. David Valle and James Phang)*
Sectional Editor, "*Molecular Nutrition" in "Animal Nutrition" (2014-)*
Editor, *Amino Acids (2008-)*

SELELCTED INVITED PRESENTATIONS (from 2014):

1. **Invited Speaker:** *Proline and tryptophan in apoptosis and autophagy.* Institute of Subtropical Agriculture, Chinese Academic Sciences, Changsha, Hunan, China. November 03, 2014.
2. **Evergreen Scholarship Lecture:** *Proline metabolism in humans and animals.* Institute of Animal Sciences, Wuhan Polytechnic University, Wuhan, China, October 30, 2014.
3. **Invited Speaker:** *Amino acids and autophagy.* Department of Animal Sciences, Texas A&M University, College Station, TX. June 06, 2014.
4. **Invited speaker:** *ApoL6 and ApoL1 in human disease.* Guangzhou Institute of traumatic Surgery, Guangzhou Red Cross Hospital, Medical College, Jinan University, Guangzhou, China. February 27, 2014.
5. **Invited speaker:** *ApoL6, ApoL1, and amino acids in disease.* China Agricultural University, Beijing, China. February 25, 2014.

PUBLICATIONS (from 2012):

Hu CA (corresponding author), Hou Y. (2014) Mammalian P5CR and P5CDH: protein structure and disease association. ***BJO Biochem. 1: 4-7.***

Contreras AU, Mebratu Y, Delgado M, Montano G, **Hu CA**, Ryter SW, Choi AM, Lin Y, Xiang J, Chand H, Tesfaigzi Y. Deacetylation of p53 induces autophagy by suppressing Bmf expression. ***J Cell Biol.*** 2013 Apr 29;201(3):427-37.

Kaini RR, Sillerud LO, Zhaorigetu S, **Hu CA (corresponding author)**. Autophagy regulates lipolysis and cell survival through lipid droplet degradation in androgen-sensitive prostate cancer cells. ***Prostate.*** 2012 Sep 15;72(13):1412-22.

Kaini RR, **Hu CA (corresponding author)**. Synergistic killing effect of chloroquine and androgen deprivation in LNCaP cells. ***Biochem Biophys Res Commun.*** 2012 Aug 24;425(2):150-6.

Hu CA (corresponding author), Klopfer EI, Ray PE. Human apolipoprotein L1 (ApoL1) in cancer and chronic kidney disease. ***FEBS Lett.*** 2012 Apr 5;586(7):947-55.

Klionsky DJ, **Hu CA** et al. Guidelines for the use and interpretation of assays for monitoring autophagy. ***Autophagy.*** 2012 Apr;8(4):445-544.

Book Chapters

Hu CA, Phang J, Valle D. (on-line edition, 2015) Disorders of proline and hydroxyproline metabolism. In **"*The Online Metabolic and Molecular Bases of Inherited Disease (OMMBID)*"** D. Valle, editor-in-chief. McGraw-Hill, Inc.

Hu CA (corresponding author), White K, Torres S, Ishak M, Sillerud L, Miao Y, Liu, Z. Wu, L. Sklar, Berwick M (2015) Apoptosis and Autophagy: The Yin-Yang of Homeostasis in Cell Death in Cancer. In ***"Autophagy: Cancer, Other Pathologies. Inflammation, Immunity, Infection, and Aging"*** Volume 7, M. A. Hayat, edit., AP Press (In press).

RESEARCH PROJECT AND CONTINUITY:

- **High-throughput screening in the identification and characterization of repurposed drugs, dipeptides, and amino acids in modulating apoptosis and autophagy in various disease models (since 2011)** (This project has been supported by UNM HSC CTSC internal grants. Collaborators include Larry Sklar (Director, UNM Center for Molecular Discovery), Warren Laskey (Chief, UNMH Cardiology), Guoyao Wu (Texas A&M), and Yongqin Hou (Wuhan Polytechnic University, Wuhan, China)
- **Human ApoL protein family in cancer cell death (since 2001)** (this project has been supported by ACS-IRG, NCI RO1, DOD, and NM-INBRE. Collaborators include Ke-Jian Jim Liu (Director, UNM BRaIN Imaging Center), Jian Yu (U Pitt), and Songqin Pan (UC Riverside)
- **ApoL6 in atherosclerosis and acute myocardial infarction (since 2008)** (this project have been supported by UNMHSC internal funds. Collaborators include Timothy McCaffrey (George Washington), Tor Jensen (UI Urbana-Champaign), Warren Laskey, Brian Walton and Siqin Zhaorigetu (Texas Heart Institute), and Songqin Pan
- **ApoL1 in HIV-associated nephropathy (since 2010)** (has been supported by a contract from Children's National Medical Center, DC, and UNM HSC internal funds. Collaborators include Patricio Ray (George Washington/Children's National), and Songqin Pan
- **Proline and tryptophan metabolic enzymes in inborn errors, cancer, and other diseases (since 1993)** (has been supported by HHMI, JHMI, UNM HSC, and DOD. Collaborators include David Valle (Director, Center for Genetic Medicine, JHMI), James Phang (NCI, Frederick), Guoyao Wu, Jian Yu, Yongqin Hou, and Yulong Yin (Institute of Subtropical Agriculture).

Current Research Support:

Project title: *"Role of cytokines and APOL1 in the pathogenesis of childhood HIV associated nephrology";* **Funding organization:** NIDDK (R01DK103564)

Principal investigator: Ray, Patricio, Children's National Medical Center, and George Washington University School of Medicine, Washington, DC

Co-investigator/Consultant: HU, Chien-An A.

Starting and stopping dates: August 01, 2014-June 30, 2018

Amount awarded for the period listed: Direct costs: $150,000/year**; indirect costs:** $108,000

Summary: Investigate the combinational effect of cytokines and ApoL-1 in HIV associated nephropathy in children using cell and animal models, and human samples.

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Meilian Liu	Assistant Professor
eRA COMMONS USER NAME (credential, e.g., agency login) Liumeilian	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Hunan Normal University, P. R. China	B.S.	06/93	Chemistry
Xiangya School of Medicine, Central South University, P. R. China	Ph.D.	06/04	Biochemistry
University of Texas Health Science Center	Post-doc	07/09	Biochemistry and Cellular Biology

A. Personal statement.

Our research goal is to identify potential therapeutic targets for the treatment of obesity and its related diseases by studying the biology of white and brown adipose tissue. Our current study mainly focuses on the browning of white adipose tissue, adipokine assembly and secretion, and adipokine-mediated communication between adipose tissue and other organs using in vivo, ex vivo, cell culture and in vitro approaches. I have being devoted my research career to study the thermogenic programing and beige adipocyte differentiation in adipose tissue since I began my faculty position in 2011. Our recent study demonstrates that Growth factor receptor-bound protein 10 (Grb10) promotes lipolysis and thermogenic gene expression in brown and beige adipose tissue through feedback inhibition of mTORC1 *(Liu et al., 2014, Cell Metabolism, 19: 967).* The long term goal further is to delineate how intracellular signaling pathways integrate various stimuli and regulate brown and beige adipocyte differentiation and thermogenic function.

B. Positions and Honors.

Position and employment

2014 - Present Assistant Professor (Tenure-track), Department of Biochemistry and Molecular Biology, University of New Mexico Health Science Center
2011 - 2013 Assistant Professor (Research), Department of Pharmacology, University of Texas Health Science Center at San Antonio (UTHSCSA)
2009 - 2011 Instructor (Research), Department of Pharmacology, UTHSCSA
2005 - 2006 Associate professor, Department of Biochemistry, Xiangya School of Medicine, Central South University, Changsha, Hunan, P. R. China
2004 - 2005 Instructor, Department of Biochemistry, Xiangya School of Medicine, Central South University, Changsha, Hunan, P. R. China

Teaching experience

June 2014 to Aug 2014
Taught undergraduate senior student BIOCHEMISTRY OF DISEASE, and Mentored postdoctoral fellow, graduate student and summer student.

Jun 2012-2013
Teaching “Cell Culture” for student in the Department of Pharmacology.

May 2006- 2013
Mentoring graduate students/undergraduate students/Research Assistants.

Jun 2004 - Apr 2006
Vice Chair, Department of Biochemistry, Central South University, Changsha, China.
Teaching course "Biochemistry and Molecular Biochemistry" for graduate and undergraduate students.

Sep 1993 - June 1998
Assistant instructor, Department of Organic Chemistry, Hunan Medical University, Changsha, China.
Taught course "Organic Chemistry" for undergraduate students.

Other Experience and Professional Memberships

2008 – Present, Member, American Diabetes Association
2009 – Present, Member, American Heart Association

Honors and Awards

2013 Junior Faculty Award of American Diabetes Association, USA
2011 Beginning in aid award of American Heart Association, USA
2005 Young Core Teacher, Hunan Government Department of Education, China
2003 The Excellent Ph.D. Student Award, Central South University, China
2002 The Excellent Graduate Student Award, Central South University, China,
2002 Award for the 1st Place of Science and Technology Association Thesis, Hunan, China
1998 Award for Ten Excellent Young Teachers, Hunan Medical University, China

Manuscript reviewer for:

Endocrinology; Autophagy; British Journal of Pharmacology; Journal of Biological Chemistry; Journal of Molecular Endocrinology; PLOS ONE

C. Selected Peer-reviewed Publications (Selected from 28 peer-reviewed publications. Publication before 2007 under name Liu Mei-Lian)

Research articles

1. **Liu M,** Bai J, He S, Villarreal R, Hu D, Zhang C, Yang X, Liang H, Slaga T, Zhou Z, Yu Y, Zhou Z, Blenis J, Scherer P, Dong L, and Liu F (2014). Grb10 Promotes Lipolysis and Brown Adipocyte Gene Expression by Phosphorylation-dependent Feedback Inhibition of mTORC1. ***Cell Metabolism***, 19(6):967-80
2. Sha H, Yang L, **Liu M**, Xia S, Liu Y, Liu F, Kersten S, Qi L. Adiopocyte XBP1s promote adiponectin multimerization and systemic glucose homestasis (2013). ***Diabetes****,* 63(3):867-79.
3. Liu J, Guo M, Zhang D, Cheng S, **Liu M,** Ding J, Shcerer P, Liu F, Lu X (2012). Adiponectin is critical in determining susceptibility to depressive behaviors and has antidepressant-like activity. ***Proc Natl. Acad. Sci. USA.*** 109(30): 12248-53.
4. **Liu M,** Xiang R, Wilk S, Zhang N, Kian, A, Sloane L, Zhou L, Chen H, Xiang G, Walter C, Austad S, Musi N, Defronzo R, Asmis R, Scherer P, Dong L, Liu F (2012). Fat-specific DsbA-L overexpression promotes adiponectin multimerization and prevents mice from diet-induced obesity and insulin resistance. ***Diabetes****,* 61(11):2776-86.
5. **Liu M*,** Zhou L, Wei Li, Ricardo, Yang X, Hu D, Riojas R, Holmes B, Langlais P, Lee H, Dong L* (2012). Phosphorylation of Adaptor Protein Containing Pleckstrin Homology Domain, Phosphotyrosine Binding Domain and Leucine Zipper Motif 1 (APPL1) at Ser^{430} Mediates ER stress-induced Insulin Resistance in Hepatocytes. ***J Biol Chem****.* 287(31): 26087-92. **(* Corresponding author)**
6. Zhang J, Zhang N, **Liu, M**, Li, X, Zhou, L, Huang W, Xu, Z, Liu, J, Musi, N, DeFronzo, R, Cunningham J, Zhou, Z, Lu, X, Liu, F (2012). Disruption of Grb10 in the Pancreas Enhances β-cell Proliferation and Protects Mice from Streptozotocin-induced β-cell Apoptosis. ***Diabetes.*** 61(12):3189-98.
7. Wang A, **Liu M*,** Liu X, Dong L, Glickman R, Slaga T, Zhou Z and Liu F***** (2011). Up-regulation of Adiponectin by Resveratrol: The Essential Roles of the Akt/FOXO1 and AMPK Signaling Pathways and DsbA-L. ***J Biol Chem****. 286: 60-6.* **(* Corresponding author)**
8. Zhou L, **Liu M,** Zhang J, Chen H, Dong L.Q, and Liu F (2010). DsbA-L Alleviates Endoplasmic Reticulum Stress-induced Adiponectin Down-regulation. ***Diabetes***. 59, 2809-16
9. **Liu M*,** Wilk S, Wang A, Zhou L, Wang R, Ogawa W, Deng C, Dong L, Liu F***** (2010). Resveratrol inhibits Amino Acid-induced mTOR signaling by Promoting the Interaction between mTOR and DEPTOR. ***J Biol Chem****.* 285: 36387-94. **(* Corresponding author)**
   Evaluated and recommended by Faculty of 1000: http://f1000.com/5319961#eval5267064

10. Zhou L, Zhang J, Fang Q, **Liu M**, Liu X, Jia W, Dong LQ, Liu F (2009) Autophagy-mediated Insulin Receptor Down-regulation Contributes to ER Stress-induced Insulin Resistance. ***Molecular Pharmacology*** 76: 596-603.
11. Wang C, Xin X, Xiang R, Ramos FJ, **Liu M**, Lee HJ, Chen H, Mao X, Kikani CK, Liu F, Dong LQ (2009). "Yin-Yang" regulation of adiponectin signaling by APPL isoforms in muscle cells. ***J Biol Chem*** 284: 31608-15
12. Liu X*, **Liu M***, Zhang JJ, Bai X, Ramos FJ, Van Remmen H, Richardson A, Liu FY, Dong LQ, Liu F (2009). Reducing Grb2 Expression Mediates the Insulin Sensitizing Effect of Calorie Restriction. ***Am J Physiol Endocrinol Metab*** 296: E1067-75 (***First two authors contribute equally to this work**)
13. Wang C, **Liu M**, Riojas RA, Xin X, Gao Z, Zeng R, Wu J, Dong LQ, Liu F (2009). PKC theta-dependent phosphorylation of PDK1 at ser504 and ser532 contributes to hyperlipidemia-induced insulin resistance. ***J Biol Chem*** 284: 2038-2044.
14. **Liu M**, Zhou L, Xu A, Lam KS, Wetzel MD, Xiang R, Zhang J, Xin X, Dong LQ, Liu F (2008). A Disulfide-bond-A Oxidoreductase-like Protein (DsbA-L) Regulates Adiponectin MultimeriZation. ***Proc Natl. Acad. Sci. USA*** 105: 18302-7
(Highlighted commentary and cover story in same issue) (Research Highlight Commentary in Proc Natl. Acad. Sci. USA. 2008, 105 (47), 18077-8).
Evaluated and recommended by Faculty of 1000:
http://www.f1000biology.com/article/id/1131889/evaluation

D. RESEARCH SUPPORT (during past five years)**:**

Ongoing research support:

Junior Faculty Award 1-13-JF-37 Liu M (PI) 01/01/13-12/30/15
American Diabetes Association
The goal of this project is to investigate the role of DsbA-L in regulating liver mitochondria function and insulin sensitivity
Role: PI

R01 DK DK100697 Liu F (PI) 09/01/13-08/31/18
NIH/NIDDK
The goal of this project is to characterize the physiological role of Grb10 in regulating mTOR signaling and thermogenic function in adipose tissue
Role: Co-investigator

RAC Internal Pilot Award Liu M (PI) 03/01/14-02/28/15
Office of Research, UNMHSC
The goal of this project is to determine whether mTORC1 signaling plays important roles in regulating browning of white fat
Role: PI

CoBRE Internal Pilot Award Liu M (PI) 03/01/14-02/28/15
BrAIN Imaging Center, UNM
The goal of this project is to study the effect of trimer form of adiponectin on Ca^{2+} signaling in hypothalamus
Role: PI

Completed research support:

Beginning Grant in Aid 11BGIA7620074 Liu M (PI) 07/01/11-06/30/13
American Heart Association
The goal of this project was to investigate the role of the phosphorylation of APPL1 in regulating adiponectin signaling and action
Role: PI

R01 DK076902 Liu F (PI) 04/01/08-01/31/13
NIH/NIDDK
The goal of this project was to identify ER chaperone DsbA-L as a critical regulator of Adiponectin Oligomerization in adipocytes
Role: Co-investigator

NAME **Robert A. Orlando, Ph.D.**	POSITION TITLE **Associate Professor of Biochemistry and Molecular Biology**		
INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
The University at Albany, Albany, NY	B.S.	1980-1983	Biology/Chemistry
University of California, Irvine, Irvine, CA	Ph.D.	1985-1989	Cellular Biochemistry
The Scripps Research Institute, La Jolla, CA	Postdoctoral	1989-1991	Cell Biology
University of California, San Diego, La Jolla, CA	Postdoctoral	1991-1995	Cell Biology

Employment History:

2014-present	Director, UG Biochem	Univ. of New Mexico	Dept. of Biochem. And Molec Biol.
2006-present	Associate Professor	Univ. of New Mexico	Dept. of Biochem. and Molec Biol.
2000-2006	Assistant Professor	Univ. of New Mexico	Dept. of Biochem. and Molec Biol.
1997-2000	Assistant Professor	UC, San Diego	Dept. of Pathology
1995-1997	Asst. Rsrch. Cell Biol.	UC, San Diego	Dept. of Pathology
1991-1995	Postdoctoral Fellow	UC, San Diego	Div. of Cell. and Molec. Med.
1989-1991	Postdoctoral Fellow	Scripps Rsrch. Inst.	Dept. of Immunology
1988-1989	Research Assistant	Univ. of CA, Irvine	Dept. of Devel. and Cell Biol.
1985-1988	Teaching Assistant	Univ. of CA, Irvine	Dept. of Devel. and Cell Biol.
1982-1983	Univ. Indep. Rsrch.	SUNY, Albany	N.Y. State Health Laboratory

Professional Recognition, Honors:

2014	Recipient of the Ervin W. Lewis Basic Science Teaching Award – UNM School of Med
2013-2015	Leadership in Education and Development – Association of American Medical Colleges
2013	Recipient of the UNM SOM Class of 2015 HIPPO Award
2012	Recipient of the UNM SOM Class of 2014 HIPPO Award
2011	Recipient of the UNM SOM Class of 2013 HIPPO Award
2011	UNM Medical School – Medical Education Scholars Program
1993-1995	National Institutes of Health Postdoctoral Fellowship
1990-1992	National Institutes of Health Training Grant Position
1984-1985	University Fellowship from the University of Chicago
1982-1983	Regional Health Fair Coordinator Service Award - Amer. Cancer Society
1976	Membership in the National Honor Society

Memberships in Professional Societies:

- International Association for Medical Science Educators
- American Association for the Advancement of Science
- American Society of Biochemistry and Molecular Biology

Extramural Professional Activities

2014-present	NIH/NICCAM - Member of ZAT1 PK (29) P01 Centers of Excellence in CAM Research
2013-present	NIH/NICCAM - Member of ZAT1 HS-14 Training, Education and AREA Study Section
2007-present	American Heart Association, Region III Consortium Study Section Member
2007-present	Clinical Medicine: Pathology, Honorary Editorial Board Member
2001-present	NIH/Fogarty International Study Section, ad hoc Member
2001-present	Research Corporation, Tucson, Arizona, ad hoc Member

Selected Peer-reviewed publications from last five years (of 59 total publications)

1. Nitta, C.F., **Orlando, R.A.** NF-κB and mitogen-activated protein kinase (MAPK) signaling pathways regulate cytokine secretion in crosstalk between adipocytes and immune cells. *J Biomol Res and Therapeutics*, submitted, 2015.
2. Ferguson, J. and **Orlando, R.A**. Curcumin Reduces Cytotoxicity of 5-Fluorouracil Treatment in Human Breast Cancer Cells. *J. Med. Food*, 1:1-6, 2014.

3. Card, N., Nitta, C.F., Garver, W.S. and **Orlando, R.A.** Additive effects of β-adrenergic and cytokine signaling on lipolytic activation. *F1000Research*, 3:134, 2014.
4. **Orlando, R.A.** and Garver, W.S. The hidden costs of high fructose corn syrup: challenges to energy balance and fat mobilization from adipose tissue. *J Biomol Res and Therap*, 2:e1, 2013.
5. Nitta, C.F., **Orlando, R.A.** Crosstalk between immune cells and adipocytes requires both paracrine factors and cell contact to modify cytokine expression. *PLoS ONE*, 8(10):e77306, 2013.
6. Garver W.S., Newman S.B., Gonzales-Pacheco D.M., Castillo J.J., Jelinek D., Heidenreich R.A., and **Orlando R.A.** The genetics of childhood obesity and interaction with dietary macronutrients. *Genes Nutr.* 8(3):271-87, 2013.
7. Garver W.S., Newman S.B., Gonzales-Pacheco D.M., Castillo J.J., Jelinek D., Heidenreich R.A., and **Orlando R.A.** The genetics of childhood obesity and interaction with dietary macronutrients. *Genes Nutr.* 8(3):271-87, 2013.
8. **Orlando, R.A.**, Gonzales, A.M., Royer, R.E., Deck, L.M., Vander Jagt, D.L. A chemical analog of curcumin as an improved inhibitor of amyloid Abeta oligomerization. *PLoS*, 7(3):e31869, Epub, 2012.
9. Sun, Y., Scavini, M., **Orlando, R.A.**, Murata, G.H., Servilla, K.S., Tzamaloukas, A.H., Schrader, R., Bedrick, E.J., Burge, M.R., Abumrad, N.A., Zager, P.G. Increased CD36 expression signals monocyte activation among patients with type 2 diabetes. *Diabetes Care*, 33(9):2065-7, 2010.

Grants and Other Awards

Grant Number: None assigned 9/1/2013-8/31/2014
Granting Institution: La Tierra Sagrada Society Board of Directors
Direct Costs: $14,598 Total Costs (direct + indirect): $14,598
Title: Improving Body Mass Index and Insulin Resistance in Emerging Adults
Principal Investigator: Alberta Kong, M.D. (R.A. Orlando, Co-Investigator)

Research Allocation Committee Intramural Funding 2/1/2009-1/31/2011
University of New Mexico, School of Medicine
Direct Costs: $25,000 Total Costs (direct + indirect): $25,000
Title: Is expression of fatty acid handling proteins in human adipose associated with clinical parameters of metabolic syndrome?
Principal Investigator: Robert A. Orlando, Ph.D.

Grant Number: none assigned 12/1/2009-11/30/2015
Granting Institution: UNM-STC Funding Award
Direct Costs: $25,000 Total Costs (direct + indirect): $25,000
Title: IBD and Anti-inflammatory Herbal Teas
Principal Investigator: Robert A. Orlando, Ph.D.

Grant Number: 1R21AG027794-01 2/1/2007-1/31/2010
Granting Institution: NIH, National Institute of Aging
Direct Costs: $250,000 Total Costs (direct + indirect): $369,814
Title: Curcumin-based Analogs as Improved Inhibitors of Abeta Aggregation
Principal Investigator: Robert A. Orlando, Ph.D.

<u>Pre-baccalaureate Student Mentoring:</u>

Perenkita Mendiola PREP Student Rsch	7-2014 to current Biochemistry Major	Accepted into UNM Biomedical Sci PhD Program
Maria Herrera Student Rsch	1-2013 to 5-2013 Biochemistry Major	Attending Baylor Masters Program, 2014
Oscar Munoz Student Rsch	1-2010 to 5-2011 Biology Major	Graduated, May 2011

Morgan Pruitt Student Rsch	1-2009 to 5-2013 Biology Major	Graduated, May 2013
Katie Thomas Honors Rsch	5-2008 to 5-2009 Biochemistry Major	Graduated Vanderbuilt Ph.D. program, 2014
Eric Vallejo Student Rsch	5-2007 to 12-2008 Biology Major	Graduated, May 2010
Mark Anderson Honors Rsch	9-2007 to 5-2008 Biochemistry Major	Attending UNM Medical School, 2009
Amelia Hilgart IMSD student	9-2006 to 5-2007 Biochemistry Major	Graduated, May 2010
Anabel Guerra Student Rsch	9-2006 to 5-2007 Biology Major	Graduated, December 2008
Jeannette Ferguson Honors Rsch	9-2006 to 5-2007 Graduated May 2007	Graduated UNM Medical School, 2011
Geneva Williams IMSD student	5-2005 to 5-2006 Biochemistry Major	Graduated, May 2008
Desiree Martinez Student Rsch.	2-2005 to 5-2006 Biochemistry Major	Expected graduation, December 2008
Britny Candia MARC student	12-2003 to 12-2005 Biochemistry Major	Attending Ph.D. program, Oregon Health Sciences Center
Amy Baca Student Rsch.	9-2002 to 5-2004 Biochemistry Major	Graduated UNM Medical School, 2015
Stephanie Zamora Pathways Student	6-2003 to 9-2003 Graduated May 2004	Graduated UNM PharmD program, 2008
Emily McLeod Student Rsch.	9-2002 to 9-2003 Continuing Education	Graduated UNM Nursing Program, 2005
Erica Atkins MBRS/MARC student	2-2002 to 5-2004 Graduated May 2004	Graduated UNM Medical School, 2008
Isaac Olguin MBRS student	8-2001 to 5-2002 Graduated May 2002	Graduated UNM PharmD program, 2006
Yvonne Lopez MBRS student	12-2000 to 5-2002 Graduated May 2002	Graduated Masters of Public Health Program Emory University, Atlanta, GA
Elizabeth Abeyta MBRS student	12-2000 to 5-2001 Graduated May 2001	Position at Genzyme Corp., Santa Fe, NM
Vivian Benoit Student Rsch.	1-1999 to 5-2000 Graduated May 2000	Graduated Ph.D. Program, U of Mass, 2005 Univ. of Massachusetts, Worcester, MA

MARCY P. OSGOOD, Ph.D.
Associate Professor, Assistant Dean of Pre-Clinical Education
MSC08 4670, 1 University of New Mexico, Albuquerque, NM 87131-0001
505-272-8184 mosgood@salud.unm.edu

Professional Preparation:

Institution	Major Degree and Year
Bates College	Biology BS, 1977
Rensselaer Polytechnic Institute	Biology MS, 1984; PhD, 1987
Rensselaer Polytechnic Institute	Biochemistry, Postdoctoral Fellow, 1987-89
Clarkson University	Molecular Biology Research Associate 1989-91

Academic/Professional Appointments:

- Assistant Dean of Pre-Clinical Education, July 2012-, Division of Undergraduate Medical Education, University of New Mexico School of Medicine, Albuquerque, NM
- Associate Professor, Undergraduate Program Director, July 2008-present, Department of Biochemistry and Molecular Biology, UNM Health Sciences Center, Albuquerque, NM
- Assistant Professor, July 2002-2008, Department of Biochemistry and Molecular Biology, University of New Mexico Health Sciences Center, Albuquerque, NM
- Lecturer III, January 1994 – June 2002, Biology Department, University of Michigan, Ann Arbor, MI
- Assistant Professor, August 1991-December 1993, Department of Physical Sciences, Albany College of Pharmacy, Union University, Albany, NY

Recent Publications

- E. Offerdahl, J. Momsen, **M. Osgood**. 2014. Commentary: PhDs in Biochemistry Education – 5 years later. Biochemistry and Molecular Biology Education.
- K.M. Aguirre, T.C. Balser, T. Jack, K. E. Marley, K. G. Miller, **M. P. Osgood**, P. A. Pape-Lindstrom, and S. L. Romano. 2013. PULSE Vision & Change Rubrics. CBE Life Sci Educ.Vol 12:579-581 http://www.lifescied.org/content/12/4/579.full.html?etoc
- **Marcy Osgood** and Karen Ocorr. The Absolute, Ultimate Guide to Lehninger Principles of Biochemistry by Nelson and Cox, 6th Edition, 2013. W. H. Freeman and Company, 41 Madison Avenue, New York, NY. 10010. 675 pages.
- National Research Council. *Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering.* Washington, DC: The National Academies Press, 2012. **(M. P. Osgood, Authoring Committee Member)**
- W. L. Anderson, C. A. Sensibaugh, **M. P. Osgood**, and S. M. Mitchell. 2011. What really matters: assessing individual problem-solving performance in the context of biological sciences. International Journal for the Scholarship of Teaching and Learning Vol. 5 (1). http://academics.georgiasouthern.edu/ijsotl/v5n1/articles/Mitchell_et_al/index.html
- K. J. Parra, **M. P. Osgood** and D. L. Pappas Jr. 2010. A research-based laboratory course designed to strengthen the research-teaching nexus. Biochemistry and Molecular Biology Education Vol. 38:1 pp. 172–179.
- **M. P. Osgood**, S. M. Mitchell, and W. L. Anderson. 2008, "Tracking student problem-solving strategies in online PBL case discussions: a method to target interventions to individuals and groups most in need of help." Invited paper for the Board on Science Education, The National Academies. http://www7.nationalacademies.org/bose/PP_Commissioned_Papers.html
- W. L. Anderson, S. M. Mitchell, and **M. P. Osgood**. 2008. Gauging the gaps in student problem solving skills: assessment of individual and group use of problem-solving strategies using online discussions. CBE Life Scences Education 7(2): 254-262.

Invited Lectures and Symposia:

- 2014, April 29 "Speaking DBERese" Invited presentation, ASBMB annual meeting (EB), San Diego, CA
- 2013, December 5 "Group *vs* Individual Problem-Solving Strategies." Invited presentation, Department of Biology, University of Georgia, Athens, GA.
- 2013, September 28 "Where are we with DBER now? Some different approaches to moving forward." Invited plenary presentation, Regional Workshop for Discipline Based Education Researchers, Albuquerque, NM
- 2013, February 23 "Group *vs* Individual Problem-Solving Strategies." Invited Keynote presentation, ASBMB RCN UBE Workshop, University of Alabama, Tuscaloosa, Alabama.
- 2012, November 1 "Group *vs* Individual Problem-Solving Strategies." Invited presentation, Department of Geology, Cal State Northridge, CA.
- 2012, September 20 "Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering." UNM STEM DBER Seminar Series.
- 2012, July 16 "Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering." Plenary Talk, with Susan Singer and Bill Wood. 2nd Annual meeting of SABER, Minneapolis Minnesota.

Synergistic Activities

- 2014 Stage I reviewer, HHMI Professors Competition
- 2012-2014 Partnership for Undergraduate Life Sciences Education (PULSE) Fellow. The PULSE program is a joint initiative of the National Science Foundation, Howard Hughes Medical Institute, and the National Institutes of Healt
- 2011-present, member, Biology Directors' Consortium
- 2010-present, founding member, Society for Advancement of Biology Education Research
- 2010-2012, authoring member, The National Academies, National Research Council, Board on Science Education Committee: Status, Contributions, and Future Directions of Discipline-Based Education Research
- 2009-2012, Regional Field Leader, FIRST IV: Faculty Institutes for Reforming Science Teaching NSF CCLI - Phase III (DUE 618501),. D. Ebert-May (PI), Terry Derting (co-PI).
- 2009-2010, Workshop presenter and career mapping facilitator, Association of American Medical Colleges, Early Career Women Faculty Professional Development Seminar, Washington, DC..

Recent Grant and Contract Funding

EPSCOR Diversity Innovation Working Group Proposal: **Determining the Drivers of STEM Educational Success in New Mexico: Creation of the First Long Term Educational Research (LTEdR) Site.**
Co-PIs: Josè Herrera (Western NM Univeristy), Marcy Osgood (UNM), and Michèle Shuster (NMSU)
Funded March 1, 2014

DUE-1316636 May 15, 2013-April 30, 2014
NSF-EAGER $17,674
HSC-18800, Meeting: Regional Workshop for Discipline Based Education Researchers
Role: Co-PI with Martina Rosenberg

DUE-1043079 6/01/2011-5/31/13; no-cost extension 5/14
NSF-Transforming Undergraduate Education in the Sciences $249,998
Designing Interdisciplinary Tools to Assess Diverse Learners' Approaches to Problem-Solving: a Cross-State Collaboration in New Mexico
Role: PI

KARLETT J. PARRA

PERSONAL STATEMENT. ***Research***: Dr. Parra investigates the molecular mechanisms that regulate function and orchestrate assembly and regulation of V-ATPase proton pumps with emphasis on the mechanisms that (1) sustain cellular pH homeostasis and (2) link glucose metabolism and V-ATPases function. Her goals include: i) defining the contributions of V-ATPase-mediated pH homeostasis in health and disease; ii) identifying V-ATPase-dependent pathways and cellular events that could be used to selectively target V-ATPase pumps to control processes relevant to disease; and iii) establishing the molecular mechanisms that regulate activity and assembly of V-ATPase proton pumps. In pursue of these goals her lab uses three model systems (cancer cell lines, *S. cerevisiae, C. albicans*). ***Student-Training*** Her current research group consists of 1 Assistant Research Professor, 1 Post-doctoral Fellow, 2 Ph.D. student, and 3 undergraduate students. She has previously mentored 4 Post-doctoral Fellows, 1 Ph.D. student 3 M.S. students, 44 undergraduate students, and 6 high school students. Dr. Parra's trainees have received 12 competitive undergraduate travel awards to present their findings in national meetings, 14 Research Achievement Awards, 1 Jack Kent Cooke Scholarship Award, 3 Goldwater Scholarship Awards, and numerous departmental awards. ***Undergraduate BMB Program Instruction***. Dr. Parra is responsible for one 3-week block in the course biochemistry of disease and research mentoring.

A. EDUCATION

Universidad Simon Bolivar, Caracas,Venezuela	B.S.	May 1990	Biology
Universidad Simon Bolivar, Caracas,Venezuela	M.S.	July 1992	Biochemistry
SUNY Upstate Medical University, Syracuse, NY	Ph.D.	May 1998	Biochemistry & Mol. Biol.

C. POSITIONS AND HONORS

Professional Appointments

Dec. 1997 - Aug.1999	**Post-Doctoral Research Associate.** Dr. Patricia M. Kane, Dept. of Biochemistry and Molecular Biology, SUNY Upstate Medical University, Syracuse, NY.
Aug. 1999 - June 2000	**Visiting Assistant Professor.** Dept. of Biology, Le Moyne College, Syracuse, NY.
Aug. 2000 - Aug. 2004	**Assistant Professor.** Dept. of Chemistry, Ball State University, Muncie, IN.
Aug. 2004 - Dec. 2006	**Associate Professor.** Dept. of Chemistry, Ball State University, Muncie, IN.
Jan. 2007 - July 2010	**Assistant Professor**. Dept. of Biochemistry and Molecular Biology, School of Medicine, University of New Mexico, Albuquerque, NM.
July 2010 - present	**Associate Professor**. Dept. of Biochemistry and Molecular Biology, School of Medicine, University of New Mexico, Albuquerque, NM.
July 2012 - present	**Chair**, Dept. of Biochemistry and Molecular Biology, School of Medicine, University of New Mexico, Albuquerque, NM.

Leadership and Honors

1983 - Outstanding Graduate Award, High School Liceo Gustavo Herrera, Caracas, Venezuela.
1990-1992 - Graduate Scholarship, Consejo Nac. de Investig. Científicas y Tecnológicas, Venezuela.
1998 - The John Bernard Henry, MD. Endowed Scholarship Award, Graduate School of SUNY.
2001 - Chair Chemistry Session, Indiana Academy of Sciences Fall Meeting
2003 - *National Science Foundation Faculty Early Career Development (CAREER) Award*.
2005 - The Ball State University 2004 -2005 Award for Outstanding Junior Faculty Member.
2006 - Gordon Research Conference in Molecular and Cellular Bioenergetics, Discussion Leader.
2010 - Faculty of Color Award for Research by the Project of New Mexico Graduates of Color.
2011 - Faculty of Color Award for Mentoring by the Project of New Mexico Graduates of Color.
2011 - Session Chair "V-ATPases: Structure, Function and Disease" at the Bioenergetics Gordon Research Conference, Proctor Academy, NH, June.
2013 - Vice Chair, *2013 Bioenergetics Gordon Research Conference, NH, June.*
2014-2019 - *Journal of Biological Chemistry*, Editorial Board
2015 - *Chair, Bioenergetics Gordon Research Conference, NH, June 21 – 26*

Travel Awards

- *MARC Travel Award.* FASEB Summer Research Conference on Transport ATPases: From Genomics to

Mechanisms and Relevance to Disease (2001, 2003**,** 2005, 2007, 2010).
- *Alfred P. Sloan Foundation*. Summer Gordon Research Conference in Mol. and Cell. Bioenergetics (2003)
- *ASBMB*, Undergraduate Faculty Travel Award*.* EB Annual Meeting (2002, 2004 - 2006).

Reviewer

Grants: (1) *The Wellcome Trust*, London, UK, Ad Hoc reviewer for International Research Fellowships (2003). (2) Advisory Panel for Molecular Biochemistry*, NSF*, Arlington, VA (2004, 2009), (3) Ad Hoc Reviewer *NSF* Research Proposals, 2004, 2006-2008. (4) *NIH* Special Emphasis Panel/Scientific Review Group HTS Assays/Probes for drug and probe discovery, Washington DC**,** June 26-27. (5) *National Institute of Health, Internet Assisted Review* (IAR). *Special Emphasis Panel (SEP),* NIH Fellowship: Oncological Sciences" (ZRG1FO9B-P(20). Ruth L. Kirschstein National Service Awards for Individual Predoctoral and Postdoctoral Fellows (2013, 2014). Journals: *Ad Hoc* for *FEBS Lett.*, *Gene*, *Biochemistry*, *Mol. Memb. Biology*, *J. Exp. & Clin. Cancer Res., Anal. Biochem, Nature, International J. of Mol. Sciences.*

.PUBLICATIONS (Past 5 Years) (*Undergraduate student* **)**

Ediger B., S. D. Melman, D. L. Pappas Jr., *M. Finch*, J. Applen, and **Parra KJ**. **"**The Tether Connecting Cytosolic (N-terminus) and Membrane (C-terminus) Domains of Yeast V-ATPase Subunit a (Vph1) is Required for Assembly of V_o Subunit d". *J. Biol. Chem.*,284:19522-19532 (2009). *PMCID*: PMC2740578

Parra KJ., M. Osgood, and D. Pappas Jr**.** "A Research-Based Biochemistry Laboratory Course Designed to Strengthen the Research-Teaching Nexus." *Biochem. Mol. Biol. Ed.*38: 172-179 (2010).

Rebecca M. Johnson, Chris Allen, Sandra D. Melman, Anna Wallar, Larry A. Sklar, and **Parra KJ**. "Inhibitors of Yeast V-ATPase Proton Pumps Identified by HTS Flow Cytometry", *Anal. Bioch.* 1 5:398(2):203-211 (2010). *PMCID*: PMC2853757.

Chan CY, Prudom C**, Raines SM**, Charkhzarrin S, Melman SD, De Haro LP, Allen C, Lee SA, Sklar LA, **Parra KJ**. "Inhibitors of V-ATPase proton transport reveal uncoupling functions of the tether linking cytosolic and membrane domains of the Vo subunit a (Vph1p)". *J. Biol. Chem*. (2012). 287(13):10236-50. PMID: 22215674. ** *equal contribution*

Parra, KJ. "Vacuolar ATPase (V-ATPase) a Model Proton Pump for Antifungal Drug Discovery", In *Emerging Strategies for Antimicrobial Drug Discover*y. GP Tegos and E. Mylonakis (Ed.), CABI, Oxfordshire, UK. *In Press.*

Michel V., Licon-Munoz Y., Trujillo K., Bisoffi M., and **Parra KJ.** ""Inhibitors of Vacuolar ATPase Proton Pumps Inhibit Human Prostate Cancer Cell Invasion and Prostate-Specific Antigen Expression and Secretion"". *International Journal of Cancer*. *In Press.*

Raines SM, Rane H, Bernardo SM, *Binder JL, Lee SA*, **Parra KJ.** "Deletion of V-ATPase Voa isoforms clarifies the role of vacuolar pH as a determinant of virulence-associated traits in C. albicans". *J. Biol. Chem*.288(9):6190-201 (2013) PMID: 23316054

Rane HS, Bernardo SM, Raines SM, *Binder JL*, **Parra** KJ, Lee SA. Candida albicans VMA3 is necessary for V-ATPase assembly and function and contributes to secretion and filamentation. Eukaryot Cell. Oct;12(10):1369-82. (2013) PMID: 23913543

Hayek SR, Lee SA, **Parra KJ**. Advances in targeting the vacuolar proton-translocating ATPase (V ATPase) for anti-fungal therapy. Front Pharmacol. 5:4 (2014) PMID: 24478704

Parra KJ., Chan Y.C., Chen J. Yeast V-ATPase Regulation by Disassembly and Re-Assembly: One Structure and Multiple Signals. *Eukaryot Cell.* 13(6):706-14 (2014).

Chan CY and **Parra Karlett J**. Yeast Phosphofructokinase-1 Subunit Pfk2p is Necessary for pH Homeostasis and Glucose-Dependent V-ATPase Reassembly. *J. Biological Chemistry,* 289(28):19448-57 (2014).

Rane HS, Bernardo SM, Hayek SR, *Binder JL*, **Parra KJ**, Lee SA. The contribution of Candida albicans vacuolar ATPase subunit V1B encoded by VMA2 to stress response, autophagy, and virulence is independent of environmental pH. *Eukaryot Cell*. Sep;13(9):1207-21.(2014). PMID: 25038082

Kulkarny VV, Chavez-Dozal A, Rane HS, Jahng M, Bernardo SM, **Parra KJ**, Lee SA. Quinacrine Inhibits Candida albicans Growth and Filamentation at Neutral pH. *Antimicrob Agents Chemother*. (2014) 58(12):7501-9. PMID: 25288082

C. RESEARCH SUPPORT (Past 5 years)

Ongoing Research Support

1R01GM086495, NIH/NIGMS **PI: Parra K.J.** 08/01/2009 - 05/31/2014
Title: V-ATPase H+ Pump Regulation in Fuel Energy Selection through - 05/31/2015 (NCE)
Overall goals: The major goals of this project are to identify the metabolic signals that communicate glucose/lipid availability to V-ATPase pumps and to establish the biochemical mechanisms by which glucose regulates V_1V_o assembly.

14PRE19020015, AHA_SWA **Sponsor: Parra K.J.** 01/01/2014 – 12/31/2015
PI: Chan YC
Title: Beta-subunit of the yeast PFK complex modulates glucose-dependent reassembly of V-ATPase pumps.
Overall goals: Pre-doctoral Fellowship Award. The major goal of this project is to dissect the role of individual PFK subunit for V-ATPase regulation

Completed Research Support

2P20RR016480-09, NCRR/NIGMS **PI: Arterburn J** 05/01/2009 - 02/28/2014
*NM-INBRE UNM: Subcontrac*t, Role: Investigator
Title: V-ATPase Pumps in Prostate Cancer: Regulatory and Functional Studies
Overall goals: To study V-ATPase expression and functions in prostate cancer cell lines.

1R03DA031666, NIH/NIDA **PI: Parra K.J.** 01/01/2011 - 12/31/2013
Title: Flow Cytometry HTS for Small Molecules that Regulate V-ATPase Proton Transport in Yeast.
Overall goals: HTS of the Molecular Libraries Probe Centers Network (MLPCN) library of small molecules to identify V-ATPase inhibitors.

NIH-NIGMS; NRSA, (F32) Award **PI: De Haro L.** 03/1/2012 - 02/28/2014
Post-Doctoral Fellowship, Role:: Sponsor
Title: The Role GADPH in the Regulation of V-ATPase Function (*Relinquished)*
Overall goals: To study cross-talk of GAPDH to glucose-dependent assembly of V-ATPase

1R01GM086495, NIH/NIGMS **PI: Parra K.J.** 01/01/2011 - 05/31/2012
Pre-Baccalaureate Diversity Research Supplement
Overall goals: To study *vma6* mutants of V-ATPase pumps in yeast.

1R01GM086495, NIH/NIGMS **PI: Parra K.J.** 02/04/2010 - 02/03/2012
Postdoctoral Diversity Supplement (Dr. Leyma DeHaro)
Overall goals: Dr. De Haro will study regulation of V-ATPase pumps by glycolysis in yeast.

UNM-Cancer Center **PI: Parra K.J.** 04/01/2011 to 08/31/2011
Post-Doctoral Fellowship Matching Funds (Dr. Vera Michel)
Title: V-ATPase Pumps in Prostate Cancer
Overall goals: Dr. Michel will study the link between V-ATPase and the PSA-AR axis in prostate cancer cell lines.

1R01GM086495, NIH/NIGMS **PI: Parra K.J.** 01/01/2010 - 12/31/2012
Pre-Baccalaureate Research Supplement (Joshua Sheak)
Title: V-ATPase H+ Pump Regulation in Fuel Energy Selection
Overall goals: To characterized V-ATPase mutants in yeast.

Grant-in-Aid, AHA **PI: Parra K.J.** 07/01/2008 – 06/30/2010
(*Relinquished, July 2009)*
Title: "Metabolic Interplay between V-ATPase Pumps and Nutrients"
Overall goals: To identify nutritional markers that control V1Vo function.

CAREER Award, NSF **PI: Parra K.J.** 03/01/2003 – 03/31/2009
Title: "Structural-functional Analysis of The V-ATPase Subunit d By Site-directed Mutagenesis and Overexpression in Yeast."
Overall goals: To examine the role of a component of the membrane V_o domain, subunit d, on V-ATPase function while effectively integrates research with the undergraduate biochemistry curriculum.

Martina Rosenberg

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Educational History:

Ph.D. 2000, Biochemistry
Department of Biology, Chemistry and Pharmacy,
Freie Universität Berlin, Germany

M.Sc. 1992, Biochemistry
Department of Chemistry, Institute of Biochemistry
Freie Universität Berlin, Germany

B.Sc. 1989, Biochemistry
Department of Chemistry, Institute of Biochemistry
Freie Universität Berlin, Germany

Employment History - principal positions since the terminal degree

Assistant Professor 7/12-present
Department of Biochemistry and Molecular Biology, University of New Mexico
Albuquerque, NM

Research Scientist 1/06-5/12
Department of Neurosciences, University of New Mexico
Albuquerque, NM

Research Scientist 5/00-7/05
College of Pharmacy, University of New Mexico
Albuquerque, NM

Memberships in Professional Societies

American Society for Biochemistry and Molecular Biology (**ASBMB**)
Society for the Advancement of Biology Education Research (**SABER**)
Faculty for Undergraduate Neuroscience (**FUN**)
Society for Neuroscience (**SfN**)
Research Society on Alcoholism (**RSA**)

Other extramural professional activities

- NM EPSCoR funded working group, invited to plan statewide collaborative proposal, Spring 2014
- **think tank participant** NSF Biology Phase I IdeasLab, 2014
- **Organizer** for Workshop for discipline-based education researchers in NM, 2013
- National Academies Summer Institute on Undergraduate Education in Biology, (2013) participant, **facilitator** 2014)
- **Reviewer** for CourseSource open-access Journal, 2013, 2014
- **Reviewer** for Tymoczko, Biochemistry, a short course, 3rd edition, 2014
- American Society of Microbiology (ASM) **Research Residency in Education Scholar**, (2013-14 cohort)

Selected original research or scholarly articles in refereed journals:

Rosenberg MJ, Abel, E, Garver, WS and Osgood, MP. Taking the Hassle out of Hasselbalch. CourseSource *In review*

Varaschin, RK, **Rosenberg, MJ,** Hamilton DA, Savage, DD. Differential effects of the histamine h3 receptor agonist methipip on dentate granule cell excitability, paired-pulse plasticity and lont-term potentiation. Alcohol Clin Exp Res. 2014 Jul;38(7):1902-11. doi: 10.1111/acer.12430. Epub 2014 May 12. PMID: 24818819

Staples, MC, **Rosenberg, MJ**, Porch, M, Allan, NASavage, DD. Impact of Combined Prenatal Ethanol and Prenatal Stress Exposure on Anxiety and Hippocampal-sensitive Learning in Adult Offspring Alcoholism: Clinical and Experimental Research, 37(12):2039-47. doi: 10.1111/acer.12190. Epub 2013 Aug 5. PMID: 23915215

Savage DD, **Rosenberg MJ**, Wolff CR, Akers KG, El-Emawy A, Staples MC, Varaschin RK, Wright CA, Seidel JL, Caldwell KK, Hamilton DA. Effects of a novel cognition–enhancing agent on fetal ethanol-induced learning deficits. Alcohol Clin Exp Res. 34(10):1793-801, 2010

Hamilton DA, Candelaria-Cook FT, Akers KG, Rice JP, Maes LI, **Rosenberg M**, Valenzuela CF, Savage DD. Patterns of social-experience-related c-fos and Arc expression in the frontal cortices of rats exposed to saccharin or moderate levels of ethanol during prenatal brain development. Behav Brain Res. 6;214(1):66-74. 2010

Varaschin RK, Akers KG, **Rosenberg MJ**, Hamilton DA, Savage DD. Effects of the cognition-enhancing agent ABT-239 on fetal ethanol-induced deficits in dentate gyrus synaptic plasticity. J Pharmacol Exp Ther. 334(1):191-8, 2010

Rosenberg MJ, Wolff CR, El-Emawy A, Staples MC, Perrone-Bizzozero NI, Savage DD. Effects of moderate drinking during pregnancy on placental gene expression. Alcohol., 44(78):673-90, 2010

Hamilton DA, Akers KG, Rice JP, Johnson TE, Candelaria-Cook FT, Maes LI, **Rosenberg M**, Valenzuela CF, Savage DD. Prenatal exposure to moderate levels of ethanol alters social behavior in adult rats: relationship to structural plasticity and immediate early gene expression in frontal cortex. Behav Brain Res. 5;207(2):290-304, 2010

Presentations at professional meetings:

Invited Oral Presentations

" The role of Discipline-based Education Research (DBER) in preparing students in health professions "
ASBMB Special Symposia Series: Transforming Undergraduate Education in Molecular Life Sciences, July 30-Aug 2, 2015 – Saint Joseph, MO

"Classroom innovation: Metacognition square"
Institutional Research and Academic Career Development Awards (IRACDA) National Conference, Albuquerque , NM, June 8-10, 2014

"Laying the Foundation: Learning Scientific Thinking, Problem Solving and Strategies for Transition to College" 9th Annual Success in the Classroom, Albuquerque, NM, Feb 14, 2014

"Rethinking the undergraduate neurobiology course:
fostering student engagement in the class room". American Society for Biochemistry and Molecular Biology (ASBMB), Washington, D.C., 2011

Panelist: Career forum- Getting your first Job as DBER. Society for the Advancement of Biology Education Research (SABER) Annnual meeting. Minneapolis. MN 2014

Most recent abstract:

Rosenberg, MJ, Knottenbelt SZ, Whalen, L. Development of student metacognition and progression of expertise across chemistry and biochemistry classes. Experimental Biology Annual Meeting, San Diego, CA, April 26-30, 2014

Grant and Awards

NSF-IUSE #7445825
Co-PI and subaward ($69135)
"BIO Phase I Ideas Lab: HUB&QR: Heuristic Undergraduate Biology & Quantitative Reasoning" *pending*

UNM-SEAC ($10,000)
Divide and Conquer: On demand anatomy in the integrated medical school curriculum, 2014

Local investigator of subaward ($15,000) originating from
NSF-TUES #1022789 (Project director Dr. Barry Stein):
Critical Thinking Assessment Test Dissemination, 2014

NSF-TUES II ($16,492)
Workshop: Regional Workshop for discipline-based education researchers, 2013
Principal investigator: Martina Rosenberg, Co-PI: Marcy Osgood

Teaching / Education

Mentoring, Regent's Undergraduate Scholar Mentor for Nicole Graham
Ph.D. student mentoring: Miranda Staples as part of her requirement of an independent education emersion project for the 'Certificate Program in University Science Teaching'. She graduated in the spring of 2013.

Teaching

- 2015, Spring Biochemistry of Disease, **BIOC 464.** Course Director of team-taught course, Instructor, Unit design
- Since 2012, every Spring and Fall, Intro to Biochemistry, **BIOC 423**. Instructor, Restructured the existing course according to the flipped classroom model

Mentoring of Faculty in Education

- Co-facilitator of Teacher Education Development (TED) Workshop, Designing Learning that lasts: Evidence-based approach to curriculum development, December 4, 2012,
- **co-facilitator and presenter**: "Generating Solutions in Introductory-level Science Classes", Workshop at NM Highlands University (Nov 16, 2013)

Service

- **University, SOM, HSC, department committees**
  - BSGP curriculum review committee, since Summer 2014
  - BMB Undergraduate Program task force Spring –Falll 2014
  - BMB planning committee for 50th anniversary of the UNM School of Medicine, Summer 2014
  - Since summer 2012, Committee for curriculum and student progress, BA/MD program,
- **Local, state, regional, national committees**
  - Steering committee (abstract submission and review) for the Society for the Advancement of Biology Education (SABER), 2013, 2014
- **Advisor for Biochemistry Majors**

Name and Terminal Degree(s): Vallabh (Raj) Shah, PhD, FASN –Molecular Epidemiologist

Educational History:

Senior Fellow, 2012, Appointed -New Mexico Center for the Advancement of Research, Engagement, & Science on Health Disparities (NM CARES HD)
FASN 2005, Appointed –Fellow of American Society of Nephrology, ASN
Trainee MPH 1994-2002 University of New Mexico - special emphasis on rural health
Post-Doctorate 1986, Summa Medical Corporation sponsored by NCI/NIH, Albuquerque, NM – Immuno-genetics
Ph.D. 1984, GAU University, Anand, India - Preclinical Science (Parasitology / Microbiology)
M.Sc. 1979, M.S. University, Baroda, India - Reproductive Physiology and Endocrinology - Zoology
B.Sc. 1977, M.S. University, Baroda, India - Biology major – Chemistry minor

Employment History:

11/12-Present	**Senior Fellow** -New Mexico Center for the Advancement of Research, Engagement, and Science on Health Disparities (NM CARES HD).
07/11-Present	**Co- Leader** / Member -Community Engagement core of UNMHSC CTSC and member of "Key Function Committee" group in community engagement for the CTSA consortium.
07/13-Present	**Professor** –tenured -Department of Internal Medicine and Dept of Biochemistry and Molecular Biology, UNMHSC, Albuquerque, New Mexico
06/10-06/2013	**Associate Professor** –tenured -Department of Internal Medicine and Dept of Biochemistry and Molecular Biology, UNMHSC, Albuquerque, New Mexico
06/04-2010	**Associate Professor** –tenure track -Department of Internal Medicine and Dept of Biochemistry and Molecular Biology, UNMHSC, Albuquerque, New Mexico
06/02-2004	**Associate Professor**-research, Department of Internal Medicine, UNMHSC, Albuquerque, New Mexico
06/90-6/02	**Assistant Professor**-research, Department of Internal Medicine, UNMHSC, Albuquerque, New Mexico

Professional recognition honors:

- 2014 6th Annual Excellence in Research Award in Population Science, Health Science Center, University of New Mexico
- 2011 Sarah Belle Brown Community Service Award, University of New Mexico

Invited presentation done at Local, National and International levels - past two years

CME presentation at the Indian Health Services hospital to clinical staff as a ground rounds about Reducing Health Disparity in Our Native Americans - Zuni Health Initiative Approach. Dec 17th, 2014, Zuni Pueblo, NM; **CME presentation** at the first annual mountain west clinical and translational research infrastructure network symposium. June 23-25, 2014 Las Vegas, NV about CHR's role in diabetes care; **Invited to be a Moderator** for "Health Behaviors and Behavioral Sciences" Scientific session of NIH, NIGMS Biennial National IDeA Symposium of NISBRE. June 16-18, 2014, Washington, DC; **CME presentation** at the NIH, NIGMS Biennial National IDeA Symposium of NISBRE. June 16-18, 2014, Washington, DC about Patient Activation measure in diabetes care; **Presentation at** the 74th scientific meeting of American Diabetes Association. June 13-17, 2014, San Francisco, CA about Gut Microbiome in diabetics; **Invited presentation** to 2014 Academic Science Education and Research Training (ASERT) program of IRACDA National Conference –"Logistics of Community Partnered Research in Reducing Health Disparity -Zuni Model" June 8-10, 2014; **CME Invitational Keynote address** to Annual Research Day, School of Nursing, College of health and social Services, New Mexico State University – "Reducing Health Disparity in Our Native Americans – Zuni Approach. May 21st, 2014; **CME Presentation** for New Mexico health resources' health provider retreat, Taos, NM, 2013; Invited presentation about home base kidney care at the National Indian Health Board meeting, DC, 2013;

Invited presentation about current status of CKD at the annual meeting of American federation for medical research, Carmel, CA 2013

Original research or scholarly articles in refereed journals For past 2 years:

1. Robert C. Williams…Vallabh O. Shah… and Robert L. Hanson and the FIND Research Group. Individual Genetic Ancestry in the Family Investigation of Nephropathy and Diabetes (FIND): Balancing Information for Poly-Ancestry (>2) Models for Stable Estimates. PLOS1 Nov 2014. **In Press**
2. Vallabh Shah, Casey Carroll*, Ryan Mals*, Donica Ghahate, Jeanette Bobelu, Phillip Sandy, Kathleen Colleran, Ronald Schrader, Thomas Faber, Mark Burge. A Home-based Educational Intervention Improves Patient Activation Measures and Diabetes Health indicators Among Zuni Indians. Plos1 Feb 2015, **In Press**
3. Vallabh O. Shah, Donica M Ghahate, Jeanette Bobelu, Phillip Sandy, Sara Newman*, Deborah L. Helitzer, Thomas Faber, and Philip Zager. Identifying Barriers to Healthcare to Reduce Health Disparity in Zuni Indians Using Focus Group Conducted by Community Health Workers. Clin Trans Sci 2014, 7:6-11, PMID:24528897
4. Sara Newman*, Terri Cheng*, Donica M Ghahate, Jeanette Bobelu, Phillip Sandy, Thomas Faber and Vallabh O. Shah. Assessing Knowledge and Attitudes of Diabetes in Zuni Indians using a Culture-Centered Approach. PLoS One. 2014 Jun 11;9(6):e99614, PMID:24919064
5. Shah VO, Townsend RR, Feldman HI, Pappan KL, Kensicki E, Vander Jagt DL. Plasma metabolomic profiles in different stages of CKD. Clin J Am Soc Nephrol 2013 Mar;8(3):363-70. PMID: 23220422
6. Farook Thameem… Vallabh O. Shah … and John R. Sedor on behalf of the Family Investigation of Nephropathy and Diabetes Research Group. A genome-wide search for linkage of estimated Glomerular Filtration Rate (eGFR) in the Family Investigation of Nephropathy and Diabetes (FIND). PLos, 2013 Dec; 8(12):e81888. PMID:24358131

Student Mentoring -abstracts and/or oral presentations at professional meetings:

- Frank A. Sanchez*, Cole Nelson*, Li Luo and Vallabh Shah- Demographics, Clinical Characteristics and Quality of life in Homeless Population at Albuquerque Opportunity Center -2014 – Presented at the American College of Physician Meeting, Oct 6th, 2014
- Stacy Lambeth*, TreChelle Carson*, Janae Lowe* and Vallabh Shah. Translational Research into Human Gut Microbiota in Non-Diabetes, Pre-Diabetes (Pre-DM) and Type 2 Diabetes (T2DM). Presented at the annual CVMD signature program, UNMHSC. April 2014 –Received 2nd prize in clinical research.
- Casey Carroll*, Ryan Mals* and Vallabh Shah. Improving Patient Activation among Zuni Indians Improves Diabetes Care Indicators and Reduces Chronic Kidney Disease Risk. Presented at the annual CVMD signature program, UNMHSC. April 2014 –Received First prize in clinical research
- T Ramaraj*, C Bell*, J Leff*, S Lambeth*, T Carson*, J Lowe* and V Shah (Mentor). Human Gut Microbiota in Non-Diabetes, Pre-Diabetes (Pre-DM) and Type 2 Diabetes (T2DM). Presentation at the 74th scientific meeting of American Diabetes Association. June 13-17, 2014, San Francisco, CA
- Amber Jahan Sulahria*, Casey Carroll*, Ryan Mals*, Mark R. Burge, Vallabh Shah. Perceptional disparities affect T2DM care among Zuni Indians. The American Federation for medical research Presentation 321, 2013
- Anju Shah*, Julie Broyles, Grtechen Ray, Katharine Juarez*, Quyna-Anh Bui*, Joan Goldsworthy*, Thomas Vanderjagt*, and Vallabh Shah. Increase in Markers of Inflammation is Associated with Pre-Diabetes and Diabetes. American Diabetes Association, 2012-1493-P
- V. Shah, T Vander Jagt*, M Morgan, J Broyles, G Ray*, D Bowden, G Talavera, J McCarthy. Genome-wide DNA Methylation Analysis in Progression of Pre-diabetes (preDM) to Diabetes (T2DM). Diabetes, 2011

Current Grant and Contract Funding:

- PCORI Community engagements grant for home base kidney care in Zuni –July 2013 – June 2016 - 2.4 calendars. Role: PI

- Zuni Health Initiative, NIGMS/NCRR (PI- Sub-project -NMINBRE) -2P20 RR016480-09 (05/01/14-04/30/1019) -2.4 calendars. The project is a community based education project with a goal of reduction of risk for chronic diseases in Zuni Indians. Role: PI
- UNMHSC - Cardiovascular and Metabolic Diseases Signature Program about gut microbiome, June 2013 – 2014
- UNMHSC CTSC pilot project about obesity intervention in Zuni children, April 2013 – 2014
- UNMHSC CTSC joint institutional pilot project award about health literacy in urban Native Americans of Oklahoma and reservation based Zuni Indians, April 2013 – 2014
- Clinical and Translational Science Award, University of New Mexico - NIH-NCRR, UL1RR0319977 (Larson - PI) 07/01/2010 – 06/30/2014 -0.60 calendar $24 million (5% efforts), The overall goals of this project are to provide transformative clinical and translational research infrastructure to funded investigators at the University of New Mexico Health Sciences Center. Role: Leadership role in the Community engagement core.

Teaching / Education

Classroom, laboratory teaching, and tutoring (courses or blocks taught or team-taught):

- Nephrology Fellows training in research methods and use of system biology tolls in basic science - the training was continuous throughout the year for every year since 1990 -we admitted more than 3-6 fellows.
- Biochem of disease –Biochem 464/564 –part II –Teaching in for more than 15 yrs –Once a year class for 2hrs, twice a week.
- Circuit rider –PIE –minimum two students –Once a year for 8-12 weeks -3 students 2013
- CVPR block – committee member and tutor -13 weeks/yr. -3 times with 3 hrs each time tutoring.
- GI Block – Tutor – 7 weeks/yr. -3 times with 3 hrs each time tutoring.
- Health Equity: Introduction to Public Health Block –tutor -2 weeks/yr.
- Master Tutor –tutoring new tutors (faculties and post doc student) twice yearly and member of TED tutor training steering committee -4 times / yr.

Mentoring:

Sanchez Frank–Medical student research 2014; Nelson Cole–Medical student research 2014; Lowe, Janae–Medical student research 2013; Carson, TreChelle–Medical student research 2013; Lambeth, Stacey–Medical student research 2013; Malls Ryan, MSII –Medical student research 2013; Carroll Casey, MSII –Medical student research 2013; Moen Hans, MSII –Medical student research 2013; Joan Goldsworthy, MSII –Medical student research 2011-12; Thomas Vanderjagt, PhD, MSII – Post Doctoral fellow 2011, Medical student research 2012; Quynh-Anh Bui, MSII –Medical student research 2011; Terri Cheng, MSII –Medical student research, 2010

Biochemistry Honors: Meyrueix Laetitia 2014-15; Katherine Juarez, BS –UPN student 2010, honors research 2012-13; Anju Shah, BS –honors research 2011; Amber Sulahria, BS –UPN summer research student 2012; Neugebauer, Monica, BS –honors research 2010; **Under Graduate Research in Zuni:** 2014 – 15 - Gchachu Joni –UNM Gallup; Wyaco Tammy–UNM Gallup; Charlie Taffany–UNM Gallup; Mandy Selecion–UNM Gallup; Tesa Frejo–UNM Gallup; Michelle Quam–UNM Gallup; Mariah Charlie–UNM Gallup; Kayla Lesarlley–UNM Gallup

University, SOM, HSC administrative duties

- Member - Committee, UNM Faculty Senate Research Policy -2009-present
- Member and mentor – Medical student research committee - more than 15 yrs -present
- Member – UNMHSC CTSC leadership team -2011-present
- Member – UNMHSC CTSC SAGE committee to review RFAs and project grants -2011-present
- Leader - UNMHSC CTSC Community Engagement Core (5% efforts covered from jan 2012) -2011-present
- Member - UNMHSC CTSC –CEnR educational task force –developing community educational material -2011 - present
- Member – CTSC consortium KFC on CEnR – represents UNMHSC CTSC -2011 - present
- Member –CVMD signature program -2007-2011

Curriculum Vitae

Dorothy J. VanderJagt

Mailing address: Department of Biochemistry and Molecular Biology
University of New Mexico School of Medicine
Basic Medical Sciences Building, Room 249
Albuquerque, NM 87131
(505)-272-5799
Dvanderjagt@salud.unm.edu

Education:

B.A., Chemistry, Holy Family College, Philadelphia, PA, 1963
M.S., Chemistry, Purdue University, West Lafayette, IN, 1967
Ph.D., Medical Sciences, University of New Mexico, Albuquerque, NM, 1988

Professional experience:

Chemical Analyst, Vick Manufacturing Company, Hatboro, PA, 1963-1965
Graduate Teaching Assistant, Chemistry Department, Purdue University, West Lafayette, IN, 1965-1967.
Research Technologist, Department of Biochemistry, Northwestern University, Evanston, IL, 1967-1969.
Research Technologist, Department of Biochemistry, University of New Mexico School of Medicine, Albuquerque, NM, 1969-1972.
Graduate Research Assistant, Clinical Nutrition Laboratory, Department of Pathology, University of New Mexico School of Medicine, Albuquerque, NM, 1981-1988.
Research Assistant Professor, Department of Pathology, University of New Mexico School of Medicine, Albuquerque, NM, 1988-1990.
Research Assistant Professor, Department of Biochemistry, University of New Mexico School of Medicine, Albuquerque, NM, 1990-1997.
Research Assistant Professor, Department of Biochemistry and Molecular Biology, Albuquerque, NM, 1997- 2001.
Research Associate Professor, Department of Biochemistry and Molecular Biology, University of New Mexico School of Medicine, 2001 to present.

Awards:

Faculty Teaching Excellence Award, Phase 1, University of New Mexico School of Medicine, October 22, 1998.
International Excellence Award, University of New Mexico, May 10, 1999.

Committees:

Steering Committee for the Interdisciplinary Training of Health Care Workers for Rural Areas, School of Allied Health, University of New Mexico School of Medicine, 1990-1994.

Project Coordinator, *Invitational Workshop on Interdisciplinary Education and Training for Health Professionals*, January 13-16, 1993, Sheraton Old Town Inn, Albuquerque, NM.

Narrative Editorial Board, University of New Mexico School of Medicine, 1996-2001.

Education Council, University of New Mexico School of Medicine, Albuquerque, NM, 2000- 2003.

Committee on Student Promotions and Evaluation (CSPE), University of New Mexico School of Medicine, 2002 to 2011.

Phase 1 Block Chairs Committee, University of New Mexico School of Medicine, 2007 to 2011.

Tutorial Steering Committee, University of New Mexico School of Medicine, 2007 to 2011.

Admissions Committee, University of New Mexico School of Medicine, 2005 to present.

Editorial board:

Project Co-Director, Editorial Committee, Tool Kit for Interdisciplinary Training Grant Programs, Prepared for the US Department of Health and Human Services , Health Resources and Services Administration, 1994-1995.

International Activities:

Co-Director of the University of New Mexico Minority International Exchange Program, 1994 to 2007.

Grants:

Relationship between vitamin C intake and leukocyte ascorbate levels in elderly and young subjects, PI: Dorothy J. VanderJagt, Hoffmann-LaRoche, Inc., $44,070, Awarded 9/91.

Interdisciplinary Training for Health Care in Rural Areas (National Workshop) PI: Joseph V. Scaletti, Ph.D., Co-PI: Dorothy J. VanderJagt, Ph.D., DHHS, $81,856, 6/1/92 to 11/1/93.

US-Nigeria Minority Biomedical Exchange Program, PI: Robert H. Glew, Ph.D., Co-PI: Dorothy J. VanderJagt, Ph.D., National Institutes of Health, 9/1/94-2001: $191,578/year.

Publications: (selected from 129)

1. Wolfe MD, Chuang LT, Rayburn WF, Wen PC, VanderJagt DJ, Glew RH. Low fatty acid concentrations in neonatal cord serum correlate with maternal serum. J Matern Fetal Neonatal Med. 2012 Aug; 25(8):1292-6.Doi:10.3109/14767058.2011.631064. Epub 2012 Apr 24.

2. Glew RH, Wold RS, VanderJagt DJ. Comparison of diets of urban American Indian and non-Hispanic whites: populations with a disparity for biliary tract cancer rates. Asian Pac J Cancer Prev. 2012; 13(7):3077-82.

3. Vanderjagt DJ, Ujah IA, Ikeh EI, Bryant J, Pam V, Hilgart A, Crossey MJ, Glew RH. Assessment of the vitamin B12 status of pregnant women in Nigeria using plasma holotranscobalamin.ISRN Obstet Gynecol. 2011;2011:365894. doi: 10.5402/2011/365894. Epub 2011 Jul 14.

4. Glew RH, Chuang LT, Berry T, Okolie H, Crossey MJ, VanderJagt DJ. Lipid profiles and trans fatty acids in serum phospholipids of semi-nomadic Fulani in northern Nigeria. J Health Popul Nutr. 2010 Apr;28(2):159-66.

5. Vanderjagt DJ, Ujah IA, Patel A, Kellywood J, Crossey MJ, Allen RH, Stabler SP, Obande OS, Glew RH. Subclinical vitamin B12 deficiency in pregnant women attending an antenatal clinic in Nigeria.J Obstet Gynaecol. 2009 May;29(4):288-95.

6. VanderJagt DJ, Waymire L, Obadofin MO, Marjon N, Glew RH. A cross-sectional study of the growth characteristics of Nigerian infants from birth to 2 years of age. J Trop Pediatr. 2009 Dec;55(6):356-62. Epub 2009 Apr 16.

7. Ikeh EI, Obadofin MO, Brindeiro B, Baugherb C, Frost F, VanderJagt D, Glew RH. Intestinal parasitism in Magama Gumau rural village and Jos Township in north central Nigeria. Niger Postgrad Med J. 2007 Dec;14(4):290-5.

8. VanderJagt DJ, Okeke E, Calvin C, Troncoso C, Crossey M, Glew RH. Use of calcaneal ultrasound and biochemical markers to assess the density and metabolic state of the bones of adults with hepatic cirrhosis. J Natl Med Assoc. 2007 Sep;99(9):1024-9.

9. VanderJagt DJ, Trujillo MR, Jalo I, Bode-Thomas F, Glew RH, Agaba P. Pulmonary function correlates with body composition in Nigerian children and young adults with sickle cell disease. J Trop Pediatr. 2008 Apr; 54(2):87-93. Epub 2007 Sep 26.

10. Tzamaloukas AH, Onime A, Agaba EI, VanderJagt DJ, Ma I, Lopez A, Tzamaloukas RA, Glew RH. Hydration abnormalities in Nigerian patients on chronic hemodialysis. Hemodial Int. 2007 Oct; 11 Suppl 3:S22-8.

11. VanderJagt DJ, Brock HS, Melah GS, El-Nafaty AU, Crossey MJ, Glew RH. Nutritional factors associated with anemia in pregnant women in northern Nigeria. J Health Popul Nutr. 2007 Mar; 25(1):75-81.

12. VanderJagt DJ, Ganga S, Obadofin MO, Stanley P, Zimmerman M, Skipper BJ, Glew RH. Comparison of the clock test and a questionnaire-based test for screening for cognitive impairment in Nigerians. West Afr J Med. 2006 Jul-Sep; 25(3):212-8.

13. Glew RH, Herbein JH, Moya MH, Valdez JM, Obadofin M, Wark WA, VanderJagt DJ. Trans fatty acids and conjugated linoleic acids in the milk of urban women and nomadic Fulani of northern Nigeria. Clin Chim Acta. 2006 May;367(1-2):48-54. Epub 2006 Feb 14.

14. Glew RH, Conn CA, VanderJagt TA, Calvin CD, Obadofin MO, Crossey M, VanderJagt DJ. Risk factors for cardiovascular disease and diet of urban and rural dwellers in northern Nigeria. J Health Popul Nutr. 2004 Dec;22(4):357-69.

15.. VanderJagt TA, Ikeh EI, Ujah IO, Belmonte J, Glew RH, VanderJagt DJ. Comparison of the OptiMAL rapid test and microscopy for detection of malaria in pregnant women in Nigeria. Trop Med Int Health. 2005 Jan;10(1):39-41.

Appendix 3

Faculty Summary Table

FACULTY SUMMARY FORM

To download a fill-able PDF form, go to: www.asbmb.org/accreditation then click on "Apply for Accreditation"

BMB Faculty Name	Department/ Affiliation	Rank	Time (%) commitment to BMB program	Role in BMB Program	# of Research UG Students Mentored in last 5 yrs
Robert Orlando	Biochemistry and Molecular Biology	Associate professor	60%	Program Director; Instructor in Biochemical Methods (Bioc 448L); Instructor for Fall/Spring semesters for Intro Bioc	8
Marcy Osgood	Biochemistry and Molecular Biology	Associate professor; Assistant Dean	40%	Faculty member: Instructor of record for Intensive Biochemistry II (Bioc 446)	none
Karlett Parra	Biochemistry and Molecular Biology	Associate professor	10%	Instructor in Biochemistry of Disease (Bioc 463) and Undergraduate Student Research Mentor	11
Martina Rosenberg	Biochemistry and Molecular Biology	Assistant Professor	56%	Advisor for Biochemistry majors; Course director of Biochemistry of Disease (Bioc 464); Instructor for Intensive Biochemistry I beginning Fall 2015 (Bioc 445); Instructor for Intro Biochem for BA/MD Program	3

FACULTY SUMMARY FORM

To download a fill-able PDF form, go to: www.asbmb.org/accreditation then click on "Apply for Accreditation"

BMB Faculty Name	Department/ Affiliation	Rank	Time (%) commitment to BMB program	Role in BMB Program	# of Research UG Students Mentored in last 5 yrs
Natalie Adolphi	Biochemistry and Molecular Biology	Research Associate Professor	5%	Instructor in Biochemistry of Disease (Bioc 463); course director for Biochemical Methods (Bioc 448L); Undergraduate student research mentor	3
William S. Garver	Biochemistry and Molecular Biology	Assistant Professor	12%	Instructor in Intensive Biochemistry I beginning Fall 2015 (Bioc 445); Instructor in Intensive Biochemistry II (Bioc 446); Undergraduate student research mentor	3
Chien-An Hu	Biochemistry and Molecular Biology	Associate Professor	46%	Director of Undergraduate Honors Research Program; Course Director/Instructor for Biochemical Methods (Bioc 448L); Past Course Director for Biochemistry of Disease (Bioc 464)	10
Meilian Liu	Biochemistry and Molecular Biology	Assistant Professor	12%	Instructor in Biochemistry of Disease (Bioc 463)	5

FACULTY SUMMARY FORM

To download a fill-able PDF form, go to: www.asbmb.org/accreditation then click on "Apply for Accreditation"

BMB Faculty Name	Department/ Affiliation	Rank	Time (%) commitment to BMB program	Role in BMB Program	# of Research UG Students Mentored in last 5 yrs
Vallabh Shah	Biochemistry and Internal Medicine	Professor	20%	Instructor in Biochemistry of Disease (Bioc 464); Undergraduate student research mentor	5
Kristina Trujillo	Biochemistry and Molecular Biology	Research Assistant Professor	5%	Undergraduate student research mentor	9
Dorothy Vanderjagt	Biochemistry and Molecular Biology	Research Associate Professor	24%	Instructor in Biochemistry of Disease (Bioc 463 and 464)	0
David Bear	Cell Biology and Physiology	Professor	24%	Instructor in Intensive Biochemistry I (Bioc 445) - officially retired in 2014. Bioc 445 will be taught in the future by William S. Garver and Martina Rosenberg	1

FACULTY SUMMARY FORM

To download a fill-able PDF form, go to: www.asbmb.org/accreditation then click on "Apply for Accreditation"

BMB Faculty Name	Department/ Affiliation	Rank	Time (%) commitment to BMB program	Role in BMB Program	# of Research UG Students Mentored in last 5 yrs
Yohannes Melbratu	Lovelace Respiratory Research Institute	Professor	3%	Instructor in Biochemistry of Disease I (Bioc 463)	0
Edward Moczydlowski	Sandia National Laboratory	Professor	3%	Instructor in Biochemistry of Disease I (Bioc 463)	0

Appendix 4

Roadmap of a 4-year Schedule of Courses for the Biochemistry Degree

UNM COLLEGE of ARTS & SCIENCES

BS BIOCHEMISTRY w/HONORS

Four Year Road Map

Course Subject and Title	Credit Hrs.	Major	Minor or 2nd Major	Core	Upper Div.	Min. Grade	Notes
Semester One:							
ENGL 110	3			3		C	
Freshman Academic Choice	3					D-	
MATH 162 (MATH 180 3 cr hrs)	**4**	**4**		**4**		**C**	
CHEM 121/123L	**4**	**4**		**4**		**C**	
*Second Language	3			3		C	
Total	**17**	**8**	**0**	**14**	**0**	**0**	
Advisement: How to use the Degree Audit							***(anytime after the 10th week)***

Course Subject and Title	Credit Hrs.	Major	Minor or 2nd Major	Core	Upper Div.	Min. Grade	Notes
Semester Two:							
ENGL 120	3			3		C	
CHEM 122/124L	**4**	**4**		**4**		**C**	
BIOL 201L	**4**	**4**				**C**	
MATH 163 (MATH 181 3 cr hrs)	**4**	**4**				**C**	
*C&J 130; PHI 156; ENGL 219 or 220	**3**			**3**		**C**	
Total	**18**	**12**	**0**	**10**	**0**	**0**	
Advisement: Enhanced Degree Audit skills							

Semester Three:							
BIOL 202L	**4**	**4**				**C**	
CHEM 301	**3**	**3**			**3**	**C**	
CHEM 303L	**1**	**1**			**1**	**C**	
PHYC 151 (or 160)	**3**	**3**				**C**	
PHYC 151L (or 160L)	1	1				C	
Humanities OR Social Behavioral	3			3			
Total	**15**	**12**	**0**	**3**	**4**		
Transferred into the College of Arts & Sciences							***(once semester grades are in)***

Semester Four:							
PHYC 152 (or 161)	**3**	**3**				**C**	
PHYC 152L (or 161L)	**1**	**1**				**C**	
CHEM 302	**3**	**3**			**3**	**C**	
CHEM 304L	**1**	**1**			**1**	**C**	
CHEM 253L	4	4				C	
Fine Arts	3			3		C	
Humanities OR Social Behavioral	3			3		C	
Total	**18**	**12**	**0**	**6**	**4**		
Advisement: Attend Departmental Orientation							***(within the 4th to 12th week)***

Semester Five:							
BIOC 445	**4**	**4**			**4**	**C**	
CHEM 315 OR Chem 311**	**4**	**4**			**4**	**C**	
Humanities OR Social Behavioral	3			3		C	
Humanities OR Social Behavioral	3			3		C	
Upper Division Elective	3				3	D-	
Total	**17**	**8**	**0**	**6**	**11**		
Visit Career Services							

Semester Six:							
BIOC 446	**4**	**4**			**4**	**C**	
BIOC 448L	**3**	**3**			**3**	**C**	
BIOC 451 OR Chem 312**	**4**	**4**			**4**	**C**	
Upper Division Elective	3				3	D-	
Total	**14**	**11**	**0**	**0**	**14**		
Complete Graduation Workshop & Apply for degree							***(after 4th week)***
Advisement: Departmental Check-In							

Semester Seven:							
BIOC upper division elective	**3**	**3**			**3**	**C**	
BIOC 497-499***	**3**				**3**	**C**	
Upper Division Elective	3				3	D-	
Upper Division Elective	3				3	D-	
Total	**12**	**3**	**0**	**0**	**12**		
Advisement: Departmental Check-In / Senior Visit							

Semester Eight:							
BIOC upper division elective	**3**	**3**			**3**	**C**	
BIOC 497-499***	**3**				**3**	**C**	
Upper Division Elective	3				3	D-	
Total	**9**	**3**	**0**	**0**	**9**		
Advisement: Senior Visit							
Visit Graduation Fair							
Degree Total	**120**	**69**	**0**	**39**	**54**		

***Should take C&J130 or PHIL 156 if not taking foreign language course first semester** ****MATH 264 is a required corequisite for CHEM 311–312**

*****THESE ARE FOR RESEARCH HONORS ONLY AND ARE NOT REQUIRED FOR THE DEGREE BUT COUNT TOWARDS 54 HOURS REQUIRED UPPER DIVISION COURSEWORK**

The University of New Mexico Core Curriculum (37 units)

Writing and Speaking: (3-9 units)
Mathematics: (3 units)
Physical and Natural Sciences: (7 units)
Social and Behavioral Sciences: (6 units)
Humanities: (6 units)
Foreign Language: (non-English language; 3 units)
Fine Arts: (3 units)

Arts and Sciences College Minimum Requirements

· Total credit hours = 120
· 300/400 level credit hours = 54
· Minimum credit hours taught in A&S = 96

University Residence Requirements

a. Minimum hours = 30
b. Senior standing = 15 past 92
c. In major = One half
d. In minor = One quarter

Career Opportunities and Pathways

health care professions (medicine, dentistry, veterinary medicine, public health)
research in biomedicine
research in food science, pharmaceuticals, bioengineering
environmental toxicology
scientific patent law

Minimum graduation GPA = 2.00

Keep in mind that minimum grades on road map are for individual coursework only. Students must maintain a minimum of a 2.0 cumulative grade point average for admission to and graduation from the College of Arts and Sciences. Minimums listed for the individual courses do NOT meet the cumulative minimum.

Important Notes

1. NONE of the Biochemistry courses can be taken until both semesters of Org Chem (301, 302) have been successfully completed.
2. BIOC 445 and 463 are ONLY offered in the Fall semesters.
3. BIOC 446, 448, 464 are only offered in the Spring semesters.
4. NONE of the upper level Biochem electives can be taken until successful completion of BCHM 446
5. Honors students must contact Dr. Andy Hu ahu@salud.unm.edu
   a. Individual laboratory/translational project, mentored by faculty member in Biology, Chemistry, or one of the Basic Sciences Depts. at UNM-SOM
   b. Project must be biochemical in nature
   c. Senior thesis (written) and oral presentation at Annual Biochemistry Research Symposium; GPA of 3.25 required

Suggested Minors/2nd Majors/Upper Division Electives:

Suggested minors: none, ususally
Connected with the career opportunites to the left...) Microbiology, A&P, Immunology

Microbiology, chemical engineering courses, Biol 203 and 204
Microbial or Soil Biochemistry
Pre-law courses

For more information see the catalogue at www.unm.edu

Contact Information

UC Advisor:	Email:	Website: http://uac.unm.edu/
Major Advisor: Martina Rosenberg	Email: mrosenberg@salud.unm.edu	Website: http://bmb.unm.edu/ **these advisors have offices on the HSC!**
Minor Advisor:	Email:	Website:
College Advisor: Valarie Maestas	Email: vlepore1@unm.edu	Website: http://artsci.unm.edu/advisement/index.html

UNM COLLEGE of ARTS & SCIENCES

BA BIOCHEMISTRY
Four Year Road Map

Course Subject and Title	Credit Hrs.	Major	Minor or 2nd Major	Core	Upper Div.	Min. Grade	Notes
Semester One:							
ENGL 110	3			3		C	
Freshman Academic Choice	3					D-	
MATH 162 (MATH 180 3 cr hr)	**4**	**4**		**4**		**C**	
CHEM 121/123L	**4**	**4**		**4**		**C**	
***Second Language**	**3**			**3**		**C**	
Total:	**17**	**8**	**0**	**14**	**0**		
Advisement: How to use the Degree Audit							***(anytime after the 10th week)***

Course Subject and Title	Credit Hrs.	Major	Minor or 2nd Major	Core	Upper Div.	Min. Grade	Notes
Semester Two:							
ENGL 120	3			3		C	
CHEM 122/124L	**4**	**4**				**C**	
BIOL 201L	**4**	**4**				**C**	
MATH 163 (MATH 181 3 cr hr)	**4**	**4**				**C**	
*C&J 130; PHI 156; ENGL 219 or 220	**3**			**3**			
Total:	**18**	**12**	**0**	**6**	**0**		
Advisement: Enhanced Degree Audit skills							

Semester Three:							
BIOL 202L	**4**	**4**				**C**	
CHEM 301	**3**	**3**			**3**	**C**	
CHEM 303L	**1**	**1**			**1**	**C**	
PHYC 151 (or 160)	**3**	**3**				**C**	
PHYC 151/ (or 160L)	1	1					
Humanities OR Social Behavioral	3			3		C	
Total	**15**	**12**	**0**	**3**	**4**		
Transferred into the College of Arts & Sciences							***(once semester grades are in)***

Semester Four:							
PHYC 152 (or 161)	**3**	**3**				**C**	
PHYC 152L (or 161L)	**1**	**1**				**C**	
CHEM 302	**3**	**3**			**3**	**C**	
CHEM 304L	**1**	**1**			**1**	**C**	
CHEM 253L	**4**	**4**				**C**	
Fine Arts	3			3		C	
Humanities OR Social Behavioral	3			3		C	
Total	**18**	**12**	**0**	**6**	**4**		
Advisement: Attend Departmental Orientation							***(within the 4th to 12th week)***

Semester Five:							
BIOC 445	**4**	**4**			**4**	**C**	
CHEM 315 OR Chem 311	**4**	**4**			**4**	**C**	
Humanities OR Social Behavioral	3			3		C	
Humanities OR Social Behavioral	3			3		C	
Upper Division Elective	3				3	D-	
Total	**17**	**8**	**0**	**6**	**11**		
Visit Career Services							

Semester Six:							
BIOC 446	**4**	**4**			**4**	**C**	
BIOC upper division elective	**3**	**3**			**3**	**C**	
Upper Division Elective	3				3	D-	
Upper Division Elective	3				3	D-	
Upper Division Elective	3				3	D-	
Total	**16**	**7**	**0**	**0**	**16**		
Complete Graduation Workshop & Apply for degree							***(after 4th week)***
Advisement: Departmental Check-In							

Semester Seven:							
BIOC upper division elective	**3**	**3**			**3**	**C**	
Upper Division Elective	3				3	D-	
Upper Division Elective	3				3	D-	
Upper Division Elective	3				3	D-	
Total	**12**	**3**	**0**	**0**	**12**		
Advisement: Departmental Check-In / Senior Visit							

Semester Eight:							
BIOC upper division elective	**3**	**3**			**3**	**C**	
Upper Division Elective	3				3	D-	
Upper Division Elective	3				3	D-	
Total	**9**	**3**	**0**	**0**	**9**		
Advisement: Senior Visit							
Visit Graduation Fair							
Degree Total	**122**	**65**	**0**	**35**	**56**		**201480**

Should take C&J130 or PHIL 156 if not taking foreign language course first semester

The University of New Mexico Core Curriculum (37 units)

Writing and Speaking: (3-9 units)
Mathematics: (3 units)
Physical and Natural Sciences: (7 units)
Social and Behavioral Sciences: (6 units)
Humanities: (6 units)
Foreign Language: (non-English language; 3 units)
Fine Arts: (3 units)

Arts and Sciences College Minimum Requirements

· Total credit hours = 120
· 300/400 level credit hours = 54
· Minimum credit hours taught in A&S = 96

University Residence Requirements

a. Minimum hours = 30
b. Senior standing = 15 past 92
c. In major = One half
d. In minor = One quarter

Minimum graduation GPA = 2.00

Keep in mind that minimum grades on road map are for individual coursework only. Students must maintain a minimum of a 2.0 cumulative grade point average for admission to and graduation from the College of Arts and Sciences. Minimums listed for the individual courses do NOT meet the cumulative minimum.

Important Notes

1. NONE of the Biochemistry courses can be taken until both semesters of Org Chem (301, 302) have been successfully completed.
2. BIOC 445 and 463 are ONLY offered in the Fall semesters.
3. BIOC 446, 448L, 464 are only offered in the Spring semesters.
4. NONE of the upper level Biochem electives can be taken until successful completion of BIOC 446

Career Opportunities and Pathways

health care professions (medicine, dentistry, veterinary medicine, public health)
research in biomedicine
research in food science, pharmaceuticals, bioengineering
environmental toxicology
scientific patent law

Suggested Minors/2nd Majors/Upper Division Electives:

Suggested minors: none, ususally
Connected with the career opportunites to the left...) Microbiology, A&P, Immunology

Microbiology, chemical engineering courses, Biol 203 and 204
Microbial or Soil Biochemistry
Pre-law courses

For more information see the catalogue at www.unm.edu

Contact Information

UC Advisor:	Email:	Website: http://uac.unm.edu/
Major Advisor: Martina Rosenberg	Email: mrosenberg@salud.unm.edu	Website: http://bmb.unm.edu/ **these advisors have offices on the HSC!**
Minor Advisor:	Email:	Website:
College Advisor:	Email:	Website: http://artsci.unm.edu/advisement/index.html

Appendix 5

Major Coursework Template

Major Coursework Template

* For Core Concepts, refer to ASBMB Program Accreditation Program Guide Appendix II.

Course Name & #	Required/Elective	Timing	Capacity	Labs	Elements
Intensive Biochemistry I (Bioc 445)	☑ Required ☐ Elective	Fall semester; usually junior year	126	☐ Yes ☑ No	☑ Written Communication ☑ Oral communication ☐ Safety ☐ Responsible conduct of research ☑ Teamwork
Brief course description including which Core Concepts are addressed This course is the entry level course for students who are majoring in Biochemistry. Major topics areas include: aqueous environment of the cell (weak non-covalent interactions, pH, pKa); energy and organization (bioenergetics)' complexity and complementarity of molecular structures (structure/function relationships); catalysis (thermodynamic principles and kinetics); cellular communication (transport and signal transduction). Completion of this course with a grade of C or better is required for students to continue as Biochemistry majors and matriculate into Intensive Biochemistry II (Bioc 446). ASBMB Core Concepts 1, 2, 3, and 4, are addressed in this course.					
Intensive Biochemistry II (Bioc 446)	☑ Required ☐ Elective	Spring semester; usually junior year	126	☐ Yes ☑ No	☑ Written Communication ☑ Oral communication ☐ Safety ☐ Responsible conduct of research ☑ Teamwork
Brief course description including which Core Concepts are addressed The course is designed specifically for students who are majoring in Biochemistry and who plan to continue their education in the field, through a graduate or professional program. It is the second class in a two-class sequence and is only taken following successful completion of Bioc 445. This course concentrates on the concepts, practices, and ways of thinking that define biochemistry. Content areas focus on intermediary metabolism of carbohydrates, lipids, amino acids, and nucleic acids, and includes ASBMB Core Concepts 1, 2, 3, and 4. Principles from Bioc 445 are drawn upon heavily in this course.					
Biochemical Methods (Bioc 448L); required for B.S. elective for B.A.	☑ Required ☐ Elective	Spring semester; junior or senior years	48	☑ Yes ☐ No	☑ Written Communication ☑ Oral communication ☑ Safety ☑ Responsible conduct of research ☑ Teamwork
Brief course description including which Core Concepts are addressed Biochemical Methods course is an introduction to the practice of Biochemistry. Laboratory work is the major component. In addition to learning practical laboratory skills and developing an understanding of biochemical methods, students gain experience in areas important to practicing scientists, such as maintenance of lab notebooks, data analysis and interpretation, and scientific collaboration and communication (oral and written). Various biochemical methods are also discussed in instructor lectures and student presentations to increase knowledge of the diversity of modern biochemical technologies.					

Major Coursework Template

* For Core Concepts, refer to ASBMB Program Accreditation Program Guide Appendix II.

Course Name & #	Required/Elective	Timing	Capacity	Labs	Elements
Biochemistry of Human Disease I (Bioc 463)	☐ Required ☑ Elective	Fall semester; senior year	50	☐ Yes ☑ No	☑ Written Communication ☑ Oral communication ☐ Safety ☑ Responsible conduct of research ☑ Teamwork
Brief course description including which Core Concepts are addressed Biochemistry of Disease I covers various disease mechanisms in the context of biochemical pathways, reactions, and regulation. Five different disease-oriented topics are included in this one semester course. Instructors use various teaching methods, such as lectures, small group discussion and presentation, to translate the knowledge of their expertise in a way that students would appreciate, understand, and be able to apply. This course fulfills ASBMB Core Concepts 1, 2, 3, and 4.					
Biochemistry of Human Disease II (Bioc 464)	☐ Required ☑ Elective	Spring semester; senior year	50	☐ Yes ☑ No	☑ Written Communication ☑ Oral communication ☐ Safety ☑ Responsible conduct of research ☑ Teamwork
Brief course description including which Core Concepts are addressed Biochemistry of Disease II is similar in concept and pedagogical approach as Biochemistry of Disease I (Bioc 463). Instructors use various teaching methods as describe for Bioc 463 and also often include accessing information from scientific journals and incorporating this information into written assignments. Also like Bioc 463, this course fulfills ASBMB Core Concepts 1, 2, 3, and 4.					
Scientific Writing (Biomed 505) - graduate level open to undergraduate Majors	☐ Required ☑ Elective	Spring semester; senior year	10	☐ Yes ☑ No	☑ Written Communication ☑ Oral communication ☐ Safety ☑ Responsible conduct of research ☑ Teamwork
Brief course description including which Core Concepts are addressed This is a one semester, two-credit course that typically includes graduate students, postdoctoral fellows, advanced undergraduates, faculty, and other health professionals. The course provides instruction in the structure and organization of a research manuscript and addresses other topics such as ethics of authorship, efficient use of reference data bases, and an overview of the publication process presented by a current editor of a scientific journal. Participants are required to have their own data for the basis of their manuscript and are expected to have a complete manuscript by the end of the semester. The class is interactive and participants spend half of each session reading and critiquing fellow participants writing. This course is especially supportive of undergraduate students pursuing Honors in Biochemical Research. This course fulfills ASBMB Core Concept 4, along with Team Building and Personal Communication skills.					

Major Coursework Template

* For Core Concepts, refer to ASBMB Program Accreditation Program Guide Appendix II.

Course Name & #	Required/Elective	Timing	Capacity	Labs	Elements
Honors Research (Bioc 497/498)	☐ Required ☑ Elective	Two semesters senior year	10-12	☑ Yes ☐ No	☑ Written Communication ☑ Oral communication ☑ Safety ☑ Responsible conduct of research ☑ Teamwork
Brief course description including which Core Concepts are addressed All declared Biochemistry Majors are encouraged to participate in current research through the Honors Research Program. Students select Research Mentors from a diverse, interdisciplinary group of faculty who employ biochemical methods in their investigations. Students are expected to spend 3 to 4 hours per week per credit hour in the laboratory and are required to meet, at minimum, once a week with the Research Mentor to discuss their progress. For the student to qualify for Departmental Honors at graduation (cum laude, magna cum laude, or summa cum laude), he/she must complete both Bioc 497 and 498, submit a written thesis of the work, and provide a public presentation of their research at the annual Research Day in April. Evaluations are made by all Departmental Faculty to determine Honors level. In addition, awards are also made (Loftfield Award) for outstanding research presentation combined with high-ranking academic accomplishments (such as GPA). ASBMB Core Concept 4.					
Independent Study (Bioc 499)	☐ Required ☑ Elective	One semester; either junior or senior yr	10-12	☑ Yes ☐ No	☑ Written Communication ☑ Oral communication ☑ Safety ☑ Responsible conduct of research ☑ Teamwork
Brief course description including which Core Concepts are addressed This course is designed for students who wish to experience a modern research environment without the long-term requirement of the Honors Research Program. As with the Honors Program, students select Research Mentors from a diverse group of faculty who use modern biochemical methods in their investigations. Progress reports and grading are determined by the Mentor and typically include a satisfactory degree of laboratory participation and personal motivation. In alignment with ASBMB Core Concept 4, along with Team Building and Personal Communication skills.					
	☐ Required ☐ Elective			☐ Yes ☐ No	☐ Written Communication ☐ Oral communication ☐ Safety ☐ Responsible conduct of research ☐ Teamwork
Brief course description including which Core Concepts are addressed					

Appendix 6

Course Structure and Alignment Tables
(Includes Syllabi)

Course Framework and Alignment Instructions with Form

Syllabus Provided

Course Name: Intensive Biochemistry I

Instructor's Name: David Bear Date: Fall Semester

Course Number: Bioc 445 Credit Hours: 4 credit hours

ASBMB Core Concepts and Associated BMB Learning Objectives

ASBMB Core Concept 1: Energy is Required by and Transformed in Biological Systems

- Apply their knowledge of basic chemical thermodynamics to biologically catalyzed systems
- Relate the laws of thermodynamics to homeostasis and explain how a cell or organism maintains homeostasis (a system seemingly in equilibrium) using nonequilibrium mechanisms.
- Quantitatively model how these reactions occur, and calculate kinetic parameters from experimental data.
- Discuss the concept of Gibbs free energy, and apply it to chemical transformations
- Identify which steps of metabolic pathways are exergonic and which are endergonic and relate the energetics of the reactions to each other.
- Show how reactions that proceed with large negative changes in free energy can be used to render other biochemical processes more favorable.
- Describe homeostasis at the level of the cell, organism, or system of organisms and hypothesize how the system would react to deviations from homeostasis.
- Summarize the different levels of control (including reaction compartmentalization, gene expression, covalent modification of key enzymes, allosteric regulation of key enzymes, substrate availability, and proteolytic cleavage), and relate these different levels of control to homeostasis

ASBMB Core Concept 2: Macromolecular Structure Determines Function and Regulation

- Discuss the diversity and complexity of various biologically relevant macromolecules and macromolecular assemblies in terms of the basic repeating units of the polymer and the types of linkages between them
- Outline the chemical and physical relationships between sequence and structure of macromolecules and evaluate chemical and energetic contributions to the appropriate levels of structure of the macromolecule
- Predict the effects of specific alterations of structure on the dynamic properties of the molecule
- Predict the determinants of specificity and affinity of a macromolecule-ligand complex
- Compare and contrast the potential ways in which the function of a macromolecule might be altered, including examples of allosteric regulation, covalent regulation, and gene level alterations of macromolecular structure/function.

ASBMB CORE CONCEPT 3: INFORMATION STORAGE AND FLOW ARE DYNAMIC AND INTERACTIVE

- Define what a genome consists of, and how the information in the various genes and other sequence classes within each genome are used to store and express genetic information.
- Explain the central dogma of biology (the message in DNA is transcribed into RNA and translated into protein) and relate the commonality of the process to all of life.
- Diagram how DNA is replicated and genes are transmitted from one generation to the next in multiple types of organisms including bacteria, eukaryotes, viruses, and retroviruses.
- Describe how the cell insures high fidelity DNA replication and identify instances where the cell employs mechanisms for damage repair.

ASBMB CORE CONCEPT 4: DISCOVERY REQUIRES OBJECTIVE MEASUREMENT, QUANTITATIVE ANALYSIS, & CLEAR COMMUNICATION

- Develop a hypothesis, and design and conduct appropriate experiments to test that hypothesis, explaining the basis of the proposed experiments and discussing potential results in the context of the hypothesis
- Analyze and interpret data using appropriate quantitative modeling and simulation tools
- Access, assess, and use available information
- Present scientific data in an appropriate context and in a variety of ways, at different levels

ASBMB EXPECTATION: ROLE OF BIOCHEMISTRY IN EVOLUTION

- Describe the principles of evolution through natural selection as foundational to biochemistry and molecular biology, and defend these principles in their work, schools, and communities.
- Use the tools of biochemistry and molecular biology (including databases of biological molecules and functional assays) to explain changes in traits, adaptations, and the success or failure of organisms and species.
- Analyze pre-existing or novel data and relate the findings in light of the theory of evolution.
- Describe what a mutation is at the molecular level and how it comes about
- Predict how changes in a nucleotide sequence can influence the expression of a gene or the amino acid sequence of the gene product (protein) and translate these findings into a conclusion about how said mutation would impact the general fitness of an organism or population

PERSONAL COMMUNICATION AND TEAM BUILDING SKILLS

- Recognize and take advantage of opportunities for interdisciplinary collaboration
- Appreciate and promote the ethical dimensions of science
- Work safely independently and in an effective team in a variety of laboratory settings
- Practice critical self-reflection in order to progress as a scientist and as a life-long learner

Course Framework and Alignment Table

Topic No.	Topic	Instructor-designed Learning Objectives	Indicate ASBMB Core Concept and/or skill	By what method are you assessing if students have accomplished the learning objective?
1	Acid-Base Biochemistry	1) Be able to describe the key properties of living organisms and the interrelationships of the oxygen, carbon and nitrogen cycles and solar energy for chemotrophs and phototrophs. 2) Use your knowledge of environmental conditions necessary for life (as we know it) including water, pH, temperature, and ionic strength to develop appropriate questions and hypotheses for detecting extraterrestrial life. 3) Practice developing definitive experiments to address hypotheses.	1,4	Pre-lecture questions/problem set for each class session iClicker quizzes Four major in-class exams Team building and discipline-specific communication development through joint case study.
2	Proteins: Bioenergetics Structure Folding Informatics	1) Be able to define the following terms in words and where appropriate with equations: thermodynamics, energy, free energy, enthalpy, entropy, equilibrium constant, endergonic, exergonic. 2) Be able to determine whether a biochemical process is spontaneous and exergonic versus nonspontaneous and endergonic given a free energy. 3) Be able to explain what makes ATP a high energy molecule. 4) Be able to write the equation for the relationship between the free energy and an equilibrium constant and to solve problem where one is given and the other must be calculated. 5) Be able to describe the following molecular interactions and order them in terms of the energies of the interactions: covalent bond (single bond); hydrogen bond, ionic interaction, hydrophobic interaction, van der Waals interaction, dispersion force.	1,2,4 Biochem of Evolution: Objectives 29 & 34	Click here to enter text.

		6) Be able to use an energy reaction diagram to determine the change in free energy of a reaction and the energy of activation. 6) Be able to describe what knowing the free energy will and will not tell you about a biochemical reaction. 7) Be able to describe the various aspects of the peptide linkage including its chemistry, the dihedral angles of the Cα-C, the C-N, and the N-Cα bonds and the possible resonance structures, and the special characteristics of proline and cysteine. 8) Be able to outline the steps in the determination of the primary structure of a protein using both the biochemical and gene sequencing approaches. 9) Be able to differentiate between primary, secondary, tertiary and quaternary structure of a protein. 10) Be able to describe the structural features of the alpha helix, the beta-pleated sheet, the beta turn, and the random coil. 11) Be able to differentiate between the terms “motif” or “super-secondary structure” and the term “domain”. 12) Be able to describe the secondary and tertiary structures present in fibrous proteins collagen and α-keratin and how these structures are important for the function of the proteins. 13) Be able to describe the intermolecular forces that drive protein folding and stabilize protein secondary and tertiary structure. 14) Define the role of the disulfide linkage in protein folding. 15) Define the effects of the following compounds on protein structure: β-mercaptoethanol, 8 M urea, guanidinium hydrochloride. 16) Be able to discuss the simple all-or-none two-state model for		

		protein folding. 17) Be able to discuss the folding-funnel and chaperone mechanisms for protein folding. 18) Be able to describe how unstructured proteins fold. 19) Be able to write Beer's law and be able to determine the concentration of a protein given its absorbance at 280 nm and its extinction coefficient. 20) Be able to describe the steps for how NMR and X-ray diffraction can be used to determine the three dimensional structure of a protein. Be able to contrast and compare the advantages and disadvantages of each technique. 21) Be able to describe the biological functions of myoglobin and hemoglobin, their general structures, and where each protein is most likely to be found in the body. 22) Be able to describe the ligand binding properties of Fe2+ and how it is coordinated with the porphyrin ring in the prosthetic group heme. 23) Be able to describe the differences between the T and R state of the heme group, and what causes the change between these states. 24) Be able to draw the binding curves for myoglobin and hemoglobin and define the cooperative binding of hemoglobin make it sensitive to the oxygen concentration in various tissues (e.g. the lung and the distal organ tissues). 25) Be able to discuss the two models for the cooperative binding of hemoglobin to O2 – the sequential and the concerted models. 26) Be able to discuss the regulation of O2 binding to hemoglobin by 2,3-BPG.		

		27) Be able to describe the Bohr effect and the molecular mechanisms for the regulation by H+ and CO2. Be able to identify the curves of each condition relative to the normal binding curve for hemoglobin 28) Be able to describe the molecular mechanism of carbon monoxide poisoning and how the O2 binding curve for hemoglobin is affected by the presence of high levels of CO. 29) Be able to discuss the structure, properties and importance of fetal hemoglobin. 30) Be able to discuss the molecular etiology (causes) of the cause of sickle cell anemia. 31) Be able to define the terms: homolog, ortholog, paralog, conservative substitution, non-conservative substitution 32) Be able to describe how a simple sequence alignment is carried out, and describe what information is gleaned from it. 33) Be able to describe what a BLAST search is and how is it carried out. 34) Be able to discuss the difference between divergent and convergent evolution and give examples of each type of evolution.		
3	Enzymes: Kinetics Mechanisms Regulation	1) Be able to list the six major classes of enzymes and provide an example of each class. 2) Be able to draw a reaction coordinate diagram for reaction diagram for non-catalyzed and enzyme catalyzed reaction. 3) Be able to define the terms V0, Vmax and Km for an enzyme and label them on a saturation velocity diagram. 4) Be able to list the major assumptions in the derivation of the Michaelis-Menten equation and be able to write the final equation	1,2,4	Click here to enter text.

		of the derivation, defining each of the terms in the equation. 5) Be able to draw a Lineweaver-Burk plot and show how Vmax and Km are determined. 6) Be able define the turnover number and kcat. 7) Be able to explain the significance and utility of knowing the value of kcat/Km for an enzyme. 8) Be able to draw the Cleland diagrams for the following classes of multi-substrate enzymatic reactions: (1) ordered single displacement; (2) sequential random; (3) double-displacement (ping-pong). 9) Be able to discuss why an understanding of enzyme inhibition is of practical importance. 10) Be able to describe and diagram each of the classes of enzyme inhibitor mechanisms (competitive, uncompetitive, noncompetitive, and mixed), be able to outline each mechanism using chemical equations, and be able to recognize the Lineweaver-Burk plots that correspond to each of the inhibition mechanisms. 11) Be able to explain how an enzyme increases the rate of a reaction. 12) Be able to explain how enzymes induce a substrate into the transition state and stabilize it, and why inhibitors must be more stable than the transition state of the reaction. 13) Be able to explain how the ES complex is stabilized by enthalpy and entropy. 14) Be able to explain how covalent catalysis avoids high-energy intermediates. 15) Be able to explain what a general acid/base catalyst is and		

		how and enzyme as both a general acid and general base catalyst. 16) Be able to explain the “proximity” and “conformational” effects in an enzyme catalyzed reaction. 17) Be able to explain the role of metal ions and the NAD/NAD+ and FADH/FAD cofactors in enzyme catalysis. 18) Be able to explain the following regarding chymotrypsin catalysis: (1) the two stages of the reaction, (2) the catalytic triad, (3) each of the main steps in the reaction, (4) the nature of the specificity for aromatic amino acids. 19) Be able to explain what a restriction endonuclease is, and the different types of DNA recognition. 20) Be able to describe how restriction enzymes achieve specificity for specific vs. non-specific DNA sequences, and explain why bacterial DNA is methylated.		
4	Membrane Transport: Carbohydrates Lipids	1) Be able to draw the Fisher projections and Haworth (furanose and pyranose) projections for glucose, fructose and galactose. 2) Be able to identify the glycosidic linkages for glycogen, amylopectin (starch), and cellulose and describe the overall three-dimensional structure of each polymer. 3) Be able to discuss what a reducing sugar is, and how the nomenclature for glycosidic linkages is applied. 4) Be able to draw the reactions and final products for the cyclization of glucose and fructose. 5) Be able to draw the structures of sucrose and lactose. 6)Be able to describe the linkage between glucose and hemoglobin to form glycated Hb and discuss the importance of glycated Hb in diabetes.	1,2	Click here to enter text.

		7) Be able to discuss the biochemical differences between the A,B,AB,O blood groups, and to be able to know what each group can donate or receive in a blood transfusion. 8) Be able to explain the basis of the starch iodide test. 9) Given the structure of a fatty acid, be able to describe whether it is in the cis or trans state, and be able to denote the location of unsaturated double bonds in both the alpha and omega systems. 10) Be able to draw a general structure for a triglyceride and a diacylglyceride 3-phosphate. 11) Be able to draw the structure of phosphatidylinositol and number the positions on the inositol rings. 12) Be to describe the fluid mosaic model for the cell membrane, and be able to distinguish between integral and peripheral membrane proteins. 13) Be able to describe the mechanism for how aspirin works to reduce inflammation. 14) Be able to discuss the dynamic motion of lipids and proteins in cell membranes. 15) Be able to describe the differences between channels and pumps (active transporters), and the general properties of ABC transporters. 16) Be able to describe the structure and function of the Na-K ATPase pump. 17) Be able to explain the function of symporters and antiporters. 18) Be able to describe the structure and function of the K ion channel transporter and the proposed mechanisms for the selectivity and high rate of transport.		

		19) Be able to describe the pathway for the synthesis and transport of membrane proteins within the cell. 20) Be able to describe the unfolded protein response (UPR). 21) Be able to describe the structure and function of the CFTR transporter and the biochemical cause of cystic fibrosis for the most common CFTR mutation, delta-F508. 22) Be able to describe the function of v-snares and t-snares.		
5	Cell Signaling	1) Be able to describe the essential processes of cells in meatazoans and to define the following terms: growth factor, mitogen, cytokine, chemokine. 2) Be able to differentiate between autocrine, paracrine and endocrine signaling. 3) Be able to discuss the differences between intracellular receptor-mediated and membrane receptor-mediated signaling pathways. 4) Be able to diagram the intracellular receptor signaling pathway for an intracellular steroid hormone receptor-mediated pathway using estrogen as the example. 5) Be able to describe how small and large G-proteins function in the activation of downstream events in signal transduction. 6) Be able to discuss how protein phosphorylation and dephosphorylation function in signal transduction. 7) Be able to discuss the roles following second messengers in the five classic signaling pathways: cAMP, Ca2+, IP3, diacylgycerol, IP3. 8) Be able to diagram and describe the essential features of the five classic membrane signal transduction pathways. Identify the class of ligand (first messenger), receptor, the transduction event	1,2,4	Click here to enter text.

		at the membrane, any second messengers, the cytoplasmic event, and the final target and effect(s).		
6	DNA Structure and Technology	1) Be able to describe the key events in the history of how DNA was shown to be the genetic material of cells. 2) Be able to describe the key events that led up to the discovery of the structure of DNA. 3) Be able to write out the structures the Watson-Crick base paring schemes for A-T and G-C base pairs and number the positions on the bases and the deoxyribose sugar. 4) Be able to give the correct names for the bases, nucleosides, and nucleotides in DNA. 5) Be able to contrast and compare the structure of B, A and Z forms of DNA, including the syn/anti conformations around the glycosidic linkage, the conformations of the sugar ring pucker, and the base tilt and roll in the A and B forms of DNA. 6) Be able to describe how the structure of Z DNA differs from the A and B forms of DNA. 7) Be able to discuss the relative contributions of hydrogen-bonding and base stacking to the stability and specificity of DNA sequences. 8) Be able to define the Tm of a DNA molecule and discuss how the Tm depends on the base composition and ionic strength. 9) Be able to discuss the topology of linear, nicked circular and covalently closed circular (CCC) DNA and be able to carry out calculations to define the linking number, twist and writhe. 10) Be able to diagram and annotate the dideoxy-NTP chain	2,3 Biochem of Evolution: Objectives 1&2	Click here to enter text.

		termination method for DNA sequencing and to be able to predict the gel electrophoresis pattern given a template sequence and a primer. 11) Be able to discuss the three different types of DNA nucleolytic digestion products of Type II restriction endonucleases. 12) Be able to describe the enzymatic activities, substrate requirements, and uses of the following enzymes in DNA cloning: T4 DNA ligase, calf intestinal alkaline phosphatase, Taq DNA polymerase; reverse transcriptase. 13) Be able to describe how electrophoresis of DNA on agarose gels is carried out and how the DNA is visualized. 14) Be able describe the different types of cloning vectors and the applications for each type. 15) Be able to contrast and compare the methods for the original and more modern strategies for cloning a gene. 16) Be able to describe how cDNA cloning is carried out and why it is useful. 17) Be able to describe how conventional PCR is carried out and diagram the steps for three cycles of PCR. 18) Be able to design a set of PCR primers to amplify a specific DNA sequence within a given DNA region of a genome. 19) Be able to describe PCR cloning. 20) Be able to explain what an expression vector is and why it is useful.		

7	Genes and Genomes DNA Replication DNA Repair and Recombination	1) Be able to describe the basic organization of the human genome. 2) Be able to describe the structure of chromatin and chromosomes. 3) Be able to describe the human microbiome. 4) Be able to describe the genome complexity conundrum; how the human genome with only 22,000 protein coding genes encodes 100,000-200,000 different proteins and thousands of other noncoding RNAs (ncRNAs). 5) Be able to describe how the Meselson-Stahl Experiments demonstrated that DNA replication is semi-conservative. 6) Describe the three hypotheses for DNA replication, the experimental approach and protocol to test these hypotheses with the expected results for each hypothesis, the actual results, and the conclusion. 7) Be able to describe the roles of the replication origin, the various types of DNA polymerases, DNA binding proteins, and enzymes in leading and lagging strand synthesis in human DNA replication. 8) Be able to describe why and how telomeres are added to the ends of chromosomes. 9) Be able to describe how DNA polymerases correct replication errors. 10) Be able to describe how trinucleotide repeat expansion errors occur. 11) Be able to describe the DNA methylation system in mammals and how it maintained during DNA replication. 12) Be able to describe the types of DNA damage that occur	2,3	Click here to enter text.

		due to replication errors and mechanisms for how the errors are reversed. 13) Be able to describe the various types of physical and chemical agents that damage DNA and the types of lesions that they create. 14) Be able to describe the major DNA damage repair pathways. 15) Be able to describe the molecular etiology of xeroderma pigmentosum, HNPCC, AT, Werner syndrome, Bloom syndrome, and BRCA1/BRCA2 dependent breast cancer.		
8	Transcription RNA Processing	1) Be able to describe the differences and similarities between the RNA polymerase core and holo enzymes in bacteria and human cells. 2) Be able to list the steps in overall transcription reaction process and the sequence of events in transcription. 3) Be able to contrast and compare the structures of the E. coli RNA polymerase and human RNA polymerase II promoters and the sequence of events for the transcription initiation at each type of promoter. 4) Be able to describe the mechanisms of transcription inhibition by actinomycin D, rifampicin (rifamycin), and DRB. 5) Be able to describe the signals and proteins involved in intrinsic and rho-dependent termination in bacteria. 6) Be able to describe sequence of events in the mRNA polyadenylation reaction in mammalian cells. 7) Be able to describe the two principle models for RNA polymerase II transcription termination in mammalian cells. 8) Be able to diagram the steps in the lifetime of an mRNA.	2,3 Biochem of Evolution: Objectives 1 & 3	Click here to enter text.

		9) Be able to describe the signals for mRNA splicing located in the mRNA. 10) Be able to diagram the steps of the mRNA splicing. 11) Be able to describe the intermediates in the splicing reaction and how each snRNP participates in these intermediates. 12) Be able to discuss the mechanism by which alternative splicing occurs. 13) Be able to discuss the mechanisms for the nucleocytoplasmic export of mRNAs and the localization of mRNAs to specific regions of the cytoplasm.		
9	Translation	1) Be able to describe the genetic code, and be able to go from a DNA sequence to an RNA sequence to an amino acid sequence. 2) Describe open reading frames, start/stop codons, and frameshift, silent missense and nonsense mutations. 3) Be able to discuss the structure and function of tRNA and how it is activated. 4) Be able to define anticodons, codon base pairing, wobble hypothesis. 5) Be able to describe the mechanism of translation, initiation, elongation, termination. 6) Describe how antibiotics inhibit translation.	2,3	Click here to enter text.
10	Gene Regulation	1) Be able to define differential gene expression. 2) Distinguish between heterochromatin and euchromatin. 3) Explain how DNA methylation and histone acetylation affects chromatin structure and regulation of transcription.	2,3	Click here to enter text.

		4) Define epigenetic inheritance. 5) Describe the role of the transcription initiation complex. 6) Define control elements and explain how they influence transcription. 7) Be able to distinguish between general and specific transcription factors. 8) Describe the role of promoters, enhancers, activators, and repressors as they are needed for transcriptional control. 9) Explain how eukaryotic genes can be coordinately expressed. 10) Describe the process and significance of alternative RNA splicing. 11) Describe factors that influence the lifespan of mRNA in the cytoplasm. 12) Explain how gene expression may be controlled at the translational and posttranslational level.		

Course Syllabus – Fall 2014

Intensive Biochemistry – Semester 1

Biochemistry 445/Biochemistry 545

Monday, Wednesday, Friday – 9:00-9:50

Collaborative Teaching and Learning Building (CTLB) Room 300

Course Overview

Welcome to Biochemistry 445/Biochemistry 545. This is Part 1 of a two-semester intensive biochemistry course intended for Biochemistry majors and graduate students. The course is divided into four sections:

- Part 1: introduction to living systems; water and acid-base biochemistry; bioenergetics; protein structure, analysis and function
- Part 2: enzymes; carbohydrates; lipids; membrane structure and trafficking
- Part 3: cell signaling; DNA and RNA structure; DNA biotechnology; genomes and genes; DNA replication and genome maintenance
- Part 4: RNA and protein synthesis; gene regulation

Throughout the course, special emphasis will be paid to medical relevance. Biochemistry 445, together with Biochemistry 446 (which focuses on metabolism), satisfies the biochemistry prerequisite for the UNM School of Medicine.

Course Objectives and Learning Outcomes

Biochemistry 445/446 is the first set of courses in the Biochemistry major at the University of New Mexico. These two courses are designed to provide students with a rigorous introduction to the subject of biochemistry. A degree in biochemistry prepares students for a number of different career possibilities in the health sciences (including medicine, pharmacy, dentistry, veterinary medicine, biomedical research, genetic counseling), biotechnology and bioengineering, agriculture, criminology and forensics, and even law (biotechnology and patent law). Beyond direct training in the scientific principles, the biochemistry curriculum also prepares students to be good critical thinkers and problem solvers; effective oral and written communicators; and productive members of teams – skills that most employers and graduate and professional degree programs value just as much as scientific knowledge. The desired course learning outcomes are the following:

1. **Be able to solve scientific problems in biochemistry and molecular biology at different levels of complexity:**
    a. Apply concepts, facts and algorithmic approaches to solve simple illustrative biochemical problems (one-step problem solving).
    b. Address important problems and questions in the health sciences that require a deeper understanding of biochemical principles and concepts, and employ quantitative reasoning and knowledge of experimental techniques (two-step problem solving).
    c. Design experimental approaches to solve complex real-world biochemical problems both as individuals and as teams (multi-step problem solving).

Assessment: To accomplish this learning outcome, there will be case studies each week that focus on mastering the skills in biochemical problem solving and critical reasoning at different levels. The grades on these problem sets will comprise 20% of the final grade.

2. **Be able to use background information in the textbook and lectures in order to read and comprehend the primary literature in biochemistry and molecular biology, including the identification of the specific steps in the scientific method that the authors have employed to answer an important questions.**

Assessment: To accomplish this learning outcome, students will be required to read the text and other appropriate materials before coming to lecture. To ensure that students are prepared, there will be set of questions/problem sets to be answered that will be due at the beginning of each class period. These reading assignments will account for 10% of the total grade in the course.

3. **Be able to achieve high scores in the area of molecular biosciences on pre-professional and graduate school admissions tests: MCAT, PCAT, DCAT, VCAT, and GRE.**

Assessment: To accomplish this learning outcome, there will be four in-class quizzes and four in-class exams, each covering one of the four major sections of the course. Each of the quizzes will be worth 5%, but lowest score will be dropped; thus, the in-class quizzes will be worth a total of 10% of the final grade. Each of the exams will be worth 20% of the final grade, but the lowest grade on the first three exams will be dropped; thus, the exams will account for a total of 60% of the final grade.

Instructor

David Bear, PhD, Professor of Cell Biology and Physiology, School of Medicine; Professor of Biochemistry and Molecular Biology, School of Medicine; Professor of Chemistry and Chemical Biology - Dr. Bear received a B.S. degree in chemistry from the University of Arizona in 1972 and a Ph.D. in biophysical chemistry from the University of California at Santa Cruz in 1978. He was a National Institutes of Health Postdoctoral Fellow at the University of Oregon Institute of Molecular Biology from 1978 to 1982 and a Visiting Postdoctoral Fellow at the University of North Carolina at Chapel Hill Lineberger Cancer Center in 1982. Dr. Bear came to the Department of Cell Biology at the University of New Mexico School of Medicine in 1982. He has previously served as Director of Graduate Studies for the School of Medicine (1989-2004), Chair of the Department of Cell Biology and Physiology (1997-2004), Dean of Admissions for the School of Medicine (2005-2011), and the Chair of the Department of Chemistry and Chemical Biology (2009-2012). His research interests focus on the synthesis and intracellular trafficking of messenger RNAs in muscle cell diseases including muscular dystrophies and muscle cell cancers.

Instructor Contact Information

- Office: 161 Fitz Hall (formerly known as the Basic Medical Sciences Building) at the Department of Cell Biology and Physiology, School of Medicine
- Phone: 505-272-8520
- E-mail: dbear@salud.unm.edu

Instructor Office Hours

- Regular office hours will be held on Mondays, Tuesdays, and Wednesdays from 2:00 to 4:00 PM in Room 161 Fitz Hall (formerly the Basic Medical Sciences Building), UNM Health Sciences Center (see map posted on UNM Learn course website). The Peer Learning Facilitators for the course will have their own office hours.
- The instructor will accommodate students who cannot come to the regular office hours through individual appointments. See instructor contact information above to make an appointment.

Course Materials

- **Text:** The required text for the course is **"Lehninger Principles of Biochemistry, 6th Edition," 2013, by D.L. Nelson and M.M. Cox, ISBN 10: 1-4292-3414-8 or ISBN 13:978-1-4292-3414-6.** The companion website for this edition is located at www.whfreeman.com/lenhinger6e and contains a large number of learning resources. This is one of the most widely used biochemistry textbooks on the market, and is a very useful reference for future graduate and professional school courses. If you would rather read the book in a digital format, the e-book is available at a significantly reduced price through the publisher at www.ebooks.bfwpub.com/lehninger6e as well as from other sources. **This is a course where reading the textbook is essential for academic success**. **If do not do the readings, you will not do very well in this course.**
- **I-Clickers:** All students will be **required** to bring an i-Clicker, i-Clicker+ or i-Clicker2 to each class. Students should carry a spare set of batteries and make sure their clickers are in working condition. Participation in the i-Clicker questions during class will be part of the final grade.

Lectures

All lecture materials (lecture/reading guides, Power Point slides, handouts, and readings) will be available on the course website at **UNM Learn** on the evening before each class session, if not sooner. Answers to i-Clicker questions and keys to exams will be posted after lectures. The "study guide" that is posted for each class session will contain a set of objectives from which the exam questions will be taken, as well as the assignment that is due for the next class session. Students are strongly encouraged to look over all posted materials prior to coming to class.

Course Design

Intensive Biochemistry is very intense! This is a ***four-credit course***, and students should be prepared to spend at least 15-20 hours per week outside of class reading and completing assignments. The course closely parallels the content level and pace of the first phase of medical, PA, and pharmacy schools. This is why admissions committees for these programs often look at the grades that applicants have earned in biochemistry as a good indicator of how they would do in professional school. The issues that make biochemistry difficult are the following: (1) The subject of biochemistry, even at the most introductory level, contains an enormous amount of material to be learned, which takes time to assimilate. Unlike other science courses that you have already taken, where you could put off intense studying until right before the exams, last minute "cramming" will not work in this course. The most common cause for students not doing well in biochemistry courses is the failure to keep up with the content material. (2) The concepts in biochemistry can sometimes be very complex, requiring some deep thinking and consultation with other resources such as websites and previous chemistry or biology textbooks. (3) Learning how to solve biochemistry problems takes time and practice. ***Each successive section of the course builds on the foundations provided by the previous section; thus, the course itself is cumulative by design.***

To increase student success, this course uses the following multi-modality learning and assessment approaches:

Attendance at all class sessions and exams is required! Class will start promptly at 9 AM and the pre-class reading assignment will be due at 9 AM. **Students who are absent from class due to personal illness or illness of a child, parent or spouse will get full credit for the session if they bring a note from a health professional (RN, BSN, PA, MD or DO).** Excuses for any reasons other than health issues will not be accepted. Students should plan vacations and other travel accordingly!

Study guides for all lectures will be posted on UNM Learn in advance of each session. The Lecture Guides will contain comprehensive study objectives for each of the lectures and quizzes, as well as the assigned readings. Readings will be posted on UNM Learn in the "Readings" folder.

Exams, Assessment and Grades

One of the unique aspects of this course is the *"no games"* nature of the exams. The instructor's philosophy of assessment is that students should know exactly what will be covered on the exams and should not have to "guess" what the instructor might ask – in other words – "no games." Thus, a list of the questions that could appear on the exams will be will provided to the students will be derived **directly from the objectives** provided in the study guides posted on UNM Learn, so students can study for exams well in advance. Because students will have the questions before the exam, grading will very rigorous. If students have done the assignments throughout the course and attended all of the lectures and discussions, they should be able to do very well on the exams. However, **waiting to study the material the week prior to the exam rather than throughout the course will make it virtually impossible to do well on the exam.**

There will four in class quizzes and four exams, with the last exam administered on the day of the regularly scheduled final exam. The exams will cover material from each corresponding section of the course. **There will be no make-up exams.** However, a student who must miss an exam due to a conflicting UNM activity (e.g. athletic meets or academic or scientific conference attendance) may take the exam within two days **before** the regularly scheduled date. **Students will be allowed to drop the lowest score on any one of the first three exams or any one of the four quizzes.** If a student misses one of the first three exams, the missed exam or quiz will count as the score to be dropped. Students who miss two of the first three exams should withdraw from the course. A second missed exam will result in a 0 for that exam. **The last exam must be taken, and cannot replace any of the other exams, nor can it be replaced by any of the first three exams.** Grades will be assigned on the following basis:

The final grade will be calculated according to the following formula:

- **Three of four exams (Each exam will count 20%; lowest of first three is dropped) 60%**
- **Cases 20%**
- **Four in-class quizzes (each quiz will count for 2.5%) 10%**
- **Pre-lecture questions/problem sets for each class session 10%**

Grades will be assigned according to the following scale:

Grade	Percent
A+	98-100
A	93-97
A-	90-92
B+	88-89
B	83-87
B-	80-82
C+	78-79
C	73-77
C-	70-72
D	55-69
F	0-54

No grades of D+ or D- will be assigned. The whole number score will be rounded from the decimal fraction using standard rules for rounding (0.5 or greater rounds to the next highest whole number). After the formal withdrawal date set by UNM (where the withdrawal does not appear on the transcript), **students may withdraw with a grade of W from the course up until the Friday before the start of final exams**. After that time, students will receive a grade for the course (A-F or Credit/No Credit depending upon how they registered for the course). **There will be no exceptions.**

Letters of Recommendation
The instructor will provide a letter of recommendation to any student with a grade of B+ or better if and only if the student demonstrated an interest in the topics in the course that go beyond the assignments and the exams. The instructor is available during office hours or by appointment for discussions, and academic and career counseling. It is impossible to write a good letter of recommendation for a student whom the instructor does not know outside of a grade book entry.

Course Etiquette
Good course etiquette significantly improves the learning atmosphere and the quality of the educational experience. Students are expected to behave in a professional manner by **arriving at class on time** before 9:00 AM and **leaving only at the end of the class** at 9:50 AM or when dismissed. **In-class quizzes and exams will begin promptly at the beginning of the class period; thus, to get the fully allotted time on the quiz, students must arrive by 9:00 AM when the quizzes and exams are started.** Students may use computers and digital tablets during class for note taking, working on group assignments, and following the online lecture handouts – **but not for texting**. Students may record the lectures.

Course Honor Code
Science is a collaborative enterprise, and students are encouraged to work collaboratively in groups during class sessions and outside of class. However, students are expected to turn in separate papers, prepared individually, for each assignment; collaborators must be acknowledged on any written assignments. Assignments must not contain verbatim copying of any kind from your collaborator(s) nor from any other source, including the Internet. Although students are encouraged to **study** for exams and quizzes in groups, **copying from another student's paper during the exam or quiz will result in an F for the course and a formal report to the Dean of Students**.

By remaining enrolled in this course, a student agrees to all of the policies delineated above.

Biochemistry 445 – Fall 2014#

Textbook: Nelson and Cox (2013) Principles of Biochemistry, 6th Edition

Section I. Protein Structure and Function

Date	Topic	Chapters to be Read Before Class
August 18	Introduction: The Chemistry of Life	Chapter 1
August 20	Acid-Base Biochemistry 1	Chapter 2 (sections 2.1 to 2.3)
August 22	Acid-Base Biochemistry 2	Chapter 2 (sections 2.4 & 2.5)
August 25	Proteins 1 – A.A. & 1° Structure	Chapter 3 (sections 3.1 & 3.2)
August 27	Bioenergetics	Chapter 13 (section 13.1)
August 29	**Quiz 1**	
September 1	**Labor Day**	Chapter 3 (sections 3.3 & 3.4)
September 3	Proteins 2 - 2°, 3°, 4° Structure	Chapter 4 (sections 4.1 & 4.2)
September 5	Proteins 3 – Folding & Characterization	Chapter 4 (sections 4.3 & 4.4)
September 8	Proteins 4 – Protein Purification	Chapter 3 (section 3.3)
September 10	Proteins 5 - Myoglobin Hemoglobin	Chapter 5 (section 5.1)
September 12	Proteins 6 – Protein Bioinformatics	Chapter 5 (sections 5.2 & 5.3)
September 15	**Exam 1**	

Section II. Enzymes, Carbohydrates, Lipids and Membranes

Date	Topic	Chapters to be Read Before Class
September 17	Enzymes 1 – Kinetics 1	Chapter 6 (sections 6.1 & 6.2)
September 19	Enzymes 2 – Kinetics 2	Chapter 6 (section 6.3)
September 22	Enzymes 3 – Mechanism 1	Chapter 6 (section 6.4)
September 24	Enzymes 4 – Mechanism 2	Chapter 6 (section 6.4)
September 26	Enzymes 5 - Regulation	Chapter 6 (section 6.5)
September 29	**Quiz 2**	Chapter 7
October 1	Carbohydrates	Chapter 10
October 3	Lipids & Membranes	Chapter 11 (sections 11.1 & 11.2)
October 6	Membrane Transport	Chapter 11 (section 11.3)
October 8	**Exam 2**	
October 10	**Fall Break**	

Section III. Genes and Genomes

Date	Topic	Chapters to be Read Before Class
October 13	Cell Signaling 1	Chapter 12 (sections 12.1 to 12.3)
October 15	Cell Signaling 2	Chapter 12 (sections 12.4 to 12.7
October 17	Cell Signaling 3	Chapter 12 (sections 12.8 to 12.12)
October 20	DNA Structure 1	Chapter 8 (sections 8.1 & 8.2)
October 22	DNA Structure 2	Chapter 8 (sections 8.3 & 8.4)
October 24	DNA Technology 1	Chapter 9 (sections 9.1 & 9.2)
October 27	DNA Technology 2	Chapter 9 (section 9.3)
October 29	**Quiz 3**	
October 31	Genes & Genomes 1	Chapter 24 (sections 24.1 & 24.2)
November 3	Genes & Genomes 2	Chapter 24 (section 24.3)
November 5	DNA Replication	Chapter 25 (section 25.1)
November 7	DNA Repair and Recombination	Chapter 25 (sections 25.2 & 25.3)
November 10	**Exam 3**	

Section IV. Gene Expression and Regulation

Date	Topic	Chapters to be Read Before Class
November 12	Transcription	Chapter 26 (section 26.1)
November 14	Transcription	Chapter 26 (paper)
November 17	RNA Processing	Chapter 26 (section 26.2)
November 19	RNA Processing	Chapter 26 (section 26.3)
November 21	Translation 1	Chapter 27 (sections 27.1 & 27.2)
November 24	Translation 2	Chapter 27 (section 27.3)
November 26	**Quiz 4**	
November 28	**Thanksgiving Vacation**	
December 1	Gene Regulation 1	Chapter 28 (sections 28.1 & 28.2)
December 3	Gene Regulation 2	Chapter 28 (section 28.3)
December 5	Gene Regulation 3	Paper
	Exam 4	

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Course Framework and Alignment Instructions with Form

Syllabus Provided

Course Name: Intensive Biochemistry II

Instructor's Name: Marcy Osgood & Sherman Garver Date: Spring Semester

Course Number: Bioc 446 Credit Hours: 4 credit hours

ASBMB Core Concepts and Associated BMB Learning Objectives

ASBMB Core Concept 1: Energy is Required by and Transformed in Biological Systems

- Apply their knowledge of basic chemical thermodynamics to biologically catalyzed systems
- Relate the laws of thermodynamics to homeostasis and explain how a cell or organism maintains homeostasis (a system seemingly in equilibrium) using nonequilibrium mechanisms.
- Quantitatively model how these reactions occur, and calculate kinetic parameters from experimental data.
- Discuss the concept of Gibbs free energy, and apply it to chemical transformations
- Identify which steps of metabolic pathways are exergonic and which are endergonic and relate the energetics of the reactions to each other.
- Show how reactions that proceed with large negative changes in free energy can be used to render other biochemical processes more favorable.
- Describe homeostasis at the level of the cell, organism, or system of organisms and hypothesize how the system would react to deviations from homeostasis.
- Summarize the different levels of control (including reaction compartmentalization, gene expression, covalent modification of key enzymes, allosteric regulation of key enzymes, substrate availability, and proteolytic cleavage), and relate these different levels of control to homeostasis

ASBMB Core Concept 2: Macromolecular Structure Determines Function and Regulation

- Discuss the diversity and complexity of various biologically relevant macromolecules and macromolecular assemblies in terms of the basic repeating units of the polymer and the types of linkages between them
- Outline the chemical and physical relationships between sequence and structure of macromolecules and evaluate chemical and energetic contributions to the appropriate levels of structure of the macromolecule
- Predict the effects of specific alterations of structure on the dynamic properties of the molecule
- Predict the determinants of specificity and affinity of a macromolecule-ligand complex
- Compare and contrast the potential ways in which the function of a macromolecule might be altered, including examples of allosteric regulation, covalent regulation, and gene level alterations of macromolecular structure/function.

ASBMB CORE CONCEPT 3: INFORMATION STORAGE AND FLOW ARE DYNAMIC AND INTERACTIVE

- Define what a genome consists of, and how the information in the various genes and other sequence classes within each genome are used to store and express genetic information.
- Explain the central dogma of biology (the message in DNA is transcribed into RNA and translated into protein) and relate the commonality of the process to all of life.
- Diagram how DNA is replicated and genes are transmitted from one generation to the next in multiple types of organisms including bacteria, eukaryotes, viruses, and retroviruses.
- Describe how the cell insures high fidelity DNA replication and identify instances where the cell employs mechanisms for damage repair.

ASBMB CORE CONCEPT 4: DISCOVERY REQUIRES OBJECTIVE MEASUREMENT, QUANTITATIVE ANALYSIS, & CLEAR COMMUNICATION

- Develop a hypothesis, and design and conduct appropriate experiments to test that hypothesis, explaining the basis of the proposed experiments and discussing potential results in the context of the hypothesis
- Analyze and interpret data using appropriate quantitative modeling and simulation tools
- Access, assess, and use available information
- Present scientific data in an appropriate context and in a variety of ways, at different levels

ASBMB EXPECTATION: ROLE OF BIOCHEMISTRY IN EVOLUTION

- Describe the principles of evolution through natural selection as foundational to biochemistry and molecular biology, and defend these principles in their work, schools, and communities.
- Use the tools of biochemistry and molecular biology (including databases of biological molecules and functional assays) to explain changes in traits, adaptations, and the success or failure of organisms and species.
- Analyze pre-existing or novel data and relate the findings in light of the theory of evolution.
- Describe what a mutation is at the molecular level and how it comes about
- Predict how changes in a nucleotide sequence can influence the expression of a gene or the amino acid sequence of the gene product (protein) and translate these findings into a conclusion about how said mutation would impact the general fitness of an organism or population

PERSONAL COMMUNICATION AND TEAM BUILDING SKILLS

- Recognize and take advantage of opportunities for interdisciplinary collaboration
- Appreciate and promote the ethical dimensions of science
- Work safely independently and in an effective team in a variety of laboratory settings
- Practice critical self-reflection in order to progress as a scientist and as a life-long learner

Course Framework and Alignment Table

Topic No.	Topic	Instructor-designed Learning Objectives	Indicate ASBMB Core Concept and/or skill	By what method are you assessing if students have accomplished the learning objective?
1	Introduction	1) Describe course structure and expectations. 2) Reflect on content knowledge from the previous semester.	1,2,3,4	Quiz, discussion, group voting on course objectives
2	Evolution and Kinetics	Define and graphically determine kinetic parameters Interpret tables, graphs Evaluate challenges and limitations in research approaches	1,2,4 Biochemistry of Evolution	Individual worksheet, group Figure evaluation, Quiz (next class) on analysis if data from the paper
3	Carbohydrate chemistry and Glycolysis	1) Be able to describe at least four different functional roles of carbohydrates and the importance of monosaccharide derivatives. 2) Be able to compare/contrast (in terms of structure and/or function): aldose vs ketose, straight chain vs cyclic structures, furanose vs pyranose, types of isomers (enantiomers, epimers, anomers), O-glycosidic vs N-glycosyl bonds, monosaccharides vs disaccharides vs polysaccharides. 3) Be able to draw: the structures of glucose, fructose, sucrose, lactose, ribose, glyceraldehyde and dihydroxyacetone. 4) Be able to answer the WHY, WHERE, WHEN metabolism questions of glycolysis. 5) Be able to describe/draw/recognize/reproduce: the NAMES, STRUCTURES, ENZYMES, COFACTORS of all of the steps of glycolysis, the TYPE of reaction catalyzed by each enzyme, the NET EQUATION of glycolysis, the fates of	1,2,4 Personal Communication & Team Building Skills	Individual quiz on pre-reading, peer-grading and discussion

		pyruvate (including NAMES, STRUCTURES, ENZYMES, COFACTORS) after glycolysis (and when/where/why they occur). 6) Be able to describe the role of gluconeogenesis in normal physiological processes. 7) Be able to list the metabolites that can act as gluconeogenic precursors. What metabolites cannot? 8) Be able to draw, with correct chemical structures, how the irreversible steps of glycolysis are bypassed in gluconeogenesis. 9) Be able to draw, on a "Cell Map", where the steps of gluconeogenesis occur in the cell, and on a "Whole Body Metabolic Map", where gluconeogenesis occurs in the human body. 10) Be able to list the net equation, energy requirements of gluconeogenesis.		
4	Regulation of glycolysis and gluconeogenesis	1) Describe which reactions in the glycolytic pathway are <u>not</u> readily reversible, and why. 2) Be able to describe the details of the control of glycolysis through the regulation of the enzymes hexokinase, PFK-1, pyruvate kinase. 3) Be able to describe the LOGIC of these regulation mechanisms (For example, why does it make sense that high [ATP] inhibits glycolysis?). 4) Define an isozyme. How are hexokinase and glucokinase similar and different? 5) Describe how the hormones insulin and glucagon "signal" to the processes of glycolysis and gluconeogenesis.	1,2,4 Personal Communication & Team Building Skills	Individual quiz on pre-reading, peer-grading and discussion; group worksheet connecting carbohydrate chemistry to signal transduction

		6) For the irreversible steps of glycolysis which are bypassed in gluconeogenesis, outline how these are regulated; draw a connected figure of glycolysis and gluconeogenesis, with similarities and differences, bypasses outlined, with regulatory molecules included. 7) Be ready to work in class on problems that illustrate the reciprocal regulation of glycolysis and gluconeogenesis; this will require that you review/relearn about allosteric enzyme kinetics!		
5	PDH and the CAC	1) Diagram the overall reaction of the pyruvate dehydrogenase complex. Where is it located? What coenzymes are integral to this complex? What is the overall purpose of the CAC? Where (the sub-cellular locations) are the enzymes of the citric acid cycle located? 2) Be able to draw the structures of all intermediates in the citric acid cycle. 3) Be able to name the enzymes and cofactors involved in all reactions of the citric acid cycle; what TYPES of reactions do the enzymes catalyze. Which other metabolic pathways are "fed" by the citric acid cycle? What does anaplerotic mean? What enzymes catalyze anaplerotic reactions?	1,2,4 Personal Communication & Team Building Skills	Individual quiz on pre-reading, peer-grading and discussion; group quiz
6	Regulation of the CAC	1) Describe which reactions in the citric acid cycle are regulated, which molecules regulate these reactions, and outline how these regulators integrate the reactions of citric acid cycle with demands for the products of the citric acid cycle. Connect this to glycolysis, gluconeogenesis. 2) List which other metabolic pathways are fed by the citric acid cycle. 3) Define anaplerotic. 4) Describe the significance of the pyruvate carboxylase reaction.	1,2,4 Personal Communication & Team Building Skills	Individual quiz on pre-reading, peer-grading and discussion; group discussion/clicker questions

		5) Describe/draw the function and the sub-cellular locations of the enzymes of the glyoxylate cycle. This cycle is important for what types of organisms?		
7	PBL Case Study:	Using a variety of data sources, determine the cause of death of the Beloved Professor	1,2,4 Personal Communication & Team Building Skills	Group Case Synopsis (several short essays on hypotheses, experimental design, data evaluation, integration after more data, final diagnosis)
8	Fatty Acid Synthesis	1) What are four general functions of fatty acids? 2) Describe how cellular positive energy balance influences regulation of glycolysis, pentose phosphate pathway, and the citric acid cycle to provide substrates for fatty acid synthesis. 3) What is the rate-limiting and regulated step for fatty acid synthesis and how is this enzyme regulated? 4) What is the enzyme responsible for fatty acid synthesis and how do the seven protein / enzyme activities function to synthesize palmitic or steric acid? 5) Be able to outline using chemical structures how fatty acid synthase elongates an acyl-ACP by two carbon units (in other words through one cycle) using the four sequential enzyme activities (condensation, reduction, dehydration, reduction). 6) Be able to name the four classes of eicosanoids and the type of fatty acids (how many carbons) from which these eicosanoids are derived. 7) Describe the general function of eicosanoids and what health / disease related processes these molecules have been best characterized. 8) Know why 18:2 ($\Delta^{9, 12}$) octadecadienoic acid and 18:3 ($\Delta^{9, 12, 15}$) octadecatrienoic acid referred to as essential fatty acids.	1,4 Personal Communication & Team Building Skills	Click here to enter text.

		Know how are these fatty acids synthesized from 18:1 (Δ^9) octadecanoic acid. 9) Be able to outline the elongation and desaturation of a fatty acid such as 18:3 ($\Delta^{6, 9, 12}$) octadecatrienoic acid to produce 20:4 ($\Delta^{5, 8, 11, 14}$) eicosatetraenoic acid. 10) Describe how fatty acid elongation of 16:0 hexadecanoic acid (palmitatic acid) to produce 18:0 octadecanoic acid (steric acid) differs when catalyzed by fatty acid synthase and the fatty acid elongation system (FAES)? 11) Outline the steps by which 20:4 ($\Delta^{5, 8, 11, 14}$) eicosatetraenoic acid and 20:5 ($\Delta^{5, 8, 11, 14, 17}$) eicosapentenoic acid released from phospholipids serve as substrates for cyclooxygenase-1 (COX-1) and cyclooxygenase-2 (COX-2) to produce prostaglandins. Know how these COX enzymes are regulated and how the function of the resulting prostaglandins differ.		
9	Fatty Acid Catabolism	1) If shown the chemical structure of a fatty acid that is 16-20 carbons long with 1-5 double bonds, be able to provide the carbon skeleton designation, systematic name, and common name. 2) If provided the carbon skeleton designation, systematic name, or common name of a fatty acid that is 16-20 carbons long with 1-5 double bonds be able to draw the chemical structure. 3) Know the general structure and primary function of triacylglycerol. 4) Be able to describe the general mechanism (8 steps) whereby dietary fat is digested, absorbed in the intestine, transported in the blood, assimilated into cells, and used to produce energy in the form of ATP. 5) Be able to describe the general mechanism (8 steps)	1,2,4 Personal Communication & Team Building Skills	Click here to enter text.

		whereby fatty acids and glycerol stored as triacylglycerol within adipocytes are mobilized and transported to other tissues and used to produce triacylglycerol or energy in the form of ATP. 6) Outline the combined action of intracellular lipases (triacylglycerol lipase, diacylglycerol lipase, and monoacyglycerol lipase) and extracellular lipases (lipoprotein lipase) that produce fatty acids and glycerol. 7) Describe the reactions how glycerol is used to produce energy in the form of ATP. 8) Be able to describe the general mechanism (acyl carnitine/carnitine shuttle) whereby fatty acids are transported from the cytoplasm into the mitochondrial matrix. 9) Know the enzymes, type of reactions these enzymes catalyze, and substrate/product for these reactions that participate in the β-oxidation of saturated fatty acids 10) Know the enzymes, type of reactions these enzymes catalyze, and substrate / product for reactions that participate in the β-oxidation of an unsaturated fatty acid. 11) Describe the mechanism responsible for “feedback inhibition” of carnitine acyl-transferase I (CAT1) which regulates the transport of acyl-CoA into the mitochondria. 12) Know the physiological purpose of ketone bodies and the physiological states by which production of ketone bodies (ketogenesis) occurs. 13) Be able to describe the tissues / cells and steps required for ketogenesis and utilization of ketone bodies as a source of energy. What is the benefit for liver / hepatocytes being able to produce ketone bodies and the brain / neurons and muscle / muscle cells for being able to utilize ketone bodies as a source of energy?		

		14) Know the enzymatic reactions responsible for synthesis and catabolism of ketone bodies. Be able to draw the structures of the ketone bodies. 15) Understand how insulin and glucagon affect pathways in various tissues to maintain tissue and whole body energy balance. 16) Be able to provide a general diagram describing an overview of energy metabolism that occurs between adipose, liver, brain, and muscle.		
10	Cholesterol and Fatty Acids	1) Be able to describe the absorption and regulation of cholesterol and fatty acids by enterocytes of the small intestine. 2) Be able to outline the basic reactions within enterocytes responsible for assembly of chylomicrons and then secretion into the lymph / blood and metabolism of chylomicrons. 3) What are the three major lipoproteins present in the fasted state? Provide an explanation as to why physicians need you to be fasted in order to measure lipids associated with these lipoproteins? 4) Be able to outline the secretion, blood metabolism, and endocytosis of VLDL and LDL in what is known as “forward lipid transport”. 5) Describe how cholesterol regulates the sterol regulatory element binding protein pathway (SREBP) pathway and the basic function of this pathway. 6) Be able to outline the formation, blood metabolism, and endocytosis of HDL in what is known as “reverse lipid transport”. 7) With your astute knowledge of the forward and reverse lipid	1,2,4 Personal Communication & Team Building Skills	Click here to enter text.

		transport pathways explain why “good cholesterol or HDL particles” and “bad cholesterol or LDL particles” have been misrepresented or misnomers. 8) Be able to describe the most likely genetic explanation for elevated LDL cholesterol levels among humans. 9) Be able to describe the most likely nutritional explanation for elevated LDL cholesterol levels among humans. 10) Provide at least two major concepts from the article by Mario Kratz.		
	Steroids	1) Be able to draw the structure of cholesterol and indicate which portions of the molecule are hydrophilic and hydrophobic. How would you propose cholesterol is oriented in the membrane? 2) Know the three general functions of cholesterol. 3) Describe the four stages of cholesterol biosynthesis. 4) Be able to outline the first three reactions in the first stage of cholesterol biosynthesis. 5) Describe how the rate-limiting step for cholesterol biosynthesis is regulated in the both short and long term. 6) What is the drug that inhibits the rate-limiting step of cholesterol biosynthesis and how does it decrease the concentration of blood cholesterol (Hint: slides 18 and 19). 7) Be able to write the reactions by which cholesterol is converted into its biologically inactive form and then back into is biologically active form. 8) Know the rate-limiting steps for steroid hormone, vitamin D, and bile acid biosynthesis. Be able to distinguish between a steroid hormone, vitamin D, and bile acid.	1,2 Personal Communication & Team Building Skills	

	Complex Lipids	1) Describe how glycerol 3-phosphate is a precursor for glycerophospholipid and triacylglycerol synthesis, but yet only serves as the “backbone” for glycerophospholipids. 2) Provide a general outline for the enzymatic steps responsible for converting glycerol 3-phosphate into phosphatidylcholine or a triacylglycerol. 3) Describe the best characterized regulated enzymatic step for glycerophospholipid synthesis and why it makes practical sense to be feedback inhibited by phosphatidylcholine. 4) Describe how triacylglycerol synthesis is regulated and relate this information to why diabetics loss weight when blood glucose levels are not properly controlled. 5) What benefit can you envision for cells that express phosphatidylserine synthase (1 or 2) and phosphatidylethanolamine methyltransferase. 6) Be able to provide a general outline of the triacylglycerol cycle, how this cycle is regulated, and the result of reciprocal regulation in adipose and liver. 7) Describe the difference between gluconeogenesis and glyceroneogenesis and the function for end products resulting from these pathways. 8) Know what molecule serves as the “backbone” of sphingolipids and what precursors combine to produce this unusual molecule. 9) Be able to describe how the general structure of	2 Personal Communication & Team Building Skills	

		sphingolipids differs from glycerophospholipids. 10) Know how the interaction of sphingolipids and glycerophospholipids with cholesterol differs and the specialized membrane microdomains that result from this interaction. Define the two general functions of these membrane microdomains? 11) Be able to outline (structures and name of structures) the rate limiting and regulated step for the synthesis of sphingolipids. 12) Describe the cellular compartment and enzymes that catalyze the degradation of sphingolipids. Hypothesize what would happen if a genetic mutation results in loss of function for one of these enzymes. 13) Be able to provide the enzyme name (phospholipase A, B, C, D) and reaction products that result from activation of a cellular signaling pathway. 14) Be able to outline how activation of phospholipase C could induce an increased concentration of cellular calcium and phosphorylation of many different proteins. 15) Be able to describe the process by which phospholipases and acyltransferases may participate in a deacylation-reacylation cycle for fatty acid remodeling.		
	Integration of Metabolism	1) Be able to describe why body weight and body mass index (BMI) which is commonly used to report prevalence of overweight or obesity represents a crude measure of human adiposity. 2) Be able to defend why you believe obesity should or should not be classified as a human disease. 3) Be able to describe the differences and similarities for the three types of human obesity.	1,2,4 Biochem of Evolution Personnel Communication & Team Building	

		4) Be able to describe what the scientific community understands concerning the genetics of human obesity. 5) Be able to describe what we understand concerning gene-environment (particularly gene- diet) interactions and human obesity. 6) Be able to describe the differences and similarities between the “thrifty gene hypothesis” and “drifty gene hypothesis” for the origin and/or evolution of human obesity. 7) Be able to describe (not memorize names or structures) how pathways of carbohydrate, amino acid, and fat metabolism contribute to positive energy balance. 8) Be able to describe the differences and similarities between white adipose and brown adipose. 9) Be able to describe (not memorize names or structures) the flow of macronutrients (glucose, amino acids, and lipids) between different tissues/organs and the ultimate storage of triacylglycerol in adipose tissue. 10) Be able to describe how the first obesity gene encoding leptin regulates energy balance. 11) Be able to describe what we understand concerning the basic components of energy balance and obesity epidemic.		

INTENSIVE BIOCHEMISTRY 446/546/512

INSTRUCTOR OF RECORD:
MARCY OSGOOD, Ph.D.
mosgood@salud.unm.edu
Office hours: M 3:35-5 PM, or by appt., BMSB 255
(I ask that you to read and follow the Guidelines for office visits before you see me--see below.)
CO-INSTRUCTOR:
W. SHERMAN GARVER, Ph.D.

COURSE DESCRIPTION AND OBJECTIVES:

The course is designed specifically for students who are majoring in Biochemistry and who plan to continue their education in the field, through a graduate or professional program. It is the second class in a two-class sequence, and you should NOT take this course unless you have completed BCHM 445/545/511 or a similar course that has been OKed by the instructor. The course will concentrate on the concepts, practices, and ways of thinking that define biochemistry. You will see connections to other disciplines; biochemistry is integrative. Because of this, you should be prepared to review material from your earlier biology, chemistry and physics courses.

Content Expectations:

We will be exploring, and you will be expected to assimilate (in quite a lot of detail), the concepts of **Intermediary Metabolism**.
In addition, you will be expected to remember a great deal of content from the previous Intensive Biochemistry course, including concepts related to:
-the aqueous environment of the cell (weak non-covalent interactions, pH, pKa)
-energy and organization (bioenergetics)
-complexity and complementarity of molecular structures (structure = function)
-catalysis (thermodynamic principles and kinetics)
-cellular communication (transport and signal transduction)
-information transfer (replication, transcription, translation, and gene regulation)

BCHM 445/545/511 largely focused on PROTEINS and NUCLEIC ACIDS, while BCHM 446/546/512 will deal largely with CARBOHYDRATES and LIPIDS, though still building on knowledge about proteins and nucleic acids.

Process Expectations:

What we hope you get out of this course, besides content knowledge, is the ability to:
-"speak" biochemistry (disciplinary literacy) to a wide variety of other people, with differing scientific backgrounds and abilities
-identify the right question, select a proper method/technique to solve a specific biochemical problem, and explain your reasoning (critical thinking and analytical problem solving)
-identify challenges and limitations in research approaches, and devise improvements
-apply biochemical processes to other disciplines and to world issues
-work and communicate effectively in a group (understand others and express yourself), orally and in writing, about biochemistry
-determine, and act upon, the knowledge of how you learn best

How to Succeed in this Course

The course is based on **individual preparation, active learning, and small group work**. What you take away from this class is determined by how much effort you invest in your own learning.

There is a high expectation of before-class preparation (assigned reading, tested by short, in-class quizzes). There will be relatively little lecture, and a lot of in-class and out-of-class group work. Just like scientists and physicians work in teams to advance the field and make the right decisions, we will use the small group cooperative learning environment to construct and evaluate scientific knowledge (i.e., engage in the scientific process). Throughout the semester we will practice organizing, communicating, applying and reflecting on biochemical knowledge in different contexts.

Come to class regularly and be engaged and involved; it gives you an opportunity to test if you can apply what you know. After each class, and each assignment or activity, reflect on what you think the take-home message was, what you need to do to close the gaps in your knowledge, how you can test if your understanding is correct, and how this new information relates to things that you have learned previously.

The course will emphasize deeper understanding and application of concepts rather than memorization (**though you will need to memorize much of the large "vocabulary" of the language of biochemistry**), which makes it unlikely that you will do well by cramming just before an exam. A good strategy, that will help you to improve your understanding, is trying to explain your thinking to your classmates. That's why working in groups will be encouraged. In addition, exams make up only half of the points that you can earn for your final grade (see Grading Policies below), so you MUST be in class for the regular quizzes, and participate in your group work, and complete the other assignments before and after class.

If you want to sit passively and listen to lectures, this is not the course (or the major) for you.

LEARNING RESOURCES

Textbook:
The book chosen for BCHM 445 and 446 for AY 2014-2015 is
Lehninger Principles of Biochemistry, 6th Edition by Nelson and Cox

You can also use any other good Biochemistry text; however, the page assignments will ONLY be given for the Nelson and Cox 6th edition text, but the Objectives and Outlines available for each topic area will make it possible for you to use any other text in order to learn the material.

BIOCHEM 446/546/512 Resources Web Site:
The CourseSite web site is restricted to students in this course.
This site contains:
Objectives, and an **Outline**, for each topic. The Quizzes that are given in class will be drawn from the Objectives and Outlines.
Some days there will also be PDF files which will consist of the figures that may have been used during the in-class discussion (minus any duplications or illustrative photographs), or that we have found to be helpful to students.
The **Objectives** and **Outlines** for each week will be posted (usually) by the Friday afternoon before that week. You can download these files (the PDF files tend to be somewhat large, and take a while to download) and print them if you desire, to bring to class to help you during the class.

In addition, primary literature readings, problem sets/activities, and any additional materials, will be made available through the course website.

Materials will be separated into Folders designated Section 1, Section 2, etc.; each "section" is the (approximately) three-week part of the course that ends with an in-class exam.

Faculty Office Hours:
The instructors are available outside of class times to help in your learning of biochemistry. Do not hesitate to contact them if you have questions. The biochemistry course covers a large amount of material. It is an upper division course that requires you to review information of previous courses and it integrates materials from biology, chemistry, and physics courses. Students use different methods to learn biochemistry and if you find that your selected method is unsuccessful the faculty may have suggestions for a more productive method to approach this topic. The easiest method to contact the faculty is through e-mail, to either ask a specific question or to schedule a meeting. In this course it is important to seek help sooner rather than later.

Guidelines for office hours
Before you come to office hours please read and follow these instructions, so that your time is most efficiently used:
If you have content questions: Come with specific written questions. Bring material for discussion with appropriate sections marked. Be ready to discuss what you have done to understand this specific concept, so that we can try and help you with different strategies.

If you have process questions (how the course is designed), and find yourself struggling, in general, be ready to discuss: Do you attend class, read and review assigned material before and after class, actively participate in the in-class group activities? If there are barriers to your participation in any of these, let us know so that we can help.

COURSE POLICIES AND CONDUCT

Academic Integrity

You are expected to:
-Commit to a code of values that honors academic and personal integrity, honesty and ethical standards.
-Complete your own work. All students are expected to work individually on in-class exams, individual quizzes, primary literature summaries or any other assignments that are designated as "individual".
-Acknowledge work and ideas of another person by appropriate citation. Collaborators must be acknowledged on any assignments, and assignments must not contain verbatim copying of any kind, from any source, including the Internet.
-In this course, any incidence of academic dishonesty will result in the attachment of a failing grade for that assignment and may involve university disciplinary action.

Courtesy

The following is expected of each student to ensure an undisrupted experience for everyone in class:
-Be on time and prepared for class.
-No cell phone use during class, unless specifically directed; please turn them off.
-Computer and tablet use is permitted only for class related activities.

Attendance

Attendance is expected.
However: Life happens. During any absences, you are responsible for acquiring any material covered, but there are no make-ups for assignments (see **Grading Criteria** below.)

Accommodations

If you have a disability or special needs, please notify the Instructor as soon as possible of any concerns or requests for accommodations and specific arrangements needed. It is your responsibility to contact the UNM Accessibility Resource Center (ARC), located on the second floor of Mesa Vista Hall, Room 2021. Mesa Vista Hall is located across the courtyard from the SUB. ARC will provide written documentation of your verified disability and recommended accommodations.
(ARC contact information: http://arc.unm.edu; phone: (505) 277-3506).

GRADING CRITERIA

This is a 4-credit course. The following outlines the weight of the various assessments that will be used.

1. In-class and Outside-of-class activities and assessments, including, but NOT restricted to: **(500 pts) 50%**

A. Individual and group quizzes (300 pts)
B. "4rth-credit" work: (200 pts)

- **5 primary and secondary (review articles) literature synopses;**
- **5 case study projects;**
- **Problem sets, take-home exams**

2. Best 3 out of 4 in-class Exams, each worth 100 pts **(300 pts) 30%**

3. Final Exam (required) (200 pts) **(200 pts) 20%**

There is no make-up for any missed activity and extra credit is not available.

1. In-class and Outside-of-class activities and assessments (50%)

A.

Individual Quizzes (usually Mon and Wed) (200 pts)

In preparation for most (29) class periods, you will be asked to read assigned portions of the textbook or other resource and take a quiz on this reading assignment in the first 5-10 minutes of class. You will earn credit for completing these quizzes, not on the number of correct answers; in other words, do the quiz, get credit. The point is that these quizzes will give you an opportunity to test yourself on the foundational knowledge necessary for in-class activities. They will make sure that you keep up with the vocabulary of biochemistry, so that you can "speak" biochemically with your group in class.

There will be 29 in-class individual quizzes (see Schedule). These will be ungraded; however, they will preview the exams, so using these quizzes to test your basic content knowledge will help prepare you for the exams.

***25-29 quizzes completed = 200 pts (20% of your total grade)**
***20-24 quizzes completed = 150 pts**
***15-19 quizzes completed = 100 pts**
***Less than 15 quizzes completed = 0 pts**

Group Quizzes (100 pts)

There will be 5-10 in-class group quizzes (which will NOT be announced) during the semester. These will be graded on correctness; all students in the group will receive the same score for these group activities. The point value of each group quiz will vary; the total number of points available from these group quizzes will be 100 pts.

B. "4rth-credit" work: (usually Fridays and outside of Class) (200 pts)

- **5 primary and secondary (review articles) literature summaries; Individual, out of class Work (10 pts each, total 50 pts)**
- **5 Group Synopses of Figures (In-class Group Work;** all students in the group will receive the same score for these group activities.) **(15 pts each, total 75 pts)**
- **5 case study projects, or problem sets (In-class Group Work;** all students in the group will receive the same score for these group activities.) **(15 pts each, total 75 pts)**

There will be NO make-up opportunities if you are absent from class and miss these activities.

2. Best 3 out of 4 Scores from the In-Class Exams (30%)

The four exams will be designed to be completed within a 50-minute class period, and will contain mixtures of the following:

-multiple-choice and short answer questions;
-problems similar to those you have worked on in class or in the cases, etc.
-interpretations of data sets, figures, graphs, that are the same as or similar to those you have seen in or out of class before.

Although the exams are *not* technically cumulative, they will build on understanding of concepts from last semester, and from previous sections throughout this semester.

The best 3 exam scores will count for this part of the course grade (in other words, the one lowest exam grade will be dropped.)

Exam dates; Fridays
Feb 6, Feb 27, March 27, April 17

3. Final Exam (20%)
The Final Exam will be given during Finals Week in the Final Exam time period (see **Schedule**). This Final exam is required of ALL students.

If the Final Exam percentage is GREATER than the regular exam average, the Final Exam percentage can replace the regular exam percentage for that portion (30%) of the grade, as well as count for the Final Exam portion (20%).

There will be NO make–up exams given. NONE. No exceptions.
In the case of university-sanctioned activities (athletic matches, for example) or professional/graduate school interviews, EARLY exams can be arranged.

NOTE that 75% of your grade is based on individual performance; 25% of the grade is based on group activities or products.

Grading Scale
The final grade will be the average of the above components and determined as follows:

Some type of A (A-, A, A+)	90% or more
B	80% or more
C	70% or more
D	60% or more
Fail	less than 60%

There is no extra credit offered, and there is no curve applied to grade distributions.
We do not "take off" points. You earn them. The difference is not merely rhetorical, nor is it trivial. In other words, you start with zero points and earn your way to a grade.

GRADUATE CREDIT (for students registered for BCHM 546 or BIOMED 512)
If you are registered for graduate credit, you have an extra assignment: to design an active-learning video, activity, or exercise based on an instructor-approved topic in metabolism. This assignment can receive a maximum of 100 points. The points earned on this graduate assignment will be added to the rest of the assessment points earned (for a total of 1100 points max).

The guidelines for this assignment will be provided to graduate students during the second week of the semester, describing the expectations in detail.

DATE	DAY	TOPIC	ACTIVITY (this only lists the "major" activity; there will usually be mini-lectures, question/answer periods, group work, each day)	READINGS (in Lehninger Principles of Biochemistry; **Chapters listed by number**; followed by pages); or ***papers***
1/12	M	Intro to 446; Review of 445	Q	(Review) **6, 13**
1/14	W	Enzyme Kinetics and Metabolism	1° Lit Work: Summary, Figures Analysis	***Bar-Even et al, 2011***
1/16	F	Carbohydrate Chemistry; Glycolysis	Q	7; 243-253 **14**; 543-568
1/21	W	Gluconeogenesis	Q	**14**; 568-575
1/23	F	Regulation of Glycolysis and Gluconeogenesis	Group Problem set	**15**: 587-595; 601-608
1/26	M	Pyruvate Dehydrogenase and the CAC	Q	**16**:633-653
1/28	W	CAC Regulation	Q	**16**: 653-659
1/30	F	Carbohydrate Metabolism	Case Study	
2/2	M	Glycogen Metabolism I	Q	7; 254-259 **15**: 612-620
2/4	W	Glycogen Metabolism II	Q	**15**: 620-626
2/6	F		EXAM 1	
2/9	M	Electron Transport: Oxidative Phosphorylation I	Q	**13**: 528-537 **19**: 731-747
2/11	W	Electron Transport: Oxidative Phosphorylation II	Q	**19**: 747-762
2/13	F	Oxygen Radicals	1° Lit Work: Summary, Figures Analysis	***Jamurtas et al, 2006***
2/16	M	Pentose Phosphate Pathway	Q	**14**: 575-580
2/18	W	Integration of Carbohydrate Metabolism	Q	**23**: 951-960
2/20	F	Fatty Acid Mobilization & Catabolism	Q	**17**: 667-686
2/23	M	Ketone Body Metabolism	Q	**17**:686-688
2/25	W	Lipid Catabolism	Case Study	
2/27	F		EXAM 2	
3/2	M	Fatty Acid Synthesis I	Q	**21**: 833-842
3/4	W	Fatty Acid Synthesis II and Eicosanoids	Q	**21**: 842-848 also, pp. 501-504
3/6	F	Integration of Fat Metabolism	1° Lit Work and Group Problem Set	***Scorletti and Byrne, 2013; pp. 231-236***
3/7	3/15	SPRING BREAK		
3/16	M	Complex Lipids I	Q	**21**: 848-852
3/18	W	Complex Lipids II	Q	**21**: 852-859
3/20	F	Integration of Lipid Metabolic Enzymes	1° Lit Work: Summary, Figures Analysis	***Shi and Burn, 2004***
3/23	M	Cholesterol Metabolism I	Q	**21**: 859-864
3/25	W	Cholesterol Metabolism II	Q	**21**: 864-876 ***(optional Kratz, 2005)***
3/27	F		EXAM 3	

3/30	M	Amino Acid Catabolism I	Q	**18:** 695-710
4/1	W	Amino Acid Catabolism II	Q	**18:** 710-725
4/3	F	Integration of Amino Acid Catabolism	Case Study	
4/6	M	Amino Acid Synthesis I	Q	**22**: 881-882; 888-891
4/8	W	Amino Acid Synthesis II	Q	**22:** 891-892; 899-900; 902-909
4/10	F	Amino Acid Metabolism	1° Lit Work: Summary, Figures Analysis	***TBA***
4/13	M	Synthesis of Purines and Pyrimidines	Q	**22:** 910-920
4/15	W	Degradation of Purines and Pyrimidines	Q	**22:** 920-925
4/17	F		EXAM 4	
4/20	M	Integration of Metabolism I	Q	23: 968-971
4/22	W	Integration of Metabolism II	Q	***TBA***
4/24	F	Integration of Metabolism III	1° Lit Work: Summary, Figures Analysis	***TBA***
4/27	M	Integration of Metabolism IV	Q	**23:** 939-960
4/29	W	Integration of Metabolism V	Q	***TBA***
5/1	F	Integration of Metabolism VI	Case Study	
5/8	F		FINAL EXAM 7:30-9:30 AM	

Course Framework and Alignment Instructions with Form

Syllabus Provided

Course Name: Biochemical Methods

Course Director's Name: Chien-An Andy Hu Date: Spring Semester

Course Number: Bioc 448L Credit Hours: 3 credit hours

ASBMB Core Concepts and Associated BMB Learning Objectives

ASBMB Core Concept 1: Energy is Required by and Transformed in Biological Systems

- Apply their knowledge of basic chemical thermodynamics to biologically catalyzed systems
- Relate the laws of thermodynamics to homeostasis and explain how a cell or organism maintains homeostasis (a system seemingly in equilibrium) using nonequilibrium mechanisms.
- Quantitatively model how these reactions occur, and calculate kinetic parameters from experimental data.
- Discuss the concept of Gibbs free energy, and apply it to chemical transformations
- Identify which steps of metabolic pathways are exergonic and which are endergonic and relate the energetics of the reactions to each other.
- Show how reactions that proceed with large negative changes in free energy can be used to render other biochemical processes more favorable.
- Describe homeostasis at the level of the cell, organism, or system of organisms and hypothesize how the system would react to deviations from homeostasis.
- Summarize the different levels of control (including reaction compartmentalization, gene expression, covalent modification of key enzymes, allosteric regulation of key enzymes, substrate availability, and proteolytic cleavage), and relate these different levels of control to homeostasis

ASBMB Core Concept 2: Macromolecular Structure Determines Function and Regulation

- Discuss the diversity and complexity of various biologically relevant macromolecules and macromolecular assemblies in terms of the basic repeating units of the polymer and the types of linkages between them
- Outline the chemical and physical relationships between sequence and structure of macromolecules and evaluate chemical and energetic contributions to the appropriate levels of structure of the macromolecule
- Predict the effects of specific alterations of structure on the dynamic properties of the molecule
- Predict the determinants of specificity and affinity of a macromolecule-ligand complex
- Compare and contrast the potential ways in which the function of a macromolecule might be altered, including examples of allosteric regulation, covalent regulation, and gene level alterations of macromolecular structure/function.

ASBMB CORE CONCEPT 3: INFORMATION STORAGE AND FLOW ARE DYNAMIC AND INTERACTIVE

- Define what a genome consists of, and how the information in the various genes and other sequence classes within each genome are used to store and express genetic information.
- Explain the central dogma of biology (the message in DNA is transcribed into RNA and translated into protein) and relate the commonality of the process to all of life.
- Diagram how DNA is replicated and genes are transmitted from one generation to the next in multiple types of organisms including bacteria, eukaryotes, viruses, and retroviruses.
- Describe how the cell insures high fidelity DNA replication and identify instances where the cell employs mechanisms for damage repair.

ASBMB CORE CONCEPT 4: DISCOVERY REQUIRES OBJECTIVE MEASUREMENT, QUANTITATIVE ANALYSIS, & CLEAR COMMUNICATION

- Develop a hypothesis, and design and conduct appropriate experiments to test that hypothesis, explaining the basis of the proposed experiments and discussing potential results in the context of the hypothesis
- Analyze and interpret data using appropriate quantitative modeling and simulation tools
- Access, assess, and use available information
- Present scientific data in an appropriate context and in a variety of ways, at different levels

ASBMB EXPECTATION: ROLE OF BIOCHEMISTRY IN EVOLUTION

- Describe the principles of evolution through natural selection as foundational to biochemistry and molecular biology, and defend these principles in their work, schools, and communities.
- Use the tools of biochemistry and molecular biology (including databases of biological molecules and functional assays) to explain changes in traits, adaptations, and the success or failure of organisms and species.
- Analyze pre-existing or novel data and relate the findings in light of the theory of evolution.
- Describe what a mutation is at the molecular level and how it comes about
- Predict how changes in a nucleotide sequence can influence the expression of a gene or the amino acid sequence of the gene product (protein) and translate these findings into a conclusion about how said mutation would impact the general fitness of an organism or population

PERSONAL COMMUNICATION AND TEAM BUILDING SKILLS

- Recognize and take advantage of opportunities for interdisciplinary collaboration
- Appreciate and promote the ethical dimensions of science
- Work safely independently and in an effective team in a variety of laboratory settings
- Practice critical self-reflection in order to progress as a scientist and as a life-long learner

Course Framework and Alignment Table

Week No.	Topic	Instructor-designed Learning Objectives	Indicate ASBMB Core Concept and/or skill	By what method are you assessing if students have accomplished the learning objective?
1	Determining Accuracy of a Pipetman	1) Be able to identify the functional parts of a pipetman. 2) Understand and demonstrate proper use of a pipetman.	4 Team Building & Communication Skills	• Notebook recording. • Data acquisition. • Statistical analysis of data.
2-4	Spectrophotometry	1) Be able to identify the functional parts of a spectrophotometer. 2) Determine of optimal absorption wavelength for a compound. 3) Be able to accurately perform dilution techniques. 4) Determine the molar absorption coefficient for a given compound. 5) Determine the unknown concentrations of a compound using your own data obtained for lambda-max and molar absorption coefficient.	4 Team Building & Communication Skills	• Notebook recording. • Data collection. • Graphing. • Statistical analysis of data. • Individual conclusions. • Observation of team work.
5-15	P5C Reductase Purification, identification and Enzymology	1) Be able to review and discuss the related literature. 2) Perform bio-computational analysis of P5CR protein sequences. 3) Be able to purify P5CR enzyme. 4) Be able to identify P5CR isoforms by immunoblot analysis and quantify your purification protocol using P5CR enzymology.	1,2,3,4 Team Building & Communication Skills	• Team projects, presentations and project reports. • Notebook recording. • Quiz. • Data collection. • Graphing. • Statistical analysis of data. • Individual conclusions. • Final report

BIOCHEM 448L SYLLABUS – SPRING 2015

Times and Locations:

Class 1:00 pm - 2:50 pm Tu HSC Domenici Center West Building Room 2112 (see map)

Lab **Four Big Groups:** 12:30 pm – 2:30 pm or 2:50 -- 4:50 pm Th or Fr BMSB267

Personnel:

Course Director: C. Andy HU Ph.D. (AHu@salud.unm.edu, 505-272-6616, Fitz 258)

Instructors: C. Andy HU Ph.D. and

Rob Orlando, Ph.D. (rorlando@salud.unm.edu, 505-272-5593, BRF 223D)

Laboratory Assistant: Sarah KIM and Sungwhan KIM

Website:
learn.unm.edu

Login using your UNM NetID and password to access course materials. Materials, including the syllabus, can be accessed from the "Course Information" link near the upper left of the Dashboard.

Course Description:

Prerequisites: Grade of C or better in 445, concurrent or previous registration in 446, completion of CHEM 253.

This course is an introduction to the practice of Biochemistry. Laboratory work is a major component. In addition to learning practical, hands-on laboratory skills and developing an understanding of biochemical methods, students will gain experience in additional areas important to practicing scientists, including maintenance of lab notebooks, data analysis and interpretation and scientific collaboration and communication (oral and written). Various biochemical methods will also be discussed in lectures and student presentations to increase your familiarity with the wide range of techniques that are important to this field. The grades for this course will be based on the following distribution:

For Orlando's Blocks –

Lab Notebook	**100 %**

For Hu's Blocks –

Lab Notebook Checks	**10 %**
Term paper and assignments	**30 %**
Group Presentations	**30 %**
Lab Reports	**30 %**

Laboratory Blocks:

Students will perform experiments, maintain a laboratory notebook, and turn in written laboratory reports. Drs. Orlando and HU will be the instructors for the Thursday and Friday labs and will also

cover topics in Tuesday lectures related to each specific lab. Students will be further divided into groups of approximately 6 and this group will be your lab partners for the semester.

Pipetman Calibration (Weeks 1-2) – Dr. Orlando

The pipetman is one of our basic and most essential tools in the laboratory. During our first week, you will learn how to properly use these tools by determining their accuracy using an analytical balance.

Tuesday Sessions: We will discuss the fundamental principles for the upcoming laboratory experiences. You will also have an opportunity to work with your lab partners to develop assays for the labs and to interpret your data. Dr. Orlando will circulate among the groups to help with troubleshooting.

Spectrophotometry (Weeks 3-4) – Dr. Orlando

Human P5CR isozymes, from Genes to Protein Isoforms to Isozymes (Weeks 5 to 15)– Dr. Hu

Biochemistry 448L – Orlando Section

Schedule – Laboratories 1 & 2

Week	Date	Lecture	Laboratory
1	1/13	Notebooks, Micro-pipettors, Dilutions	
	1/15 1/16		Laboratory 1 – Proper use of a micro-pipettor
2	1/20	Beer-Lambert, Spectrophotometers	
	1/22 1/23		Laboratory 2 – Relationship between concentration and absorbance. Determining absorbance spectra
3	1/27	Group work/Problem Solving	
	1/29 1/30		Laboratory 2 – Relationship between concentration and absorbance. Determining extinction coefficient
4	2/3	Group work/Problem Solving – Quiz?	
	2/5 2/6		Laboratory 2 – Relationship between concentration and absorbance. Using your data to determine an unknown concentration

Summary of Lab Reports

Lab reports are to be written up individually, not with your lab partner. However, keep in mind that you and your lab partner have the same data and therefore, should have the same results after calculations are completed. You may check with your lab partner in this respect ONLY. You each may reach different conclusions, which is perfectly acceptable—just be sure to make a strong argument for your conclusion.

Reports for Laboratories 1 & 2 are due by February 13. Any reports turned in after the due date will be reduced by one full letter grade for each day that it is late.

Laboratory 1: Use of Micro-Pipettes

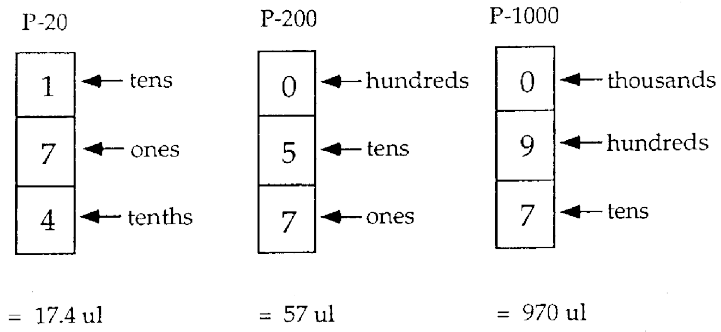
Introduction

In Bioc 448L we will be using micro-pipettes for most experiments. In order to obtain accurate and precise data, correct operation of the micro-pipettes is imperative. For this reason, we are going to start the course with an exercise to familiarize everyone with micro-pipettes.

Use of the Microliter Pipettor

A microliter pipettor, or more commonly called a pipetman, is a variable-stroke piston pipette. The volume indicator consists of three number dials and is read from top to bottom.

Sample Pipetman settings:



The range of each pipette is given below. ***Do not use outside of these ranges!***

Manufacturer's Specifications

Model	Range, µL	Accuracy*	Precision*
P-20	2-20	1%	0.5%
P-200	20-200	0.8%	0.25%
P-1000	200-1000	0.8%	0.2%

***Relative % at mid-range**

Accuracy is the closeness to which the dispensed volume approximates the true volume as set on the pipette. Accuracy is expressed as *mean error* or *% error*, the percent by which the mean value of a large number of replicate measurements of the same volume will deviate from the expected or "true" volume. The accuracy of these pipettes is determined by the factory calibration and checked gravimetrically using distilled water and an analytical balance. Careful use will maintain this calibration and accuracy throughout the semester.

Precision refers to the "scatter" of individual measurements around the mean of replicate measurements. It can be expressed as *sample standard deviation*.

Operation of the Microliter Pipette

1. Set the volume by turning the volume adjustment knob at the end of the pipette until the correct volume shows on the indicator.

   Note: Never go above or below the range of the pipettor! Know these ranges at all times.

2. Attach a new disposable tip to the pipette shaft. Press firmly with a slight twisting motion. Make sure you are using tips of the correct size for each pipette.
3. When drawing sample, press the plunger to the ***first stop***. This part of the stroke is the calibrated volume displayed on the digital volume indicator. Do ***not*** press the plunger all the way down, or you will draw up too much solution.
4. Holding the pipetman vertically, immerse part of the disposable tip into the sample (a few millimeters is sufficient).
5. Allow the push-button to return ***slowly*** to the up position***. Never let it snap up!*** (If it *does* happen, the pipetman may have to be dismantled and cleaned to prevent corrosion and the contamination of your succeeding samples.) Do this slowly and keep the tip submerged in the solution to prevent any air bubbles from entering the tip.
6. Wait a few seconds to ensure that the full volume of sample is drawn into the tip.
7. Withdraw the tip from the sample liquid. *You should observe the liquid in each type of tip with each micro-pipettor so that you can become aware if there is a significant problem with the micro-pipettor. This is an important part of learning the technique and your becoming proficient at pipetting small volumes.*
8. To dispense the sample, touch the tip end to the sidewall of the receiving tube and depress the plunger ***slowly*** to the first stop. ***Wait two seconds***. Then press the plunger to the ***second stop*** (the bottom stroke), expelling any residual liquid in the tip.
9. With the plunger fully depressed, carefully withdraw the pipetman from the tube.
10. Allow the plunger to return ***slowly*** to the ***up*** position.
11. Discard the tip. You want to use a different tip each time you are gathering/dispensing different materials. If you don't do this in this lab, your concentrations of solutions will be inaccurate, and as a result, so will your data.

Note: To prevent liquids from being drawn into the pipetman shaft, *pipette slowly* and *never* invert or lay microliter pipettor on its side with liquid in the tip.

Part 1: Calibrating and Using a Micro-pipette

Please fill in the following table with the most appropriate equipment to measure the listed volume. (There may be more than one answer for some.)

	Volume Required (µL)	Type (P1000, P200, P20)	Reading on Pipette
1	25		
2	12.5		
3	300		
4	5		
5	1000		
6	958		
7	150.2		
8	1.5		
9	7000		
10	1250		

1. Place a weigh dish on a balance and tare it.
2. Pipette 15 µL using the correct model of pipette 10 times (a total of 150 µL) into the weigh dish, and record the mass in the table below. Do this three times.
3. Using the correct size of pipette, find the mass of 50 µL of water. Repeat this three times, and record your measurements in the table below. Repeat this step with 250 µL and 750 µL.
4. Using the recorded values, calculate the means and standard deviations.

	Observed Mass (mg)			
Volume	10 x 15 µL	50 µL	250 µL	750 µL
1				
2				
3				
Mean (x **)**				
Std Dev (σ **)**				
Low Value ($x - \sigma$ **)**				
High Value ($x + \sigma$**)**				
Range (*high - low* **)**				

Part 2: Micro-pipetting and Accuracy Measured by Dilution Technique

1. Turn on spectrophotometer. It takes approximately 10-15 minutes to warm up the lamp. Select ABS on the dial for absorbance. Adjust the dial to set the wavelength to 700 nm.
2. Weigh out the appropriate amount of copper sulfate and make 2 mL of 1.0 M aqueous $CuSO_4 \cdot (H_2O)_5$ (MW = 249.68 g/mol) in a test tube. Mix the solution well and make sure that it looks clear so you get accurate absorbance readings.
3. While taking note of the recommended range of each micro-pipette size and using the correct size tips, make the following solutions in eight separate test tubes. (Be sure to label them to not mix them up)

Tube	**Distilled H2O (µL)**	**1M Copper Sulfate (µL)**	**Concentration (M)**	**Absorbance**
1	1000	-	0	
2	990	10		
3	980	20		
4	950	50		
5	900	100		
6	800	200		
7	700	300		
8	600	400		

4. Look at the level of solution in each test tube. If your pipetting was accurate, each of the test tubes should have the same amount of solution. Mix the solutions well.
5. Using the correct micro-pipette, transfer each of the solutions from the test tubes to separate cuvettes. When handling the cuvettes, only touch the top portion, as fingerprints on them will leave oily smudges which can interfere with your absorbance measurements.
6. Place tube #1 (the blank) in the sample slot of the spectrophotometer and close the compartment lid.

7. Adjust the dial to read "0" absorbance. This will establish the baseline for the spectrophotometer.
8. Replace tube #1 with tube #2 and record the absorbance in the table above.
9. Repeat step 8 for tubes #3-8.
10. Draw a plot of absorbance (y-axis) vs. concentration (x-axis). What is your linear correlation coefficient (r-value)?

Data to be turned in for Laboratory 1

1. The tables from Parts 1 and 2, typed or handwritten in pen (scan or photocopy from your notebook is fine).

2. Plot of concentration vs. absorbance for dilution study. Remember to properly label axes and include units. Determine the equation of the line and include r- value for the linear fit to the data points.

3. Show your math. Example: How did you calculate concentration of $CuSO_4 \cdot (H_2O)_5$ for each of the dilutions?

Laboratory 2: Relationship between Absorbance and Concentration

Introduction:

In this lab, we will be exploring the Beer-Lambert Law and proper use of a spectrophotometer. There are three parts to this laboratory exercise and you will have three lab periods to complete this assignment.

1. Determine the wavelength of visible light that provides maximum absorbance for $CuSO_4$.
2. Determine the molar extinction coefficient for $CuSO_4$.
3. Using your data obtained from Parts 1 & 2, determine the concentrations for several unknown samples of $CuSO_4$.

We will discuss the principles of spectrophotometry and light absorption in our Tuesday class sessions. Working in pairs, you will be responsible for developing and carrying out the protocols to achieve each of your three objectives. I have reserved two of our Tuesday sessions for protocol work and problem solving.

The purpose of this approach is to provide you with experience in actual laboratory science. Laboratory 1 was designed to provide training and experience in using a pipetman, and to get you started in 448L with a standard protocol. In Laboratory 2, you are given objectives and must not only perform the experiments to achieve these objectives, but also design the most appropriate protocol to provide you with the most accurate and reliable data for reporting. I will present theoretical details in class that should provide you with the foundational material to develop your protocols. And I will provide troubleshooting help in our Tuesday classes.

Grading:

Grading for this Laboratory will be based on your protocol design and your accuracy in the data you report. Protocols must be complete and reproducible by anyone without additional aid or assistance. Your data is expected to be within 10% of values obtained by your instructor and/or TAs; in other words, no more than 10% error will be accepted; errors greater than 10% will result in a reduced letter grade. You are given three weeks to accomplish these tasks. This is plenty of time to repeat one or more protocols to optimize your results.

Data to be turned in for Laboratory 2

1. Your protocols for each of the three parts to Laboratory 2, typed or handwritten in pen (scan or photocopy from your notebook is fine).

2. Raw data you collected from spectrophotometer measurements for each of the three parts.

3. Graphs you generated from the raw data. Remember to include proper labeling of axes and include units where appropriate.

4. Show your math. Example: How did you calculate the extinction coefficient of $CuSO_4$? How did you determine the concentrations of the unknown $CuSO_4$ samples?

2015 448L Section II-- Protein/Enzyme Purification and Characterization

	Tues	Classroom
10-Feb	Hu Lecture 1	DCWest DCW Room 2112
17-Feb	Hu Lecture 2	DCWest DCW Room 2112
24-Feb	P5CR SEQUENCE ALIGNMENTS I	DCWest DCW Room 2112
3-Mar	P5CR SEQUENCE ALIGNMENTS II	DCWest DCW Room 2112
10-Mar	**SPRING BREAK**	
17-Mar	P5CR in human diseases	DCWest DCW Room 2112
24-Mar	P5CR Enzyme Functions and Activities I	DCWest DCW Room 2112
31-Mar	P5CR Enzyme Functions and Activities II	DCWest DCW Room 2112
7-Apr	P5CR Purification I	DCWest DCW Room 2112
14-Apr	P5CR Purification II	DCWest DCW Room 2112
21-Apr	Clinics-- Discussion of results	HSSB Health Sciences Room 105
28-Apr	Clinics-- Discussion of results	DCWest DCW Room 2112

2015 448L Section II-- Protein/Enzyme Purification and Characterizat

	Thurs/Fri Wet Lab	Thurs/Fri classroom
12-Feb	P5CR sequence alignment I	P5CR sequence alignment I
19-Feb	P5CR sequence alignment II	P5CR sequence alignment II
26-Feb	**Ammonium sulfate (I)**	**P5CR sequence alignment II**
5-Mar	**Ammonium sulfate (II)**	**P5CR individual topics**
10-Mar	**Spring Break**	
19-Mar	**Protein Desalting**	**Protein purification**
26-Mar	**SDS-PAGE gel electrophoresis & transfer**	**Western blot analysis I**
2-Apr	**Primary Antibody**	**Western blot analysis II**
9-Apr	**Secondary antibody, ECL and Film**	**P5CR enzymology I**
16-Apr	**Enzyme assay I**	**P5CR enzymology II**
23-Apr	**Enzyme assay II**	**P5CR Purification**
30-Apr	**P5CR Purification**	

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Course Framework and Alignment Instructions with Form

Syllabus Provided

Course Name: Biochemistry of Human Disease

Course Director's Name: Chien-An Andy Hu Date: Fall Semester

Course Number: Bioc 463 Credit Hours: 3 credit hours

ASBMB Core Concepts and Associated BMB Learning Objectives

ASBMB Core Concept 1: Energy is Required by and Transformed in Biological Systems

- Apply their knowledge of basic chemical thermodynamics to biologically catalyzed systems
- Relate the laws of thermodynamics to homeostasis and explain how a cell or organism maintains homeostasis (a system seemingly in equilibrium) using nonequilibrium mechanisms.
- Quantitatively model how these reactions occur, and calculate kinetic parameters from experimental data.
- Discuss the concept of Gibbs free energy, and apply it to chemical transformations
- Identify which steps of metabolic pathways are exergonic and which are endergonic and relate the energetics of the reactions to each other.
- Show how reactions that proceed with large negative changes in free energy can be used to render other biochemical processes more favorable.
- Describe homeostasis at the level of the cell, organism, or system of organisms and hypothesize how the system would react to deviations from homeostasis.
- Summarize the different levels of control (including reaction compartmentalization, gene expression, covalent modification of key enzymes, allosteric regulation of key enzymes, substrate availability, and proteolytic cleavage), and relate these different levels of control to homeostasis

ASBMB Core Concept 2: Macromolecular Structure Determines Function and Regulation

- Discuss the diversity and complexity of various biologically relevant macromolecules and macromolecular assemblies in terms of the basic repeating units of the polymer and the types of linkages between them
- Outline the chemical and physical relationships between sequence and structure of macromolecules and evaluate chemical and energetic contributions to the appropriate levels of structure of the macromolecule
- Predict the effects of specific alterations of structure on the dynamic properties of the molecule
- Predict the determinants of specificity and affinity of a macromolecule-ligand complex
- Compare and contrast the potential ways in which the function of a macromolecule might be altered, including examples of allosteric regulation, covalent regulation, and gene level alterations of macromolecular structure/function.

ASBMB CORE CONCEPT 3: INFORMATION STORAGE AND FLOW ARE DYNAMIC AND INTERACTIVE

- Define what a genome consists of, and how the information in the various genes and other sequence classes within each genome are used to store and express genetic information.
- Explain the central dogma of biology (the message in DNA is transcribed into RNA and translated into protein) and relate the commonality of the process to all of life.
- Diagram how DNA is replicated and genes are transmitted from one generation to the next in multiple types of organisms including bacteria, eukaryotes, viruses, and retroviruses.
- Describe how the cell insures high fidelity DNA replication and identify instances where the cell employs mechanisms for damage repair.

ASBMB CORE CONCEPT 4: DISCOVERY REQUIRES OBJECTIVE MEASUREMENT, QUANTITATIVE ANALYSIS, & CLEAR COMMUNICATION

- Develop a hypothesis, and design and conduct appropriate experiments to test that hypothesis, explaining the basis of the proposed experiments and discussing potential results in the context of the hypothesis
- Analyze and interpret data using appropriate quantitative modeling and simulation tools
- Access, assess, and use available information
- Present scientific data in an appropriate context and in a variety of ways, at different levels

ASBMB EXPECTATION: ROLE OF BIOCHEMISTRY IN EVOLUTION

- Describe the principles of evolution through natural selection as foundational to biochemistry and molecular biology, and defend these principles in their work, schools, and communities.
- Use the tools of biochemistry and molecular biology (including databases of biological molecules and functional assays) to explain changes in traits, adaptations, and the success or failure of organisms and species.
- Analyze pre-existing or novel data and relate the findings in light of the theory of evolution.
- Describe what a mutation is at the molecular level and how it comes about
- Predict how changes in a nucleotide sequence can influence the expression of a gene or the amino acid sequence of the gene product (protein) and translate these findings into a conclusion about how said mutation would impact the general fitness of an organism or population

PERSONAL COMMUNICATION AND TEAM BUILDING SKILLS

- Recognize and take advantage of opportunities for interdisciplinary collaboration
- Appreciate and promote the ethical dimensions of science
- Work safely independently and in an effective team in a variety of laboratory settings
- Practice critical self-reflection in order to progress as a scientist and as a life-long learner

Course Framework and Alignment Table

Topic No.	Topic	Instructor-designed Learning Objectives	Indicate ASBMB Core Concept and/or skill	By what method are you assessing if students have accomplished the learning objective?
1	Dr. Chien-An Andy Hu: Inborn Errors of Proline Metabolism	1) Understand proline metabolism in all living organisms. 2) Define the enzymes and reactions involved in the interconversions of proline, P5C, glutamate, and ornithine. 3) Understand inborn errors/genetic disorders of proline metabolic enzymes and how this information is used for treating patients.	1,2,3 Team Building & Communications	Small group project Small group discussion Small group presentation Quizzes Group term paper
2	Dr. Edward Moczydlowski: Diseases of Protein Folding: Current Strategies in Alzheimer's Disease Research	1) Understand the historical perspective of biochemical correlations related to Alzheimer's Disease (AD) pathology. 2) Describe the histological pattern of extracellular deposits (amyloid plaques) and intracellular lesions (neurofibrillary tangles) in the autopsied brains of a female patient who suffered from severe dementia. 3) Relate Alzheimer's pathology to Creutzfeld-Jakob (prion) disease, Parkinson's disease, Huntington's disease, and ALS (amyotrophic lateral sclerosis). 4) Define these diseases as those of protein misfolding.	1,2.4 Team Building & Communications	Review of literature describing the current status of research with a view toward new approaches to diagnosis and treatment. Exam writing skills development. Each student will create and submit on 9/24 an original 2-page exam (with answer key) designed to assess learning objectives.

3	Dr. Meilian Liu: mTOR Signaling and Metabolic Diseases	1) Understand of mTOR complex assembly and function. 2) Understand mTOR behaving as a Serine/Threonine kinase and belonging to PI3K family. 3) Understand the role of mTOR signaling in regulating glucose and lipid homeostasis. 4) Understand the mechanisms that underlie the regulation of mTOR signaling. 5) Explain the relationship between mTOR signaling and obesity, type 2 diabetes, aging, and cancer.	1,2 Team Building & Communications	Group discussion and presentation of project.
4	Dr. Karlett Parra: V-ATPases in Health and Disease	1) Define active transport of ions across cellular membranes. 2) Understand the rotational mechanism of proton transport by a model molecular motor (V-ATPase). 3) Understand and interpret experimental evidences demonstrating V-ATPase (and related ATP synthase) molecular rotation and virulence. 4) Demonstrate understanding of a pH sensitive HST assay to selectively screen for V-ATPase inhibitor molecules. 5) Explain the roles of V-ATPase in pH regulation and C. albicans virulence. 6) Explain the cellular and physiologic	1,2,4 Team Building & Communications Biochemical Evolution	Discussion of published literature. Summative: Exam at end of unit.

		functions of V-ATPase pumps in fungi and humans and its link to glycolysis. 7) Recognize human pathologies (cancer, renal dysfunction, and osteopetrosis) resulting for V-ATPase genetic mutations. 8) Demonstrate understanding of the concepts of IC50 to interpret efficacy of an enzyme inhibitor.		
5	Dr. Natalie Adolfi: Breast and Ovarian Cancers	1) Be able to discuss where new opportunities lie for improving diagnosis and therapy, with an emphasis on molecular imaging and targeted therapeutics. 2) Define macromolecule-ligand interactions in the context of molecular imaging/targeting. 3) Be able to access information (3 scientific articles from the literature, at least 2 primary sources), assess the information, and incorporate into knowledge base.	2,4 Team Building & Communications	Discussion of published literature. Written assignment (1 page "press release") where the goal is to express the scientific information in a larger context at a level appropriate for an educated, non-scientist reader,
6	Dr. Dorothy Vanderjagt: Research Ethics	1) Understand and be able to define authorship, plagiarism, treatment of data, conflict of interest, use of human and animal subjects, genomic research, and international research as they pertain to research ethics.	4 Team Building & Communications	Group project on an assigned problem and/or a term paper.

BIOCHEMISTRY OF DISEASE Coordinator: **Dr. C. Andy Hu**
Biochem 463/Biochem 563 Depart Biochem & Mol Biol
Fall, 2014 AHu@salud.unm.edu; 272-8816
M, W 1:00 to 2:15 PM
College of Nursing (CoN) Room 353-- In College of Pharmacy & Nursing Building, EXCEPT MONDAY, AUGUST 18 AND WEDNESDAY, AUGUST 27, THESE TWO MEETINGS WILL BE HELD AT CoN257.

Biochemistry of Disease consists of five 3-week topics, each designed to develop basic and advanced concepts of biochemistry, cell and molecular biology in the context of health and disease states.

Prerequisite: Biochem 445 or Biochem 423

Topic #1: Aug. 18 to Sep. 8 (8/18, 8/20, 8/25, 8/27, 9/3, and 9/8)

Inborn Errors of Proline Metabolism

Dr. C. Andy Hu (email: AHu@salud.unm.edu; office: BMSB258)

Proline metabolism in mammals involves four other amino acids, glutamate, ornithine, arginine, and glutamine, and 7 enzymatic activities, Δ^1-pyrroline-5-carboxylate (P5C) reductase (P5CR), proline dehydrogenase/proline oxidase (PRODH/POX), P5C dehydrogenase (P5CDH), P5C synthase (P5CS), ornithine-δ-aminotransferase (OAT), glutamine synthetase (GS), and glutaminase (GLS). With the exception of OAT, which catalyzes a reversible reaction, the other 6 enzymes are unidirectional, suggesting that proline-related metabolism is purpose-driven, tightly regulated, and compartmentalized. This five-amino-acid system also links with three other essential metabolic systems, namely the TCA cycle, the urea cycle, and the pentose phosphate pathway. In this section, we will discuss the biochemistry and molecular biology of proline metabolism and its related abnormalities.

Note: this section will be assessed by a group project and term paper.

Topic #2: Sep. 10 to Sep. 29 (9/10, 9/15, 9/17, 9/22, 9/24, and 9/29)

Diseases of Protein Folding: Current Strategies in Alzheimer's Disease Research

Dr. Edward Moczydlowski (email: egmoczy@sandia.gov; office: 505-284-9347; cell 505-259-0011)

The first clue of a biochemical correlate to Alzheimer's Disease (AD) pathology was published in 1907 by Alois Alzheimer with the histological description of extracellular deposits (amyloid plaques) and intracellular lesions (neurofibrillary tangles) in the autopsied brain of a female patient who suffered from severe dementia. Today AD is recognized as one of several largely intractable diseases of protein folding that include Creutzfeld-Jakob (prion) disease, Parkinson's disease, Huntington's disease, and ALS (amyotrophic lateral sclerosis). These diseases all involve pathological repercussions of protein misfolding. The course objective is to review the current status of research with a view toward new approaches to diagnosis and treatment.

Note: This section will be assessed by an exercise in exam writing. Each student will create and submit on 9/24 an original 2-page exam (with answer key) designed to assess learning objectives. (Pretend you are the course instructor.) The final session of the course on 9/29 will be devoted to review of class exam submissions and discussion of practical aspects of testing as implemented in science courses.

Topic #3: Oct. 1 to Oct. 20 (10/1, 10/6, 10/8, 10/13, 10/15, and 10/20)

mTOR Signaling and Metabolic Diseases

Dr. Meilian Liu (email: meilianliu@salud.unm.edu; office: BMSB 257)

The mechanistic (or mammalian) target of rapamycin (mTOR) is an intracellular energy sensor, which integrates distinct signals such as hormone, nutrient, and stress, and plays an important role in regulating multiple cellular processes including protein translation, lipid metabolism, cell growth and survival. mTOR exists in two distinct complexes, mTORC1 and mTORC2, which differ in subunit compositions and biological functions. The dysregulation of mTORC1 and mTORC2 are associated with numerous diseases, such as obesity, diabetes, cancer, depression, Alzheimer disease and aging. This section will discuss the composition of mTOR complexes, mTOR signaling transduction, the regulation of mTORC1 and mTORC2, functional role of mTOR signaling, and mTOR-related diseases.

Note: this section is projected to have a sectional examination on 10/20.

Topic #4: Oct. 22 to Nov. 10 (10/22, 10/27, 10/29, 11/3, 11/5, and 11/10)

V-ATPases in Health and Disease

Dr. Karlett Parra (email: Kjparra@salud.unm.edu; office: BMSB 249)

V-ATPase proton pumps are molecular motors that acidify cellular compartments and energize membranes. A broad spectrum of physiological processes relies on V-ATPase activity including endocytic and secretory vesicular transport, zymogen activation, and protein sorting. Cancer, distal renal tubular acidosis, fungal infections, male fertility, and osteopetrosis are malignancies associated with V-ATPase function and dysfunction. This section will discuss scientific literature describing V-ATPase structure, function and regulation in normal physiology and pathophysiology.

Note: this section is projected to have a sectional examination on 11/10.

Topic #5: Nov. 12 to Dec. 1 (11/12, 11/17, 11/19, 11/24, 11/26, and 12/1)

Research Ethics

Dr. Dorothy VanderJagt (email: dvanderjagt@salud.unm.edu; office: BRF227)

This section will provide an overview of research ethics and will include such topics as authorship, plagiarism, treatment of data, conflict of interest, use of human and animal subjects, genomic research, and international research. There will be no exam for this section. Instead, students will be graded on a group presentation to the class during the last two sessions on an assigned problem. A brief written report on the same question will be turned in the last day of section. Details and logistics will be explained during the first session.

Note: this section will be assessed by a group project and/or a term paper.

PDFs of Syllabi, slide files, and reading materials will be posted on the "UNM Learn", https://learn.unm.edu

Grading: the final average score of all five sections

>95, A+; >90, A; >85, A-; >80, B+; >75, B; >70, B-; >65, C+; >60, C

Course Framework and Alignment Instructions with Form

Syllabus Provided

Course Name: Biochemistry of Human Disease

Course Director's Name: Martina Rosenberg Date: Spring Semester

Course Number: Bioc 464 Credit Hours: 3 credit hours

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- Predict the effects of specific alterations of structure on the dynamic properties of the molecule
- Predict the determinants of specificity and affinity of a macromolecule-ligand complex
- Compare and contrast the potential ways in which the function of a macromolecule might be altered, including examples of allosteric regulation, covalent regulation, and gene level alterations of macromolecular structure/function.

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- Define what a genome consists of, and how the information in the various genes and other sequence classes within each genome are used to store and express genetic information.
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- Analyze pre-existing or novel data and relate the findings in light of the theory of evolution.
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- Predict how changes in a nucleotide sequence can influence the expression of a gene or the amino acid sequence of the gene product (protein) and translate these findings into a conclusion about how said mutation would impact the general fitness of an organism or population

PERSONAL COMMUNICATION AND TEAM BUILDING SKILLS

- Recognize and take advantage of opportunities for interdisciplinary collaboration
- Appreciate and promote the ethical dimensions of science
- Work safely independently and in an effective team in a variety of laboratory settings
- Practice critical self-reflection in order to progress as a scientist and as a life-long learner

Course Framework and Alignment Table

Topic No.	Topic	Instructor-designed Learning Objectives	Indicate ASBMB Core Concept and/or skill	By what method are you assessing if students have accomplished the learning objective?
1	Dr. Raj Shah Metabolic Syndrome	1) Describe the epidemiology of metabolic syndrome with main emphasis on obesity and diabetes and its complications with economic impact. 2) Understand the two major complications of diabetes: Microvascular and Macrovascular. 3) Delineate the biochemistry of diabetic complications (four major hypotheses). 4) Describe the diabetic complications of: Eye, Kidney, and Nerve. 5) Describe the mechanism of Dyslipidaemia and atherogenesis.	2 Team Building Ethical Considerations & Self-Reflection	In-class assignments Summative Exam: 50-70% critical thinking multiple choice questions 20-30% case-based application questions Option: real life research project for 90%
2	Dr. Dorothy Vanderjagt: Anemias	1) Define what anemia is and the effect on human health. 2) Distinguish major types of anemias. 3) Describe the composition of red blood cell membranes and the functions of these main components. 4) Explain the role of the pentose phosphate pathway in red cell metabolism.	1,2 Team Building & Communications	Following each lecture, students are given a homework problem that is turned in at the next session when the problem is discussed in class. The homework accounts for 50% of the grade. An exam is given at the last session and accounts for the other half of the grade. Total points are =100.

		5) Explain the consequences of glucose-6-phosphate deficiency in the red blood cell. 6) Explain the biochemical basis for anemias of genetic, metabolic and nutritional origin. 7) Describe properties of red blood cells, and the roles of erythropoietin and hypoxia-inducible factor in red cell homeostasis. 8) Describe iron homeostasis and how iron is transported and stored. 9) Recognize the structure of folic acid and how it is metabolized. 10) Describe the consequences of folate and/or vitamin B12 deficiency. 11) Explain the biochemical basis for the laboratory diagnosis of sickle cell disease. 12) Describe the synthesis of heme and effects of different types of porphyrias on heme synthesis.		
3	Dr. Mebratu: Apoptosis and Inflammation in Lung Diseases	1) Compare and contrast apoptotic cell death to necrosis. 2) Understand the significance of apoptosis in development, morphogenesis, and diseases. 3) Understand the Intrinsic and	1,2,4 Team Building & Communications	Individual assignment and one group assignment each representing 50% of the final grade.

		Extrinsic molecular apoptotic death Pathways. 4) Understand the significance of apoptosis in health and diseases. 5) Understand the regulation of apoptosis in chronic lung diseases.		
4	Dr. Sherman Garver: Salivary and Gastric Glands	1) Describe the function of different cells that comprise a salivon and the primary functions of saliva. 2) Name the six (6) types of diffusion (protein function) across hydrophobic membranes. 3) Describe the key enzymatic reaction that drives production of primary and secondary saliva. 4) Name a disease that results from impaired secretion of saliva. 5) Draw a diagram describing how dietary macronutrients stimulate secretion of HCL. 6) Draw a diagram describing how gastric acid inhibits secretion of HCL. 7) Describe the primary function and necessary proteins of Chief cells. 8) Describe the primary function and necessary proteins of mucous cells. 9) Name a disease that results from mucosal erosion of the stomach	1,2,4 Team Building & Communications	Summative: Exam at end of unit.

		and/or small intestine.		
5	Pancreas and Small Intestine Glands	1) Understand the cellular architecture of the pancreas, especially with regard to exocrine and endocrine function. 2) Describe the function of different cells (acinar and ductal cells) that comprise the exocrine pancreas. 3) Name the general types of digestive enzymes that are secreted from the exocrine pancreas. 4) Describe how inactive zymogens are activated to produce active digestive enzymes in the small intestine. 5) Describe regulation of pancreatic secretions during the cephalic, gastric, and intestinal phases. 6) Draw a diagram describing how “I cells” of the intestinal mucosa secrete cholecystokinin (CKK). 7) Understand the primary purpose of bicarbonate and water secretion from pancreatic ductal cells and the origin of bicarbonate ion production. 8) Understand the biochemical mechanism of how cystic fibrosis	2,4 Team Building & Communications	Summative: Exam at end of unit.

		leads to pancreatic insufficiency.		
6	Digestion and Absorption of Protein and Carbohydrates	1) Understand the purpose of zymogen secretion by pancreatic acinar cells, followed by activation in the intestinal lumen. 2) Understand how proteases digest proteins and peptides in the intestinal lumen (ie., endopeptidase and exopeptidase hydrolysis reactions). 3) Describe the mechanism whereby amino acids and small peptides are absorbed from the intestinal lumen into the blood. 4) Recognize the structure of common dietary carbohydrates (amylose, amylopectin, lactose, sucrose). 5) Know the chemical bonds that are hydrolyzed by the enzymes amylase, maltase, isomaltase, lactase, and sucrose. 6) Describe the molecular basis for lactase deficiency or lactose intolerance. 7) Describe the absorption (intestinal lumen into blood steam) of monosaccharides by intestinal enterocytes.	1,2 Team Building & Communications	Summative: Exam at end of unit.

7	Digestion and Absorption of Lipids	1) Name the dietary lipids (and provide the general structure) entering the duodenum from the stomach. 2) Know the enzymatic reaction catalyzed by the acidic lipases (lingual and gastric lipase). 3) Describe the phase transitions of dietary lipids necessary for absorption by intestinal enterocytes. 4) Understand the difference for the origins of primary bile acids and secondary bile acids. 5) Know the enzymatic reactions catalyzed by pancreatic lipase and phospholipase A2. 6) Know the two enzymatic reactions catalyzed by the non-specific cholesterol esterase. 7) Describe two mechanisms by which intestinal enterocytes regulate the absorption of dietary cholesterol. 8) Name four (4) therapeutic molecules being used to limit fat absorption or appetite to prevent/treat excessive weight gain	1,2,4 Team Building & Communications	Summative: Exam at end of unit.

		and how these molecules function.		
8	Pharmacology of Digestive Disorders	1) Describe the general chemical structure of all statins. 2) Describe the physiological mechanism for how statins decrease blood LDL concentrations. 3) Besides decreasing blood LDL concentrations, name two additional physiological mechanisms of action for how statins may be used to treat cardiovascular disease. 3) Describe the physiological mechanism for how Ezetimibe decreases blood LDL concentrations. 4) Describe the physiological mechanism for how bile acid sequestrants decrease blood LDL concentrations. 5) Describe the physiological mechanism for how niacin decreases blood triacylglycerol concentrations. 6) Describe the physiological mechanism for how ursodeoxycholic acid is used to treat gallstones. 7) Describe the physiological mechanism of action for how the	1,2 Team Building & Communications	Summative: Exam at end of unit.

		drug called “Creon” is used to treat chronic pancreatitis.		
9	Dr. Martina Rosenberg Your brain on food	1) Review metabolism in context of dietary sources. 2) Outline the connection of specific brain regions (e.g. limbic system & Hypothalamus on feeding behavior). 3) Relate molecules involved in information flow to and from the brain to nutritional state of tissues and cells. 4) List the players in basic CNS signaling events and explain their interaction.	1,2,3 Interdisciplinary Studies	Clicker questions, Summative exam at end of unit
10	Neural control of appetite	1) Explain the connection of specific brain regions (e.g. limbic system & Hypothalamus on feeding behavior). 2) Differentiate between the cognitive and metabolic role of the brain in food uptake.	2,3 Interdisciplinary Studies	Formative: worksheet activity , Summative exam at end of unit
11	Homeostasis and reward aspects of food intake	1) Explain the mechanisms of the reward circuit in context. 2) Define addiction on a cellular and molecular level. 3) Differentiate between liking versus wanting on molecular level.	Interdisciplinary Studies	Formative: worksheet activity, clicker , Summative exam at end of unit

12	Diets	1) Compare and contrast the impact of different nutritional compositions of food (Low cal diets vs no carb diets). 2) Explain the the hunger-obesity paradox. 3) Explain why patterns of food uptake matter.	1 Interdisciplinary Studies	Summative exam at end of unit
13	Disorders	1) Explain what is known about the CNS involvement in disorders related to eating and give examples. 2) Explain what is known about diet and the relation to CNS disorders and give examples. 3) Outline the controversy about the connection of ampetamines, anorexia, D2 downregulation. 4) Define neural regulation of brown fat in obesity.	Interdisciplinary Studies	Summative exam at end of unit
14	Transporter and addiction	1) Explain which mechanisms of regulation may be employed in the DAT system. 2) Integrate Ca2+ signaling, regulatory G-proteins, vesicle transport, translational control, receptor density.	Interdisciplinary Studies	Summative exam at end of unit

Biochemistry of Disease II

BIOC 464 Spring 2015 M,W 1:00-2:15pm COP 353/357

Course Director: Martina Rosenberg
mrosenberg@salud.unm.edu
Basic Research Facility BRF 223 J
Phone: 272-6778

Office hours by arrangement. To set up an appointment see me after class or use the contact information above.
Do not hesitate to contact any of the instructors if you have questions.
In general, we will do our best to respond to you in a timely fashion, but emails after 7pm and on weekends may not get attention immediately.

Prerequisites
BIOC 423 or BIOC 445

Course Description and Goals:

In this class you will explore selected basic concepts of biochemistry, cell biology and molecular biology in the context of health and disease states. It is team taught consisting of five 3-week topics. *3 credits, 16 weeks.*

What we hope you get out of this course is the ability to

1. connect foundamental concepts of biochemistry to human physiology
2. compare and contrast specific biochemical events in health and disease
3. use the 'language' of biochemistry (disciplinary literacy)
4. identify challenges and/or limitations in research approaches, devise improvements and present your ideas in class
5. apply your knowledge of processes in biochemistry by creating a hypothesis, investigating, evaluating, integrating and reflecting using biochemical data
6. communicate effectively (understand others and express yourself), in written or oral forms of presentation.

TOPIC #1 ***Complications of Metabolic Syndrome***
Jan 12 to Feb 2 [1/12, 1/14, 1/21, 1/26, 1/28, 2/2: no instruction on MLK Day]

Instructor: Dr. Vallabh Raj Shah (vshah@salud.unm.edu; Office: BRF-223G; Phone: 272-9615)

Learning Objectives:

1. Describe the epidemiology of Metabolic syndrome with main emphasis on diabetes and its complications with economic impact
2. Understand the two major complications of diabetes: Microvascular and macrovascular
3. Delineate the biochemistry of diabetic complications (four major hypotheses)

4. Describe the diabetic complications of: Eye, Kidney, and Nerve
5. Describe the mechanism of dyslipidaemia and atherogenesis

TOPIC #2 ***Biochemistry of the Anemias***
Feb 4 to Feb 23 [2/4, 2/9, 2/11, 2/16, 2/18, 2/23]

Instructor: Dr. Dorothy VanderJagt (dvanderjagt@salud.unm.edu; Office: BRF227; Phone: 272-5799)

Anemia is defined as a deficiency of red blood cells. This condition can result from blood loss, decreased production, or increased destruction red blood cells. During this section of the course we will discuss the nutritional causes as well as the metabolic and genetic causes of anemia. Students will be given a problem question after each lecture to be handed in at the beginning of the next meeting. The written homework will constitute 50 % of the grade. The remainder of the grade will be calculated from the score obtained on a written examination given at the last session

Learning Objectives: Available on UNMLearn in Unit 2

TOPIC #3 ***Apoptosis and Inflammation in Lung Diseases***

Instructor: Dr. Yohannes Mebratu (ymebratu@lrri.org) Phone: 348-9163
Feb 25 to March 23 [2/25, 3/2, 3/4, 3/16, 3/18, 3/23; no instruction during spring break]

This section will review biochemical, cellular, and molecular bases of apoptotic cell death in mammalian cells, with a focus on the role of apoptosis in during development, in chronic lung diseases and cancer.

Learning Objectives: Available on UNMLearn in Unit 3

TOPIC #4 ***Digestion and Energy Balance***
Instructor: Dr. William S. Garver (WGarver@salud.unm.edu); Office Fitz Bldg 265, Phone: 272-4790
March 25 to April 13 [3/25, 3/30, 4/1, 4/6, 4/8, 4/13]

We are discussion the role of glands in digestion, how the macromolecules in our diet are absorbed and digestive disease connected these phenomenas.

Learning Objectives: Available on UNMLearn in Unit 4

TOPIC #5 ***Your Brain on Food***
Instructor: Dr. Martina Rosenberg (mrosenberg@salud.unm.edu; Office: BRF223J; Phone: 272-6778)

April 15 to May 4 [4/15, 4/20, 4/22, 4/27, 4/29, 5/4]

In this sections we take another look at the role the brain plays in food uptake and discuss the legitimacy of the term “food addiction”.

Learning Objectives: Available on UNMLearn in Unit 5

How to succeed in this course

You will encounter different formats of presentation of the material depending on the instructor’s preference. This may include traditional lecture or components of active learning and small group work. Trying to explain your thinking to your classmates (in class and outside of class) is a good strategy that will help you to improve your understanding.
Independent of format: What you take away from this class is determined in large by how much effort you are investing in your learning:
Come to class prepared and be engaged; it gives you an opportunity to test if you can apply what you know. Focus on the *learning objectives* to guide you in review of the content and studying for the exams. Reflect on what you think the take home message was, what you need to close the gaps in your understanding, how would you test if your understanding is correct, and how this new information relates to things that you have learned previously.

Class material:

- ❑ there is NO required textbook, but you may want to use any of the standard Biochemistry books as reference
- ❑ Other material as needed, e.g. loose sheets of paper and writing utensils
- ❑ **Material on UNMLearn**

Lecture notes, including objectives, unit syllaby, reminders and any additional material is available as pdf through UNMLearn (https://learn.unm.edu/webapps/login). Make sure to check this site for announcements as well. Should you encounter technical problems with UNMLearn call 277-0857.

Course Policies and Conduct

The following is expected to ensure an undisrupted experience for everyone in class:

- ❑ Be on time and ready for class,
- ❑ No cell phone use during class, please turn them off,
- ❑ Computer and tablet use is permitted only for class related activities, i.e. for note taking and following the online lecture handouts – but not for surfing the Internet or e-mails,
- ❑ Consequences of distracting or disruptive behavior are the instructor’s prerogative.

If you have a disability or special needs, please notify the course director as soon as possible of any concerns or requests for accommodations and specific

arrangements needed. It is your responsibility to contact the UNM Accessibility Resource Center (ARC, online at arc.unm.edu ; phone: (505) 277-3506). They are located on the second floor of Mesa Vista Hall (across the courtyard from the SUB) Room 2021. ARC will provide written documentation of your verified disability and recommended accommodations.

Academic Integrity

You are expected to

- ❑ commit to a code of values that honors academic and personal integrity, honesty and ethical standards,
- ❑ complete your own work; all students are expected to work individually on in-class exams.
- ❑ acknowledge work and ideas of another person by appropriate citation. Collaborators must be acknowledged on any written assignments, and assignments must not contained verbatim copying of any kind from any source, *including* the internet.

In this course, any incident of academic dishonesty will result in the attachment of a failing grade for that assignment and may involve university disciplinary action.

Absences

Attendance is expected and your class participation is part of your grade. However: Life happens. During your absences *you* are responsible for acquiring any material covered and assignments given. In the event of UNM closure check for extra instructions on UNM Learn.

Grading Criteria

Please refer to the unit instructor's policies on assessments. The final grade is the average of the points awarded in each unit (200pts each =1000pts=100%)

The final grade will be the total percentage achieved in all five and determined as follows:

A+	95.0% or more
A	90.0%
A-	85.0%
B+	80.0%
B	75.0%
B-	70.0%
C+	65.0%
C	60.0%
Fail	59.9% or less

Course Framework and Alignment Instructions with Form

Syllabus Provided

Course Name:_Scientific Writing

Course Director's Name: Dorothy Vanderjagt Date: Fall Semester

Course Number: Biomed 505 Credit Hours: 2 credit hours

ASBMB Core Concepts and Associated BMB Learning Objectives

ASBMB Core Concept 1: Energy is Required by and Transformed in Biological Systems

- Apply their knowledge of basic chemical thermodynamics to biologically catalyzed systems
- Relate the laws of thermodynamics to homeostasis and explain how a cell or organism maintains homeostasis (a system seemingly in equilibrium) using nonequilibrium mechanisms.
- Quantitatively model how these reactions occur, and calculate kinetic parameters from experimental data.
- Discuss the concept of Gibbs free energy, and apply it to chemical transformations
- Identify which steps of metabolic pathways are exergonic and which are endergonic and relate the energetics of the reactions to each other.
- Show how reactions that proceed with large negative changes in free energy can be used to render other biochemical processes more favorable.
- Describe homeostasis at the level of the cell, organism, or system of organisms and hypothesize how the system would react to deviations from homeostasis.
- Summarize the different levels of control (including reaction compartmentalization, gene expression, covalent modification of key enzymes, allosteric regulation of key enzymes, substrate availability, and proteolytic cleavage), and relate these different levels of control to homeostasis

ASBMB Core Concept 2: Macromolecular Structure Determines Function and Regulation

- Discuss the diversity and complexity of various biologically relevant macromolecules and macromolecular assemblies in terms of the basic repeating units of the polymer and the types of linkages between them
- Outline the chemical and physical relationships between sequence and structure of macromolecules and evaluate chemical and energetic contributions to the appropriate levels of structure of the macromolecule
- Predict the effects of specific alterations of structure on the dynamic properties of the molecule
- Predict the determinants of specificity and affinity of a macromolecule-ligand complex
- Compare and contrast the potential ways in which the function of a macromolecule might be altered, including examples of allosteric regulation, covalent regulation, and gene level alterations of macromolecular structure/function.

ASBMB CORE CONCEPT 3: INFORMATION STORAGE AND FLOW ARE DYNAMIC AND INTERACTIVE

- Define what a genome consists of, and how the information in the various genes and other sequence classes within each genome are used to store and express genetic information.
- Explain the central dogma of biology (the message in DNA is transcribed into RNA and translated into protein) and relate the commonality of the process to all of life.
- Diagram how DNA is replicated and genes are transmitted from one generation to the next in multiple types of organisms including bacteria, eukaryotes, viruses, and retroviruses.
- Describe how the cell insures high fidelity DNA replication and identify instances where the cell employs mechanisms for damage repair.

ASBMB CORE CONCEPT 4: DISCOVERY REQUIRES OBJECTIVE MEASUREMENT, QUANTITATIVE ANALYSIS, & CLEAR COMMUNICATION

- Develop a hypothesis, and design and conduct appropriate experiments to test that hypothesis, explaining the basis of the proposed experiments and discussing potential results in the context of the hypothesis
- Analyze and interpret data using appropriate quantitative modeling and simulation tools
- Access, assess, and use available information
- Present scientific data in an appropriate context and in a variety of ways, at different levels

ASBMB EXPECTATION: ROLE OF BIOCHEMISTRY IN EVOLUTION

- Describe the principles of evolution through natural selection as foundational to biochemistry and molecular biology, and defend these principles in their work, schools, and communities.
- Use the tools of biochemistry and molecular biology (including databases of biological molecules and functional assays) to explain changes in traits, adaptations, and the success or failure of organisms and species.
- Analyze pre-existing or novel data and relate the findings in light of the theory of evolution.
- Describe what a mutation is at the molecular level and how it comes about
- Predict how changes in a nucleotide sequence can influence the expression of a gene or the amino acid sequence of the gene product (protein) and translate these findings into a conclusion about how said mutation would impact the general fitness of an organism or population

PERSONAL COMMUNICATION AND TEAM BUILDING SKILLS

- Recognize and take advantage of opportunities for interdisciplinary collaboration
- Appreciate and promote the ethical dimensions of science
- Work safely independently and in an effective team in a variety of laboratory settings
- Practice critical self-reflection in order to progress as a scientist and as a life-long learner

Course Framework and Alignment Table

Topic No.	Topic	Instructor-designed Learning Objectives	Indicate ASBMB Core Concept and/or skill	By what method are you assessing if students have accomplished the learning objective?
1	Introduction to the course.	1) Be able to discuss expectations and grading, attitudes toward writing, authorship, and plagiarism.	All topic areas will align with Core Concept 4, and may include Cores 1,2, and 3 depending on the nature of research Team Building & Communications Skills	Participants are required to have their own data for the basis of their manuscript and are expected to have a complete manuscript by the end of the semester. The class is interactive and participants spend half of each session reading and critiquing fellow participants writing.
2	Elements of a good title/ Demonstration of computerized reference management programs	1) Be able to construct a concise information title that accurately reflects the work. 2) Understand and use reference management programs.		
3	Read and critique Titles Discuss Introduction	1) Understand the components of the Introduction including organization and balance.		
4	Read and critique Introductions Discuss Methods Read and critique Methods Introduce the Results	1) Understand the components of the Methods, Results, Discussion, and Abstract.		

	Read and critique Results Introduce Discussion Read and critique Discussions Introduce the Abstract Read and critique Abstracts.			
5	The Publication Process	1) Understand perspectives from a journal editor, including the submission process, letter of submission, manuscript revisions, and addressing response to reviewers.		

BIOMED 505-Scientific Writing

Dorothy VanderJagt, Ph.D.
Research Associate Professor
Department of Biochemistry and Molecular Biology

BIOMED 505 (Scientific Writing) is a one semester, two-credit course that is offered in the fall semester each year. Participants include graduate students, postdoctoral fellows, advanced undergraduates, faculty, and other health professionals from both the Health Sciences Center and the UNM main campus. The class meets on Thursday afternoons from 3:00-5:00 p.m. The course provides instruction in the structure and organization of a research manuscript and addresses other topics such as ethics of authorship, efficient use of reference data bases, and an overview of the publication process presented by a current editor of a scientific journal.

Participants are required to have their own data for the basis of their manuscript and are expected to have a complete manuscript by the end of the semester. The class is interactive and participants spend half of each session reading and critiquing fellow participants writing. Because of the interactive nature of the course, it is limited to ten students.

UNM The University of New Mexico
Biochemistry Major
Department of Biochemistry & Molecular Biology

Honors in Biochemistry

Loftfield Awards | Past Research Projects | Publications | Former Students

One of the missions of the Department of Biochemistry and Molecular Biology is to provide a research experience for majors in Biochemistry. Students are eligible to receive departmental honors at graduation if they complete a research project under the supervision of a faculty member in addition to other requirements.

Upon completion of the honors requirements a student will receive cum laude, magna cum laude, or summa cum laude honors in Biochemistry at graduation depending on the quality of their research work.

Program Requirements

- **A GPA of 3.2 at the completion of course work**
- **Present your research at the Department of Biochemistry and Molecular Biology Research Day**
- **Submit your senior honors thesis.**
- **Complete 6 hours of research credit (Biochem 497, 498).**

How to begin your honors research

Students usually start their research experience at the end of the second year of course work. However, interested students may begin earlier depending on their interest and the availability of research mentors. The first step is to make an appointment with the Director of Undergraduate Research for the Department of Biochemistry and Molecular Biology for advisement in selecting a research mentor.

Loftfield Award

Students who qualify for honors are eligible to receive one of the Robert B. Loftfield Awards that are presented to senior students for outstanding academic or research performance. These awards are named for Professor Emeritus Robert B. Loftfield, the first Chair of the Biochemistry Department, and are presented at the Department of Biochemistry and Molecular Biology commencement ceremony.

Director of Undergraduate Research

Dr. Chien-An Andy Hu

AHu@salud.unm.edu

THE UNIVERSITY OF NEW MEXICO ◆ HEALTH SCIENCES CENTER
SCHOOL OF MEDICINE

Biochemistry Research Education Program
Department of Biochemistry and Molecular Biology
Basic Medical Sciences Building, Room 249

Robert A. Orlando, Ph.D.
Research Program Director
rorlando@salud.unm.edu

Application form to register for research credit

Please check one of the following research options: ☐ Bioc 497 ☐ Bioc 498 ☐ Bioc 499

Submit this form to the Program Director after selecting your research mentor.

Student Name:

ID number:

Email:

Anticipated Graduation Date:

Project Title:

Research Mentor:

Department Affiliation:

Mentor email:

Research Project Description:

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Mentor agreement form

You have been identified as the research mentor for _____, an undergraduate student who has registered for research credits in Biochemistry and Molecular Biology (course catalog nos. 497, 498 or 499). In order to ensure uniformity in the research experience for students registered for these courses, we provide you with the following guidelines.

For each hour of credit, the student is expected to spend 3 to 4 hours per week in the laboratory. It is recommended that student sign up for no more than 3 to 4 credits per semester without prior approval of the Program Director. The student is required to meet, at minimum, once a week with the Research Mentor to discuss their progress.

At the end of the semester, the student must submit a written progress report to the Research Mentor and provide a copy to the Program Director. This progress report, as well as the quality and quantity of the effort in the laboratory, should be used to assign a grade (see grading policy attached). The progress report should be signed by the Mentor and forwarded to the Program Director at the end of the semester in addition to the recommended grade.

If the student is qualifying for Departmental Honors at graduation, he/she must complete 3 credit hours in both Bioc 497 and Bioc 498, and present their research to the faculty of the Department of Biochemistry and Molecular Biology at the annual Research Day in April. A written thesis of the work must also be submitted by the student to the faculty for review. It is strongly recommended that the Research Mentor assist the student in the preparation of the written and oral presentations and that they both attend the Departmental Research Day.

_____

Signature Date

Research Mentor:

THE UNIVERSITY OF NEW MEXICO ◆ HEALTH SCIENCES CENTER
SCHOOL OF MEDICINE

Biochemistry Research Education Program
Department of Biochemistry and Molecular Biology
Basic Medical Sciences Building, Room 249

Robert A. Orlando, Ph.D.
Research Program Director
rorlando@salud.unm.edu

Grading Policy for Bioc 497, 498 and 499

The grade for the research credit (A,B,C, etc.) will be assigned by the student's Research Mentor and submitted, along with the progress report, to the Program Director by finals week to ensure timely recording of the student's grade.

In grading, the mentor should take the following guidelines into consideration:

1) Time the student spent working on the project. (The student is expected to spend 3 to 4 hours per week on average for each credit hour.)

2) The performance of the student in the laboratory.

3) The quality of the progress report that the student must submit to the mentor.